

Geotechnical Investigation Report: TCAAP Redevelopment Area

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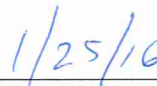
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I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



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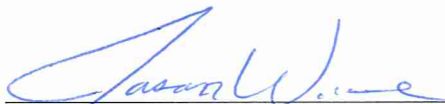


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Responsive partner. Exceptional outcomes.

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1.0 Project Information

1.1 Background

Ramsey County and the City of Arden Hills have formed a partnership to redevelop approximately 427 acres at the former Twin Cities Army Ammunition Plant (TCAAP). The project site is located in Ramsey County, Minnesota predominately within the limits of the City of Arden Hills. The site is located within portions of Sections 9 and 16, Township 30 North, Range 23 West of the 5th Principal Meridian, (the Site). The Site is bounded by U.S. Interstate Highway 35W on the west, Minnesota State Aid Highway (CSAH) 96 to the south and U.S. Highway 10 to the Southwest (Figure 1). The Arden Hills Army Training Site (AHATS) bounds the Site to the east.

An infrastructure improvement plan was developed by Kimley-Horn and Associates, Inc. (Kimley-Horn) to prepare the site for the proposed redevelopment. In support of this plan, Wenck Associates, Inc. (Wenck) was retained to prepare a geotechnical drilling and testing program to evaluate the subsurface conditions in proposed infrastructure improvement areas. A request for quote was completed and presented to Ramsey County to issue for contractor bidding. Bids were received and a contract was subsequently awarded to Northern Technologies, Inc. (NTI) to complete the geotechnical field investigation, sample collection, and sample testing. This report summarizes the geotechnical investigation and sample analysis results completed by NTI, and includes geotechnical recommendations for each development area provided by Wenck.

Previous investigations at the site include a preliminary geotechnical investigation conducted by American Engineering Testing, Inc. and Braun Intertec Corporation for Ryan Companies US, Inc. in 2007. In that investigation, 219 soil borings were conducted on a 500-foot grid across the site to evaluate the general suitability of the site for redevelopment. Information from an interim report of that investigation entitled "*Interim Report-Preliminary Geotechnical Evaluation*" provides an overview of site geology, groundwater conditions, and unsuitable soils. A copy of the report was provided by Ramsey County and is included in Appendix A. The report is referenced herein to supplement the area-specific data collected for this investigation.

2.0 Spine Road Bridge

2.1 Proposed Design Understanding

It is our understanding that the proposed Spine Road Bridge will be supported by a driven pile foundation. The design loads on this foundation were provided by the structural design engineer (Kimley-Horn) as follows:

- ▲ Vertical Reaction: 66 kips/foot
- ▲ Horizontal Reaction (Outward): 90 kips/foot
- ▲ Allowable Horizontal Movement (Outward): 0.84 inches

2.2 Soil Borings

Four soil borings (BR-600, BR-601, BR-602 and BR-603) were completed at the proposed Spine Road Bridge site in the locations shown in Figure 2. Boreholes were advanced with hollow stem auger methods using a 3.25-inch I.D. auger. Standard Penetration Testing was completed at 2.5-foot intervals to a depth of 20-feet below ground surface, then at 5-foot intervals until the end of each boring. All four soil borings were completed to a depth of approximately 75 feet below ground surface.

2.2.1 Southeast Abutment Subsurface Conditions

Borehole locations BR-600 and BR-601 represent the approximate extents of the proposed southeast abutment. In general, materials encountered below the southeast abutment location included varying amounts of fill and undisturbed alluvial and swamp deposit soils composed of fine-grained, medium dense silty sand with organics to depth of approximately 14.5 feet below the surface. A peat layer was encountered in BR-601 from 12.0- 14.5 feet. This material was underlain by sediments composed of medium-dense silty to clayey sand to a depth of approximately 35 feet below ground surface. A medium stiff to very stiff sandy lean clay material was encountered at 35 feet and continued to a depth ranging from 65-76 feet. Very dense poorly graded sand with some gravel was encountered below the sandy lean clay in both borings and continued to termination depth.

Groundwater was encountered at a depth of approximately 17 feet below the surface in BR-600 and approximately 4 feet below the surface in BR-601. The high groundwater elevation in BR-601 is apparently due to water collecting in the organic fill material encountered above the native soils. Heaving sands were also noted at the termination depth in BR-601.

2.2.2 Northwest Abutment Subsurface Conditions

Borehole locations BR-602 and BR-603 represent the approximate extents of the proposed northwest abutment. Materials encountered in these boring generally consisted of a shallow topsoil layer followed alternating layers of silty sand and sandy clay fluvial sediments to an approximate depth of 24 feet. This was underlain by stiff lean clay with sand to a depth of approximately 60 feet. A layer of stiff to very stiff silty lean clay was encountered from approximately 60 -70 feet below the surface, followed by very dense poorly graded sand with gravel to termination depth.

Groundwater was encountered in BR-602 at a depth of 17 feet below the surface, and in BR-603 at a depth of approximately 12 feet. All boreholes were grouted to the surface upon completion. A complete description of materials encountered is given on the boring logs included in Appendix B.

2.3 Sample Collection and Laboratory Testing

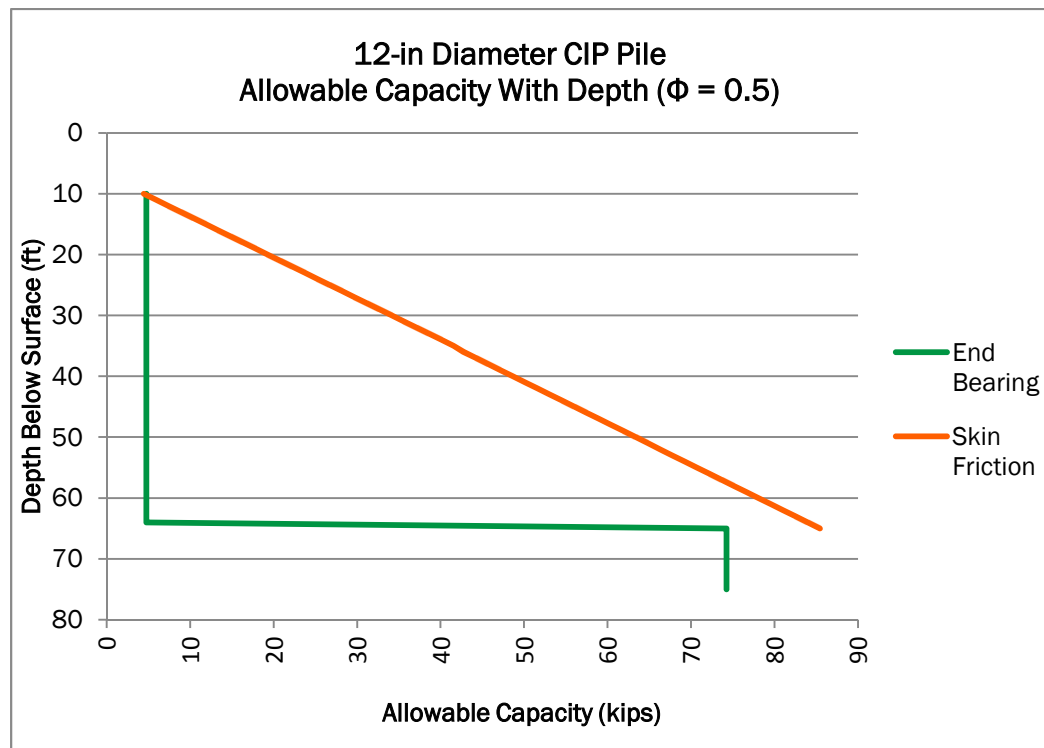
Shelby Tube samples of the clayey sand and sandy lean clay layers were collected at various depths in soil borings BR-600, BR-601 and BR-602. Selected samples were delivered to a soils testing laboratory and tested for the following:

- ▲ Atterberg Limits
- ▲ Moisture Content
- ▲ Mechanical Sieve Analysis
- ▲ Dry Density
- ▲ Tri-axial Compression Testing (CU with pore pressure measurements)

Soils from the samples were classified according to the Unified Soil Classification System using the test results. Summary reports of lab test results are given in Appendix C.

2.4 Driven Pile Capacity Evaluation

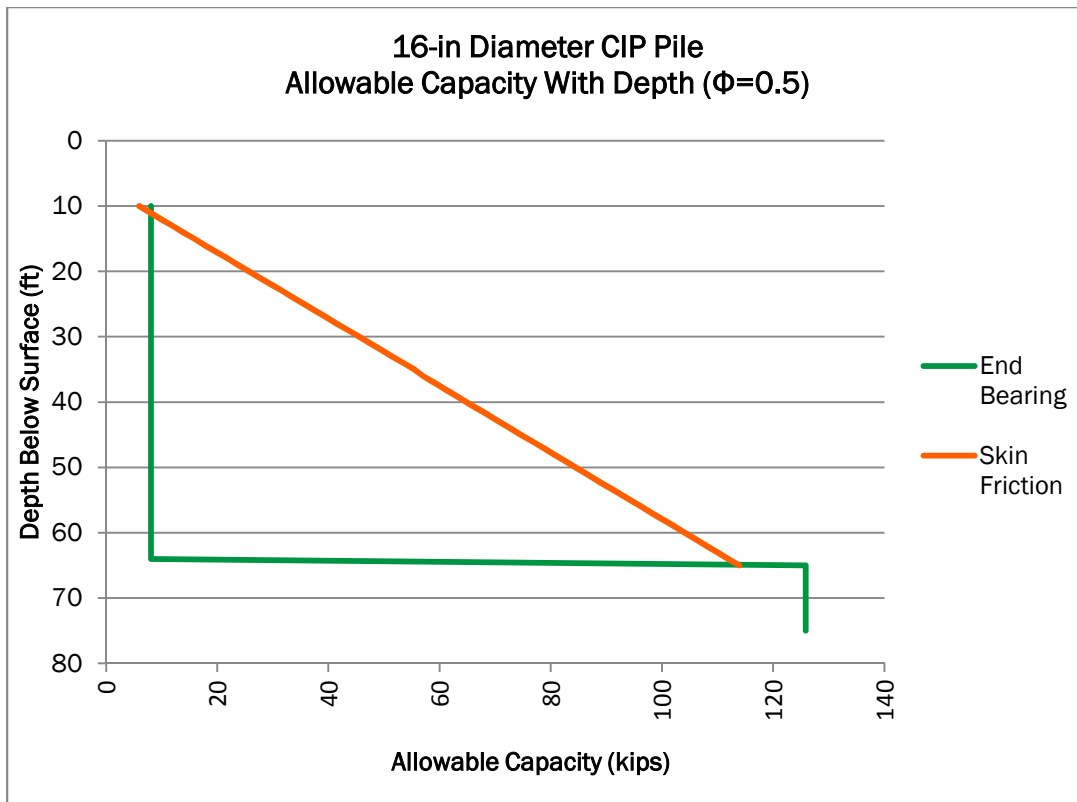
The proposed design calls for the installation of driven pile foundations to support the structure. An evaluation of CIP pile capacity was performed by calculating the ultimate end bearing and skin friction using information from boring log BR-600 and the soil sample data collected from the site. The top 10 feet of soil was neglected in the capacity analysis. An LRFD resistance factor ($\Phi = 0.5$) was used to determine the allowable capacity values (per MnDOT MPF12 for CIP piles). The results of the evaluation are illustrated in the chart below:



The drilled shaft capacity calculations indicate that the allowable end bearing capacity of a 12-inch diameter CIP pile is approximately 5 kips in the clayey sediments ranging from 10-65 feet below ground surface. This is likely conservative because there is typically some increase in soil strength with depth, as indicated by the N-values observed in boring logs BR-601, BR-602, and BR-603. However, there was little to no consistent increase in N-values with depth in the clayey sediments shown in BR-600. Therefore, the most conservative case was evaluated.

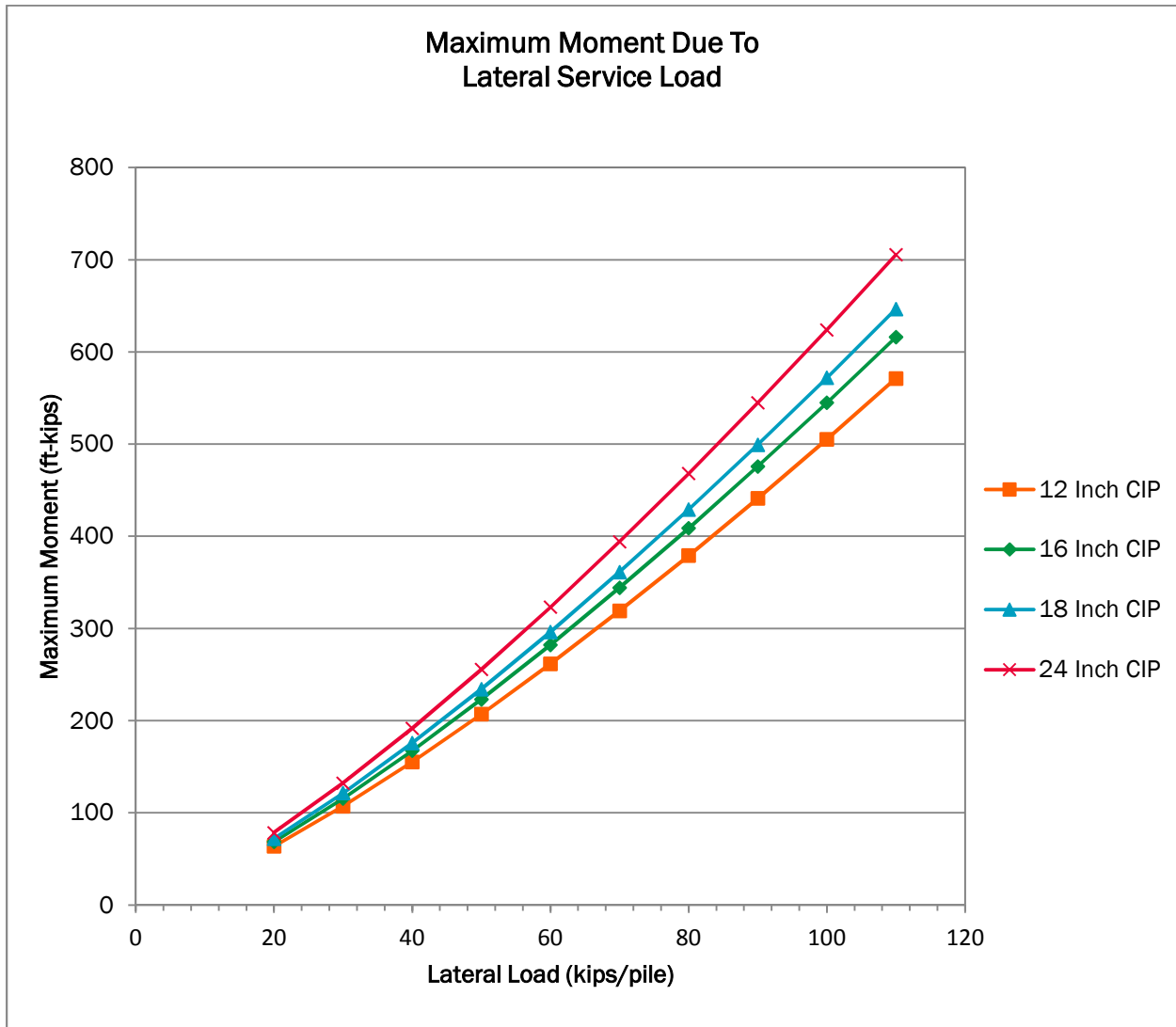
At approximately 65 feet, the calculated allowable end bearing capacity increases to approximately 74 kips as dense sand with gravel is encountered. Allowable skin friction increases at a rate of approximately 1.5 kips/ft over the interval from 10-65 feet below surface. According to the analysis a 12-inch CIP pile driven to the dense sand and gravel bearing strata at 65 feet below surface will provide an allowable vertical load capacity of approximately 155-160 kips.

A 16-inch CIP pile was also evaluated. As shown in the chart below, a 16-inch CIP pile driven to the dense sand and gravel bearing strata at 65 feet below surface will provide an allowable vertical load capacity of approximately 125 kips due to end bearing resistance and 114 kips due to skin friction. The total vertical load capacity is approximately 240 kips.

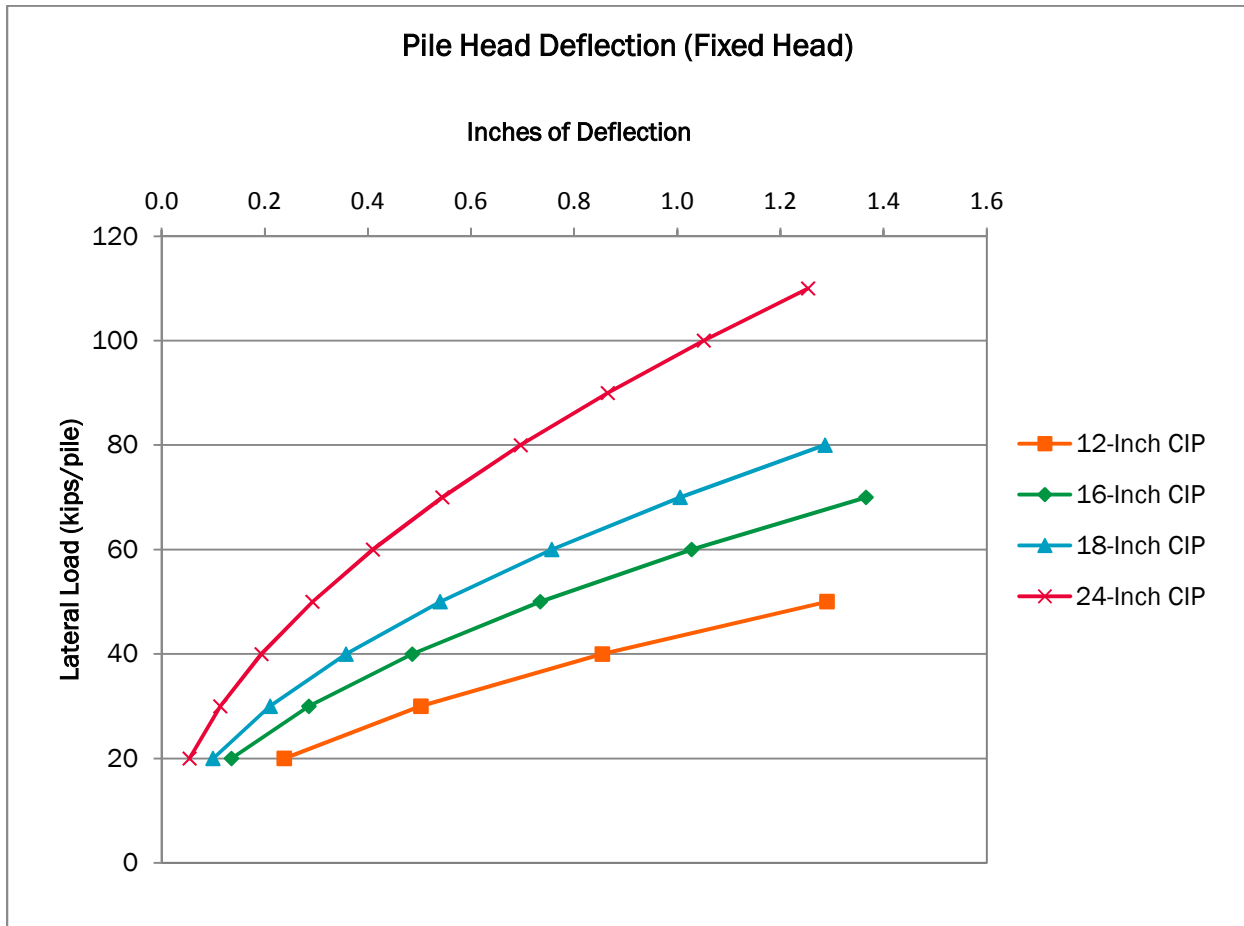


An analysis of lateral capacity of the proposed piles was performed using a software program called LpileCLM2.0 Version1. The analysis included an evaluation of maximum moment and pile head deflection for various piles sizes subject to a range of loads. These analyses were performed without applying load or resistance factors and represent the

ultimate expected values. The results of the maximum moment analysis are shown in the chart below:



The pile head deflection for various pile sizes was also evaluated and the results are shown in the chart below:



A resistance factor of $\Phi = 0.5$ is recommended for use in LRFD pile design (per MnDOT MPF12 for CIP piles).

2.5 Lateral Earth Pressure

Based on the soil properties, we recommend the following coefficients of earth pressure for design purposes:

- ▲ Active: 0.42
- ▲ At Rest: 0.50
- ▲ Passive: 2.37

2.6 Shallow Foundation Bearing Capacity

If shallow foundations are needed for this area, we estimate that shallow foundations bearing on suitable or corrected soils may be designed for an allowable net bearing pressure

of approximately 2500 psf. A coefficient of friction of 0.5 is estimated between the bottom of shallow foundations and suitable base grade soils.

2.7 Soil Correction

The boring logs indicated uncontrolled fill and unsuitable organic soils from the surface to a depth of approximately 14.5 feet below the proposed southeast abutment area. Fill depths of up to 5 feet below the surface were encountered in the northwest abutment area. It is recommended that all uncontrolled fill and organic containing soils be excavated and replaced with suitable controlled fill. The following minimum excavation depths are recommended:

Boring Location	Surface Elevation (ft)	Water Level Elevation (ft)	Minimum Excavation Depth (ft)	Excavation Bottom Elevation (ft)
BR-600	884.7	867.4	14.5	870.2
BR-601	884.8	880.8	14.5	870.3
BR-602	884.4	867.4	5.0	879.4
BR-603	883.3	871.3	4.5	878.8

Excavations for foundation elements such as bridge abutments should extend laterally beyond the edges of the proposed foundation. This extension distance should equal the vertical depth of fill needed to attain foundation base grade (1:1 lateral oversize). Suitable controlled fill material should consist of a free draining graded aggregate material free from frozen soil, organics, vegetation, debris, rocks larger than three inches in diameter. Fill material placed below abutment areas should be placed in maximum eight-inch lifts and compacted to a minimum of 98% Standard Proctor dry density to within three feet of the base grade elevation. The final three feet of aggregate fill should be compacted to 100% Standard Proctor dry density.

Foundation excavations in areas where soil correction has taken place should be inspected by the project geotechnical engineer or competent representative prior to the installation of aggregate base to ensure suitable material exists at the base grade elevation. Unsuitable or soft soils found at base grade elevation in soil corrected areas should be undercut a minimum of 24 inches and backfilled to base grade elevation with a well-graded aggregate material. The aggregate material should be compacted to 100% Standard Proctor dry density.

2.8 Excavation

The stability of excavation side slopes is dependent on soil strength, site geometry, moisture content, and surcharge load from excavated soils and equipment. The Contractor is solely responsible for assessing the stability and executing underground utility and project excavations using safe methods. The Contractor is also responsible for naming the "competent individual" as per Subpart P of 29 CFR 1926.6 (Federal Register - OSHA).

Excavation depths and sidewall inclinations should not exceed those specified in local, state or federal regulations. Excavations may need to be widened and sloped, or temporarily braced, to maintain or develop a safe work environment. Temporary shoring must be designed in accordance with applicable regulatory requirements.

Slopes created by placed fill material should not exceed 3H:1V. No continuous slope face should exceed 20 feet in height. Slopes required to exceed 20 feet in height should be

benched a minimum of 6 feet horizontally for every 20 feet of height to reduce the continuous slope length.

2.9 Dewatering

Groundwater was encountered as shallow as 4-feet below the surface in the project area during completion of the subsurface investigation soil borings. Dewatering will likely be required to keep excavations dry. It is recommended that groundwater be lowered to a level at least 3 feet below the bottom of any planned excavation.

Depending on the depth of the planned excavation, the required dewatering effort may be substantial. A well point or installed well dewatering system may be necessary to reduce the groundwater elevation to the required level. A groundwater cutoff wall created by installation of a grout curtain or sheet pile wall may also be considered if site constraints limit the size of the excavation area. The grout curtain or sheet pile wall would likely need to extend to a depth of up to 35 feet to encounter the less permeably sandy lean clay layer beneath the site. Additional soil borings or CPT soundings should be conducted along the proposed grout curtain or sheet pile alignment to verify required depths if this method is to be used.

2.10 Trenching and Backfill

If utility trenches are needed for the project, they should be backfilled with non-organic suitable soils placed in eight-inch maximum depth loose lifts. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for this use. Frozen soils will not be considered suitable for backfill. The utility trench backfill should be compacted sufficiently to minimize future settlement of green areas and areas that may receive pavement or structures. It is recommended that trench fill soils be compacted as follows:

- ▲ no less than 90% of the Standard Proctor maximum dry density to three feet below top of subgrade elevation
- ▲ no less than 95% of the Standard Proctor maximum dry density from three feet below top of subgrade elevation to top of subgrade elevation for green areas
- ▲ no less than 98% of the Standard Proctor maximum dry density from three feet below top of subgrade elevation to top of subgrade elevation for areas which may receive pavement or will provide foundation support

3.0 Spine Road Alignment

3.1 Proposed Design Understanding

It is our understanding that the Spine Road will be the main thoroughfare of the proposed development area and is anticipated to accommodate moderate to heavy vehicle loads. The alignment investigated includes a secondary roadway north of the proposed round-about known as the Thumb Road (See Figure 3). References to the Spine Road alignment in this report include both roadways.

3.2 Soil Borings

A total of 26 soil borings (SR-200 through SR-225) were completed along the Spine Road alignment in the locations shown in Figure 3. Boreholes were advanced with hollow stem auger methods using a 3.25-inch I.D. auger. Standard Penetration Testing was completed at 2.5-foot intervals to the end of each boring at a nominal depth of 20-feet below ground surface. In some cases, the soil borings could not be completed at the staked location due to accessibility issues. Off-set direction and distances are indicated on the soil boring logs where an off-set was required. Soil boring logs for these boreholes are included in Appendix D.

A review of the soil boring logs indicates that the subsurface along the alignment generally consisted of varying depths of top soil and fill material underlain by glacial, alluvial and occasional swamp deposits. Fill material was composed of poorly graded sand, silty sand, and clayey sand. Glacial deposits consisted of clayey sand, lean sandy clay, and silty clay and were generally encountered underlying the fill material in the south half of the alignment. The alluvial deposits consisted of poorly graded sand and silty sand and were generally encountered underlying the fill material in the north half of the alignment. Localized pockets of swamp deposits (soft, silty clay and peat) were also encountered along the alignment (soil borings SR-200 and SR-218)

Groundwater observations were recorded during drilling on each boring log. Groundwater was not encountered in most soil borings on the south half of the alignment in the clayey sand and lean sandy clay deposits. Groundwater was encountered in the poorly graded sand and silty sand deposits in the north half of the alignment at depths ranging from 7 to 18 feet below ground surface.

3.3 Sample Collection and Laboratory Testing

Representative samples of the clayey soil units encountered were collected for laboratory analysis. Selected samples tested for the following:

- ▲ Atterberg Limits
- ▲ Moisture Content
- ▲ Mechanical Sieve Analysis

The test results were used to confirm the field classifications of soils encountered during the investigation and to provide additional characterization of the clayey soils present at the site.

Tests performed on samples of the clayey sand (SC) and sandy lean clay (CL) soils indicated that they are low to medium plasticity soils and are considered inactive with regard to shrink-swell potential. The results for the samples tested are shown on the soil boring logs in Appendix D.

3.4 Soil Correction

The boring logs indicated varying depths of topsoil, uncontrolled fill material, and swamp deposits along the proposed road alignment. The topsoil and swamp deposits are unsuitable for road subgrade material and it is recommended that they be excavated and replaced with suitable controlled fill. However, much of the existing fill material is of good quality. This material may be excavated approximately three feet below subgrade elevation and replaced as controlled fill. The following minimum excavation depths are estimated along the road alignment based on conditions encountered during the geotechnical investigation:

Boring Location	Soil Boring Surface Elevation (ft)	Groundwater Elevation Encountered (ft)	Estimated Excavation Depth (ft)	Estimated Excavation Bottom Elevation (ft)
SR-200	925.18	911	18.0	907
SR-201	951.10	--	3.0	948
SR-202	955.31	--	1.5	954
SR-203	956.01	--	3.0	953
SR-204	965.60	--	0.0	--
SR-205	951.02	--	0.5	950
SR-206	942.32	--	3.0	939
SR-207	938.51	--	3.0	935
SR-208	935.64	--	3.0	931
SR-209	911.04	--	3.0	908
SR-210	913.64	909	2.0	911
SR-211	907.43	--	3.0	904
SR-212	894.22	880	3.5	890
SR-213	890.76	879	3.0	887
SR-214	890.28	881	1.5	888
SR-215	889.66	883	3.0	886
SR-216	887.29	880	1.5	885
SR-217	886.05	879	0.0	--
SR-218	883.67	869	14.5	869
SR-219	898.15	--	3.0	895
SR-220	884.33	--	3.0	881
SR-221	892.07	877	3.0	889
SR-222	897.17	880	3.0	894
SR-223	898.48	881	3.0	895
SR-224	899.93	884	3.0	897
SR-225	898.97	--	0.0	--

3.5 Excavation

Excavations for the road subgrade soil correction should extend laterally beyond the edges of the proposed base aggregate. This extension distance should equal the vertical depth of fill needed to attain base grade (1:1 lateral oversize). Soil correction excavation areas should be inspected by the project geotechnical engineer or competent representative prior

to the installation of controlled fill to ensure suitable material exists at the base of the excavation.

3.6 Dewatering

Groundwater was generally encountered in the silty sand material in the northern half of the proposed road alignment during this investigation. However, during the preliminary investigation conducted in 2007, groundwater was encountered site wide, including the area along the southern half of the proposed road alignment. A site-wide groundwater contour map was produced based on those observations and included in the *Interim Report-Preliminary Geotechnical Evaluation, (AET and Braun, 2007)* attached in Appendix A.

Based on groundwater observations from this investigation and the 2007 preliminary investigation by AET and Braun, groundwater may be encountered during excavation for soil correction activities along the Spine Road alignment. It is recommended that groundwater be lowered to a level at least 3 feet below the bottom of any planned excavation to allow dry placement of controlled fill.

3.7 Controlled Fill

Controlled fill suitable for subgrade backfill in soil correction areas along the proposed road alignment should consist of material free of high plasticity clays, silt, organics, vegetation, debris, and rocks larger than three inches in diameter. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for subgrade backfill when placed and compacted as controlled fill.

The base of the excavation should be scarified and re-compacted prior to placement of controlled fill material. Controlled fill material should be moisture conditioned to within +/- 3% of optimum moisture content and placed in maximum eight-inch lifts. Controlled fill should be compacted to a minimum of 95% of the Standard Proctor dry density to within three feet of the base grade elevation. The final three feet of controlled fill placed for subgrade backfill should be compacted to a minimum of 98% of the Standard Proctor dry density.

3.8 Estimated Subgrade R-Value

Table 5-3.3a of the MNDOT Pavement Manual indicates that typical R-Values for non-plastic sands and sandy loam soils range from 30-70, depending on the fines content. Values on the low end to middle of this range are recommended for initial pavement design purposes. However, it is recommended that samples of proposed subgrade backfill material stockpiled during site grading operations be collected and tested in a soils laboratory to verify the final design R-Value.

4.0 Rice Creek Re-Meander

4.1 Proposed Design Understanding

A portion of Rice Creek will be re-meandered to improve the alignment of the proposed Spine Road Bridge crossing the creek. The re-meander will involve excavation and placement of soil to re-locate a section of Rice Creek.

4.2 Soil Borings

A total of 4 soil borings (RC-500 through RC-503) were completed in the proposed Rice Creek re-meander alignment in the locations shown in Figure 4. Boreholes were advanced with hollow stem auger methods using a 3.25-inch I.D. auger. Standard Penetration Testing was completed at 2.5-foot intervals to the end of each boring at a nominal depth of 20-feet below ground surface. Soil borings RC-502 and RC-503 could not be completed at the staked location due to accessibility issues. These two boreholes were off-set approximately 15 feet west of the staked location. Soil boring logs for the Rice Creek boreholes are included in Appendix E.

A review of the soil boring logs indicates that the subsurface in the proposed re-meander alignment generally consisted of 1.5 to 4.5 feet of fill underlain by alluvial and swamp deposits. Fill material was composed of silty sand and gravel. The alluvial deposits consisted of silty sands with some organic material and thin peat layers. Sandy lean clay was encountered at 15 feet below the surface in borehole RC-501. Groundwater was encountered in all four of the boreholes and ranged in elevation from 875 ft. to 879 ft.

4.3 Sample Collection and Laboratory Testing

Samples of the clayey soil encountered in RC-501 and silty sand with trace organics encountered in RC-503 were collected for laboratory analysis and tested for the following:

- ▲ Atterberg Limits
- ▲ Moisture Content
- ▲ Mechanical Sieve Analysis

During testing, it was found that the silty sand material from RC-503 was non-cohesive and Atterberg Limit tests were not performed. However, the organic content of this material was determined to be 2.6%.

Tests performed on the sandy clay sample from RC-501 indicated that it is a low to medium plasticity clay soil and inactive with regard to shrink-swell potential. The results for the samples tested are shown on the soil boring logs in Appendix E.

4.4 Excavation

Soil excavated from the area should be stripped of vegetation and topsoil and sorted according to suitability for reuse. Inorganic soils suitable for controlled fill can be stockpiled for backfill material. Organic soils may be stockpiled for potential topsoil use during site restoration. Excavated areas that will receive controlled fill should be inspected by the

project geotechnical engineer or competent representative prior to the installation of controlled fill to ensure suitable material exists at the base of the excavation.

4.5 Dewatering

Based on groundwater observations in the soil borings, groundwater will likely be encountered during excavation of the new creek channel. However, because the work will largely involve excavation and shaping of existing soil rather than placement of controlled fill, it is anticipated that adequate dewatering can be achieved by directing surface water away from work areas and pumping from sumps as needed.

4.6 Controlled Fill

If controlled fill is needed for streambank construction suitable embankment material should consist of mineral soil free of high plasticity clays, silt, organics, vegetation, debris, and rocks larger than three inches in diameter. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for this use.

The prepared subgrade in areas to receive controlled fill should be inspected by the project geotechnical engineer or qualified representative to verify suitability of the surface to receive fill. The subgrade surface should be scarified and re-compacted prior to placement of controlled fill material. Controlled fill material should be moisture conditioned to within +/- 3% of optimum moisture content and placed in maximum eight-inch lifts. Controlled fill placed for embankment construction should be compacted to a minimum of 95% of the Standard Proctor dry density.

Material suitable for placement as general fill in non-structural areas such as constructed wetlands and green areas may consist of common excavation material free of vegetation, debris, and large rocks. This material may be placed in 1-2 foot lifts and receive quality compaction equivalent to approximately 90% Standard Proctor dry density.

5.0 Water Main

5.1 Proposed Design Understanding

A new water main is proposed to extend potable water supply to parts of the development area. The alignment was divided into two areas: A short section near a proposed water tower near the southern end of the site, and a longer alignment located in the western portion of the site.

5.2 Soil Borings

A total of 11 soil borings (WM-400 through WM-410) were completed along the proposed water main alignment in the locations shown in Figure 5. Boreholes were advanced with hollow stem auger methods using a 3.25-inch I.D. auger. Standard Penetration Testing was completed at 2.5-foot intervals to the end of each boring at a nominal depth of 15-feet below ground surface. Some of the boreholes could not be completed at the staked location due to accessibility issues. These boreholes were off-set from the staked location as indicated on the boring logs. Soil boring logs for the Rice Creek boreholes are included in Appendix F.

A review of the soil boring logs indicates that the subsurface in the proposed water main alignment generally consisted of a thin topsoil layer and 0 to 6.0 feet of fill underlain by alluvial, glacial and swamp deposits. Fill material was composed of silty sand and poorly graded sand with silt and clay. The alluvial deposits consisted of silty sands and poorly graded sand with silt. Glacial deposits included clayey sand and sandy lean clay. A 9.5 thick layer of peaty swamp deposits was encountered in borehole WM-406.

Groundwater was not encountered in soil borings WM-400 and WM-401. However, groundwater was encountered in the remaining soil borings ranging in elevation from approximately 903 ft. on the south end of the alignment to 880 ft. on the north end of the alignment.

5.3 Sample Collection and Laboratory Testing

Samples of silty sand, clayey sand, sandy lean clay, and poorly graded sand with silt were collected for laboratory analysis. Samples were tested for the following as applicable:

- ▲ Atterberg Limits
- ▲ Moisture Content
- ▲ Mechanical Sieve Analysis

Tests performed on the sandy lean clay and clayey sand materials indicated that they are low to medium plasticity clay soils and inactive with regard to shrink-swell potential. The results for the samples tested are shown on the soil boring logs in Appendix F.

5.4 Trench Excavation

It is anticipated that the water main piping will be installed using open trench methods. Excavation depths and sidewall inclinations should not exceed those specified in local, state

or federal regulations. Given the sandy, non-cohesive nature of much of the soils encountered along the proposed alignment, excavations may need to be widened and sloped, or temporarily braced to maintain or develop a safe work environment. Temporary shoring must be designed in accordance with applicable regulatory requirements.

The stability of excavation side slopes is dependent on soil strength, site geometry, moisture content, and surcharge load from excavated soils and equipment. The Contractor is solely responsible for assessing the stability and executing underground utility and project excavations using safe methods. The Contractor is also responsible for naming the "competent individual" as per Subpart P of 29 CFR 1926.6 (Federal Register - OSHA).

The sandy and clayey mineral soils encountered in the borehole locations along the alignment are generally suitable for pipe support. However, organic swamp deposits were encountered in WM-406. These soils are unsuitable for pipe support and should be removed and replaced with suitable controlled fill. If swamp deposits are encountered at the base of the excavation, they should be over-excavated a minimum of two feet and replaced with suitable controlled fill.

5.5 Dewatering

Groundwater was encountered as shallow as 5-feet below the surface along the water main alignment during completion of the subsurface investigation soil borings. Groundwater was generally found in non-cohesive sandy soils which may become unstable when unconfined if the groundwater is not controlled to an elevation below the excavation. Dewatering along the water main trench alignment will likely require a well point dewatering system in addition to sumps located in the excavation. It is recommended that groundwater be lowered to a level at least 3 feet below the bottom of the water main excavation.

5.6 Pipe Bedding

The existing silty sand and poorly graded sand with silt soils are suitable for pipe support and no additional pipe bedding is necessary where these soils are encountered at the pipe invert. However, in areas where clayey soils are encountered at the proposed pipe invert, granular bedding material should be used. Stockpiled site soils composed of silty sand (SM), and poorly graded sand (SP) are suitable for this use.

5.7 Backfill and Compaction

The water main trench should be backfilled with non-organic suitable soils placed in eight-inch maximum depth loose lifts. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for this use. The backfill should be compacted sufficiently to minimize future settlement of green areas and areas that may receive pavement or structures. It is recommended that trench fill soils be compacted as follows:

- ▲ no less than 90% of the Standard Proctor maximum dry density to three feet below top of subgrade elevation
- ▲ no less than 95% of the Standard Proctor maximum dry density from three feet below top of subgrade elevation to top of subgrade elevation for green areas

- ▲ no less than 98% of the Standard Proctor maximum dry density from three feet below top of subgrade elevation to top of subgrade elevation for areas which may receive pavement or will provide foundation support

6.0 Natural Resources Corridor

6.1 Proposed Design Understanding

The natural resources corridor will consist of constructed wetlands, storm water infiltration features, and green areas. The area will be accessible by various walking trails constructed throughout the site.

6.2 Soil Borings

A total of 34 soil borings (NR-100 through NR-133) were completed in the proposed natural resources corridor in the locations shown in Figure 6. Boreholes were advanced with hollow stem auger methods using a 3.25-inch I.D. auger. Standard Penetration Testing was completed at 2.5-foot intervals to the end of each boring at a nominal depth of 20-feet below ground surface. Some soil borings could not be completed at the staked location due to accessibility issues. These boreholes were off-set as indicated on the soil boring logs. Soil boring logs for the natural resources corridor boreholes are included in Appendix G.

A review of the soil boring logs indicates that the subsurface in the natural resources corridor is similar to other areas of the site. Soils encountered generally consisted of thin layers of topsoil and/or fill ranging from 0 to 7 feet in thickness. Fill material was composed of silty sand, silty sand with gravel, and clayey sand. The fill, where present, was underlain by alluvial, glacial and swamp deposits. The alluvial deposits consisted of silty sands, poorly graded sand with gravel. Glacial sediments encountered included clayey sand, sandy lean clay, and lean clay with sand. Swamp deposits of peat material were encountered in various locations across the corridor.

Groundwater was encountered in approximately half of the boreholes in the natural resources corridor and ranged in elevation from 875 ft. to 879 ft.

6.3 Sample Collection and Laboratory Testing

Representative samples of clayey and sandy soil units encountered were collected for laboratory analysis and testing. However, upon review of the soil boring logs, it was determined that the soils encountered were already well characterized by testing performed on samples collected in other development areas surrounding the natural resources corridor. As a result, no testing was requested on samples collected from this area. Samples have been retained for future testing, should it be deemed necessary.

6.4 Infiltration Testing

Infiltration testing was performed to assess the infiltration capacity of soils in the natural resources corridor. Infiltration testing was performed according to the *Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer (ASTM D3385)*.

Tests were performed in 9 locations as shown on Figure 6. The near surface soils in this area generally consist of poorly graded sand with silt and silty sand fill as shown in the water main soil boring logs (WM-402 to WM-410), spine road boring logs (SR-211 to SR-217), and natural resources corridor boring log NR-133. However, there are areas of near

surface clayey soils present as well, as indicated in natural resources corridor boring log NR-132. Graphs of the infiltration rate test results are included in Appendix H.

6.5 Excavation

It is anticipated that soil excavation activities in this area will consist of grading and shaping to create the proposed wetlands and surface water ponds. Soil excavation operations should include stripping of vegetation and topsoil and sorting excess materials according to suitability for reuse. Inorganic soils suitable for controlled fill can be stockpiled for backfill material. Organic soils may be stockpiled for potential topsoil use during site restoration. Excavated areas that will receive controlled fill should be inspected by the project geotechnical engineer or competent representative prior to the installation of controlled fill to ensure suitable material exists at the base of the excavation.

6.6 Dewatering

Based on groundwater observations in the soil borings, groundwater will likely be encountered during excavation of the pond areas. However, because the work will largely involve excavation and shaping of existing soil rather than placement of controlled fill, it is anticipated that adequate dewatering can be achieved by directing surface water away from work areas and pumping from sumps as needed.

6.7 Controlled Fill

Controlled fill is needed for pond construction suitable material should consist of mineral soil free of high plasticity clays, silt, organics, vegetation, debris, and rocks larger than three inches in diameter. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for this use.

The prepared subgrade in areas to receive controlled fill should be inspected by the project geotechnical engineer or qualified representative to verify suitability of the surface to receive fill. The subgrade surface should be scarified and re-compacted prior to placement of controlled fill material. Controlled fill material should be moisture conditioned to within +/- 3% of optimum moisture content and placed in maximum eight-inch lifts. Controlled fill placed for embankment construction should be compacted to a minimum of 95% of the Standard Proctor dry density.

Material suitable for placement as general fill in non-structural areas such as constructed wetlands and green areas may consist of common excavation material from the site free of vegetation, debris, and large rocks. This material may be placed in 1-2 foot lifts and receive quality compaction equivalent to approximately 90% Standard Proctor dry density.

Slopes created by placed fill material should not exceed 3H:1V. No continuous slope face should exceed 20 feet in height. Slopes required to exceed 20 feet in height should be benched a minimum of 6 feet horizontally for every 20 feet of height to reduce the continuous slope length.

7.0 Regional Trail

7.1 Proposed Design Understanding

A walking trail named the Rice Creek Regional Trail will be constructed throughout the development area for recreational use. The trail is anticipated to be asphalt paved and constructed to support light duty maintenance vehicles.

A total of 10 soil borings (TR-300 through TR-309) were completed along the eastern portion of the proposed trail alignment in the locations shown in Figure 7. Other portions of the trail wind through areas which have already been characterized by soil borings. Boreholes were advanced with hollow stem auger methods using a 3.25-inch I.D. auger. Standard Penetration Testing was completed at 2.5-foot intervals to the end of each boring at a nominal depth of 12-feet below ground surface. Soil borings TR-303, TR-304, and TR-305 could not be completed at the staked location due to accessibility issues. These three boreholes were off-set as indicated on the soil boring log. Soil boring logs for the Regional Trail boreholes are included in Appendix I.

A review of the soil boring logs indicates that the subsurface along the trail alignment was similar to other areas of the site and generally consisted of varying depths of topsoil and/or fill underlain by poorly graded sand with silt/gravel, silty sand, clayey sand, and sandy lean clay. A 1-foot thick swamp deposit of peat was encountered at 7 feet below the surface in soil boring TR-308.

Groundwater was encountered in boring locations TR-305 to TR-309. The elevation of groundwater encountered ranged from approximately 927 ft. in TR-305 to 885 ft. in TR-308.

7.2 Sample Collection and Laboratory Testing

Representative soil samples were collected for laboratory analysis and tested for the following as applicable:

- ▲ Atterberg Limits
- ▲ Moisture Content
- ▲ Mechanical Sieve Analysis

Tests performed on clayey sand samples indicated that it is a low to medium plasticity clay soil and inactive with regard to shrink-swell potential. The results for the samples tested are shown on the soil boring logs in Appendix I.

7.3 Soil Correction

The boring logs indicated varying depths of topsoil, uncontrolled fill material, and swamp deposits along the proposed trail alignment. The topsoil and swamp deposits are unsuitable for trail subgrade material. However, the existing fill material, native sands and sandy clays are generally suitable for trail subgrade material if they are placed in a controlled manner.

It is recommended that the soil beneath the trail construction area be excavated to an elevation of 1 foot below the top of base grade elevation. Suitable soils found at the base of the excavation may be scarified and recompactd in preparation to receive controlled fill. If soft soil or organic soils such as topsoil or swamp deposits are encountered at the base of the excavation, it is recommended that they be over-excavated a minimum of two feet below top of subgrade elevation and replaced with suitable controlled fill.

7.4 Excavation

Excavations for the trail subgrade soil correction should extend laterally beyond the edges of the proposed base aggregate. This extension distance should equal the vertical depth of fill needed to attain base grade (1:1 lateral oversize). Soil correction excavation areas should be inspected by the project geotechnical engineer or competent representative prior to the installation of controlled fill to ensure suitable material exists at the base of the excavation.

7.5 Dewatering

Groundwater was generally encountered 4 to 12 feet below the ground surface in the soil borings along the trail alignment. If groundwater is encountered during trail construction, it is recommended that it be lowered to a level at least 1 foot below the bottom of the trail excavation to allow dry placement of controlled fill. This can likely be accomplished by pumping from sumps placed as needed along the alignment.

7.6 Controlled Fill

Controlled fill for trail subgrade will consist of mineral soil free of high plasticity clays, silt, organics, vegetation, debris, and rocks larger than three inches in diameter. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for this use to within 1 foot of top of subgrade elevation. Stockpiled soil classified as silty sand (SM), and poorly graded sand (SP) are suitable use as controlled from 1 foot below top of subgrade elevation to top of subgrade elevation.

The prepared subgrade in areas to receive controlled fill should be inspected by the project geotechnical engineer or qualified representative to verify suitability of the surface to receive fill. The subgrade surface should be scarified and re-compacted prior to placement of controlled fill material. Controlled fill material should be moisture conditioned to within +/- 3% of optimum moisture content and placed in maximum eight-inch lifts. Controlled fill should be compacted to a minimum of 98% of the Standard Proctor dry density.

7.7 Estimated Subgrade R-Value

As discussed in Section 3.8, Table 5-3.3a of the MNDOT Pavement Manual indicates that typical R-Values for non-plastic sands and sandy loam soils range from 30-70, depending on the fines content. Values on the low end to middle of this range are recommended for initial pavement design purposes. However, it is recommended that samples of proposed subgrade backfill material stockpiled during site grading operations be collected and tested in a soils laboratory to verify the final design R-Value.

8.0 Town and Creek Development Area

8.1 Proposed Design Understanding

The Town and Creek Development Area will include potential residential and commercial development. Construction in this area is expected to include shallow foundations, utilities, and green spaces.

8.2 Soil Borings

A total of 26 soil borings (DE-800 through DE-825) were completed in the proposed development area in the locations shown in Figure 8. Boreholes were advanced with hollow stem auger methods using a 3.25-inch I.D. auger. Standard Penetration Testing was completed at 2.5-foot intervals to the end of each boring at a nominal depth of 20-feet below ground surface. Soil borings DE-802, DE-803 and DE-804 could not be completed at the staked location due to accessibility issues. These boreholes were off-set approximately as shown on each boring log. Soil boring logs for the Town and Creek Development Area boreholes are included in Appendix J.

A review of the soil boring logs indicates that the subsurface in the development area was similar to other areas of the site and generally consisted of varying depths of topsoil and/or fill material underlain by poorly graded sand with silt/gravel, silty sand, clayey sand, and sandy lean clay. Swamp deposits of peat were encountered in soil borings DE-818, DE-819, and DE-820.

8.3 Soil Correction

The boring logs indicated varying depths of topsoil, uncontrolled fill material, and organic swamp deposits in the development area. The topsoil and swamp deposits are unsuitable for foundation subgrade material. However, the existing fill material, native sands and sandy clays are generally suitable for subgrade material if they are recompacted and placed as controlled fill.

The subgrade requirements for site specific foundations should be evaluated once their type and location are known. However, in general, it is recommended that the soil beneath shallow foundations be excavated to an elevation of 3 foot below the top of base grade elevation. Suitable soils found at the base of the excavation may be scarified and recompacted in preparation to receive controlled fill. If soft soil or organic soils such as topsoil or swamp deposits are encountered at the base of the excavation, it is recommended that they be over-excavated an additional two feet below top of subgrade elevation and replaced with suitable controlled fill.

Suitable controlled fill material should consist of a free draining graded aggregate material free from frozen soil, organics, vegetation, debris, rocks larger than three inches in diameter. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for this use from the bottom of excavations to within 3 feet of top of subgrade elevation. Stockpiled soil classified as silty

sand (SM), and poorly graded sand (SP) are suitable use as controlled from 3 feet below top of subgrade elevation to top of subgrade elevation.

The prepared subgrade in areas to receive controlled fill should be inspected by the project geotechnical engineer or qualified representative to verify suitability of the surface to receive fill. Controlled fill material should be moisture conditioned to within +/- 3% of optimum moisture content and placed in maximum eight-inch lifts. Controlled fill in foundation areas should be compacted to a minimum of 95% Standard Proctor dry density to within three feet of the base grade elevation. The final three feet of fill should be compacted to a minimum of 98% Standard Proctor dry density.

8.4 Bearing Capacity

We estimate that shallow foundations bearing on suitable or corrected soils may be designed for an allowable net bearing pressure of approximately 2500 psf. A coefficient of friction of 0.5 is estimated between the bottom of shallow foundations and suitable base grade soils.

8.5 Excavation

The stability of excavation side slopes is dependent on soil strength, site geometry, moisture content, and surcharge load from excavated soils and equipment. The Contractor is solely responsible for assessing the stability and executing underground utility and project excavations using safe methods. The Contractor is also responsible for naming the "competent individual" as per Subpart P of 29 CFR 1926.6 (Federal Register - OSHA).

Excavations for foundation elements should extend laterally beyond the edges of the proposed foundation. This extension distance should equal the vertical depth of fill needed to attain foundation base grade (1:1 lateral oversize). Excavation depths and sidewall inclinations should not exceed those specified in local, state or federal regulations. Excavations may need to be widened and sloped, or temporarily braced, to maintain or develop a safe work environment. Temporary shoring must be designed in accordance with applicable regulatory requirements.

8.6 Dewatering

Groundwater was encountered as shallow as 3.5 feet and as deep as 14.5 feet below the surface in the project area during completion of the subsurface investigation soil borings. Groundwater found in non-cohesive sandy soils may become unstable when unconfined if the groundwater is not controlled to an elevation below the excavation. It is recommended that groundwater be lowered to a level at least 3 feet below the bottom of foundation excavations to allow proper subgrade preparation.

Dewatering, if necessary, will likely be achieved pumping from sumps in the excavation area. However, if deep excavations are required in saturated areas, a well-point dewatering system may be required. Each excavation should be evaluated individually to assess the dewatering methods needed.

8.7 Trenching and Backfill

Utility trenches excavated in the development area should be constructed following the excavation stability recommendations in Section 8.5 and the dewatering recommendations

in Section 8.6. Where sewer and water services will be installed, the existing silty sand and poorly graded sand with silt soils are suitable for pipe support and no additional pipe bedding is necessary where these soils are encountered at the pipe invert. However, in areas where clayey soils are encountered at the proposed pipe invert, granular bedding material should be used. Stockpiled site soils composed of silty sand (SM), and poorly graded sand (SP) are suitable for this use.

Trenches should be backfilled with non-organic suitable soils placed in eight-inch maximum depth loose lifts. Stockpiled site soils classified as clayey sand (SC), lean sandy clay (CL), silty sand (SM), and poorly graded sand (SP) are suitable for this use. Frozen soils will not be considered suitable for backfill. The utility trench backfill should be compacted sufficiently to minimize future settlement of green areas and areas that may receive pavement or structures. It is recommended that trench fill soils be compacted as follows:

- ▲ no less than 90% of the Standard Proctor maximum dry density to three feet below top of subgrade elevation
- ▲ no less than 95% of the Standard Proctor maximum dry density from three feet below top of subgrade elevation to top of subgrade elevation for green areas
- ▲ no less than 98% of the Standard Proctor maximum dry density from three feet below top of subgrade elevation to top of subgrade elevation for areas which may receive pavement or will provide foundation support

9.0 Qualifications

9.1 Variations in Subsurface Conditions

Our evaluation, analysis and recommendations were developed from a limited amount of Owner-provided subsurface information. It is not standard practice to collect soil samples continuously with depth, and therefore the interface between soil layers and their estimated thicknesses are inferred. Soil layer boundaries may also be gradual transitions, and can be expected to vary in depth, elevation and thickness away from the exploration locations.

Variations in subsurface conditions, including the location and presence of groundwater, determined between exploration locations may not be revealed until additional exploration work is completed, or construction commences. If any such variations are revealed, they should be evaluated by the project geotechnical engineer.

9.2 Standard Of Care

In performing its services, Wenck Associates, Inc. used a degree of care and skill ordinarily exercised by similar professionals working under similar circumstances in the same general geographic area and at the same time. No warranty, express or implied, is made.

Figures

Figure 1: Site Location Map

Figure 2: Spine Road Bridge Borehole Location Map

Figure 3: Spine Road Borehole Location Map

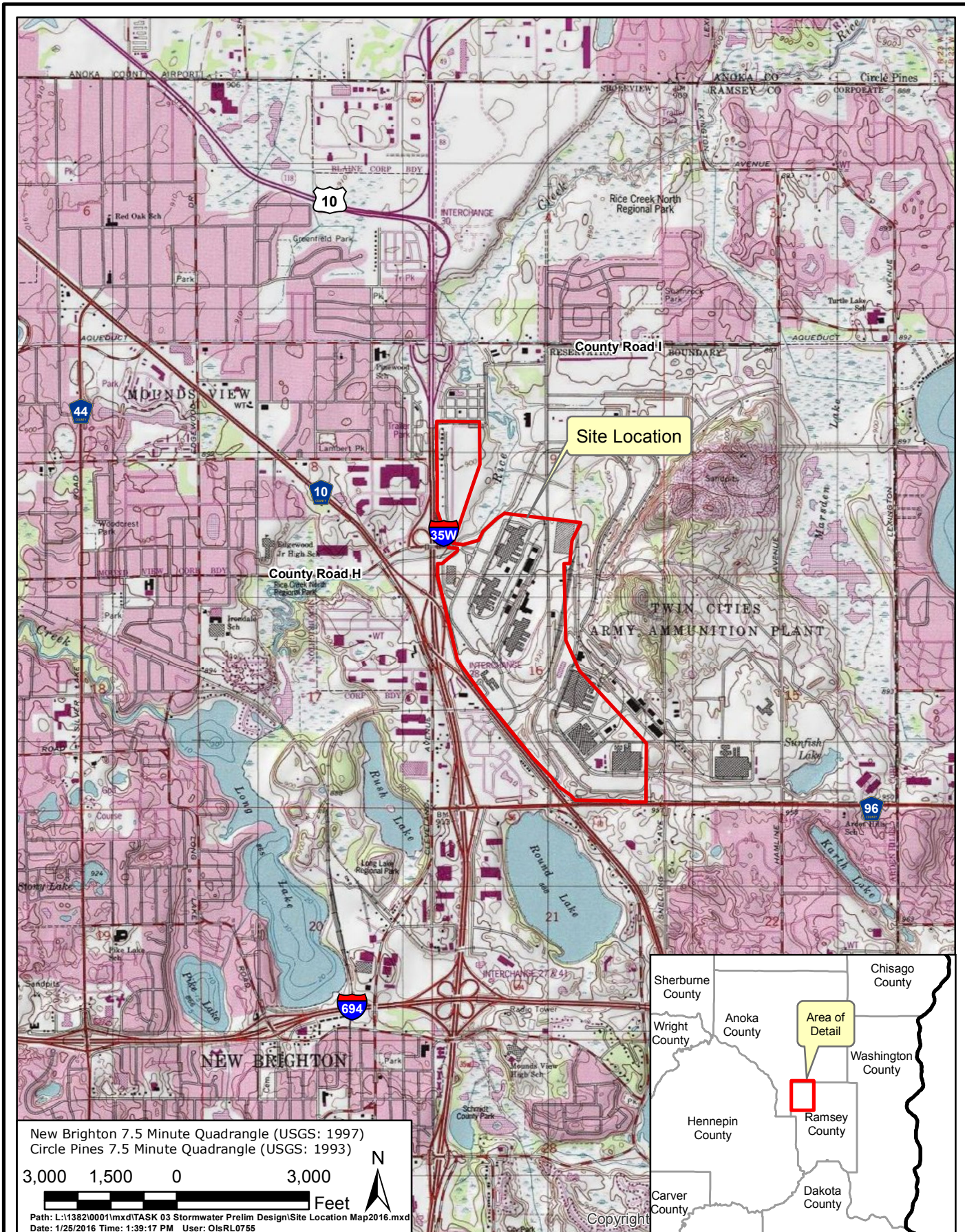
Figure 4: Rice Creek Re-Meander Borehole Location Map

Figure 5: Water Main Borehole Location Map

Figure 6: Natural Resources Corridor Borehole and Infiltration
Test Location Map

Figure 7: Regional Trail Borehole Location Map

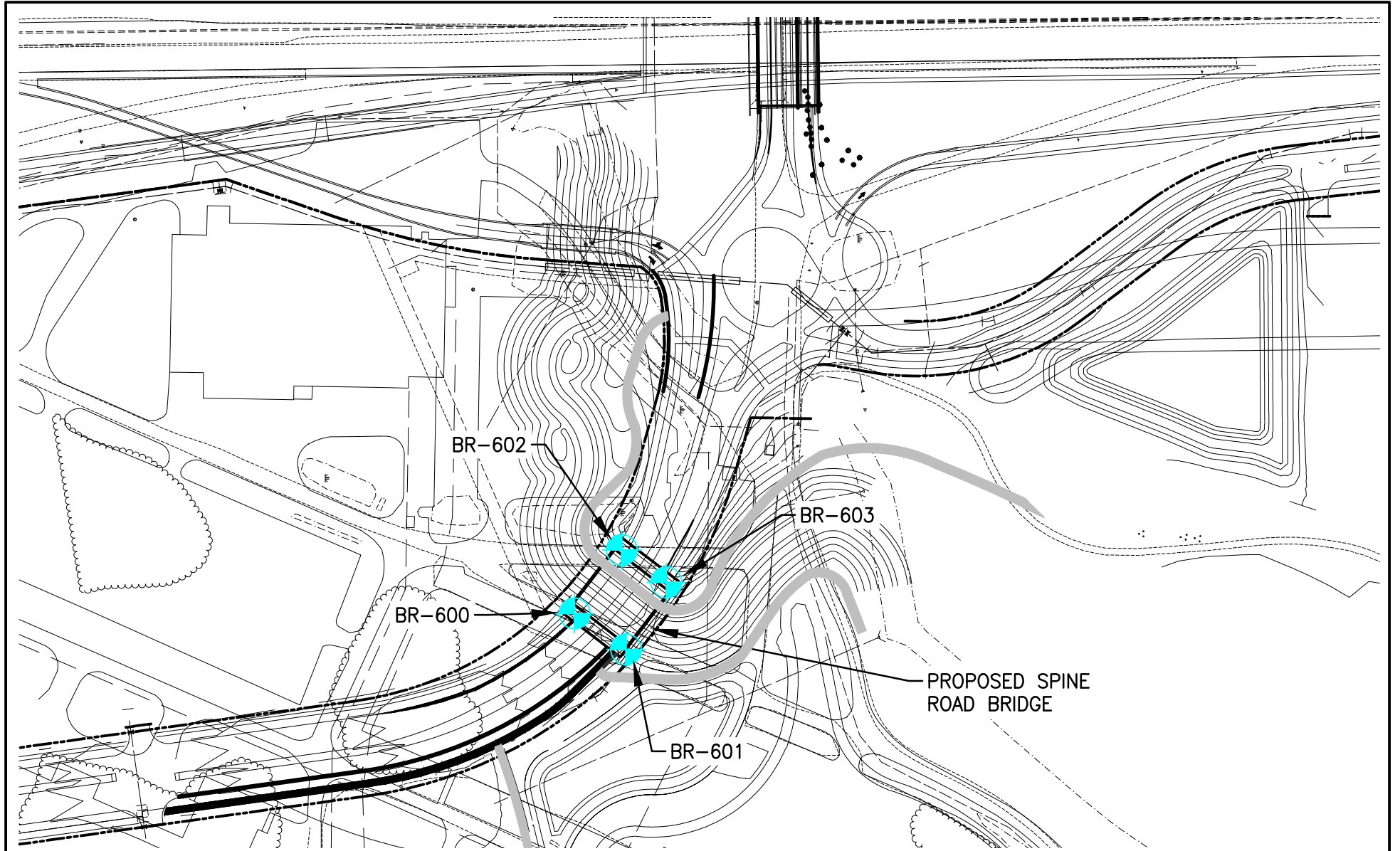
Figure 8: Town and Creek Development Area Borehole Location
Map





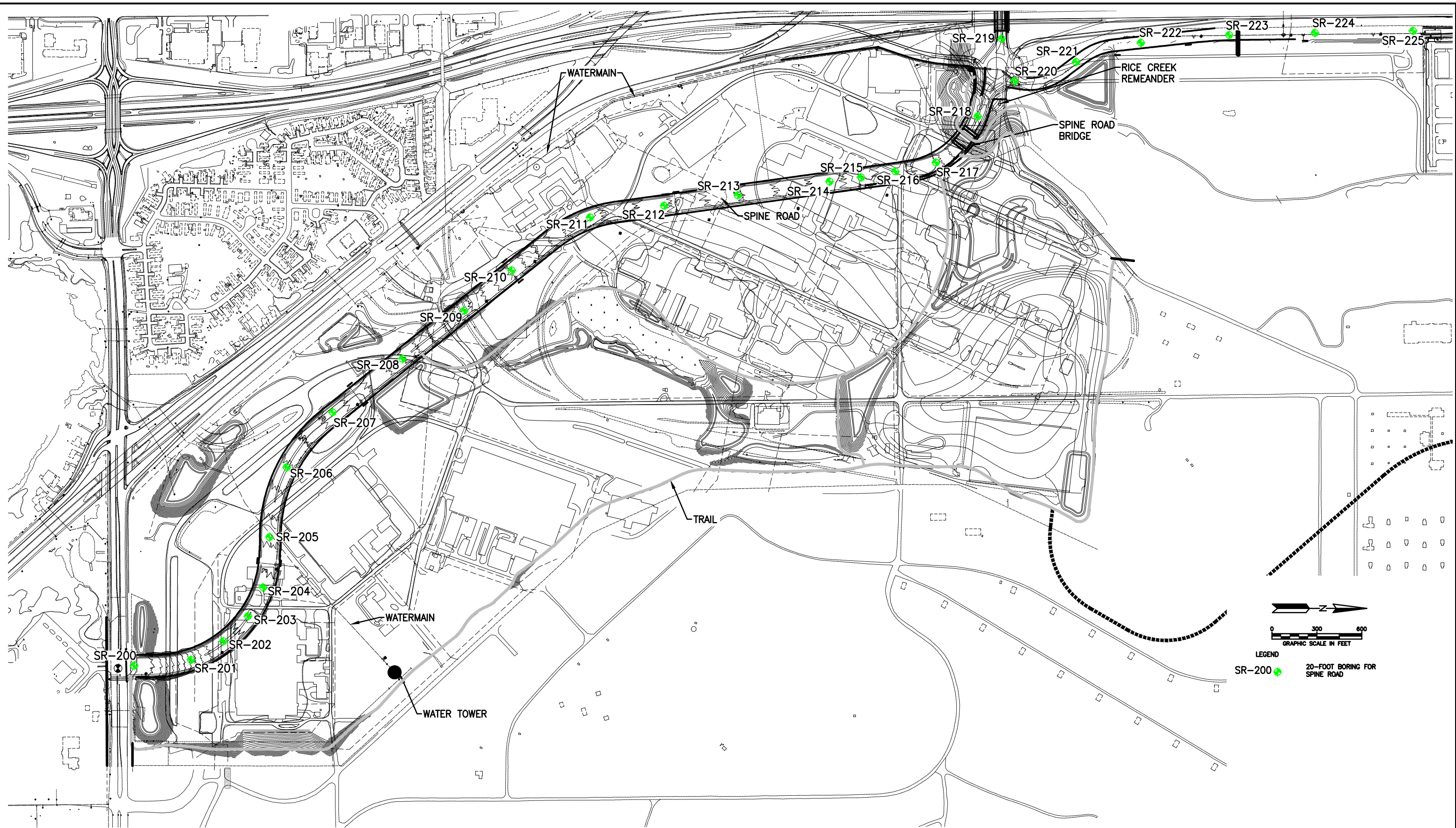
TCAAP REDEVELOPMENT SITE
Site Location Map



JAN 2016
Figure 1



 <p>WENCK ASSOCIATES 1800 PIONEER CREEK CENTER MAPLE PLAIN, MN P 763-479-4294 F 763-479-4200</p> <p>Responsive partner. Exceptional outcomes.</p>		CLIENT		PROJECT								
		 <p>Kimley Horn Expect More. Experience Better.</p>		BORING LOCATIONS								
REV		DWN	APP	REV DATE	DWN BY	CHK'D	APP'D	DWG DATE	JAN. 2016	PROJECT NO.	SHEET NO.	REV NO.
					JVB	JW	JW	SCALE	AS NOTED	1382-0001	FIGURE 2	A



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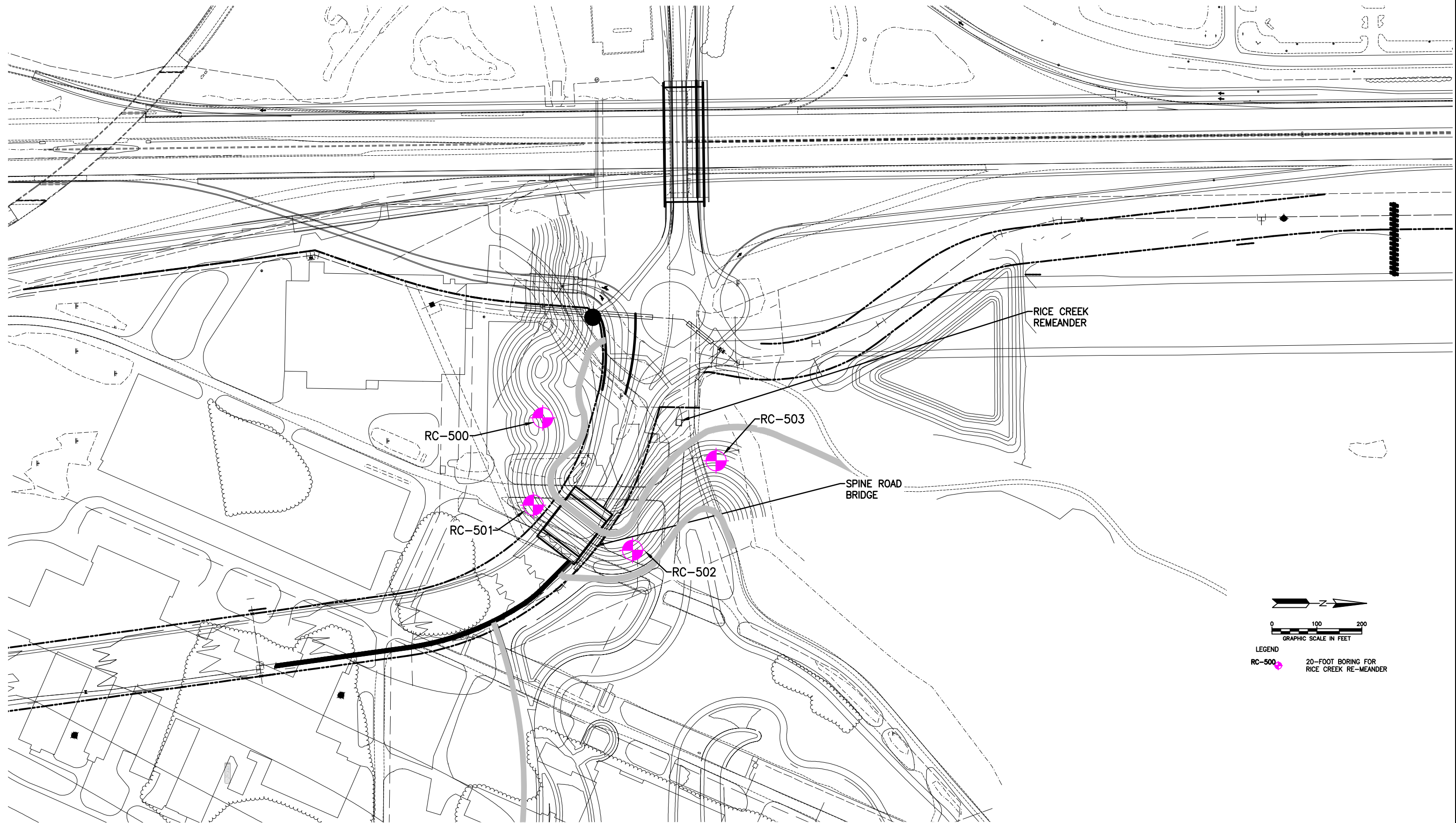
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PROJECT TITLE
GEOTECHNICAL INVESTIGATION REPORT

SHEET TITLE
SPINE ROAD BORING LOCATION MAP

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PROJECT NO. 1382-0001	SHEET NO. FIGURE 3	SCALE AS NOTED	REV NO. 1



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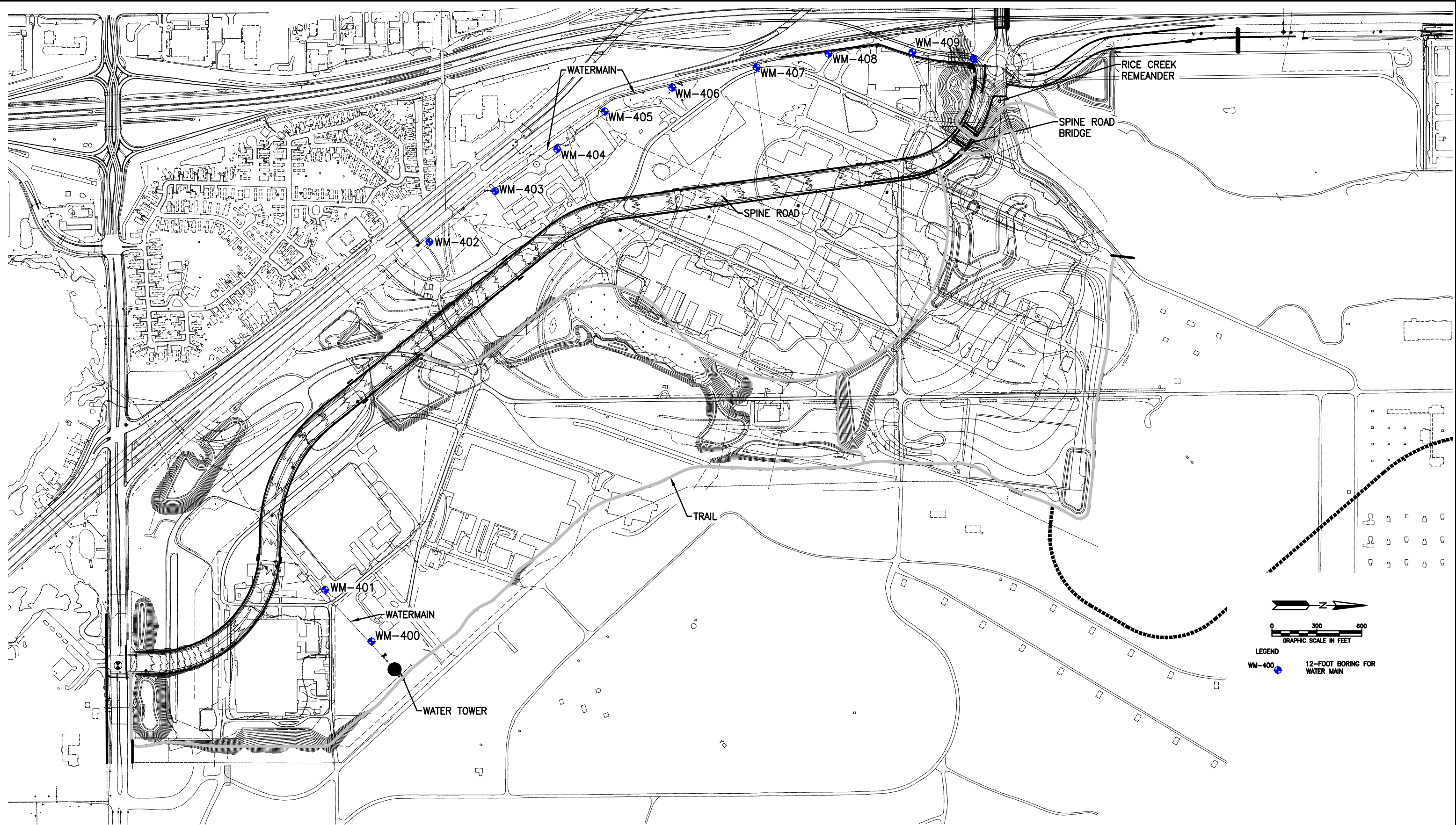
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PROJECT TITLE
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SHEET TITLE			
RICE CREEK RE-MEANDER BOREHOLE LOCATION MAP			
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PROJECT NO.		SCALE	
1382-0001		AS NOTED	
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FIGURE 4		1	



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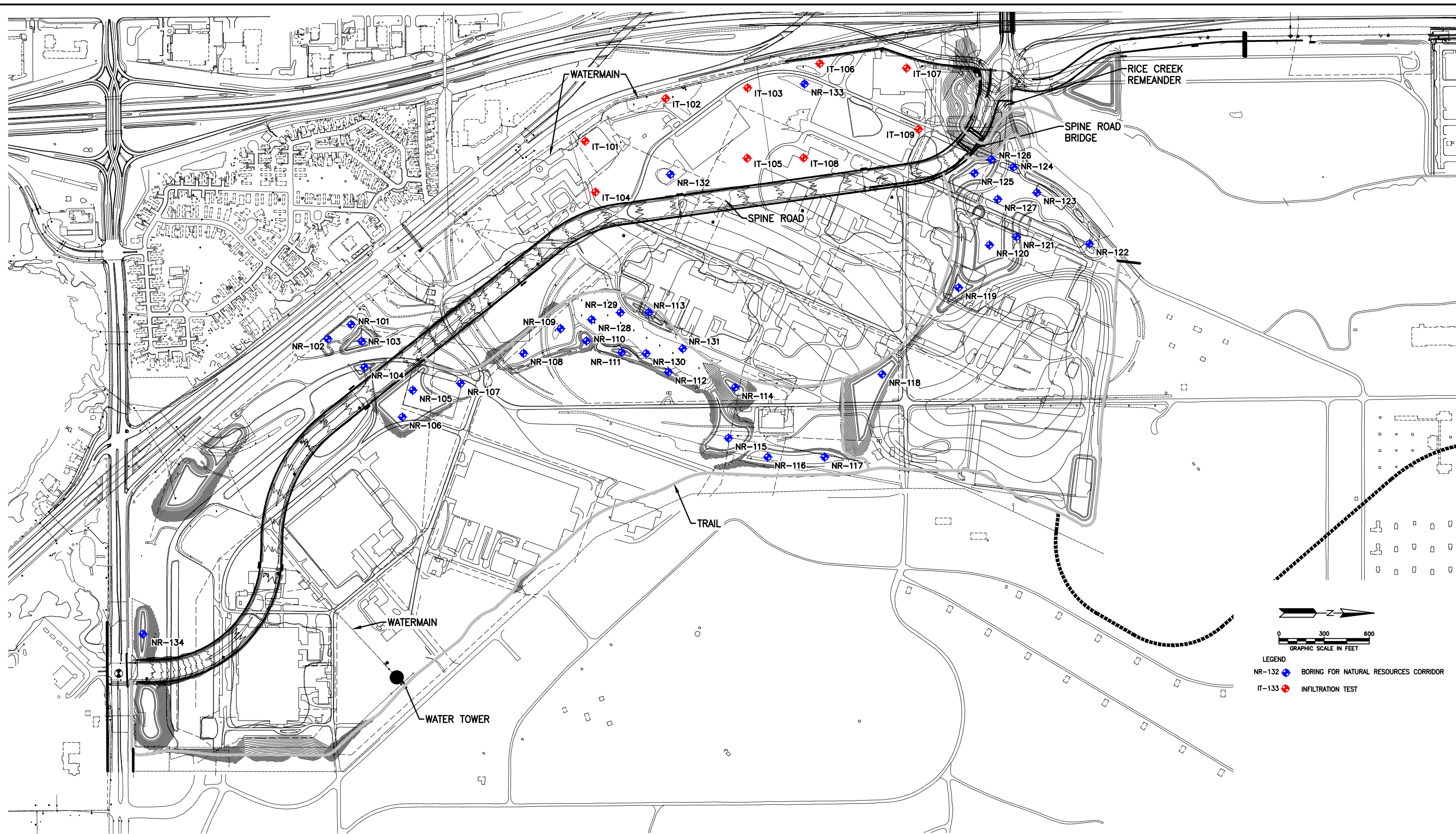
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SHEET TITLE	WATER MAIN BOREHOLE LOCATION MAP		
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PROJECT NO.	SHEET NO.	SCALE	AS NOTED
1382-0001	FIGURE 5		

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LEGEND
 NR-132 BORING FOR NATURAL RESOURCES CORRIDOR
 IT-133 INFILTRATION TEST

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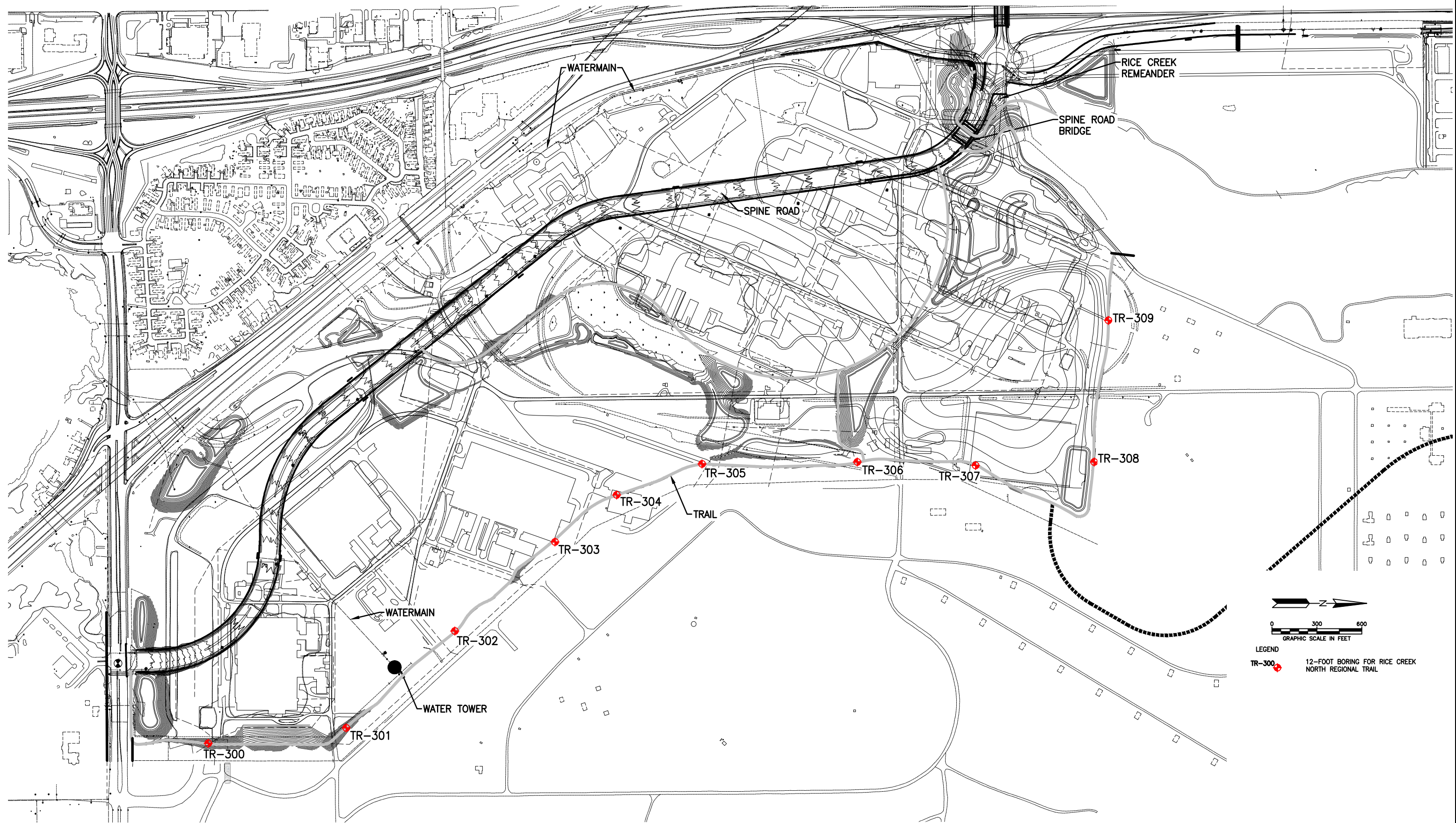
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SHEET TITLE NATURAL RESOURCES CORRIDOR BOREHOLE AND INFILTRATION TEST LOCATION MAP			
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1382-0001	FIGURE 6	AS NOTED	1



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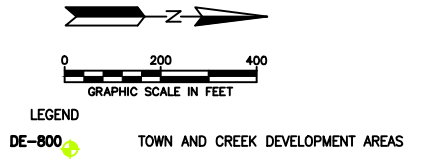
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GEOTECHNICAL INVESTIGATION REPORT

SHEET TITLE

REGIONAL TRAIL BOREHOLE LOCATION MAP

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PROJECT NO.	SHEET NO.	SCALE	AS NOTED
1382-0001	FIGURE 7		
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SHEET TITLE			
TOWN AND CREEK DEVELOPMENT AREA BOREHOLE LOCATION MAP			
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JVB	JW	TR	JANUARY 2016
PROJECT NO.	SHEET NO.	SCALE	AS NOTED
1382-0001	FIGURE 8		
			REV NO.
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Appendix A

Interim Report-Preliminary Geotechnical Evaluation (AET and Braun, 2007)

January 2016

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Appendix B

Spine Road Bridge Soil Boring Logs

January 2016

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BORING NUMBER BR-600

PAGE 1 OF 3

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 884.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.30 ft / Elev 867.35 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose, trace gravel (Fill)	SS 1	78	3-4-3 (7)							
882.7												
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, medium dense, trace gravel	SS 2	67	4-5-6 (11)							
5												
7.0		SILTY SAND, (SM) gray, fine grained, moist, dense	SS 3	56	4-4-6 (10)							
877.7												
9.5		SILTY SAND, (SM) gray, fine grained, moist, medium dense, little organics	SS 4	117	6-11-10 (21)							
875.2												
12.0		NOTE: Organic materials encountered at 11.0 feet.	SS 5	100	4-3-6 (9)							
872.7												
14.5		LEAN CLAY, (CL) gray, moist, medium, little organics	SS 6	67	2-2-4 (6)							
870.2												
15		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SS 7	78	2-2-3 (5)							
17.30	<input checked="" type="checkbox"/>		SS 8	100	2-3-4 (7)							
20			SS 9	100	3-3-5 (8)							
25			SS 10	89	4-5-5 (10)							
30												
30.0												
854.7												

(Continued Next Page)



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BORING NUMBER BR-600

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:1-P-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
30		CLAYEY SAND, (SC) gray, fine grained, saturated, medium dense, trace fine gravel	SH 11					16	28	13	15	50	
35			35.0	849.7	SS 12	33	3-4-5 (9)						
40		SANDY LEAN CLAY, (CL) gray, wet, medium to very stiff, trace fine gravel	SS 13	100	4-4-5 (9)								
45			SS 14	83	5-5-34 (39)								
50			SS 15	100	4-4-4 (8)								
55			SH 16										
60			SS 17	33	5-5-5 (10)								

(Continued Next Page)



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BORING NUMBER BR-600

CLIENT Carl Bolander and Sons, Co.

PROJECT NAME Ramsey County Re-Development Site (TCAAP)

PROJECT NUMBER 15.60936.100

PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SANDY LEAN CLAY, (CL) gray, wet, medium to very stiff, trace fine gravel <i>(continued)</i> NOTE: Driller over-spun auger at 65.0 feet. N values based on disturbed soil.	SS 18	78	1-2-2 (4)							
70		POORLY GRADED SAND WITH GRAVEL, (SP) gray, fine to coarse grained, saturated, very dense, fine to coarse gravel	SS 19	100	57-62-65 (127)							
75		SILTY SAND, (SM) brown, fine to medium grained, saturated, very dense, trace gravel	SS 20	100	21-25-34 (59)							

Borehole backfilled with grout.
 Bottom of borehole at 76.5 feet.



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BORING NUMBER BR-601

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/9/15 **COMPLETED** 6/9/15 **GROUND ELEVATION** 884.82 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.00 ft / Elev 880.82 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, wet, trace gravel (Fill) 884.6	SS 1	100	7-7-5 (12)							
2.0		ORGANIC SOIL WITH SAND, (SP) brown, fine grained, wet, (wood chip debris) (Fill) 882.8	SS 2	44	6-9-9 (18)							
4.0		ORGANIC SOIL, brown, saturated, decaying wood (Fill) NOTE: Hydrocarbon odor based on human perception. 880.8	SS 3	56	6-8-7 (15)							
6.0		SILTY SAND, (SM) dark gray to gray, fine grained, saturated (Fill) 878.8	SS 4	67	6-7-9 (16)							
10			SS 5	56	8-4-3 (7)							
12.0		PEAT, (Pt) dark gray to black, saturated, medium 872.8	SS 6	22	2-2-3 (5)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense 870.3	SS 7	100	4-3-4 (7)							
20			SS 8	100	7-7-5 (12)							
25			SS 9	100	5-6-6 (12)							
30			SS 10	100	5-5-5 (10)							

(Continued Next Page)



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BORING NUMBER BR-601

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense (continued)	SS 11	100	2-3-4 (7)							
35		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace gravel	SS 12	56	4-5-5 (10)							
40		SANDY LEAN CLAY, (CL) gray, fine grained, wet, rather stiff, trace gravel	SH 13					16				51
45		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace fine to coarse gravel	SS 14	100	4-7-7 (14)							
50			SS 15	100	6-6-8 (14)							
55			SS 16	100	5-5-6 (11)							
60			SS 17	100	6-6-7 (13)							

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BORING NUMBER BR-601

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace fine to coarse gravel (<i>continued</i>) NOTE: Silty sand (SM) seams at 65.0 feet.	SS 18	100	4-6-7 (13)							
70			SS 19	100	6-7-9 (16)							
75			SS 20	100	11-19-29 (48)							

76.0
76.5

808.8
808.3

POORLY GRADED SAND, (SP) gray to brown, fine to medium grained, saturated, very dense

Borehole backfilled with grout.
 Boring terminated at 76.5 feet due to heaving sands in auger.
 Bottom of borehole at 76.5 feet.



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BORING NUMBER BR-602

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 884.41 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.00 ft / Elev 867.41 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 5 ft. E **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5.0	[Cross-hatched pattern]	SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist	SS 1	44	5-6-7 (13)							
			SS 2	78	11-14-15 (29)							
5.0		879.4	SS 3	89	8-12-15 (27)							
			SS 4	83	9-16-16 (32)							
10			SS 5	67	6-8-9 (17)							
12.0		872.4	SS 6	89	3-3-1 (4)							
14.5		869.9	SS 7	78	3-3-4 (7)							
17.0		867.4	SS 8	100	9-5-7 (12)							
19.5		864.9	SS 9	100	5-6-7 (13)							
24.0		860.4	SH 10					15	28	12	16	48
25			SS 11	100	3-5-7 (12)							
30												

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BORING NUMBER BR-602

CLIENT Carl Bolander and Sons, Co.

PROJECT NAME Ramsey County Re-Development Site (TCAAP)

PROJECT NUMBER 15.60936.100

PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:10 - H:11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to stiff, trace to a little gravel (continued)	SS 12	100	3-5-5 (10)							
35			SS 13	100	4-6-7 (13)							
40			SS 14	100	4-5-7 (12)							
45			SS 15	100	5-8-12 (20)							
50			SS 16	83	7-8-12 (20)							
54.5		829.9										
55		SANDY LEAN CLAY, (CL) gray, wet, stiff, trace gravel	SS 17	67	9-9-10 (19)							
59.5		824.9										
60		SILTY LEAN CLAY, (CL-ML) gray brown, wet, stiff	SS 18	78	7-8-9 (17)							

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PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SILTY LEAN CLAY, (CL-ML) gray brown, wet, stiff <i>(continued)</i>	SS 19	100	9-10-11 (21)							
70		CLAYEY SAND, (SC) gray brown, fine to medium grained, wet, dense, trace gravel	SS 20	89	11-10-9 (19)							
75		SILTY SAND, (SM) gray, fine grained, saturated, very dense, trace gravel	SS 21	89	40-50-60 (110)							

Borehole backfilled with grout.
 Bottom of borehole at 76.0 feet.



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BORING NUMBER BR-603

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/1/15 **COMPLETED** 6/1/15 **GROUND ELEVATION** 883.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ---
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft. E **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:10 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		882.3	SS 1	100	4-8-9 (17)							
		SILTY SAND, (SM) light brown, fine to medium grained, moist, dense to medium dense	SS 2	78	5-6-6 (12)							
4.5		878.8	SS 3	67	6-10-12 (22)							
		SILTY SAND, (SM) gray, fine grained, moist, dense to loose	SS 4	89	4-8-12 (20)							
			SS 5	100	3-3-3 (6)							
12.0		871.3	SS 6	33	1-0-0 (0)							
		SILTY SAND, (SM) gray, fine grained, saturated, very loose to medium dense, trace gravel	SS 7	100	5-5-3 (8)							
			SS 8	100	5-5-5 (10)							
			SS 9	100	5-6-7 (13)							
24.5		858.8	SS 10	100	5-6-5 (11)							
		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace gravel										
30												

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BORING NUMBER BR-603

CLIENT Carl Bolander and Sons, Co.

PROJECT NAME Ramsey County Re-Development Site (TCAAP)

PROJECT NUMBER 15.60936.100

PROJECT LOCATION Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace gravel (continued)	X SS 11	56	5-6-8 (14)							
35			X SS 12	100	4-3-7 (10)							
40			X SS 13	100	6-7-10 (17)							
45			X SS 14	100	6-7-10 (17)							
50			X SS 15	100	7-8-10 (18)							
55												
60		SILTY LEAN CLAY, (CL-ML) brown, moist to wet, very stiff, trace gravel	X SS 17	100	18-22-24 (46)							

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PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SILTY LEAN CLAY, (CL-ML) brown, moist to wet, very stiff, trace gravel (continued) NOTE: Sand (SP) lenses at 65.0 feet.	SS 18	67	20-20-17 (37)							
70		POORLY GRADED SAND WITH GRAVEL, (SP) gray to brown, fine to coarse grained, saturated, very dense	SS 19	33	19-21-24 (45)							
75			SS 20									

Borehole backfilled with grout.
 Bottom of borehole at 76.0 feet.

Appendix C

Spine Road Bridge Triaxial Compression Test Results

January 2016

T:\1382 KimleyHorn\01 TCAAP Rice Creek Remeander\TASK 15 Geotechnical\Geotech Results and Reports\Geotechnical Investigation Report\Geotechnical Report Text.docx



Responsive partner. Exceptional outcomes.

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

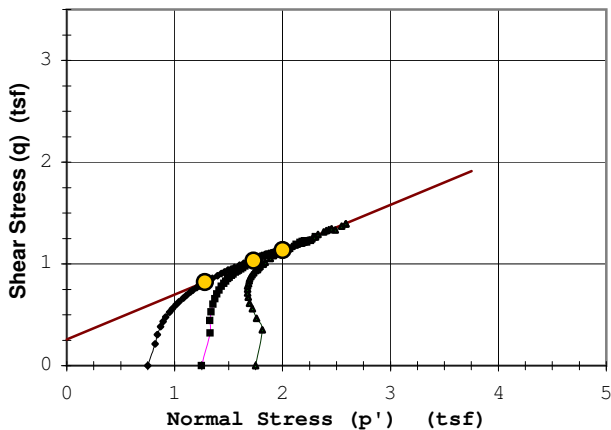
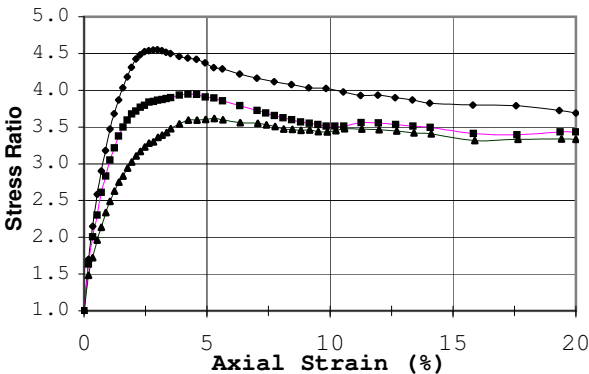
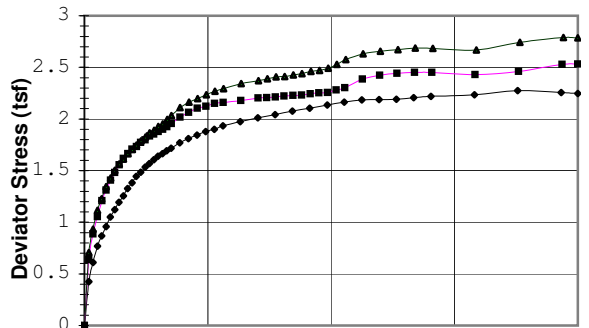
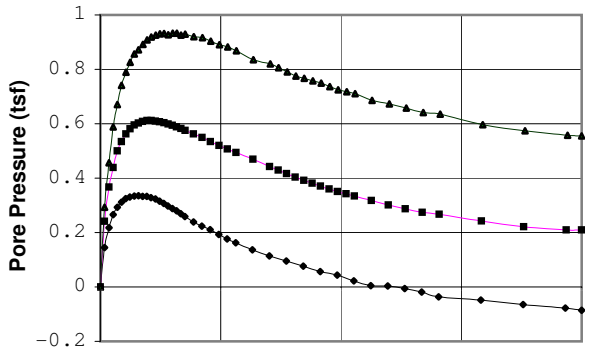
Project: TCAAP - #15.60936.100

Boring #: BR-602

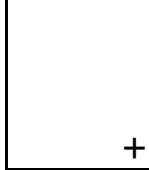
Sample #: SH-10 Type: 3T

Depth (ft): 22

Soil Type: Sandy Lean Clay w/a trace of gravel (CL/SC)



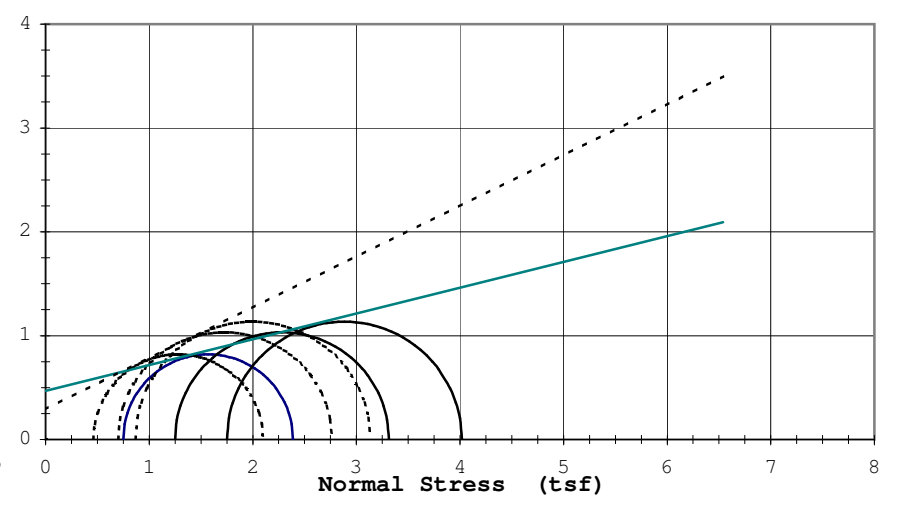
Rupture Envelope at Failure
 $\alpha = 23.8^\circ$ $a = 0.3$ (tsf)



Failure Criterion: Max. Stress Ratio	
Angle of internal friction, $\phi' = 26.1^\circ$	
Apparent Cohesion, $c' = 0.29$ (tsf)	
Test Date: 7/7/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.68
Strain Rate (%/min): 0.025	
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.43 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	15.9 16.3 16.2
Void Ratio	113.8 113.1 112.3
After Consolidation	
Diameter (in)	0.47 0.48 0.49
Height (in)	1.42 1.42 1.41
Water Content (%)	2.85 2.84 2.83
Dry Density (pcf)	16.4 16.0 16.0
Void Ratio	116.2 117.0 117.1
Back Pressure (tsf)	0.44 0.43 0.43
Minor Principal Stress (tsf)	4.6 4.0 4.2
Max. Deviator Stress (tsf)	0.75 1.25 1.75
Ultimate Deviator Stress (tsf)	2.27 2.53 2.79
Deviator Stress at Failure (tsf)	2.25 2.53 2.79
Max. Pore Pressure Buildup (tsf)	1.64 2.06 2.27
Pore Pressure Parameter "B"	0.34 0.61 0.93
Pct. Axial Strain at Failure	0.95 0.95 0.95
	3.0 4.2 5.3

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective ϕ' : 26.1° $c' = 0.29$ (tsf)
 _____ Total ϕ : 14.0° $c = 0.47$ (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

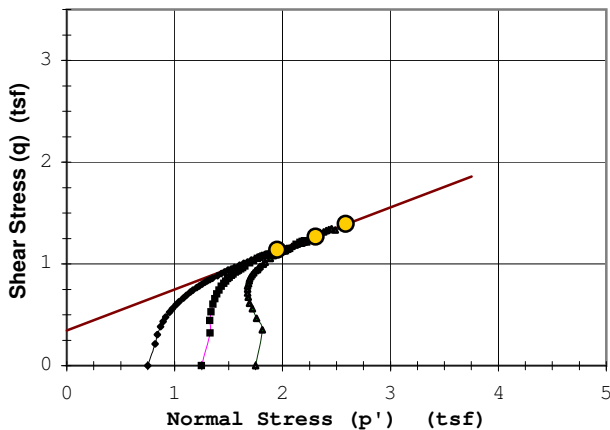
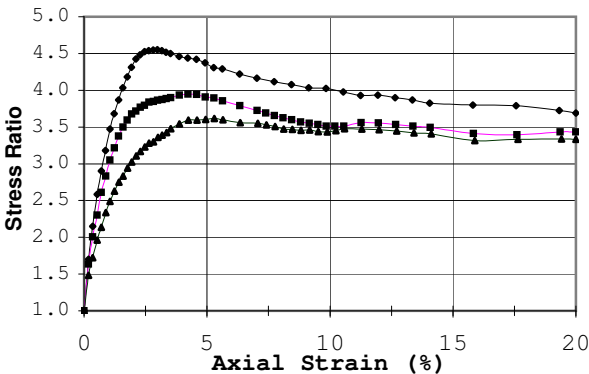
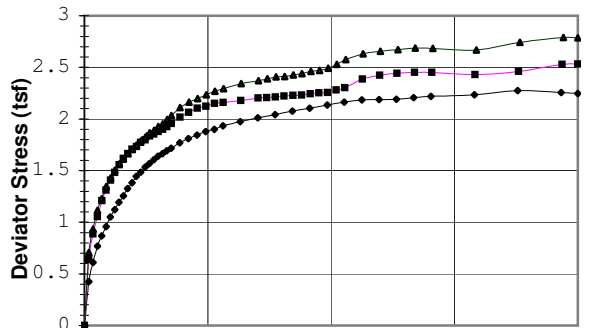
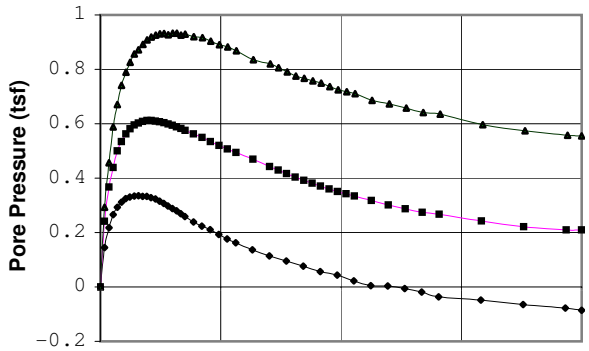
Project: TCAAP - #15.60936.100

Boring #: BR-602

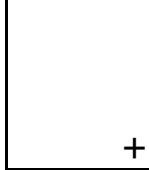
Sample #: SH-10 Type: 3T

Depth (ft): 22

Soil Type: Sandy Lean Clay w/a trace of gravel (CL/SC)



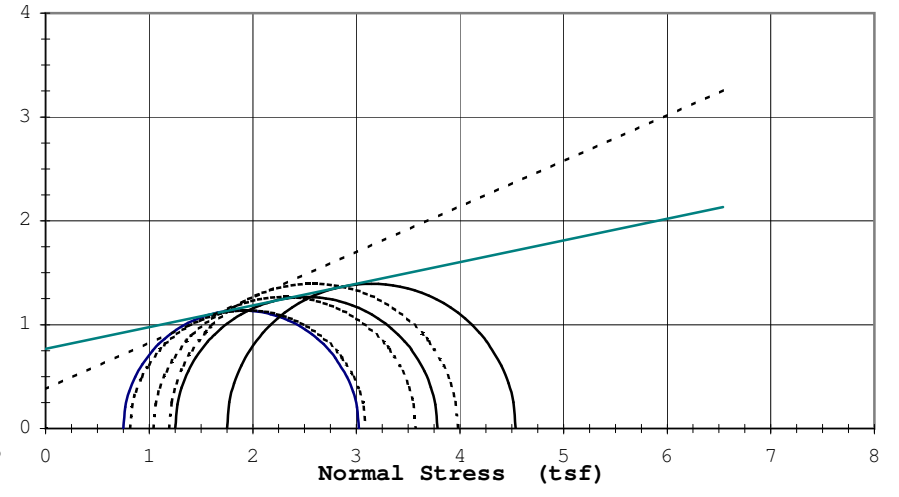
Rupture Envelope at Failure
 $\alpha = 22.0^\circ$ $a = 0.3$ (tsf)



Failure Criterion: Max. Deviator Stress	
Angle of internal friction, $\phi' = 23.8^\circ$	
Apparent Cohesion, $c' = 0.38$ (tsf)	
Test Date: 7/7/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.68
Strain Rate (%/min): 0.025	
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.43 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	15.9 16.3 16.2
Void Ratio	113.8 113.1 112.3
After Consolidation	
Diameter (in)	0.47 0.48 0.49
Height (in)	1.42 1.42 1.41
Water Content (%)	2.85 2.84 2.83
Dry Density (pcf)	16.4 16.0 16.0
Void Ratio	116.2 117.0 117.1
Back Pressure (tsf)	0.44 0.43 0.43
Minor Principal Stress (tsf)	4.6 4.0 4.2
Max. Deviator Stress (tsf)	0.75 1.25 1.75
Ultimate Deviator Stress (tsf)	2.27 2.53 2.79
Deviator Stress at Failure (tsf)	2.25 2.53 2.79
Max. Pore Pressure Buildup (tsf)	2.27 2.53 2.79
Pore Pressure Parameter "B"	0.34 0.61 0.93
Pct. Axial Strain at Failure	0.95 0.95 0.95
	17.6 20.0 19.4

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective ϕ' : 23.8° $c' = 0.38$ (tsf)
 _____ Total ϕ : 11.8° $c = 0.77$ (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

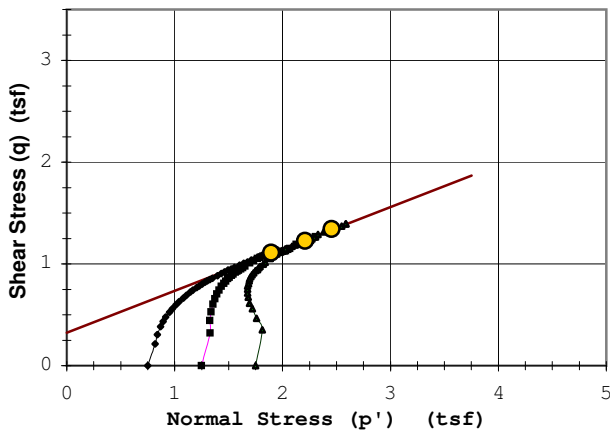
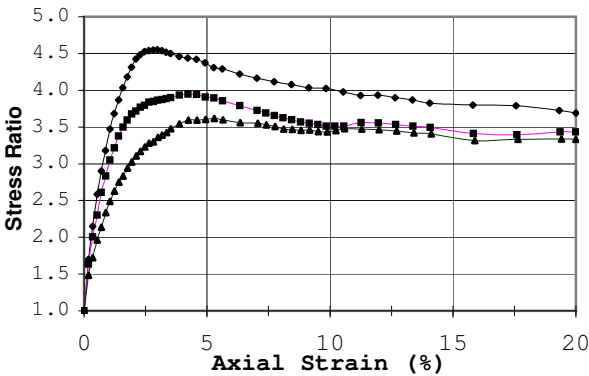
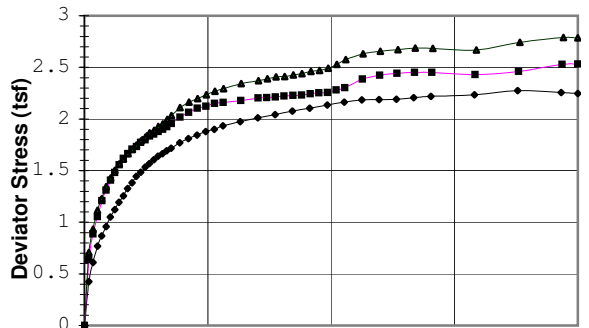
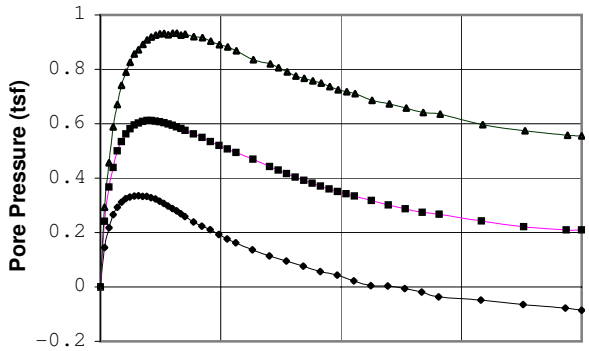
Project: TCAAP - #15.60936.100

Boring #: BR-602

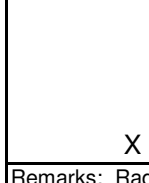
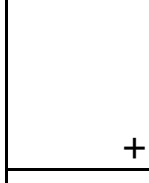
Sample #: SH-10 Type: 3T

Depth (ft): 22

Soil Type: Sandy Lean Clay w/a trace of gravel (CL/SC)



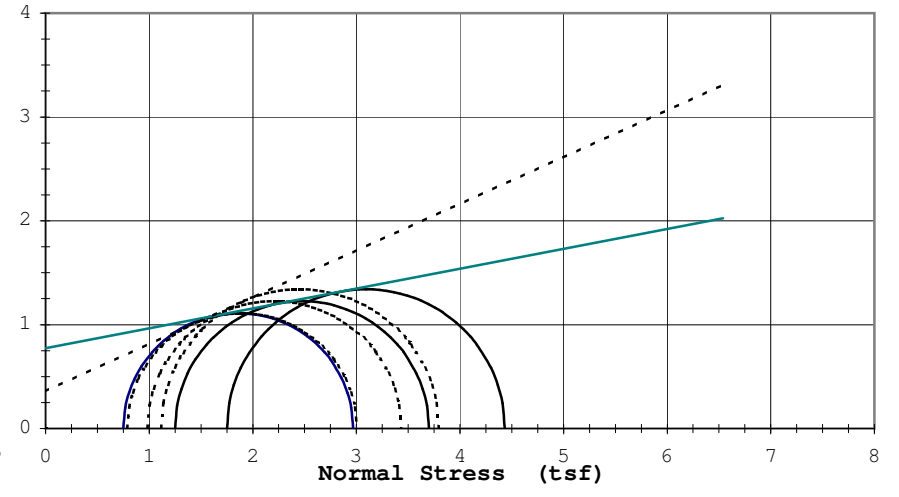
Rupture Envelope at Failure
 $\alpha = 22.4^\circ$ $a = 0.3$ (tsf)



Failure Criterion: Given Strain of: 15%	
Angle of internal friction, $\phi' = 24.3^\circ$	
Apparent Cohesion, $c' = 0.36$ (tsf)	
Test Date: 7/7/15	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.68
Strain Rate (%/min): 0.025	
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.43 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	15.9 16.3 16.2
Void Ratio	113.8 113.1 112.3
After Consolidation	
Diameter (in)	1.42 1.42 1.41
Height (in)	2.85 2.84 2.83
Water Content (%)	16.4 16.0 16.0
Dry Density (pcf)	116.2 117.0 117.1
Void Ratio	0.47 0.48 0.49
Back Pressure (tsf)	4.6 4.0 4.2
Minor Principal Stress (tsf)	0.75 1.25 1.75
Max. Deviator Stress (tsf)	2.27 2.53 2.79
Ultimate Deviator Stress (tsf)	2.25 2.53 2.79
Deviator Stress at Failure (tsf)	2.22 2.45 2.68
Max. Pore Pressure Buildup (tsf)	0.34 0.61 0.93
Pore Pressure Parameter "B"	0.95 0.95 0.95
Pct. Axial Strain at Failure	15.0 15.0 15.0

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective ϕ' : 24.3° $c' = 0.36$ (tsf)
 _____ Total ϕ : 10.8° $c = 0.77$ (tsf)

Triaxial Data

Job: 9919

Boring: BR-602

Sample: SH-10

Depth: 22

Date: 7/14/15

Sample 1			Sample 2			Sample 3			Sample 4			Sample 5		
Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
0.18	0.42	0.14	0.18	0.64	0.24	0.18	0.71	0.29						
0.35	0.61	0.22	0.36	0.89	0.37	0.35	0.93	0.46						
0.53	0.77	0.27	0.53	1.05	0.44	0.53	1.12	0.59						
0.71	0.87	0.29	0.71	1.21	0.50	0.71	1.23	0.67						
0.88	0.96	0.31	0.88	1.31	0.53	0.88	1.35	0.74						
1.05	1.05	0.32	1.06	1.41	0.56	1.06	1.43	0.79						
1.23	1.12	0.33	1.24	1.48	0.58	1.24	1.50	0.83						
1.40	1.19	0.33	1.41	1.56	0.60	1.41	1.56	0.86						
1.58	1.26	0.34	1.59	1.62	0.60	1.59	1.61	0.87						
1.76	1.33	0.33	1.76	1.66	0.61	1.77	1.66	0.89						
1.93	1.38	0.33	1.94	1.71	0.61	1.94	1.70	0.91						
2.11	1.45	0.33	2.11	1.73	0.61	2.12	1.75	0.92						
2.28	1.48	0.32	2.29	1.77	0.61	2.29	1.79	0.93						
2.46	1.54	0.31	2.46	1.80	0.61	2.47	1.83	0.93						
2.63	1.57	0.31	2.64	1.84	0.60	2.65	1.87	0.93						
2.81	1.61	0.30	2.82	1.85	0.60	2.82	1.89	0.93						
2.99	1.64	0.29	3.00	1.88	0.59	3.00	1.93	0.93						
3.16	1.67	0.28	3.17	1.90	0.59	3.18	1.95	0.93						
3.34	1.69	0.27	3.35	1.93	0.58	3.35	2.00	0.93						
3.51	1.72	0.26	3.52	1.96	0.58	3.53	2.03	0.93						
3.86	1.77	0.24	3.88	2.02	0.56	3.88	2.11	0.92						
4.21	1.81	0.22	4.23	2.06	0.55	4.24	2.16	0.92						
4.57	1.84	0.21	4.58	2.10	0.53	4.59	2.20	0.90						
4.92	1.88	0.19	4.93	2.12	0.52	4.94	2.24	0.89						
5.27	1.90	0.18	5.28	2.15	0.51	5.30	2.27	0.88						
5.62	1.93	0.16	5.64	2.16	0.49	5.65	2.29	0.87						
6.32	1.98	0.14	6.34	2.18	0.47	6.35	2.34	0.83						
7.02	2.01	0.11	7.04	2.20	0.44	7.06	2.37	0.82						
7.73	2.04	0.10	7.39	2.21	0.43	7.41	2.39	0.81						
8.43	2.08	0.08	7.74	2.21	0.42	7.77	2.41	0.79						
9.13	2.10	0.06	8.10	2.22	0.40	8.12	2.41	0.78						
9.84	2.14	0.04	8.45	2.23	0.39	8.47	2.43	0.77						
10.54	2.16	0.02	8.80	2.23	0.38	8.83	2.44	0.76						
11.24	2.18	0.00	9.16	2.24	0.37	9.18	2.46	0.75						
11.94	2.19	0.00	9.51	2.25	0.36	9.53	2.47	0.74						
12.65	2.19	-0.01	9.86	2.26	0.35	9.88	2.49	0.73						
13.35	2.21	-0.02	10.21	2.28	0.34	10.24	2.53	0.72						
14.05	2.22	-0.04	10.56	2.30	0.33	10.59	2.58	0.71						
15.81	2.24	-0.05	11.27	2.39	0.32	11.30	2.63	0.69						
17.56	2.27	-0.06	11.97	2.42	0.30	12.00	2.65	0.67						
19.32	2.26	-0.08	12.67	2.44	0.29	12.71	2.67	0.66						
20.00	2.25	-0.09	13.38	2.45	0.27	13.41	2.69	0.64						
			14.08	2.45	0.27	14.12	2.68	0.64						
			15.84	2.43	0.24	15.89	2.67	0.60						
			17.60	2.46	0.22	17.65	2.74	0.57						
			19.36	2.53	0.21	19.42	2.79	0.56						
			20.00	2.53	0.21	20.00	2.79	0.56						

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

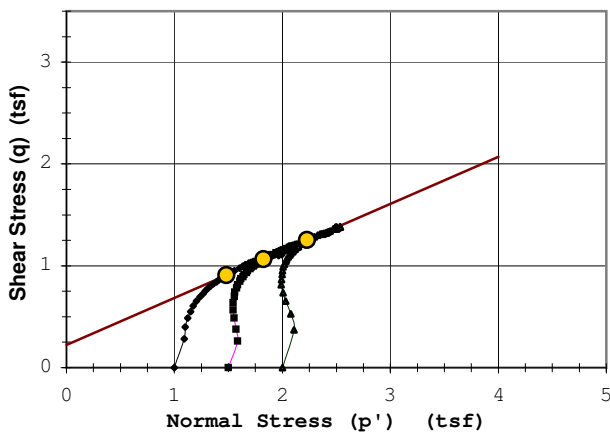
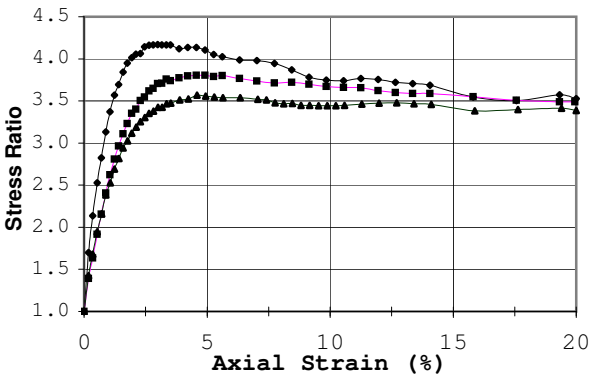
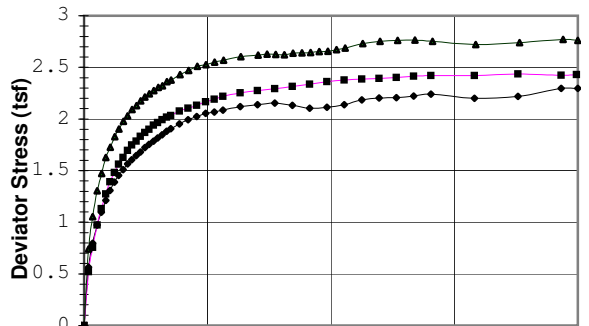
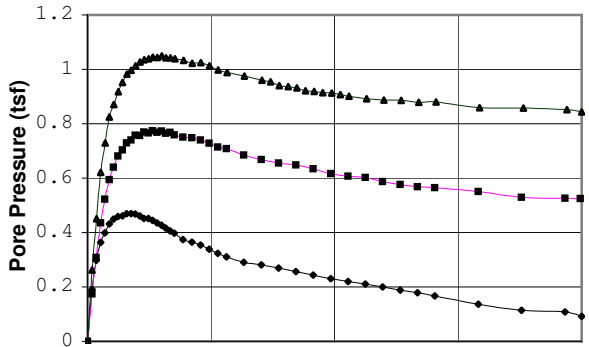
Project: TCAAP - #15.60936.100

Boring #: BR600

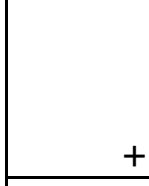
Sample #: SH-11 Type: 3T

Depth (ft): 30

Soil Type: Clayey Sand w/a little gravel (SC/CL)



Rupture Envelope at Failure
 $\alpha = 24.8^\circ$ $a = 0.2$ (tsf)



Failure Criterion: **Max. Stress Ratio**

Angle of internal friction, $\phi' = 27.5^\circ$

Apparent Cohesion, $c' = 0.25$ (tsf)

Test Date: 7/3/15

Test Type: CU w/pp

Strain Rate (in/min): 0.00071

Strain Rate (%/min): 0.025

Liquid Limit:

Plasticity Limit:

Spec. Gravity (Assumed): 2.67

Before Consolidation

Diameter (in)

Height (in)

Water Content (%)

Dry Density (pcf)

Void Ratio

	A	B	C	D	E
Diameter (in)	1.44	1.44	1.44		
Height (in)	2.86	2.86	2.86		
Water Content (%)	16.5	16.6	16.7		
Dry Density (pcf)	111.6	111.9	111.4		
Void Ratio	0.49	0.49	0.50		

After Consolidation

Diameter (in)

Height (in)

Water Content (%)

Dry Density (pcf)

Void Ratio

Diameter (in)	1.42	1.42	1.41		
Height (in)	2.85	2.85	2.84		
Water Content (%)	16.8	16.7	15.8		
Dry Density (pcf)	115.0	115.3	117.2		
Void Ratio	0.45	0.45	0.42		

Back Pressure (tsf)

Minor Principal Stress (tsf)

Max. Deviator Stress (tsf)

Ultimate Deviator Stress (tsf)

Deviator Stress at Failure (tsf)

Max. Pore Pressure Buildup (tsf)

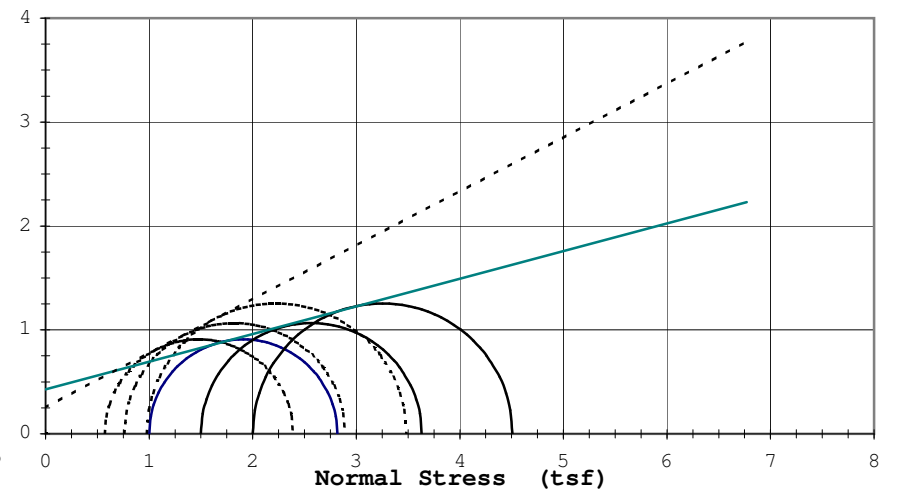
Pore Pressure Parameter "B"

Pct. Axial Strain at Failure

Back Pressure (tsf)	9.1	4.4	4.0		
Minor Principal Stress (tsf)	1.00	1.50	2.00		
Max. Deviator Stress (tsf)	2.30	2.44	2.77		
Ultimate Deviator Stress (tsf)	2.30	2.43	2.76		
Deviator Stress at Failure (tsf)	1.82	2.13	2.51		
Max. Pore Pressure Buildup (tsf)	0.47	0.77	1.05		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	3.0	4.6	4.6		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective ϕ' : 27.5° $c' = 0.25$ (tsf)
 _____ Total ϕ : 14.9° $c = 0.43$ (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

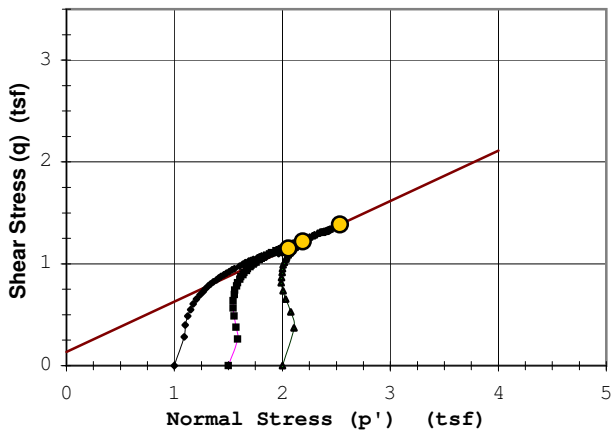
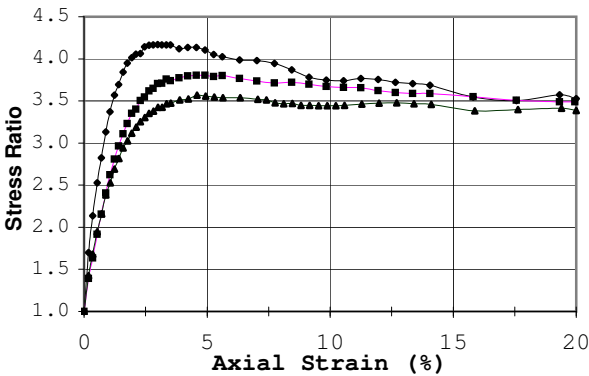
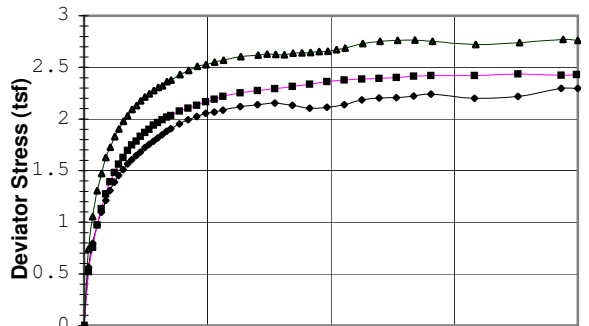
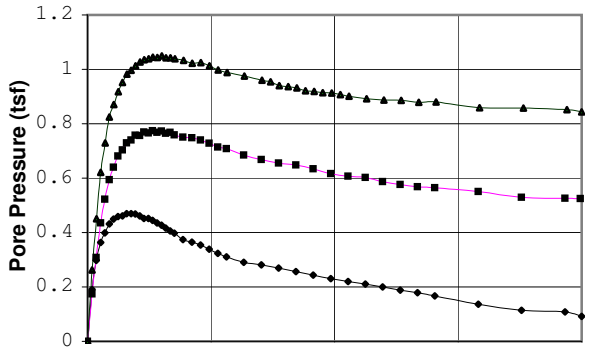
Project: TCAAP - #15.60936.100

Boring #: BR600

Sample #: SH-11 Type: 3T

Depth (ft): 30

Soil Type: Clayey Sand w/a little gravel (SC/CL)



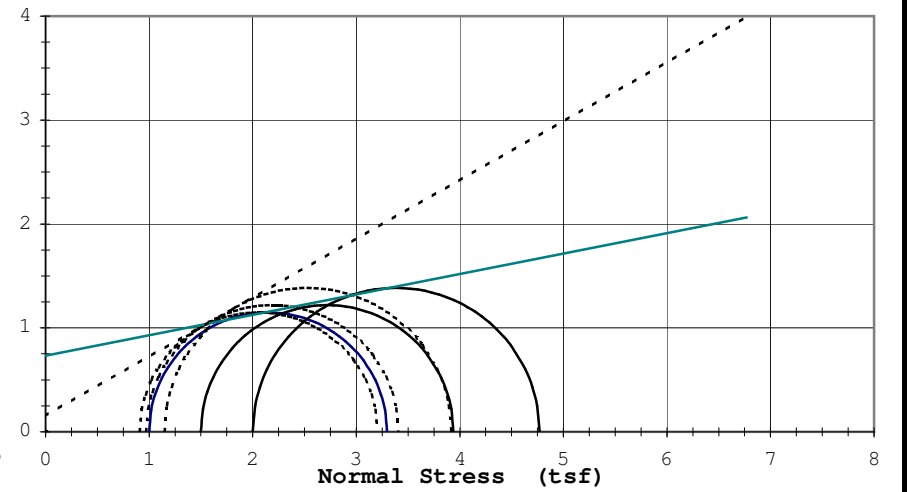
Rupture Envelope at Failure
 $\alpha = 26.3^\circ$ $a = 0.1$ (tsf)



Failure Criterion: Max. Deviator Stress	
Angle of internal friction, $\phi' = 29.6^\circ$	
Apparent Cohesion, $c' = 0.15$ (tsf)	
Test Date: 7/3/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.67
Strain Rate (%/min): 0.025	
Before Consolidation	
Diameter (in)	A B C D E
Height (in)	1.44 1.44 1.44
Water Content (%)	2.86 2.86 2.86
Dry Density (pcf)	16.5 16.6 16.7
Void Ratio	111.6 111.9 111.4
After Consolidation	
Diameter (in)	0.49 0.49 0.50
Height (in)	1.42 1.42 1.41
Water Content (%)	2.85 2.85 2.84
Dry Density (pcf)	16.8 16.7 15.8
Void Ratio	115.0 115.3 117.2
Back Pressure (tsf)	0.45 0.45 0.42
Minor Principal Stress (tsf)	9.1 4.4 4.0
Max. Deviator Stress (tsf)	1.00 1.50 2.00
Ultimate Deviator Stress (tsf)	2.30 2.44 2.77
Deviator Stress at Failure (tsf)	2.30 2.43 2.76
Max. Pore Pressure Buildup (tsf)	2.30 2.44 2.77
Pore Pressure Parameter "B"	0.47 0.77 1.05
Pct. Axial Strain at Failure	0.95 0.95 0.95
	20.0 17.6 19.4

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



----- Effective ϕ' : 29.6° $c' = 0.15$ (tsf)
 _____ Total ϕ : 11.1° $c = 0.73$ (tsf)

TRIAXIAL TEST ASTM: D 4767

Job No. 9919

Date: 7/14/15

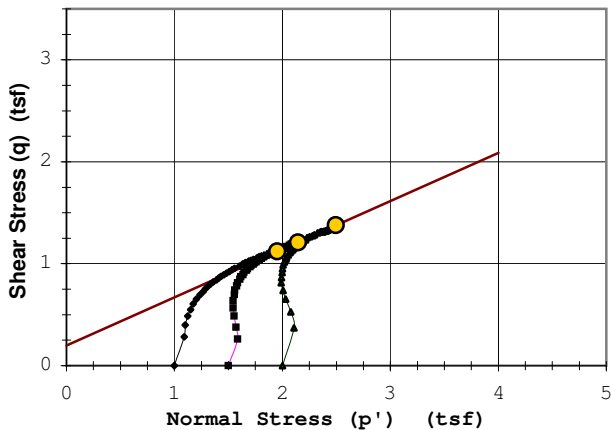
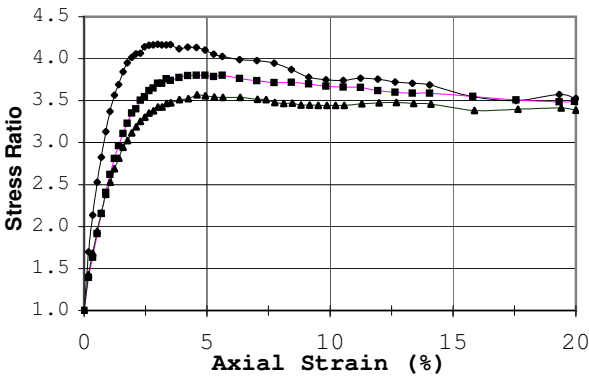
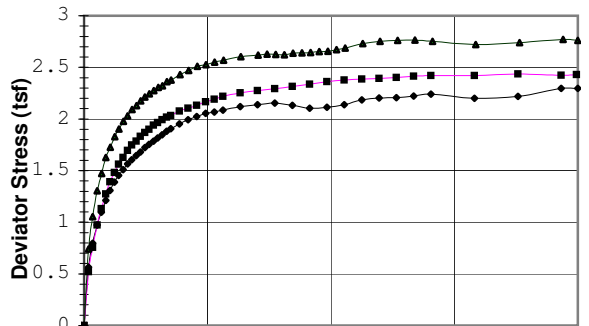
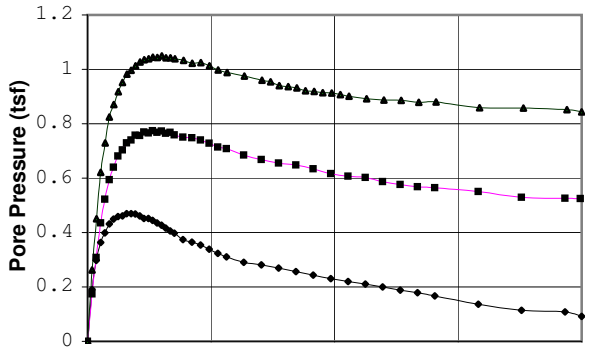
Project: TCAAP - #15.60936.100

Boring #: BR600

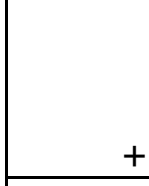
Sample #: SH-11 Type: 3T

Depth (ft): 30

Soil Type: Clayey Sand w/a little gravel (SC/CL)



Rupture Envelope at Failure
 $\alpha = 25.3^\circ$ $a = 0.2$ (tsf)



Failure Criterion: **Given Strain of: 15%**

Angle of internal friction, $\phi' = 28.2^\circ$
 Apparent Cohesion, $c' = 0.22$ (tsf)

Test Date: 7/3/15	Liquid Limit:
Test Type: CU w/pp	Plasticity Limit:
Strain Rate (in/min): 0.00071	Spec. Gravity (Assumed): 2.67
Strain Rate (%/min): 0.025	

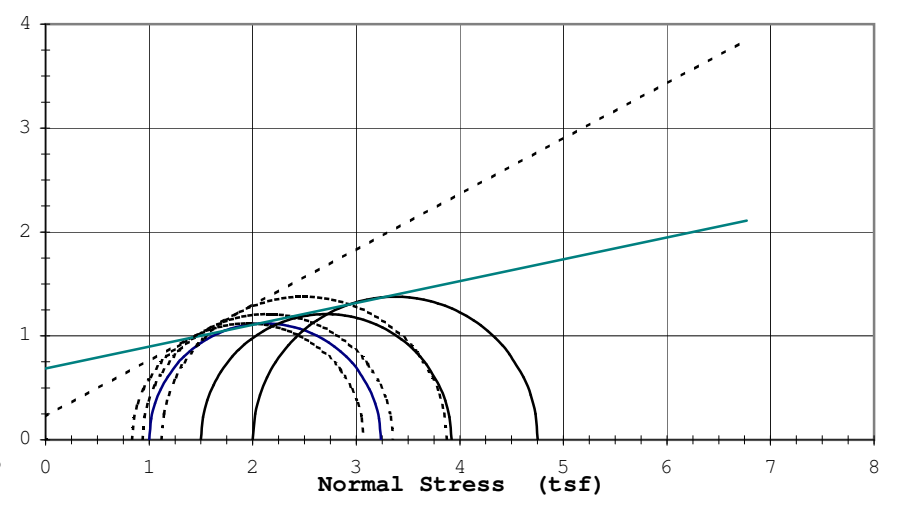
Before Consolidation		A	B	C	D	E
Diameter (in)		1.44	1.44	1.44		
Height (in)		2.86	2.86	2.86		
Water Content (%)		16.5	16.6	16.7		
Dry Density (pcf)		111.6	111.9	111.4		
Void Ratio		0.49	0.49	0.50		

After Consolidation		A	B	C	D	E
Diameter (in)		1.42	1.42	1.41		
Height (in)		2.85	2.85	2.84		
Water Content (%)		16.8	16.7	15.8		
Dry Density (pcf)		115.0	115.3	117.2		
Void Ratio		0.45	0.45	0.42		

Back Pressure (tsf)	9.1	4.4	4.0		
Minor Principal Stress (tsf)	1.00	1.50	2.00		
Max. Deviator Stress (tsf)	2.30	2.44	2.77		
Ultimate Deviator Stress (tsf)	2.30	2.43	2.76		
Deviator Stress at Failure (tsf)	2.24	2.42	2.75		
Max. Pore Pressure Buildup (tsf)	0.47	0.77	1.05		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	15.0	15.0	15.0		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Radial drainage strips applied to trimmed specimen; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.



-----	Effective ϕ' : 28.2°	$c' = 0.22$ (tsf)
_____	Total ϕ : 11.9°	$c = 0.69$ (tsf)

Triaxial Data

Job: 9919

Boring: BR600

Sample: SH-11

Depth: 30

Date: 7/14/15

Sample 1			Sample 2			Sample 3			Sample 4			Sample 5		
Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
0.18	0.57	0.19	0.18	0.52	0.17	0.18	0.74	0.26						
0.35	0.80	0.30	0.35	0.76	0.31	0.36	1.06	0.45						
0.53	0.97	0.36	0.53	0.97	0.44	0.53	1.30	0.62						
0.70	1.10	0.40	0.70	1.13	0.52	0.71	1.47	0.73						
0.88	1.21	0.43	0.88	1.27	0.59	0.89	1.63	0.82						
1.05	1.31	0.45	1.05	1.39	0.64	1.06	1.72	0.87						
1.23	1.39	0.46	1.23	1.48	0.68	1.24	1.83	0.92						
1.41	1.45	0.46	1.41	1.56	0.70	1.41	1.90	0.95						
1.58	1.51	0.47	1.58	1.63	0.73	1.59	1.98	0.98						
1.76	1.57	0.47	1.76	1.70	0.74	1.77	2.03	1.00						
1.93	1.60	0.47	1.93	1.75	0.76	1.94	2.09	1.01						
2.11	1.65	0.46	2.11	1.79	0.76	2.12	2.13	1.03						
2.28	1.68	0.45	2.28	1.83	0.77	2.29	2.18	1.03						
2.46	1.72	0.45	2.46	1.87	0.77	2.47	2.21	1.04						
2.64	1.75	0.44	2.64	1.90	0.77	2.65	2.24	1.05						
2.81	1.79	0.44	2.81	1.94	0.77	2.83	2.28	1.04						
2.99	1.82	0.43	2.99	1.97	0.77	3.00	2.31	1.05						
3.16	1.85	0.42	3.16	1.99	0.76	3.18	2.32	1.04						
3.34	1.88	0.41	3.34	2.02	0.77	3.35	2.36	1.04						
3.51	1.91	0.40	3.51	2.03	0.76	3.53	2.38	1.04						
3.87	1.95	0.37	3.87	2.08	0.75	3.88	2.43	1.03						
4.22	1.99	0.36	4.22	2.10	0.75	4.24	2.47	1.02						
4.57	2.02	0.35	4.57	2.13	0.74	4.59	2.51	1.02						
4.92	2.05	0.34	4.92	2.16	0.73	4.94	2.53	1.01						
5.27	2.07	0.32	5.27	2.19	0.71	5.29	2.55	1.00						
5.62	2.08	0.31	5.62	2.22	0.71	5.65	2.57	0.99						
6.33	2.12	0.29	6.33	2.25	0.69	6.35	2.60	0.97						
7.03	2.14	0.28	7.03	2.28	0.67	7.06	2.62	0.96						
7.73	2.15	0.27	7.73	2.29	0.66	7.41	2.63	0.95						
8.43	2.13	0.26	8.43	2.31	0.65	7.76	2.62	0.94						
9.14	2.10	0.24	9.14	2.34	0.63	8.12	2.62	0.94						
9.84	2.11	0.23	9.84	2.36	0.62	8.47	2.64	0.93						
10.54	2.14	0.22	10.54	2.38	0.61	8.82	2.64	0.92						
11.25	2.18	0.21	11.25	2.38	0.60	9.17	2.64	0.92						
11.95	2.20	0.20	11.95	2.39	0.59	9.53	2.65	0.91						
12.65	2.21	0.19	12.65	2.40	0.58	9.88	2.66	0.91						
13.35	2.22	0.18	13.35	2.41	0.57	10.23	2.67	0.91						
14.06	2.24	0.17	14.06	2.42	0.57	10.58	2.69	0.90						
15.81	2.20	0.14	15.81	2.42	0.55	11.29	2.73	0.89						
17.57	2.22	0.11	17.57	2.44	0.53	12.00	2.75	0.89						
19.33	2.30	0.11	19.33	2.42	0.53	12.70	2.76	0.89						
20.00	2.30	0.09	19.95	2.43	0.52	13.41	2.76	0.88						
						14.11	2.75	0.88						
						15.87	2.72	0.86						
						17.64	2.74	0.86						
						19.40	2.77	0.85						
						20.00	2.76	0.84						

Appendix D

Spine Road Soil Boring Logs

January 2016

T:\1382 KimleyHorn\01 TCAAP Rice Creek Remeander\TASK 15 Geotechnical\Geotech Results and Reports\Geotechnical Investigation Report\Geotechnical Report Text.docx



Responsive partner. Exceptional outcomes.



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BORING NUMBER SR-200

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/30/15 **COMPLETED** 6/30/15 **GROUND ELEVATION** 925.18 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.00 ft / Elev 911.18 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 31 ft S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (4 Inches)										
0.3		924.9	SS 1	33	2-3-2 (5)							
		SILTY SAND, (SM) brown, fine grained, moist, loose to very loose, trace gravel	SS 2	56	3-3-3 (6)							
5			SS 3	33	2-2-1 (3)							
7.0		918.2	SS 4	78	0-1-2 (3)							
		SILTY LEAN CLAY, (CL-ML) dark gray, moist, soft NOTE: Weight of Hammer at 7.0 feet.										
9.5		915.7	SH 5									
		PEAT, (Pt) black, moist to wet, soft NOTE: Sand (SP) lenses at 12.0 feet.	SS 6	67	1-2-2 (4)							
15			SS 7	44	1-2-2 (4)							
17.5		907.7	SS 8	56	1-1-2 (3)							
		POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, very loose										
20		905.2	SS 9	78	1-2-2 (4)							
		POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, very loose, trace gravel										
21.5		903.7										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER SR-201

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 951.1 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	950.6									
1.5		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, moist (Fill)	949.6	78	6-8-3 (11)							
3.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	948.1	78	4-5-6 (11)							
5		SANDY LEAN CLAY, (CL) gray, moist, medium to stiff, trace gravel		33	3-4-4 (8)							
			SH 4									
			SS 5	89	3-4-6 (10)							
			SS 6	89	5-7-11 (18)							
			SS 7	78	8-11-12 (23)							
			SS 8	72	7-9-12 (21)							
			SS 9	67	8-10-13 (23)							
20.0		POORLY GRADED SAND WITH GRAVEL, (SP) gray to brown, fine to medium grained, moist, dense	931.1									
21.0			930.1									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-202

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 955.31 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	954.8									
1.5		SILTY SAND WITH GRAVEL, (SM) brown, moist (Fill)	953.8	33	3-4-5 (9)							
		LEAN CLAY WITH SAND, (CL) brown to gray, fine grained, moist, rather stiff to very stiff, trace gravel		78	4-6-8 (14)							
5			SS 2	78	4-6-8 (14)							
			SS 3	78	5-7-8 (15)							
			SS 4	100	4-7-9 (16)							
10			SS 5	100	5-7-8 (15)							
			SS 6	100	5-10-12 (22)							
15			SS 7	100	5-9-11 (20)							
			SS 8	100	5-15-25 (40)							
20			SH 9									
21.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER SR-203

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 956.01 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist, occasional clayey sand (SC) seams (Fill) NOTE: Rock in tip of Split-Spoon	SS 1	44	1-1-1 (2)							
			SS 2	56	8-6-6 (12)							
5		951.5										
7.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	SS 3	56	7-9-10 (19)							
			SS 4	67	2-4-7 (11)							
10		949.0										
10.0		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense to loose	SS 5	67	4-4-4 (8)							
			SH 6									
15		946.0										
		LEAN CLAY WITH SAND, (CL) brown to gray, moist, medium to stiff, trace gravel, sand lenses	SS 7	56	2-3-4 (7)							
			SS 8	100	4-8-10 (18)							
20			SS 9									
21.0		935.0										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-204

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 954.6 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft N **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense to loose	SS 1	67	4-4-5 (9)							
			SS 2	56	4-4-6 (10)							
5		NOTE: Sand lense at 4.5 feet	SS 3	78	1-4-4 (8)							
6.0		CLAYEY SAND, (SC) brown, moist, dense, trace gravel	SH 4					14	25	13	12	44
			SS 5	44	3-7-10 (17)							
			SS 6	100	7-8-10 (18)							
			SS 7	100	5-9-11 (20)							
17.0		CLAYEY SAND, (SC) brown, fine to coarse grained, moist, very dense, trace coarse gravel	SS 8	68	32/6"							
		NOTE: Hard drilling due to coarse gravel at 17.0 feet.										
19.5		SANDY LEAN CLAY, brown, moist, stiff, little fine to coarse gravel	SS 9	44	10-13-14 (27)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-205

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 951.02 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft SE **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)	SS 1	67	5-6-6 (12)							
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist, medium dense	SS 2	56	6-6-8 (14)							
4.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense	SS 3	67	4-7-10 (17)							
		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff to very stiff, trace gravel, sand lenses at 12.0 feet	SS 4	83	6-8-8 (16)							
			SS 5	78	6-8-12 (20)							
			SS 6	100	6-8-10 (18)							
			SS 7	100	5-7-7 (14)							
			SH 8									
21.0			SS 9	100	9-15-19 (34)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-206

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 942.32 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft N **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 4.5		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist (Fill)	SS 1	44	9-10-10 (20)							
4.5 - 5.0			SS 2	56	8-8-6 (14)							
5.0 - 7.0		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 3	100	5-6-6 (12)							
7.0 - 9.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense	SS 4	78	3-5-6 (11)							
9.5 - 10.0			SH 5									
10.0 - 17.0		LEAN CLAY WITH SAND, (CL) brown, moist, stiff to very stiff, little gravel	SS 6	89	7-9-10 (19)							
17.0 - 19.5			SS 7	100	8-10-11 (21)							
19.5 - 21.0			SS 8	0	13-20-25 (45)							
21.0			SS 9	0	13-22-27 (49)							

NOTE: No Recovery due to coarse gravel at 17.0 feet. Sampled auger cuttings.

NOTE: No Recovery due to coarse gravel at 19.5 feet. Sampled auger cuttings.

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-207

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 938.51 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	SS 1	44	9-9-10 (19)							
3.0		CLAYEY SAND, (SC) gray, moist, medium dense	SS 2	56	5-9-12 (21)							
5			SH 3					16	29	14	15	43
10			SS 4	89	3-4-5 (9)							
10			SS 5	89	4-5-4 (9)							
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to stiff, trace gravel	SS 6	100	3-3-3 (6)							
15			SS 7	44	4-5-6 (11)							
20			SS 8	44	7-12-11 (23)							
21.0			SS 9	33	5-8-10 (18)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-208

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 935.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill) 933.6	SS 1	39	4-6-7 (13)							
4.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill) 931.6	SS 2	100	5-5-5 (10)							
5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose to medium dense, trace gravel	SS 3	17	2-3-4 (7)							
10			SH 4									
12.0			SS 5	67	3-5-6 (11)							
15		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff to stiff, trace gravel 923.6	SS 6	89	4-5-5 (10)							
			SS 7	89	5-6-6 (12)							
			SS 8	78	5-7-10 (17)							
20			SS 9	56	9-12-12 (24)							
21.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, dense, trace gravel 915.6 / 914.6										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-209

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 911.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, moist, trace gravel (Fill)	SS 1	33	2-3-4 (7)							
908.0		SANDY LEAN CLAY, (CL) brown to gray, moist, medium to rather stiff, trace gravel	SS 2	67	3-4-4 (8)							
5			SS 3	67	4-4-5 (9)							
10			SS 4	100	3-4-4 (8)							
15			SH 5									
			SS 6	100	1-3-4 (7)							
			SS 7	100	2-3-5 (8)							
			SS 8	100	2-3-4 (7)							
21.0			SS 9	89	2-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-210

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 913.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.50 ft / Elev 909.14 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft NE **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) some gravel (Fill)	SS 1	33	1-2-3 (5)							
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) fine to medium grained, dense, trace gravel	SS 2	78	5-12-14 (26)							
5.0		CLAYEY SILT, (SC) saturated, trace gravel										
6.0		POORLY GRADED SAND WITH SILT, (SP-SM) saturated, trace gravel	SS 3	17								
8.5		CLAYEY SAND, (SC) gray, saturated, loose to dense, trace gravel	SS 4	22								
10.0			SS 5	33	4-6-6 (12)							
12.0			SS 6	89	3-3-4 (7)							
14.0			SS 7	89	4-5-7 (12)							
16.0			SS 8	17	5-7-8 (15)							
18.0			SS 9	11	5-8-10 (18)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-211

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 907.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	906.9	SS 1	56	3-3-2 (5)						
3.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill) NOTE: No recovery at 2.0 feet. Sampled auger cuttings.	904.4	SS 2	0	3-4-3 (7)						
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose to medium dense, trace gravel		SS 3	56	2-3-3 (6)						
				SS 4	67	4-6-6 (12)						
9.5		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel	897.9	SS 5	78	5-6-5 (11)						
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel	895.4	SS 6	83	3-4-4 (8)						
15				SH 7								
				SS 8	100	6-6-7 (13)						
20				SS 9	100	7-6-8 (14)						
21.0			886.4									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-212

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 894.22 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 879.72 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft NW **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		FILL/TOPSOIL, (SC) black, very loose to loose, with organics	893.2	SS 1	78	1-1-1 (2)						
3.5		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	890.7	SS 2	33	2-2-2 (4)						
5				SS 3	78	1-3-3 (6)						
				SS 4	100	3-4-5 (9)						
10		NOTE: Trace gravel below 9.5 feet.		SS 5	100	3-5-5 (10)						
15				SH 6				14	23	10	13	52
				SS 7	78	2-2-3 (5)						
				SS 8	100	2-3-4 (7)						
20				SS 9	100	3-4-5 (9)						
21.0			873.2									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-213

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 890.76 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 878.76 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SILTY SAND WITH GRAVEL, (SM) fine grained, moist (Fill) NOTE: Sampled auger cutting.	SS 1	0	8-4-6 (10)							
4.0		886.8	SS 2	78	16-12-15 (27)							
5		LEAN CLAY WITH SAND, (CL) moist, stiff to rather stiff, trace gravel	SS 3	44	8-9-11 (20)							
8.5		882.3	SS 4	83	2-6-8 (14)							
10		SILTY SAND, (SM) fine grained, moist, loose, trace gravel	SS 5	78	3-3-5 (8)							
11.0		879.8	SS 6	89	3-3-4 (7)							
15		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SH 7									
20			SS 8	100	2-4-5 (9)							
21.0		869.8	SS 9	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-214

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 890.28 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 880.78 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	67	4-4-3 (7)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 2	56	4-5-5 (10)							
8.5		SILTY SAND, (SM) brown to gray, fine grained, moist to saturated, medium dense to dense	SS 3	67	6-7-6 (13)							
10.5			SS 4	56	4-4-5 (9)							
12.5			SS 5	56	6-7-7 (14)							
14.5			SS 6	89	5-5-5 (10)							
16.5			SS 7	100	6-8-7 (15)							
18.5			SS 8	56	8-8-9 (17)							

Borehole backfilled soil cuttings.
 Bottom of borehole at 18.5 feet.



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BORING NUMBER SR-215

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 889.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 882.66 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND, (SP-SM) brown, fine to coarse grained, moist, trace gravel (Fill) 888.2	SS 1	44	3-4-3 (7)							
3.5		SILTY SAND, (SM) gray to brown, fine grained, moist (Fill) 886.2	SS 2	56	5-4-6 (10)							
5		SILTY SAND, (SM) brown, fine grained, moist to saturated, medium dense NOTE: Borehole wet cave-in at 5.7 feet.	SS 3	78	4-5-4 (9)							
10			SS 4	67	6-6-7 (13)							
12.0			SS 5	100	6-8-6 (14)							
15			SS 6	100	6-8-9 (17)							
17.5			SS 7	100	6-4-10 (14)							
19.5			SS 8	100	4-10-5 (15)							
21.0			SS 9	100	5-6-6 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-216

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 887.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 880.29 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		SILTY SAND, (SM) brown, fine to medium grained, moist, trace gravel (Fill)	887.0 885.8	SS 1	67	3-5-5 (10)						
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist (Fill)	883.8	SS 2	56	3-6-6 (12)						
3.5		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist, medium dense	881.3	SS 3	67	5-7-6 (13)						
6.0		SILTY SAND, (SM) light brown, fine grained, moist, medium dense, trace gravel		SS 4	44	3-3-4 (7)						
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, moist to saturated, loose, trace gravel		SS 5	44	1-2-2 (4)						
11.0			876.3									

NOTE: Boring terminated at 11.0 feet due to borehole cave-in.

Borehole backfilled with auger cuttings.
 Bottom of borehole at 11.0 feet.



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BORING NUMBER SR-217

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 886.05 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 879.05 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
5		SILTY SAND, (SM) brown, fine grained, moist to saturated, loose to medium dense, trace gravel	SS 1	56	4-6-5 (11)							
			SS 2	67	4-9-7 (16)							
			SS 3	78	4-5-4 (9)							
8.5		877.6	SS 4	100	3-3-2 (5)							
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, saturated, medium dense, trace gravel	SS 5	89	5-7-6 (13)							
14.5		871.6	SH 6									
15		SILTY SAND, (SM) brown, medium to coarse grained, saturated, medium dense, trace gravel	SS 7	100	4-6-7 (13)							
17.0		869.1										
18.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, loose	SS 8	78	3-3-2 (5)							
20		SANDY LEAN CLAY, (CL) gray, saturated, medium, trace gravel										
21.0		NOTE: Silty sand seam at 20.0 feet. 865.1	SS 9	67	3-3-4 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-218

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 883.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 869.17 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist (Fill) 881.7	SS 1	56	6-7-6 (13)							
5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 2	56	8-8-9 (17)							
7.0			SS 3	67	7-6-9 (15)							
9.5		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, moist, dense 876.7	SS 4	56	10-11-13 (24)							
10		PEAT, (Pt) black to dark gray, moist, rather stiff 874.2	SS 5	67	4-5-6 (11)							
14.5			SH 6									
15		SILTY SAND, (SM) gray, fine to medium grained, saturated, medium dense 869.2	SS 7	56	4-4-5 (9)							
20			SS 8	100	6-7-7 (14)							
21.0			SS 9	89	7-6-6 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-219

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 898.15 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT (1.5 Inches)										
0.1		BASE (4 Inches)										
0.5		POORLY GRADED SAND WITH SILT, (SP-SM) light brown to brown, fine to medium grained, dry to moist, trace gravel (Fill)	SS 1	44	8-11-11 (22)							
			SS 2	67	10-11-12 (23)							
5			SS 3	67	9-10-12 (22)							
			SS 4	89	10-8-9 (17)							
10			SS 5	78	10-11-13 (24)							
		POORLY GRADED SAND, (SP-SM) brown, fine to medium grained, moist, little gravel, apparent roadway base material (Fill)	SS 6	100	13-15-16 (31)							
15		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, dry, dense, trace gravel	SS 7	56	8-12-11 (23)							
			SS 8	89	6-8-6 (14)							
20		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, medium dense	SS 9	100	6-7-7 (14)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-220

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 884.33 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		TOPSOIL (2 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, trace gravel (Fill)	SS 1	67	8-10-11 (21)							
2.0		SILTY SAND, (SM) light brown to gray, fine grained, moist (Fill)	SS 2	56	9-13-15 (28)							
5			SS 3	67	8-11-12 (23)							
			SS 4	67	3-5-5 (10)							
9.5		SILTY SAND, (SM) gray, fine grained, moist, asphalt pieces (Fill)	SS 5	100	32/6"							
12.0		SILTY SAND, (SM) gray, fine grained, moist, trace gravel (Fill)	SS 6	67	6-6-7 (13)							
14.5		SILTY SAND, (SM) dark gray to gray, fine grained, moist, loose, organic stain	SS 7	56	2-2-3 (5)							
			SS 8	100	4-3-4 (7)							
20			SS 9	56	3-3-5 (8)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-221

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 892.07 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 15.30 ft / Elev 876.77 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		TOPSOIL (2 Inches)										
		SILTY SAND, (SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	4-2-4 (6)							
			SS 2	89	3-3-4 (7)							
3.5		SILTY SAND, (SM) light brown, fine grained, moist, loose to medium dense										
			SS 3	67	3-4-4 (8)							
			SS 4	78	4-6-8 (14)							
			SS 5	100	4-6-8 (14)							
12.0		SILTY SAND, (SM) light brown, fine grained, moist to saturated, loose to medium dense										
			SS 6	89	3-5-4 (9)							
			SS 7	78	3-3-5 (8)							
			SS 8	78	4-5-7 (12)							
21.0			SS 9	56	5-7-9 (16)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-222

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 897.17 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.70 ft / Elev 879.47 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, very loose, trace gravel	SS 1	56	2-2-2 (4)							
		SILTY SAND, (SM) brown to light brown, fine grained, moist, very loose to dense	SS 2	78	2-3-2 (5)							
5			SS 3	56	2-1-2 (3)							
			SS 4	78	5-9-9 (18)							
10			SS 5	78	4-5-7 (12)							
			SS 6	67	4-6-7 (13)							
15		SILTY SAND, (SM) light brown, fine grained, moist to saturated, loose to medium dense	SS 7	78	2-3-5 (8)							
			SS 8	56	4-6-7 (13)							
20			SS 9	78	5-6-7 (13)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-223

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 898.48 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.20 ft / Elev 881.28 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
			SS 1	67	1-3-2 (5)							
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, loose, trace gravel										
			SS 2	78	2-2-3 (5)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, loose, trace medium to coarse gravel										
			SS 3	67	1-2-2 (4)							
			SS 4	78	1-2-2 (4)							
			SS 5	67	1-1-3 (4)							
			SS 6	78	2-3-4 (7)							
			SS 7	22	2-3-3 (6)							
			SS 8	67	5-8-10 (18)							
21.0			SS 9	78	8-10-10 (20)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-224

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 899.93 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 16.00 ft / Elev 883.93 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose	SS 1	78	3-3-2 (5)							
		SILTY SAND, (SM) brown to light brown, fine grained, moist to saturated, very loose to dense	SS 2	67	2-2-2 (4)							
5			SS 3	56	2-2-3 (5)							
		NOTE: Trace gravel at 7.0 feet.	SS 4	44	1-2-2 (4)							
10			SS 5	78	3-5-6 (11)							
			SS 6	67	3-4-5 (9)							
15			SS 7	67	2-2-3 (5)							
			SS 8	56	5-9-9 (18)							
20			SS 9	56	5-9-12 (21)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-225

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 898.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 19.5		POORLY GRADED SAND WITH SILT, (SP-SM) light brown to dark brown, fine to medium grained, moist, medium dense to very loose	SS 1	56	3-4-3 (7)							
			SS 2	78	5-5-5 (10)							
			SS 3	89	3-3-3 (6)							
			SS 4	78	5-6-6 (12)							
			SS 5	78	4-5-6 (11)							
			SS 6	67	2-2-2 (4)							
			SS 7	56	2-3-3 (6)							
			SS 8	56	3-2-3 (5)							
19.5 - 21.0		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose	SS 9	67	4-4-3 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

Appendix E

Rice Creek Re-Meander Bridge Soil Boring Logs

January 2016

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BORING NUMBER RC-500

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 883.81 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 4.50 ft / Elev 879.31 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		POORLY GRADED GRAVEL WITH SAND, (GP) brown, fine to medium grained, coarse gravel (Fill)	SS 1	44	4-5-4 (9)							
3.0		880.8	SS 2	56	6-6-8 (14)							
5		∇ SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, medium dense to dense	SS 3	67	8-11-10 (21)							
7.0		876.8	SS 4	78	5-6-7 (13)							
10		SILTY SAND, (SM) gray, fine to medium grained, saturated, medium dense	SS 5	100	5-6-5 (11)							
15		14.5	SS 6	100	4-4-5 (9)							
15		869.3	SS 7	78	2-3-3 (6)							
20		SILTY SAND, (SM) gray, fine to medium grained, saturated, loose, trace gravel	SS 8	89	3-4-3 (7)							
21.0		862.8	SS 9	100	4-4-3 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

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BORING NUMBER RC-501

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 884.4 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 874.90 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 13:44 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTRC - RICE CREEK REMEASUR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, trace gravel (Fill)	SS 1	78	5-5-7 (12)							
		SILTY SAND, (SM) brown, fine to medium grained, moist, dense to medium dense, trace gravel	SS 2	78	6-7-10 (17)							
5			SS 3	89	7-10-11 (21)							
8.0		PEAT, (Pt) dark gray to black, dry, rather stiff	SS 4	78	4-5-7 (12)							
8.5		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense, trace coarse gravel	SS 5	67	4-5-3 (8)							
			SS 6	100	4-7-7 (14)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel	SS 7	100	2-2-3 (5)							
			SS 8	100	3-4-4 (8)							
21.0		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose, trace gravel	SH 9					16	26	11	15	51
22.0												26

Borehole backfilled with auger cuttings.
 Bottom of borehole at 22.0 feet.



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BORING NUMBER RC-502

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 884.24 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 877.24 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 15 ft. W **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry (Fill) 882.2	SS 1	78	7-9-10 (19)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist (Fill) 879.7	SS 2	56	8-9-9 (18)							
5		SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, dense to very loose	SS 3	100	7-9-11 (20)							
		<input checked="" type="checkbox"/>	SS 4	100	3-1-1 (2)							
10			SS 5	67	1-1-1 (2)							
			SS 6	78	2-2-3 (5)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, very loose to medium dense, trace gravel 869.7	SS 7	56	2-2-1 (3)							
			SS 8	100	6-7-6 (13)							
20			SS 9	89	4-4-5 (9)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 13:44 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTRC - RICE CREEK REMEASUR.GPJ



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BORING NUMBER RC-503

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 881.95 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ---
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 15 ft. SW **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry (Fill)	SS 1	67	3-2-3 (5)							
5.0		SILTY SAND, (SM) brown, fine grained, moist, loose, trace gravel	SS 2	67	3-3-3 (6)							
7.0		SILTY SAND, (SM) gray to dark gray, fine grained, saturated, very loose to medium dense, trace organics	SS 3	67	3-3-3 (6)							
10.0		Note: Organic content at 10 feet = 2.6%	SH 5					15				16
15.0			SS 6	56	3-3-2 (5)							
17.0		NOTE: Borehole wet cave-in at 17.0 feet.	SS 7	78	2-2-2 (4)							
18.5			SS 8	78	2-4-6 (10)							
19.5		POORLY GRADED GRAVEL, (GP) gray, saturated, medium dense, fine to medium gravel										
21.0		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, saturated, medium dense	SS 9	100	4-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

Water Main Soil Boring Logs

January 2016

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BORING NUMBER WM-400

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 965.77 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	964.9									
		CLAYEY SAND, (SC) brown, moist, loose to medium dense, trace gravel	SS 1	56	4-5-6 (11)							
			SS 2	100	6-4-5 (9)							
4.5		SANDY LEAN CLAY, (CL) brown, moist, medium to very stiff, trace gravel	961.3									
			SS 3	67	3-2-3 (5)							
			SS 4	100	3-4-3 (7)							
10			SH 5					17	29	13	16	51
		NOTE: No recovery. Sampled auger cuttings.										
13.5			952.3									
			SS 6	0	32							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-401

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 954.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINTWM - WATER MAIN.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		SILTY SAND, (SM) brown, fine to medium grained, moist, little gravel (Fill)	953.1	SS 1	67	5-10-7 (17)						
3.0		CLAYEY SAND, (SC) brown, fine grained, moist, trace gravel (Fill)	951.6	SS 2	56	5-6-7 (13)						
4.5		CLAYEY SAND, (SC) brown, fine grained, moist, medium dense, trace gravel	950.1	SS 3	67	4-3-4 (7)						
		CLAYEY SAND, (SC) brown, fine grained, moist, medium dense to stiff, trace gravel		SS 4	100	5-5-7 (12)						
10				SH 5				12	23	13	10	30
												45
13.5			941.1	SS 6	100	7-8-8 (16)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-402

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 915.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 903.63 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)	914.8	SS 1	78	3-3-2 (5)						
0.8		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist (Fill)	912.6	SS 2	100	4-6-5 (11)						
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist, loose		SS 3	89	4-5-3 (8)						
5				SS 4	78	4-3-4 (7)						
7.0		CLAYEY SAND, (SC) moist, loose, trace gravel	907.6	SH 5				11				
8.0		SILTY SAND, (SM) brown, fine to medium grained, moist, medium, trace clay (CL) lenses		SS 6	100	4-4-5 (9)						
10												30
12.8			902.8									
13.5		CLAYEY SAND, (SC) gray, saturated, medium dense, trace gravel	902.1									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-403

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 907.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ▽ 7.50 ft / Elev 900.16 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		TOPSOIL (5 inches)	907.2									
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace coarse gravel (Fill)	906.2	SS 1	67	5-4-4 (8)						
2.7		SANDY LEAN CLAY, (CL) brown, moist, rather stiff	905.0	SS 2	100	7-6-7 (13)						
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist to saturated, medium dense		SS 3	100	5-6-6 (12)						
7.7	▽	LEAN CLAY WITH SAND, (CL) brown, wet, medium	900.0	SS 4	78	2-3-3 (6)						
9.5		CLAYEY SAND, (SC) blue gray, saturated, very loose	898.2	SS 5	100	2-2-2 (4)						
12.5		LEAN CLAY, (CL) blue gray, wet, trace gravel	895.2	SH 6								
15.0			892.7									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 15.0 feet.

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BORING NUMBER WM-404

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/5/15 **COMPLETED** 6/5/15 **GROUND ELEVATION** 907.25 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 895.25 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		POORLY GRADED SAND WITH CLAY, (SP-SC) dark brown, fine grained, moist, trace gravel (Fill)	906.3	SS 1	78	6-5-6 (11)						
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, dense, trace gravel	903.8	SS 2	89	7-8-8 (16)						
5				SS 3	89	11-10-8 (18)						
7.0		SILTY SAND, (SM) light brown, fine grained, moist to saturated, dense to medium dense, trace gravel	900.3	SH 4	100							
10				SS 5	100	10-10-8 (18)						
13.5			893.8	SS 6	89	7-6-7 (13)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-405

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/5/15 **COMPLETED** 6/5/15 **GROUND ELEVATION** 899.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 889.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 40 ft. E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown to light brown, fine to medium grained, moist to saturated, medium dense to loose, trace gravel	SS 1	56	7-7-6 (13)							
			SS 2	89	6-9-7 (16)							
5			SS 3	78	3-3-4 (7)							
			SS 4	100	8-6-7 (13)							
10			SS 5	100	7-5-5 (10)							
			SS 6	100	4-4-4 (8)							
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-406

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/23/15 **COMPLETED** 6/23/15 **GROUND ELEVATION** 891.68 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 879.68 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown, fine to medium grained, moist, very loose to loose	SS 1	44	1-2-3 (5)							
3.0		PEAT, (Pt) black, moist, soft, trace gravel	SS 2	78	3-3-4 (7)							
5			SH 3									
			SS 4	83	2-2-2 (4)							
10			SH 5									
12.5		NOTE: Weight of Hammer at 12.0 feet. SILTY SAND WITH GRAVEL, (SM) gray, fine grained, saturated, loose, fine gravel	SS 6	44	0-2-4 (6)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 7	83	4-5-6 (11)							
16.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 16.0 feet.



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BORING NUMBER WM-407

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 889.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 6.25 ft / Elev 882.87 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 10 ft. E **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill) 887.6	SS 1	56	8-9-11 (20)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill) 884.6	SS 2	56	6-10-11 (21)							
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist to saturated, dense, little organics, iron oxide staining 882.1	SS 3	89	6-11-12 (23)							
7.0		SILTY SAND, (SM) light brown to gray, fine grained, saturated, medium dense 879.6	SS 4	78	7-6-8 (14)							
9.5		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, saturated, loose to medium dense 875.6	SS 5	67	3-3-4 (7)			15				6
13.5			SS 6	67	5-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-408

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 888.74 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 5.00 ft / Elev 883.74 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 15 ft. E **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little fine to medium gravel (Fill)	SS 1	33	8-9-8 (17)							
4.0		884.7										
5.5		POORLY GRADED SAND, (SP) brown, moist to saturated, loose, little fine gravel	SS 2	22	10-13-12 (25)							
5.5		883.2										
5.5		SILTY SAND, (SM) gray, fine grained, saturated, very loose to loose, trace gravel	SS 3	44	3-4-3 (7)							
			SS 4	44	1-1-1 (2)							
			SS 5	44	2-1-2 (3)							
			SS 6	89	3-4-4 (8)							
13.5		875.2										

Borehole backfilled with soil cuttings.
 Bottom of borehole at 13.5 feet.



Northern Technologies, Inc.
 1408 Northland Drive, Suite 107
 Mendota Heights, MN 55120
 Telephone: 651-389-4191

BORING NUMBER WM-409

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 886.87 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 879.87 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, trace gravel (Fill) 885.4	SS 1	78	4-3-4 (7)							
		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 2	100	4-7-6 (13)							
5	[Dotted pattern]	6.0	SS 3	89	3-5-5 (10)							
		SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, medium dense to loose, iron oxide staining	SS 4	78	3-5-4 (9)							
10			SS 5	56	2-4-4 (8)							
13.5			873.4	SS 6	56	2-2-3 (5)						

Borehole backfilled with soil cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H1-PROJECTS\2015 PROJECT SITCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ



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BORING NUMBER WM-410

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/25/15 **COMPLETED** 6/25/15 **GROUND ELEVATION** 877.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 870.04 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	SS 1	78	2-3-4 (7)							
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose to dense, trace fine to coarse gravel, trace roots, iron oxide staining, clay (CL) pieces	SS 2	89	8-8-8 (16)							
5		NOTE: Hard drilling at 5.0 feet due to coarse gravel.	SS 3	56	9-20-10 (30)							
7.0			SS 4	78	7-4-4 (8)							
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to coarse grained, saturated, loose, trace fine gravel	SS 5	89	4-3-2 (5)							
			SS 6	89	2-2-3 (5)							
14.5			SS 7	100	4-4-5 (9)							
		SANDY LEAN CLAY, (CL) gray, wet, medium, trace fine gravel	SH 8									
21.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/2/15 15:44:43 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ

Appendix G

Natural Resources Corridor Soil Boring Logs

January 2016

T:\1382 KimleyHorn\01 TCAAP Rice Creek Remeander\TASK 15 Geotechnical\Geotech Results and Reports\Geotechnical Investigation Report\Geotechnical Report Text.docx



Responsive partner. Exceptional outcomes.



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BORING NUMBER NR-101

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 914.14 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)										
		CLAYEY SAND, (SC) brown to dark brown, fine grained, moist, very loose to medium dense, trace gravel, lenses of silt, iron oxide staining	SS 1	44	1-2-2 (4)							
			SS 2	89	4-6-6 (12)							
5			SS 3	89	5-7-7 (14)							
			SS 4	89	3-3-3 (6)							
9.5		PEAT, (Pt) black, moist, rather stiff to soft, trace gravel	SS 5	78	4-6-5 (11)							
13.3		LEAN CLAY WITH SAND, (CL) gray and brown, moist to wet, rather stiff, trace gravel, organic material seams	SS 6	44	2-2-1 (3)							
15			SS 7	89	3-5-6 (11)							
			SS 8	100	3-6-5 (11)							
21.5			SH 9									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-102

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 915.35 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 12.00 ft / Elev 903.35 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---
O/S 20 ft NE

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.6		TOPSOIL (7 Inches)	914.8									
2.0		CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, loose	913.4	56	2-2-3 (5)							
		SILTY SAND, (SM) brown and dark brown, fine grained, moist, loose		67	3-3-5 (8)							
4.5		SILTY SAND, (SM) reddish brown, fine grained, moist, medium dense	910.9	56	4-8-8 (16)							
7.0		CLAYEY SAND, (SC) black, fine grained, dry to moist, loose, some organics, organic stain	908.4	67	4-4-4 (8)							
10.5		PEAT, (Pt) black, dry to moist, rather stiff	904.9	67	4-5-5 (10)							
12.0	∇	SILTY SAND, (SM) gray, fine grained, saturated, medium dense	903.4	78	5-6-6 (12)							
				67	4-5-5 (10)							
				89	6-6-8 (14)							
				100	3-4-5 (9)							
21.0			894.4									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-103

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 924.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 6 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		CLAYEY SAND, (SC) brown, fine grained, moist, loose	SS 1	56	3-3-3 (6)							
2.0		SANDY LEAN CLAY, (CL) brown, moist, medium to rather stiff	SS 2	56	4-4-4 (8)							
5		NOTE: Sampled auger cuttings at 4.5 feet.	SS 3	17	4-5-5 (10)							
7.0		SILTY SAND, (SM) dark brown to dark gray, fine grained, moist, dense, clay (CL) lenses	SS 4	67	4-7-12 (19)							
10			SH 5									
12.0		SILTY SAND, (SM) brown, moist, medium dense, trace gravel	SS 6	78	6-8-8 (16)							
15			SS 7	56	7-7-7 (14)							
15.5		CLAYEY SAND, (SC) gray, fine grained, moist, medium dense, trace gravel										
17.0		SILTY SAND, (SM) gray, fine grained, dry to moist, loose	SS 8	44	2-2-3 (5)							
19.5			SS 9	100	5-5-7 (12)							
20		LEAN CLAY WITH SAND, (CL) dark brown, moist, rather stiff										
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-104

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 932.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 8 ft NE

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, dry, fine to coarse gravel (Fill) 930.6	SS 1	56	10-14-15 (29)							
4.0		CLAYEY SAND WITH GRAVEL, (SC) reddish brown, fine to coarse grained, moist, fine to coarse gravel (Fill) 928.6	SS 2	78	9-10-10 (20)							
5		SANDY LEAN CLAY, (CL) reddish brown to light brown, moist, medium, trace fine to coarse gravel	SS 3	56	5-3-5 (8)							
8.3		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace fine to medium gravel 924.4	SS 4	33	4-4-4 (8)							
10			SH 5									
14.5		SANDY LEAN CLAY, (CL) brown, moist, stiff, trace fine gravel, iron oxide staining 918.1	SS 6	78	9-10-13 (23)							
15			SS 7	89	5-7-9 (16)							
17.0		SANDY LEAN CLAY, (CL) brown to reddish brown, dry, very stiff, little fine to coarse gravel 915.6	SS 8	56	7-14-19 (33)							
20			SS 9	78	8-16-16 (32)							
21.0		911.6										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-106

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 939.86 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A AT TIME OF DRILLING --- No groundwater observed.
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 Inches)	939.0									
2.0		CLAYEY SAND, (SC) light brown and dark brown, fine grained, moist, loose	937.9	SS 1	67	1-2-4 (6)						
		CLAYEY SAND, (SC) brown, fine grained, moist, very loose		SS 2	22	1-1-1 (2)						
5				SS 3	22	1-1-1 (2)						
				SH 4								
9.5		LEAN CLAY WITH SAND, (CL) reddish brown to light brown, moist, rather stiff to stiff, trace gravel	930.4	SS 5	100	3-5-7 (12)						
				SS 6	100	4-5-5 (10)						
15				SS 7	89	5-10-7 (17)						
17.0		SANDY LEAN CLAY, (CL) reddish brown, moist, stiff, trace gravel	922.9	SS 8	67	12-13-15 (28)						
18.0		POORLY GRADED SAND, (SP) light brown, fine grained, dry, medium dense, little medium to coarse gravel	921.9	SS 9	33	7-8-8 (16)						
20												
21.0			918.9									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-107

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 933.09 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 15 ft S

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5.0	[Cross-hatched pattern]	CLAYEY SAND, (SC) brown, fine to medium grained, dry to moist, little gravel (Fill)	SS 1	44	3-5-9 (14)							
5.0 - 7.0	[Diagonal lines pattern]	LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 2	28	5-5-5 (10)							
7.0 - 12.0	[Dotted pattern]	SILTY SAND, (SM) light brown, fine grained, moist, medium dense to loose	SS 3	67	3-4-5 (9)							
12.0 - 17.0	[Dotted pattern]	LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 4	56	4-6-7 (13)							
17.0 - 19.5	[Diagonal lines pattern]	SANDY LEAN CLAY, (CL) reddish brown and brown, dry, stiff, iron oxide staining	SS 5	67	4-4-2 (6)							
19.5 - 21.0	[Dotted pattern]	POORLY GRADED SAND, (SP) light brown, medium grained, dry, dense	SS 6	100	3-5-6 (11)							
			SH 7									
			SS 8	100	8-12-16 (28)							
			SS 9	78	7-7-10 (17)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-108

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 915.92 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 10 ft E

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	915.4									
2.0		CLAYEY SAND, (SC) brown and dark brown, fine grained, moist, loose, trace fine gravel	913.9	56	1-2-4 (6)							
		LEAN CLAY WITH SAND, (CL) gray and brown, moist, medium, trace fine gravel, trace organics		67	3-4-4 (8)							
4.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace fine gravel, iron oxide staining	911.4	78	2-3-3 (6)							
7.0		SANDY LEAN CLAY, (CL) gray brown, moist, medium to rather stiff, trace fine gravel, iron oxide staining	908.9	78	3-3-5 (8)							
12.0		SANDY LEAN CLAY, (CL) dark gray, moist, rather stiff to medium, trace fine gravel	903.9	100	3-5-7 (12)							
15				78	2-3-4 (7)							
20				100	3-3-5 (8)							
21.5			894.4	67								

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-110

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 919.86 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 19.50 ft / Elev 900.36 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft N

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		SILTY SAND, (SM) brown, fine to medium grained, moist, some gravel (Fill)	SS 1	67	2-3-3 (6)							
			SS 2	78	5-7-8 (15)							
			SS 3	100	5-6-7 (13)							
7.0		PEAT, (Pt) black, moist, soft	SH 4									
9.5		LEAN CLAY WITH SAND, (CL) gray brown, moist, soft to medium, trace gravel	SS 5	100	1-1-2 (3)							
			SS 6	100	2-3-4 (7)							
			SS 7	100	3-3-4 (7)							
17.5		LEAN CLAY WITH SAND, (CL) gray, moist to wet, rather stiff, trace gravel	SS 8	100	4-5-6 (11)							
			SS 9	22	2-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-111

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 918.95 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 inches)	918.3									
		CLAYEY SAND, (SC) brown and dark brown, fine grained, moist, trace fine to medium gravel (FILL)	SS 1	56	1-1-2 (3)							
			SS 2	100	4-6-7 (13)							
5		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace fine gravel, peat (Pt) lenses	914.0									
			SS 3	100	4-5-6 (11)							
		LEAN CLAY WITH SAND, (CL) blue gray, moist, medium, trace fine gravel	912.0									
			SS 4	89	3-3-3 (6)							
10		NOTE: Silty sand (SM) seam at 8.0 feet.	909.5									
		LEAN CLAY WITH SAND, (CL) gray and dark brown, moist, medium to stiff, trace fine to medium gravel, iron oxide staining	SS 5	67	3-3-4 (7)							
			SS 6	100	3-4-4 (8)							
15			SS 7	100	2-4-4 (8)							
			SS 8	33	6-8-8 (16)							
20			SH 9	75								
21.5		897.5										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



Northern Technologies, Inc.
 6160 Carmen Avenue East
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BORING NUMBER NR-112

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 923.3 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.6		TOPSOIL (7 inches)										
		SILTY SAND, (SM) brown, fine grained, moist, loose to medium dense, trace clay	SS 1	78	1-1-3 (4)							
		NOTE: Sand seam (SP) at 2.0 feet.	SS 2	100	5-5-5 (10)							
4.0												
		SANDY LEAN CLAY, (CL) light brown to tan, moist, rather stiff, trace gravel, iron oxide staining	SH 3	83								
9.5			SS 4	100	3-4-5 (9)							
		LEAN CLAY WITH SAND, (CL) light brown, moist, rather stiff, trace fine to coarse gravel	SS 5	100	4-5-6 (11)							
			SS 6	100	3-4-6 (10)							
14.5			SS 7	100	4-6-8 (14)							
		LEAN CLAY WITH SAND, (CL) gray brown, moist, rather stiff, trace fine to coarse gravel	SS 8	100	3-5-7 (12)							
			SS 9	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-113

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 900.69 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 893.69 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace clay (Fill) 898.7	SS 1	44	3-3-2 (5)							
4.5		SILTY SAND, (SM) dark gray, fine grained, moist, trace gravel, trace organics (Fill) 896.2	SS 2	67	4-4-3 (7)							
7.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium, trace fine to coarse gravel 893.7	SS 3	56	3-4-4 (8)							
7.0		LEAN CLAY WITH SAND, (CL) brown, wet, rather stiff, trace fine to medium gravel 893.7	SS 4	78	4-5-5 (10)							
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to medium, trace fine to medium gravel 888.7	SH 5									
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to medium, trace fine to medium gravel 888.7	SS 6	44	3-5-4 (9)							
15.0			SS 7	100	4-3-3 (6)							
15.0			SS 8	100	3-3-4 (7)							
21.0			SS 9	89	2-3-5 (8)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-114

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 921.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	920.8									
		CLAYEY SAND, (SC) brown, fine to medium grained, dry (Fill)	SS 1	78	3-3-3 (6)							
			SS 2	100	7-9-12 (21)							
4.0			917.7									
		LEAN CLAY WITH SAND, (CL) light brown, dry, medium, trace fine to medium gravel	SS 3	78	2-3-4 (7)							
7.0			914.7									
		SANDY LEAN CLAY, (CL) brown, moist, medium to rather stiff, trace fine to medium gravel, iron oxide staining	SS 4	89	2-3-5 (8)							
			SS 5	100	2-3-5 (8)							
			SH 6									
15			SS 7	100	3-5-7 (12)							
			SS 8	100	2-4-7 (11)							
19.5			902.2									
		SANDY LEAN CLAY, (CL) gray brown, moist, rather stiff, trace fine to medium gravel	SS 9	100	3-5-9 (14)							
21.0			900.7									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-115

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 912.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches)										
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist (Fill)	SS 1	56	1-2-3 (5)							
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	78	7-4-4 (8)							
5		LEAN CLAY WITH SAND, (CL) brown, moist, medium to rather stiff, trace gravel	SS 3	89	3-4-5 (9)							
			SH 4									
9.5		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 5	89	3-4-5 (9)							
		NOTE: Sand seam (SP) at 12.5 feet.	SS 6	100	3-5-7 (12)							
			SS 7	100	3-5-7 (12)							
			SS 8	100	3-5-7 (12)							
21.0			SS 9	100	4-6-9 (15)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-116

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 911.44 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.1		TOPSOIL (1 Inch)	911.4									
2.0		LEAN CLAY WITH SAND, (CL) brown, moist, soft, trace gravel, sand lense	909.4	78	2-2-2 (4)							
		LEAN CLAY WITH SAND, (CL) moist, medium, trace gravel		100	3-2-3 (5)							
5				89	2-2-3 (5)							
9.5		LEAN CLAY WITH SAND, (CL) moist, rather stiff to stiff, trace gravel	901.9	33	3-5-7 (12)							
				33	9-9-9 (18)							
14.5		LEAN CLAY WITH SAND, (CL) moist, rather stiff, trace gravel	896.9	100	3-5-7 (12)							
				100	4-6-8 (14)							
21.0			890.4	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-117

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 908.79 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 896.79 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	2-3-3 (6)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel	SS 2	67	3-6-6 (12)							
7.0		SILTY LEAN CLAY, (CL-ML) tan and gray, moist, rather stiff, trace gravel	SS 3	83	4-7-6 (13)							
9.0		LEAN CLAY WITH SAND, (CL) brown, moist to wet, rather stiff	SS 4	100	4-6-6 (12)							
12.0			SH 5									
14.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 6	100	3-5-6 (11)							
17.0		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose NOTE: No recovery at 17.0 feet. Sampled auger cuttings.	SS 7	0	3-3-4 (7)							
19.5			SH 8									
21.0		LEAN CLAY WITH SAND, (CL) dark gray, wet, rather stiff, trace gravel	SS 9	100	5-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-118

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 0 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 2.00 ft / Elev -2.00 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. not provided. **AFTER DRILLING** ---
Boring not staked. Estimated location from drawing.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)										
2.0		SILTY SAND, (SM) brown, fine to medium grained, saturated, very loose, trace gravel	SS 1	67	1-1-1 (2)							
		PEAT, (Pt) black and dark gray, saturated, soft	SS 2	78	2-2-2 (4)							
4.6		SILTY SAND, (SM) brown, fine grained, saturated, medium dense, trace fine to medium gravel	SS 3	67	2-6-5 (11)							
7.0		CLAYEY SAND, (SC) dark gray, fine grained, saturated, medium dense, trace fine gravel, trace roots	SS 4	28	6-7-5 (12)							
9.5		LEAN CLAY WITH SAND, (CL) brown and gray, wet, rather stiff, trace gravel	SS 5	100	4-6-7 (13)							
			SS 6	100	3-5-5 (10)							
17.0		SILTY LEAN CLAY, (CL-ML) gray, wet, rather stiff, trace fine gravel	SS 8	100	4-4-5 (9)							
19.5		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace fine gravel	SS 9	100	4-5-7 (12)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-119

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/23/15 **COMPLETED** 6/23/15 **GROUND ELEVATION** 0 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 2.60 ft / Elev -2.60 ft
LOGGED BY BH **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. not provided. **AFTER DRILLING** ---
Boring not staked. Estimated location from drawing.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
2.0		CLAYEY SAND, (SC) brown to dark brown, fine grained, moist, very loose, trace gravel, trace organics, iron oxide staining, trace roots NOTE: Weight of Hammer at Sample No. 1.	SS 1	33	0-1-2 (3)							
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, saturated, medium dense, trace gravel, iron oxide staining	SS 2	100	3-5-5 (10)							
			SS 3	100	4-6-6 (12)							
7.0		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel	SS 4	100	3-3-4 (7)							
			SH 5									
			SS 6	100	1-3-3 (6)	1.0						
			SS 7	100	1-3-3 (6)							
			SS 8	100	1-3-3 (6)	0.8						
			SS 9	100	1-3-3 (6)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-120

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 885.05 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND, (SP) brown, fine to medium grained, dry (Fill) 883.6	SS 1	56	4-4-3 (7)							
4.0		SILTY SAND, (SM) brown, fine grained, moist (Fill) 881.1	SS 2	44	6-8-8 (16)							
5		SILTY SAND, (SM) gray, fine grained, moist, medium dense, little gravel 878.1	SS 3	78	4-6-4 (10)							
7.0		CLAYEY SAND, (SC) gray, fine to medium grained, moist, medium dense 878.1	SS 4	78	4-4-5 (9)							
10		LEAN CLAY WITH SAND, (CL) gray, moist, soft to medium, trace gravel 875.6	SS 5	78	3-3-2 (5)							
15			SS 6	100	2-3-2 (5)							
			SS 7	100	2-1-3 (4)							
			SS 8	100	3-3-4 (7)							
20			SS 9	100	2-2-3 (5)							
21.0		864.1										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-122

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 886.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 871.54 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (36 Inches)	SS 1	28	3-1-3 (4)							
3.0		883.0 POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose	SS 2	22	4-3-3 (6)							
5		7.0 879.0 SILTY SAND, (SM) black, fine grained, moist, very loose, little organics	SS 3	22	3-2-3 (5)							
10		9.5 876.5 PEAT, (Pt) black, moist, soft	SS 4	67	2-2-2 (4)							
15		14.5 871.5 SH 6	SS 5	78	1-2-1 (3)							
15		SILTY SAND, (SM) gray, fine to coarse grained, saturated, very loose to loose NOTE: Hydrocarbon odor by human perception at 15.0 feet.	SS 7	78	2-2-2 (4)							
20		17.8 868.2 SILTY LEAN CLAY, (CL-ML) gray, wet, medium, trace gravel	SS 8	33	2-3-3 (6)							
20		21.0 865.0 NOTE: Sand (SP) seam at 20.0 feet.	SS 9	78	3-3-3 (6)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-123

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 885.83 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 8.50 ft / Elev 877.33 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:26 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2	ASPHALT (2 Inches)	885.7	SS 1	56	1-3-1 (4)							
2.0	POORLY GRADED SAND WITH SILT, (SP) brown, fine to coarse grained, dry, some fine to coarse gravel (Fill)	883.8	SS 2	56	10-12-13 (25)							
3.5	POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine grained, moist, trace fine gravel (Fill)	882.3	SS 3	67	6-11-19 (30)							
5	SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, dense to very loose		SS 4	78	7-9-9 (18)							
10			SS 5	89	2-1-1 (2)							
12.0	SILTY SAND, (SM) dark gray, fine grained, saturated, loose, trace peat	873.8	SS 6	100	2-3-4 (7)							
15			SS 7	89	2-3-3 (6)							
17.2	SILTY LEAN CLAY, (CL-ML) blue gray, wet, medium, little fine to coarse gravel, trace sand	868.6	SS 8	89	2-3-4 (7)							
20			SS 9	89	2-3-2 (5)							
20.5		865.3										
21.0	SANDY LEAN CLAY, (CL) gray, wet, medium, trace fine gravel	864.8										

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-124

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 885.19 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 8.50 ft / Elev 876.69 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 1	56	3-3-4 (7)							
		SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, dense to medium dense	SS 2	89	4-8-10 (18)							
5			SS 3	56	8-11-10 (21)							
			SS 4	78	8-11-12 (23)							
10			SS 5	33	5-5-8 (13)							
11.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 6	89	4-3-2 (5)							
15			SH 7									
			SS 8	78	3-3-4 (7)							
20			SS 9	89	4-6-4 (10)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-125

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 885.98 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 11.00 ft / Elev 874.98 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		POORLY GRADED SAND, (SP) brown, fine grained, dry, little gravel (Fill)	SS 1	33	6-5-4 (9)							
882.5			SS 2	44	8-11-11 (22)							
5		SILTY SAND, (SM) brown, fine grained, moist, dense, trace gravel	SS 3	67	8-13-12 (25)							
9.5			SS 4	78	9-12-12 (24)							
876.5			SS 5	89	3-2-3 (5)							
10.5		PEAT, (Pt) black, saturated, medium	SS 6	89	4-4-3 (7)							
875.5			SS 7	78	4-4-4 (8)							
13.3		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to loose	SS 8	100	3-5-4 (9)							
872.7			SS 9	100	4-4-3 (7)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-126

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 883.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 871.67 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.5		POORLY GRADED SAND WITH SILT, (SP-SM) fine to medium grained, moist, trace gravel (Fill)	SS 1	56	3-4-4 (8)							
881.2												
5		SILTY SAND, (SM) brown, fine grained, moist, dense, trace gravel, clay (CL) lenses	SS 2	100	5-12-13 (25)							
8.0												
8.0		PEAT, (Pt) black, moist, rather stiff, trace gravel	SS 4	78	6-8-12 (20)							
10												
13.0			SH 5									
13.0		SILTY SAND, (SM) gray, fine grained, saturated, loose to dense, peat (Pt) lenses	SS 6	67	3-5-5 (10)							
15												
15			SS 7	78	5-4-4 (8)							
20												
20			SS 8	67	10-15-12 (27)							
21.0												
21.0			SS 9	89	10-11-11 (22)							
862.7												

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-127

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 885.56 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 8.00 ft / Elev 877.56 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		ASPHALT (3 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, dry, trace gravel (Fill)	SS 1	56	6-7-6 (13)							
		SILTY SAND, (SM) brown to gray, fine grained, moist to saturated, dense	SS 2	67	8-11-12 (23)							
			SS 3	89	8-11-11 (22)							
			SS 4	78	7-10-12 (22)							
9.5		SILTY SAND, (SM) dark gray, fine grained, saturated, dense to loose, silt (ML) lenses	SS 5	78	6-8-9 (17)							
			SS 6	67	4-3-2 (5)							
14.5		SILTY SAND, (SM) black and gray, saturated, loose, trace to some organic materials	SS 7	89	7-3-2 (5)							
			SH 8									
19.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 9	78	4-4-5 (9)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-128

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 912.47 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 2.00 ft / Elev 910.47 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft N

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (24 Inches)										
2.0	▽	NOTE: Weight of Hammer at Sample No. 1.										
2.0		SANDY LEAN CLAY, (CL) light brown and gray, wet, medium, trace fine gravel, iron oxide staining	SS 1	28	0-0-0 (0)							
5			SS 2	78	2-2-3 (5)							
5			SS 3	100	2-3-4 (7)							
5			SS 4	100	3-3-5 (8)							
10			SH 5									
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 6	100	3-3-5 (8)							
15			SS 7	100	2-4-4 (8)							
15			SS 8	100	3-4-6 (10)							
20			SS 9	100	3-4-4 (8)							
23.5			SS 10	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 23.5 feet.



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BORING NUMBER NR-129

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 903.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft E

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (24 Inches)										
2.0		NOTE: Weight of Hammer at Sample No. 1. No recovery. Sampled auger cuttings.	SS 1	0	0-0-0 (0)							
2.0		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SH 2	58								
5			SS 3	94	2-3-4 (7)							
10			SS 4	100	3-3-4 (7)							
15			SS 5	94	2-4-4 (8)							
15			SS 6	100	2-5-5 (10)							
15			SS 7	100	4-4-6 (10)							
20			SS 8	100	4-5-7 (12)							
21.0			SS 9	100	4-6-9 (15)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-130

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 915.53 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 10 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)		914.8								
		LEAN CLAY WITH SAND, (CL) light brown to brown, moist, soft to rather stiff, trace gravel	SS 1	44	0-0-1 (1)							
			SS 2	67	2-3-4 (7)							
		NOTE: Weight of Hammer at Sample No. 1.										
5			SS 3	100	3-3-5 (8)							
			SS 4	100	4-5-7 (12)							
10			SH 5	92								
			SS 6	100	3-5-7 (12)							
15			SS 7	100	3-6-7 (13)							
17.0		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 8	100	3-4-6 (10)							
20			SS 9	100	2-4-7 (11)							
21.0				894.5								

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-131

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 906.2 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		LEAN CLAY WITH SAND, (CL) brown, moist, soft to rather stiff, trace gravel	SS 1	0	0-0-0 (0)							
		NOTE: Weight of Hammer at Sample No. 1. No recovery. Sampled auger cuttings.	SS 2	78	7-5-5 (10)							
			SS 3	89	5-6-6 (12)							
			SS 4	94	3-5-5 (10)							
			SH 5									
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel	SS 6	83	2-4-5 (9)							
			SS 7	89	2-4-4 (8)							
			SS 8	100	2-4-6 (10)							
21.0			SS 9	100	2-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-132

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 894.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 12.50 ft / Elev 881.93 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft NW

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	893.6									
		LEAN CLAY WITH SAND, (CL) gray, moist, soft to rather stiff, trace gravel		SS 1	67	0-1-3 (4)						
3.5			890.9									
		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose, trace gravel		SS 2	56	5-5-7 (12)						
5												
				SS 3	78	5-4-4 (8)						
				SS 4	44	3-3-3 (6)						
10				SH 5								
12.0			882.4									
		▽ CLAYEY SAND, (SC) gray, fine to medium grained, saturated, medium dense, trace gravel		SS 6	89	4-6-7 (13)						
13.5			880.9									
		SILTY SAND, (SM) gray, fine grained, saturated, dense, trace gravel		SS 7	56	8-9-11 (20)						
15				SS 8	56	7-9-11 (20)						
20				SS 9	56	8-10-11 (21)						
21.0			873.4									

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-133

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/22/15 COMPLETED 5/22/15 GROUND ELEVATION 887.8 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 6.00 ft / Elev 881.80 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR. NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) reddish brown, fine to medium grained, moist, fine to medium gravel (Fill)	SS 1	44	3-2-3 (5)							
4.5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 2	56	4-4-5 (9)							
5		SILTY SAND, (SM) gray and brown, fine grained, moist to saturated, loose to medium dense	SS 3	67	4-3-6 (9)							
9.5		SILTY SAND, (SM) brown, fine grained, saturated, loose	SS 5	78	2-3-2 (5)							
13.0		PEAT, (Pt) black, moist, soft	SS 6	56	3-3-4 (7)							
15			SS 7	89	3-2-2 (4)							
19.5			SH 8									
21.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 9	100	4-4-5 (9)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.

Infiltration Test Results

January 2016

T:\1382 KimleyHorn\01 TCAAP Rice Creek Remeander\TASK 15 Geotechnical\Geotech Results and Reports\Geotechnical Investigation Report\Geotechnical Report Text.docx



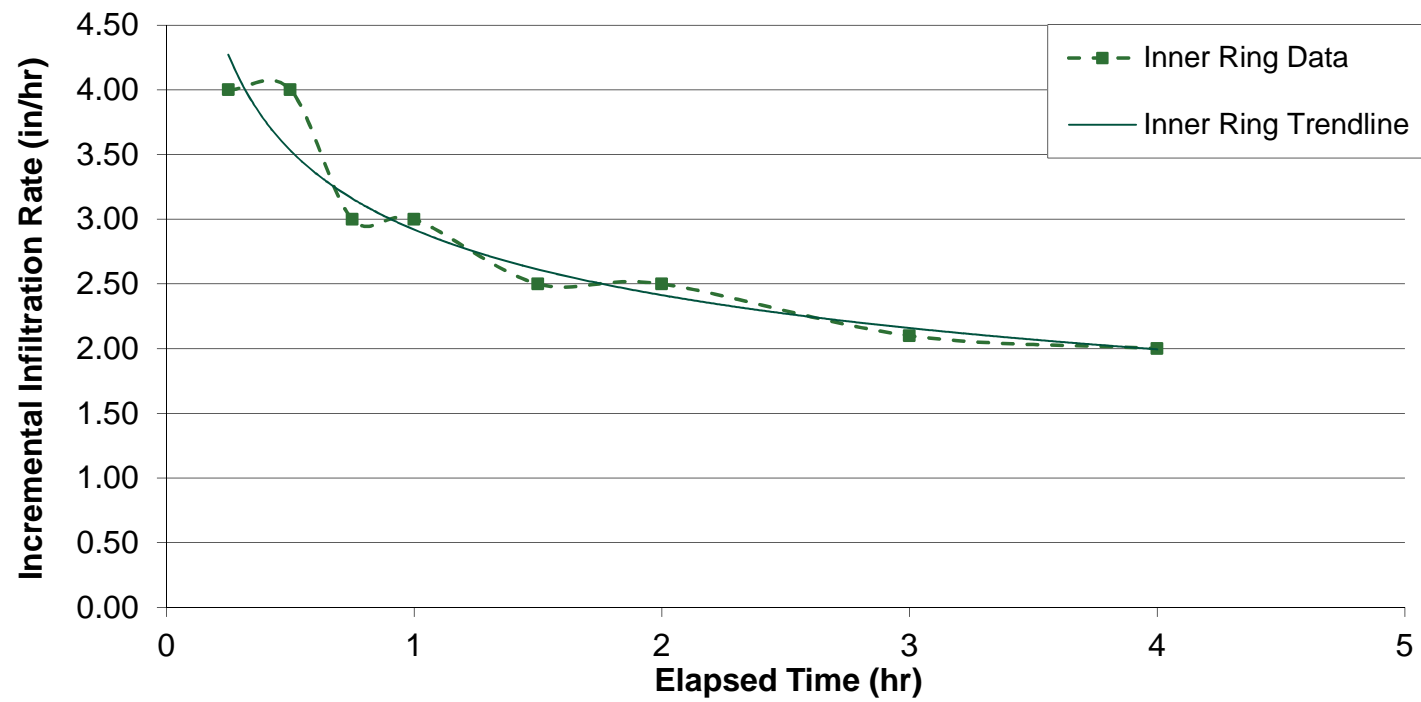
Responsive partner. Exceptional outcomes.



Infiltration Area Evaluations
IT-101

Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100

IT 101- Infiltration Rate vs Time

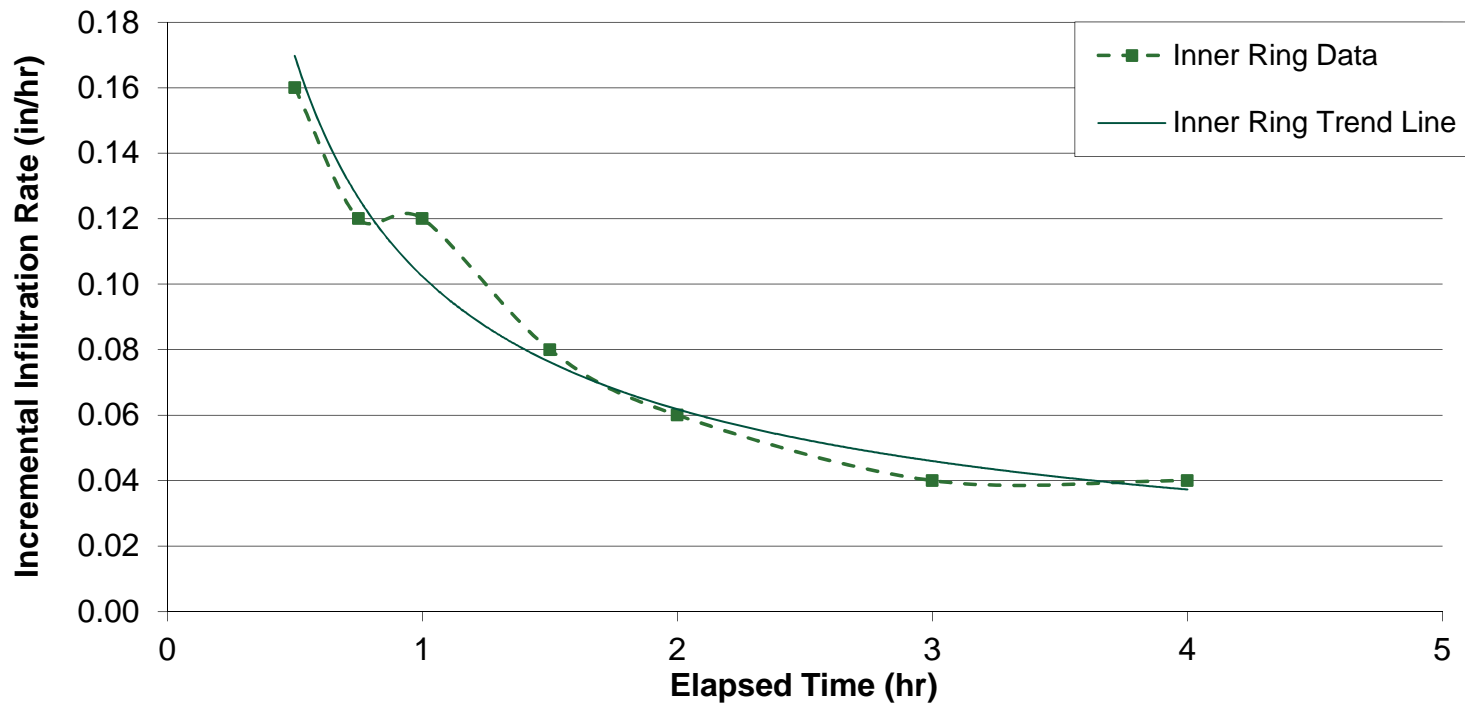




Infiltration Area Evaluations
IT-102

Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100

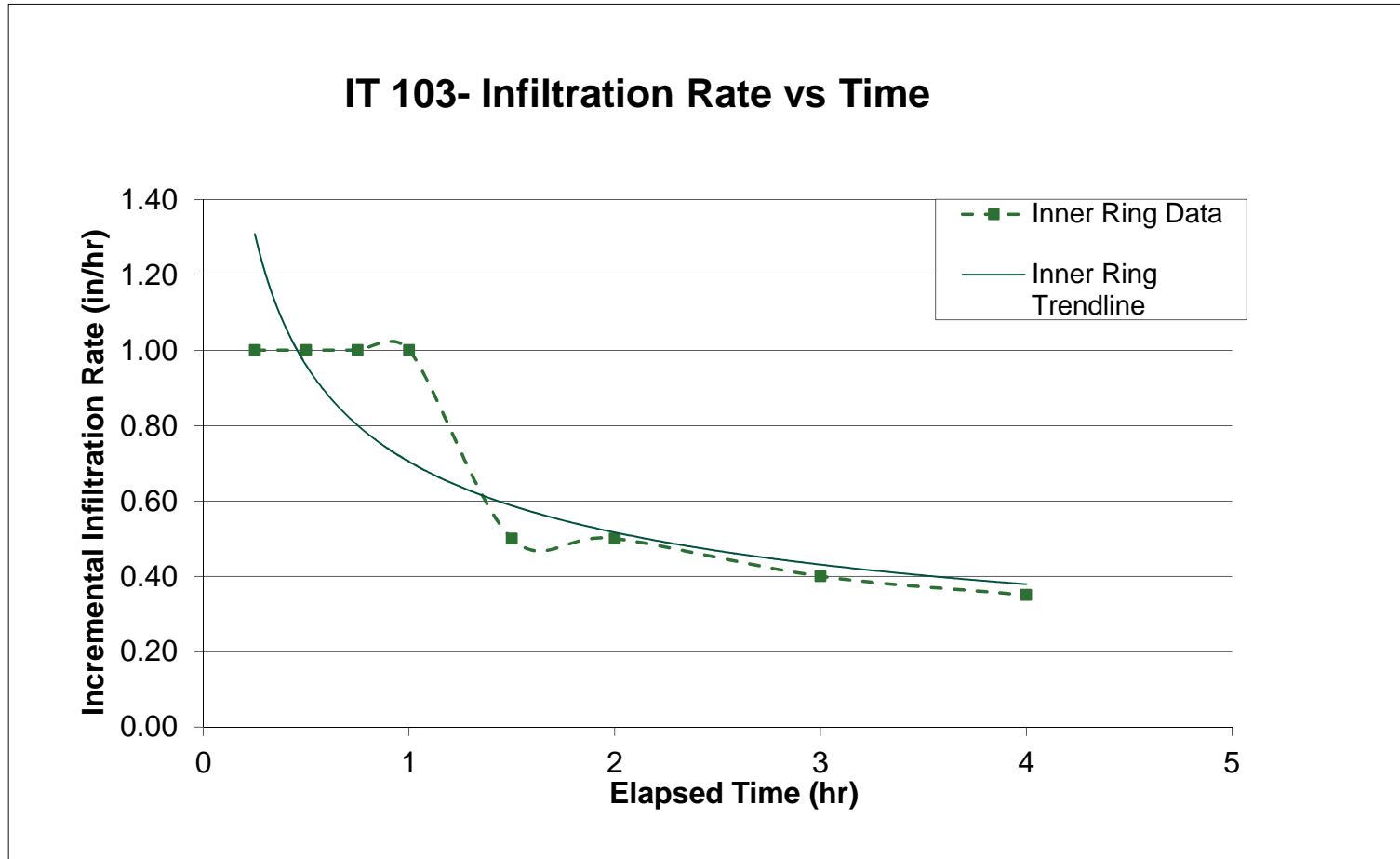
IT 102- Infiltration Rate vs Time





Infiltration Area Evaluations
IT-103

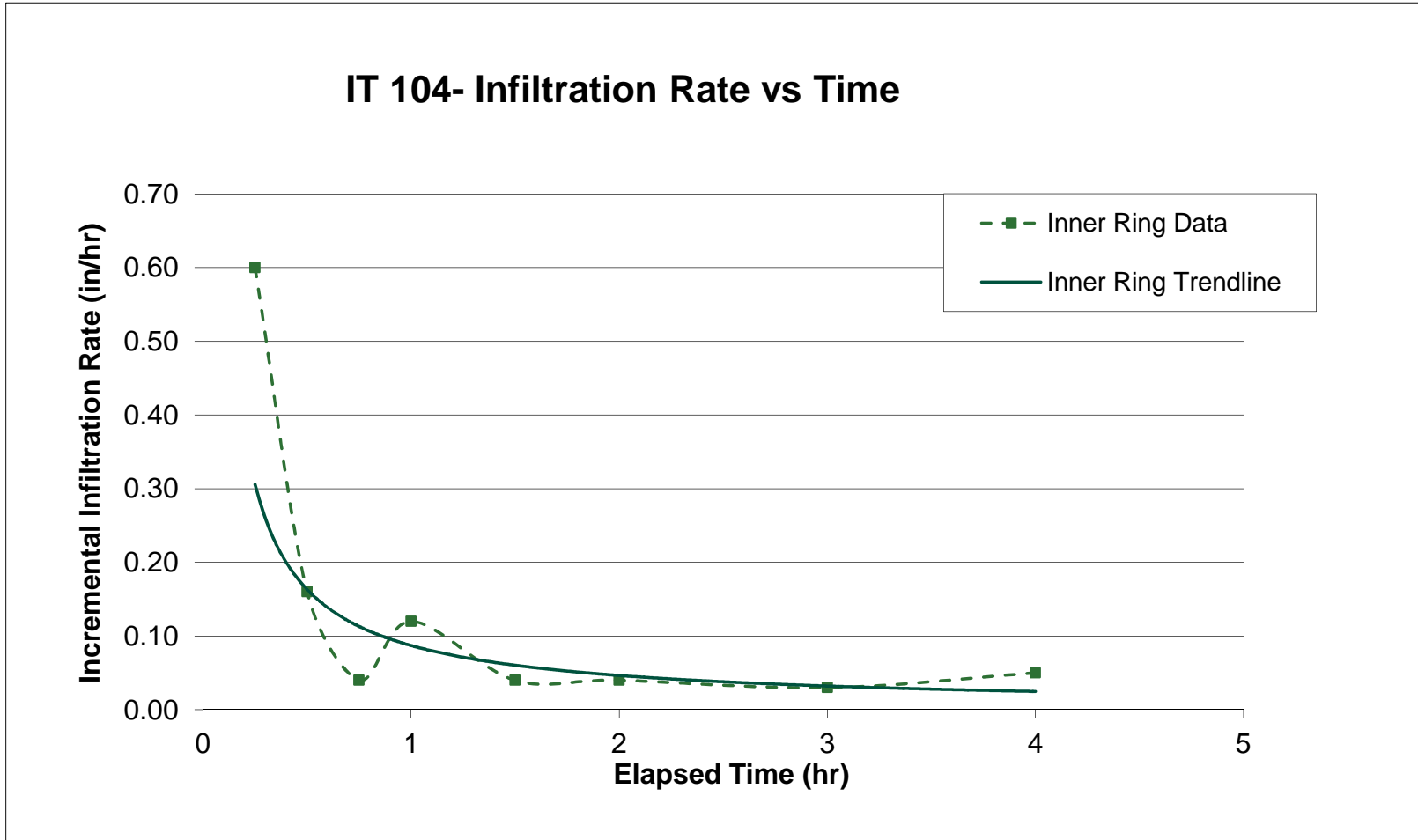
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-104

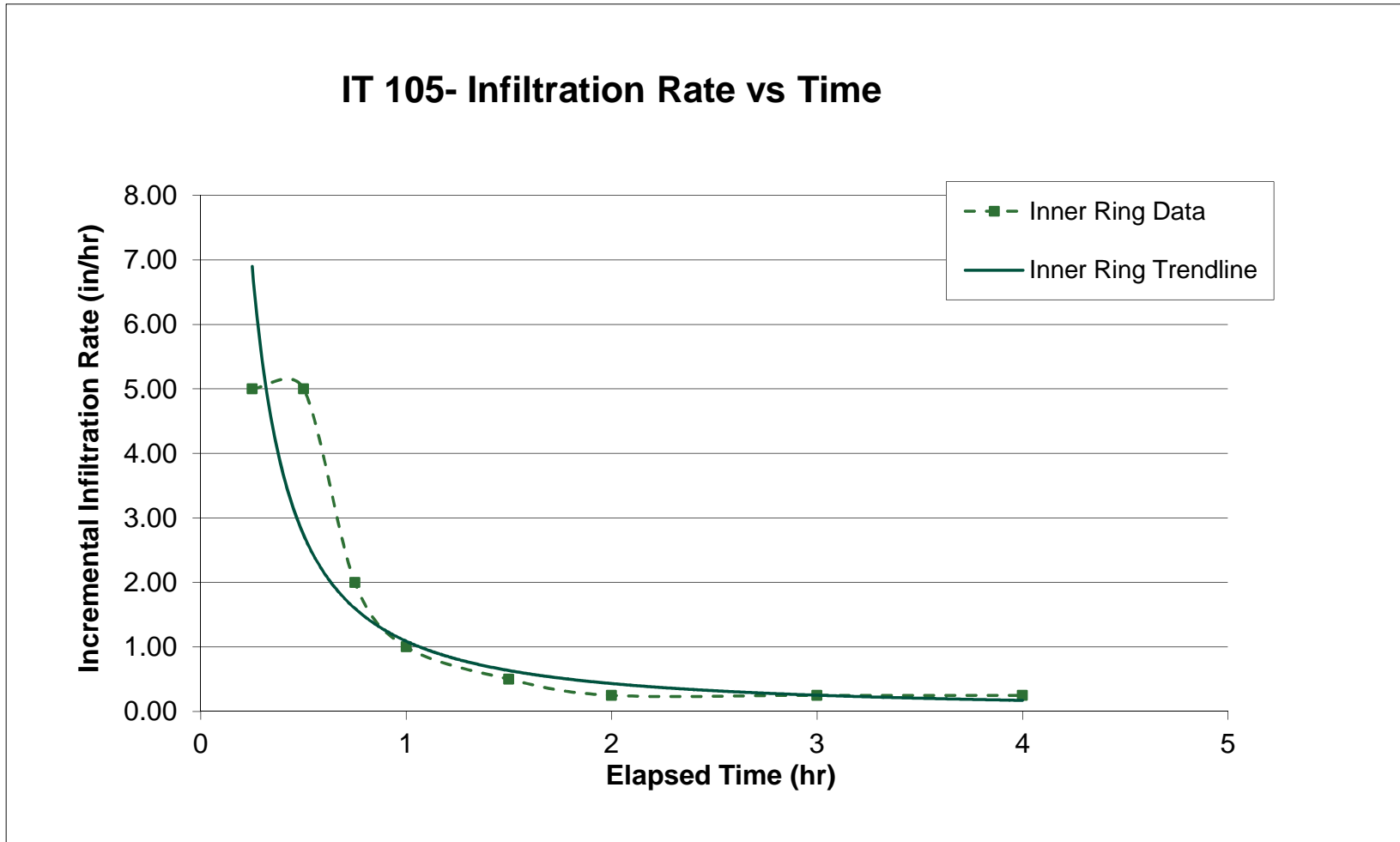
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-105

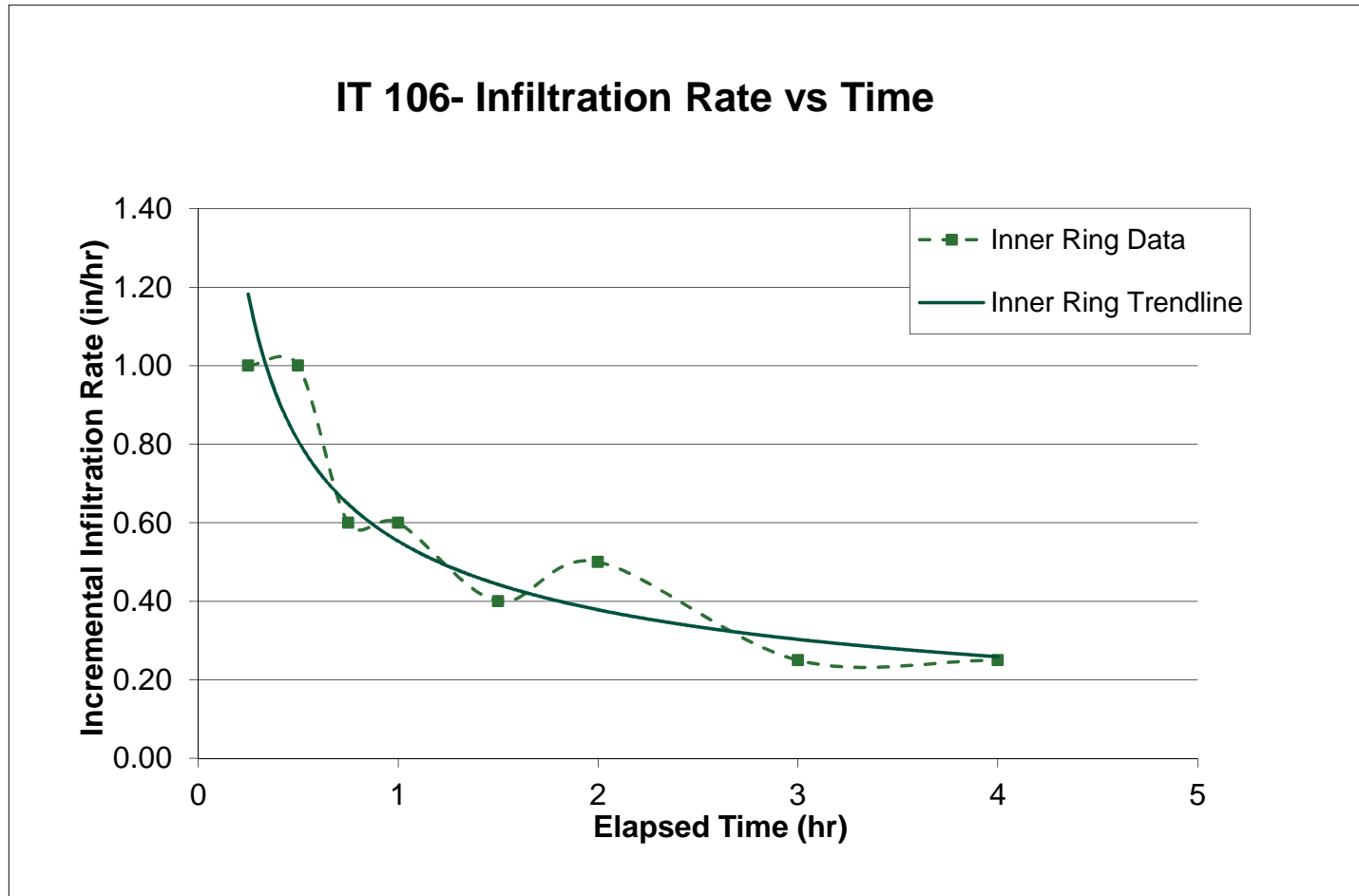
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-106

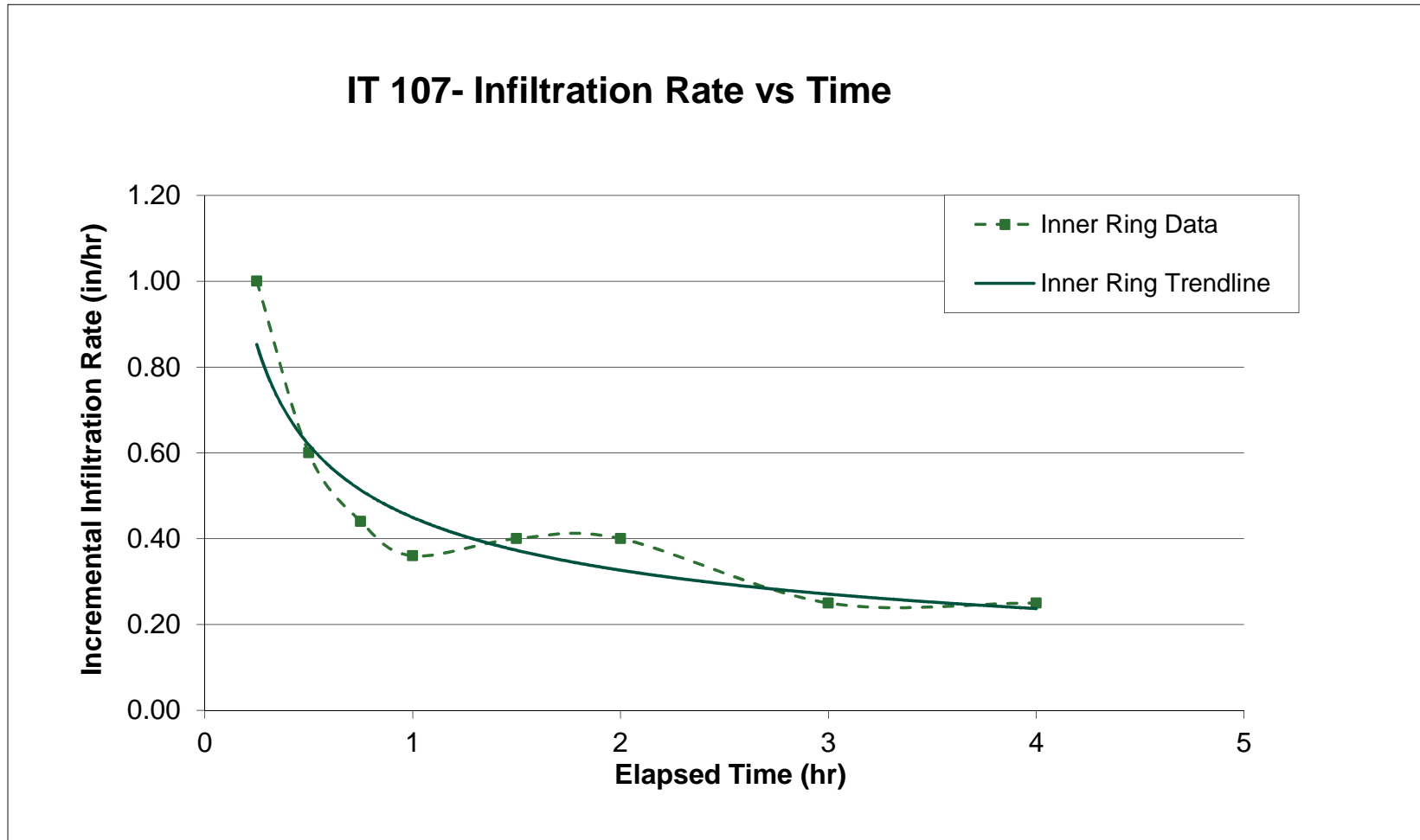
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-107

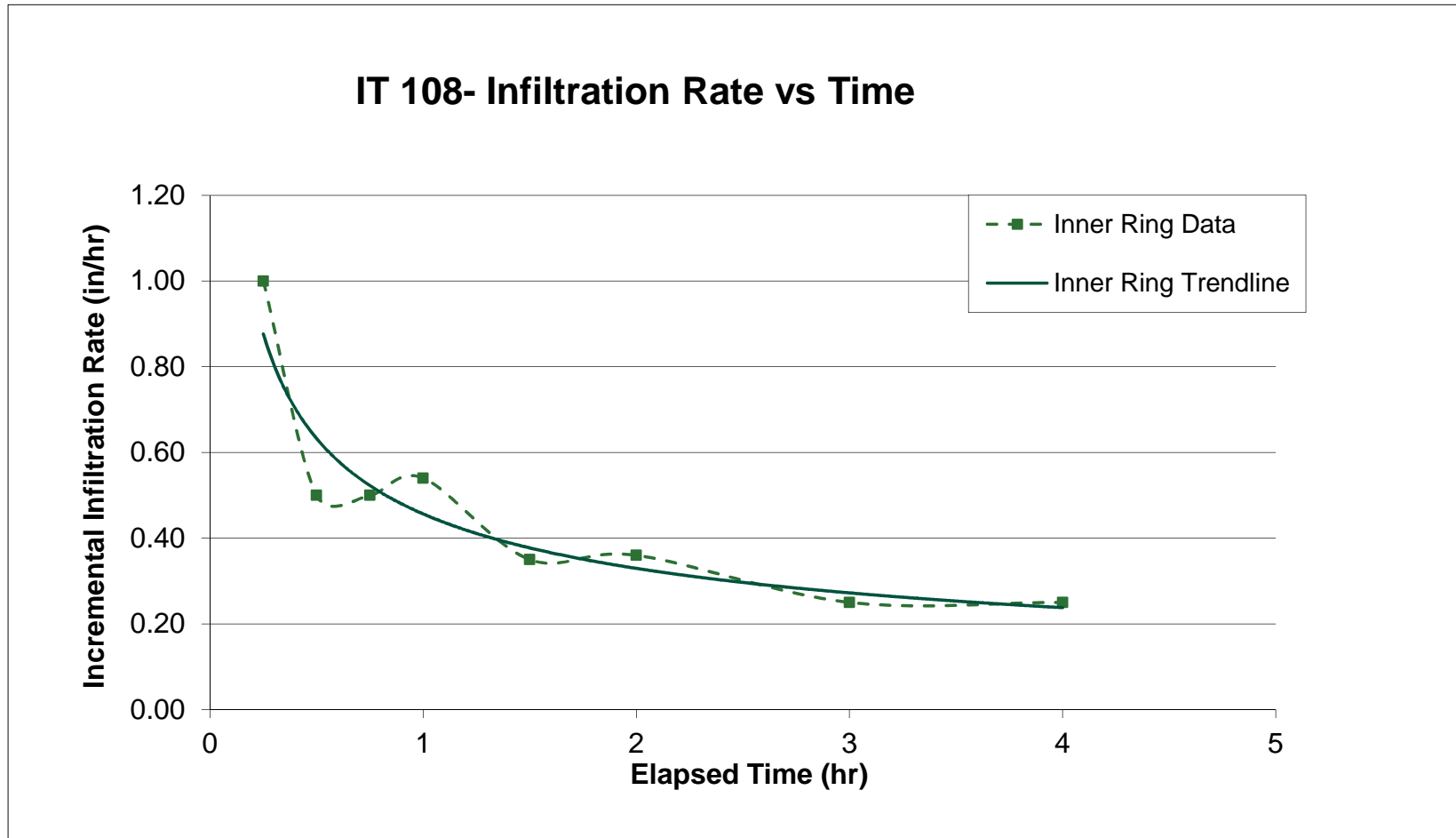
Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





Infiltration Area Evaluations
IT-108

Ramsey County Re-Development Site (TCAAP)
Arden Hills, MN
NTI Project 15.60936.100





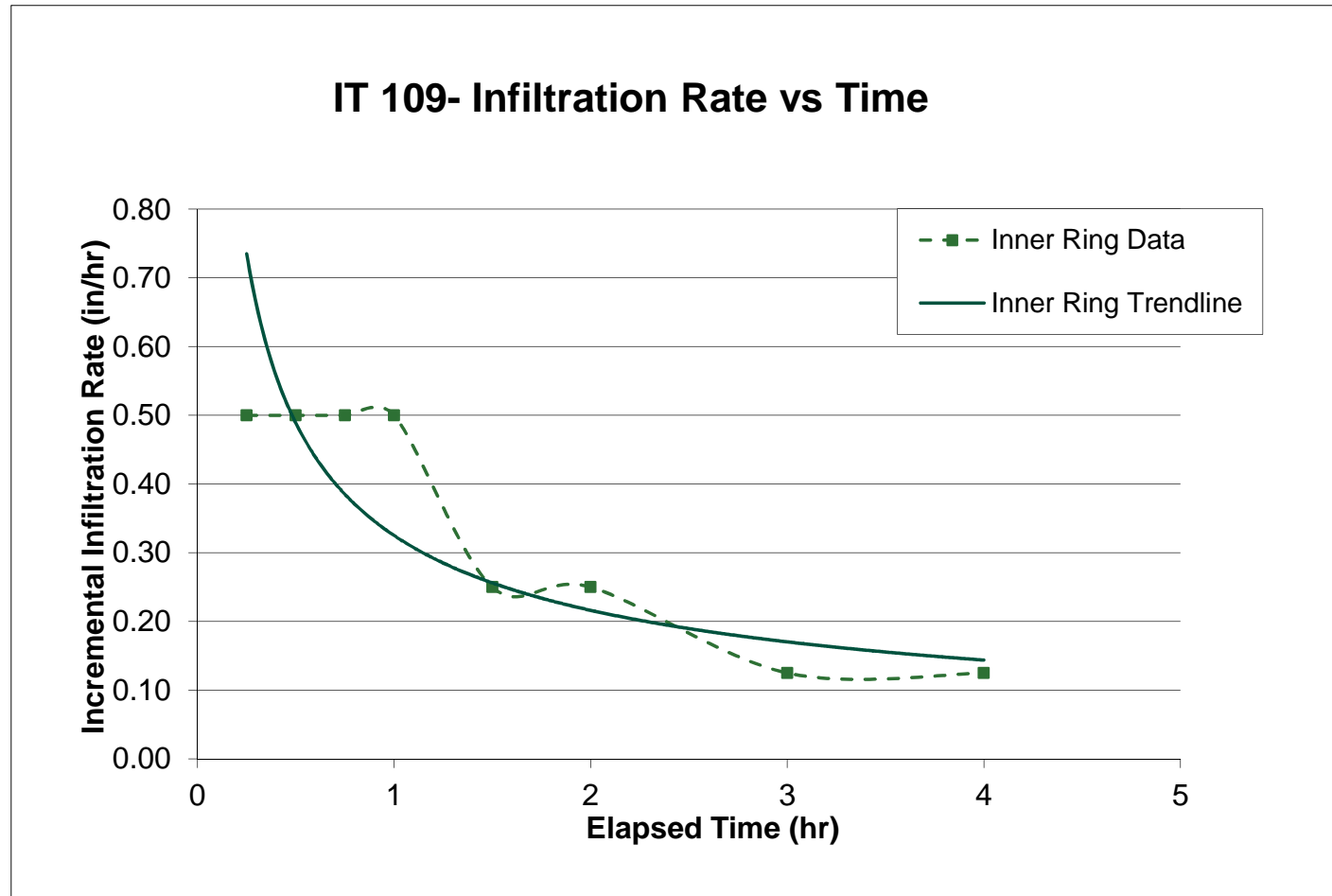
Infiltration Area Evaluations

IT-109

Ramsey County Re-Development Site (TCAAP)

Arden Hills, MN

NTI Project 15.60936.100



Appendix I

Rice Creek Regional Trail Soil Boring Logs

January 2016

T:\1382 KimleyHorn\01 TCAAP Rice Creek Remeander\TASK 15 Geotechnical\Geotech Results and Reports\Geotechnical Investigation Report\Geotechnical Report Text.docx



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BORING NUMBER TR-300

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 955.22 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		BITUMINOUS PAVEMENT (4 Inches)	AU 1									
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	67	4-4-7 (11)							
5		CLAYEY SAND, (SC) reddish brown, fine to coarse grained, moist, medium dense to dense, trace gravel, iron oxide staining	SS 3	100	6-6-7 (13)			10	31	13	18	42
9.5		LEAN CLAY WITH SAND, (CL) reddish brown, moist, stiff, trace medium to coarse gravel	SS 5	22	8-10-9 (19)							
12.0		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace gravel	SS 6	100	7-9-8 (17)							
13.5		Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.										

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H11-PROJECT\S2015 PROJECT\B1TCAAP PROJECT ARDEN HILLS - GEO - (15 60936 100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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BORING NUMBER TR-301

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 960.7 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H11-PROJECTS2015 PROJECT\B1TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		BITUMINOUS PAVEMENT (2.5 Inches)	AU 1									
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, trace fine to coarse gravel (Fill)	SS 2	44	10-15-15 (30)							
4.5		CLAYEY SAND, (SC) gray, fine grained, moist, trace gravel (Fill)	SS 3	67	9-10-10 (20)							
7.0		POORLY GRADED SAND, (SP) reddish brown, fine to medium grained, dry to moist, trace medium to coarse gravel (Fill)	SS 4	89	7-9-8 (17)							
9.5		SILTY SAND, (SM) reddish brown, fine grained, moist, dense, trace gravel	SS 5	67	10-11-12 (23)							
12.0		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist, dense, trace fine to medium gravel	SS 6	100	32							
12.5		LEAN CLAY WITH SAND, (CL) gray, moist, very stiff, trace coarse gravel										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 12.5 feet.



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BORING NUMBER TR-302

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 956.27 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)	955.6									
1.5		CLAYEY SAND, (SC) brown, fine grained, moist, loose, trace gravel, trace organics	954.8	SS 1	67	2-3-3 (6)						
		SANDY LEAN CLAY, (CL) brown to tan, moist, medium to stiff, trace fine gravel, iron oxide staining		SS 2	0	2-3-3 (6)						
5		NOTE: No recovery at Sample No. 2. Sampled auger cuttings.		SS 3	56	3-4-4 (8)						
				SS 4	100	5-5-7 (12)						
10				SS 5	100	4-5-5 (10)						
13.5			942.8	SS 6	94	5-11-12 (23)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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BORING NUMBER TR-303

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 943.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 20 ft. S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		CLAYEY SAND, (SC) brown, fine to coarse grained, moist, loose to dense, trace fine to medium gravel, iron oxide staining	SS 1	33	3-3-3 (6)							
			SS 2	44	4-4-4 (8)			11	30	13	17	35
			SS 3	39	3-3-4 (7)							
			SS 4	106	8-9-10 (19)							
			SS 5	133	10-12-12 (24)							
			SS 6	133	11-12-12 (24)							
13.0		POORLY GRADED SAND WITH CLAY AND GRAVEL, (SP-SC) brown, fine to medium grained, moist, dense, fine to coarse gravel										
13.5												
		Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.										

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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BORING NUMBER TR-304

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 944.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 30 ft. S **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, dry, loose, fine to coarse gravel	SS 1	44	3-3-3 (6)							
		NOTE: Sampled auger cuttings for Sample No. 2.	SS 2	6	3-2-3 (5)							
3.5		940.5 LEAN CLAY WITH SAND, (CL) brown, moist, medium to stiff, trace fine gravel	SS 3	83	3-3-3 (6)							
5			SS 4	78	10-14-14 (28)							
9.5		934.5 POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine grained, moist, medium dense, trace fine gravel, iron oxide staining	SS 5	44	5-7-7 (14)							
12.0		932.0 SILTY LEAN CLAY, (CL-ML) reddish brown, moist, rather stiff, trace fine gravel	SS 6	100	5-6-7 (13)							
13.5		930.5										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER TR-305

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 933.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 926.80 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 8 ft. SE **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist to saturated, medium dense to dense NOTE: Sand and gravel (SP) layer at 2.5 feet.	SS 1	44	3-4-5 (9)							
			SS 2	44	8-11-10 (21)							
5		NOTE: Sampled auger cuttings for Sample No. 3.	SS 3	22	11-11-8 (19)							
7.0												
		POORLY GRADED SAND, (SP) brown, fine grained, saturated, loose	SS 4	56	3-3-3 (6)							
8.5												
		LEAN CLAY WITH SAND, (CL) brown to gray, wet, medium	SS 5	56	2-2-3 (5)							
11.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 11.0 feet.



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BORING NUMBER TR-306

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 907.55 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 895.55 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
		CLAYEY SAND, (SC) gray brown, fine to medium grained, moist, medium dense, trace fine to medium gravel	SS 1	44	4-8-8 (16)							
			SS 2	56	3-5-5 (10)							
			SS 3	83	4-6-9 (15)							
			SS 4	33	5-7-8 (15)							
8.5		SANDY LEAN CLAY, (CL) blue gray, moist to wet, rather stiff, trace gravel, iron oxide staining										
			SS 5	78	5-6-7 (13)							
			SS 6	89	4-4-5 (9)							
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\11-PROJECT\S2015 PROJECT\BTDCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ



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BORING NUMBER TR-307

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 898.93 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 5.00 ft / Elev 893.93 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECT\S2015 PROJECT\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill)	SS 1	44	2-4-7 (11)							
5			SS 2	56	12-24-24 (48)							
5 - 12.0		SILTY SAND, (SM) brown, fine to coarse grained, saturated, very dense to loose, trace gravel, few silt lenses	SS 3	67	17-23-24 (47)							
12.0 - 12.5			SS 4	44	3-3-5 (8)			6				14
12.5 - 13.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense, little gravel	SS 5	44	2-4-8 (12)							
13.0 - 13.5		CLAYEY SAND, (SC) brown, fine grained, saturated, medium dense	SS 6	56	5-6-6 (12)							
13.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense										
Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.												



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BORING NUMBER TR-308

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 894.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 884.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1\PROJECT\S2015 PROJECT\B\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	893.9									
2.0		SILTY SAND, (SM) dark brown, fine grained, moist, loose, trace gravel	892.4	SS 1	56	2-3-3 (6)						
		POORLY GRADED SAND, (SP) brown, fine grained, moist, loose to medium dense, trace gravel		SS 2	56	4-4-4 (8)						
5				SS 3	33	3-7-9 (16)						
7.0		PEAT, (Pt) black, dry to moist, stiff	887.4									
8.0		SILTY SAND, (SM) gray, fine grained, moist to saturated, dense	886.4	SS 4	89	4-6-12 (18)						
10				SS 5	67	5-8-14 (22)						
13.5			880.9	SS 6		4-8-12 (20)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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 1408 Northland Drive, Suite 107
 Mendota Heights, MN 55120
 Telephone: 651-389-4191

BORING NUMBER TR-309

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 890.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 4.00 ft / Elev 886.43 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
1.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose, trace gravel NOTE: Weight of Hammer at Sample No. 1.	SS 1	100	0-3-4 (7)							
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, moist to saturated, medium dense, trace gravel, few clay lenses	SS 2	78	3-4-8 (12)			13				9
5			SS 3	89	4-6-9 (15)							
			SS 4	44	2-5-5 (10)							
10			SS 5	56	4-6-6 (12)							
12.0		SANDY LEAN CLAY, (CL) gray, saturated, medium, trace gravel, few sand lenses	SS 6		3-4-4 (8)							
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 10/19/15 16:18 - H:\1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15 60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TR - RICE CREEK TRAIL.GPJ

Appendix J

Town and Creek Development Area Soil Boring Logs

January 2016

T:\1382 KimleyHorn\01 TCAAP Rice Creek Remeander\TASK 15 Geotechnical\Geotech Results and Reports\Geotechnical Investigation Report\Geotechnical Report Text.docx



Responsive partner. Exceptional outcomes.



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BORING NUMBER DE-800

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 900.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 888.65 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-45 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, trace gravel (Fill) 899.2	SS 1	56	4-4-3 (7)							
3.5		CLAYEY SAND, (SC) brown gray, fine to medium grained, moist, trace gravel, little organics (Fill) 897.2	SS 2	67	3-3-2 (5)							
5		SANDY LEAN CLAY, (CL) brown, moist to wet, medium to rather stiff, trace fine to coarse gravel, iron oxide staining	SS 3	78	3-3-2 (5)							
			SS 4	100	3-9-6 (15)							
9.5		LEAN CLAY WITH SAND, (CL) gray to dark gray, wet, rather stiff to medium, trace fine to coarse gravel 891.2	SS 5	100	4-6-6 (12)							
			SS 6	100	4-3-4 (7)							
15			SS 7	100	3-3-5 (8)							
			SS 8	100	3-4-4 (8)							
20			SS 9	56	3-4-3 (7)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-801

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 899.36 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 6.50 ft / Elev 892.86 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:45 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist (Fill) NOTE: No recovery Sample No. 1. Sampled auger cuttings.	SS 1	0	4-4-4 (8)							
			SS 2	17	5-4-4 (8)							
4.5		SANDY LEAN CLAY, (CL) brown, moist to wet, medium, trace gravel	SS 3	22	2-4-3 (7)							
7.0												
8.4		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to coarse grained, saturated, loose	SS 4	67	3-3-2 (5)							
9.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium, trace fine to coarse gravel, iron oxide staining										
		CLAYEY SAND, (SC) gray, fine to coarse grained, saturated, loose, trace fine to coarse gravel	SS 5	56	2-3-4 (7)							
12.0		SANDY LEAN CLAY, (CL) gray, wet, medium	SS 6	100	3-4-3 (7)							
			SS 7	100	2-3-5 (8)							
			SS 8	100	3-3-4 (7)							
19.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium	SS 9	100	3-2-5 (7)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-803

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 892.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 14.50 ft / Elev 878.47 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 25 ft East

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:45 - H1-PROJECTS\2016 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		SILTY SAND, (SM) brown, fine grained, moist, little gravel (Fill) 889.5	SS 1	44	2-3-5 (8)							
5		POORLY GRADED SAND WITH GRAVEL, (SP) brown, medium to coarse grained, moist (Fill) 889.5	SS 2	44	7-12-14 (26)							
		NOTE: Sampled auger cuttings.	SS 3	56	5-9-12 (21)							
10		LEAN CLAY WITH SAND, (CL) gray, moist to saturated, medium to rather stiff, trace gravel 883.0	SS 4	11	3-4-6 (10)							
		NOTE: Sampled auger cuttings.	SS 5	67	3-3-4 (7)							
15		∇	SS 6	6	7-7-7 (14)							
			SS 7	94	3-3-4 (7)							
			SS 8	89	3-5-7 (12)							
20			SS 9	100	4-6-9 (15)							
21.0		872.0										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-804

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 897.51 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groudwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft North

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 1445 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill) 895.5	SS 1	56	2-2-1 (3)							
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill) 893.0	SS 2	44	2-3-2 (5)							
5		LEAN CLAY WITH SAND, (CL) light brown, moist, medium to rather stiff, trace gravel	SS 3	100	2-3-5 (8)							
			SS 4	100	3-6-7 (13)							
			SS 5	100	4-4-6 (10)							
			SS 6	100	5-6-6 (12)							
			SS 7	100	3-4-4 (8)							
15.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel 882.0	SS 8	100	3-4-3 (7)							
			SS 9	100	4-4-7 (11)							
21.0			876.5									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-805

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 893.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 6.00 ft / Elev 887.43 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 1445 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill) 891.4	SS 1	33	2-2-3 (5)							
2.7		LEAN CLAY WITH SAND, (CL) brown, moist, trace gravel (Fill) 890.8	SS 2	78	8-6-5 (11)							
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, trace gravel (Fill) 887.4	SS 3	22	5-8-8 (16)							
6.0												
7.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense, trace gravel 885.9	SS 4	67	7-5-6 (11)							
10		SANDY LEAN CLAY, (CL) brown, wet, medium to rather stiff	SS 5	100	3-3-2 (5)							
			SS 6	100	5-5-6 (11)							
15			SS 7	100	3-5-5 (10)							
			SS 8	89	4-5-4 (9)							
19.5												
20		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, sand lenses 873.9	SS 9	83	6-7-6 (13)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-806

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 901.27 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 12.00 ft / Elev 889.27 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:45 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		TOPSOIL (5 inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	2-3-4 (7)							
			SS 2	33	8-10-9 (19)							
			SS 3	22	9-13-12 (25)							
			SS 4	56	4-6-5 (11)							
10.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, soft to rather stiff, trace gravel	SS 5	56	2-2-2 (4)							
			SS 6	100	3-3-6 (9)							
			SS 7	100	2-5-6 (11)							
			SS 8	100	5-5-8 (13)							
21.0			SS 9	100	4-6-8 (14)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-807

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 898.18 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.50 ft / Elev 893.68 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 1445 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 inches)										
		CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, trace gravel, trace organics (Fill).	SS 1	78	2-2-3 (5)							
3.5		LEAN CLAY WITH SAND, (CL) brown, wet to moist, soft to medium, trace gravel	SS 2	72	3-5-5 (10)							
			SS 3	39	2-1-3 (4)							
			SS 4	56	3-5-9 (14)							
9.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 5	100	3-4-5 (9)							
			SS 6	100	3-3-4 (7)							
			SS 7	89	2-3-5 (8)							
			SS 8	100	2-3-4 (7)							
21.0			SS 9	100	3-3-5 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-809

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/19/15 COMPLETED 5/19/15 GROUND ELEVATION 890.82 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 7.00 ft / Elev 883.82 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches).										
1.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill).	SS 1	56	3-5-5 (10)							
		SILTY SAND, (SM) brown, fine grained, moist, medium dense to dense NOTE: No recovery Sample No. 2. Sampled auger cuttings.	SS 2	0	4-6-7 (13)							
5			SS 3	67	4-8-9 (17)							
7.0		CLAYEY SAND, (SC) gray, fine grained, saturated, loose	SS 4	83	3-3-3 (6)							
9.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium to soft	SS 5	89	2-2-2 (4)							
			SS 6	44	1-2-3 (5)							
15			SS 7	100	2-2-3 (5)							
17.0		LEAN CLAY WITH SAND, (CL) gray, wet, soft, trace gravel NOTE: Weight of Hammer at Sample No. 8.	SS 8	100	0-2-2 (4)							
20			AU 9	100								
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-810

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 890.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 880.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT- TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches).										
2.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill).	SS 1	56	4-5-5 (10)							
		LEAN CLAY WITH SAND, (CL) brown, moist, trace gravel (Fill).	SS 2	78	6-8-8 (16)							
5			SS 3	78	5-5-5 (10)							
7.0			SS 4	33	3-4-6 (10)							
		SILTY SAND, (SM) brown to dark gray, fine grained, moist to saturated, medium dense to loose	SS 5	83	5-6-8 (14)							
13.5			SS 6	67	2-3-5 (8)							
		POORLY GRADED SAND WITH CLAY, (SP-SC) light brown, fine grained, saturated, very loose to medium dense, clay lenses	SS 7	44	3-1-1 (2)							
			SS 8	56	5-5-6 (11)							
21.0			SS 9	83	6-6-5 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies, Inc.
 6160 Carmen Avenue East
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 Telephone: 651-389-4191

BORING NUMBER DE-811

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 897.49 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill). 894.5	SS 1	44	1-3-5 (8)							
5.0		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel NOTE: No recovery. Sampled auger cuttings. 890.5	SS 2	56	4-4-5 (9)							
7.0		POORLY GRADED SAND, (SP) brown, fine to coarse grained, moist, loose, trace gravel 890.5	SS 3	0	6-6-5 (11)							
10.0		POORLY GRADED SAND, (SP) brown, fine to coarse grained, moist, loose, trace gravel 887.0	SS 4	44	2-3-5 (8)							
10.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel 887.0	SS 5	78	4-2-4 (6)							
15.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel	SS 6	100	2-2-3 (5)							
15.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel	SS 7	56	2-3-4 (7)							
20.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel	SS 8	100	2-3-4 (7)							
21.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel 876.5	SS 9	89	1-4-4 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-812

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 891.84 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 8.00 ft / Elev 883.84 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.00936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ROADWAY BASE (30 inches).	SS 1	0	3-2-1 (3)							
2.5		NOTE: No recovery. Sampled auger cuttings.										
4.5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill)	SS 2	56	9-9-9 (18)							
6.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist (Fill)	SS 3	67	4-5-6 (11)							
9.5		POORLY GRADED SAND, (SP) brown, fine grained, moist to saturated, dense	SS 4	78	7-10-12 (22)							
12.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, medium dense	SS 5	44	4-7-8 (15)							
14.5		SILTY SAND, (SM) brown, fine grained, saturated, loose	SS 6	89	4-3-2 (5)							
21.0		LEAN CLAY WITH SAND, (CL) brown gray, wet, medium to rather stiff	SS 7	100	2-5-4 (9)							
			SS 8	78	3-4-3 (7)							
			SS 9	100	2-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-813

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 888.09 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 9.50 ft / Elev 878.59 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0			AU 1									
0-5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, some fine to coarse gravel (Fill)	SS 2	100	8-9-9 (18)							
5		NOTE: No Recovery due to gravel. Sampled auger cuttings.	SS 3	0	4-4-5 (9)							
5-6.0		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 4	89	6-7-6 (13)							
6.0-8.5		∇ SILTY SAND, (SM) gray, fine grained, moist to saturated, medium dense	SS 5	67	6-6-7 (13)							
8.5-10			SS 6	100	4-6-6 (12)							
10-15			SS 7	78	5-6-5 (11)							
15-20			SS 8	67	7-5-5 (10)							
20-21.0			SS 9	89	6-5-6 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-814

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 888.1 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.50 ft / Elev 883.60 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0			AU 1									
4.5		SILTY SAND, (SM) brown and tan, fine grained, moist (Fill)	SS 2	56	3-3-4 (7)							
6.0		SILTY SAND, (SM) reddish brown, fine grained, saturated (Fill)	SS 3	100	6-8-7 (15)							
8.3		POORLY GRADED SAND WITH SILT, (SP-SM) dark gray, fine grained, saturated, loose, trace gravel	SS 4	83	3-2-3 (5)							
9.5		SANDY SILT, (ML) dark gray, wet, medium	SS 5	67	5-6-3 (9)							
12.0		SANDY LEAN CLAY, (CL) dark gray, wet, medium to rather stiff, trace fine to coarse sand	SS 6	56	2-4-3 (7)							
15.0			SS 7	100	3-3-4 (7)							
17.5			SS 8	100	4-4-6 (10)							
20.0			SS 9	100	5-6-5 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-815

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 892.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 5.00 ft / Elev 887.67 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0			AU 1									
5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist to saturated, some fine to coarse gravel (Fill). ▽	SS 2	44	2-2-3 (5)							
6.0		886.7	SS 3	33	1-1-1 (2)							
9.5		883.2	SS 4	78	4-5-5 (10)							
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, loose, trace gravel	SS 5	56	3-3-2 (5)							
12.0		880.7	SS 6	78	2-3-3 (6)							
15		LEAN CLAY WITH SAND, (CL) dark gray, wet, medium to rather stiff, trace gravel	SS 7	100	3-3-3 (6)							
			SS 8	78	4-7-3 (10)							
20			SS 9	67	5-6-5 (11)							
21.0		871.7										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-816

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 903.88 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 to 5		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, moist, fine to medium gravel (Fill) NOTE: No recovery. Sampled auger cuttings.	SS 1	44	2-6-8 (14)							
5		898.9	SS 2	0	3-3-4 (7)							
5 to 12		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 3	89	2-4-5 (9)							
12		891.9	SS 4	100	3-5-6 (11)							
12 to 21		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 5	100	4-6-8 (14)							
15			SS 6	100	4-5-6 (11)							
20			SS 7	100	3-4-6 (10)							
			SS 8	100	3-5-6 (11)							
21		882.9	SS 9	100	2-5-6 (11)							

Borehole backfilled with soil cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-817

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 901.99 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 4.50 ft / Elev 897.49 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill) 900.0	SS 1	67	2-2-2 (4)							
4.0		SILTY SAND, (SM) brown and light brown, fine to medium grained, moist, trace gravel (Fill) 898.0	SS 2	56	3-3-3 (6)							
5.0	∇	SILTY SAND, (SM) gray, fine to coarse grained, saturated, very loose 895.0	SS 3	83	1-1-1 (2)							
7.0		SILTY SAND, (SM) brown, fine to coarse grained, saturated, loose to medium dense, trace to a little gravel 895.0	SS 4	78	3-5-6 (11)							
10.0			SS 5	56	2-3-4 (7)							
14.5			SS 6	44	4-6-7 (13)							
15.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, saturated, medium dense, trace gravel 887.5	SS 7	100	1-5-4 (9)							
17.0		CLAYEY SAND, (SC) brown, fine to coarse grained, saturated, loose, trace gravel 885.0	SS 8	78	3-3-5 (8)							
19.5			SS 9	89	4-3-4 (7)							
20.0		SILTY SAND, (SM) brown, fine to coarse grained, saturated, loose, trace gravel 882.5										
21.0												

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-818

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 897.33 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 7.00 ft / Elev 890.33 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel, trace roots (Fill) 895.3	SS 1	44	1-3-4 (7)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist (Fill) 892.8	SS 2	67	5-8-7 (15)							
6.0		SANDY LEAN CLAY, (CL) gray, moist, stiff, trace gravel 891.3	SS 3	44	8-10-11 (21)							
8.3		▽ POORLY GRADED SAND, (SP) gray to brown, fine to medium grained, moist to saturated, medium dense, trace gravel 889.1	SS 4	78	2-3-6 (9)							
9.5		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel 887.8	SS 5	56	2-3-3 (6)							
12.8		PEAT, (Pt) black, moist, soft, fibrous 884.5	SS 6	83	2-3-3 (6)							
16.5		SILTY SAND, (SM) gray, fine grained, saturated, loose, trace gravel 880.8	SS 7	78	1-1-1 (2)							
21.0		SILTY SAND, (SM) gray, fine grained, saturated, loose, trace gravel 876.3	SS 8	56	3-3-4 (7)							
			SS 9	83	1-6-2 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-819

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 894.26 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 5.00 ft / Elev 889.26 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.0	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	44	2-4-6 (10)							
2.8	[Dotted pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, medium dense, trace gravel	SS 2	83	3-6-7 (13)							
4.5	[Diagonal lines /]	SANDY LEAN CLAY, (CL) gray brown, moist, rather stiff, trace gravel										
5.0	▽	SILTY SAND, (SM) brown to dark brown, fine grained, moist to saturated, medium dense, trace gravel	SS 3	56	3-8-6 (14)							
			SS 4	67	3-6-7 (13)							
10.0	▽	PEAT, (Pt) black, moist, medium	SS 5	78	2-4-1 (5)							
10.5		SILTY SAND, (SM) dark gray to gray, fine grained, saturated, loose, trace gravel	SS 6	56	1-3-2 (5)							
14.5		CLAYEY SAND, (SC) gray, fine grained, saturated, very loose, trace gravel	SS 7	67	2-1-1 (2)							
17.0		SANDY LEAN CLAY, (CL) gray, wet, medium to soft, trace gravel	SS 8	33	2-3-3 (6)							
21.0			SS 9	28	2-2-1 (3)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-820

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 894.31 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 5.00 ft / Elev 889.31 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, trace gravel (Fill)	SS 1	83	2-3-5 (8)							
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, dense, little gravel	SS 2	56	6-11-11 (22)							
5		▽ SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, dense, trace gravel	SS 3	78	8-11-10 (21)							
8.0		SANDY LEAN CLAY, (CL) blue gray, wet, rather stiff, trace gravel	SS 4	78	3-7-5 (12)							
9.5		SILTY SAND, (SM) gray, fine grained, saturated, loose, trace gravel	SS 5	44	3-4-3 (7)							
10.5		PEAT, (Pt) black, moist, soft										
13.0		SILTY SAND, (SM) gray, fine grained, saturated, very loose, trace gravel	SS 6	67	1-1-1 (2)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 7	89	2-5-4 (9)							
17.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to very loose, trace gravel	SS 8	100	4-10-2 (12)							
20			SS 9	100	1-1-1 (2)							
			SS 10	100	3-4-4 (8)							
24.5		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 11	100	4-4-6 (10)							
26.0												

Borehole backfilled with auger cuttings.
Bottom of borehole at 26.0 feet.



Northern Technologies, Inc.
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BORING NUMBER DE-821

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 888.46 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 7.00 ft / Elev 881.46 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill) NOTE: No recovery. Sampled auger cuttings.	SS 1	33	1-1-2 (3)							
885.0			SS 2	0	2-3-5 (8)							
5		POORLY GRADED SAND WITH CLAY, (SP-SC) brown, fine to medium grained, moist, trace gravel, clay (CL) lenses (Fill)	SS 3	33	1-1-1 (2)							
6.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium, trace gravel	SS 4	56	2-2-4 (6)							
10			SS 5	94	2-3-3 (6)							
15			SS 6	100	2-3-5 (8)							
			SS 7	89	2-2-3 (5)							
			SS 8	100	2-3-4 (7)							
20			SS 9	100	2-3-5 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-822

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 890.4 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 883.40 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	SANDY SILT, (ML) brown, moist (Fill)	SS 1	44	1-2-2 (4)							
3.0	[Diagonal lines pattern]	SILTY SAND, (SM) brown, fine to medium grained, moist (Fill)	SS 2	78	2-2-3 (5)							
5.0	[Diagonal lines pattern]	LEAN CLAY WITH SAND, (CL) gray, moist, medium	SS 3	28	2-3-2 (5)							
7.0	[Dotted pattern]	POORLY GRADED SAND, (SP) brown, fine grained, saturated, very loose, trace gravel	SS 4	56	2-1-3 (4)							
9.5	[Dotted pattern]	SILTY SAND, (SM) gray and brown, fine grained, saturated, very loose, trace gravel	SS 5	44	3-1-1 (2)							
12.5	[Diagonal lines pattern]	LEAN CLAY WITH SAND, (CL) gray, wet, soft to medium, trace gravel, sand lenses	SS 6	100	2-2-2 (4)							
15.0	[Diagonal lines pattern]		SS 7	83	2-3-4 (7)							
20.0	[Diagonal lines pattern]		SS 8	100	2-3-4 (7)							
21.0	[Diagonal lines pattern]		SS 9	100	2-3-4 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-824

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/18/15 COMPLETED 5/18/15 GROUND ELEVATION 888.51 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 4.50 ft / Elev 884.01 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		SILTY SAND, (SM) brown, fine grained, moist, loose to very loose, trace gravel	SS 1	83	2-4-4 (8)							
5			SS 2	56	2-2-2 (4)							
6.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, very loose	SS 3	56	3-2-1 (3)							
6.0		SILTY SAND, (SM) brown, fine grained, saturated, very loose, trace gravel	SS 4	67	2-1-2 (3)							
10.0			SS 5	78	2-2-2 (4)							
10.0		SILTY LEAN CLAY, (CL-ML) gray, wet, soft to medium, trace gravel, little sand	SS 6	83	1-2-3 (5)							
15			SS 7	78	2-1-2 (3)							
20			SS 8	100	2-3-3 (6)							
21.0			SS 9	83	2-1-2 (3)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-825

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 893.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 12516 14-48 - H1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 1	78	2-5-4 (9)							
			SS 2	44	5-5-5 (10)							
5		SILTY SAND, (SM) brown, fine to medium grained, moist, loose, trace gravel	SS 3	56	3-3-3 (6)							
7.5		SANDY LEAN CLAY, (CL) gray brown, moist, medium, trace gravel	SS 4	78	3-2-3 (5)							
			SS 5	56	4-4-4 (8)							
			SS 6	28	3-3-4 (7)							
14.5		LEAN CLAY WITH SAND, (CL) gray to dark gray, moist, medium, trace gravel	SS 7	94	3-3-3 (6)							
			SS 8	100	2-3-4 (7)							
21.0			SS 9	100	3-3-4 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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Williston
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SOUTH DAKOTA

Pierre
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WYOMING

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Sheridan
307-675-1148

Preliminary Geotechnical Evaluation Report

Rice Creek Commons Mass Grading
Former Twin Cities Army Ammunition Plant
Northeast of US Highway 10 and Highway 96
Arden Hills, Minnesota

Prepared for

Kimley-Horn and Associates, Inc.

Professional Certification:

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

Robert J. Janssen, PE
President – Principal Engineer
License Number: 19943
August 21, 2018

Project B1706398

Braun Intertec Corporation

August 21, 2018

Project B1706398

Mr. Thomas Lincoln
Kimley-Horn and Associates, Inc.
2550 University Avenue West, Suite 238N
Saint Paul, Minnesota

Re: Preliminary Geotechnical Evaluation
Rice Creek Commons Mass Grading
Former Twin Cities Army Ammunition Plant
Northeast of US Highway 10 and Highway 96
Arden Hills, Minnesota

Dear Mr. Lincoln:

We are pleased to present this Geotechnical Evaluation Report for the mass grading phase of the proposed Rice Creek Commons project in Arden Hills, Minnesota.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Bob Janssen at 651.487.7017 or bjanssen@braunintertec.com or Joel Kurpius at 651.487.7006 or jkurpius@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Robert J. Janssen, PE
President – Principal Engineer

Joel C. Kurpius, PE
Project Engineer

c: Ms. Carla Dunham, Alatus, LLC
Mr. Clark Wicklund, Alliant Engineering, Inc.
Mr. Tom Shaver, Inland Development Partners
Mr. Alex Duval, Duval Companies

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Appendix A

Soil Boring and Cone Penetrometer Test Locations Sketch

Appendix B

Log of Boring Sheets, 2018 Braun Intertec Corporation

Log of Boring Sheets, 2016 Wenck

Log of Boring Sheets, 2007 American Engineering Testing, Inc./Braun Intertec Corporation

Appendix C

Log of CPT Sounding Sheets, Soundings CPT-1 through CPT-6

Appendix D

Descriptive Terminology of Soil

Descriptive Terminology Cone Penetration Test

Appendix E

Table E1. Topsoil

Table E2. Organic Swamp Deposits

Table E3. Buried Topsoil

Table E4. Existing Fill

Table E5. Unsuitable Soil

Table E6. Groundwater

Appendix F

Consolidation Tests

Appendix G

Figure G1. Area 4

Figure G2. Area 3

Appendix H

Figure H1.

Figure H2.

Figure H3.

Figure H4.

Figure H5.

A. Introduction

A.1. Project Description and Key Stakeholders

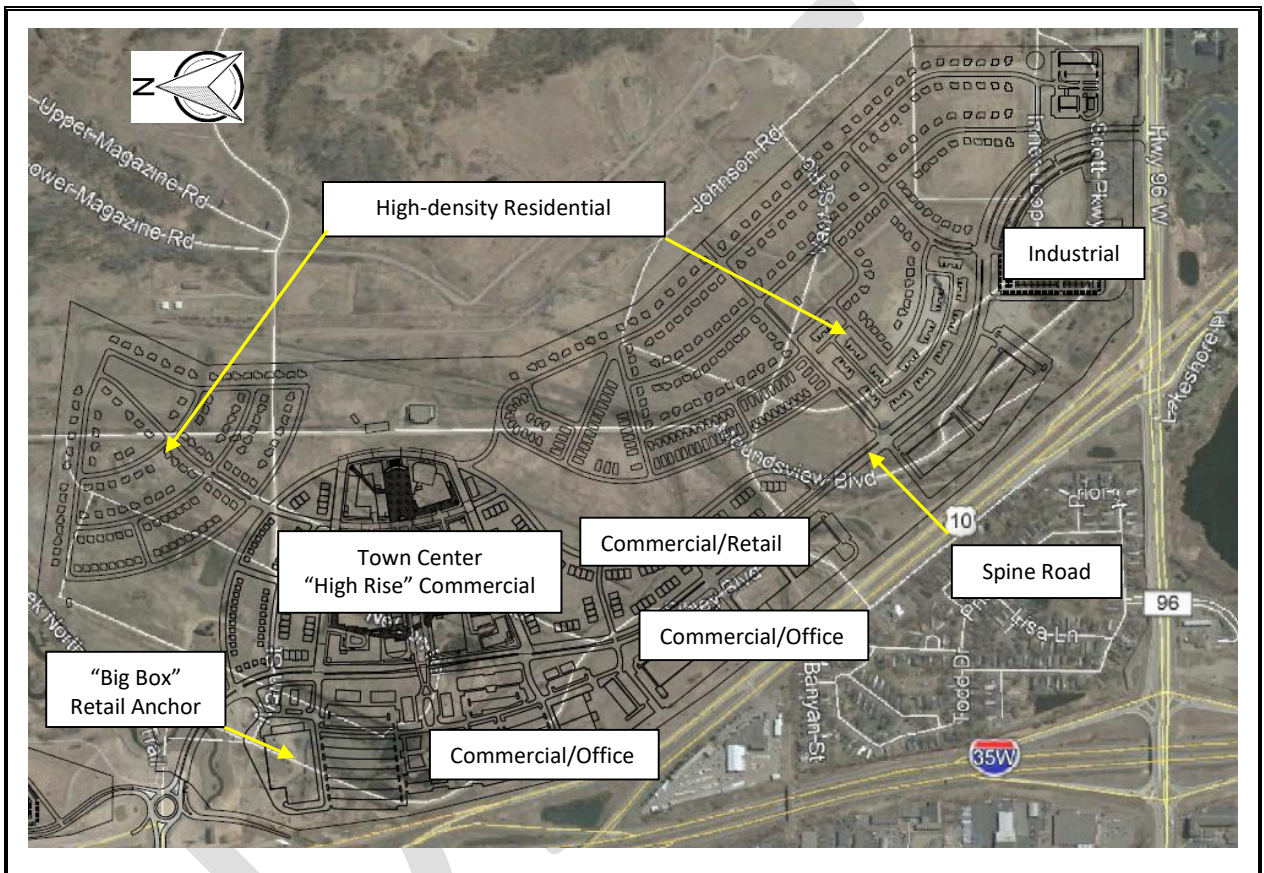
Ramsey County and the City of Arden Hills have formed a partnership to redevelop approximately 427 acres at the former Twin Cities Army Ammunition Plant (TCAAP) in Arden Hills, Minnesota. The project site is generally located northwest of United States Highway 10 and Highway 96. The working title of the development is Rice Creek Commons. In addition to Ramsey County and the City of Arden Hills, current project team members also include the firms presented below in Table 1.

Table 1. Project Stakeholders and Roles

Stakeholder	Role
Ramsey County	<ul style="list-style-type: none"> ▪ Current Owner of all 427 acres slated for developed ▪ Future owner of select portions of the development infrastructure (roads, utilities, etc.)
City of Arden Hills	<ul style="list-style-type: none"> ▪ Development partner with Ramsey County ▪ Future owner of development infrastructure ▪ Potential building owner within Project (possible City Hall) ▪ Owner/operator of future Water Tower
Kimley-Horn and Associates, Inc.	<ul style="list-style-type: none"> ▪ Project civil engineer, working on behalf of the City and County ▪ Focus mostly on infrastructure design and developing plans for the mass grading phase of the overall development
Alatus, LLC	<ul style="list-style-type: none"> ▪ Real Estate development ▪ Lead private developer
Inland Development Partners	<ul style="list-style-type: none"> ▪ Real Estate development ▪ Support of Alatus, LLC
Alliant Engineering, Inc.	<ul style="list-style-type: none"> ▪ Project civil engineer, working on behalf of the Alatus development team ▪ Focus mostly on design of building and residential development
Bay West, LLC	<ul style="list-style-type: none"> ▪ Environmental Consultant ▪ Lead environmental consultant for Ramsey County and chief liaison between Ramsey County and the former property owner, the US Army, and their representatives

A concept plan of the redevelopment furnished to us is shown below in Figure 1 (which is an excerpt from a concept plan provided to us by Kimley-Horn). The concept plan shown in Figure 1 is the most up-to-date conceptual plan at the time of this report. To help provide perspective, the proposed development is shown over a recent aerial image of the property.

Figure 1. Concept Plan: Rice Creek Commons



As shown in Figure 1, the project will be effectively divided into an East portion and a West portion, with the County-owned Spine Road separating the two. In previous incarnations of project development, differing stakeholders were responsible for grading certain portions of the site. Currently, the mass grading of the entire 427-acre site will be performed under one contract.

Kimley-Horn indicated to us that the specific site features shown in Figure 1 remain preliminary in nature and will likely change; however, the overall concept will generally remain consistent with what is shown in Figure 1. With the understanding of the high likelihood that development structures (buildings, parking lots, etc.) will shift from what is currently shown in Figure 1, it is our understanding that is desired to mass grade the site so that buildings can be constructed anywhere within the buildable limits without prompting significant subgrade preparation/improvement activities prior to construction.

Also, in recent technical reports prepared by our firm, we referenced a Northwest portion, which is also referred to as the “Thumb Property.” It is our understanding that the Northwest/“Thumb” property will not be graded along with the 427-acre site.

A.2. Development Schedule

While participating in a recent project team meeting on June 5, 2018, our firm was provided with a preliminary schedule for the various phases of construction/development. Figure 2 shows how construction of the proposed development will be phased.

Figure 2. Project Phasing – Tranche 1, 2, 3, and 4 (as of May 1, 2018)

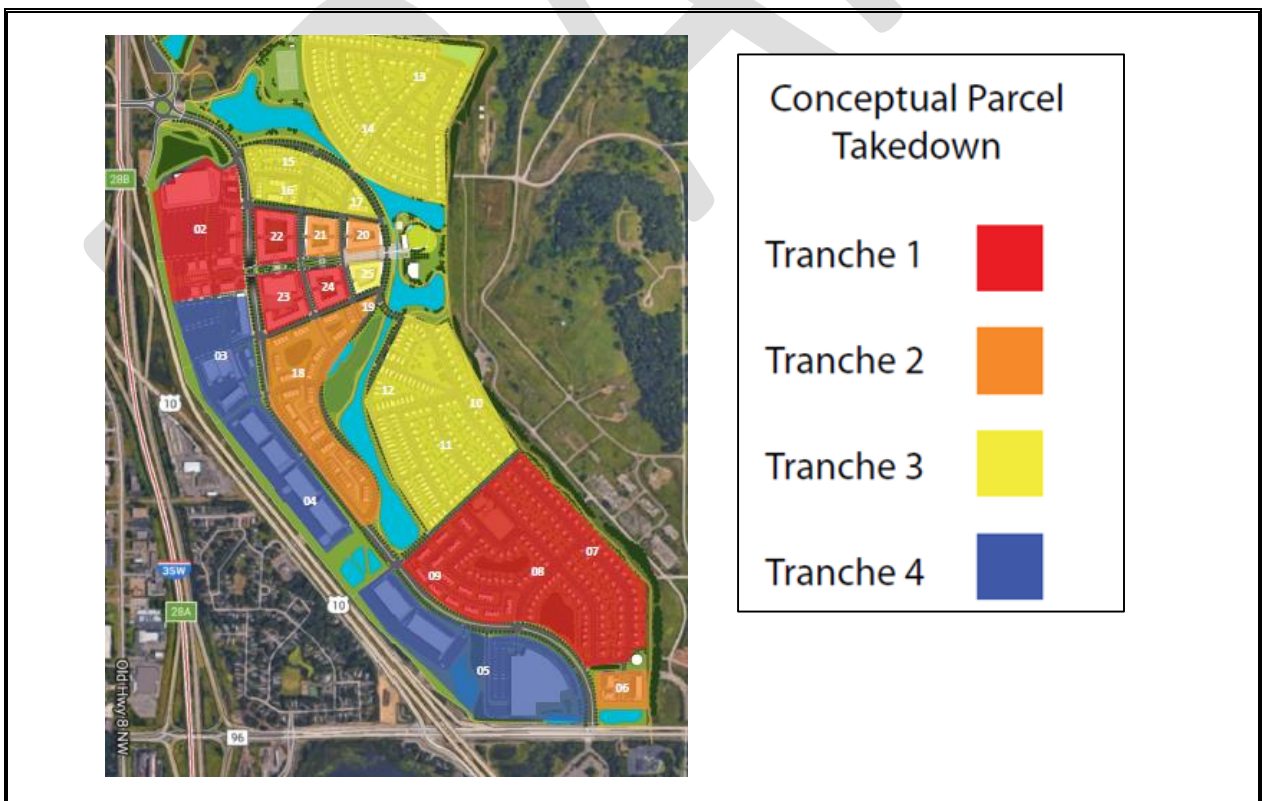
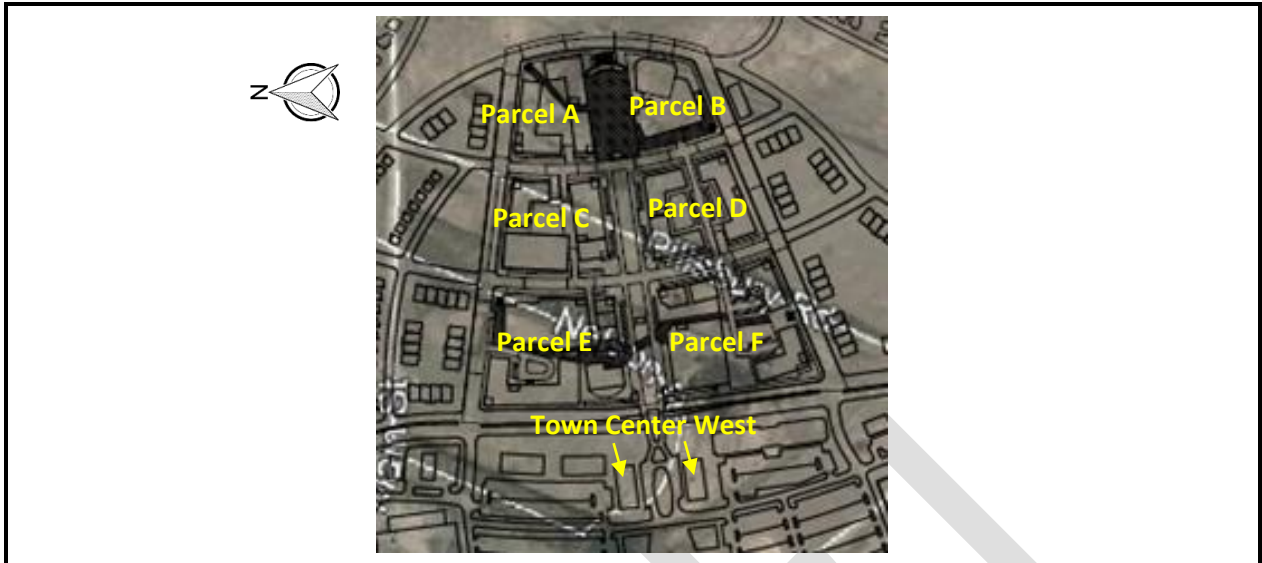


Figure 3. Overview of Town Center Parcels



As Figure 3 shows an overview of the Town Center development, Figure 4, provided to us on July 6, 2018, shows a more-detailed plan of the Town Center development. Note that north arrow orientation has changed. The likely number of below-grade (parking) and above-grade stories are shown, as well as a building type key.

Figure 4. Town Center Development

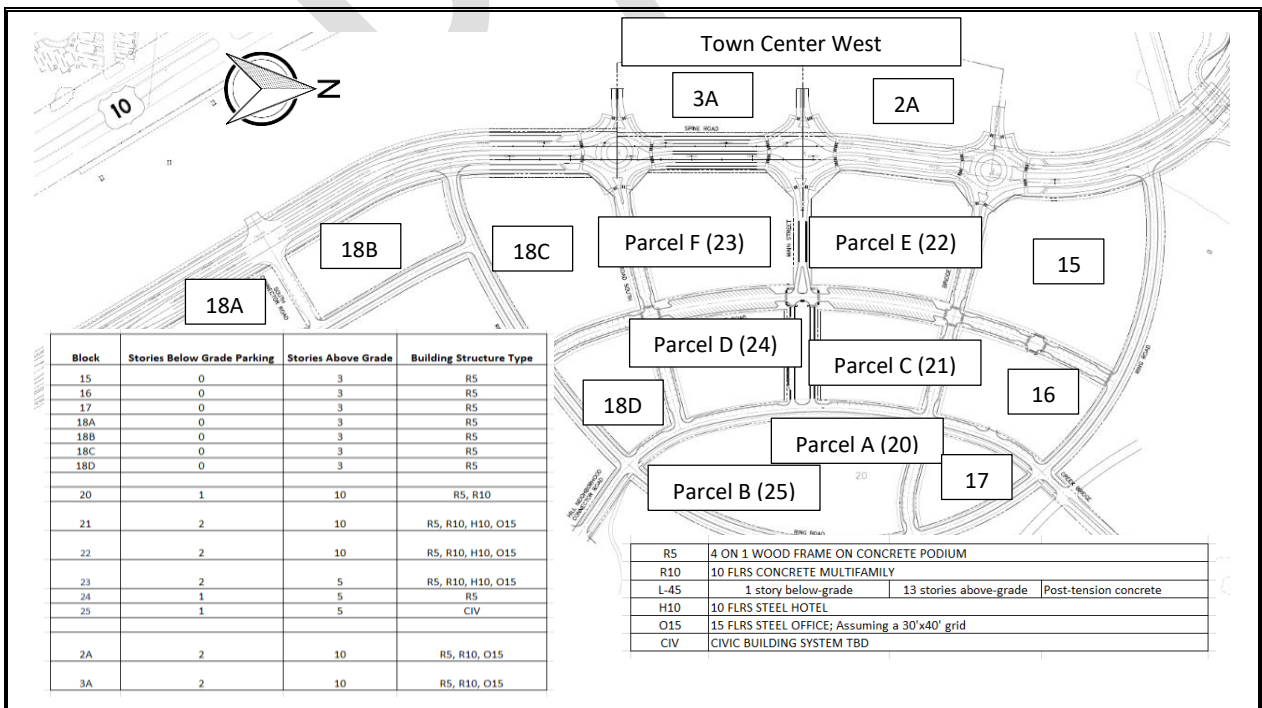


Table 3 presents the building configurations for the Town Center parcels (Blocks 15 through 25, 2A, and 3A) provided to us, as well as assumed building loads, presumed year of construction, and also the main-/street-level floor elevations. Also, for Parcels A through F, underground parking will exist below the footprint of the entire parcel, not just the building footprints. However, underground parking will not be extended below the Town Center streets.

Table 3. Town Center Building Configuration and Assumed Structural Loads

Block	Type	Building Levels		Building Loads		Construction Date (Year)	Elevations	
		Below Grade	Above Grade	Perimeter (kips)	Interior (kips)		Street-level	Lowest Floor
15	R5	0	3	425	650	Not Available		
16	R5	0	3	425	650	Not Available		
17	R5	0	3	425	650	Not Available		
18A	R5	0	3	425	650	Not Available		
18B	R5	0	3	425	650	Not Available		
18C	R5	0	3	425	650	Not Available		
18D	R5	0	3	425	650	Not Available		
20 Par. A	R5	0	3	425	650	2023	910	910
	R10	2	10	1,230	1,700	2023	910	898
21 Par. C	R5	0	3	425	650	2023	910.5	910.5
	R10	2	10	1,230	1,700	2023	910.5	886.5
	H10	2	10	1,050	1,450	2023	910.5	886.5
	O15	2	10	2,150	2,950	2023	910.5	886.5
22 Par. E	R5	0	3	425	650	2020	911	911
	R10	2	10	1,230	1,700	2020	911	887
	H10	2	10	1,050	1,450	2020	911	887
	O15	2	10	2,150	2,950	2020	911	887
23 Par. F	R5	0	3	425	650	2020	911	911
	R10	2	10	1,230	1,700	2020	911	887
	H10	2	10	1,050	1,450	2020	911	887
	O15	2	10	2,150	2,950	2020	911	887
24 Par. D	R5	1	5	425	650	2020	910.5	898.5
25 Par. B	CIV	0	2	150	300	2026	910.5	910.5
2A	R5	0	3	425	650	2020	910.5	910.5
	R10	2	10	1,230	1,700	2020	910.5	898.5
	O15	2	10	2,150	2,950	2020	910.5	898.5

Block	Type	Building Levels		Building Loads		Construction Date (Year)	Elevations ^a	
		Below Grade	Above Grade	Perimeter (kips)	Interior (kips)		Street-level	Lowest Floor
3A	R5	0	3	425	650	2020	910.5	910.5
	R10	2	10	1,230	1,700	2020	910.5	898.5
	O15	2	10	2,150	2,950	2020	910.5	898.5

The assumed remaining building configurations for the remainder of the of the areas as follows:

- **High-density Residential:** typical wood-framed residential construction, 1 to 2 levels above grade, various lookout, walkout, and rambler designs, typically 1 to 3 kips per lineal foot.
- **Retail Anchor:** single story, no basement, masonry or precast walls, steel columns and roof, typically 4 to 6 kips per lineal foot, maximum column loads of about 125 kips.
- **Commercial Retail:** single story, no basement, steel-/wood-stud walls with wood or steal roofs, column loads of about 75 kips, wall loads typically 3 to 5 kips per lineal foot.
- **Commercial Office Single-story:** single story, no basement, masonry or precast walls, steel column and roof, typically 4 to 6 kips per lineal foot of wall, maximum column loads of about 125 kips.
- **Commercial Office Multi-story:** two- to three-story, no basement, masonry or precast walls, steel column and roof, typically 6 to 8 kips per lineal foot of wall, typical column loads of 125 kips, maximum column loads of about 300 kips.
- **Industrial:** single story “warehouse height,” interior office mezzanine level, no basement, masonry or precast walls, steel columns and roof, typically 4 to 6 kips per lineal foot of wall, typical column loads of about 100 kips, maximum column loads of about 200 kips.
- **Commercial Corporate Office South:** located near Highway 96 within southern portion of site, likely west of Spine road, three to four stories above-grade, one below-grade, typically 6 to 8 kips per lineal foot of wall, typical column loads of about 200 kips, maximum column loads of about 500 kips.

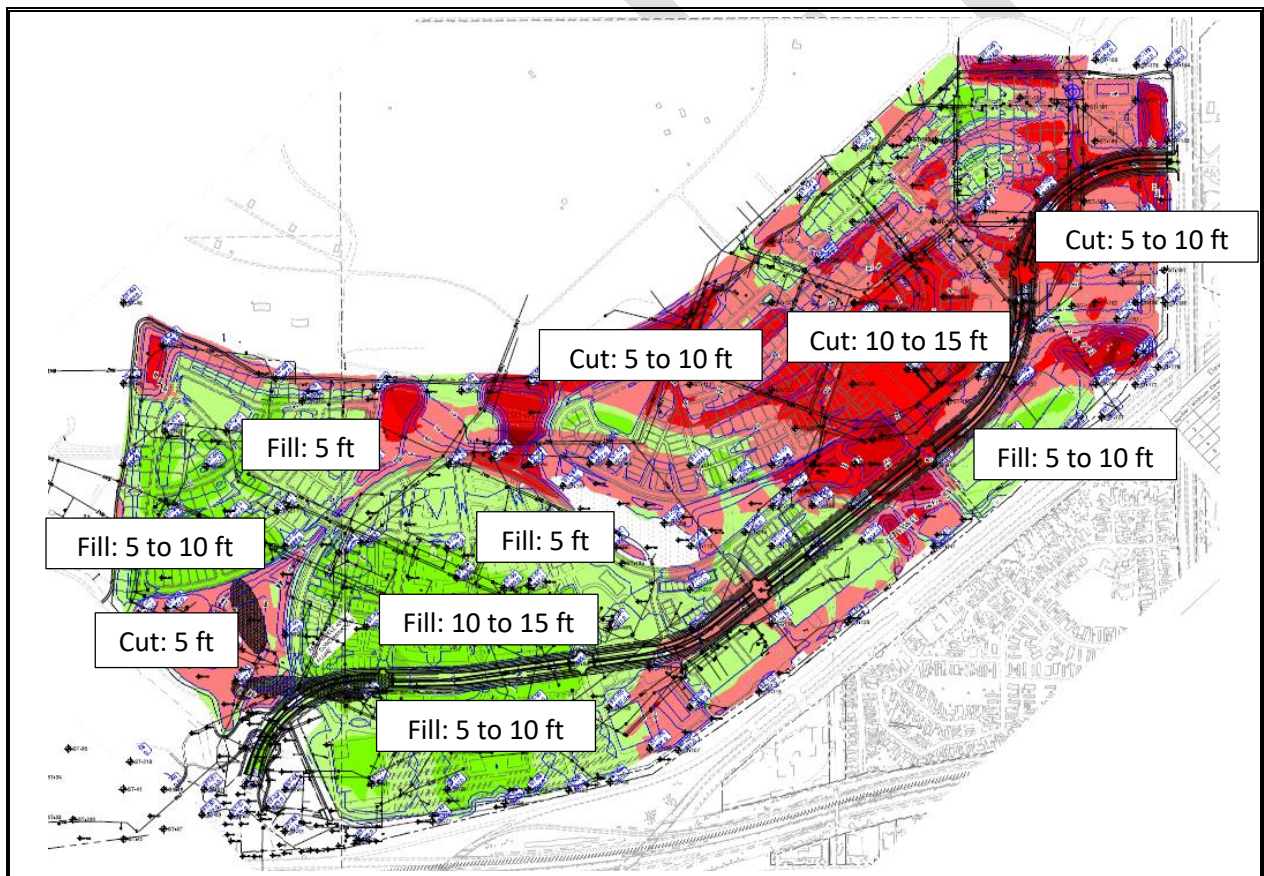
A.3.b. Statement of Building Settlement Tolerance

As reported to us, total building settlement is to be less than 1 inch and differential settlement is to be less than 1/2 inch in 40 lineal feet.

A.3.c. Proposed Surface Grade Changes

In the fall of 2017, we were provided with a preliminary cut/fill illustration. Based on our recent conversations with the project team, we understand the cut/fill illustration generally remains valid. A copy of that diagram is shown below in Figure 5. We have added notes showing area cuts (lowering) and fills (raising) required to achieve proposed surface grades. In general, red shades are indicative of areas that will be lowered to achieve proposed grades and green shades are indicative of areas that will be raised to achieve proposed grades.

Figure 5. Estimated Cut/Fill Illustration



The illustration in Figure 5, however, shows only main/street-level finished grades and does NOT incorporate basement elevations. For the Town Center parcels, cut-fill information that does incorporate under-ground parking configuration is presented in Table 4.

Table 4. Town Center Cut/Fill Information

Parcel	Existing Surface Grades Elevations ^a	Lowest Floor Elevation	Cut/Fill
A	898 to 901	898	At-grade to Cut 3 feet
B	900 to 902	898	Cut 2 to 4 feet
C	892 to 898	886.5	Cut 6 to 12 feet
D	897 to 898	898.5	At-grade to Fill 1 to 2 feet
E	890 to 891	887	Cut 3 to 4 feet
F	890 to 898	887	Cut 3 to 11 feet
West (2 buildings)	889 to 891	898.5	Fill 7 to 9 feet

a From Log of Boring sheets.

NOTE: With regard to the Town Center area of the site, during our August 8, 2018, meeting with Kimley-Horn, it was reported to us that the parcels within this area would generally be graded to an elevation approximately equivalent to the surrounding street elevations. In past iterations, to help reduce the volume of soil to be excavated to achieve building subgrade elevations (for those with one or two levels of below-grade parking), the project team had considered grading all or a portion of the parcels to a surface elevation lower than adjacent street elevations.

A.3.d. Trunk Underground Utilities

Trunk sanitary sewer and water main servicing the development will be installed below the Spine Road. Based on our review of the Sanitary and Water Main Layout sketch prepared and furnished to us by Kimley-Horn, we understand the trunk sanitary sewer line will be located along the western portion of the Spine Road and the trunk water main will be installed along the eastern portion of the Spine Road.

The trunk sanitary sewer line will typically be installed about 15 to 18 feet below finished road elevations, and locally as deep as about 20 to 24 feet near the Town Center. Areas where existing surface grades will be raised along the sanitary sewer alignment are presented in Table 5. Elsewhere along the alignment, proposed surface grades will be at or lower than existing surface grades.

Table 5. Surface Grade Changes Along Trunk Sanitary Sewer Alignment

Alignment Location (Sanitary Stations)	Ground Surface Raise in Grade
124+00 to 125+00	0 to 5 feet
125+00 to 129+50	5 to 10 feet
129+50 to 132+00	0 to 5 feet
140+50 to 143+00	0 to 5 feet
143+00 to 145+00	5 to 10 feet
145+00 to 147+00 (near Town Center)	10 to 12 feet
147+00 to 163+00	5 to 10 feet

Trunk water main will typically be installed about 8 to 10 feet below proposed surface grades, with the exception to north connection point where the new trunk water main will connect with an existing line about 15 feet below existing/proposed surface grades in that area.

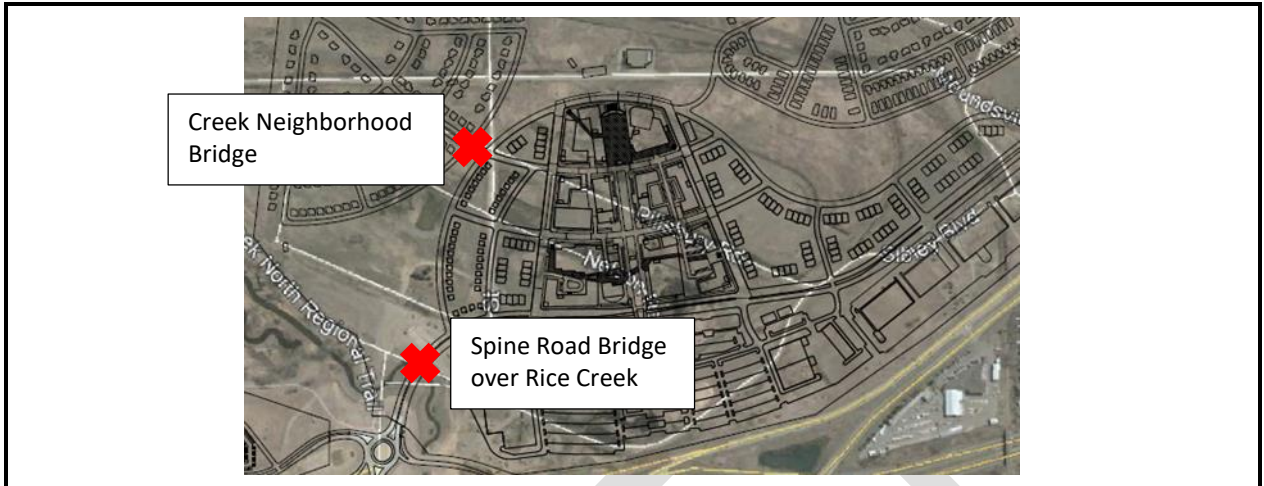
A.3.e. Proposed Pavements

For the this report, it was requested that we provide the project team with an estimated R-value for roadway subgrades and that we are NOT to provide specific pavement section recommendations at this time. As reported to us at a July 13, 2018, team meeting, however, we understand the Spine Road will include a concrete section, and the remainder of the roads will include bituminous sections.

A.3.f. Proposed Bridges

We understand that two road bridges will be constructed for this project. The approximate locations and names of the two bridges are shown in Figure 6.

Figure 6. Proposed Bridge Locations

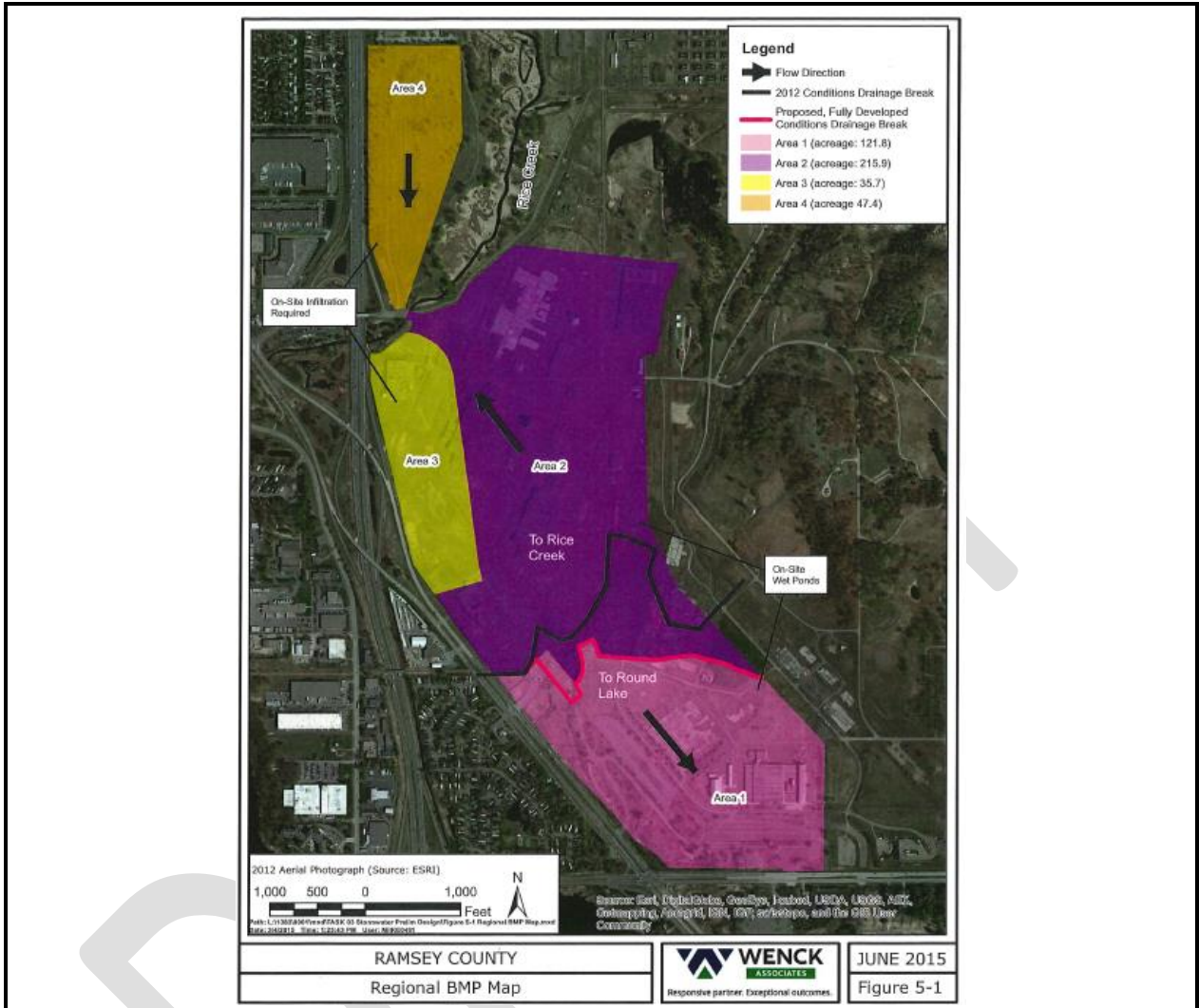


A.3.g. Stormwater Infiltration

Mr. Clark Wicklund of Alliant Engineering provided us with a copy of a Regional Best Management Practices (BMP) Map prepared by Wenck Associates that shows the TCAAP redevelopment property divided into Areas 1, 2, 3, and 4, with each area having differing requirements for stormwater management. That map is shown in Figure 7.

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Figure 7. Regional BMP Map (Wenck 2015)



As shown in Figure 7, on-site stormwater infiltration within Areas 3 and 4 will be required.

A.4. Overview of Site History and Existing Conditions

A.4.a. TCAAP Historical Boundaries and Pre-development Usage

From a historical perspective, TCAAP covered a total of approximately 2,370 acres. The full extent of TCAAP is bounded by Lexington Avenue on the east, Interstate 35W and US Highway 10 on the west, Highway 96 on the south, and County Road I on the north. As mentioned previously, the site that is the subject of this report encompasses about 427 acres of that total. Prior to construction of TCAAP (in 1941), this site was used mainly for agricultural purposes.

A.4.b. United States Army Activities

Construction of TCAAP started in August of 1941 by Federal Cartridge Corporation. The TCAAP facility was used for the production, storage, and testing of small arms ammunition at various intervals from the 1940s to the mid-1990s. Many of the production and support buildings were located on the 427-acre site, while certain areas in the eastern and northern portions of the larger TCAAP facility were used for weapons testing and waste disposal. In response to the discovery of off-site groundwater contamination originating from TCAAP, the facility was placed on the National Priority List in 1983 as the New Brighton/Arden Hills Superfund Site.

In 2002, the federal government declared a portion of the TCAAP facility, including but not limited to the 427-acre site, to be excess land no longer needed by the Department of Defense. Additional soil investigation and cleanup by the new owner was necessary prior to lifting land use controls at the Site to allow for redevelopment.

A.4.c. Ramsey County Activities

Ramsey County acquired 397 acres of the 427-acre Site on April 15, 2013, and leased the remaining 30 acres of the 427-acre Site until certain environmental investigation and cleanup criteria were met. Ramsey County acquired the remaining 30 acres shortly after the Certificate of Completion was issued.

Environmental oversight during removal of buildings, pavements, buried utilities, and other subsurface features was provided by Wenck Associates on behalf of Carl Bolander & Sons Co., with additional support from Bay West, LLC, on behalf of Ramsey County.

Ramsey County's response actions have achieved conditions suitable for residential or recreational use across the Site, and the existing land use controls were lifted accordingly, once Ramsey County achieved ownership of the full 427 acres.

A complete environmental cleanup history is located at the development online website at RiceCreekCommons.com/documents.

A.4.d. Braun Intertec Activities

In 2007, American Engineering Testing, Inc., and Braun Intertec Corporation completed a joint investigation for Ryan Companies and prepared a report entitled Interim Report, Preliminary Geotechnical Evaluation. As part of that investigation, 218 soil borings were performed. All of that work was done prior to the recent building and utility demolition and removal and environmental site remediation.

A.4.e. Existing Surface Conditions

As described previously, to date, the buildings have been demolished, associated known underground utilities have been removed, railroad tracks have been removed, and pavement has been removed. It is our understanding that surface grades throughout the bulk of the site have not been significantly altered since the closing of TCAAP, but portions have been graded to improve drainage and support the recently-constructed roadway interchange from US Highway 10 and associated stub road located within the northwestern portion of the site. The proposed Spine Road will connect to that roadway stub.

In general, the bulk of the 427 acres is covered in heavy surface vegetation. Several gravel roads providing access to the various portions of the site remain in-place and gravel-covered former staging areas also remain within the site (northwest and southwest areas). Stockpiles of unknown materials (presumably consisting of “clean” topsoil, soil, or recycled construction materials) are sporadically scattered across the site.

A.5. Geotechnical Background Information and Reference Documents

A.5.a. Previous Geotechnical Evaluation Reports

Geotechnical data to be reviewed was gathered as part of two major geotechnical investigations on the TCAAP site over the past decade.

- As mentioned previously, American Engineering Testing, Inc. and Braun Intertec Corporation completed a joint investigation for Ryan Companies in 2007 and prepared a report entitled Interim Report, Preliminary Geotechnical Evaluation. As part of that investigation, 218 soil borings were performed. All of that work was done prior to the recent building and utility demolition and removal and environmental site remediation.

- Wenck Associates completed a Geotechnical Investigation Report: TCAAP Redevelopment Area, August 2016. As part of that evaluation, 124 soil borings were performed for the infrastructure improvements, which were done after the recent demolition and environmental site remediation.

A.5.b. Desktop Review and Interviews

In 2017, prior to performing additional subsurface exploration for this geotechnical evaluation report, we performed a desktop review of available previous geotechnical evaluation performed for this site and conducted interviews with project team members and the earthwork contractor that performed recent demolition and earthwork services, Carl Bolander and Sons, Inc. The purpose of conducting the interview with Bolander was to determine the extent of work provided during the recent demolition and environmental site remediation. That desktop review was addressed in a report dated August 3, 2017.

A.5.c. Additional Reference Documents

The following information was furnished to us for our review.

- Various CAD/DWG files showing previous boring locations (AET/Braun and Wenck borings) and proposed development (prepared by Kimley-Horn).
- CAD/DWG file showing proposed utilities for the Spine Road (prepared by Kimley-Horn).
- Cut/Fill sketch (prepared by Kimley-Horn).
- Conceptual Tranche Sequencing diagram (provided by Kimley-Horn).
- Building finished floor elevations (FFE) sketch for buildings located within the city center “high rise” portion of the site (provided by Alliant Engineering).
- Tabulation and location sketch of known monitoring wells within TCAAP property (prepared by Wenck, and provided by Bay West, LLC).
- Potential building foundation loading for Town Center buildings, conversation with Mr. Daniel Murphy of Meyer, Borgman & Johnson, Inc. (MBJ), July 3, 2018.

- Town Center building configuration and structural loads matrix, prepared by MBJ, dated July 16, 2018.
- Meeting Minutes from meeting with Kimley-Horn, August 8, 2018.
- Building demolition, environmental soil corrections as-built information (limits of excavations) provided by Carl Bolander and Sons Co. (Bolander). This information is also available on the project online directory at RiceCreekCommons.com/documents.
- Ramsey County's online directory, RiceCreekCommons.com, Due Diligence Documents. This website is a repository for all known environmental and geotechnical documents associated with the 427-acre property.
- Pre-TCAAP development aerial photographs dated 1937 and 1940 furnished by Bay West; geo-referenced versions of these aerials were also obtained from Historical Information Gatherers (HIG).

In addition to the provided sources, we have used several publicly available sources of information, namely historical aerials obtained through Historical Gatherers Information, the Geological Atlas of Ramsey County (University of Minnesota, 1992), and Well Log Records available through the Minnesota Department of Health's County Well Index portal.

A.5.d. Document Review Statement

We have described our understanding of the historical land usage and proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experiences with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.6. Purpose

After reviewing the available historical geotechnical data, and based on input provided by the project design team, we prepared a proposal which included performing additional geotechnical borings, cone penetrometer test (CPT) soundings, and laboratory testing to help us better address the geotechnical issues associated with this site. As that additional work had been completed, this report includes geotechnical recommendations for mass grading and soil corrections to support the Mass Grading Bid Documents for the entire 427-acre property.

A.7. Scope of Services

We performed our scope of services for the project in accordance with our two Proposals addressed to Mr. Thomas Lincoln of Kimley-Horn and Associates, Inc. (Kimley-Horn), the first one dated August 4, 2017, and the second one dated March 20, 2018. Our scope of services presented in those two proposal was authorized in contracts between Kimley-Horn and us that were dated August 24, 2017, and March 21, 2018, respectively. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and clearing the exploration locations of underground utilities. We selected and staked the new exploration locations. We acquired the surface elevations and locations with GPS technology using the State of Minnesota's permanent GPS base station network. The Soil Boring and Cone Penetrometer Test Sounding Location Sketch included in the Appendix shows the approximate locations of the borings and soundings. Private utilities that were not the responsibility of the public agencies, namely, the underground pipes associated with the water treatment facility, were cleared by a representative from GHD.
- Preparing and submitting our work plan to the Minnesota Department of Health in accordance with the requirements of the Special Well and Boring Construction Area (SWBCA) Notification program.
- Preparing and submitting our work plan to the Minnesota Environmental Protection Agency for approval (MPCA Project Number VP22892).

- Performing 33 additional standard penetration test (SPT) borings to nominal depths ranging from about 25 to 100 feet, for a total of about 1,425 lineal feet of drilling. As discussed in our contract, it was intended to complete the borings in phases and also have the ability to modify the number and depths of borings based on the subsurface conditions encountered and also along with changes in the development plan. For this report, we have thus far completed 21 additional standard penetration test borings to nominal depths ranging from about 25 to 60 feet, for a total of about 755 lineal feet of drilling. Penetration resistance tests were performed as the borings were advanced. The depths at which the tests were performed, and the results of the tests, are shown on the attached Log of Boring sheets. Penetration resistances, measured in blows-per-foot (BPF), provide an empirical means of estimating relative material density, consistency, strength, and compaction. Drilling equipment was steam cleaned before arriving at the site and again on-site prior to demobilizing from the site. The boreholes were sealed in accordance with MDH guidelines.
- Performing 10 cone penetration tests (CPT) soundings to nominal depths ranging from about 40 to 60 feet, for a total of about 460 lineal feet of sounding. As discussed in our contract, it was intended to complete the soundings in phases and also have the ability modify the number and depths of soundings based on the subsurface conditions encountered and also along with changes in the development plan. For this report, we have thus far completed 6 CPT soundings to nominal depths ranging from about 70 to 100 feet, for a total of about 510 lineal feet of sounding. CPT equipment was steam cleaned before arriving at the site and again on-site prior to demobilizing from the site. The sounding holes were sealed in accordance with MDH guidelines.
- Installing eleven piezometers, eight within the Town Center portion of the site, and three at strategic locations across the site (two within the northeast residential area and one within the southeastern residential area). Of the eleven, six were budgeted to be installed to depths less than 15 feet (shallow piezometer) and five were budgeted to be installed to depths greater than 15 feet (MDH monitoring well). As discussed in our contract, it was intended to complete the piezometer/well installations in phases and also have the ability to modify the number and depths of piezometers/wells based on the subsurface conditions encountered and also along with changes in the development plan. For this report, we have thus far installed eight piezometers at five locations within or near the city center portion of the site; at three of the locations, both a shallow piezometer and deep monitoring well were installed.

- Performing laboratory testing on select samples to aid in soil classification and engineering analysis budgeted to include 21 Atterberg limits tests, 23 mechanical analyses (through the No. 200 sieve only), 51 moisture content tests, 6 organic content tests, 7 time-rate consolidation tests, and 5 standard Proctor tests. As discussed in our contract, it was intended to complete the laboratory testing in phases and also have the ability to modify the type and number of tests based on the subsurface conditions encountered and also along with changes in the development plan. For this report, we have thus far completed 19 Atterberg limits tests, 27 mechanical analyses (through the No. 200 sieve only), 45 moisture content tests, 3 dry density tests, and 5 time-rate consolidation tests.
- Preparing this preliminary report containing an exploration location sketch, logs of soil borings (previously and recent), logs of the CPT soundings, a summary of the soils encountered, results of laboratory tests, and recommendations for structure and pavement subgrade preparation, utility installation (water main, sanitary sewer and stormwater sewer), and stormwater improvements, and the preliminary design of foundations, floor slabs, exterior slabs, and pavements (estimated R-value, for design by others).

Our scope of services did not include environmental-related services. While we did not observe any obvious signs of environmental concerns, the Braun Intertec staff performing services for this geotechnical project are not trained environmental professionals. Please contact us if you would like us to assist in evaluating what environmental services may be required for your project.

B. Results

B.1. Geologic Overview

Based on our experiences on this site and our review of the geotechnical publications and other geotechnical data available to us, the surface soils on this site generally consist of glacial and lacustrine sands, surface fill, and some areas of organic soils and wetlands. The upper soil layers, typically referred to in previous studies as “Unit 1,” consist of topsoil and surface vegetation, swamp/organic deposits, existing fill and native alluvium, and the overall thickness of the Unit 1 soil ranges from about 10 to 20 feet. Below the upper soil layers in most areas of the site, there is a cohesive and relatively impervious clay till (Unit 2) that varies in thicknesses from about 20 to 70 feet. Older glacial outwash and valley sediment materials (Unit 3) underlie the till, and extend to depths on the order of 100 to 400 feet, or to the top of bedrock. The depth to bedrock varies considerably across the site. The bedrock in this area generally consists of weathered and fractured dolomite of the Prairie du Chien Group overlying Jordan Sandstone.

Perched groundwater is present above the Unit 2 “aquitard,” with deeper hydrostatic groundwater present in the Unit 3 glacial outwash above the bedrock. The bedrock also acts as a separate aquifer.

Review of historic pre-TCAAP development aerial photographs (from 1937 and 1940) indicates that depressions and wetlands existed throughout the site before TCAAP was first constructed. Many of those depressions and wetlands had been filled during the original development of the TCAAP site.

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Previous Geotechnical Information

B.2.a. 2007 and 2016 Geotechnical Evaluations

As mentioned previously, Braun Intertec/AET performed soil borings on this site in 2007, the logs of which are included in Appendix A. Since then, with the demolition and associated re-grading, near-surface conditions have changed and the near-surface conditions reported on the 2007 boring logs may not ultimately reflect current near-surface conditions. Also, because of the recent grading on this site, the surface elevations shown on the Braun/AET boring logs may be different than the current surface elevations at those locations.

It is our understanding that the Wenck borings performed in 2015 were performed after the demolition and associated re-grading had been completed. As such, the near-surface conditions shown on the Wenck boring logs, also included in Appendix B, are likely more representative of current near surface conditions.

B.2.b. Bolander Commentary

As mentioned previously in Section A.3.c, Bolander served as the general contractor during the environmental site cleanup that was performed from 2013 to 2015. In 2017, we interviewed the senior project manager, Mr. Todd Planting, from Bolander for that project. The purpose of the interview was to obtain general information about the cleanup work that had occurred since Ramsey County purchased the property in 2013. In summary, a complete description of Bolander's work is available through the RiceCreekCommons.com website, the Due Diligence Documents portal. As mentioned previously, for the most part, the excavation work that Bolander performed terminated at relatively shallow depths below existing surface grades (for slab removal, foundation removal, near-surface environmental cleanup, utility removal, etc.). However, some excavations associated with the environmental cleanup were extended to depths as great as about 20 feet below existing surface grades in certain areas of the site, namely the Site 1 and Site K areas of the site.

During the recent demolition and environmental remediation work performed by Bolander, it was reported to us that no earthwork and observations or testing services were performed by an independent geotechnical engineering firm. However, Bolander commented that material was generally backfilled in a compacted manner in accordance with industry standards. Furthermore, Kimley-Horn referred us to a select, limited number of soil borings from the 2015 Wenck borings that were specifically performed in trench/excavation backfill. From our review of those borings, the blow counts (N values) recorded in the near-surface fill suggest that the backfill was generally placed in a compacted manner.

We refer you to Section B.3.d for further discussion on existing fill.

B.3. Boring Results

As revealed by the soil borings, the site is underlain with a variety of geologic materials including, in descending order, topsoil, surface vegetation and aggregate base, existing fill, surface and buried swamp/organic deposits, native mineral alluvium, and native mineral glacial soils (glacial till and glacial outwash). For simplicity in this report, we define existing fill to mean existing and undocumented fill (with the general exception to the overall limited portions to the backfilled placed in a controlled manner by Bolander).

Due to the vast amount of soil boring data that has been obtained since 2007, the findings are generally summarized in the following sections. Note that the narrative often refers to soil data tabulations that are included in Appendix E, which are as follows:

- Table E1. Topsoil
- Table E2. Organic Swamp Deposits
- Table E3. Buried Topsoil
- Table E4. Existing Fill
- Table E5. Unsuitable Soil
- Table E6. Groundwater

B.3.a. Topsoil and Surface Vegetation (Table E1)

As mentioned previously in Section A, the site is generally covered in mature surface vegetation, with the exception to (a) localized staging and former building pad areas scattered throughout the site, especially within the northwestern and southwestern portions of the site, which are predominantly covered in gravel, and (b) gravel roadways.

As presented in Table E1 in the Appendix, about half of the geotechnical soil borings performed on this site initially encountered topsoil. In general, topsoil consists of silt- and clay-rich soil that is typically dark brown to black in coloration, contains variable concentrations of roots, and is organic in nature, typically possessing an organic content of about 5 percent or greater. Topsoil thicknesses ranged from about 1/4 to 4 feet, with an average of about 1 foot.

B.3.b. Organic Swamp Deposits (Table E2 and Figure E1)

Of the 291 geotechnical soil borings performed on this site, 33 of them encountered organic swamp deposits that typically consisted of peat and organic silt/clay. Of those 33 borings, only 1 boring encountered the organic deposits initially at the surface, whereas its thickness of 7 feet differentiated it from topsoil discussed in Section B.3.c; elsewhere, the organic deposits were concealed by existing fill. The thicknesses of the buried organic swamp deposits ranged from 2 to 12 feet, with an average thickness of about 5 feet.

B.3.c. Buried Topsoil (Table E3)

Of the 291 geotechnical soil borings performed on this site, 36 of them encountered a layer of buried topsoil that was concealed by existing fill. The thicknesses of the buried topsoil ranged from about 1/2 to 3 feet, with an average thickness of about 2 feet.

NOTE: Given the 2 1/2- to 5-foot sampling interval of standard penetration test borings, it is possible that the soil borings that initially encountered existing fill at the surface may not have encountered relatively thin layers of buried topsoil directly below the existing fill.

B.3.d. Existing Fill (Table E4)

Most of the soil borings encountered existing fill to depths ranging from about 1 to 25 feet, with an average depth of about 7 feet. The existing fill consisted of a variety of soils ranging from relatively clean poorly graded sand (SP) and poorly graded sand with silt (SP-SM) to predominantly fine-grained soils such as silty sand (SM), clayey sand (SC), and lean clay (CL).

About two-thirds of the penetration resistance values recorded in the existing fill were less than about 15 BPF, which is the threshold value that typically indicates that a soil is moderately well to well compacted. As mentioned previously, a number of the 2015 Wenck soil borings were performed in areas that were recently backfilled by Bolander as part of the environmental cleanup phase. Those borings do suggest that the backfill in those boring areas associated with the cleanup phase was typically placed in a compacted manner. However, the existing fill encountered by the 2007 soil borings was overall poorly compacted. In many cases across the site, the “2015 existing fill” was surrounded by “2007 existing fill,” thus the entirety of the existing fill remains unsuitable for support of proposed structures.

Recommendations pertaining to the existing fill are discussed in further detail in Section C.

B.3.e. Unsuitable Soils (Table E5)

For planning purposes, we have summarized anticipated excavation depths to remove unsuitable soils at the soil boring locations. For the purposes of this report, unsuitable soil is defined as topsoil, organic swamp deposits, buried topsoil, and existing fill.

B.3.f. Native Alluvial and Glacial Deposits

All of the 2007 AET/Braun Intertec geotechnical soil borings were advanced through the near-surface strata of organic deposits and existing fill and were terminated in native mineral soils consisting of alluvium, generally referred to as Unit 1, and glacial deposits (glacial outwash and glacial till), generally referred to as Unit 2.

The bulk of the alluvial deposits were encountered within the northern half of the site. The alluvium typically consisted of poorly graded sand and poorly graded sand with silt and, to a lesser extent, silty sand and silt (ML). The alluvium was typically encountered to depths of less than about 10 feet below existing surface grades, but locally to depths as great as about 20 feet. The alluvium in this area was typically wet. Penetration test borings recorded in the alluvium typically ranged from about 5 to 10 BPF, indicating that the alluvium was typically loose, but was locally very loose and medium. The alluvium was typically moist above the perched groundwater and wet below.

Below the Unit 1 materials (existing fill, organic deposits, alluvium), the bulk of the borings encountered layered strata of glacial soils comprised of deposits of glacial till consisting mostly of clayey sand, silty sand, and sandy lean clay and glacial outwash consisting of poorly graded sand. In general, the glacial till encountered within the southern half of the site consisted of Superior Lobe till, which is typically reddish-brown to brown and consists mostly of silty sand and clayey sand, and the glacial till encountered within the northern half of the site consisted of Des Moines Lobe till, which is typically grayish-brown to gray and consists mostly of sandy lean clay (CL) and clayey sand. Within the southern portion of the site, the Superior Lobe till was typically capped by a relatively thin strata of Des Moines Lobe till. The layered strata of glacial outwash, consisting of poorly graded sand, was encountered within the southern portion of the site, and was typically capped by about 15 to 20 feet of glacial till.

With regard to the penetration test values recorded in the glacial soils:

- **Des Moines Lobe Till:** Penetration test values within the upper 10 to 25 feet of the strata were typically less than about 5 to 7 BPF, indicating that the till was typically soft to medium. Below that upper strata, the till was typically medium to stiff.
- **Superior Lobe Till:** Penetration test values recorded within the superior lobe till were typically greater than about 15 BPF indicating the till was overall stiff to very stiff (clays and clayey sands) and medium dense (silty sand).
- **Glacial Outwash:** Penetration test values recorded in the glacial outwash sands typically exceeded 10 BPF, indicating the glacial outwash was overall medium dense to dense.

B.4. Cone Penetrometer Test Soundings

Together with our soil borings, we performed Cone Penetrometer Test (CPT) soundings. The Appendix includes CPT Sounding Logs that present the tip resistance, sleeve resistance, pore pressure, and correlations based on the aforementioned data that indicates a soil boring penetration resistance (N_{60}), and soil behavior type (SBT). The SBT does not correlate to soil classification based on grain size distribution or plasticity, and the SBT is not a reliable indicator of existing fill material. We performed CPT soundings to provide a relatively continuous profile of in-situ conditions that we use to estimate soil behavior properties for our engineering analyses. Refer to the attached Descriptive Terminology Cone Penetration Test in the Appendix for more information.

The results of the soundings indicate a soil profile consistent with findings in adjacent soil borings. More specifically, the results are consistent with the results of our standard penetration tests performed as the soil borings were advanced.

We inferred strata boundaries and the SBT from changes in tip resistance, sleeve friction, and pore pressure, and while cone measurements are relatively continuous with depth, the boundaries are still only approximate, likely vary away from the sounding locations and may occur as gradual rather than abrupt transitions.

A dissipation test was performed at Sounding CPT-3 (ST-1009) at depth of 15 feet. The purpose of a dissipation test is to assist us in estimating the time-rate of consolidation factor, C_v . The result of the dissipation test was 1.2 ft²/day. The average C_v value computed from the laboratory consolidation test under similar loading conditions was about 1.25 ft²/day, which correlates very well with the dissipation test data.

B.5. Groundwater

The soil boring logs included in Appendix B include groundwater information that was observed as the borings were advanced. Table E5 in Appendix E presents the groundwater information on a boring-by-boring basis. As is typical with perched groundwater conditions, project planning should expect groundwater levels across this site will be highly variable and will fluctuate with time.

Within the northern portion of the site, namely the Town Center, northeastern residential, and western commercial areas of the site, it appeared that groundwater at the time our recent borings were performed, and the readings obtained on June 1, 2018, had risen on the order of about 3 to 4 feet since the AET/Braun borings were performed in 2007. The most recent readings obtained on August 17, 2018, however, indicate that the perched groundwater table has lowered about 1 to 2 feet within the central and western portion of the Town Center since our June reading. It is likely that the initial rises in groundwater levels observed from 2007 to spring of 2018 were primarily the result of site changes that had occurred since the 2007 borings were performed, such as removal of nearly all impervious materials and stormwater management features. However, with the removal of these materials, the change in the groundwater level from one season to the next may be more volatile due to an increased sensitivity to seasonal precipitation, whereas the non-pervious materials and stormwater management feature tend to regulate groundwater level fluctuation, but not necessarily eliminate fluctuations.

Table 6 includes the groundwater measurements that were observed by our firm during the drilling of our soil borings in May of 2018 and in the piezometers (P) and monitoring wells (MW) in June and, most recently, in August of 2018.

Table 6. 2018 Groundwater Summary

Location	Ground Surface or Top-of-Riser ^a Elevation	Approximate Depth to Groundwater (feet)	Estimated Corresponding Groundwater Elevation (feet)	2018 Reading Date
P/ST-1	898.0	2.0	896.0	5/3/2018
P/ST-2	898.4	13.0	885.4	5/4/2018
P/ST-2 (P)	898.4	3.0	895.4	6/1/2018
P/ST-2 (P)	904.1 ^a	8.3	895.8	8/17/2018
P/ST-3	901.5	<i>Not observed during drilling</i>		
P/ST-3 (P)	901.5	3.1	898.4	6/1/2018
P/ST-3 (P)	905.5 ^a	7.3	898.2	8/17/2018
P/ST-4	895.2	2.3	892.9	5/4/2018
P-ST-5	890.7	4.0	886.7	5/2/2018
P/ST-5 (MW)	890.7	1.9	888.8	6/1/2018
P/ST-5 (MW)	894.0	7.6	886.4	8/17/2018
P/ST-5 (P)	890.7	2.1	888.6	6/1/2018
P/ST-5 (P)	893.6	7.2	886.4	8/17/2018
P/ST-6	894.5	2.6	891.9	5/7/2018
P/ST-6 (MW)	894.5	3.3	891.2	6/1/2018
P/ST-6 (MW)	898.2 ^a	8.7	889.5	8/17/2018
P/ST-6 (P)	894.5	3.2	891.3	6/1/2018
P/ST-6 (P)	898.5	8.9	889.6	8/17/2018
P/ST-7	955.8	<i>Not observed during drilling</i>		
ST-1001	903.9	<i>Not observed during drilling</i>		
ST-1003	895.8	2.0	893.8	5/11/2018
ST-1004	900.9	<i>Not observed during drilling</i>		
ST-1005	893.1	2.5	890.6	5/8/2018
ST-1007	889.8	1.5	888.3	5/10/2018
ST-1008	890.7	4.0	886.7	5/2/2018
ST-1008 (MW)	890.7	2.1	888.6	6/1/2018
ST-1008 (MW)	894.1 ^a	7.1	887.0	8/17/2018
ST-1008 (P)	890.7	2.7	888.0	6/1/2018

Location	Ground Surface or Top-of-Riser ^a Elevation	Approximate Depth to Groundwater (feet)	Estimated Corresponding Groundwater Elevation (feet)	2018 Reading Date
ST-1008 (P)	893.7	6.7	887.0	8/17/2018
ST-1009	890.7	4.0	886.7	5/1/2018
ST-1010	888.1	3.0	885.1	5/9/2018
ST-1011	888.2	2.0	886.2	5/9/2018
ST-1017	911.7	5.0	906.7	5/4/2018
ST-1018	928.5	<i>Not observed during drilling</i>		
ST-1020	946.0	<i>Not observed during drilling</i>		
ST-1021	944.0	<i>Not observed during drilling</i>		
ST-1022	944.0	7.0	937.0	5/8/2018

a Top-of-riser pipe elevation.

B.6. Laboratory Test Results

Tables 7 and 8 present the results of our laboratory tests that were performed on samples obtained from our 2018 soil borings. Laboratory tests performed on samples obtained from the 2007 (AET/Braun) and 2015 (Wenck) soil borings are included on those boring logs.

Table 7. 2018 Laboratory Classification Test Results

Location	Sample Depth (ft)	Classification	Moisture Content (%)	Percent Passing the No. 200 Sieve	Liquid Limit	Plastic Index
P/ST-1	2 1/2	SM	14	---	---	---
	5	SC	19	---	---	---
	7 1/2	SC	16	46	24	11
P/ST-2	5	SC	13	---	---	---
	7 1/2	SC	15	---	---	---
	10	SC	15	45	23	10
P/ST-3	2 1/2	SC	5	---	---	---
	5	SC	15	---	---	---
P/ST-4	2 1/2	SC	21	46	30	16
	5	SC	16	45	26	12

Location	Sample Depth (ft)	Classification	Moisture Content (%)	Percent Passing the No. 200 Sieve	Liquid Limit	Plastic Index
	12	SC	15	43	26	12
P/ST-5	5	SP-SM	15	---	---	---
	7 1/2	SP-SM	19	6	---	---
P/ST-6	14 1/2	SC	16	45	24	11
P/ST-7	5	SM	9	---	---	---
	10	SM	8	---	---	---
ST-1001	5	SM	15	19	---	---
ST-1003	15	SC	15	---	---	---
	19 1/2	SC	15	48	30	17
	25	CL	17	51	28	15
	30	CL	16	---	---	---
	50	CL	15	51	29	17
	59 1/2	CL	16	53	33	19
ST-1004	2 1/2	SM	16	15	---	---
	7 1/2	SC	15	---	---	---
	10	SC	16	---	---	---
ST-1007	19 1/2	SC	15	46	23	11
ST-1008	2 1/2	SC	15	30	---	---
	5	ML	36	93	---	---
	10	SP-SM	20	5	---	---
	15	SP-SM	19	---	---	---
	19 1/2	SM	16	35	18	Non Plastic
ST-1009	2 1/2	SM	19	---	---	---
	5	SP-SM	21	---	---	---
	7 1/2	ML	29	---	---	---
	9 1/2	SM	19	13	19	Non Plastic
	11	SC	16	41	23	10
	13	SC	13	44	23	10
	15	SC	15	---	---	---
	20	SC	15	---	---	---
ST-1017	2 1/2	SM	14	32	---	---
	5	SP-SM	18	9	---	---
ST-1021	10	SM	7	27	---	---

Table 8. 2018 Laboratory Dry Density and Compression Test Results

Location	Sample Depth (ft)	Classification	Dry Density (γ , pcf)	Compression Index		Estimated Pre-Consolidation Pressure (P_c , tsf)
				C_c	C_r	
P/ST-4	12	SC	117.1	---	---	---
P/ST-6	14 1/2	SC	117.5	0.09	0.01	1.36
ST-1003	19 1/2	SC	117.2	0.11	0.01	2.27
ST-1003	59 1/2	CL	118.1	0.12	0.02	4.14
ST-1007	19 1/2	SC	119.4	0.10	0.01	1.44
ST-1008	19 1/2	SM	120.5	---	---	---
ST-1009	11	SC	120.5	---	---	---
ST-1009	13 1/2	SC	120.0	0.09	0.01	1.90

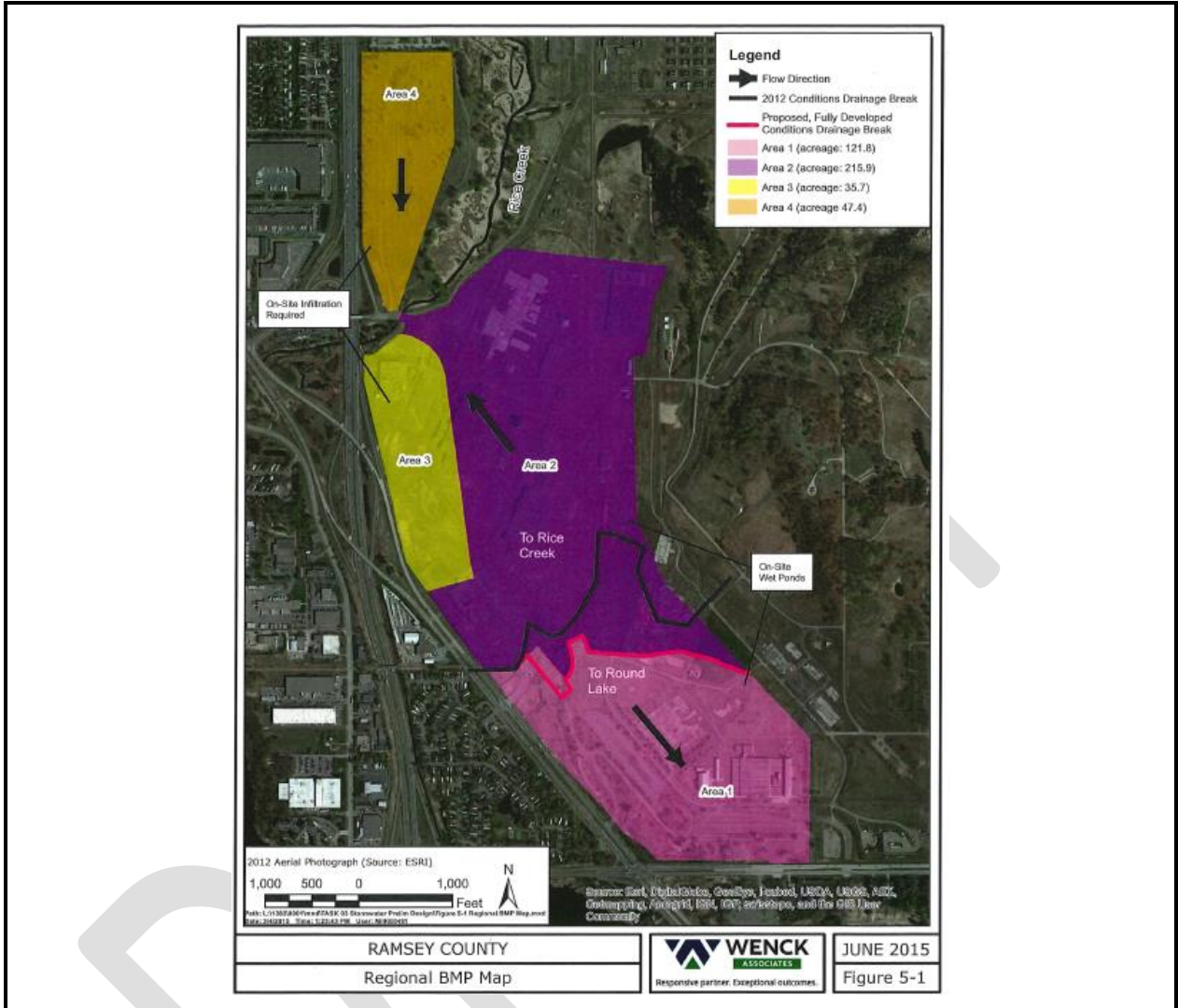
C. Recommendations

C.1. Special Geotechnical Considerations

C.1.a. Stormwater Infiltration

Mr. Clark Wicklund of Alliant Engineering provided us with a copy of a Regional BMP Map prepared by Wenck Associates that shows the TCAAP redevelopment property divided in to Areas 1, 2, 3, and 4, with each area having differing requirements for stormwater management. That map is shown in Illustration 1.

Illustration 1. Regional BMP Map (Wenck 2015)



As shown in Illustration 1, on-site stormwater infiltration within Areas 3 and 4 will be required.

We reviewed the available geotechnical data, namely soil classification descriptions provided on available soil boring logs (2007 Braun/AET, 2015 Wenck, and 2018 Braun) and infiltration test data performed by Wenck in 2015. A summary of that data is provided on the attached Figures H1 and H2 in Appendix H. Figure H1 is a summary of soil classification data for Area 4 and Figure H2 is a summary of soil classification data and infiltration test results for Area 3.

- In general, we presented our findings (on Figures H1 and H2 in Appendix H) in a color-coded Red/Amber/Green format, based on the following definitions:

- RED: subsurface infiltration not feasible due to (a) soil conditions, i.e., low permeability, (b) groundwater conditions/levels, (c) a likely necessity to perform extensive soil corrections and to “import” large quantities of free-draining sandy soil to facilitate infiltration, or (d) a combination thereof.
- AMBER: subsurface infiltration feasible with limited subsurface preparation required; however, infiltration rates will likely be rather slow, generally lower than 0.5 inch/hour.
- GREEN: subsurface infiltration feasible at those locations as the soil conditions typically consist of rather clean sands that possess infiltration rates exceeding 0.5 inch/hour. In those areas, we anticipate that virtually no engineering-specific subsurface preparation will be required, provided the system maintains the minimum separation from groundwater as typically required by the Watershed District.

Technically, Area 4 is NOT under the same grading contract as Areas 1, 2, and 3. However, we understand that there may be some contingencies placed in contract documents that allow for “sharing” of infiltration requirements. As shown in the attached Figure H1, prospects for subsurface infiltration are promising throughout most portions of Area 4, due largely to the fact that most of the near-surface sandy soils likely possess a relatively high permeability/infiltration rate and that groundwater in this area is typically deep enough to promote subsurface infiltration.

As shown on the attached Figure H2, most of the acreage in Area 3 is not conducive to subsurface infiltration due to (a) the variability of soil conditions, (b) the fine-grained nature of the bulk of the near-surface soils in this area, and (c) the relatively high groundwater table with respect to existing ground surface elevations. There are, however, limited areas where subsurface infiltration appears to be feasible, mostly in the southern portion of Area 3, where subsurface conditions are more similar to those that readily exist in Area 4, consisting largely of cleaner sands.

C.1.b. Groundwater Table in TCAAP Unit 1 Soil Strata

TCAAP Unit 1 Soil Strata consists of near-surface alluvial and lacustrine deposits of a primarily granular nature, existing fill, and localized deposits of organic soils and wetlands, with strata thicknesses generally ranging from about 10 to 20 feet. In most areas of the site, Unit 1 Soil Strata is underlain with Unit 2 Soil Strata consisting primarily of cohesive and relatively impervious clay-rich tills with strata thicknesses generally ranging from about from about 20 to 70 feet.

With this soil profile, groundwater was typically encountered within the sandy Unit 1 Soil Strata and appears to be trapped within Unit 1 Soil Strata due to the predominantly low permeability of the bulk of the underlying Unit 2 Soil Strata. As such, the groundwater table within Unit 1 is said to be “perched.” In some subsurface conditions, perched groundwater can be limited/localized to a relatively small footprint, and sometimes perched water can be geo-hydrologically significant, whereas it is more or less treated as a permanent “hydrostatic” condition. The Unit 1 condition within the TCAAP is typical of the latter description (significant/hydrostatic), although some areas within TCAAP are of the former (localized).

In 2007, Braun Intertec and AET completed over 200 geotechnical soil borings. From the soil and groundwater data collected, we prepared a groundwater surface contour plan, which was included in our October 3, 2007, Preliminary Geotechnical Evaluation Report. Since those borings were performed, all of the buildings and pavements have been demolished and nearly all of the stormwater management utilities had been removed. With the demolition and removal of hard (impervious) surfaces, such as buildings and pavements, and with the elimination of most of the on-site stormwater structures, we would typically expect to see a subsequent rise in the water table. This assertion was verified during our interview with Bolander, who was earthwork contractor during the demolition/utility removal phase. During the interview Bolander remarked that shortly after the removal of the buildings/pavements, the groundwater table (within Unit 1) had risen throughout much of the northern portion of the TCAAP property.

For this evaluation, we plotted the 2015 Wenck groundwater level data (and a limited number AECOM data from their 2011 report) onto the groundwater contour map that was provided in the 2007 AET/Braun report. The attached Figures H1, H2, H3, and H4 in Appendix I show the approximate locations of the 2015 Wenck/2011 AECOM groundwater data, their estimated groundwater elevations, and the “delta” when compared to the 2007 Braun/AET estimated elevations. Figure H5 shows the Wenck “delta” with respect to the proposed site layout.

The proposed timeline for construction within each Tranche is presented in Table 2.

Table 2. Proposed Development Schedule for Construction

Tranche	Development / Construction Schedule (Year)
Tranche 1: <ul style="list-style-type: none"> ▪ Western half of “high rise” city center ▪ Southern half of southern high-density residential ▪ Northern portion of western commercial (“big box retailer) 	2020
Tranche 2: <ul style="list-style-type: none"> ▪ Northeastern portion of city center ▪ Central commercial/retail ▪ Southern half of southern high-density residential 	2023
Tranche 3: <ul style="list-style-type: none"> ▪ Northern high-density residential ▪ Northern half of southern high-density residential 	2029
Tranche 4: <ul style="list-style-type: none"> ▪ Western office/commercial ▪ Southern commercial/industrial 	2032

A.3. Proposed Construction

A.3.a. Assumed Building Configuration and Structural Loads

The Town Center will consist mostly of multi-level buildings consisting of five to ten above-grade levels and mostly one to two levels of below-grade parking, although certain buildings within this area will not include underground parking. The portion of the Town Center that is east of the Spine Road has been divided in to six parcels, Parcels A, B, C, D, E, and F. The portion of the Town Center that is west of the Spine Road is commonly referred to as Towne Center West (two buildings).

The location of the Town Center parcels are shown in Figure 2, which was provided to us by Alliant Engineering. Figure 3 also shows how the parcels are currently labeled.

We used this information to develop work plan for this geotechnical evaluation, which, as described previously, included the installation of five “shallow” piezometers installed to measure Unit 1 groundwater table elevations and three “deep” piezometers (monitoring wells). The upper portions of the deeper piezometers were sealed through the Unit 1 zone of soils, so that we could evaluate if the recorded groundwater levels in the Unit 1 soils were perched on top of the Unit 2 clayey soils, or if the measured water levels also extended into the Unit 2 clayey soils. That information was particularly important in the Town Center portion of the development where it is currently desired that the proposed buildings will include one to two levels of below-grade parking, which may extend into the Unit 2 clayey soils.

When compared to the 2007 Braun/AET and the 2015 Wenck/AECOM groundwater levels, it appears that the current groundwater table has generally risen within much of the north and north central portions of the development, which is generally expected after the removal of the buildings/pavements and stormwater management features. However, as discussed previously in Section B.5, with the removal of the buildings/pavements and stormwater management features, groundwater level fluctuations levels from one season to the next may ultimately be more volatile due to an increased sensitivity to seasonal precipitation, whereas the non-pervious materials and stormwater management features likely tended to regulate groundwater level fluctuations, but did not necessarily eliminate fluctuations.

With that, site grading activities to remove unsuitable soils (described in further detail in Section C.2) will likely require implementation of a temporary dewatering plan.

As presented in Table 6, the groundwater levels measured in early June of 2018 (which is when the highest groundwater levels were observed within the Town Center portion of the development) ranged in elevations from about 898.4 within the eastern edge of the Town Center to about 891.2 within the western area of the Town Center. As presented in Table 3, the lowest proposed floor elevation will be 898 within the eastern third of the Town Center, the lowest proposed floor elevation will be 886.5 within the central portion of the Town Center, and the lowest proposed floor elevation will be 887 within the western portion of the Town Center. With that, it appears that the lowest floor elevations will generally be about 4 feet below the groundwater levels observed in June of 2018. As such, it is our opinion a permanent dewatering system generally consisting of groundwater cutoff and drainage features will have to be incorporated to the design documents and, as an added measure, building designs should, in our opinion, incorporate measures to resist groundwater seepage, such as waterproofing and floor drainage system consisting of a network of drain pipe, clean aggregate and sump pumps.

C.1.c. Trunk Utilities

We have evaluated the consolidation characteristics of the foundation soils located within the area of the Spine Road between Stations 124+50 and 132+00 and between Stations 140+50 and 163+50, which are the areas where surface grades will be raised to achieve proposed surface grade elevations; it is within these areas that the proposed surface grades will be raised as much as about 15 feet above existing surface grades to achieve design subgrade elevations. Station 163+50 is the approximate location where the sanitary sewer veers to the west towards the lift station.

The soil borings performed along the Spine Road alignment in these areas (2007 AET/Braun, 2015 Wenck, and recent Braun 2018 borings) encountered near-surface loose sands and relatively soft clays, which are judged to be rather compressible. As such, it is our opinion that the soils located within the Spine Road in these areas will experience varying amounts of consolidation under the proposed fill loads. Since the fill loads and pipe invert elevations vary along the Spine Road alignment, the estimated amounts of utility pipe settlements will also vary and will be primarily a function of the amount of fill placed and the location of the pipe. The estimated amounts of utility pipe settlements for the range of fill heights and pipe invert elevations are provided in Table 9.

Table 9. Range of Estimated Settlements for Spine Road Sanitary Sewer Pipe (STA 124+50 and North)

Fill Height (feet)	Pipe Depth Below Street Surface (feet)	Estimated Settlement of Pipe (inches)
5	10 to 20	1 1/2 to 2
10	15 to 20	3 to 3 1/2
15	20	4

These estimated settlements of the sanitary sewer assume that the pipe will be installed prior to filling the Spine road to proposed grades. If it is desired to reduce settlements to the pipe, the Spine road area can be filled to grade (either partially or fully, depending on settlement tolerances) prior to installing the sanitary sewer, delaying utility construction until much of the settlement has occurred. It should be noted that there appears to be no abrupt transitions in soil conditions along the alignment in these areas and that raises-in-grades in these areas are also gradual. As such, we expect that the rates of differential settlements will be rather minimal and possibly within the tolerances of the utilities pipes.

To better evaluate estimated settlements (both total and differential), as part of our final/supplemental phase of subsurface exploration, we recommend performing a series of CPT soundings at a relatively tight spacing of approximately 100 feet within in the fill-to-grade areas along the sanitary sewer alignment of the Spine Road.

C.1.d. Town Center Grading Approach

Various grading alternatives for the Town Center portion of the development (Town Center Parcels A, B, C, D, E, F, and Town Center West, as described previously in Section A.3) were discussed at the June 5, 2018, July 13, 2018, and August 8, 2018, team meetings. Overall, it was initially preferred by the design team to “double handle” as little soil as possible during the mass grading phase of the project. (It was reported that about 500,000 cubic yards of soil would be required to fill the Town Center parcels to street level from existing grade, and that large portions of that quantity would then have to be removed to construct the below-grade portions of the buildings located in the Town Center parcels.) However, as discussed previously in Section A.3.c, the project team has decided to grade the Town Center parcels to elevations that are near to the surrounding street elevations.

C.1.e. Building Foundation Types

With regard to building loads in the Town Center area (as previously discussed in Section A.2, Table 3), the multi-story steel/concrete buildings will likely be configured to exert loads typically ranging 1,000 to 2,000 kips and as great as up to about 3,000 kips. In order for us to evaluate the various settlement estimates with each of the fill loading and structural load scenarios, we have thusly incorporated loading due to raise in grade, building loads, and loads due to below-grade wall backfill placement.

We first considered the scenario of filling the entirety of the building pad area to street level (which would require the placement of approximately 10 to 20 feet of fill) and allowing that to remain in place for a minimum of 6 months. Using bearing pressures ranging from 4,000 to 8,000 psf, we computed that buildings configurations R10, H10, and O15 supported on conventional spread footings would experience settlements that exceed the stated tolerance of 1 inch total and 1/2 inch differential.

However, for the building R5 and CIV configurations, using a bearing pressure of 5,000 psf, we estimate that the building will experience settlements of less than the stated tolerances under the scenario where the building pad is raised to street level and a construction delay of at least 6 months is incorporated.

For the building configurations R10, H10, and O15, we then considered surcharging the building pad area at various surcharge heights ranging from 10 to 20 feet above street level, which would accelerate primary and secondary components of settlement within a duration of about 6 months. However, even with the surcharge load being considered, we computed that building configurations R10, H10, and O15 supported on conventional spread footing will experience settlements exceeding the stated tolerance.

With that, in our opinion, the building configurations R10, H10, and O15 located with the Town Center development will need to be supported on deep foundation system, such as driven pile, or an intermediate foundation system, such as rammed aggregate piers (RAP). Based on the design and schedule information provided to us, Table 10 presents the recommended foundation system(s) for each of the Town Center parcels.

NOTE: With regard to floor slab construction, in our opinion, the lowest floor slabs do not need to be supported with driven pile (i.e., a “structural slab” is not warranted), provided that the parcels are indeed filled to near street level for a duration of at least 6 months prior to construction.

Table 10. Recommended Foundation System within the Town Center Parcels

Parcel	Building Configuration	Foundation System
A	R10, H10, O10	Driven Pile
B		Driven Pile or Aggregate Piers
C		Driven Pile
D		Driven Pile or Aggregate Piers
E		Driven Pile
F		Driven Pile
Town Center West (2 buildings)		Driven Pile

With the implementation of driven pile or aggregate pier foundation systems, where appropriate, in our opinion building foundations will experience total and differential settlements of less than the stated tolerances.

Elsewhere on the site outside of the Town Center parcels, assuming the range of building designs described in section A.3, and assuming a delay in building construction of at least 6 months after completion of site grading, we recommend:

- Supporting slab-on-grade buildings with no underground parking on conventional spread footings sized to exert a net allowable bearing pressure of up to 3,000 psf.
- Supporting the southern multi-story corporate office building with underground parking on conventional spread footings sized to exert a net allowable bearing pressure of up to 6,000 psf.

In our opinion, those buildings will experience total and differential settlements of less than the stated tolerance.

C.1.f. Existing Fill

As previously discussed in Section B.3.c, most of the soil borings performed on this site encountered existing fill to depths ranging from about 1 to 25 feet, with an average depth of about 7 feet. The existing fill consisted of a variety of soils consisting of clean sands, silty and clayey sands, and lean clays.

About two-thirds of the penetration resistance values recorded in the existing fill were less than about 15 BPF, which is the threshold value that typically indicates that a soil is moderately well to well compacted. Furthermore, a significant number of the soil borings encountered approximately 2 to 13 feet of compressible organic deposits beneath the existing fill.

A number of the 2015 Wenck soil borings were performed in areas that were recently backfilled by Bolander as part of the environmental cleanup phase. The penetration resistance values recorded in those borings generally suggest that the backfill tested were typically placed in a compacted manner. However, because the existing fill encountered by the 2007 soil borings was overall poorly compacted, and in most cases across the site, the “2015 existing fill was surrounded by “2007 existing fill,” and because much of the fill conceals organic soils, it is our opinion the existing fill on this site should be judged to be geotechnically unsuitable for support of the proposed buildings, utilities, and pavements. As such, we recommend that the existing fill be removed and replaced with suitable compacted backfill.

C.2. Site Grading and Subgrade Preparation

C.2.a. Subgrade Excavations

We recommend removing unsuitable materials from below buildings, utilities, and pavements. We define unsuitable materials as surface vegetation, pavement materials, topsoil, root zones, existing fill, surficial and buried organic deposits, buried topsoil, frozen materials, existing structures (a limited number remain), and existing utilities. Table E4 in Appendix E (Unsuitable Soils) shows the anticipated excavation depths and bottom elevations for each of the geotechnical borings performed on this site and included in Appendix B.

NOTE: As mentioned previously, given the work that has been performed on this since 2007, it should be anticipated that near-surface conditions shown on the 2007 soil boring logs may not accurately reflect existing conditions at those locations, and the surface elevations shown on those borings may be different.

Excavation depths will vary between the borings locations. Portions of the excavations may also extend deeper than indicated by the borings.

C.2.b. Engineering Observation and Evaluation of Exposed Soils

We recommend a geotechnical representative observe the excavations to make the necessary field judgments regarding the suitability of the exposed soils.

To assist in the evaluation process, and also to help promote subgrade uniformity, in areas where excavations to remove unsuitable soils terminate within 5 feet of proposed subgrade elevations, we recommend implementing the following sequence:

1. Scarify the exposed materials to a depth of about 8 inches.
2. Moisture condition the exposed subgrade soils to near their optimum moisture contents.
3. Compact the subgrade soils to a minimum of 98 percent of the material's standard Proctor maximum dry density (determined in accordance with ASTM D 698).
4. A geotechnical representative should evaluate the suitability of the soils exposed after the removal of unsuitable soils and compactive efforts as fill is placed.

C.2.c. Excavation Oversizing

When removing unsuitable materials below building limits, we recommend the excavation extend outward and downward from the outside edges of the buildings and pavements at a slope of 1H:1V or flatter.

C.2.d. Excavated Slopes (General Excavation and Utility Excavation)

Based on the borings, we anticipate on-site soils in excavations will predominately consist of sandy lean clay, silty sand, and clayey sand. These soils are typically considered Type C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient no steeper than 1 1/2H:1V. Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches." This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.2.e. Excavation Dewatering

We recommend removing groundwater from the excavations. Project planning should include temporary sumps and pumps for excavations in low-permeability soils, such as silty sands, clayey sands, and sandy lean clays.

Dewatering of high-permeability soils (e.g., sands) from within the excavation with conventional pumps has the potential to loosen the soils, due to upward flow. A well contractor should develop a dewatering plan; the design team should review this plan.

NOTE: Dewatering plans shall be design and implemented in accordance with the approved Response Action Plan (RAP) or applicable environmental requirements.

C.2.f. Engineered Fill Materials and Compaction

Table 11 below contains our recommendations for engineered fill materials.

NOTE: Engineered fill materials should satisfy the approved Response Action Plan (RAP) or applicable environmental requirements.

Table 11. Engineered Fill Materials

Locations To Be Used	Engineered Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
Mass Grading: At depths greater than 12 feet below proposed subgrade elevations	Structural fill	SM, SP-SM, SP	100% passing 4-inch sieve < 20% passing #200 sieve	Free of debris and contains an organic content less than 3 percent
Mass Grading: Within 12 feet of proposed subgrade elevations	Structural fill	SM, SC, CL, SP-SM, SP	100% passing 4-inch sieve	
Drainage material (soil)	<ul style="list-style-type: none"> ▪ Free-draining ▪ Non-frost-susceptible fill 	SP	100% passing 1-inch sieve < 50% passing #40 sieve < 5% passing #200 sieve	
Retaining Walls	Retained engineered fill	SP, SW, SP-SM, SM	100% passing 2-inch sieve < 20% passing #200 sieve	
Replacement Topsoil Only	Topsoil, Buried Topsoil, Peat		—	—
Below landscaped surfaces, where subsidence is not a concern	Non-structural fill	SM, SC, CL, SP-SM, SP, ML, OL	100% passing 6-inch sieve	< 10% OC

We recommend that project documents not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material.

We recommend spreading engineered fill in loose lifts of approximately 8 to 12 inches thick. We recommend moisture conditioning and compacting engineered fill in accordance with the criteria presented below in Table 12. The project documents should specify both relative moisture content and compaction levels of engineered fill.

Table 12. Compaction Recommendations Summary

Reference	Relative Compaction, percent (ASTM D698 – Standard Proctor)	Moisture Content Variance from Optimum at Time of Compaction, percentage points	
		< 20% Passing #200 Sieve (typically SP, SP-SM, limited SM)	> 20% Passing #200 Sieve (typically CL, SC, SM)
Mass Grading: At depths greater than 12 feet below proposed subgrade elevations	100	±3	-1 to +3
Mass Grading: Within 12 feet of proposed subgrade elevations	98	±3	-1 to +3
Utility Trench	98	±3	±3
Below landscaped surfaces	90	±5	±4
Adjacent to retaining wall	97	±3	-1 to +3

We recommend performing moisture and density tests in engineered fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

C.3. Pavements

C.3.a. Estimated Subgrade R-value

Our scope of services for this project did not include laboratory tests on subgrade soils to determine an R-value for pavement design. Based on our experience with similar soils anticipated at the pavement subgrade elevation, we recommend pavement design assume an R-value of 20.

C.3.b. Pavement Sections

Appropriate pavement sections are critical to the performance of rigid and flexible pavements. We can provide recommendations for pavement sections during final pavement design.

C.3.c. Bituminous Pavement Materials

Appropriate mix designs are critical to the performance of flexible pavements. We can provide recommendations for pavement material selection during final pavement design.

C.4. Utilities

C.4.a. Subgrade Stabilization

Earthwork activities associated with utility installations located inside the building area should adhere to the recommendations in Section C.2.

For exterior utilities, assuming the soils are corrected as recommended previously, we anticipate the soils at typical invert elevations will be suitable for utility support. However, if construction encounters unfavorable conditions such as soft clay, organic soils, or perched water at invert grades, the unsuitable soils may require some additional subcutting and replacement with sand or crushed rock to prepare a proper subgrade for pipe support.

C.4.b. Corrosion Potential

Based on our experience, most of the soils encountered by the borings are considered to be moderately corrosive to metallic conduits, but only marginally corrosive to concrete. We recommend specifying non-corrosive materials or providing corrosion protection, unless project planning chooses to perform additional tests to demonstrate the soils are not corrosive.

C.5. Intermediate and Deep Foundation Systems

C.5.a. Intermediate Foundation Systems: Aggregate Piers or Stone Columns

As discussed previously, where appropriate, for the proposed buildings located within the Town Center portion of the development, there is the option to support foundations for those buildings on aggregate piers or stone columns, commonly known by trade names such as: Geopier®, Vibro Piers®, Vibro Stone Columns®, etc.

A foundation subgrade improved with aggregate piers or stone columns will reduce the potential for detrimental settlement, provide adequate bearing capacity, and eliminate the need for deep foundations where appropriate.

Different design firms and contractors use varying techniques to design and/or construct aggregate piers, but methods generally consist of excavating soil from a hole with an auger or vibrating a probe into the ground, and then building a column of clean, open-graded aggregate. The contractor constructs the pier by placing the aggregate in lifts from the bottom of the pier and compacting each lift before placing aggregate for the subsequent lift. The vibratory energy, and sometimes ramming action, causes the aggregate to interlock, forming a stiff pier that provides soil reinforcement and increases shear resistance. We can assist you with developing a list of pre-qualified contractors prior to bidding or with reviewing contractor experience as part of the bidding process. The aggregate pier designer will determine the allowable soil bearing capacity of footings bearing upon rammed aggregate piers. Aggregate piers are typically able to support net allowable bearing pressures of 6,000 to 8,000 pounds per square foot.

As discussed previously, it is our opinion that aggregate piers only need to be installed below footings provided the slab subgrades are preloaded by filling the building pad areas to near proposed finished street grades prior to building construction.

C.5.b. Driven Pile: Preliminary Estimated Lengths and Capacities

Based on the soils encountered in the borings near structures recommended to utilize a driven pile foundation system, for this preliminary evaluation, we evaluated design requirements for using 12-inch diameter, closed-end, driven pipe pile. Based on the soil profile and the anticipated loading, we do not recommend using a pile with a smaller diameter. If the resistances discussed herein are insufficient for design, the design team could consider using a larger diameter pile.

We used the computer program UniPile, version 5.0, to estimate the static, ultimate, geotechnical resistance of the pile sections. We utilized the Beta-method, an effective stress method, to estimate the static, geotechnical resistance for these piles. This method determines shaft resistance using Bjerrum-Burland beta coefficients (β), which are based on soil type and effective friction angle. We estimated the β values for each layer based on our experience and on Figure 9.20 from the Federal Highway Administration (FHWA) Publication No. NHI-05-042, Design and Construction of Driven Pile Foundations, April 2006. The Beta-method determines end-bearing resistance using toe bearing capacity factors (N_t), which are also based on soil type and effective friction angle. We estimated the N_t values from our experience and Table 9-6 of the April 2006 FHWA publication identified previously.

We determined allowable (working) geotechnical pile resistances by dividing the ultimate resistance value by a factor of safety reflecting the level of anticipated quality control. We recommend using a safety factor of 2.0 with the level of pile construction/quality control. If the project team implements an alternate level of quality control, we will need to reevaluate predicted pile lengths and the applicable safety factor.

Based on the anticipated grading-to-construction (buildings) sequence, which includes a minimum 6-month construction delay, we do not anticipate that drag loads will control the pile design. If no construction delay is proposed, we can re-evaluate the impact of the site grading on the driven pile sections.

The following tables summarize the anticipated pile lengths and tip elevations along with ultimate resistances, and working resistances.

Table 13. Anticipated Pile Lengths and Resistances, 12-inch OD Pipe Piles

Boring	Top-of-Pile Elevation	Estimated Pile Length	Estimated Tip Elevation	Working Resistance	
				tons	kips
CPT-3	895 ±	85	810 ±	50	100
CPT-3	895 ±	100	795 ±	75	150

These estimated pile lengths are preliminary in nature and we recommend performing building-specific analysis as final design is complete and additional deep borings are completed.

We anticipate total deformation of the pile heads will be less than 1 inch under the loads provided by discussed herein. Differential settlement of the pile heads will be less than 1/2 inch.

C.6. Retaining Walls

C.6.a. Subgrade Preparation

We recommend removing unsuitable soil from below the retaining wall and the reinforcement zone. Based on the Wenck soil borings RW-1, RW-2, and RW-3, we anticipate respective excavations depths of 7, 4, and 7 feet at those locations.

We recommend replacing the materials with engineered fill selected, placed, and compacted in accordance with the recommendations provided in Section C.2.f.

C.6.b. Drainage Control

We recommend installing drain tile to remove water behind the below-grade walls. The retaining wall drainage system should also incorporate free-draining engineered fill (as defined in Table 11) or clean drainage aggregate connected to the drain tile.

C.6.c. Lateral Earth Pressures

Below-grade wall design can use active earth pressure conditions, if the walls can rotate slightly. If the wall design cannot tolerate rotation, then design should use at-rest earth pressure conditions. Rotation up to 0.002 times the wall height is generally required for walls supporting sand (as defined in Table 11). We recommend using the estimated values presented below in Table 14 to compute lateral earth pressures. Our recommend values are un-factored and assume that the retained fill is selected and placed in conformance with Section C.2.f.

Table 14. Estimated Lateral Earth Pressure Coefficients

Material Classification for Retained Fill	Soil Unit Weight (pcf)	Internal Friction Angle (deg.)	Pressure Coefficients			Sliding Coefficient
			At-rest, K_0	Active, K_A	Passive, K_P	
SM	130	28	0.59	0.42	2.37	0.40
SP, SP-SM	120	30	0.56	0.39	2.56	0.40

Designs should also consider the slope of any engineered fill and dead or live loads placed behind the walls within a horizontal distance that is equal to the height of the walls. Our recommended values assume the wall design provides drainage so water cannot accumulate behind the walls. The construction documents should clearly identify what soils the contractor should use for engineered fill of walls.

C.7. Stormwater

We estimated infiltration rates for some of the soils we encountered in our soil borings, as listed in Table 15. These infiltration rates represent the long-term infiltration capacity of a practice and not the capacity of the soils in their natural state. Field testing, such as with a double-ring infiltrometer (ASTM D3385), may justify the use of higher infiltration rates. However, we recommend adjusting field test rates by the appropriate correction factor, as provided for in the Minnesota Stormwater Manual or as allowed by the local watershed. We recommend consulting the Minnesota Stormwater Manual for stormwater design.

Table 15. Estimated Design Infiltration Rates Based on Soil Classification

Soil Type	Infiltration Rate ^{a,b} (inches/hour)
Sands with less than 12% fines, fine- to medium-grained poorly graded sands (SP, such as the on-site fine- to medium-grained Alluvium and coarser-grained Glacial Outwash)	0.8
Fine-grained sands (SP, SP-SM, such as the on-site fine-grained sandy Alluvium)	0.45
Very fine sands, silty fine sands (SM, such as the on-site Alluvium and Till)	0.2
Clayey sands, clays, and silts (CL, SC, ML, such as the on-site Glacial Till and Alluvium)	0.06

a From Minnesota Stormwater Manual. Rates may differ at individual sites.

b Generally assumes non-saturated conditions and the an adequate separation from the water table.

Fine-grained soils (silts and clays), topsoil or organic matter that mixes into or washes onto the soil will lower the permeability. The contractor should maintain and protect infiltration areas during construction. Furthermore, organic matter and silt washed into the system after construction can fill the soil pores and reduce permeability over time. Proper maintenance is important for long-term performance of infiltration systems.

This geotechnical evaluation does not constitute a review of site suitability for stormwater infiltration or evaluate the potential impacts, if any, from infiltration of large amounts of stormwater.

C.8. Spine Road Bridge: LRFD Design

C.8.a. Pile Resistances

Based on our conversations with the project team, and the Spine Road Bridge design provided to us, we evaluated design requirements for the following types of driven piles: 12- and 16-inch steel pipe pile (referred to as “CIP” on the project documents). Structural details, including anticipated foundation loads, are not available at this time. Based on the soils encountered in the borings, we have assumed deep foundations to support the new bridge will experience a factored design load of 100 tons (200 kips) for each 12-inch closed-ended pipe (CEP) pile and 170 tons (340 kips) for each 16-inch CEP pile.

We used the computer program UniPile, version 5.0, to estimate the static, ultimate, geotechnical resistance of the pile sections. We utilized the Beta-method, an effective stress method, to estimate the static, geotechnical resistance for these piles. This method determines shaft resistance using Bjerrum-Burland beta coefficients (β), which are based on soil type and effective friction angle. We estimated the β values for each layer based on our experience and on Figure 9.20 from the Federal Highway Administration (FHWA) Publication No. NHI-05-042, Design and Construction of Driven Pile Foundations, April 2006. The Beta-method determines end-bearing resistance using toe bearing capacity factors (N_t), which are also based on soil type and effective friction angle. We estimated the N_t values from our experience and Table 9-6 of the April 2006 FHWA publication identified previously.

Factored geotechnical pile capacities are determined by multiplying the pile driving resistance factor ($\phi_{dynamic}$) by the nominal pile resistance (R_n). The American Association of State Highway and Transportation Officials (AASHTO) and MnDOT recommend relating $\phi_{dynamic}$ to the degree of construction control. For situations where subsurface exploration and static calculations have been completed, MnDOT recommends the following $\phi_{dynamic}$ factors.

Table 16. Recommended Pile Driving Resistance Factors

Specified Construction Control	$\phi_{dynamic}$
MnDOT Pile Formula 2012 (MPF12) for Pipe Pile Sections	0.50

Based on the anticipated very dense bearing layer based on the soil borings Wenck performed for the bridge structure, we evaluated the necessary pile lengths to achieve the required geotechnical resistance for the MnDOT LRFD dynamic pile capacity formula method of field control. For the MnDOT LRFD dynamic pile capacity formula method, we used a $\phi_{dynamic}$ of 0.50 to estimate the desired R_n capacities ($R_n = \phi Q_n / \phi_{dynamic}$). If a different construction control method is performed, the pile lengths or capacities may need to be revised. The estimated lengths are provided in Table 17 of this report.

Table 17. Spine Road Bridge Estimated Pile Lengths and Resistances (12- and 16-inch OD Pile)

Wenck Boring	Abutment Location	Pile Diameter (inch)	Top of Pile Elevation	Estimated Tip Elevation	Pile Length (feet)	Nominal Resistance (tons)	Factored Design Load; $\phi_{dynamic} = 0.5$ using MPF12 driving formula as field quality control (tons)
BR-601	East	12	877	802 ^a	75	200	100
BR-603	West	12	877	807	70	200	100
BR-601	East	16	877	802 ^a	75	340	170
BR-603	West	16	877	807	70	340	170

a Estimated pile length extends beyond boring termination depth. Bottom layer extrapolated to estimate the nominal resistance.

Based on the anticipated grading-to-construction (buildings) sequence, which includes a minimum 6-month construction delay, we do not anticipate that drag loads will control the pile design. If no construction delay is proposed, we can re-evaluate the impact of the site grading on the driven pile sections.

C.8.b. Pile Specification and Driving

We anticipate the pipe piles will conform to MnDOT Specification 2452 and 3371. The minimum required wall thickness is 1/4 inch for 12-inch pile and 5/16-inch for 16-inch pile.

If a pile's resistance to driving is not obtained at the anticipated length, we recommend driving be halted, and that the capacity be evaluated on restrike after a waiting period of at least 1 day. If the pile toe is driven past the estimated toe elevations shown in Table 16, it is possible the piles have been overdriven and, after soil setup occurs, the pile capacities will be adequate.

C.8.c. Lateral Earth Pressure Calculations for P-Y Curves and Lateral Earth Forces

Table 18 and 19 provide the recommended soil parameters for lateral pile analysis and p-y curve generation, from existing grade, using the current version of the computer program LPILE. Based on the soils encountered in the borings, we recommend using the default lateral modulus of subgrade reaction values included in LPILE. For preliminary planning purposes, we have included preliminary lateral analysis using LPILE, Version 2018 in the Appendix. For our analysis, we analyzed the magnitude of shear loading that would result in 1/4, 1/2, and 1 inch of pile-top deflection under a fixed-head condition.

Table 18. Soil Parameters for p-y Curve Generation - East Abutment (Boring BR-601)

Layer Top Depth Below Existing Grade (feet)	Layer Bottom Depth Below Existing Grade (feet)	Moist Unit Weight (pounds per cubic foot)	Internal Angle of Friction (degrees)	Undrained Shear Strength (pounds per square foot)	Material Type
0	6	110	---	500	Soft Clay
6	12	115	29	---	Sand
12	15	80	---	150	Soft Clay
15	35	120	30	---	Sand
35	75	125	---	2,000	Stiff Clay w/o Free Water
75	75+	120	37	---	Sand

Table 19. Soil Parameters for p-y Curve Generation - West Abutment (Boring BR-603)

Layer Top Depth Below Existing Grade (feet)	Layer Bottom Depth Below Existing Grade (feet)	Moist Unit Weight (pounds per cubic foot)	Internal Angle of Friction (degrees)	Undrained Shear Strength (pounds per square foot)	Material Type
0	8	115	30	---	Sand
8	17	110	27	---	Sand
17	25	115	30	---	Sand
25	55	125	---	2,000	Stiff Clay w/o Free Water
55	70	130	---	5,000	Stiff Clay w/o Free Water
70	70+	120	37	---	Sand

C.8.d. Pile Spacing and Group Effect

The pile design does not need to consider group effects for axial loading if the pile spacing is at least 3-pile diameters center-to-center. For lateral loading, consideration of group effects is not necessary for a center-to-center pile spacing of at least 5-pile diameters. If the project team selects a closer spacing, we recommend having us evaluate the magnitude of the group effect.

C.9. Pile Settlement

We anticipate total deformation of the pile heads will be less than 1 inch under the loads discussed herein. Differential settlement of the pile heads will be less than 1/2 inch.

C.9.a. Pile Cap Embedment

We recommend foundation design include minimum pile cap embedment 60 inches below final grade for pile caps supporting unheated structures.

C.9.b. Pile Driving System

Using an under or oversized pile-driving hammer can be detrimental to the successful installation of piling. Prior to system acceptance, we therefore recommend performing a wave equation analysis modeling prospective contractors' pile installation systems. The wave equation analysis is used to estimate probable driving stresses and pile penetration resistance based on the type of hammer proposed, the specified pile type/size and the site-specific material conditions which, when combined, help evaluate system suitability. Our firm can discuss the requirements and limitations of wave equation analyses and, if needed, perform them.

C.9.c. Pile Quality Control

We based the allowable resistances determined for this project on standardized calculations and material conditions (layer thicknesses, strengths, etc.) at a limited number of boring locations. To more accurately predict actual pile lengths and resistances, and develop criteria to drive all the project piles to, we recommend designating at least 1 pile per substructure (each abutment or pier) piles as test piles.

We recommend having the remaining foundation piles driven under the continuous observation of a geotechnical engineer or a MnDOT-certified bridge inspector. Information noted for each production pile should include, but may not be limited to, driving criterion, pile length, tip elevation, driving resistance, splices and any observed damage.

After driving the piles to adequate bearing and cutting them off at design elevations, we recommend inspecting them for damage and plumbness/batter. The geotechnical and structural engineers should review their load-carrying capabilities if the inspection identifies pile damage, or if the piles do not meet the required plumbness or batter tolerances. We recommend including contingencies in the project budget for additional piles and/or longer piles.

D. Procedures

D.1. Penetration Test Borings

We drilled our 2018 penetration test borings with an all-terrain carrier-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2- or 5-foot intervals in general accordance to ASTM D1586. We collected thin-walled tube samples in general accordance with ASTM D1587 at selected depths. The boring logs show the actual sample intervals and corresponding depths.

We sealed penetration test boreholes meeting the Minnesota Department of Health (MDH) Environmental Borehole criteria with an MDH-approved grout. We will forward/forwarded a sealing record (or sealing records) for those boreholes to the Minnesota Department of Health Well Management Section.

D.2. Cone Penetration Test Soundings

We performed CPT soundings by advancing a 1.75-inch diameter A.P. van den Berg piezocone with an unequal end area ratio of 0.8. We used a 15-ton track-mounted rig to advance the cone into the ground. We performed the soundings in general accordance with ASTM D5778. While advancing the cone, we digitally recorded tip resistance (Q_t), sleeve friction (F_s), and pore pressure (U_2).

D.3. Exploration Logs

D.3.a. Log of Boring Sheets (2007 and 2018 Braun Intertec Borings)

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance and other in-situ tests performed. The logs also present the results of laboratory tests performed on penetration test samples and groundwater measurements.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.3.b. Cone Penetration Test Sounding Logs

The Appendix also includes CPT Sounding Logs. The CPT sounding logs report the tip resistance (Q_t), sleeve friction (F_s) and pore pressure (U_2) measured by the cone during advancement, as well as, the soil behavior type (SBT) inferred from established relationships between tip resistance, sleeve friction and pore pressure. The SBT does not indicate a soil classification based on grain size distribution. Refer to the attached Descriptive Terminology Cone Penetration Test in the Appendix for more information. The CPT logs also report the friction ratio, which calculated by dividing the sleeve friction by the tip resistance.

We inferred strata boundaries, like SBT, from changes in tip resistance, sleeve friction and pore pressure. While cone measurements are relatively continuous with depth, the boundaries are still only approximate, likely vary away from the sounding locations and may also occur as gradual rather than abrupt transitions.

D.3.c. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.4. Material Classification and Testing

D.4.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. Appendix C includes a chart explaining the classification system we used.

D.4.b. Laboratory Testing

The exploration logs (2018 Braun Intertec logs only) in the Appendix note the results of the laboratory tests we performed on geologic material samples. We performed the tests in general accordance with ASTM procedures, namely:

- Moisture Content: ASTM D 2216
- Organic Content: ASTM D 2974
- Atterberg Limits: ASTM D 4318
- Mechanical Analyses (through the No. 200 sieve only): ASTM C 117

D.5. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

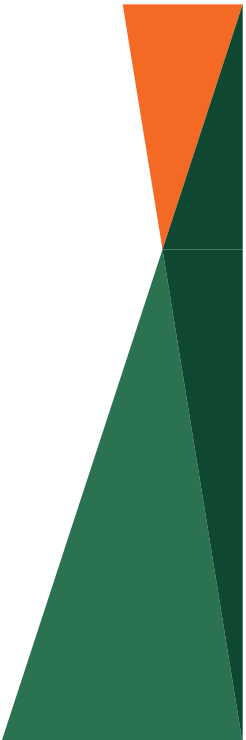
In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

DRAFT

Appendix A

Soil Boring and Cone Penetrometer Test Sounding Location Sketch

DRAFT



Drawing Information

Project No:	B1706398
Drawing No:	B1706398
Drawn By:	BJB
Date Drawn:	4/23/18
Checked By:	JCK
Last Modified:	5/7/18

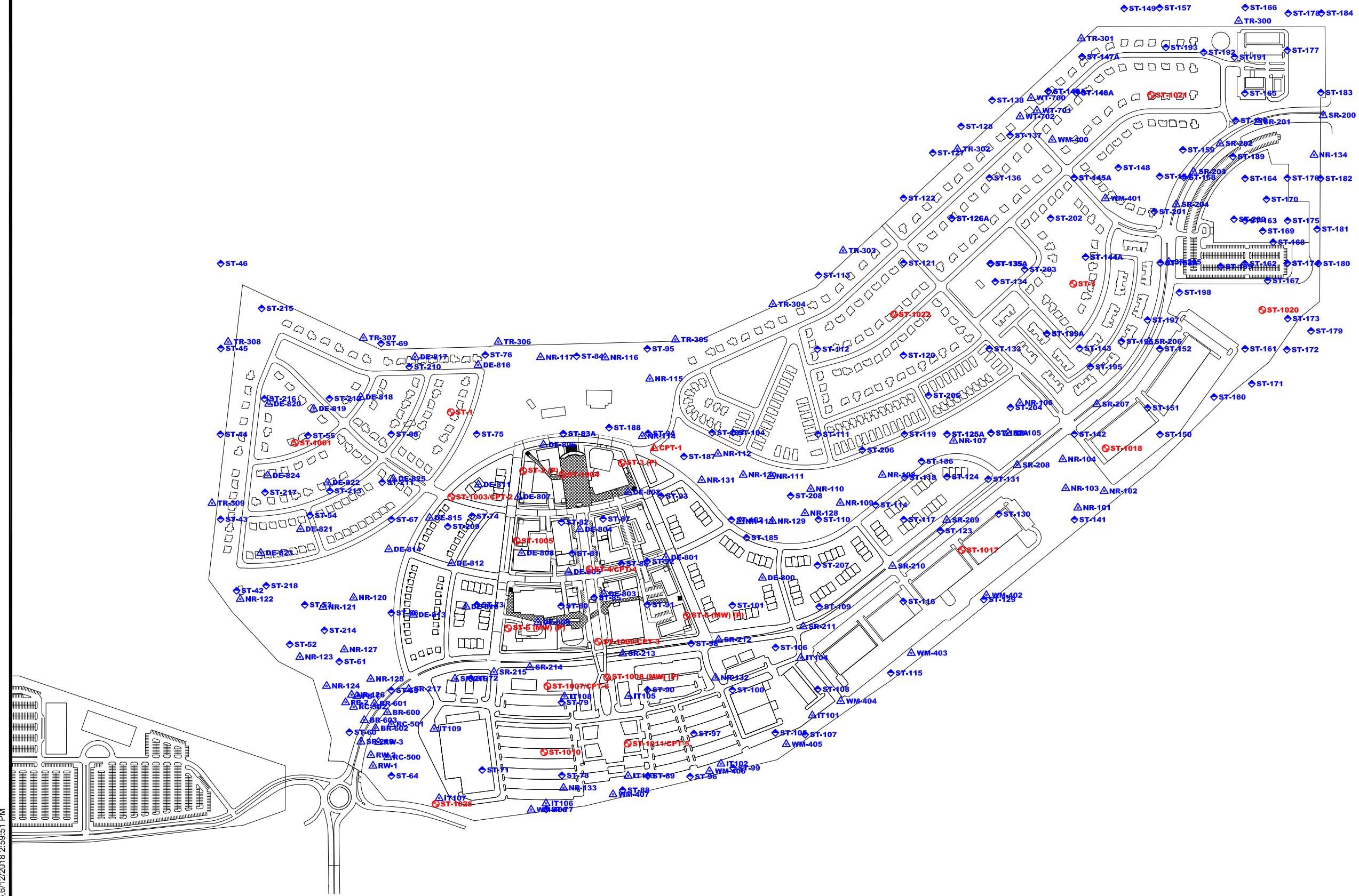
Project Information

TCAAP Redevelopment -
Mass Grading

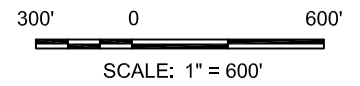
Northeast of US Highway
10 and Highway 96

Arden Hills, Minnesota

Soil Boring and
CPT Sounding
Sketch



- ◆ DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING
- ◆ DENOTES APPROXIMATE LOCATION OF PREVIOUS SOIL BORING PERFORMED BY AET / BRAUN INTERTEC
- ▲ DENOTES APPROXIMATE LOCATION OF PREVIOUS SOIL BORING PERFORMED BY WENCK
- P = PIEZOMETER
- MW = MONITORING WELL
- CPT = CONE PENETRATION TEST SOUNDING
- ▲ DENOTES APPROXIMATE LOCATION OF CONE PENETRATION TEST SOUNDING



Appendix B

Log of Boring Sheets

2018 Braun Intertec Corporation

Borings P/ST-1, P/ST-2, P/ST-2 (P), P/ST-3, P/ST-3 (P), P/ST-4, P/ST-5, P/ST-5 (MW), P/ST-5 (P), P/ST-6, P/ST-6 (MW), P/ST-6 (P), P/ST-7, ST-1001, ST-1003 through ST-1005, ST-1007, ST-1008, ST-1008 (MW), ST-1008 (P), ST-1009 through ST-1011, ST-1017, ST-1018, and ST-1020 through ST-1022

2016 Wenck

Borings PB-1 through PB-4, NR-100 through NR-134, SR-200 through SR-225, TR-300 through TR-309, WM-400 through WM-410, BR-600 through BR-603, and DE-800 through DE-825

2007 American Engineering Testing, Inc./Braun Intertec Corporation

Borings ST-1 through ST-55, ST-57 through ST-83, ST-83A, ST-84 through ST-125, ST-125A, ST-126, ST-126A, ST-127 through ST-132, ST-132A, ST-133 through ST-135, ST-135A, ST-136 through ST-139, ST-139A, ST-140, ST-140A, ST-141 through ST-144, ST-144A, ST-145, ST-145A, ST-146, ST-146A, ST-147, ST-147A, ST-148 through ST-153, ST-153A, ST-154, and ST-157 through ST-224

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: P/ST-1				
DRILLER: B. Kammermeier			METHOD: 3 1/4" HSA, Autohammer		DATE: 5/3/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
898.0	0.0								
896.7	1.3	FILL	FILL: Poorly Graded Sand with Silt, with Gravel, brown, moist.						
		FILL	FILL: Silty Sand, fine- to medium-grained, brown and dark brown, moist to 2' then wet.		▽				
894.0	4.0	SC	CLAYEY SAND, trace of Gravel, brown to 12' then gray, moist, soft to stiff. (Glacial Till)	2		14			
				4		18			
				8		15	46	LL=24 PI=11	
				8					
				9					
				8					
879.0	19.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)	9					
				9					
				10					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: P/ST-1 (cont.) LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 5/3/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
866.0	32.0		SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till) (<i>continued</i>)						
				10					
857.0	41.0			7					
			END OF BORING. Water not observed with 39 1/2 feet of hollow stem auger in the ground. Water observed at a depth of 2 feet with a cave-in depth of 15 feet immediately after withdrawal of auger. Water observed at a depth of 2 1/2 feet when rechecked 24 hours after withdrawal of the auger. Boring then grouted.						

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: P/ST-2				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/3/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
898.4	0.0	TS	SILTY SAND, trace of roots, black, wet. (Topsoil)					
894.4	4.0	SC	CLAYEY SAND, trace of Gravel, brown to 9' then gray, moist, medium. (Glacial Till)	14		13		
				6		14		
				7		14		
				9		14	45	LL=23 PI=10
				6				
				6				
879.4	19.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, meidum. (Glacial Till)					
				7				*Water not observed while drilling.
				6				Water not observed to cave-in depth of 13 feet immediately after withdrawal of auger.
				7				Water observed at a depth of 13 feet when rechecked 24 hours after withdrawal of the auger.
867.4	31.0		END OF BORING.*					Boring then grouted.

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: P/ST-2 (P) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/24/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
898.4	0.0						
898.4	0.0		Piezometer installed on 5-24-2018: Bottom of piezometer screen: Depth = 12' Elevation = 886.4 Top of piezometer screen: Depth = 7' Elevation = 891.4 Water level measured on 6-1-2018: Depth = 3.0' Elevation = 895.4 Water level measured on 8-17-2018: Elevation = 895.8				

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: P/ST-3 LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/3/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
901.5	0.0	TS	SILTY SAND, trace of roots, black, moist.				
897.5	4.0	SC	CLAYEY SAND, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)	14		5	
				8		15	
				9			
				7			
				8			
				8			
				9			
879.5	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)				
				8			*Water not observed with 29 1/2 feet of hollow stem auger in the ground.
							Water not observed to cave-in depth of 22 feet immediately after withdrawal of auger.
							Water not observed when rechecked 24 hours after withdrawal of auger.
870.5	31.0		END OF BORING.*	10			Boring then grouted.

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: P/ST-3 (P) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/24/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
901.5	0.0						
901.5	0.0		Piezometer installed on 5-24-2018: Bottom of piezometer screen: Depth = 12' Elevation = 894.5 Top of piezometer screen: Depth = 7' Elevation = 899.5 Water level measured on 6-1-2018: Depth = 3.1' Elevation = 898.4 Water level measured on 8-17-2018: Elevation = 898.2				

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: P/ST-4				
DRILLER: B. Kammermeier			METHOD: 3 1/4" HSA, Autohammer		DATE: 5/4/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
895.2	0.0	TS	SILTY SAND, trace of roots, black, wet. (Topsoil)						
893.2	2.0	SC	CLAYEY SAND, trace of Gravel, brown with orange-brown and gray to 12' then gray, moist. (Glacial Till)	4	▽	20	46	LL=30 PI=16	
				7		15	45	LL=26 PI=12	
				7					
				10					
				8					
				TW		15	43	*TW - #4 LL=26 PI=14 DD=117.1 pcf	
876.2	19.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium. (Glacial Till)	7				*Water not observed with 29 1/2 feet of hollow stem auger in the ground.	
				6				Water observed at a depth of 2.3 feet with 29 1/2 feet of hollow-stem auger in the ground when rechecked 3 hours after withdrawal of auger.	
				7				Boring then grouted.	
864.2	31.0		END OF BORING.*						

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: P/ST-5				
DRILLER: B. Kammermeier			METHOD: 3 1/4" HSA, Autohammer		DATE: 5/2/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
890.7	0.0								
889.7	1.0	FILL	FILL: Silty Sand, trace of roots, black, wet.						
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, mixed dark brown and brown, moist.						
886.7	4.0			7					
		SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, brown, wet, very loose to loose. (Alluvium)	8		15			
				10		19	6		
				9					
				12					
				4					
871.7	19.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, soft to medium. (Glacial Till)	3					*Water observed at a depth of 5.6 feet with 9 1/2 feet of hollow-stem auger in the ground.
				6					Water observed at 4.6 feet with 14 1/2 feet of hollow-stem auger in the ground.
860.7	30.0			7					Water observed at a depth of 4 feet with 29 1/2 feet of hollow-stem auger in the ground when rechecked 3 hours after withdrawal of auger.
			END OF BORING.*						Boring then grouted.

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: P/ST-6 (MW) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/24/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
894.5	0.0						
894.5	0.0		Monitoring well installed on 5-25-2018: Bottom of well screen: Depth = 23' Elevation = 871.5 Top of well screen: Depth = 18' Elevation = 876.5 Water level measured on 6-1-2018: Depth = 3.3' Elevation = 891.2 Water level measured on 8-17-2018: Elevation = 889.5				

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: P/ST-6 (P) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/24/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
894.5	0.0						
894.5	0.0		Piezometer installed on 5-24-2018: Bottom of piezometer screen: Depth = 7' Elevation = 887.5 Top of piezometer screen: Depth = 2' Elevation = 892.5 Water level measured on 6-1-2018: Depth = 3.2' Elevation = 891.3 Water level measured on 8-17-2018: Elevation = 889.6				

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: P/ST-7 LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/7/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
955.8	0.0	TS	SILTY SAND, trace of roots, dark brown, moist. (Topsoil)				
954.3	1.5	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, stiff. (Glacial Till)	14			
951.8	4.0	SM	SILTY SAND, trace of Gravel, reddish brown, moist, medium dense. (Glacial Till)	24		9	
				23			
				23		8	
943.8	12.0	SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Outwash)	16			
				28			
				19			
933.8	22.0	SP	POORLY GRADED SAND, fine-grained, light brown, moist, medium dense. (Glaciofluvium)				
				27			
928.8	27.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Outwash)				
				23			

(See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: P/ST-7 (cont.) LOCATION: See attached sketch.		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/7/18	SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
923.8	32.0		POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Outwash) <i>(continued)</i>				
				23			
914.8	41.0			28			
			END OF BORING. Water not observed with 39 1/2 feet of hollow stem auger in the ground. Boring then grouted.				

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1001				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/10/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
903.9	0.0							
902.9	1.0	FILL	FILL: Silty Sand, trace of roots, black, moist.					
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, mixed dark brown and dark gray, moist.					
				3				
				3		15	19	
				2				
				WH				
				10				
889.9	14.0	SC	CLAYEY SAND, trace of Gravel, brown, moist, stiff. (Glacial Till)					
				13				
				10				
879.9	24.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium. (Glacial Till)					
				8				
872.9	31.0							
				7				
			END OF BORING.*					

Water not observed with 29 1/2 feet of hollow stem auger in the ground.

Boring then grouted.

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1003 LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 5/11/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
895.8	0.0	FILL	FILL: Poorly Graded Sand with Silt and Gravel, brown, moist.						
893.8	2.0	FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, mixed orange-brown and light brown to brown, wet.	8	▽				
891.8	4.0	FILL	FILL: Clayey Sand, mixed brown and dark brown, wet.	6					
886.8	9.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, trace of Gravel, brown, wet, medium dense. (Lacustrine Deposit)	11					
881.8	14.0	SC	CLAYEY SAND, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)	6		15			
871.8	24.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, stiff. (Glacial Till)	8		17	51	LL=28 PI=15	
					TW	15	48	TW - #6 LL=30 PI=17	
				9		16			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1003 (cont.) LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 5/11/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
863.8	32.0		SANDY LEAN CLAY, trace of Gravel, gray, moist, stiff. (Glacial Till) (continued)						
				9					
				11					
				10					
				11		15	51		LL=29 PI=17
				11					*Water observed at a depth of 7 feet with 9 1/2 feet of hollow-stem auger in the ground.
				TW		15	53		Water observed at a depth of 2 feet with 59 1/2 feet of hollow-stem auger in the ground. Boring then grouted. TW - #7 LL=33 PI=53
834.8	61.0		END OF BORING.*						

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1004				
DRILLER: B. Kammermeier			METHOD: 3 1/4" HSA, Autohammer		DATE: 5/10/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
900.9	0.0								
899.9	1.0	FILL	FILL: Silty Sand, trace of roots, dark brown, moist.						
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, brown, wet.						
896.9	4.0			9		16	15		
		SC	CLAYEY SAND, trace of roots, black, moist. (Buried Topsoil)						
893.9	7.0			13					
		SC	CLAYEY SAND, trace of Gravel, brown to 12' then gray, moist, medium to stiff. (Glacial Till)						
				8		15			
				13		16			
				13					
				8					
881.9	19.0								
		CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, stiff. (Glacial Till)						
				15*					*no recovery suspected cobble *Water not observed with 29 1/2 feet of hollow stem auger in the ground.
				10					Water not observed to cave-in depth of 29 1/2 feet when rechecked 24 hours after withdrawal of auger.
869.9	31.0								
				9					Boring then grouted
			END OF BORING.*						

(See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1005 LOCATION: See attached sketch.		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/7/18	SCALE: 1" = 4'	
Elev. feet 893.1	Depth feet 0.0	Symbol	Description of Materials <small>(Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)</small>	BPF	WL	Tests or Notes
		TS	SILTY SAND, trace of roots, black, wet. (Topsoil)			
890.1	3.0	SC	CLAYEY SAND, trace of Gravel, brown to 7' then gray, moist, medium to stiff. (Glacial Till)	3	▽	
				13		
				9		
				5		
				5		
				7		
				8		
869.1	24.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)	7		*Water observed at a depth of 5 feet with 7 feet of hollow-stem auger in the ground. Water not observed with 29 1/2 feet of hollow stem auger in the ground. Water observed at a depth of 2.5 feet with a cave-in depth of 29 1/2 feet when rechecked 24 hours after withdrawal of auger.
862.1	31.0			9		
			END OF BORING.*			Boring then grouted.

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1007 (cont.) LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 5/10/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
857.8	32.0								
			SANDY LEAN CLAY, trace of Gravel, gray, moist, medium. (Glacial Till) (continued)						
853.8	36.0			8					
			END OF BORING. Water observed at a depth of 1.5 feet with 29 feet of hollow-stem auger in the ground. Boring then grouted.						

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1008					
DRILLER: B. Kammermeier				METHOD: 3 1/4" HSA, Autohammer		DATE: 5/2/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
890.7	0.0								
889.7	1.0	FILL	FILL: Silty Sand, trace of roots, black, wet.						
		FILL	FILL: Clayey Sand, fine- to medium-grained, trace of Gravel, dark brown, moist.						
886.7	4.0			6		15	30	LL=24 PI=8	
		ML	SILT, light gray, wet, loose. (Alluvium)						
883.7	7.0			9		36	94		
		SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, light brown to 10' then gray, wet, loose to medium dense. (Alluvium)		▽			An open triangle in the water level (WL) column indicates the depth at which groundwater was observed while drilling.	
				9					
				13		19	5		
				11					
				12		19			
871.7	19.0								
		SM	SILTY SAND, fine- to medium-grained, trace of Gravel, gray, moist, very loose to loose. (Alluvium)						
				4					
				TW*		16	35	*TW - #3 LL=18 PI=NP DD=120.5 pcf	
				6					
				2					

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1008 (cont.) LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/2/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
858.7	32.0							
856.7	34.0		SILTY SAND, fine- to medium-grained, trace of Gravel, gray, moist, very loose to loose. (Alluvium) (continued)					
		CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)					
				9				
				10				
				11				
				14				
				9				*Water observed at a depth of 7 feet with 9 1/2 feet of hollow-stem auger in the ground.
				9				Water observed at a depth of 9 feet with 59 feet of hollow-stem auger in the ground.
				8				Water observed at a depth of 4 feet with 29 1/2 feet of hollow-stem auger in the ground when rechecked 3 hours after withdrawal of auger.
829.7	61.0		END OF BORING.*					Boring then grouted.

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1008 (MW) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/25/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
890.7	0.0		Monitoring well installed on 5-25-2018: Bottom of well screen: Depth = 30' Elevation = 860.7 Top of well screen: Depth = 25' Elevation = 865.7 Water level measured on 6-1-2018: Depth = 2.1' Elevation = 888.6 Water level measured on 8-17-2018: Elevation = 887.0				

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1008 (P) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/24/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
890.7	0.0		Piezometer installed on 5-24-2018: Bottom of piezometer screen: Depth = 13' Elevation = 877.7 Top of piezometer screen: Depth = 3' Elevation = 887.7 Water level measured on 6-1-2018: Depth = 2.7' Elevation = 888 Water level measured on 8-17-2018: Elevation = 887.0				

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1009				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/1/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
890.7	0.0	TS	SILTY SAND, trace of roots, black, wet. (Topsoil)					
888.7	2.0	SM	SILTY SAND, fine- to medium-grained, brown with orange-brown, moist, loose. (Alluvium)	6	▽	19		
886.7	4.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, brown, moist, loose. (Alluvium)	8		21		
883.7	7.0	ML	SANDY SILT, gray to brown, wet, loose. (Alluvium)	8		29	53	LL=24 PI=NP
881.7	9.0	SC	CLAYEY SAND, trace of Gravel, gray, moist, soft to medium. (Glacial Till)	4		16		
				TW*		16	41	*TW - #1 LL=23 PI=10
				3		15		
				TW*		13	44	*TW - #2 LL=23 PI=10
				6		15		
866.7	24.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)	6				
				7				

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1009 (cont.) LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 5/1/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
858.7	32.0		SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till) (continued)						
				8					
				10					
				9					
				10					
				9					
				11					
829.7	61.0		END OF BORING.*						
								*Water observed at a depth of 6 feet with 7 feet of hollow-stem auger in the ground. Water observed at 5 feet with 59 feet of hollow-stem auger in the ground. Water observed at a depth of 4 feet with 59 feet of hollow-stem auger in the ground when rechecked 30 minutes after withdrawal of auger. Boring then grouted.	

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1010		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/9/18		
SCALE: 1" = 4'		LOCATION: See attached sketch.				
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
888.1	0.0					
887.1	1.0	FILL	FILL: Poorly Graded Sand with Silt, trace of Gravel, brown, moist.			
		SP	POORLY GRADED SAND, fine- to medium-grained, brown to 12' then gray, moist to 3' then wet, very loose to medium dense. (Lacustrine Deposit)	12	▽	
				11		
				4		
				2		
				WH		
				5		
				6		
864.1	24.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, stiff to very stiff. (Glacial Till)	9		
						*Water observed at a depth of 5 feet with 6 1/2 feet of hollow-stem auger in the ground.
						Water observed at a depth of 3 feet with 29 1/2 feet of hollow-stem auger in the ground.
857.1	31.0			16		
			END OF BORING.*			Boring then grouted.

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398					BORING: ST-1011	
Geotechnical Evaluation					LOCATION: See attached sketch.	
TCAAP Redevelopment - Mass Grading						
Northeast of US Highway 10 and Highway 96						
Arden Hills, Minnesota						
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/9/18	SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
888.2	0.0	PT	PEAT, black, wet. (Swamp Deposit)		▽	
884.2	4.0	OL	SANDY ORGANIC CLAY, light gray, wet, soft. (Alluvium)	3		
881.2	7.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, brown, wet. (Alluvium)	4		
				9		
				7		
				6		
				11		
				8		
862.2	26.0			6		
			END OF BORING.			
			Water observed at a depth of 5 feet with 6 1/2 feet of hollow-stem auger in the ground.			
			Water observed at a depth of 2 feet with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1017				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/4/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
911.7	0.0							
910.2	1.5	FILL	FILL: Silty Sand, trace of roots, trace of Gravel, dark brown, wet.					
907.7	4.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, gray with olive, moist. (Alluvium)	9		14	32	
904.7	7.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, trace of Gravel, brown, wet. (Alluvium)	22	▽	18	9	
		SC	CLAYEY SAND, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)	5				
				6				
				7				
				9				
				9				
885.7	26.0		END OF BORING.*	8				

*Water observed at a depth of 5 feet with 7 feet of hollow-stem auger in the ground.

Water observed at a depth of 5 feet with 29 1/2 feet of hollow-stem auger in the ground when rechecked 2 hours after withdrawal of auger.

Boring then grouted.

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1018		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/8/18		
Elev. feet		Depth feet		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
928.5	0.0					
926.5	2.0	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, trace of Gravel, brown, moist.			
		FILL	FILL: Clayey Sand, trace of Gravel, trace of roots, mixed brown, dark brown and gray, moist.	9		
				7		
				11		
				11		
916.5	12.0	SM	SILTY SAND, trace of roots, black, moist. (Buried Topsoil)	6		
914.5	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray and brown, moist, medium to stiff. (Glacial Till)	6		
				11		
				10		
901.5	27.0	SC	CLAYEY SAND, trace of Gravel, reddish brown, moist, very stiff to hard. (Glacial Till)	21		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1018 (cont.)		
					LOCATION: See attached sketch.		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/8/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials <small>(Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)</small>	BPF	WL	Tests or Notes	
896.5	32.0		CLAYEY SAND, trace of Gravel, reddish brown, moist, very stiff to hard. (Glacial Till) <i>(continued)</i>	40			
892.5	36.0		END OF BORING. Water not observed with 34 1/2 feet of hollow stem auger in the ground. Boring then grouted.				

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1020		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/8/18		
SCALE: 1" = 4'		LOCATION: See attached sketch.				
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
946.0	0.0	TS	SILTY SAND, trace of roots, black, moist. (Topsoil)			
945.0	1.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown with orange-brown, and gray, moist, medium to very stiff. (Glacial Till)	5		
				14		
				15		
				16		
				17		
				16		
927.0	19.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, stiff to very stiff. (Glacial Till)	15		
				18		
919.0	27.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense to dense. (Glacial Till)	*		*50 blows for 6" suspected cobbles

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1020 (cont.) LOCATION: See attached sketch.	
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/8/18	SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
914.0	32.0					
			SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense to dense. (Glacial Till) <i>(continued)</i>			
910.0	36.0			30		
			END OF BORING. Water not observed with 34 1/2 feet of hollow stem auger in the ground. Boring then grouted.			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1021 LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 5/7/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes	
944.0	0.0								
942.5	1.5	FILL	FILL: Poorly Graded Sand with Gravel, light brown, moist.						
		CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, very stiff. (Glacial Till)	18					
937.0	7.0			19					
935.0	9.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Outwash)	22					
		SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense. (Glacial Till)	24		7	27	LL=11 PI=NP	
				26					
				30					
				26					
920.0	24.0	SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Outwash)	13					
				23					

LOG OF BORING (See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-1021 (cont.) LOCATION: See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/7/18		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	P200 %	Tests or Notes
912.0	32.0							
910.0	34.0		POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Outwash) <i>(continued)</i>					
		SP	POORLY GRADED SAND, fine-grained, light brown, moist, medium dense to dense. (Glacial Till)	23				
				32				
900.0	44.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Till)	24				
898.0	46.0		END OF BORING. Water not observed with 44 1/2 feet of hollow stem auger in the ground. Boring then grouted.					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-1022 LOCATION: See attached sketch.	
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/8/18	SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
944.0	0.0	FILL	FILL: Poorly Graded Sand, fine- to medium-grained, trace of Gravel, brown, moist to 7' then wet.			
				24		
				10		
				7	▽	
				6		
932.0	12.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, soft to medium. (Glacial Till)			
				3		
				5		
925.0	19.0	CL	LEAN CLAY, reddish brown, moist, very stiff. (Glaciofluvium)			
				30		
918.0	26.0		END OF BORING.	18		
			Water observed at a depth of 7 feet with 9 1/2 feet of hollow-stem auger in the ground.			
			Water observed at a depth of 24 feet with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-5 (MW) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/25/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
890.7	0.0		Monitoring well installed on 5-25-2018: Bottom of well screen: Depth = 30' Elevation = 860.7 Top of well screen: Depth = 25' Elevation = 865.7 Water level measured on 6-1-2018: Depth = 1.9' Elevation = 888.8 Water level measured on 8-17-2018: Elevation = 886.4				

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\06398.GPJ BRAUN_V8_CURRENT.GDT 8/20/18 16:00

Braun Project B1706398 Geotechnical Evaluation TCAAP Redevelopment - Mass Grading Northeast of US Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-5 (P) LOCATION: See attached sketch.			
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/25/18		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes	
890.7	0.0						
890.7	0.0		Piezometer installed on 5-25-2018: Bottom of piezometer screen: Depth = 13' Elevation = 877.7 Top of piezometer screen: Depth = 3' Elevation = 887.7 Water level measured on 6-1-2018: Depth = 2.1' Elevation = 888.6 Water level measured on 8-17-2018: Elevation = 886.4				



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

BORING NUMBER PB-1

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/11/16 **COMPLETED** 5/16/16 **GROUND ELEVATION** 883.184 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.00 ft / Elev 866.18 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES South Pedestrian Bridge. Elevation at staked location provided by client. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - #92016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10.0 Inches)	AU 1									
		POORLY GRADED SAND WITH SILT, (SP-SM) brown to dark brown, fine to medium grained, moist, trace gravel, trace organics	SS 2	100	8-8-7 (15)							
5			SS 3	100	9-11-10 (21)							
8.0		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, moist, medium dense to loose, trace gravel	SS 4	89	6-7-6 (13)							
			SS 5	89	4-4-4 (8)							
12.0		SILTY SAND, (SM) gray, fine grained, moist to saturated, very loose, trace gravel, trace organics NOTE: Pushed Shelby Tube at 12.0 feet. No Recovery.	SPT 6									
15			SS 7	78	1-1-1 (2)			26				13
19.5		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, dense, trace gravel	SS 8	89	8-10-8 (18)							
24.5		SANDY LEAN CLAY, (CL) gray, wet, medium to rather stiff, trace gravel	SS 9	100	7-7-8 (15)							
30			SS 10	100	3-3-4 (7)			18	27	12	15	52

(Continued Next Page)



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BORING NUMBER PB-1

CLIENT Wenck Associates PROJECT NAME Ramsey County Re-Development - (TCAAP)
 PROJECT NUMBER 16.61435.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - #92016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SANDY LEAN CLAY, (CL) gray, wet, medium to rather stiff, trace gravel (continued)	X SS 11	100	4-5-5 (10)							
40			X SS 12	100	4-4-5 (9)							
45			X SS 13	100	4-6-5 (11)							
50			X SS 14	100	5-5-6 (11)							
55			X SS 15	100	6-6-6 (12)							
60			X SS 16	100	6-5-7 (12)							
65			X SS 17	100	6-7-6 (13)							
70	X SS 18	100	5-6-6 (12)									

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BORING NUMBER PB-1

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75	[Hatched Box]	SANDY LEAN CLAY, (CL) gray, wet, medium to rather stiff, trace gravel <i>(continued)</i>	SS 19	100	6-5-6 (11)							
76.0		Bottom of borehole at 76.0 feet.										

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 630/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ



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BORING NUMBER PB-2

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/9/16 **COMPLETED** 5/9/16 **GROUND ELEVATION** 883.681 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 12.00 ft / Elev 871.68 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES South Pedestrian Bridge. Elevation at staked location provided by client AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - #92016 11:54 - INTIDATARAMSEY11-PROJECTS/TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGREPORTS/GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (17.0 Inches)	AU 1									
1.4		882.3										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel	SS 2	67	9-13-14 (27)							
5			SS 3	83	10-12-15 (27)							
7.0		876.7										
		SILT WITH SAND, (ML) dark brown, fine grained, moist, medium, trace gravel, trace organics	SS 4	56	4-4-4 (8)							
10			SH 5	93				14				56
12.0	▽	871.7										
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, medium dense to very loose, trace gravel	SS 6	67	4-4-5 (9)							
15		NOTE: Pushed Shelby Tube at 14.5 feet. No Recovery.	SS 7	83	1-1-1 (2)							
			SS 8	100	3-1-6 (7)							
19.5		864.2										
		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, medium dense, trace gravel	SS 9	100	10-4-5 (9)							
24.5		859.2										
		CLAYEY SAND, (SC) gray, wet, loose to dense, little gravel	SS 10	100	4-4-4 (8)							
30			SH 11	97				15	24	12	12	46

(Continued Next Page)



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BORING NUMBER PB-2

CLIENT Wenck Associates PROJECT NAME Ramsey County Re-Development - (TCAAP)
 PROJECT NUMBER 16.61435.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - #92016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTS/TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS/GINT/TCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
35		CLAYEY SAND, (SC) gray, wet, loose to dense, little gravel (continued)	X SS 12	100	4-5-5 (10)								
40			X SS 13	100	4-4-4 (8)			15	25	13	12	49	
45			X SS 14	100	4-5-6 (11)								
50			X SS 15	100	5-5-5 (10)								
55			X SS 16	100	10-9-9 (18)								
60			X SS 17	100	6-7-9 (16)								
65	X SS 18	100	7-7-9 (16)										
70	X SS 19	100	8-7-8 (15)										

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BORING NUMBER PB-2

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75		CLAYEY SAND, (SC) gray, wet, loose to dense, little gravel (continued)										
			SS 20	100	6-9-8 (17)							
		Bottom of borehole at 76.0 feet.										

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 630/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ



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BORING NUMBER PB-3

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/11/16 **COMPLETED** 5/11/16 **GROUND ELEVATION** 877.466 ft **HOLE SIZE** 6 1/2 inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 12.00 ft / Elev 865.47 ft
LOGGED BY Robert Hawkins **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES North Pedestrian Bridge. Elevation at staked location provided by client.AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - #92016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (15.0 Inches)	AU 1									
1.3		876.2										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel	SS 2	56	4-4-4 (8)							
4.5		873.0										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, dense to medium dense, trace gravel	SS 3	67	8-10-11 (21)							
			SS 4	78	4-5-6 (11)							
9.5		868.0										
		SILTY SAND, (SM) dark brown, fine to medium grained, moist, medium dense, trace gravel, trace organics, occasional fine roots	SS 5	78	4-4-5 (9)							
12.0	▽	865.5										
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, very loose, trace gravel	SS 6	78	2-1-2 (3)							
			SS 7	78	2-2-2 (4)							
17.0		860.5										
		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose, trace gravel	SS 8	78	2-3-3 (6)							
20			SH 9	80				12				12
24.5		853.0										
		SANDY LEAN CLAY, (CL) gray, wet, rather stiff to stiff, trace gravel	SS 10	100	4-5-5 (10)							
30			SS 11	100	5-5-6 (11)							

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BORING NUMBER PB-3

CLIENT Wenck Associates PROJECT NAME Ramsey County Re-Development - (TCAAP)
 PROJECT NUMBER 16.61435.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD. U.S. LAB MAY 2012/GDT - #92016 11:54 - INTIDATA\RAMSEY\PROJECTS\2016 PROJECTS\TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)\ENGINEERING\ENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SANDY LEAN CLAY, (CL) gray, wet, rather stiff to stiff, trace gravel (continued)	X SS 12	100	5-5-7 (12)							
40			X SS 13	100	6-7-7 (14)							
45			X SS 14	100	6-7-6 (13)							
50			X SS 15	78	8-8-8 (16)							
55			X SS 16	89	7-10-9 (19)							
60			X SS 17	100	8-8-8 (16)							
65	X SS 18	100	12-14-13 (27)									
70		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, dense, trace gravel	X SS 19	100	9-10-10 (20)							

69.5

808.0

(Continued Next Page)



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BORING NUMBER PB-3

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, dense, trace gravel <i>(continued)</i>	803.0									
		SANDY LEAN CLAY, (CL) brown, wet, stiff, trace gravel, occasional silt (ML) seams	801.5	SS 20	100	8-9-8 (17)						

Bottom of borehole at 76.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 630/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ



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BORING NUMBER PB-4

CLIENT Wenck Associates PROJECT NAME Ramsey County Re-Development - (TCAAP)
 PROJECT NUMBER 16.61435.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/9/16 COMPLETED 5/10/16 GROUND ELEVATION 878.006 ft HOLE SIZE 6 1/2 inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 7.00 ft / Elev 871.01 ft
 LOGGED BY Robert Hawkins CHECKED BY DAS AT END OF DRILLING ---
 NOTES North Pedestrian Bridge. Elevation at staked location provided by client. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - #92016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTS2016 PROJECTS2016 NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (13.0 Inches)	AU 1									
1.1		876.9										
		CLAYEY SAND, (SC) dark brown, fine to medium grained, moist, very loose, trace gravel, trace organics, occasional fine roots	SS 2	56	1-1-2 (3)							
5			SS 3	67	1-2-1 (3)							
7.0		871.0										
		SILTY SAND, (SM) gray, wet, very loose, trace gravel	SS 4	100	1-1-2 (3)							
10			SH 5	77				14	16	14	2	40
12.0		866.0										
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, saturated, medium dense, trace gravel	SS 6	100	3-4-6 (10)							
15		863.5										
		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 7	100	3-4-5 (9)							
			SS 8	100	5-5-6 (11)							
20			SS 9	100	6-5-6 (11)							
25			SS 10	100	6-6-6 (12)							
30			SS 11	100	7-8-7 (15)							

(Continued Next Page)



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BORING NUMBER PB-4

CLIENT Wenck Associates PROJECT NAME Ramsey County Re-Development - (TCAAP)
 PROJECT NUMBER 16.61435.100 PROJECT LOCATION Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - #92016 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTS/TCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS/GINT/TCAAP - ROUND 3.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
35		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel (continued)	X SS 12	83	6-7-6 (13)								
40			X SS 13	100	6-4-10 (14)								
45			X SS 14	100	3-5-7 (12)								
50			49.5	828.5	X SS 15	83	6-9-9 (18)						
55					X SS 16	100	9-15-12 (27)						
60			SH 17	60				21	26	18	8	97	
65			X SS 18	100	6-8-9 (17)								
70	69.5	808.5	X SS 19	100	6-9-9 (18)								

(Continued Next Page)



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BORING NUMBER PB-4

CLIENT Wenck Associates **PROJECT NAME** Ramsey County Re-Development - (TCAAP)
PROJECT NUMBER 16.61435.100 **PROJECT LOCATION** Arden Hills, MN

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75		CLAYEY SAND, (SC) brown, fine to medium grained, saturated, dense, trace gravel <i>(continued)</i>	803.5									
		POORLY GRADED SAND WITH SILT, (SP-SC) brown, fine to medium grained, saturated, dense, trace gravel	802.0	SS 20	100	8-10-9 (19)						

Bottom of borehole at 76.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012/GDT - 630/16 11:54 - INTIDATARAMSEY11-PROJECTS2016 PROJECTSITCAAP - NEW PEDESTRIAN BRIDGES AND RETAINING WALL - GEO - (16.61435.100)ENGINEERINGENGINEERING REPORTS\GINTTCAAP - ROUND 3.GPJ



Northern Technologies, Inc.
 6160 Carmen Avenue East
 Inver Grove Heights, MN 55076
 Telephone: 651-389-4191

BORING NUMBER NR-101

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 914.14 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)	913.4									
		CLAYEY SAND, (SC) brown to dark brown, fine grained, moist, very loose to medium dense, trace gravel, lenses of silt, iron oxide staining	SS 1	44	1-2-2 (4)							
			SS 2	89	4-6-6 (12)							
5			SS 3	89	5-7-7 (14)							
			SS 4	89	3-3-3 (6)							
9.5		PEAT, (Pt) black, moist, rather stiff to soft, trace gravel	904.6									
			SS 5	78	4-6-5 (11)							
13.3		LEAN CLAY WITH SAND, (CL) gray and brown, moist to wet, rather stiff, trace gravel, organic material seams	900.8									
			SS 6	44	2-2-1 (3)							
			SS 7	89	3-5-6 (11)							
			SS 8	100	3-6-5 (11)							
21.5			SH 9									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-102

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 915.35 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 903.35 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft NE

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.6		TOPSOIL (7 Inches)	914.8									
2.0		CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, loose	913.4	56	2-2-3 (5)							
		SILTY SAND, (SM) brown and dark brown, fine grained, moist, loose		67	3-3-5 (8)							
4.5		SILTY SAND, (SM) reddish brown, fine grained, moist, medium dense	910.9	56	4-8-8 (16)							
7.0		CLAYEY SAND, (SC) black, fine grained, dry to moist, loose, some organics, organic stain	908.4	67	4-4-4 (8)							
10.5		PEAT, (Pt) black, dry to moist, rather stiff	904.9	67	4-5-5 (10)							
12.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	903.4	78	5-6-6 (12)							
				67	4-5-5 (10)							
				89	6-6-8 (14)							
				100	3-4-5 (9)							
21.0			894.4									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-103

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 924.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 6 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		CLAYEY SAND, (SC) brown, fine grained, moist, loose	SS 1	56	3-3-3 (6)							
2.0		SANDY LEAN CLAY, (CL) brown, moist, medium to rather stiff	SS 2	56	4-4-4 (8)							
5		NOTE: Sampled auger cuttings at 4.5 feet.	SS 3	17	4-5-5 (10)							
7.0		SILTY SAND, (SM) dark brown to dark gray, fine grained, moist, dense, clay (CL) lenses	SS 4	67	4-7-12 (19)							
10			SH 5									
12.0		SILTY SAND, (SM) brown, moist, medium dense, trace gravel	SS 6	78	6-8-8 (16)							
15			SS 7	56	7-7-7 (14)							
15.5		CLAYEY SAND, (SC) gray, fine grained, moist, medium dense, trace gravel										
17.0		SILTY SAND, (SM) gray, fine grained, dry to moist, loose	SS 8	44	2-2-3 (5)							
19.5			SS 9	100	5-5-7 (12)							
21.0		LEAN CLAY WITH SAND, (CL) dark brown, moist, rather stiff										

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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 Telephone: 651-389-4191

BORING NUMBER NR-104

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 932.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 8 ft NE

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, dry, fine to coarse gravel (Fill) 930.6	SS 1	56	10-14-15 (29)							
4.0		CLAYEY SAND WITH GRAVEL, (SC) reddish brown, fine to coarse grained, moist, fine to coarse gravel (Fill) 928.6	SS 2	78	9-10-10 (20)							
5		SANDY LEAN CLAY, (CL) reddish brown to light brown, moist, medium, trace fine to coarse gravel	SS 3	56	5-3-5 (8)							
8.3		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace fine to medium gravel 924.4	SS 4	33	4-4-4 (8)							
10			SH 5									
14.5		SANDY LEAN CLAY, (CL) brown, moist, stiff, trace fine gravel, iron oxide staining 918.1	SS 6	78	9-10-13 (23)							
15			SS 7	89	5-7-9 (16)							
17.0		SANDY LEAN CLAY, (CL) brown to reddish brown, dry, very stiff, little fine to coarse gravel 915.6	SS 8	56	7-14-19 (33)							
20			SS 9	78	8-16-16 (32)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-106

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 939.86 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 Inches)	939.0									
2.0		CLAYEY SAND, (SC) light brown and dark brown, fine grained, moist, loose	937.9	SS 1	67	1-2-4 (6)						
		CLAYEY SAND, (SC) brown, fine grained, moist, very loose		SS 2	22	1-1-1 (2)						
				SS 3	22	1-1-1 (2)						
				SH 4								
9.5		LEAN CLAY WITH SAND, (CL) reddish brown to light brown, moist, rather stiff to stiff, trace gravel	930.4	SS 5	100	3-5-7 (12)						
				SS 6	100	4-5-5 (10)						
				SS 7	89	5-10-7 (17)						
17.0		SANDY LEAN CLAY, (CL) reddish brown, moist, stiff, trace gravel	922.9	SS 8	67	12-13-15 (28)						
18.0		POORLY GRADED SAND, (SP) light brown, fine grained, dry, medium dense, little medium to coarse gravel	921.9	SS 8	67	12-13-15 (28)						
21.0			918.9	SS 9	33	7-8-8 (16)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-107

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 933.09 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 15 ft S

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5.0	[Cross-hatched pattern]	CLAYEY SAND, (SC) brown, fine to medium grained, dry to moist, little gravel (Fill)	SS 1	44	3-5-9 (14)							
5.0 - 7.0	[Diagonal lines pattern]	LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 2	28	5-5-5 (10)							
7.0 - 12.0	[Dotted pattern]	SILTY SAND, (SM) light brown, fine grained, moist, medium dense to loose	SS 3	67	3-4-5 (9)							
12.0 - 17.0	[Dotted pattern]	LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff, trace gravel	SS 4	56	4-6-7 (13)							
17.0 - 19.5	[Diagonal lines pattern]	SANDY LEAN CLAY, (CL) reddish brown and brown, dry, stiff, iron oxide staining	SS 5	67	4-4-2 (6)							
19.5 - 21.0	[Dotted pattern]	POORLY GRADED SAND, (SP) light brown, medium grained, dry, dense	SS 6	100	3-5-6 (11)							
			SH 7									
			SS 8	100	8-12-16 (28)							
			SS 9	78	7-7-10 (17)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-108

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 915.92 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 10 ft E

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 + H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	915.4									
2.0		CLAYEY SAND, (SC) brown and dark brown, fine grained, moist, loose, trace fine gravel	913.9	56	1-2-4 (6)							
		LEAN CLAY WITH SAND, (CL) gray and brown, moist, medium, trace fine gravel, trace organics		67	3-4-4 (8)							
4.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace fine gravel, iron oxide staining	911.4	78	2-3-3 (6)							
7.0		SANDY LEAN CLAY, (CL) gray brown, moist, medium to rather stiff, trace fine gravel, iron oxide staining	908.9	78	3-3-5 (8)							
12.0		SANDY LEAN CLAY, (CL) dark gray, moist, rather stiff to medium, trace fine gravel	903.9	100	3-5-7 (12)							
15				78	2-3-4 (7)							
20				100	3-3-5 (8)							
21.5			894.4	67								

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-109

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 916.84 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD. US. LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)	916.2									
2.0		LEAN CLAY WITH SAND, (CL) brown, moist, medium	914.8	SS 1	56	2-3-3 (6)						
5.5		SILTY SAND, (SM) light brown, fine to coarse grained, moist, medium dense to very loose, trace fine gravel, trace lenses of silt		SS 2	67	2-4-5 (9)						
6.0		PEAT, (Pt) black, moist, soft	911.3 910.8	SS 3	44	2-2-2 (4)						
		LEAN CLAY WITH SAND, (CL) brown and gray, moist, medium, trace fine to medium gravel		SS 4	100	3-3-3 (6)						
				SS 5	100	2-3-5 (8)						
				SH 7								
12.0		SANDY LEAN CLAY, (CL) gray, moist, rather stiff, trace fine to medium gravel	904.8	SS 6	100	3-5-5 (10)						
17.0		LEAN CLAY WITH SAND, (CL) dark gray, moist, rather stiff, trace fine to medium gravel	899.8	SS 8	100	4-5-6 (11)						
21.0			895.8	SS 9	100	5-5-5 (10)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-110

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 919.86 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 19.50 ft / Elev 900.36 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft N

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		SILTY SAND, (SM) brown, fine to medium grained, moist, some gravel (Fill)	SS 1	67	2-3-3 (6)							
			SS 2	78	5-7-8 (15)							
			SS 3	100	5-6-7 (13)							
7.0		PEAT, (Pt) black, moist, soft	SH 4									
9.5		LEAN CLAY WITH SAND, (CL) gray brown, moist, soft to medium, trace gravel	SS 5	100	1-1-2 (3)							
			SS 6	100	2-3-4 (7)							
			SS 7	100	3-3-4 (7)							
17.5		LEAN CLAY WITH SAND, (CL) gray, moist to wet, rather stiff, trace gravel	SS 8	100	4-5-6 (11)							
			SS 9	22	2-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-111

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 918.95 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 inches)	918.3									
		CLAYEY SAND, (SC) brown and dark brown, fine grained, moist, trace fine to medium gravel (FILL)	SS 1	56	1-1-2 (3)							
			SS 2	100	4-6-7 (13)							
5		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace fine gravel, peat (Pt) lenses	914.0									
			SS 3	100	4-5-6 (11)							
		LEAN CLAY WITH SAND, (CL) blue gray, moist, medium, trace fine gravel	912.0									
			SS 4	89	3-3-3 (6)							
10		NOTE: Silty sand (SM) seam at 8.0 feet.	909.5									
		LEAN CLAY WITH SAND, (CL) gray and dark brown, moist, medium to stiff, trace fine to medium gravel, iron oxide staining	SS 5	67	3-3-4 (7)							
			SS 6	100	3-4-4 (8)							
15			SS 7	100	2-4-4 (8)							
			SS 8	33	6-8-8 (16)							
20			SH 9	75								
21.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-112

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 923.3 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.6		TOPSOIL (7 inches)	922.7									
		SILTY SAND, (SM) brown, fine grained, moist, loose to medium dense, trace clay	SS 1	78	1-1-3 (4)							
		NOTE: Sand seam (SP) at 2.0 feet.	SS 2	100	5-5-5 (10)							
4.0			919.3									
		SANDY LEAN CLAY, (CL) light brown to tan, moist, rather stiff, trace gravel, iron oxide staining	SH 3	83								
9.5			913.8									
		LEAN CLAY WITH SAND, (CL) light brown, moist, rather stiff, trace fine to coarse gravel	SS 4	100	3-4-5 (9)							
14.5			908.8									
		LEAN CLAY WITH SAND, (CL) gray brown, moist, rather stiff, trace fine to coarse gravel	SS 5	100	4-5-6 (11)							
			SS 6	100	3-4-6 (10)							
			SS 7	100	4-6-8 (14)							
			SS 8	100	3-5-7 (12)							
			SS 9	100	3-5-7 (12)							
21.0			902.3									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-113

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/21/15 COMPLETED 5/21/15 GROUND ELEVATION 900.69 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 7.00 ft / Elev 893.69 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace clay (Fill) 898.7	SS 1	44	3-3-2 (5)							
4.5		SILTY SAND, (SM) dark gray, fine grained, moist, trace gravel, trace organics (Fill) 896.2	SS 2	67	4-4-3 (7)							
7.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium, trace fine to coarse gravel 893.7	SS 3	56	3-4-4 (8)							
7.0		LEAN CLAY WITH SAND, (CL) brown, wet, rather stiff, trace fine to medium gravel 893.7	SS 4	78	4-5-5 (10)							
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to medium, trace fine to medium gravel 888.7	SH 5									
15			SS 6	44	3-5-4 (9)							
20			SS 7	100	4-3-3 (6)							
20			SS 8	100	3-3-4 (7)							
21.0			SS 9	89	2-3-5 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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 Telephone: 651-389-4191

BORING NUMBER NR-114

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 921.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	920.8									
		CLAYEY SAND, (SC) brown, fine to medium grained, dry (Fill)	SS 1	78	3-3-3 (6)							
			SS 2	100	7-9-12 (21)							
4.0		917.7										
		LEAN CLAY WITH SAND, (CL) light brown, dry, medium, trace fine to medium gravel	SS 3	78	2-3-4 (7)							
7.0		914.7										
		SANDY LEAN CLAY, (CL) brown, moist, medium to rather stiff, trace fine to medium gravel, iron oxide staining	SS 4	89	2-3-5 (8)							
			SS 5	100	2-3-5 (8)							
			SH 6									
15			SS 7	100	3-5-7 (12)							
			SS 8	100	2-4-7 (11)							
19.5		902.2										
		SANDY LEAN CLAY, (CL) gray brown, moist, rather stiff, trace fine to medium gravel	SS 9	100	3-5-9 (14)							
21.0		900.7										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-115

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 912.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches)										
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist (Fill)	SS 1	56	1-2-3 (5)							
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	78	7-4-4 (8)							
5.0		LEAN CLAY WITH SAND, (CL) brown, moist, medium to rather stiff, trace gravel	SS 3	89	3-4-5 (9)							
			SH 4									
9.5		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 5	89	3-4-5 (9)							
		NOTE: Sand seam (SP) at 12.5 feet.	SS 6	100	3-5-7 (12)							
			SS 7	100	3-5-7 (12)							
			SS 8	100	3-5-7 (12)							
21.0			SS 9	100	4-6-9 (15)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-116

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 911.44 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.1		TOPSOIL (1 Inch)	911.4									
2.0		LEAN CLAY WITH SAND, (CL) brown, moist, soft, trace gravel, sand lense	909.4	78	2-2-2 (4)							
		LEAN CLAY WITH SAND, (CL) moist, medium, trace gravel		100	3-2-3 (5)							
5				89	2-2-3 (5)							
9.5		LEAN CLAY WITH SAND, (CL) moist, rather stiff to stiff, trace gravel	901.9									
				33	3-5-7 (12)							
				33	9-9-9 (18)							
14.5		LEAN CLAY WITH SAND, (CL) moist, rather stiff, trace gravel	896.9									
				100	3-5-7 (12)							
				100	4-6-8 (14)							
21.0			890.4									
				100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-117

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/19/15 COMPLETED 5/19/15 GROUND ELEVATION 908.79 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 12.00 ft / Elev 896.79 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	2-3-3 (6)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel	SS 2	67	3-6-6 (12)							
7.0		SILTY LEAN CLAY, (CL-ML) tan and gray, moist, rather stiff, trace gravel	SS 3	83	4-7-6 (13)							
9.5		LEAN CLAY WITH SAND, (CL) brown, moist to wet, rather stiff	SS 4	100	4-6-6 (12)							
12.0	∇		SH 5									
14.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 6	100	3-5-6 (11)							
17.0		CLAYEY SAND, (SC) gray, fine to medium grained, saturated, loose NOTE: No recovery at 17.0 feet. Sampled auger cuttings.	SS 7	0	3-3-4 (7)							
19.5		LEAN CLAY WITH SAND, (CL) dark gray, wet, rather stiff, trace gravel	SS 8									
21.0			SS 9	100	5-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-118

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CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/28/15 COMPLETED 5/28/15 GROUND ELEVATION 0 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A AT TIME OF DRILLING 2.00 ft / Elev -2.00 ft
 LOGGED BY _____ CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. not provided. AFTER DRILLING ---
Boring not staked. Estimated location from drawing.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	-0.8									
2.0		SILTY SAND, (SM) brown, fine to medium grained, saturated, very loose, trace gravel	-2.0									
		PEAT, (Pt) black and dark gray, saturated, soft										
4.6		SILTY SAND, (SM) brown, fine grained, saturated, medium dense, trace fine to medium gravel	-4.6									
7.0		CLAYEY SAND, (SC) dark gray, fine grained, saturated, medium dense, trace fine gravel, trace roots	-7.0									
9.5		LEAN CLAY WITH SAND, (CL) brown and gray, wet, rather stiff, trace gravel	-9.5									
17.0		SILTY LEAN CLAY, (CL-ML) gray, wet, rather stiff, trace fine gravel	-17.0									
19.5		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace fine gravel	-19.5									
21.0		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace fine gravel	-21.0									

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-119

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/23/15 **COMPLETED** 6/23/15 **GROUND ELEVATION** 0 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 2.60 ft / Elev -2.60 ft
LOGGED BY BH **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. not provided. **AFTER DRILLING** ---
Boring not staked. Estimated location from drawing.

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
2.0		CLAYEY SAND, (SC) brown to dark brown, fine grained, moist, very loose, trace gravel, trace organics, iron oxide staining, trace roots NOTE: Weight of Hammer at Sample No. 1.	SS 1	33	0-1-2 (3)							
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, saturated, medium dense, trace gravel, iron oxide staining	SS 2	100	3-5-5 (10)							
			SS 3	100	4-6-6 (12)							
7.0		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel	SS 4	100	3-3-4 (7)							
			SH 5									
			SS 6	100	1-3-3 (6)	1.0						
			SS 7	100	1-3-3 (6)							
			SS 8	100	1-3-3 (6)	0.8						
			SS 9	100	1-3-3 (6)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER NR-120

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 885.05 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, dry (Fill) 883.6	SS 1	56	4-4-3 (7)							
4.0	[Cross-hatched pattern]	SILTY SAND, (SM) brown, fine grained, moist (Fill) 881.1	SS 2	44	6-8-8 (16)							
5	[Dotted pattern]	SILTY SAND, (SM) gray, fine grained, moist, medium dense, little gravel 878.1	SS 3	78	4-6-4 (10)							
7.0	[Dotted pattern]	CLAYEY SAND, (SC) gray, fine to medium grained, moist, medium dense 878.1	SS 4	78	4-4-5 (9)							
10	[Diagonal lines]	LEAN CLAY WITH SAND, (CL) gray, moist, soft to medium, trace gravel 875.6	SS 5	78	3-3-2 (5)							
15	[Diagonal lines]		SS 6	100	2-3-2 (5)							
	[Diagonal lines]		SS 7	100	2-1-3 (4)							
	[Diagonal lines]		SS 8	100	3-3-4 (7)							
20	[Diagonal lines]		SS 9	100	2-2-3 (5)							
21.0	[Diagonal lines]											

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-121

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 884.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 7.00 ft / Elev 877.12 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 26 ft NE

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill) 882.6	SS 1	44	3-2-1 (3)							
3.5	[Dotted pattern]	SILTY SAND, (SM) gray, fine grained, moist (Fill) 880.6 NOTE: Clay (CL) seam at 2.0 feet.	SS 2	67	2-2-2 (4)							
5	[Dotted pattern]	SILTY SAND, (SM) gray, fine grained, moist to saturated, medium dense to loose, trace gravel	SS 3	56	3-6-7 (13)							
8.0	[Dotted pattern]	▽ LEAN CLAY WITH SAND, (CL) dark gray, moist, medium, trace gravel 876.1	SS 4	56	2-2-3 (5)							
10	[Diagonal hatching]		SS 5	67	2-2-3 (5)							
15	[Diagonal hatching]		SS 6	100	3-3-3 (6)							
15	[Diagonal hatching]		SS 7	89	2-3-5 (8)							
20	[Diagonal hatching]		SS 8	100	3-3-4 (7)							
22.0	[Diagonal hatching]		SH 9									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 22.0 feet.



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BORING NUMBER NR-122

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 886.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 871.54 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (36 Inches)	SS 1	28	3-1-3 (4)							
3.0		883.0 POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose	SS 2	22	4-3-3 (6)							
5		7.0 879.0 SILTY SAND, (SM) black, fine grained, moist, very loose, little organics	SS 3	22	3-2-3 (5)							
10		9.5 876.5 PEAT, (Pt) black, moist, soft	SS 4	67	2-2-2 (4)							
15		14.5 871.5 SH 6	SS 5	78	1-2-1 (3)							
15		14.5 871.5 SILTY SAND, (SM) gray, fine to coarse grained, saturated, very loose to loose NOTE: Hydrocarbon odor by human perception at 15.0 feet.	SS 6	78	2-2-2 (4)							
17.8		868.2 SILTY LEAN CLAY, (CL-ML) gray, wet, medium, trace gravel	SS 7	33	2-3-3 (6)							
20		21.0 865.0 NOTE: Sand (SP) seam at 20.0 feet.	SS 8	78	3-3-3 (6)							
21.0		865.0	SS 9	78	3-3-3 (6)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-123

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 885.83 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 8.50 ft / Elev 877.33 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2	ASPHALT (2 Inches)	885.7	SS 1	56	1-3-1 (4)							
2.0	POORLY GRADED SAND WITH SILT, (SP) brown, fine to coarse grained, dry, some fine to coarse gravel (Fill)	883.8	SS 2	56	10-12-13 (25)							
3.5	POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine grained, moist, trace fine gravel (Fill)	882.3	SS 3	67	6-11-19 (30)							
5	SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, dense to very loose		SS 4	78	7-9-9 (18)							
10	▽		SS 5	89	2-1-1 (2)							
12.0	SILTY SAND, (SM) dark gray, fine grained, saturated, loose, trace peat	873.8	SS 6	100	2-3-4 (7)							
15			SS 7	89	2-3-3 (6)							
17.2	SILTY LEAN CLAY, (CL-ML) blue gray, wet, medium, little fine to coarse gravel, trace sand	868.6	SS 8	89	2-3-4 (7)							
20			SS 9	89	2-3-2 (5)							
20.5		865.3										
21.0	SANDY LEAN CLAY, (CL) gray, wet, medium, trace fine gravel	864.8										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-124

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 885.19 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 8.50 ft / Elev 876.69 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 1	56	3-3-4 (7)							
		SILTY SAND, (SM) light brown to gray, fine grained, moist to saturated, dense to medium dense	SS 2	89	4-8-10 (18)							
5			SS 3	56	8-11-10 (21)							
			SS 4	78	8-11-12 (23)							
10			SS 5	33	5-5-8 (13)							
11.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 6	89	4-3-2 (5)							
15			SH 7									
			SS 8	78	3-3-4 (7)							
20			SS 9	89	4-6-4 (10)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies, Inc.
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 Telephone: 651-389-4191

BORING NUMBER NR-125

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 885.98 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 11.00 ft / Elev 874.98 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 + H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		POORLY GRADED SAND, (SP) brown, fine grained, dry, little gravel (Fill)	SS 1	33	6-5-4 (9)							
882.5			SS 2	44	8-11-11 (22)							
5		SILTY SAND, (SM) brown, fine grained, moist, dense, trace gravel	SS 3	67	8-13-12 (25)							
9.5			SS 4	78	9-12-12 (24)							
10		SILTY SAND, (SM) dark gray to black, fine grained, moist, loose, trace gravel, organic stain	SS 5	89	3-2-3 (5)							
10.5		PEAT, (Pt) black, saturated, medium										
13.3		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to loose	SS 6	89	4-4-3 (7)							
15			SS 7	78	4-4-4 (8)							
20			SS 8	100	3-5-4 (9)							
21.0			SS 9	100	4-4-3 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-126

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 883.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 871.67 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.5		POORLY GRADED SAND WITH SILT, (SP-SM) fine to medium grained, moist, trace gravel (Fill)	SS 1	56	3-4-4 (8)							
881.2												
5		SILTY SAND, (SM) brown, fine grained, moist, dense, trace gravel, clay (CL) lenses	SS 2	100	5-12-13 (25)							
8.0												
8.0		PEAT, (Pt) black, moist, rather stiff, trace gravel	SS 4	78	6-8-12 (20)							
10												
13.0			SH 5									
870.7												
13.0		SILTY SAND, (SM) gray, fine grained, saturated, loose to dense, peat (Pt) lenses	SS 6	67	3-5-5 (10)							
15												
15			SS 7	78	5-4-4 (8)							
20												
20			SS 8	67	10-15-12 (27)							
21.0												
21.0			SS 9	89	10-11-11 (22)							

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-127

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 885.56 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 8.00 ft / Elev 877.56 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		ASPHALT (3 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, dry, trace gravel (Fill)	SS 1	56	6-7-6 (13)							
		SILTY SAND, (SM) brown to gray, fine grained, moist to saturated, dense	SS 2	67	8-11-12 (23)							
			SS 3	89	8-11-11 (22)							
			SS 4	78	7-10-12 (22)							
9.5		SILTY SAND, (SM) dark gray, fine grained, saturated, dense to loose, silt (ML) lenses	SS 5	78	6-8-9 (17)							
			SS 6	67	4-3-2 (5)							
14.5		SILTY SAND, (SM) black and gray, saturated, loose, trace to some organic materials	SS 7	89	7-3-2 (5)							
			SH 8									
19.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 9	78	4-4-5 (9)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-128

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 912.47 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 2.00 ft / Elev 910.47 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft N

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (24 Inches)										
2.0	▽	NOTE: Weight of Hammer at Sample No. 1.										
2.0		SANDY LEAN CLAY, (CL) light brown and gray, wet, medium, trace fine gravel, iron oxide staining	SS 1	28	0-0-0 (0)							
5			SS 2	78	2-2-3 (5)							
5			SS 3	100	2-3-4 (7)							
5			SS 4	100	3-3-5 (8)							
10			SH 5									
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 6	100	3-3-5 (8)							
15			SS 7	100	2-4-4 (8)							
15			SS 8	100	3-4-6 (10)							
20			SS 9	100	3-4-4 (8)							
23.5			SS 10	100	3-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 23.5 feet.



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BORING NUMBER NR-129

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 903.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft E

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (24 Inches)										
2.0		NOTE: Weight of Hammer at Sample No. 1. No recovery. Sampled auger cuttings.	SS 1	0	0-0-0 (0)							
2.0		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	SH 2	58								
5			SS 3	94	2-3-4 (7)							
10			SS 4	100	3-3-4 (7)							
15			SS 5	94	2-4-4 (8)							
15			SS 6	100	2-5-5 (10)							
20			SS 7	100	4-4-6 (10)							
20			SS 8	100	4-5-7 (12)							
21.0			SS 9	100	4-6-9 (15)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

882.1



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BORING NUMBER NR-130

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 915.53 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 10 ft W

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)										
		LEAN CLAY WITH SAND, (CL) light brown to brown, moist, soft to rather stiff, trace gravel	SS 1	44	0-0-1 (1)							
			SS 2	67	2-3-4 (7)							
		NOTE: Weight of Hammer at Sample No. 1.										
5			SS 3	100	3-3-5 (8)							
			SS 4	100	4-5-7 (12)							
10			SH 5	92								
			SS 6	100	3-5-7 (12)							
15			SS 7	100	3-6-7 (13)							
17.0		LEAN CLAY WITH SAND, (CL) gray, moist, rather stiff, trace gravel	SS 8	100	3-4-6 (10)							
20			SS 9	100	2-4-7 (11)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-131

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 906.2 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 +H1+PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		LEAN CLAY WITH SAND, (CL) brown, moist, soft to rather stiff, trace gravel	SS 1	0	0-0-0 (0)							
		NOTE: Weight of Hammer at Sample No. 1. No recovery. Sampled auger cuttings.	SS 2	78	7-5-5 (10)							
			SS 3	89	5-6-6 (12)							
			SS 4	94	3-5-5 (10)							
			SH 5									
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel	SS 6	83	2-4-5 (9)							
			SS 7	89	2-4-4 (8)							
			SS 8	100	2-4-6 (10)							
21.0			SS 9	100	2-5-7 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-132

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 894.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 12.50 ft / Elev 881.93 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 20 ft NW

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 + H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTNR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	893.6									
		LEAN CLAY WITH SAND, (CL) gray, moist, soft to rather stiff, trace gravel	SS 1	67	0-1-3 (4)							
3.5			890.9									
		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose, trace gravel	SS 2	56	5-5-7 (12)							
5												
			SS 3	78	5-4-4 (8)							
			SS 4	44	3-3-3 (6)							
10			SH 5									
12.0			882.4									
		∇ CLAYEY SAND, (SC) gray, fine to medium grained, saturated, medium dense, trace gravel	SS 6	89	4-6-7 (13)							
13.5			880.9									
		SILTY SAND, (SM) gray, fine grained, saturated, dense, trace gravel	SS 7	56	8-9-11 (20)							
15												
			SS 8	56	7-9-11 (20)							
20												
			SS 9	56	8-10-11 (21)							
21.0			873.4									

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-133

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 887.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 6.00 ft / Elev 881.80 ft
LOGGED BY _____ **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) reddish brown, fine to medium grained, moist, fine to medium gravel (Fill) 885.8	SS 1	44	3-2-3 (5)							
4.5		SILTY SAND, (SM) brown, fine grained, moist (Fill) 883.3	SS 2	56	4-4-5 (9)							
5		SILTY SAND, (SM) gray and brown, fine grained, moist to saturated, loose to medium dense 878.3	SS 3	67	4-3-6 (9)							
9.5		SILTY SAND, (SM) brown, fine grained, saturated, loose 878.3	SS 5	78	2-3-2 (5)							
13.0		PEAT, (Pt) black, moist, soft 874.8	SS 6	56	3-3-4 (7)							
15			SS 7	89	3-2-2 (4)							
19.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense 868.3	SH 8									
21.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense 866.8	SS 9	100	4-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER NR-134

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/23/15 **COMPLETED** 6/23/15 **GROUND ELEVATION** 949.77 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --
LOGGED BY BH **CHECKED BY** DAS **AT END OF DRILLING** --
NOTES Elev. at staked location. **AFTER DRILLING** --

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:28 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\NR-NATURAL RESOURCES CORRIDOR.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
		CLAYEY SAND, (SC) light brown to brown, fine to medium grained, moist, loose to medium dense, little gravel, iron oxide staining NOTE: Weight of Hammer at Sample No. 1.	SS 1	22	0-2-3 (5)							
			SS 2	89	4-6-7 (13)							
		PEAT, (Pt) black, moist, rather stiff										
5		CLAYEY SAND, (SC) light brown to brown, fine to coarse grained, moist to dry, dense to very dense, little gravel, iron oxide staining	SS 3	56	6-14-12 (26)							
			SS 4	78	9-13-14 (27)							
			SS 5	67	14-14-14 (28)							
			SS 6	78	6-16-20 (36)							
			SS 7	89	8-16-20 (36)							
			SS 8	83	8-19-19 (38)							

NOTE: Practical auger refusal at 19.0 feet due to coarse gravel.
 Borehole backfilled with auger cuttings.
 Bottom of borehole at 19.0 feet.



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BORING NUMBER SR-200

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/30/15 **COMPLETED** 6/30/15 **GROUND ELEVATION** 925.18 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.00 ft / Elev 911.18 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 31 ft S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		SILTY SAND, (SM) brown, fine grained, moist, loose to very loose, trace gravel	SS 1	33	2-3-2 (5)							
			SS 2	56	3-3-3 (6)							
5			SS 3	33	2-2-1 (3)							
7.0		SILTY LEAN CLAY, (CL-ML) dark gray, moist, soft NOTE: Weight of Hammer at 7.0 feet.	SS 4	78	0-1-2 (3)							
9.5		PEAT, (Pt) black, moist to wet, soft	SH 5									
		NOTE: Sand (SP) lenses at 12.0 feet.	SS 6	67	1-2-2 (4)							
15			SS 7	44	1-2-2 (4)							
17.5		POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, very loose	SS 8	56	1-1-2 (3)							
20.0		POORLY GRADED SAND, (SP) gray, fine to medium grained, saturated, very loose, trace gravel	SS 9	78	1-2-2 (4)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER SR-201

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 951.1 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	950.6									
1.5		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, moist (Fill)	949.6	78	6-8-3 (11)							
3.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	948.1	78	4-5-6 (11)							
5		SANDY LEAN CLAY, (CL) gray, moist, medium to stiff, trace gravel		33	3-4-4 (8)							
			SH 4									
10			SS 5	89	3-4-6 (10)							
			SS 6	89	5-7-11 (18)							
15			SS 7	78	8-11-12 (23)							
			SS 8	72	7-9-12 (21)							
20			SS 9	67	8-10-13 (23)							
20.0		POORLY GRADED SAND WITH GRAVEL, (SP) gray to brown, fine to medium grained, moist, dense	931.1									
21.0			930.1									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-202

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 955.31 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	954.8									
1.5		SILTY SAND WITH GRAVEL, (SM) brown, moist (Fill)	953.8	33	3-4-5 (9)							
		LEAN CLAY WITH SAND, (CL) brown to gray, fine grained, moist, rather stiff to very stiff, trace gravel		78	4-6-8 (14)							
5			SS 3	78	5-7-8 (15)							
			SS 4	100	4-7-9 (16)							
10			SS 5	100	5-7-8 (15)							
			SS 6	100	5-10-12 (22)							
15			SS 7	100	5-9-11 (20)							
			SS 8	100	5-15-25 (40)							
20			SH 9									
21.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 956.01 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist, occasional clayey sand (SC) seams (Fill) NOTE: Rock in tip of Split-Spoon	SS 1	44	1-1-1 (2)							
			SS 2	56	8-6-6 (12)							
5		951.5										
7.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	SS 3	56	7-9-10 (19)							
			SS 4	67	2-4-7 (11)							
10		949.0										
10.0		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense to loose	SS 5	67	4-4-4 (8)							
			SH 6									
15		946.0										
			SS 7	56	2-3-4 (7)							
			SS 8	100	4-8-10 (18)							
20			SS 9									
21.0		935.0										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-204

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 954.6 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft N **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense to loose	SS 1	67	4-4-5 (9)							
			SS 2	56	4-4-6 (10)							
5		NOTE: Sand lense at 4.5 feet	SS 3	78	1-4-4 (8)							
6.0		CLAYEY SAND, (SC) brown, moist, dense, trace gravel	SH 4					14	25	13	12	44
			SS 5	44	3-7-10 (17)							
			SS 6	100	7-8-10 (18)							
			SS 7	100	5-9-11 (20)							
17.0		CLAYEY SAND, (SC) brown, fine to coarse grained, moist, very dense, trace coarse gravel NOTE: Hard drilling due to coarse gravel at 17.0 feet.	SS 8	68	32/6"							
19.5		SANDY LEAN CLAY, brown, moist, stiff, little fine to coarse gravel	SS 9	44	10-13-14 (27)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-205

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 951.02 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft SE **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)	SS 1	67	5-6-6 (12)							
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist, medium dense	SS 2	56	6-6-8 (14)							
4.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense	SS 3	67	4-7-10 (17)							
5		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff to very stiff, trace gravel, sand lenses at 12.0 feet	SS 4	83	6-8-8 (16)							
10			SS 5	78	6-8-12 (20)							
15			SS 6	100	6-8-10 (18)							
20			SS 7	100	5-7-7 (14)							
			SH 8									
21.0			SS 9	100	9-15-19 (34)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-206

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 942.32 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft N **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist (Fill)	SS 1	44	9-10-10 (20)							
			SS 2	56	8-8-6 (14)							
5		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 3	100	5-6-6 (12)							
7.0		CLAYEY SAND, (SC) brown, fine to medium grained, moist, medium dense	SS 4	78	3-5-6 (11)							
9.5		LEAN CLAY WITH SAND, (CL) brown, moist, stiff to very stiff, little gravel	SH 5									
			SS 6	89	7-9-10 (19)							
			SS 7	100	8-10-11 (21)							
		NOTE: No Recovery due to coarse gravel at 17.0 feet. Sampled auger cuttings.	SS 8	0	13-20-25 (45)							
20		NOTE: No Recovery due to coarse gravel at 19.5 feet. Sampled auger cuttings.	SS 9	0	13-22-27 (49)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-207

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 938.51 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill)	SS 1	44	9-9-10 (19)							
3.0		CLAYEY SAND, (SC) gray, moist, medium dense	SS 2	56	5-9-12 (21)							
5			SH 3					16	29	14	15	43
10			SS 4	89	3-4-5 (9)							
10			SS 5	89	4-5-4 (9)							
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to stiff, trace gravel	SS 6	100	3-3-3 (6)							
15			SS 7	44	4-5-6 (11)							
20			SS 8	44	7-12-11 (23)							
21.0			SS 9	33	5-8-10 (18)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-208

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 935.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill) 933.6	SS 1	39	4-6-7 (13)							
4.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill) 931.6	SS 2	100	5-5-5 (10)							
5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose to medium dense, trace gravel	SS 3	17	2-3-4 (7)							
			SH 4									
10			SS 5	67	3-5-6 (11)							
12.0		LEAN CLAY WITH SAND, (CL) brown, moist, rather stiff to stiff, trace gravel 923.6	SS 6	89	4-5-5 (10)							
15			SS 7	89	5-6-6 (12)							
			SS 8	78	5-7-10 (17)							
20			SS 9	56	9-12-12 (24)							
20.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, dense, trace gravel 915.6										
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-209

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 911.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, moist, trace gravel (Fill)	SS 1	33	2-3-4 (7)							
908.0		SANDY LEAN CLAY, (CL) brown to gray, moist, medium to rather stiff, trace gravel	SS 2	67	3-4-4 (8)							
5			SS 3	67	4-4-5 (9)							
10			SS 4	100	3-4-4 (8)							
15			SH 5									
			SS 6	100	1-3-4 (7)							
			SS 7	100	2-3-5 (8)							
			SS 8	100	2-3-4 (7)							
21.0			SS 9	89	2-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-210

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 913.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.50 ft / Elev 909.14 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 6 ft NE **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) some gravel (Fill)	SS 1	33	1-2-3 (5)							
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) fine to medium grained, dense, trace gravel	SS 2	78	5-12-14 (26)							
5.0		CLAYEY SILT, (SC) saturated, trace gravel										
6.0		POORLY GRADED SAND WITH SILT, (SP-SM) saturated, trace gravel	SS 3	17								
8.5		CLAYEY SAND, (SC) gray, saturated, loose to dense, trace gravel	SS 4	22								
10.0			SS 5	33	4-6-6 (12)							
12.0			SS 6	89	3-3-4 (7)							
14.0			SS 7	89	4-5-7 (12)							
16.0			SS 8	17	5-7-8 (15)							
18.0			SS 9	11	5-8-10 (18)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-211

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 907.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	906.9									
3.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill) NOTE: No recovery at 2.0 feet. Sampled auger cuttings.	904.4									
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose to medium dense, trace gravel										
9.5		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel	897.9									
12.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel	895.4									
15												
20												
21.0			886.4									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-212

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 894.22 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 879.72 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft NW **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		FILL/TOPSOIL, (SC) black, very loose to loose, with organics	893.2	SS 1	78	1-1-1 (2)						
3.5		SANDY LEAN CLAY, (CL) gray, moist to wet, medium to rather stiff, trace gravel	890.7	SS 2	33	2-2-2 (4)						
5				SS 3	78	1-3-3 (6)						
				SS 4	100	3-4-5 (9)						
10		NOTE: Trace gravel below 9.5 feet.		SS 5	100	3-5-5 (10)						
				SH 6				14	23	10	13	52
15				SS 7	78	2-2-3 (5)						
				SS 8	100	2-3-4 (7)						
20				SS 9	100	3-4-5 (9)						
21.0			873.2									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-213

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 890.76 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 878.76 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SILTY SAND WITH GRAVEL, (SM) fine grained, moist (Fill) NOTE: Sampled auger cutting.	SS 1	0	8-4-6 (10)							
4.0		886.8	SS 2	78	16-12-15 (27)							
5		LEAN CLAY WITH SAND, (CL) moist, stiff to rather stiff, trace gravel	SS 3	44	8-9-11 (20)							
8.5		882.3	SS 4	83	2-6-8 (14)							
10		SILTY SAND, (SM) fine grained, moist, loose, trace gravel	SS 5	78	3-3-5 (8)							
11.0		879.8	SS 6	89	3-3-4 (7)							
15		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium to rather stiff, trace gravel <input checked="" type="checkbox"/>	SH 7									
			SS 8	100	2-4-5 (9)							
20			SS 9	100	3-5-7 (12)							
21.0		869.8										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 890.28 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 880.78 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	67	4-4-3 (7)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 2	56	4-5-5 (10)							
5		SILTY SAND, (SM) brown to gray, fine grained, moist to saturated, medium dense to dense	SS 3	67	6-7-6 (13)							
10			SS 4	56	4-4-5 (9)							
15			SS 5	56	6-7-7 (14)							
			SS 6	89	5-5-5 (10)							
			SS 7	100	6-8-7 (15)							
18.5			SS 8	56	8-8-9 (17)							

Borehole backfilled soil cuttings.
 Bottom of borehole at 18.5 feet.



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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 889.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 882.66 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND, (SP-SM) brown, fine to coarse grained, moist, trace gravel (Fill) 888.2	SS 1	44	3-4-3 (7)							
3.5		SILTY SAND, (SM) gray to brown, fine grained, moist (Fill) 886.2	SS 2	56	5-4-6 (10)							
5		SILTY SAND, (SM) brown, fine grained, moist to saturated, medium dense NOTE: Borehole wet cave-in at 5.7 feet.	SS 3	78	4-5-4 (9)							
		<input checked="" type="checkbox"/> AT TIME OF DRILLING 7.00 ft / Elev 882.66 ft	SS 4	67	6-6-7 (13)							
10			SS 5	100	6-8-6 (14)							
12.0		SILTY SAND, (SM) light brown, fine grained, saturated, dense to medium dense 877.7	SS 6	100	6-8-9 (17)							
15			SS 7	100	6-4-10 (14)							
			SS 8	100	4-10-5 (15)							
20		NOTE: Fine to coarse grained below 19.5 feet.	SS 9	100	5-6-6 (12)							
21.0		868.7										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-216

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 887.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 880.29 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		SILTY SAND, (SM) brown, fine to medium grained, moist, trace gravel (Fill)	887.0									
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist (Fill)	885.8	SS 1	67	3-5-5 (10)						
3.5		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist, medium dense (Fill)	883.8	SS 2	56	3-6-6 (12)						
5		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist, medium dense		SS 3	67	5-7-6 (13)						
6.0		SILTY SAND, (SM) light brown, fine grained, moist, medium dense, trace gravel	881.3	SS 4	44	3-3-4 (7)						
		POORLY GRADED SAND WITH SILT, (SP-SM) light brown, fine to medium grained, moist to saturated, loose, trace gravel		SS 5	44	1-2-2 (4)						
11.0			876.3									

NOTE: Boring terminated at 11.0 feet due to borehole cave-in.

Borehole backfilled with auger cuttings.
 Bottom of borehole at 11.0 feet.

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 886.05 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 879.05 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
5		SILTY SAND, (SM) brown, fine grained, moist to saturated, loose to medium dense, trace gravel ∇	SS 1	56	4-6-5 (11)							
			SS 2	67	4-9-7 (16)							
			SS 3	78	4-5-4 (9)							
8.5		877.6	SS 4	100	3-3-2 (5)							
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, saturated, medium dense, trace gravel	SS 5	89	5-7-6 (13)							
14.5		871.6	SH 6									
15		SILTY SAND, (SM) brown, medium to coarse grained, saturated, medium dense, trace gravel	SS 7	100	4-6-7 (13)							
17.0		869.1										
18.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, loose	SS 8	78	3-3-2 (5)							
20		867.6										
		SANDY LEAN CLAY, (CL) gray, saturated, medium, trace gravel										
21.0		865.1	SS 9	67	3-3-4 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-218

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 883.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 14.50 ft / Elev 869.17 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist (Fill)	SS 1	56	6-7-6 (13)							
5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 2	56	8-8-9 (17)							
7.0		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, moist, dense	SS 3	67	7-6-9 (15)							
9.5		PEAT, (Pt) black to dark gray, moist, rather stiff	SS 4	56	10-11-13 (24)							
14.5		SILTY SAND, (SM) gray, fine to medium grained, saturated, medium dense	SS 5	67	4-5-6 (11)							
			SH 6									
			SS 7	56	4-4-5 (9)							
			SS 8	100	6-7-7 (14)							
			SS 9	89	7-6-6 (12)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 898.15 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT (1.5 Inches)										
0.1		BASE (4 Inches)										
0.5		POORLY GRADED SAND WITH SILT, (SP-SM) light brown to brown, fine to medium grained, dry to moist, trace gravel (Fill)	SS 1	44	8-11-11 (22)							
			SS 2	67	10-11-12 (23)							
			SS 3	67	9-10-12 (22)							
			SS 4	89	10-8-9 (17)							
			SS 5	78	10-11-13 (24)							
5		POORLY GRADED SAND, (SP-SM) brown, fine to medium grained, moist, little gravel, apparent roadway base material (Fill)	SS 6	100	13-15-16 (31)							
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, dry, dense, trace gravel	SS 7	56	8-12-11 (23)							
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, medium dense	SS 8	89	6-8-6 (14)							
			SS 9	100	6-7-7 (14)							
10												
15												
20												
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-220

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 884.33 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		TOPSOIL (2 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, trace gravel (Fill)	SS 1	67	8-10-11 (21)							
		SILTY SAND, (SM) light brown to gray, fine grained, moist (Fill)	SS 2	56	9-13-15 (28)							
5			SS 3	67	8-11-12 (23)							
			SS 4	67	3-5-5 (10)							
9.5		SILTY SAND, (SM) gray, fine grained, moist, asphalt pieces (Fill)	SS 5	100	32/6"							
12.0		SILTY SAND, (SM) gray, fine grained, moist, trace gravel (Fill)	SS 6	67	6-6-7 (13)							
14.5		SILTY SAND, (SM) dark gray to gray, fine grained, moist, loose, organic stain	SS 7	56	2-2-3 (5)							
			SS 8	100	4-3-4 (7)							
20			SS 9	56	3-3-5 (8)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-221

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NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/5/15 09:35 - H:\RAMSEY11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936,100)\ENGINEERING\ENGINEERING REPORTS\GINT\SR SPINE ROAD.GPJ

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 892.07 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 15.30 ft / Elev 876.77 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		TOPSOIL (2 Inches)										
		SILTY SAND, (SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	4-2-4 (6)							
			SS 2	89	3-3-4 (7)							
3.5		SILTY SAND, (SM) light brown, fine grained, moist, loose to medium dense										
			SS 3	67	3-4-4 (8)							
			SS 4	78	4-6-8 (14)							
			SS 5	100	4-6-8 (14)							
12.0		SILTY SAND, (SM) light brown, fine grained, moist to saturated, loose to medium dense										
			SS 6	89	3-5-4 (9)							
			SS 7	78	3-3-5 (8)							
			SS 8	78	4-5-7 (12)							
21.0			SS 9	56	5-7-9 (16)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 897.17 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.70 ft / Elev 879.47 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, very loose, trace gravel	SS 1	56	2-2-2 (4)							
		SILTY SAND, (SM) brown to light brown, fine grained, moist, very loose to dense	SS 2	78	2-3-2 (5)							
5			SS 3	56	2-1-2 (3)							
			SS 4	78	5-9-9 (18)							
10			SS 5	78	4-5-7 (12)							
			SS 6	67	4-6-7 (13)							
15		SILTY SAND, (SM) light brown, fine grained, moist to saturated, loose to medium dense	SS 7	78	2-3-5 (8)							
			SS 8	56	4-6-7 (13)							
20			SS 9	78	5-6-7 (13)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 898.48 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 17.20 ft / Elev 881.28 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
			SS 1	67	1-3-2 (5)							
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, loose, trace gravel										
			SS 2	78	2-2-3 (5)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, loose, trace medium to coarse gravel										
			SS 3	67	1-2-2 (4)							
			SS 4	78	1-2-2 (4)							
			SS 5	67	1-1-3 (4)							
			SS 6	78	2-3-4 (7)							
			SS 7	22	2-3-3 (6)							
			SS 8	67	5-8-10 (18)							
21.0			SS 9	78	8-10-10 (20)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-224

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CLIENT <u>Carl Bolander and Sons, Co.</u>	PROJECT NAME <u>Ramsey County Re-Development Site (TCAAP)</u>
PROJECT NUMBER <u>15.60936.100</u>	PROJECT LOCATION <u>Arden Hills, MN</u>
DATE STARTED <u>5/28/15</u> COMPLETED <u>5/28/15</u>	GROUND ELEVATION <u>899.93 ft</u> HOLE SIZE <u>"6 1/2" inches</u>
DRILLING CONTRACTOR <u>NTI</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>3 1/4 in H.S.A</u>	▽ AT TIME OF DRILLING <u>16.00 ft / Elev 883.93 ft</u>
LOGGED BY <u>DAS</u> CHECKED BY <u>DAS</u>	AT END OF DRILLING <u>---</u>
NOTES <u>Elev. at staked location.</u>	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose	SS 1	78	3-3-2 (5)							
		SILTY SAND, (SM) brown to light brown, fine grained, moist to saturated, very loose to dense	SS 2	67	2-2-2 (4)							
5			SS 3	56	2-2-3 (5)							
		NOTE: Trace gravel at 7.0 feet.	SS 4	44	1-2-2 (4)							
10			SS 5	78	3-5-6 (11)							
			SS 6	67	3-4-5 (9)							
15			SS 7	67	2-2-3 (5)							
			SS 8	56	5-9-9 (18)							
20			SS 9	56	5-9-12 (21)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER SR-225

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/8/15 **COMPLETED** 6/8/15 **GROUND ELEVATION** 898.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		POORLY GRADED SAND WITH SILT, (SP-SM) light brown to dark brown, fine to medium grained, moist, medium dense to very loose	SS 1	56	3-4-3 (7)							
			SS 2	78	5-5-5 (10)							
5			SS 3	89	3-3-3 (6)							
			SS 4	78	5-6-6 (12)							
10			SS 5	78	4-5-6 (11)							
			SS 6	67	2-2-2 (4)							
15			SS 7	56	2-3-3 (6)							
			SS 8	56	3-2-3 (5)							
20			CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose	SS 9	67	4-4-3 (7)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER TR-300

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 955.22 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		BITUMINOUS PAVEMENT (4 Inches)	AU 1									
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	SS 2	67	4-4-7 (11)							
5		CLAYEY SAND, (SC) reddish brown, fine to coarse grained, moist, medium dense to dense, trace gravel, iron oxide staining	SS 3	100	6-6-7 (13)			10	31	13	18	42
9.5		LEAN CLAY WITH SAND, (CL) reddish brown, moist, stiff, trace medium to coarse gravel	SS 5	22	8-10-9 (19)							
12.0		CLAYEY SAND, (SC) reddish brown, fine to medium grained, moist, dense, trace gravel	SS 6	100	7-9-8 (17)							
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER TR-301

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 960.7 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		BITUMINOUS PAVEMENT (2.5 Inches)	AU 1									
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, dry, trace fine to coarse gravel (Fill)	SS 2	44	10-15-15 (30)							
4.5		CLAYEY SAND, (SC) gray, fine grained, moist, trace gravel (Fill)	SS 3	67	9-10-10 (20)							
7.0		POORLY GRADED SAND, (SP) reddish brown, fine to medium grained, dry to moist, trace medium to coarse gravel (Fill)	SS 4	89	7-9-8 (17)							
9.5		SILTY SAND, (SM) reddish brown, fine grained, moist, dense, trace gravel	SS 5	67	10-11-12 (23)							
12.0		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist, dense, trace fine to medium gravel	SS 6	100	32							
12.5		LEAN CLAY WITH SAND, (CL) gray, moist, very stiff, trace coarse gravel										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 12.5 feet.



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BORING NUMBER TR-302

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 956.27 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 Inches)	955.6									
1.5		CLAYEY SAND, (SC) brown, fine grained, moist, loose, trace gravel, trace organics	954.8	67	2-3-3 (6)							
		SANDY LEAN CLAY, (CL) brown to tan, moist, medium to stiff, trace fine gravel, iron oxide staining		0	2-3-3 (6)							
5		NOTE: No recovery at Sample No. 2. Sampled auger cuttings.										
				56	3-4-4 (8)							
				100	5-5-7 (12)							
10				100	4-5-5 (10)							
13.5				94	5-11-12 (23)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER TR-303

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 943.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 20 ft. S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		CLAYEY SAND, (SC) brown, fine to coarse grained, moist, loose to dense, trace fine to medium gravel, iron oxide staining	SS 1	33	3-3-3 (6)							
			SS 2	44	4-4-4 (8)			11	30	13	17	35
			SS 3	39	3-3-4 (7)							
			SS 4	106	8-9-10 (19)							
			SS 5	133	10-12-12 (24)							
			SS 6	133	11-12-12 (24)							
13.0		POORLY GRADED SAND WITH CLAY AND GRAVEL, (SP-SC) brown, fine to medium grained, moist, dense, fine to coarse gravel										
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER TR-304

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 944.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 30 ft. S **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, dry, loose, fine to coarse gravel	SS 1	44	3-3-3 (6)							
		NOTE: Sampled auger cuttings for Sample No. 2.	SS 2	6	3-2-3 (5)							
3.5		940.5 LEAN CLAY WITH SAND, (CL) brown, moist, medium to stiff, trace fine gravel	SS 3	83	3-3-3 (6)							
5			SS 4	78	10-14-14 (28)							
9.5		934.5 POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine grained, moist, medium dense, trace fine gravel, iron oxide staining	SS 5	44	5-7-7 (14)							
12.0		932.0 SILTY LEAN CLAY, (CL-ML) reddish brown, moist, rather stiff, trace fine gravel	SS 6	100	5-6-7 (13)							
13.5		930.5										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER TR-305

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/22/15 **COMPLETED** 5/22/15 **GROUND ELEVATION** 933.8 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 7.00 ft / Elev 926.80 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 8 ft. SE **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 Inches)										
		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist to saturated, medium dense to dense NOTE: Sand and gravel (SP) layer at 2.5 feet.	SS 1	44	3-4-5 (9)							
			SS 2	44	8-11-10 (21)							
5		NOTE: Sampled auger cuttings for Sample No. 3.	SS 3	22	11-11-8 (19)							
7.0												
		POORLY GRADED SAND, (SP) brown, fine grained, saturated, loose	SS 4	56	3-3-3 (6)							
8.5												
		LEAN CLAY WITH SAND, (CL) brown to gray, wet, medium	SS 5	56	2-2-3 (5)							
10												
11.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 11.0 feet.



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BORING NUMBER TR-306

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 907.55 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 895.55 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 Inches)										
		CLAYEY SAND, (SC) gray brown, fine to medium grained, moist, medium dense, trace fine to medium gravel	SS 1	44	4-8-8 (16)							
			SS 2	56	3-5-5 (10)							
			SS 3	83	4-6-9 (15)							
			SS 4	33	5-7-8 (15)							
8.5		SANDY LEAN CLAY, (CL) blue gray, moist to wet, rather stiff, trace gravel, iron oxide staining										
			SS 5	78	5-6-7 (13)							
			SS 6	89	4-4-5 (9)							
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER TR-307

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 898.93 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 5.00 ft / Elev 893.93 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill)	SS 1	44	2-4-7 (11)							
5			SS 2	56	12-24-24 (48)							
5 - 10		SILTY SAND, (SM) brown, fine to coarse grained, saturated, very dense to loose, trace gravel, few silt lenses	SS 3	67	17-23-24 (47)							
10 - 12.0			SS 4	44	3-3-5 (8)			6				14
12.0 - 12.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense, little gravel	SS 5	44	2-4-8 (12)							
12.5 - 13.0		CLAYEY SAND, (SC) brown, fine grained, saturated, medium dense	SS 6	56	5-6-6 (12)							
13.0 - 13.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense										
Borehole backfilled with auger cuttings. Bottom of borehole at 13.5 feet.												



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BORING NUMBER TR-308

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 894.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 884.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)	893.9									
2.0		SILTY SAND, (SM) dark brown, fine grained, moist, loose, trace gravel	892.4	SS 1	56	2-3-3 (6)						
		POORLY GRADED SAND, (SP) brown, fine grained, moist, loose to medium dense, trace gravel		SS 2	56	4-4-4 (8)						
5				SS 3	33	3-7-9 (16)						
7.0		PEAT, (Pt) black, dry to moist, stiff	887.4									
8.0		SILTY SAND, (SM) gray, fine grained, moist to saturated, dense	886.4	SS 4	89	4-6-12 (18)						
10				SS 5	67	5-8-14 (22)						
13.5			880.9	SS 6		4-8-12 (20)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER TR-309

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 890.43 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.00 ft / Elev 886.43 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
1.5		CLAYEY SAND, (SC) brown, fine to medium grained, moist, loose, trace gravel NOTE: Weight of Hammer at Sample No. 1.	SS 1	100	0-3-4 (7)							
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to medium grained, moist to saturated, medium dense, trace gravel, few clay lenses	SS 2	78	3-4-8 (12)			13				9
			SS 3	89	4-6-9 (15)							
			SS 4	44	2-5-5 (10)							
			SS 5	56	4-6-6 (12)							
12.0		SANDY LEAN CLAY, (CL) gray, saturated, medium, trace gravel, few sand lenses	SS 6		3-4-4 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-400

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 965.77 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	964.9									
		CLAYEY SAND, (SC) brown, moist, loose to medium dense, trace gravel	SS 1	56	4-5-6 (11)							
			SS 2	100	6-4-5 (9)							
4.5		SANDY LEAN CLAY, (CL) brown, moist, medium to very stiff, trace gravel	961.3									
			SS 3	67	3-2-3 (5)							
			SS 4	100	3-4-3 (7)							
10			SH 5					17	29	13	16	51
		NOTE: No recovery. Sampled auger cuttings.										
13.5			952.3									
			SS 6	0	32							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-401

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 954.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		SILTY SAND, (SM) brown, fine to medium grained, moist, little gravel (Fill)	953.1	SS 1	67	5-10-7 (17)						
3.0		CLAYEY SAND, (SC) brown, fine grained, moist, trace gravel (Fill)	951.6	SS 2	56	5-6-7 (13)						
4.5		CLAYEY SAND, (SC) brown, fine grained, moist, medium dense, trace gravel	950.1	SS 3	67	4-3-4 (7)						
		CLAYEY SAND, (SC) brown, fine grained, moist, medium dense to stiff, trace gravel		SS 4	100	5-5-7 (12)						
10				SH 5				12	23	13	10	30
												45
13.5			941.1	SS 6	100	7-8-8 (16)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-402

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 915.63 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 903.63 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 inches)	914.8									
3.0		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist (Fill)	912.6	SS 1	78	3-3-2 (5)						
5.0		POORLY GRADED SAND WITH SILT, (SP-SM) reddish brown, fine to medium grained, moist, loose		SS 2	100	4-6-5 (11)						
7.0			908.6	SS 3	89	4-5-3 (8)						
8.0		CLAYEY SAND, (SC) moist, loose, trace gravel	907.6	SS 4	78	4-3-4 (7)						
10.0		SILTY SAND, (SM) brown, fine to medium grained, moist, medium, trace clay (CL) lenses		SH 5				11				30
12.8			902.8	SS 6	100	4-4-5 (9)						
13.5		CLAYEY SAND, (SC) gray, saturated, medium dense, trace gravel	902.1									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-403

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/4/15 **COMPLETED** 6/4/15 **GROUND ELEVATION** 907.66 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ▽ 7.50 ft / Elev 900.16 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		TOPSOIL (5 inches)	907.2									
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace coarse gravel (Fill)	906.2	SS 1	67	5-4-4 (8)						
2.7		SANDY LEAN CLAY, (CL) brown, moist, rather stiff	905.0	SS 2	100	7-6-7 (13)						
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist to saturated, medium dense		SS 3	100	5-6-6 (12)						
7.7	▽	LEAN CLAY WITH SAND, (CL) brown, wet, medium	900.0	SS 4	78	2-3-3 (6)						
9.5		CLAYEY SAND, (SC) blue gray, saturated, very loose	898.2	SS 5	100	2-2-2 (4)						
12.5		LEAN CLAY, (CL) blue gray, wet, trace gravel	895.2	SH 6								
15.0			892.7									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 15.0 feet.

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BORING NUMBER WM-404

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/5/15 **COMPLETED** 6/5/15 **GROUND ELEVATION** 907.25 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ▽ 12.00 ft / Elev 895.25 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		POORLY GRADED SAND WITH CLAY, (SP-SC) dark brown, fine grained, moist, trace gravel (Fill)	906.3	SS 1	78	6-5-6 (11)						
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, dense, trace gravel	903.8	SS 2	89	7-8-8 (16)						
5				SS 3	89	11-10-8 (18)						
7.0		SILTY SAND, (SM) light brown, fine grained, moist to saturated, dense to medium dense, trace gravel	900.3	SH 4	100							
10				SS 5	100	10-10-8 (18)						
13.5			893.8	SS 6	89	7-6-7 (13)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-405

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/5/15 **COMPLETED** 6/5/15 **GROUND ELEVATION** 899.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 889.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 40 ft. E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.8		TOPSOIL (10 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown to light brown, fine to medium grained, moist to saturated, medium dense to loose, trace gravel	SS 1	56	7-7-6 (13)							
			SS 2	89	6-9-7 (16)							
5			SS 3	78	3-3-4 (7)							
			SS 4	100	8-6-7 (13)							
10			SS 5	100	7-5-5 (10)							
			SS 6	100	4-4-4 (8)							
13.5												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-406

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/23/15 **COMPLETED** 6/23/15 **GROUND ELEVATION** 891.68 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 12.00 ft / Elev 879.68 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark brown, fine to medium grained, moist, very loose to loose	SS 1	44	1-2-3 (5)							
3.0		PEAT, (Pt) black, moist, soft, trace gravel	SS 2	78	3-3-4 (7)							
5			SH 3									
			SS 4	83	2-2-2 (4)							
10			SH 5									
12.5		NOTE: Weight of Hammer at 12.0 feet. SILTY SAND WITH GRAVEL, (SM) gray, fine grained, saturated, loose, fine gravel	SS 6	44	0-2-4 (6)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 7	83	4-5-6 (11)							
16.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 16.0 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 15:44:31 - H:1 - PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ



Northern Technologies, Inc.
 1408 Northland Drive, Suite 107
 Mendota Heights, MN 55120
 Telephone: 651-389-4191

BORING NUMBER WM-407

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 889.12 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 6.25 ft / Elev 882.87 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 10 ft. E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill) 887.6	SS 1	56	8-9-11 (20)							
4.5		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill) 884.6	SS 2	56	6-10-11 (21)							
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist to saturated, dense, little organics, iron oxide staining 882.1	SS 3	89	6-11-12 (23)							
7.0		SILTY SAND, (SM) light brown to gray, fine grained, saturated, medium dense 879.6	SS 4	78	7-6-8 (14)							
9.5		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, saturated, loose to medium dense 875.6	SS 5	67	3-3-4 (7)			15				6
13.5			SS 6	67	5-4-5 (9)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 13.5 feet.

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H-1-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - 15.60936.100\ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN\GPI



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BORING NUMBER WM-408

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 888.74 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 5.00 ft / Elev 883.74 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S 15 ft. E **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little fine to medium gravel (Fill)	SS 1	33	8-9-8 (17)							
5.5		POORLY GRADED SAND, (SP) brown, moist to saturated, loose, little fine gravel	SS 2	22	10-13-12 (25)							
5.5		SILTY SAND, (SM) gray, fine grained, saturated, very loose to loose, trace gravel	SS 3	44	3-4-3 (7)							
			SS 4	44	1-1-1 (2)							
			SS 5	44	2-1-2 (3)							
13.5			SS 6	89	3-4-4 (8)							

Borehole backfilled with soil cuttings.
 Bottom of borehole at 13.5 feet.



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BORING NUMBER WM-409

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 886.87 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 879.87 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist, trace gravel (Fill) 885.4	SS 1	78	4-3-4 (7)							
		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 2	100	4-7-6 (13)							
5	[Dotted pattern]	6.0	SS 3	89	3-5-5 (10)							
		▽	SS 4	78	3-5-4 (9)							
			SS 5	56	2-4-4 (8)							
			873.4	SS 6	56	2-2-3 (5)						
10												
13.5												

Borehole backfilled with soil cuttings.
 Bottom of borehole at 13.5 feet.

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BORING NUMBER WM-410

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/25/15 **COMPLETED** 6/25/15 **GROUND ELEVATION** 877.04 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ▽ 7.00 ft / Elev 870.04 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 8/21/15 14:43 - H11-PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - 15.60936.100\ENGINEERING\ENGINEERING REPORTS\GINT\WM - WATER MAIN.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 Inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, loose to dense, trace fine to coarse gravel, trace roots, iron oxide staining, clay (CL) pieces	SS 1	78	2-3-4 (7)							
			SS 2	89	8-8-8 (16)							
5		NOTE: Hard drilling at 5.0 feet due to coarse gravel.	SS 3	56	9-20-10 (30)							
7.0	▽											
		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine to coarse grained, saturated, loose, trace fine gravel	SS 4	78	7-4-4 (8)							
			SS 5	89	4-3-2 (5)							
			SS 6	89	2-2-3 (5)							
14.5												
		SANDY LEAN CLAY, (CL) gray, wet, medium, trace fine gravel	SS 7	100	4-4-5 (9)							
21.5			SH 8									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.5 feet.



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BORING NUMBER BR-600

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30												
		CLAYEY SAND, (SC) gray, fine grained, saturated, medium dense, trace fine gravel	SH 11					16	28	13	15	50
35	35.0	849.7	SS 12	33	3-4-5 (9)							
40		SANDY LEAN CLAY, (CL) gray, wet, medium to very stiff, trace fine gravel	SS 13	100	4-4-5 (9)							
45			SS 14	83	5-5-34 (39)							
50			SS 15	100	4-4-4 (8)							
55			SH 16									
60			SS 17	33	5-5-5 (10)							

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BORING NUMBER BR-600

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SANDY LEAN CLAY, (CL) gray, wet, medium to very stiff, trace fine gravel <i>(continued)</i> NOTE: Driller over-spun auger at 65.0 feet. N values based on disturbed soil.	SS 18	78	1-2-2 (4)							
65.5		POORLY GRADED SAND WITH GRAVEL, (SP) gray, fine to coarse grained, saturated, very dense, fine to coarse gravel										
70				SS 19	100	57-62-65 (127)						
75		SILTY SAND, (SM) brown, fine to medium grained, saturated, very dense, trace gravel	SS 20	100	21-25-34 (59)							

Borehole backfilled with grout.
 Bottom of borehole at 76.5 feet.



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BORING NUMBER BR-601

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/9/15 **COMPLETED** 6/9/15 **GROUND ELEVATION** 884.82 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 4.00 ft / Elev 880.82 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 10 ft S **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.2		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, wet, trace gravel (Fill) 884.6	SS 1	100	7-7-5 (12)							
2.0		ORGANIC SOIL WITH SAND, (SP) brown, fine grained, wet, (wood chip debris) (Fill) 882.8	SS 2	44	6-9-9 (18)							
4.0		ORGANIC SOIL, brown, saturated, decaying wood (Fill) NOTE: Hydrocarbon odor based on human perception. 880.8	SS 3	56	6-8-7 (15)							
6.0		SILTY SAND, (SM) dark gray to gray, fine grained, saturated (Fill) 878.8	SS 4	67	6-7-9 (16)							
10			SS 5	56	8-4-3 (7)							
12.0		PEAT, (Pt) dark gray to black, saturated, medium 872.8	SS 6	22	2-2-3 (5)							
14.5		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense 870.3	SS 7	100	4-3-4 (7)							
20			SS 8	100	7-7-5 (12)							
25			SS 9	100	5-6-6 (12)							
30			SS 10	100	5-5-5 (10)							

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BORING NUMBER BR-601

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		SILTY SAND, (SM) gray, fine grained, saturated, loose to medium dense (continued)	SS 11	100	2-3-4 (7)							
35		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace gravel	SS 12	56	4-5-5 (10)							
40		SANDY LEAN CLAY, (CL) gray, fine grained, wet, rather stiff, trace gravel	SH 13					16				51
45		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace fine to coarse gravel	SS 14	100	4-7-7 (14)							
50			SS 15	100	6-6-8 (14)							
55			SS 16	100	5-5-6 (11)							
60			SS 17	100	6-6-7 (13)							

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BORING NUMBER BR-601

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:09 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace fine to coarse gravel (<i>continued</i>) NOTE: Silty sand (SM) seams at 65.0 feet.	SS 18	100	4-6-7 (13)							
70			SS 19	100	6-7-9 (16)							
75			SS 20	100	11-19-29 (48)							

76.0
 76.5
 808.8
 808.3

POORLY GRADED SAND, (SP) gray to brown, fine to medium grained, saturated, very dense

Borehole backfilled with grout.
 Boring terminated at 76.5 feet due to heaving sands in auger.
 Bottom of borehole at 76.5 feet.



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BORING NUMBER BR-602

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/28/15 **COMPLETED** 5/28/15 **GROUND ELEVATION** 884.41 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ▽ 17.00 ft / Elev 867.41 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 5 ft. E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0 - 5.0		SILTY SAND WITH GRAVEL, (SM) brown, fine to medium grained, moist	SS 1	44	5-6-7 (13)							
			SS 2	78	11-14-15 (29)							
5.0		879.4	SS 3	89	8-12-15 (27)							
			SS 4	83	9-16-16 (32)							
10			SS 5	67	6-8-9 (17)							
12.0		872.4	SS 6	89	3-3-1 (4)							
14.5		869.9	SS 7	78	3-3-4 (7)							
17.0		867.4	SS 8	100	9-5-7 (12)							
19.5		864.9	SS 9	100	5-6-7 (13)							
24.0		860.4	SH 10					15	28	12	16	48
25			SS 11	100	3-5-7 (12)							
30												

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BORING NUMBER BR-602

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:10 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to stiff, trace to a little gravel (continued)	SS 12	100	3-5-5 (10)							
35			SS 13	100	4-6-7 (13)							
40			SS 14	100	4-5-7 (12)							
45			SS 15	100	5-8-12 (20)							
50			SS 16	83	7-8-12 (20)							
54.5		SANDY LEAN CLAY, (CL) gray, wet, stiff, trace gravel	SS 17	67	9-9-10 (19)							
59.5			SS 18	78	7-8-9 (17)							
60		SILTY LEAN CLAY, (CL-ML) gray brown, wet, stiff										

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BORING NUMBER BR-602

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:10 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SILTY LEAN CLAY, (CL-ML) gray brown, wet, stiff <i>(continued)</i>	SS 19	100	9-10-11 (21)							
70		CLAYEY SAND, (SC) gray brown, fine to medium grained, wet, dense, trace gravel	SS 20	89	11-10-9 (19)							
75		SILTY SAND, (SM) gray, fine grained, saturated, very dense, trace gravel	SS 21	89	40-50-60 (110)							
Borehole backfilled with grout. Bottom of borehole at 76.0 feet.												



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BORING NUMBER BR-603

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 6/1/15 **COMPLETED** 6/1/15 **GROUND ELEVATION** 883.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** ---
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. O/S boring 12 ft. E **AFTER DRILLING** ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 Inches)										
1.0		882.3	SS 1	100	4-8-9 (17)							
		SILTY SAND, (SM) light brown, fine to medium grained, moist, dense to medium dense	SS 2	78	5-6-6 (12)							
4.5		878.8	SS 3	67	6-10-12 (22)							
		SILTY SAND, (SM) gray, fine grained, moist, dense to loose	SS 4	89	4-8-12 (20)							
			SS 5	100	3-3-3 (6)							
12.0		871.3	SS 6	33	1-0-0 (0)							
		SILTY SAND, (SM) gray, fine grained, saturated, very loose to medium dense, trace gravel	SS 7	100	5-5-3 (8)							
			SS 8	100	5-5-5 (10)							
			SS 9	100	5-6-7 (13)							
24.5		858.8	SS 10	100	5-6-5 (11)							
		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace gravel										
30												

(Continued Next Page)



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BORING NUMBER BR-603

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:10 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
30		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff to very stiff, trace gravel (continued)	SS 11	56	5-6-8 (14)							
35			SS 12	100	4-3-7 (10)							
40			SS 13	100	6-7-10 (17)							
45			SS 14	100	6-7-10 (17)							
50			SS 15	100	7-8-10 (18)							
55			SS 16	100	10-24-22 (46)							
60		SILTY LEAN CLAY, (CL-ML) brown, moist to wet, very stiff, trace gravel	SS 17	100	18-22-24 (46)							

(Continued Next Page)



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BORING NUMBER BR-603

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 7/21/15 15:10 - H:\1\PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT\BR - RICE CREEK BRIDGE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
65		SILTY LEAN CLAY, (CL-ML) brown, moist to wet, very stiff, trace gravel <i>(continued)</i> NOTE: Sand (SP) lenses at 65.0 feet.	SS 18	67	20-20-17 (37)							
70		POORLY GRADED SAND WITH GRAVEL, (SP) gray to brown, fine to coarse grained, saturated, very dense	SS 19	33	19-21-24 (45)							
75			SS 20									

Borehole backfilled with grout.
 Bottom of borehole at 76.0 feet.



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BORING NUMBER DE-800

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 900.65 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 12.00 ft / Elev 888.65 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, trace gravel (Fill) 899.2	SS 1	56	4-4-3 (7)							
3.5		CLAYEY SAND, (SC) brown gray, fine to medium grained, moist, trace gravel, little organics (Fill) 897.2	SS 2	67	3-3-2 (5)							
5		SANDY LEAN CLAY, (CL) brown, moist to wet, medium to rather stiff, trace fine to coarse gravel, iron oxide staining	SS 3	78	3-3-2 (5)							
			SS 4	100	3-9-6 (15)							
9.5		LEAN CLAY WITH SAND, (CL) gray to dark gray, wet, rather stiff to medium, trace fine to coarse gravel 891.2	SS 5	100	4-6-6 (12)							
			SS 6	100	4-3-4 (7)							
15			SS 7	100	3-3-5 (8)							
			SS 8	100	3-4-4 (8)							
20			SS 9	56	3-4-3 (7)							
21.0		879.7										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-801

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 899.36 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 6.50 ft / Elev 892.86 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:45 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist (Fill) NOTE: No recovery Sample No. 1. Sampled auger cuttings.	SS 1	0	4-4-4 (8)							
			SS 2	17	5-4-4 (8)							
4.5		SANDY LEAN CLAY, (CL) brown, moist to wet, medium, trace gravel	SS 3	22	2-4-3 (7)							
7.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to coarse grained, saturated, loose	SS 4	67	3-3-2 (5)							
8.4		LEAN CLAY WITH SAND, (CL) gray, wet, medium, trace fine to coarse gravel, iron oxide staining	SS 5	56	2-3-4 (7)							
9.5		CLAYEY SAND, (SC) gray, fine to coarse grained, saturated, loose, trace fine to coarse gravel	SS 6	100	3-4-3 (7)							
12.0		SANDY LEAN CLAY, (CL) gray, wet, medium	SS 7	100	2-3-5 (8)							
			SS 8	100	3-3-4 (7)							
19.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium	SS 9	100	3-2-5 (7)							
21.0												

Borehole backfilled with auger cuttings.
Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-803

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/27/15 **COMPLETED** 5/27/15 **GROUND ELEVATION** 892.97 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 14.50 ft / Elev 878.47 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 25 ft East

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		SILTY SAND, (SM) brown, fine grained, moist, little gravel (Fill)	SS 1	44	2-3-5 (8)							
889.5			SS 2	44	7-12-14 (26)							
5		POORLY GRADED SAND WITH GRAVEL, (SP) brown, medium to coarse grained, moist (Fill)	SS 3	56	5-9-12 (21)							
		NOTE: Sampled auger cuttings.	SS 4	11	3-4-6 (10)							
10		10.0	883.0	SS 5	67	3-3-4 (7)						
		NOTE: Sampled auger cuttings.	SS 6	6	7-7-7 (14)							
15		∇		SS 7	94	3-3-4 (7)						
				SS 8	89	3-5-7 (12)						
20				SS 9	100	4-6-9 (15)						
21.0		872.0										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-804

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/20/15 **COMPLETED** 5/20/15 **GROUND ELEVATION** 897.51 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groudwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---
O/S 5 ft North

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill) 895.5	SS 1	56	2-2-1 (3)							
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill) 893.0	SS 2	44	2-3-2 (5)							
5		LEAN CLAY WITH SAND, (CL) light brown, moist, medium to rather stiff, trace gravel	SS 3	100	2-3-5 (8)							
			SS 4	100	3-6-7 (13)							
			SS 5	100	4-4-6 (10)							
			SS 6	100	5-6-6 (12)							
			SS 7	100	3-4-4 (8)							
15.5		LEAN CLAY WITH SAND, (CL) gray, moist, medium to rather stiff, trace gravel 882.0	SS 8	100	3-4-3 (7)							
			SS 9	100	4-4-7 (11)							
21.0			876.5									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-805

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/19/15 COMPLETED 5/19/15 GROUND ELEVATION 893.43 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 6.00 ft / Elev 887.43 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH GRAVEL, (SP) brown, fine to medium grained, moist (Fill) 891.4	SS 1	33	2-2-3 (5)							
2.7		LEAN CLAY WITH SAND, (CL) brown, moist, trace gravel (Fill) 890.8	SS 2	78	8-6-5 (11)							
5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, trace gravel (Fill) 887.4	SS 3	22	5-8-8 (16)							
6.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense, trace gravel (Fill) 885.9	SS 4	67	7-5-6 (11)							
7.5		SANDY LEAN CLAY, (CL) brown, wet, medium to rather stiff	SS 5	100	3-3-2 (5)							
10			SS 6	100	5-5-6 (11)							
15			SS 7	100	3-5-5 (10)							
19.5			SS 8	89	4-5-4 (9)							
20		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, sand lenses 873.9	SS 9	83	6-7-6 (13)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-806

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/21/15 **COMPLETED** 5/21/15 **GROUND ELEVATION** 901.27 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 12.00 ft / Elev 889.27 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:45 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTIDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		TOPSOIL (5 inches)										
		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel (Fill)	SS 1	56	2-3-4 (7)							
			SS 2	33	8-10-9 (19)							
			SS 3	22	9-13-12 (25)							
			SS 4	56	4-6-5 (11)							
10.0		LEAN CLAY WITH SAND, (CL) gray, moist to wet, soft to rather stiff, trace gravel	SS 5	56	2-2-2 (4)							
			SS 6	100	3-3-6 (9)							
			SS 7	100	2-5-6 (11)							
			SS 8	100	5-5-8 (13)							
21.0			SS 9	100	4-6-8 (14)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-807

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 898.18 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 4.50 ft / Elev 893.68 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:45 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINTIDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		TOPSOIL (6 inches)	897.7									
		CLAYEY SAND, (SC) brown to light brown, fine to medium grained, moist, trace gravel, trace organics (Fill).	SS 1	78	2-2-3 (5)							
3.5		LEAN CLAY WITH SAND, (CL) brown, wet to moist, soft to medium, trace gravel	894.7									
			SS 2	72	3-5-5 (10)							
5			SS 3	39	2-1-3 (4)							
			SS 4	56	3-5-9 (14)							
9.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	888.7									
			SS 5	100	3-4-5 (9)							
			SS 6	100	3-3-4 (7)							
15			SS 7	89	2-3-5 (8)							
			SS 8	100	2-3-4 (7)							
20			SS 9	100	3-3-5 (8)							
21.0			877.2									

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-808

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 892.29 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 3.50 ft / Elev 888.79 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (4 inches). POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, moist (Fill).	SS 1	44	1-2-2 (4)							
3.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, medium dense	SS 2	56	4-5-7 (12)							
7.0		LEAN CLAY WITH SAND, (CL) gray, wet, rather stiff, trace gravel	SS 3	67	5-7-6 (13)							
10.3		SILTY SAND, (SM) gray, fine grained, saturated, medium dense	SS 4	56	4-6-7 (13)							
12.0		LEAN CLAY WITH SAND, (CL) gray, wet, medium to rather stiff, trace gravel	SS 5	44	5-6-5 (11)							
			SS 6	100	6-7-7 (14)							
			SS 7	100	2-4-5 (9)							
			SS 8	100	2-3-5 (8)							
			SS 9	89	3-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-809

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 890.82 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 7.00 ft / Elev 883.82 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches).										
1.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill).	SS 1	56	3-5-5 (10)							
		SILTY SAND, (SM) brown, fine grained, moist, medium dense to dense NOTE: No recovery Sample No. 2. Sampled auger cuttings.	SS 2	0	4-6-7 (13)							
5			SS 3	67	4-8-9 (17)							
7.0		CLAYEY SAND, (SC) gray, fine grained, saturated, loose	SS 4	83	3-3-3 (6)							
9.5		LEAN CLAY WITH SAND, (CL) gray, wet, medium to soft	SS 5	89	2-2-2 (4)							
15			SS 6	44	1-2-3 (5)							
			SS 7	100	2-2-3 (5)							
17.0		LEAN CLAY WITH SAND, (CL) gray, wet, soft, trace gravel NOTE: Weight of Hammer at Sample No. 8.	SS 8	100	0-2-2 (4)							
20			AU 9	100								
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



Northern Technologies, Inc.
 6160 Carmen Avenue East
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 Telephone: 651-389-4191

BORING NUMBER DE-810

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 890.38 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 880.88 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.3		TOPSOIL (3 inches).										
2.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill).	SS 1	56	4-5-5 (10)							
		LEAN CLAY WITH SAND, (CL) brown, moist, trace gravel (Fill).	SS 2	78	6-8-8 (16)							
5			SS 3	78	5-5-5 (10)							
7.0		SILTY SAND, (SM) brown to dark gray, fine grained, moist to saturated, medium dense to loose	SS 4	33	3-4-6 (10)							
10			SS 5	83	5-6-8 (14)							
13.5		POORLY GRADED SAND WITH CLAY, (SP-SC) light brown, fine grained, saturated, very loose to medium dense, clay lenses	SS 6	67	2-3-5 (8)							
15			SS 7	44	3-1-1 (2)							
20			SS 8	56	5-5-6 (11)							
21.0			SS 9	83	6-6-5 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-811

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 897.49 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.0		SILTY SAND, (SM) brown, fine grained, moist, trace gravel (Fill). 894.5	SS 1	44	1-3-5 (8)							
5.0		SILTY SAND, (SM) brown, fine grained, moist, medium dense, trace gravel NOTE: No recovery. Sampled auger cuttings. 890.5	SS 2	56	4-4-5 (9)							
7.0		POORLY GRADED SAND, (SP) brown, fine to coarse grained, moist, loose, trace gravel 890.5	SS 3	0	6-6-5 (11)							
10.0			SS 4	44	2-3-5 (8)							
10.5			SS 5	78	4-2-4 (6)							
15.0		LEAN CLAY WITH SAND, (CL) gray, moist, medium, trace gravel 887.0	SS 6	100	2-2-3 (5)							
			SS 7	56	2-3-4 (7)							
			SS 8	100	2-3-4 (7)							
20.0			SS 9	89	1-4-4 (8)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-812

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 891.84 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 8.00 ft / Elev 883.84 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-TOWN AND CREEK DEVELOPMENT (2).GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ROADWAY BASE (30 inches).	SS 1	0	3-2-1 (3)							
2.5		NOTE: No recovery. Sampled auger cuttings.										
4.5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, little gravel (Fill)	SS 2	56	9-9-9 (18)							
6.0		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist (Fill)	SS 3	67	4-5-6 (11)							
9.5		POORLY GRADED SAND, (SP) brown, fine grained, moist to saturated, dense	SS 4	78	7-10-12 (22)							
12.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, saturated, medium dense	SS 5	44	4-7-8 (15)							
14.5		SILTY SAND, (SM) brown, fine grained, saturated, loose	SS 6	89	4-3-2 (5)							
21.0		LEAN CLAY WITH SAND, (CL) brown gray, wet, medium to rather stiff	SS 7	100	2-5-4 (9)							
			SS 8	78	3-4-3 (7)							
			SS 9	100	2-4-6 (10)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-813

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 888.09 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 878.59 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-IDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0			AU 1									
0-6.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, some fine to coarse gravel (Fill)	SS 2	100	8-9-9 (18)							
6.0		NOTE: No Recovery due to gravel. Sampled auger cuttings.	SS 3	0	4-4-5 (9)							
6.0-8.5		SILTY SAND, (SM) brown, fine grained, moist (Fill)	SS 4	89	6-7-6 (13)							
8.5		▽ SILTY SAND, (SM) gray, fine grained, moist to saturated, medium dense	SS 5	67	6-6-7 (13)							
8.5-10			SS 6	100	4-6-6 (12)							
10-15			SS 7	78	5-6-5 (11)							
15-20			SS 8	67	7-5-5 (10)							
20-21.0			SS 9	89	6-5-6 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-814

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 888.1 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 4.50 ft / Elev 883.60 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-TOWN AND CREEK DEVELOPMENT (2)GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
		SILTY SAND, (SM) brown and tan, fine grained, moist (Fill)	AU 1									
			SS 2	56	3-3-4 (7)							
4.5	▽	883.6										
		SILTY SAND, (SM) reddish brown, fine grained, saturated (Fill)	SS 3	100	6-8-7 (15)							
6.0		882.1										
		POORLY GRADED SAND WITH SILT, (SP-SM) dark gray, fine grained, saturated, loose, trace gravel	SS 4	83	3-2-3 (5)							
8.3		879.8										
		SANDY SILT, (ML) dark gray, wet, medium	SS 5	67	5-6-3 (9)							
9.5		878.6										
		SILTY SAND, (SM) dark gray, fine grained, saturated, medium dense, trace gravel	SS 6	56	2-4-3 (7)							
12.0		876.1										
		SANDY LEAN CLAY, (CL) dark gray, wet, medium to rather stiff, trace fine to coarse sand	SS 7	100	3-3-4 (7)							
15			SS 8	100	4-4-6 (10)							
20			SS 9	100	5-6-5 (11)							
21.0		867.1										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-815

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/19/15 **COMPLETED** 5/19/15 **GROUND ELEVATION** 892.67 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **▽ AT TIME OF DRILLING** 5.00 ft / Elev 887.67 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0			AU 1									
5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist to saturated, some fine to coarse gravel (Fill). ▽	SS 2	44	2-2-3 (5)							
6.0		886.7	SS 3	33	1-1-1 (2)							
9.5		883.2	SS 4	78	4-5-5 (10)							
10		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, loose, trace gravel	SS 5	56	3-3-2 (5)							
12.0		880.7	SS 6	78	2-3-3 (6)							
15		LEAN CLAY WITH SAND, (CL) dark gray, wet, medium to rather stiff, trace gravel	SS 7	100	3-3-3 (6)							
20			SS 8	78	4-7-3 (10)							
21.0		871.7	SS 9	67	5-6-5 (11)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-816

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 903.88 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTIDE-TOWN AND CREEK DEVELOPMENT (2) (2).D

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
5.0		SILTY SAND WITH GRAVEL, (SM) brown, fine grained, moist, fine to medium gravel (Fill) NOTE: No recovery. Sampled auger cuttings.	SS 1	44	2-6-8 (14)							
			SS 2	0	3-3-4 (7)							
898.9			SS 3	89	2-4-5 (9)							
			SS 4	100	3-5-6 (11)							
			SS 5	100	4-6-8 (14)							
891.9			SS 6	100	4-5-6 (11)							
			SS 7	100	3-4-6 (10)							
			SS 8	100	3-5-6 (11)							
882.9			SS 9	100	2-5-6 (11)							

Borehole backfilled with soil cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-818

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CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 897.33 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 7.00 ft / Elev 890.33 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, trace gravel, trace roots (Fill)	SS 1	44	1-3-4 (7)							
4.5		SILTY SAND, (SM) brown, fine to medium grained, moist (Fill)	SS 2	67	5-8-7 (15)							
6.0		SANDY LEAN CLAY, (CL) gray, moist, stiff, trace gravel	SS 3	44	8-10-11 (21)							
8.3		∇ POORLY GRADED SAND, (SP) gray to brown, fine to medium grained, moist to saturated, medium dense, trace gravel	SS 4	78	2-3-6 (9)							
9.5		SANDY LEAN CLAY, (CL) gray, wet, medium, trace gravel	SS 5	56	2-3-3 (6)							
12.8		PEAT, (Pt) black, moist, soft, fibrous	SS 6	83	2-3-3 (6)							
16.5		SILTY SAND, (SM) gray, fine grained, saturated, loose, trace gravel	SS 7	78	1-1-1 (2)							
21.0			SS 8	56	3-3-4 (7)							
			SS 9	83	1-6-2 (8)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-819

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 894.26 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 5.00 ft / Elev 889.26 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD. US. LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTIDE-TOWN AND CREEK DEVELOPMENT (2)GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.0	[Cross-hatched pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill)	893.3 SS 1	44	2-4-6 (10)							
2.8	[Dotted pattern]	POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, medium dense, trace gravel	891.4 SS 2	83	3-6-7 (13)							
4.5	[Diagonal lines /]	SANDY LEAN CLAY, (CL) gray brown, moist, rather stiff, trace gravel	889.8									
5	[Dotted pattern]	SILTY SAND, (SM) brown to dark brown, fine grained, moist to saturated, medium dense, trace gravel	SS 3	56	3-8-6 (14)							
			SS 4	67	3-6-7 (13)							
10			884.3 SS 5	78	2-4-1 (5)							
10.5		PEAT, (Pt) black, moist, medium	883.8									
		SILTY SAND, (SM) dark gray to gray, fine grained, saturated, loose, trace gravel	SS 6	56	1-3-2 (5)							
15			879.8									
14.5		CLAYEY SAND, (SC) gray, fine grained, saturated, very loose, trace gravel	SS 7	67	2-1-1 (2)							
17.0			877.3									
		SANDY LEAN CLAY, (CL) gray, wet, medium to soft, trace gravel	SS 8	33	2-3-3 (6)							
20			873.3									
			SS 9	28	2-2-1 (3)							
21.0												

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-820

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. PROJECT NAME Ramsey County Re-Development Site (TCAAP)
 PROJECT NUMBER 15.60936.100 PROJECT LOCATION Arden Hills, MN
 DATE STARTED 5/18/15 COMPLETED 5/18/15 GROUND ELEVATION 894.31 ft HOLE SIZE "6 1/2" inches
 DRILLING CONTRACTOR NTI GROUND WATER LEVELS:
 DRILLING METHOD 3 1/4 in H.S.A ∇ AT TIME OF DRILLING 5.00 ft / Elev 889.31 ft
 LOGGED BY DAS CHECKED BY DAS AT END OF DRILLING ---
 NOTES Elev. at staked location. AFTER DRILLING ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:46 + H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)ENGINEERING\ENGINEERING REPORTS\GINTIDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
2.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, trace gravel (Fill)	SS 1	83	2-3-5 (8)							
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to coarse grained, moist, dense, little gravel	SS 2	56	6-11-11 (22)							
5		∇ SILTY SAND, (SM) brown, fine to medium grained, moist to saturated, dense, trace gravel	SS 3	78	8-11-10 (21)							
8.0		SANDY LEAN CLAY, (CL) blue gray, wet, rather stiff, trace gravel	SS 4	78	3-7-5 (12)							
9.5		SILTY SAND, (SM) gray, fine grained, saturated, loose, trace gravel	SS 5	44	3-4-3 (7)							
10.5		PEAT, (Pt) black, moist, soft										
13.0		SILTY SAND, (SM) gray, fine grained, saturated, very loose, trace gravel	SS 6	67	1-1-1 (2)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 7	89	2-5-4 (9)							
17.0		SILTY SAND, (SM) gray, fine grained, saturated, medium dense to very loose, trace gravel	SS 8	100	4-10-2 (12)							
20			SS 9	100	1-1-1 (2)							
			SS 10	100	3-4-4 (8)							
24.5		SANDY LEAN CLAY, (CL) gray, wet, rather stiff, trace gravel	SS 11	100	4-4-6 (10)							
26.0												

Borehole backfilled with auger cuttings.
Bottom of borehole at 26.0 feet.



Northern Technologies, Inc.
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 Telephone: 651-389-4191

BORING NUMBER DE-821

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/15/15 **COMPLETED** 5/15/15 **GROUND ELEVATION** 888.46 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ∇ **AT TIME OF DRILLING** 7.00 ft / Elev 881.46 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-IDE-TOWN AND CREEK DEVELOPMENT (2) (R).P1

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
3.5		POORLY GRADED SAND, (SP) brown, fine to medium grained, moist, trace gravel (Fill) NOTE: No recovery. Sampled auger cuttings.	SS 1	33	1-1-2 (3)							
885.0			SS 2	0	2-3-5 (8)							
6.0		POORLY GRADED SAND WITH CLAY, (SP-SC) brown, fine to medium grained, moist, trace gravel, clay (CL) lenses (Fill)	SS 3	33	1-1-1 (2)							
882.5			SS 4	56	2-2-4 (6)							
		LEAN CLAY WITH SAND, (CL) gray, moist to wet, medium, trace gravel	SS 5	94	2-3-3 (6)							
			SS 6	100	2-3-5 (8)							
			SS 7	89	2-2-3 (5)							
			SS 8	100	2-3-4 (7)							
21.0				SS 9	100	2-3-5 (8)						

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-822

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 890.4 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 7.00 ft / Elev 883.40 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2).RPT

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
1.5	[Cross-hatched pattern]	SANDY SILT, (ML) brown, moist (Fill)	888.9 SS 1	44	1-2-2 (4)							
3.0	[Diagonal lines pattern]	SILTY SAND, (SM) brown, fine to medium grained, moist (Fill)	887.4 SS 2	78	2-2-3 (5)							
5.0	[Diagonal lines pattern]	LEAN CLAY WITH SAND, (CL) gray, moist, medium	SS 3	28	2-3-2 (5)							
7.0	[Dotted pattern]	POORLY GRADED SAND, (SP) brown, fine grained, saturated, very loose, trace gravel	883.4 SS 4	56	2-1-3 (4)							
9.5	[Dotted pattern]	SILTY SAND, (SM) gray and brown, fine grained, saturated, very loose, trace gravel	880.9 SS 5	44	3-1-1 (2)							
12.5	[Diagonal lines pattern]	LEAN CLAY WITH SAND, (CL) gray, wet, soft to medium, trace gravel, sand lenses	877.9 SS 6	100	2-2-2 (4)							
15.0	[Diagonal lines pattern]		SS 7	83	2-3-4 (7)							
20.0	[Diagonal lines pattern]		SS 8	100	2-3-4 (7)							
21.0	[Diagonal lines pattern]		869.4 SS 9	100	2-3-4 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-823

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 889.15 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** 9.50 ft / Elev 879.65 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINTDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.7		TOPSOIL (8 inches).	888.5									
2.0		SILTY SAND, (SM) brown, fine grained, moist (Fill)	887.2	56	1-3-4 (7)							
3.0		POORLY GRADED SAND, (SP) light brown, fine to medium grained, dry, trace gravel (Fill)	886.2	44	6-4-3 (7)							
5.0		SANDY LEAN CLAY, (CL) brown, moist, medium		56	4-2-4 (6)							
7.0		SANDY LEAN CLAY, (CL) gray, moist to wet, medium	882.2	100	3-3-3 (6)							
10.0				100	3-3-4 (7)							
15.0				100	3-4-4 (8)							
14.5		SANDY LEAN CLAY, (CL) gray, wet, medium, little fine to coarse gravel	874.7	100	6-5-4 (9)							
20.0				89	5-4-4 (8)							
21.0			868.2	89	3-3-2 (5)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-824

PAGE 1 OF 1

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 888.51 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A ▽ AT TIME OF DRILLING 4.50 ft / Elev 884.01 ft
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\REPORTS\GINT-IDE-TOWN AND CREEK DEVELOPMENT (2).GPI

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5	▽											
4.5		SILTY SAND, (SM) brown, fine grained, moist, loose to very loose, trace gravel	SS 1	83	2-4-4 (8)							
			SS 2	56	2-2-2 (4)							
5		884.0										
6.0		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, saturated, very loose	SS 3	56	3-2-1 (3)							
			SS 4	67	2-1-2 (3)							
10		882.5										
10.0		SILTY SAND, (SM) brown, fine grained, saturated, very loose, trace gravel	SS 5	78	2-2-2 (4)							
			SS 6	83	1-2-3 (5)							
15		878.5										
		SILTY LEAN CLAY, (CL-ML) gray, wet, soft to medium, trace gravel, little sand	SS 7	78	2-1-2 (3)							
			SS 8	100	2-3-3 (6)							
20			SS 9	83	2-1-2 (3)							
21.0		867.5										

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.



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BORING NUMBER DE-825

CLIENT Carl Bolander and Sons, Co. **PROJECT NAME** Ramsey County Re-Development Site (TCAAP)
PROJECT NUMBER 15.60936.100 **PROJECT LOCATION** Arden Hills, MN
DATE STARTED 5/18/15 **COMPLETED** 5/18/15 **GROUND ELEVATION** 893.64 ft **HOLE SIZE** "6 1/2" inches
DRILLING CONTRACTOR NTI **GROUND WATER LEVELS:**
DRILLING METHOD 3 1/4 in H.S.A **AT TIME OF DRILLING** --- No groundwater observed.
LOGGED BY DAS **CHECKED BY** DAS **AT END OF DRILLING** ---
NOTES Elev. at staked location. **AFTER DRILLING** ---

NTI GEOTECH COLUMNS - GINT STD US LAB MAY 2012.GDT - 1/25/16 14:48 - H11-PROJECTS\2015 PROJECTS\TCAAP PROJECT ARDEN HILLS - GEO - (15.60936.100)\ENGINEERING\ENGINEERING REPORTS\GINT-DE-TOWN AND CREEK DEVELOPMENT (2)R.P.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
4.5		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine to medium grained, moist, medium dense, trace gravel	SS 1	78	2-5-4 (9)							
			SS 2	44	5-5-5 (10)							
5		SILTY SAND, (SM) brown, fine to medium grained, moist, loose, trace gravel	SS 3	56	3-3-3 (6)							
7.5		SANDY LEAN CLAY, (CL) gray brown, moist, medium, trace gravel	SS 4	78	3-2-3 (5)							
			SS 5	56	4-4-4 (8)							
			SS 6	28	3-3-4 (7)							
14.5		LEAN CLAY WITH SAND, (CL) gray to dark gray, moist, medium, trace gravel	SS 7	94	3-3-3 (6)							
			SS 8	100	2-3-4 (7)							
21.0			SS 9	100	3-3-4 (7)							

Borehole backfilled with auger cuttings.
 Bottom of borehole at 21.0 feet.

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-1 LOCATION: N: 213690.577, E: 550665.094 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/19/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
908.1	0.0					
907.6	0.5	SM	SILTY SAND, trace of Roots, dark brown, wet. (Topsoil)			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown to light brown, moist, loose. (Lacustrine)	4		
				3		
				5		
				5		
896.1	12.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, loose to medium dense. (Glaciofluvium)	6		
				13		
890.1	18.0	ML	SANDY SILT, Sand seams, brown, wet, medium dense. (Glaciofluvium)			
				19		
886.1	22.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, medium dense. (Glaciofluvium)			
882.1	26.0		END OF BORING.	15		
			Water not observed with 24 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-2
	LOCATION: N: 213683.523, E: 550898.513 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/22/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
901.3	0.0					
900.8	0.5	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		SM	SILTY SAND, fine-grained, reddish-brown to brown, moist, loose to medium dense. (Glaciofluvium)	8		
				16		
				13		
892.3	9.0					
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, loose to medium dense. (Glaciofluvium)	11		
				9		
				7		
				14		
878.3	23.0				▽	
		SM	SILTY SAND, fine-grained, gray, waterbearing.			
875.3	26.0			21		
			END OF BORING.			
			Water observed at 23 feet while drilling.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-3 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>902.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SILTY SAND, trace roots, dark brown, moist, medium dense (SM)	TOPSOIL COARSE ALLUVIUM	11	M	SS	17					
2	SAND WITH SILT, fine grained, trace roots, brown, moist, medium dense (SP-SM)										
3	SAND WITH SILT, fine grained, brown, moist, loose (SP-SM)		9	M	SS	14					
4	SILTY SAND, fine grained, brown, light grayish brown, moist, medium dense, laminations of sand with silt (SM)										
5			13	M	SS	19					
6											
7											
8	SAND WITH SILT, fine grained, light grayish brown, a little brown, moist, medium dense, laminations of silty sand (SP-SM)										
9			15	M	SS	19					
10											
11	SAND WITH SILT, fine grained, light brownish gray, a little brown, moist, loose, laminations of silty sand (SP-SM)										
12			10	M	SS	17					
13	SILTY SAND, fine grained, light brownish gray, moist, loose (SM)										
14			7	M	SS	18					
15											
16	SAND WITH SILT, fine grained, light brownish gray, a little brown, moist, dense, laminations of silty sand (SP-SM)										
17											
18											
19											
20	SAND WITH SILT, fine grained, light brownish gray, a little brown, moist, dense, laminations of silty sand (SP-SM)										
21			34	M	SS	17					
22	SILT, gray, wet, dense (ML)										
23											
24											
25											
26		FINE ALLUVIUM	32	M/W	SS	16	25				
END OF BORING Northing=213682.3 Easting=551397.5											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
DEPTH	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-24 1/2'	3.25" HSA	6/20/07	2:15	26.5	24.5	24.6		None	
BORING COMPLETED: 6/20/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871			BORING: RI-3003-02 ST-4			
Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota			LOCATION: N: 213984.454, E: 553013.279 See attached sketch.			
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/23/07		SCALE: 1" = 4'
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
893.5	0.0					
892.5	1.0	SM	SILTY SAND, fine-grained, with Organic fines, dark brown, moist. (Topsoil)			
		SP	POORLY GRADED SAND, fine-grained, brown, moist, loose. (Glacial Outwash)	8		
				7		
				10		
884.5	9.0	SP	POORLY GRADED SAND, fine-grained, brown, wet to waterbearing, loose to medium dense. (Glacial Outwash)	11		
				10	▽	
				6		
875.5	18.0	SP	POORLY GRADED SAND, fine-grained, gray, waterbearing, loose. (Glacial Outwash)	9		
870.5	23.0	ML	SILT, gray, wet, loose. (Glaciofluvium)			
867.5	26.0			7		
			END OF BORING. Water observed at 13 feet while drilling. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-5 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>895.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, surface roots, trace roots, black	FILL	18	M	SS	15	7				
2	FILL, mixture of silty sand and clayey sand, trace roots, pieces of concrete, brown and light brown										
3											
4	SAND WITH SILT, fine grained, trace roots, light brown and brown, moist, medium dense (SP-SM) (possible fill)	COARSE ALLUVIUM OR FILL	18	M	SS	15					
5											
6	CLAYEY SAND, a little gravel, light brown and brown, laminations of silty sand, stiff (SC) (possible fill)	MIXED ALLUVIUM OR FILL	12	M	SS	18					
7											
8	SAND WITH SILT, fine to medium grained, light brown, moist, medium dense (SP-SM)	COARSE ALLUVIUM	15	M	SS	19					
9											
10											
11			11	M	SS	19					
12											
13	SANDY SILT, brownish gray, a little brown, wet, medium dense, laminations of silt (ML)	FINE ALLUVIUM	12	W	SS	14	26				
14											
15	SILTY SAND WITH GRAVEL, brown, medium dense (SM)	TILL	17	W	SS	14					
16											
17											
18											
19											
20	CLAYEY SAND, a little gravel, dark gray, soft to firm (SC)		4	M	SS	21	17				
21											
22											
23											
24											
25											
26			7	M	SS	20	18				
END OF BORING Northing=214014.0 Easting=553398.3											

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	
0-24½'	3.25" HSA	7/10/07	9:10	14.0	12.0	12.0		None
		7/10/07	9:15	16.5	14.5	13.8		12.6
BORING COMPLETED:	7/10/07	7/10/07	9:25	26.5	24.5	26.3		23.9
DR: SG	LG: SB	Rig: 91C						



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-6 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>891.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS						
							WC	DEN	LL	PL	%-#200		
1	FILL, mixture of silty sand and clayey sand, with gravel, pieces of bituminous, surface roots, trace roots, black and brown, a little gray	FILL	4	M	SS	10	12						
2													
3	SILTY SAND, fine to medium grained, gray, a little brown, moist, medium dense, laminations of sandy silt (SM)	COARSE ALLUVIUM	14	W	SS	13							
4													
5	SILTY SAND, fine to medium grained, brown, moist, medium dense (SM)	FINE ALLUVIUM	20	W	SS	16	27						
6	SANDY SILT, gray, wet, medium dense (ML)												
7	CLAYEY SAND, a little gravel, dark gray, soft to stiff (SC)	TILL	4	M	SS	21	17						
8				5		M	18	17					
9				4		M	20	19					
10				5		M	22	19					
11				6		M	24	17					
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
END OF BORING Northing=214024.0 Easting=553898.1													

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	
0-4½'	3.25" HSA								
4½'-24½'	RD w/DM	7/10/07	10:15	4.0	2.0	2.0		1.9	
BORING COMPLETED:	7/10/07								
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-7 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>901.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, a little gravel, surface roots, trace roots, dark brown and black FILL, mixture of clayey sand, sandy lean clay and silty sand, with gravel, possible cobbles, trace roots, brown, black and gray	FILL	26	M	SS	15					
2			39	M	SS	5	7				
3			7	M	SS	19	16				
4	CLAYEY SAND, a little gravel, gray, dark brown and black, moist, soft, laminations of organic clay and silty sand (SC) (possible fill)	MIXED ALLUVIUM OR FILL	4	M	SS	15	18				
5			1	W/M	SS	NR					
6	SANDY LEAN CLAY, a little gravel, brown, stiff to firm (CL)	TILL	9	M	SS	18	20				
7			7	M	SS	3	23				
8			7	M	SS	24	18				
9	CLAYEY SAND, a little gravel, dark gray, firm to stiff (SC)		7	M	SS	24	18				
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
<p>END OF BORING Northing=214012.7 Easting=554397.0</p>											

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	7/10/07	11:20	11.5	9.5	10.0		9.9	
BORING COMPLETED:	7/10/07								
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-8 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>899.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of silty sand and clayey sand, a little gravel, surface roots, trace roots, brown and dark brown	FILL	10	M	SS	15	9					
2												
3			9	M	SS	12	12					
4												
5	SAPRIC PEAT, black (PT)	SWAMP DEPOSIT					229					
6	ORGANIC CLAY, trace roots, black, soft (OL/OH)		4	M	SS	17	64					
7	CLAYEY SAND, a little gravel, gray, very soft (SC)	WEATHERED TILL										
8			1	M	SS	19	22					
9												
10	SANDY LEAN CLAY, with roots, light gray, soft (CL)	TILL										
11			3	M	SS	23	16					
12												
13			2	M	SS	18	18					
14												
15												
16			4	M	SS	21	13					
17												
18												
19	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)											
20												
21			10	M	SS	19	16					
22												
23												
24												
25												
26			10	M	SS	23	16					
END OF BORING Northing=214013.8 Easting=554896.8												

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	
0-24½'	3.25" HSA	7/10/07	3:40	26.5	24.5	25.2		None	
BORING COMPLETED: 7/10/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871				BORING: ST-9			
Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				LOCATION: N: 214014.029, E: 555398.546 See attached sketch.			
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/12/07		SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
901.0	0.0						
900.0	1.0	FILL	FILL: Silty Sand, fine-grained, with Organic fines, dark brown, moist.				
		FILL	FILL: Clayey Sand, dark brown to black, moist.				
896.5	4.5	CL	SANDY LEAN CLAY, brown, wet, soft. (Lacustrine)	5		19	
894.0	7.0	CL	SANDY LEAN CLAY, trace of Gravel, gray with iron staining, wet, rather soft. (Glacial Till)	2			
				5			
889.0	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray with iron staining, moist, rather stiff. (Glacial Till)	5			
887.0	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to rather stiff. (Glacial Till)	10			
				8			
				7			
875.0	26.0			9			
			END OF BORING.				
			Water not observed during drilling.				
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.				
			Boring then grouted.				

BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GPT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-10
	LOCATION: N: 214020.705, E: 555901.142 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/12/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
900.6	0.0						
899.1	1.5	SM	SILTY SAND, fine-grained, with Organic fines, dark brown, moist.				
		CL	SANDY LEAN CLAY, brown and gray with iron staining, wet, rather soft. (Lacustrine)	5		15	
893.6	7.0	CL	SANDY LEAN CLAY, trace of Gravel, brown with iron staining, moist, rather stiff. (Glacial Till)	9			
		CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to rather stiff. (Glacial Till)	9			
888.6	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to rather stiff. (Glacial Till)	8			
				9			
				8			
874.6	26.0			10			
			END OF BORING.				
			Water not observed during drilling.				
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.				
			Boring then grouted.				



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-11 (p. 1 of 4)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>901.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SILTY SAND, surface roots, trace roots, dark brown, moist, loose (SM)	TOPSOIL COARSE ALLUVIUM	8	M	SS	14					
2	SAND WITH SILT, trace roots, light brown, moist, loose (SP-SM)										
3	SILTY SAND, fine grained, brown, a little light brown, moist, medium dense, laminations of sand with silt (SM)		15	M	SS	18					
4											
5											
6				20	M	SS	18				
7	SAND WITH SILT, fine grained, light grayish brown to light brownish gray, moist, medium dense to loose (SP-SM)		15	M	SS	16					
8											
9											
10											
11				11	M	SS	17				
12											
13	SAND WITH SILT, fine grained, light brownish gray, a little brown, moist, medium dense, laminations of sandy silt (SP-SM)		6	M	SS	17					
14											
15				18	M	SS	20				
16	SAND WITH SILT, fine grained, light gray, a little gray, moist, dense, laminations of silt (SP-SM)										
17											
18											
19				33	M	SS	17				
20	SAND WITH SILT, fine grained, light brownish gray, waterbearing, medium dense (SP-SM)										
21											
22											
23											
24											
25											
26				16	M/W	SS	19				
27											
28		TILL									

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	
0-24½'	3.25" HSA								
24½'-99½'	RD w/DM	6/20/07	8:55	26.5	24.5	24.5		24.4	
BORING COMPLETED:	6/20/07								
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-11 (p. 2 of 4)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DEN	LL	PL	%-#200				
30	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL) <i>(continued)</i>	TILL <i>(continued)</i>													
31			6	M	SS	24	17								
32															
33															
34															
35															
36					7	M	SS	24	17						
37															
38															
39															
40															
41					10	M	SS	24	20						
42															
43															
44															
45															
46			10	M	SS	24	17								
47															
48															
49															
50															
51			11	M	SS	24	19								
52															
53															
54															
55															
56			10	M	SS	24	20								
57															
58															
59															
60															
61			10	M	SS	22	18								
62															
63															



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-11 (p. 3 of 4)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
64	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL) <i>(continued)</i>	TILL <i>(continued)</i>	5	M	SS	24	19					
65												
66												
67												
68	SILTY SAND, fine to medium grained, brownish gray, wet, loose (SM)	COARSE ALLUVIUM	5	M	SS	2	23					
69												
70												
71												
72												
73	LEAN CLAY WITH SAND, brown, hard (CL)	FINE ALLUVIUM	36	M	SS	24	17					
74												
75												
76												
77												
78	FAT CLAY, brown, hard to very stiff, laminations of silty sand (CH)		43	M	SS	24	33					
79												
80												
81												
82												
83												
84												
85												
86			27	M	SS	24	25					
87												
88	CLAYEY SAND, a little gravel, possible cobbles, brown, hard (SC)	TILL	62	M	SS	21	13					
89												
90												
91												
92												
93												
94												
95												
96			70	M	SS	21	11					
97												



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-11 (p. 4 of 4)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
98	CLAYEY SAND, a little gravel, possible cobbles, brown, hard (SC) <i>(continued)</i>	TILL <i>(continued)</i>									
99											
100											
101			98	M	SS	26	10				
	END OF BORING Northing=213491.7 Easting=551397.2										



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-12 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>893.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%#200
1	FILL, mixture of clayey sand and silty sand, a little gravel, piece of bituminous, surface roots, trace roots, dark brown and brown	FILL	30	M	SS	15					
2											
3	FILL, mixture of sand with silt and gravel and silty sand, brown and light brown		36	M	SS	18					
4											
5	SAND WITH SILT, trace roots, fine grained, light brown, moist, medium dense (SP-SM)	COARSE ALLUVIUM	13	M	SS	15					
6											
7	SILTY SAND, fine grained, brown, moist, medium dense (SM)		18	M	SS	18					
8											
9											
10	SAND WITH SILT, fine grained, light brown, moist to waterbearing at 14.5', medium dense (SP-SM)		17	M	SS	17					
11											
12											
13											
14											
15											
16			16	W	SS	17					
17											
18											
19											
20											
21			21	W	SS	17					
22											
23	CLAYEY SAND, a little gravel, gray, stiff, laminations of lean clay (SC)	TILL									
24											
25											
26	CLAYEY SAND, a little gravel, dark brown, stiff (SC)		15	M	SS	16	17	13			
END OF BORING Northing=213513.2 Easting=552938.3											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/10/07	8:10	16.5	14.5	15.5		19.1	
		7/10/07	8:25	26.5	24.5	24.7		19.2	
BORING COMPLETED: 7/10/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-13 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>894.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1-2	FILL, mixture of silty sand, clayey sand and sandy lean clay, a little gravel, surface roots, trace roots, light brown, dark brown and black	FILL	14	M	SS	16	12				
3-4			15	M	SS	8	7				
5-6	SILTY SAND, a little gravel, trace roots, brown, moist, medium dense (SM) (possible fill)	TILL OR FILL	13	M	SS	18					
7-8	SANDY LEAN CLAY, a little gravel, gray and brown mottled, stiff, laminations of silty sand (CL)	TILL	9	M	SS	12	14				
9-10			10	M	SS	19	15				
11-12	CLAYEY SAND, a little gravel, brown, stiff (SC)										
13-14	CLAYEY SAND, a little gravel, gray, a little brown, stiff to firm, laminations of silty sand (SC)										
15-16	SANDY LEAN CLAY, a little gravel, dark gray, firm (CL)		5	M	SS	24	15				
17-18			6	M	SS	17	19				
19-20											
21-22											
23-24											
25-26											
27-28											
29-30											
31-32											
33-34											
35-36											
37-38											
39-40											
41-42											
43-44											
45-46											
47-48											
49-50											
51-52											
53-54											
55-56											
57-58											
59-60											
61-62											
63-64											
65-66											
67-68											
69-70											
71-72											
73-74											
75-76											
77-78											
79-80											
81-82											
83-84											
85-86											
87-88											
89-90											
91-92											
93-94											
95-96											
97-98											
99-100											
END OF BORING Northing=213523.1 Easting=553398.0											

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	
0-24½'	3.25" HSA	7/10/07	1:00	26.5	24.5	25.0		None
BORING COMPLETED:	7/10/07							
DR: SG	LG: SB	Rig: 91C						



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-14 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>890.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	% #200
1	FILL, mixture of clayey sand and silty sand, surface roots, trace roots, dark brown	FILL	7	M	SS	14					
2	FILL, mixture of sand with silt and clayey sand, a little gravel, trace roots, brown										
3	CLAYEY SAND, a little gravel, brown and gray mottled, firm to stiff, laminations of silty sand (SC)	WEATHERED TILL	8	M	SS	18	14				
4											
5											
6			8	M	SS	20	15				
7											
8			12	M	SS	20	16				
9											
10	CLAYEY SAND, a little gravel, dark gray, a little brown, very stiff, laminations of silty sand (SC)	TILL	16	M	SS	24	17				
11											
12	CLAYEY SAND, a little gravel, dark gray, very stiff to stiff (SC)		12	M	SS	22	15				
13											
14											
15											
16			12	M	SS	24	15				
17											
18											
19											
20											
21			11	M	SS	24	14				
22											
23											
24											
25											
26			15	M	SS	24	15				
END OF BORING Northing=213513.9 Easting=553880.7											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/10/07	2:00	26.5	24.5	26.0		None	
BORING COMPLETED: 7/10/07									
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-15 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>903.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of clayey sand and silty sand, a little gravel, surface roots, trace roots, dark brown and brown	FILL	18	M	SS	17	15				
2											
3			17	M		12	5				
4											
5	CLAYEY SAND, a little gravel, brown and light brown mottled, a little light gray, stiff, laminations of silt (SC)	WEATHERED TILL	12	M	SS	24	15				
6											
7											
8			12	M		19	17				
9											
10	CLAYEY SAND, a little gravel, grayish brown and brown mottled, a little black, stiff, laminations of silt with sand (SC)	TILL	12	M	SS	24	17				
11											
12											
13			13	M		24	16				
14											
15	CLAYEY SAND, a little gravel, dark gray, stiff (SC)		12	M	SS	18	15				
16											
17											
18											
19											
20											
21			13	M	SS	8	14				
22											
23											
24											
25											
26			10	M	SS	24	16				
END OF BORING Northing=213513.9 Easting=554397.3											

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	
0-24½'	3.25" HSA	7/10/07	2:50	26.5	24.5	26.5		None
BORING COMPLETED: 7/10/07								
DR: SG LG: SB Rig: 91C								

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-16 LOCATION: N: 213514.810, E: 554896.627 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/13/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
909.7	0.0	SM	SILTY SAND, fine-grained, with Organic fines, dark brown, moist.					
908.2	1.5	CL	SANDY LEAN CLAY, brown, moist, rather soft. (Lacustrine)	5				
905.7	4.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, wet, rather soft. (Glacial Till)	4		19	41	
902.7	7.0	CL	SANDY LEAN CLAY, trace of Gravel, brown and gray with iron staining, wet, medium. (Glacial Till)	6				
				6				
				7				
895.7	14.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, wet, medium. (Glacial Till)	6				
891.7	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff. (Glacial Till)	12				
883.7	26.0		END OF BORING. Water not observed during drilling. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	10				

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-17 LOCATION: N: 213512.855, E: 555394.920 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/13/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
914.3	0.0					
913.3	1.0	FILL	FILL: Silty Sand, fine-grained, with Organic fines, dark brown, moist.			
		FILL	FILL: Clayey Sand, with Root Fibers, dark brown, moist.			
910.3	4.0	CL	SANDY LEAN CLAY, trace of Gravel, brown and tan, moist, medium to rather stiff. (Glacial Till)	6		
				7		
				9		
905.3	9.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, medium to stiff. (Glacial Till)	9		
				8		
				13		
				12		
892.3	22.0	SC	CLAYEY SAND, trace of Gravel, gray, moist, rather stiff. (Glacial Till)			
888.3	26.0		END OF BORING.	9		
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871				BORING: ST-18		
Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				LOCATION: N: 213514.329, E: 555898.425 See attached sketch.		
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/12/07	SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
905.6	0.0					
905.1	0.5	FILL	FILL: Silty Sand, fine-grained, dark brown, moist.			
		FILL	FILL: Poorly Graded Sand, fine- to coarse-grained, brown, moist.			
			With chunks of Silty Sand at 5 1/2 feet.	26		
				28		
898.6	7.0	SC	CLAYEY SAND, black, moist. (Buried Topsoil)			
897.1	8.5	SP-SM	POORLY GRADED SAND with SILT, with lenses of Lean Clay, olive, wet, loose. (Lacustrine)			
				8		
893.6	12.0	CL	SANDY LEAN CLAY, gray, wet, rather soft. (Lacustrine)			
				4		
				5		
888.6	17.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium to rather stiff. (Glacial Till)			
				8		
879.6	26.0		END OF BORING.	10		
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44
 (See Descriptive Terminology sheet for explanation of abbreviations)

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-19
	LOCATION: N: 213183.570, E: 550706.966 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/19/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
898.1	0.0							
897.1	1.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)					
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist. (Lacustrine)	9				
894.1	4.0	SM	SILTY SAND, fine-grained, brown, wet, medium dense. (Lacustrine)	11				
891.1	7.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, loose to medium dense. (Lacustrine)	11		6	6	
				9				
884.1	14.0	SM	SILTY SAND, light brown, moist, medium dense. (Glacial Outwash)	6				
				15				
880.1	18.0	SM	SILTY SAND, fine-grained, light brown, to gray, waterbearing, medium dense to very dense. (Glacial Outwash)		▽			
				35				
872.1	26.0			60				
			END OF BORING.					
			Water observed at 18 feet while drilling.					
			Boring then grouted.					

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-20 LOCATION: N: 213171.742, E: 551046.195 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
900.8	0.0							
900.3	0.5	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)					
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, rust at 2' sample depth, moist, loose to medium dense. (Lacustrine)	15				
				10				
				8				
891.8	9.0	ML	SANDY SILT, light brown, wet, loose. (Lacustrine)	6				
				9		17	62	
886.8	14.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, medium dense. (Lacustrine)	28		4	7	
882.8	18.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, dense. (Lacustrine)	34				
878.8	22.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose. (Lacustrine)		▽			
874.8	26.0		END OF BORING. Water observed at 22 feet while drilling. Boring then grouted.	10				

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-21 LOCATION: N: 213183.350, E: 553196.596 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
900.6	0.0					
900.1	0.5	SM	SILTY SAND, trace of Roots, brown, moist. (Topsoil)			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, very loose to medium dense. (Lacustrine)	7		
				13		
				8		
				6		
				4		
886.6	14.0	SM	SILTY SAND, fine-grained, light brown, moist, loose. (Lacustrine)	9		
				10		
876.6	24.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brownish-gray, waterbearing, medium dense. (Lacustrine)	11	▽	
874.6	26.0		END OF BORING.			
			Water observed at 24 feet while drilling.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-22 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>892.8</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of silty sand and sand with silt, surface roots, trace roots, brown and light brown	FILL	11	M	SS	11					
2											
3			5	M	SS	16					
4											
5	SILTY SAND, light brownish gray and brown, wet, medium dense (SM)	TILL	18	M	SS	20					
6											
7											
8			12	W	SS	16					
9											
10	SANDY LEAN CLAY, brownish gray, a little dark brown, stiff, lense of clayey sand at 11' (CL)		13	M	SS	18	20				
11											
12	SANDY LEAN CLAY, a little gravel, gray, stiff, laminations of sandy silt (CL)		14	M	SS	14	13				
13											
14											
15	CLAYEY SAND, a little gravel, gray, stiff (SC)		10	M	SS	23	15				
16											
17											
18											
19											
20											
21			9	M	SS	22	17				
22											
23											
24											
25											
26			10	M	SS	24	17				
END OF BORING Northing=213032.8 Easting=552898.9											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/9/07	2:55	9.0	7.0	8.5		None	
		7/9/07	3:15	26.5	24.5	26.5		None	
BORING COMPLETED: 7/9/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-23
	LOCATION: N: 213034.010, E: 553395.870 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/12/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ | BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
890.1	0.0					
889.6	0.5	FILL	FILL: Silty Sand, fine-grained, with Organic fines, trace of Gravel, black, moist.			
		FILL	FILL: Silty Sand, fine-grained, brown and dark brown, moist.			
886.1	4.0	FILL	FILL: Sandy Lean Clay, dark brown to black, moist.	11		
883.1	7.0	CL	SANDY LEAN CLAY, trace of Gravel, gray with iron staining, moist, rather soft. (Glacial Till)	5		
				5		
878.1	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray with iron staining, moist, medium to rather stiff. (Glacial Till)	8		
				6		
				8		
864.1	26.0		END OF BORING.	10		
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-24 LOCATION: N: 213032.373, E: 553900.008 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/12/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING: SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
892.8	0.0						
891.8	1.0	FILL	FILL: Silty Sand, fine-grained, with Organic fines, black, moist.				
		FILL	FILL: Clayey Sand, trace of Gravel, dark brown to brown, moist.	6			
				4		13	
885.8	7.0	OL	ORGANIC CLAY, black, moist. (Swamp Deposit)	5			
883.8	9.0	SC	CLAYEY SAND, gray with iron staining, wet, soft. (Lacustrine)	3			
880.8	12.0	SC	CLAYEY SAND, trace of Gravel, gray, wet, rather soft to medium. (Glacial Till)	5			
				5			
				4			
866.8	26.0		END OF BORING.	6			
			Water not observed during drilling.				
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.				
			Boring then grouted.				

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-25					
DRILLER: K. Keck				METHOD: 3 1/4" HSA, Autohmr		DATE: 6/19/07		SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes	
895.9	0.0								
894.9	1.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)						
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, loose.	8					
				6					
				8					
				7					
883.9	12.0	ML	SANDY SILT, gray with bands of orangish-brown, wet, loose.						
881.9	14.0		(Lacustrine)	6					
		SM	SILTY SAND, fine-grained, Silt laminations, brown to dark brown, wet, medium dense.						
			(Glaciofluvium)	18					
878.9	17.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, waterbearing, medium dense.						
			(Glaciofluvium)	6					
873.9	22.0	SC	CLAYEY SAND, trace of Gravel, gray, wet, medium dense.						
			(Glacial Till)						
869.9	26.0		END OF BORING.	6		13	42	LL = 23% PI = 12%	
			Water observed at 17 feet while drilling. Boring then grouted.						

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-26
	LOCATION: N: 212751.010, E: 551024.200 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
896.2	0.0					
895.7	0.5	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to brown, rust at 15' sample depth, moist, loose to medium dense. (Lacustrine)	10		
				12		
				12		
				10		
				12		
				11		
877.2	19.0	ML	SANDY SILT, gray, waterbearing, medium dense. (Glaciofluvium)		▽	
				19		
870.2	26.0		END OF BORING.	15		
			Water observed at 19 feet while drilling.			
			Boring then grouted.			

(See Descriptive Terminology sheet for explanation of abbreviations)

BRAUN BASIC LOG OF BORING: SP0605871.GPJ BRAUN.GDT 10/2/07 14:44

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-27 LOCATION: N: 212677.165, E: 551403.522 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
893.3	0.0							
892.3	1.0	SM	SILTY SAND, very fine- to fine-grained, dark brown, moist. (Topsoil)					
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, very loose to medium dense. (Lacustrine)	4				
				9				
				10				
				11		4	5	
881.3	12.0				▽			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown to light brown, waterbearing, loose. (Lacustrine)	8				
				6		22	11	
876.3	17.0							
		ML	SILT with SAND, grayish-brown to gray, wet, loose to medium dense. (Glaciofluvium)					
				9				
				24		24	82	
866.3	27.0							
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, medium dense. (Glaciofluvium)					
				28				
861.3	32.0							

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-27 (cont.) LOCATION: N: 212677.165, E: 551403.522 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
861.3	32.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff. (Glacial Till)	9				
856.3	37.0	SC	CLAYEY SAND, trace of Gravel, gray, wet, rather stiff. (Glacial Till)	9		15	46	
850.3	43.0	CL	SANDY LEAN CLAY, trace of Gravel, wet, rather stiff. (Glacial Till)	9				
				10		18	51	
				9				
				9				

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-27 (cont.)
	LOCATION: N: 212677.165, E: 551403.522 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING: SP0605871.GPJ BRAUN.GDT: 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
829.3	64.0		SANDY LEAN CLAY, trace of Gravel, wet, rather stiff. (Glacial Till) <i>(continued)</i>	9				
				9				
				12				
816.3	77.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, wet, very stiff to hard. (Glacial Till)	21				
				34		14	62	
				41				
801.3	92.0	CL	LEAN CLAY, reddish-brown to grayish-brown with laminations of brown, very stiff to hard. (Glaciofluvium)	22				

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-27 (cont.) LOCATION: N: 212677.165, E: 551403.522 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
797.3	96.0		LEAN CLAY, reddish-brown to grayish-brown with laminations of brown, very stiff to hard. (Glaciofluvium) (continued)					
792.3	101.0		END OF BORING. Water observed at 12 feet while drilling. Boring then grouted.	30				

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-28 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 887.8 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of sand with silt and silty sand, a little gravel, surface roots, trace roots, black, dark brown, gray and light brown	FILL	10	M	SS	14					
2											
3											
4	SAND WITH SILT, fine grained, trace roots, gray and light brown, moist, loose (SP-SM) (possible fill)	COARSE ALLUVIUM OR FILL	7	M	SS	16					
5											
6	SILTY SAND, a little gravel, gray, light brown, moist, medium dense (SM) (possible fill)		14	W	SS	3					
7											
8											
9	CLAYEY SAND, a little gravel, gray, soft to stiff (SC)	TILL	7	M	SS	16	14				
10											
11											
12											
13											
14											
15	7	M	SS	24	17						
16											
17											
18											
19	3	M	SS	22	16						
20											
21	6	M	SS	22	17						
22											
23											
24											
25											
26	10	M	SS	22	9						
END OF BORING Northing=212534.7 Easting=552897.1											

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	
0-24½'	3.25" HSA	7/9/07	1:55	9.0	7.0	8.7		None	
		7/9/07	2:15	26.5	24.5	24.5		None	
BORING COMPLETED: 7/9/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-29 RI-3008-29 LOCATION: N: 212533.840, E: 553396.120 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/19/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
888.1	0.0	FILL	FILL: SANDY LEAN CLAY, trace of Gravel, mixed brown to dark brown, moist.	8		
882.1	6.0	PT	PEAT, dark gray, wet. (Swamp Deposit)	3		
879.1	9.0	SM	SILTY SAND, fine-grained, gray, waterbearing, medium dense. (Lacustrine)	9	▽	
877.1	11.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft to medium. (Glacial Till)	3		
				4		
				8		
862.1	26.0		END OF BORING. Water observed at 9 feet while drilling. Boring then grouted.	7		

INTERTEC

Braun Project SP-06-05871				BORING: ST-30			
Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				LOCATION: N: 212475.559, E: 554035.366 See attached sketch.			
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/12/07		SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
885.9	0.0						
		OL	ORGANIC CLAY, black, moist. (Topsoil)				
883.9	2.0						
		SP	POORLY GRADED SAND, fine- to medium-grained, brown, wet to waterbearing, loose. (Glacial Outwash)	4	▽		
				7			
878.9	7.0						
		CL	SANDY LEAN CLAY, gray, wet, soft. (Lacustrine)	2		19	
				3			
873.9	12.0						
		CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft to medium. (Glacial Till)	5			
				5			
				7			
859.9	26.0						
			END OF BORING.	6			
			Water observed at 4 feet while drilling.				
			Boring then grouted.				

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-31 LOCATION: N: 212415.495, E: 551003.074 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
892.9	0.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
	0.5	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown, moist, medium dense. (Lacustrine)			
888.9	4.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, orange-brown to grayish-brown with rust at 7' sample depth, loose to medium dense. (Lacustrine)			
				11		
				9		
				15		
				12	▽	
880.9	12.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, grayish-brown, waterbearing, medium dense. (Glaciofluvium)			
				22		
				23		
				16		
869.9	23.0	ML	SANDY SILT, gray, wet, medium dense. (Glaciofluvium)			
				15		
866.9	26.0		END OF BORING.			
			Water observed at 11 feet while drilling.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-32 LOCATION: N: 212330.333, E: 551226.541 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/20/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
893.5	0.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)					
892.5	1.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, very loose to loose. (Lacustrine)	2				
886.5	7.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, orange-brown, moist to wet, loose to medium dense. (Lacustrine)	11		5	5	
881.5	12.0	SM	SILTY SAND, fine-grained, grayish-brown, waterbearing, very loose to medium dense. (Lacustrine)	6	▽			
				2		23	29	
				12				
870.5	23.0	CL-ML	SILTY CLAY, gray, wet, loose. (Glaciofluvium)					
867.5	26.0		END OF BORING.	9		23	96	LL = 27 PI = 6
			Water observed at 13 feet while drilling. Boring then grouted.					

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-33 LOCATION: N: 212183.655, E: 550725.056 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/19/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
895.7	0.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)					
894.7	1.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown to light brown, moist, very loose to loose. (Lacustrine)	4				
				6				
				7				
886.7	9.0	SM	SILTY SAND, fine-grained, brown to grayish-brown, moist, medium dense. (Glaciofluvium)	13				
				11				
881.7	14.0	SM	SILTY SAND, fine-grained, grayish-brown, waterbearing, medium dense. (Glaciofluvium)	14	▽			
877.7	18.0	ML	SANDY SILT, gray, wet, medium dense. (Glaciofluvium)	14		22	55	
873.7	22.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose. (Glaciofluvium)	7				
869.7	26.0		END OF BORING. Water observed at 14 feet while drilling. Boring then grouted.					

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-34 LOCATION: N: 212181.205, E: 550971629 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
894.3	0.0							
893.3	1.0	SM	SILTY SAND, dark brown, moist. (Topsoil)					
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to brown, moist, loose to medium dense. (Lacustrine)	5				
				12				
885.3	9.0			11		11	6	
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, orange-brown, moist to wet, medium dense. (Lacustrine)	11				
				11				
880.3	14.0				▽			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, grayish-brown, waterbearing, very loose. (Lacustrine)	4				
876.3	18.0							
		SM	SILTY SAND, fine-grained, grayish-brown, waterbearing, medium dense. (Lacustrine)	13				
				13				
868.3	26.0		END OF BORING.					
			Water observed at 14 feet while drilling.					
			Boring then grouted.					

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-35
	LOCATION: N: 212022.662, E: 551147.722 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/20/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
896.0	0.0					
895.5	0.5	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to brown, moist, very loose to loose. (Lacustrine)	3		
				7		
				10		
				10		
				8		
				8		
879.0	17.0	SM	SILTY SAND, fine-grained, grayish-brown to gray, waterbearing, medium dense. (Glaciofluvium)		▽	
				13		
870.0	26.0			11		
			END OF BORING.			
			Water observed at 16 feet while drilling.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-36 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 887.6 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%#200			
1	2.5" Bituminous Pavement	FILL			SU									
2	FILL, mixture of clayey sand and silty sand, a little gravel, trace roots, brown		20	M	SS	16								
3	FILL, mixture of sand with silt and silty sand, a little gravel, brown and light brown		17	M	SS	14								
4														
5														
6														
7														
8														
9														
10	SANDY LEAN CLAY, a little gravel, dark gray, stiff, laminations of silt at 10' (CL)	FINE ALLUVIUM												
11			9	M	SS	14	20							
12	LEAN CLAY WITH SAND, a little gravel, dark gray, firm, laminations of silt (CL)		7	M	SS	20	23							
13														
14														
15	SILTY CLAY, a little gravel, brownish gray, very stiff, lense of clayey sand at 15' (CL-ML)	TILL												
16	SANDY SILT, a little gravel, light brown, medium dense (ML)		30	M	SS	15	14							
17														
18	CLAYEY SAND, a little gravel, gray, very stiff to stiff (SC)	TILL												
19														
20														
21														
22														
23														
24														
25														
26														
END OF BORING Northing=212032.3 Easting=552445.3														

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
DEPTH	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-24½'	3.25" HSA	7/6/07	12:00	26.5	24.5	24.5		None	
BORING COMPLETED: 7/9/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-37 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>888.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of clayey sand and silty sand, a little gravel, surface roots, trace roots, brown and dark brown	FILL	14	M	SS	21	10					
2												
3												
4	SANDY LEAN CLAY, a little gravel, light brown, firm (CL)	TILL	7	M	SS	7	9					
5	CLAYEY SAND, a little gravel, gray, firm to stiff (SC)											
6												
7												
8												
9												
10												
11												
12	SANDY LEAN CLAY, a little gravel, dark gray, stiff to very stiff (CL/SC)											
13												
14												
15												
16												
17												
18	12	M	SS	17	15							
19												
20	13	M	SS	20	15							
21												
22												
23	18	M	SS	24	14							
24												
25												
26												
END OF BORING Northing=212033.5 Easting=552895.2												

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/9/07	1:10	26.5	24.5	26.5		None	
BORING COMPLETED: 7/9/07									
DR: SG	LG: SB	Rig: 91C							

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-38 RI-3008-23 LOCATION: N: 212018.960, E: 553405.450 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/19/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
885.4	0.0	FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, mixed light brown to brown, moist.	9		
878.4	7.0	PT	PEAT, dark gray, wet. (Swamp Deposit)	2	▽	
876.9	8.5		END OF BORING. (Per Tetra Tech) Water observed at 7 feet while drilling. Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-39 LOCATION: N: 553901.512, E: 553901.512 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/11/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
887.9	0.0	FILL	FILL: Silty Sand, trace of Roots, dark brown to brown, moist.	11		
880.9	7.0	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, trace of Gravel, gray, moist.	4		
875.9	12.0	PT	PEAT, dark gray, wet. (Swamp Deposit)	4	▽	
869.9	18.0	OL	ORGANIC SILT, dark gray, wet. (Swamp Deposit)	6		
865.9	22.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, gray, waterbearing, loose. (Glacial Outwash)	10		
861.9	26.0		END OF BORING. Water observed at 14 feet while drilling. Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-40
	LOCATION: N: 211680.392, E: 550589.817 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/22/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
893.7	0.0	SM				
893.2	0.5	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
			SILTY SAND, fine-grained, dark brown, moist, very loose. (Lacustrine)	2		
889.7	4.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to grayish-brown with rust at 10' sample depth, moist, very loose to medium dense. (Lacustrine)	3		
				8		
				9		
879.7	14.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, grayish-brown to gray, waterbearing, loose to medium dense. (Lacustrine)	6		
				11	▽	
				16		
867.7	26.0			24		
			END OF BORING.			
			Water observed at 13 feet while drilling.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-41
	LOCATION: N: 211684.376. E: 550897.834 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
892.5	0.0					
891.8	0.7	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to brown, moist, loose to medium dense. (Lacustrine)	15		
				8		
				12		
				12		
880.5	12.0	SM	SILTY SAND, fine-grained, brownish-gray, waterbearing, loose to medium dense. (Lacustrine)	10	▽	
				17		
				16		
870.5	22.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose. (Lacustrine)			
866.5	26.0		END OF BORING.	7		
			Water observed at 12 feet while drilling.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-42 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>885.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of sandy silt and silty sand, with gravel, surface roots, trace roots, brown and dark brown	FILL	29	M	SS	14					
2											
3	FILL, mixture of sand with silt, silty sand and clayey sand, a little gravel, brown, a little brownish gray and gray	FILL	23	M	SS	8					
4											
5											
6											
7	SAND WITH SILT, fine grained, brownish gray to gray and black, medium dense, lenses and laminations of organic silt (SP-SM)	COARSE ALLUVIUM OR TOPSOIL	17	M	SS	19					
8											
9											
10											
11	SAND, medium to fine grained, brown and gray, waterbearing, loose, lenses of sandy silt (SP)	COARSE ALLUVIUM	5	W	SS	4					
12											
13	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL)	TILL	7	M	SS	8	22				
14											
15											
16											
17											
18	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL)	TILL	8	M	SS	15	16				
19											
20											
21	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL)	TILL	13	M	SS	18	16				
22											
23											
24											
25											
26	END OF BORING Northing=211590.1 Easting=551980.4										

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/21/07	11:45	11.5	9.5	10.3		10.1	
BORING COMPLETED: 6/21/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-43 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>890.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of clayey sand and silty sand, trace roots, brown and dark brown		11	M	SS	16	13				
2	SAND WITH SILT, trace roots, brown mottled to grayish brown, moist, dense, lenses and laminations of organic silt (SP-SM) (possible fill)	COARSE ALLUVIUM OR FILL	31	M	SS	14					
3											
4	SAND WITH SILT, light brown and gray mottled, waterbearing, medium dense (SP-SM)	COARSE ALLUVIUM	22	W	SS	16	20				
5											
6											
7	SILTY SAND, a little gravel, gray, medium dense (SM)	TILL	25	M	SS	14	11				
8											
9	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL)		8	M	SS	15	18				
10											
11											
12											
13											
14											
15											
16											
17											
18	8	M	SS	22	15						
19											
20											
21	6	M	SS	21	17						
22											
23											
24											
25	6	M	SS	21	23						
26											
END OF BORING Northing=211683.6 Easting=552398.6											

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/25/07	8:15	6.5	4.5	5.5		None	
		6/25/07	8:20	9.0	7.0	7.6		6.8	
BORING COMPLETED: 6/25/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-44 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>888.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of sand with silt and clayey sand, a little gravel, trace roots, surface roots, pieces of plastic and concrete, brown and dark brown	FILL	5	M	SS	16	9				
2	SANDY LEAN CLAY, a little gravel, gray and brown mottled, firm, laminations of silty sand (CL)	TILL	8	M	SS	7	16				
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14	SANDY LEAN CLAY, a little gravel, dark gray, firm to stiff (CL)		8	M	SS	21	15				
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26			11	M	SS	20	15				
END OF BORING Northing=211684.3 Easting=552896.6											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/22/07	11:45	26.5	24.5	26.5		None	
BORING COMPLETED: 6/22/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-45 RI-3008-18
	LOCATION: N: 211681.830, E: 553399.700 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/18/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
892.4	0.0					
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, moist.			
888.4	4.0	FILL	FILL: Clayey Sand, trace of Roots, brown to dark gray.	26		
885.4	7.0	FILL	FILL: Silty Sand, fine-grained, waterbearing, medium dense.	12		Fuel Odor
883.9	8.5	FILL	FILL: Silty Sand, fine-grained, waterbearing, medium dense.	12		
			END OF BORING. (Per Tetra Tech).			
			Water observed at 6 1/2 feet while drilling.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-46
	LOCATION: N: 211683.156, E: 553897.273 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/11/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING: SP0605871.GPI BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
895.4	0.0					
894.4	1.0	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.			
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel with Wood fragments at 8' sample depth, reddish brown to gray moist to wet.	12		
				14		
				5		
				2	▽	
883.4	12.0	PT	PEAT, dark gray, wet. (Swamp Deposit)	3		
				3		
				5		
873.4	22.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, waterbearing, medium dense. (Glacial Outwash)			
869.4	26.0		END OF BORING.	11		
			Water observed at 11 feet while drilling. Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-47 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>893.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	SAND WITH SILT, surface roots, trace roots, fine grained, brown, a little dark brown, moist, very loose (SP-SM) (possible fill)	COARSE ALLUVIUM OR FILL	4	M	SS	13						
2	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, very loose (SP-SM) (possible fill)			7	M	SS	15					
3	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)		COARSE ALLUVIUM	8	M	SS	17					
4	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)				10	M	SS	16				
5	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)				9	M	SS	17				
6	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)				9	W	SS	16				
7	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)				11	M	SS	15				
8	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)				41	M	SS	18				
9	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
10	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
11	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
12	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
13	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
14	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
15	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
16	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
17	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
18	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
19	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
20	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
21	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
22	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
23	SAND WITH SILT, trace roots, fine grained, light brown and brown mottled, moist, loose, lenses and laminations of silty sand (SP-SM) (possible fill)											
24	SAND WITH SILT, a little gravel, fine grained, gray, waterbearing, loose (SP-SM)											
25	CLAYEY SAND, a little gravel, gray, stiff (SC)	TILL	10	M	SS	18	17					
26	END OF BORING Northing=211436.0 Easting=550652.0											

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	
0-14½'	3.25" HSA								
14½'-24½'	RD w/DM	6/19/07	10:30	14.0	12.0	12.1		None	
		6/19/07	10:35	16.5	14.5	14.5		14.4	
BORING COMPLETED: 6/19/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-48 LOCATION: N: 211431.925, E: 550895.208 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
890.9	0.0							
889.4	1.5	FILL	FILL: Silty Sand, trace of Roots and concrete debris, dark brown, moist.					
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, orange-brown to light brown, moist, loose. (Lacustrine)	5				
				8				
				10				
879.9	11.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown to gray, waterbearing, very loose to loose. (Lacustrine)	10	▽			
				6				
				4		22	11	
872.9	18.0	SM	SILTY SAND, fine-grained, grayish-brown to gray, waterbearing, medium dense. (Lacustrine)	8				
				14				
864.9	26.0		END OF BORING.					
			Water observed at 11 feet while drilling.					
			Boring then grouted.					

BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-50				
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 6/22/07		SCALE: 1" = 4'		
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
882.8	0.0							
881.8	1.0	FILL	FILL: Silty Sand, very fine- to fine-grained, trace of Roots, dark brown, moist.					
		FILL	FILL: Clayey Sand, asphalt and concrete debris, trace of Roots, dark gray, moist.	15		8	16	OC = 2%
878.8	4.0	FILL	FILL: Poorly Graded Sand with Silt, very fine- to fine-grained, brown, moist.	11				
875.8	7.0	SM	SILTY SAND, slightly Organic, dark gray, wet, very loose. (Swamp Deposit)	3				
				3	▽	39	34	OC = 4 LL = 34 PI = 1
870.8	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft to rather stiff. (Glacial Till)	4				
				10				
				5				
				7				
856.8	26.0		END OF BORING. Water observed at 11 feet while drilling. Boring then grouted.					

BRAUN BASIC LOG OF BORING SP-06-05871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-51 LOCATION: N: 211184.241, E: 550897.404 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/21/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
881.2	0.0							
880.4	0.8	FILL	FILL: Silty Sand, very fine- to fine-grained, trace of Roots, dark brown, moist.					
		FILL	FILL: Silty Sand, very fine- to fine-grained, mixed dark brown to brown, moist.	8				
				2		13	15	OC = 2%
874.2	7.0	SM	SILTY SAND, fine-grained, trace of fibers, dark gray, moist, very loose. (Swamp Deposit)	3		28	17	OC = 3
				4	▽			
869.2	12.0	SM	SILTY SAND, fine-grained, dark gray, waterbearing, loose. (Lacustrine)	5				
				5				
864.2	17.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)	6				
				6				
855.2	26.0		END OF BORING. Water observed at 9 feet while drilling. Boring then grouted.					



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-52 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 885.9 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DEN	LL	PL	%-#200				
1	4.5" Bituminous Pavement	FILL			SU										
2	FILL, mixture of clayey sand and silty sand, with gravel, trace roots, brown and light brownish gray			12	M	SS	12	10							
3	FILL, mixture of sand, silty sand and clayey sand, a little gravel, pieces of wood at about 5', brown, light brownish gray and black			18	M	SS	19								
4															
5															
6				41	M	SS	19								
7															
8				14	W	SS	17								
9															
10				16		SS	17								
11															
12	SAND WITH SILT, fine grained, gray, a little black, waterbearing, very loose, laminations of silty sand (SP-SM)		COARSE ALLUVIUM												
13			4	W	SS	14	19								
14	CLAYEY SAND, a little gravel, dark gray, soft (SC)	TILL													
15															
16	CLAYEY SAND, gray, a little brown, soft, laminations of silty sand (SC)		4	M	SS	19	20								
17															
18	SANDY LEAN CLAY, a little gravel, gray, soft to firm (CL)														
19															
20			4	M	SS	19	20								
21															
22															
23															
24															
25															
26			7	M	SS	17	19								
END OF BORING Northing=211278.6 Easting=551665.8															

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	
0-14½'	3.25" HSA								
14½'-24½'	RD w/DM	6/21/07	10:45	14.0	12.0	12.4		10.9	
BORING COMPLETED: 6/21/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-53 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>885.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly sand with silt, with gravel, surface roots, trace roots, dark brown and brown	FILL	13	M	SS	12					
2											
3											
4	FILL, mixture of silty sand and sand with silt, trace roots, brown, light brown, a little black		9	M	SS	13					
5											
6											
7											
8	SILTY SAND, fine grained, brown, moist to about 9.5', then wet, medium dense, lenses and laminations of sand with silt (SM)	COARSE ALLUVIUM	21	W/M	SS	17					
9											
10											
11	CLAYEY SAND, a little gravel, brownish gray, firm (SC)	TILL	6	M	SS	24	19				
12											
13	SANDY LEAN CLAY, a little gravel, brownish gray, stiff (CL)		13	M	SS	23	19				
14											
15											
16											
17											
18			10	M	SS	21	16				
19											
20											
21											
22			12	M	SS	24	17				
23											
24											
25											
26	END OF BORING Northing=211190.3 Easting=551897.8										

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/21/07	1:00	11.5	9.5	10.6		10.3	
BORING COMPLETED: 6/21/07									
DR: SG LG: SB RIG: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-54 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>888.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of silty sand and clayey sand, a little gravel, trace roots, dark brown and brown, pieces of brick	FILL	18	M	SS	16						
2												
3			56	W/M	SS	1	19					
4												
5	CLAYEY SAND, brown and gray mottled, very soft, laminations of silty sand and sand with silt (SC)	WEATHERED TILL	4	W/M	SS	17						
6		TILL					22					
7	SANDY LEAN CLAY, a little gravel, gray, soft to stiff (CL)		5	M	SS	19	18					
8												
9												
10			15	M	SS	19	16					
11												
12												
13			8	M	SS	24	17					
14												
15			9	M	SS	23	14					
16												
17												
18												
19												
20												
21			10	M	SS	24	19					
22												
23												
24												
25												
26			10	M	SS	24	16					
END OF BORING Northing=211160.7 Easting=552421.7												

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
<u>0-24½'</u>	<u>3.25" HSA</u>	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		<u>6/25/07</u>	<u>9:30</u>	<u>9.0</u>	<u>7.0</u>	<u>8.5</u>			<u>None</u>
BORING COMPLETED: <u>6/25/07</u>									
DR: <u>SG</u> LG: <u>SB</u> Rig: <u>91C</u>									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-55 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>892.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%#200	
1	FILL, mixture of clayey sand and silty sand, a little gravel, trace roots, pieces of bituminous, brown, gray and black	FILL	12	M	SS	13	10					
2												
3	SANDY LEAN CLAY, a little gravel, gray and brown mottled, firm, laminations of silty sand and silt (CL)	WEATHERED TILL	7	M	SS	14	18					
4												
5												
6	SANDY LEAN CLAY, a little gravel, light brownish gray, a little brown, stiff to very stiff, laminations of silty sand (CL)	TILL	9	M	SS	22	17					
7												
8												
9												
10	SANDY LEAN CLAY, a little gravel, dark gray, a little brown, stiff to firm, laminations of silty sand (CL)		14	M	SS	18	16					
11												
12												
13												
14												
15												
16			11	M	SS	20	16					
17												
18												
19			10	M	SS	21	17					
20												
21			8	M	SS	19	15					
22												
23												
24												
25			13	M	SS	24	15					
26												
END OF BORING Northin=211171.6 Easting=552889.1												

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/22/07	11:00	26.5	24.5	25.0		None	
BORING COMPLETED: 6/22/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-57 (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>893.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS												
							WC	DEN	LL	PL	%-#200								
1	4.25" Bituminous Pavement	FILL																	
2	FILL, mixture of sand with silt and silty sand, light brown and brown				M	SU													
3			67	M	SS	18													
4																			
5																			
6			44	M	SS	18													
7	FILL, mixture of sand with silt and silty sand, a little gravel, brown, dark brownish gray and black																		
8			64	M	SS	23													
9																			
10			78	M	SS	17													
11																			
12																			
13			5	M	SS	14													
14																			
15			12	M	SS	17													
16																			
17																			
18			38	W/M	SS	19													
19																			
20																			
21			14	M	SS	17													
22																			
23	SAND WITH SILT, trace roots, fine grained, brownish gray, a little black, waterbearing, medium dense, laminations of organic silt (SP-SM)	TOPSOIL OR COARSE ALLUVIUM	19	W/M	SS	19													
24		COARSE ALLUVIUM																	
25	SAND, fine grained, brownish gray, waterbearing, medium dense, lense of fine to medium grained sand (SP)		14	W	SS	22													
26	SANDY LEAN CLAY, a little gravel, brownish gray, stiff (CL)	TILL																	
27																			
28																			

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
24½'-29½'	RD w/DM	6/19/07	12:15	24.0	22.0	22.4			None
		6/19/07	12:20	26.5	24.5	24.1			22.5
BORING COMPLETED: 6/19/07									
DR: SG LG: SB Rig: 91C									




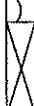
AMERICAN
ENGINEERING
TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-57 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30 - 31 -	SANDY LEAN CLAY, a little gravel, brownish gray, stiff (CL) (continued)	 TILL (continued)	9	M	 SS	24	15				
	END OF BORING Northing=211018.6 Easting=550730.8										



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-59 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>884.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, a little gravel, pieces of bituminous, surface roots, trace roots, brown and dark brown	FILL	10	M	SS	14					
2			FILL, mixture of sand with silt and silty sand, a little gravel, trace roots, brown and dark brown	26	M	SS	16				
4				28	M	SS	19				
6				23	M	SS	17				
7	FILL, mixture of organic clay and silty sand, trace roots, black and brown	FILL	13	M	SS	17	17				
8			11	M	SS	17	24				
9	LEAN CLAY WITH ORGANICS, trace roots, black, a little gray, stiff, laminations of sand (CL)	TOPSOIL									
10	SAND, fine grained, light brownish gray, waterbearing, medium dense (SP)	COARSE ALLUVIUM	11	W	SS	17					
11			4	W	SS	16					
12	SAND, a little gravel, fine grained, brownish gray, a little black, waterbearing, very loose, laminations of organic silt (SP)										
13	SAND WITH SILT, fine grained, light brownish gray, waterbearing, dense (SP-SM)		37	W	SS	18					
14											
15											
16	SILTY SAND, fine grained, light brownish gray, wet, dense (SM)										
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
END OF BORING Northing=210936.8 Easting=550917.0											

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	
0-14½'	3.25" HSA								
14½'-20½'	RD w/DM	6/19/07	1:40	14.0	12.0	12.2		12.1	
BORING COMPLETED:	6/19/07								
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-60 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 883.9 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%#200			
1	FILL, mixture of silty sand, sandy silt and organic silt, a little gravel, trace roots, brown, dark brown and black	FILL	10	M	SS	14								
2														
3			FILL, mixture of sand with silt, silty sand and clayey sand, a little gravel, organic clay, trace roots, brown, a little light brown and black	FILL	16	M	SS	14						
4														
5														
6							4	W/M	SS	14				
7														
8							3	W	SS	14				
9														
10														
11							5	W	SS	17				
12														
13							13	W	SS	12				
14					SAPRIC PEAT, black, laminations of waterbearing sand (PT)	SWAMP DEPOSIT								
15														
16							WH	W	SS	19	48			
17	SAND, fine grained, gray to brownish gray, waterbearing, medium dense (SP)													
18														
19					12	W	SS	16						
20														
21					22	W	SS	19						
22														
23														
24														
25														
26					28	W	SS	21						
END OF BORING Northing=210929.3 Easting=551151.1														

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/19/07	2:45	9.0	7.0	7.0		None	
		6/19/07	2:50	11.5	9.5	9.0		8.0	
BORING COMPLETED: 6/19/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-61 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>885.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS									
							WC	DEN	LL	PL	%-#200					
1	5" Bituminous Pavement	FILL			SU											
2	FILL, mixture of silty sand and sand with silt, a little gravel, trace roots, brown and gray		20	M	SS	14										
3			32	M	SS	17										
4																
5																
6																
7	CLAYEY SAND, black, a little gray, hard, laminations of sand with silt (SC)	TOPSOIL						13								
8	SILTY SAND, fine grained, light brownish gray, moist, dense (SM)	COARSE ALLUVIUM	38	M	SS	20										
9	SILTY SAND, fine grained, gray, wet, loose (SM)		8	W	SS	18										
10																
11																
12																
13	SAND WITH SILT, trace roots, fine grained, gray, a little black, waterbearing, medium dense, laminations of clayey sand (SP-SM)		12	W	SS	14										
14																
15																
16																
17																
18																
19																
20	SAND WITH SILT, fine grained, gray, waterbearing, medium dense (SP-SM)		21	W	SS	17										
21																
22																
23																
24																
25																
26																
END OF BORING Northing=210988.6 Easting=551565.3																

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/21/07	9:30	11.5	9.5	9.7		9.4	
BORING COMPLETED: 6/21/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-62				
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 6/25/07		SCALE: 1" = 4'		
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
884.3	0.0							
883.8	0.5	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.					
		FILL	FILL: Silty Sand, very fine- to fine-grained, trace of Gravel, mixed with Poorly Graded Sand, light brown to brown, moist.	18				
				22				
				14				
				7				
872.3	12.0	SM	SILTY SAND, fine-grained, trace of Roots, slightly Organic, dark gray, waterbearing, loose. (Swamp Deposit)	6	▽	25	17	OC = 2%
870.3	14.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose. (Lacustrine)	5				
866.3	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium to rather stiff. (Glacial Till)	7				
858.3	26.0		END OF BORING.	10				
			Water observed at 12 feet while drilling.					
			Boring then grouted.					

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45
 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-63
	LOCATION: N: 210687.940, E: 550637.026 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/25/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
886.1	0.0	FILL	FILL: Poorly Graded Sand with Silt, fine-grained, trace of Gravel, mostly brown mixed with dark brown, moist.			
				23		
				17		
				23		
877.1	9.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown to grayish-brown, loose. (Lacustrine)			
				7		
				6		
872.1	14.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, very loose. (Lacustrine)		▽	
				3		
868.1	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft to rather stiff. (Glacial Till)			
				5		
860.1	26.0		END OF BORING.	10		
			Water observed at 14 feet while drilling.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-64 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>883.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%-#200			
1	2.25" Bituminous Pavement	FILL			SU									
2	FILL, mixture of gravelly sand with silt and clayey sand, trace roots, brown		7	M	SS	12								
3	FILL, mixture of sand with silt, silty sand and clayey sand, a little gravel, brown, a little dark brown, gray and black		12	M	SS	16	11							
4														
5														
6														
7														
8	FILL, mixture of silty sand and organic clay, trace roots, brownish gray and black				SS	20								
9	SAPRIC PEAT, black (PT)													
10		SWAMP DEPOSIT												
11	SILTY SAND, trace roots, fine grained, gray and black, wet very loose, laminations of organic silt (SM)				SS	14								
12		COARSE ALLUVIUM												
13					SS	12								
14														
15	SANDY LEAN CLAY, a little gravel, gray, firm to stiff, laminations of sand (CL)	TILL			SS	12	14							
16														
17														
18														
19														
20														
21					SS	22	16							
22														
23														
24														
25														
26					SS	22	17							
END OF BORING Northing=210683.3 Easting=550895.7														

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/20/07	3:35	11.5	9.5	10.9		10.2	
BORING COMPLETED: 6/20/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-65 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>886.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS									
							WC	DEN	LL	PL	%-#200					
1	4.5" Bituminous Pavement	FILL			SU											
2	FILL, mixture of silty sand, sand with silt and clayey sand, with gravel, trace roots, dark brown, light brown and gray			14	M	SS	13									
3	SAND WITH SILT, fine grained, light brown and brown mottled, moist, medium dense, laminations of silty sand (SP-SM)	COARSE ALLUVIUM			SS	19										
4				22	M	SS	19									
5	SAND WITH SILT, fine grained, light brown, moist to waterbearing, medium dense (SP-SM)			23	W	SS	17									
6					SS	17										
7	SAND WITH SILT, fine grained, brownish gray, a little black, waterbearing to about 9.5', then moist, medium dense, laminations of silty sand (SP-SM)	FINE ALLUVIUM			SS	17										
8				15	M	SS	17									
9				14	M	SS	20									
10	SAND WITH SILT, trace roots, fine grained, gray and black, moist, medium dense, lenses of organic silt (SP-SM)				SS	19										
11			12	W	SS	19										
12	SAND, fine grained, gray and light grayish brown mottled, waterbearing, medium dense (SP)				SS	17										
13			8	M	SS	17										
14	SANDY SILT, gray and brownish gray, wet, loose, lenses and laminations of lean clay (ML)				SS	17										
15					SS	17										
16					SS	17										
17					SS	17										
18	CLAYEY SAND, a little gravel, gray, stiff, laminations of wet silty sand (SC)	TILL			SS	20	14									
19				9	M	SS	20	14								
20					SS	20	14									
21					SS	20	14									
22					SS	20	14									
23	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)				SS	19	19									
24			13	M	SS	19	19									
25					SS	19	19									
26					SS	19	19									
END OF BORING Northing=210684.0 Easting=551396.3																

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	
0-12'	3.25" HSA								
12'-24½'	RD w/DM	6/21/07	8:20	14.0	12.0	12.1		10.0	
BORING COMPLETED: 6/21/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-66 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 888.9 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS									
							WC	DEN	LL	PL	%#200					
1	FILL, mostly silty sand, a little gravel, trace roots, dark brown	FILL														
2	FILL, mixture of sand with silt and silty sand, a little gravel, trace roots, light brown and brown	COARSE ALLUVIUM	20	M	SS	19										
3	SILTY SAND, fine grained, brown, moist, medium dense (SM)		20	M	SS	18										
4	SAND WITH SILT, fine grained, light grayish brown to brown mottled, moist, medium dense, laminations of silty sand (SP-SM)		15	M	SS	15										
5			18	M	SS	18										
6			12	W	SS	17										
7	SAND WITH SILT, fine grained, light brownish gray and brown mottled, moist to about 9.5', then waterbearing, medium dense to loose (SP-SM)		6	W	SS	14										
8			2	W	SS	13										
9		18														
10	SILTY SAND, a little gravel, fine to medium grained, gray, wet, very loose (SM)															
11	CLAYEY SAND, a little gravel, gray, soft (SC)	TILL	4	M	SS	24	18									
12																
13																
14	SANDY LEAN CLAY, a little gravel, gray, firm (CL)		7	M	SS	24	21									
15																
16																
17	END OF BORING Northing=210683.5 Easting=551850.2															

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/21/07	2:05	11.5	9.5	10.2		10.0	
BORING COMPLETED:	6/21/07								
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-67 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>888.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mostly organic silt, surface roots, trace roots, dark brown and black	FILL	8	M	SS	15						
2	FILL, mixture of silty sand and clayey sand, a little gravel, trace roots, dark brown, brown and light brown											
3	SAND WITH SILT, a little gravel, light brown to light brown mottled, waterbearing, loose to medium dense (SP-SM)	COARSE ALLUVIUM	17	M	SS	14						
4												
5												
6												
7												
8			21	W	SS	17						
9												
10												
11			9	W	SS	15						
12	CLAYEY SAND, a little gravel, gray, stiff (CL)	TILL										
13			9	M	SS	10	17					
14												
15	SANDY LEAN CLAY, a little gravel, gray, firm to stiff											
16			6	M	SS	17	15					
17												
18												
19												
20												
21			11	M	SS	16	17					
22												
23												
24												
25												
26			10	M	SS	18	18					
END OF BORING Northing=210683.4 Easting=552397.5												

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/22/07	8:40	9.0	7.0	6.8		6.0	
BORING COMPLETED: 6/22/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-68 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>895.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of silty sand and sand with silt, a little gravel, surface roots, trace roots, light brown, brown and dark brown	FILL	13	M	SS	12					
2											
3			16	M	SS	6					
4											
5											
6											
7	ORGANIC CLAY, trace roots, black, soft (OL/OH)	TOPSOIL OR SWAMP DEPOSIT	3	M	SS	10	39				
9	SAND WITH SILT, a little gravel, brown and gray, waterbearing, medium dense (SP-SM)	COARSE ALLUVIUM	28	W	SS	17					
12	LEAN CLAY, gray and black, stiff, lenses of sandy lean clay, laminations of fat clay (CL)	TILL	14	M	SS	24	16				
14	SANDY LEAN CLAY, a little gravel, gray, firm to stiff, laminations of lean clay (CL)		5	M	SS	6					
16											
17											
18											
19											
20											
21			11	M	SS	19	17				
22											
23											
24											
25											
26			12	M	SS	21	18				
END OF BORING Northing=210684.3 Easting=552897.4											

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	
0-4½'	3.25" HSA								
4½'-24½'	RD w/DM	6/22/07	1:00	6.5	4.5	6.0		5.2	
BORING COMPLETED: 6/22/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-69 RI-3002-05 LOCATION: N: 210744.173, E: 553428.679 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/19/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
894.8	0.0					
893.8	1.0	FILL	FILL: Poorly Graded Sand with Silt, trace of Gravel, dark brown, moist.			
		SM	SILTY SAND, fine-grained, gray, moist, loose. (Lacustrine)	8		
890.8	4.0	SP-SM	POORLY GRADED SAND with SILT, trace of Gravel, brown, waterbearing, very loose to loose. (Lacustrine)	10	▽	
				7		
				3		
				10		
880.8	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium to rather stiff. (Glacial Till)	10		
				8		
868.8	26.0		END OF BORING.	10		
			Water observed at 4 feet while drilling.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45
 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-70
	LOCATION: N: 210240.974. E: 550584.304 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/25/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
885.0	0.0					
883.5	1.5	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, orange-brown, moist, loose. (Lacustrine)	9		
878.0	7.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to gray with rust, waterbearing, very loose to loose. (Lacustrine)	4	▽	
				4		
				8		
871.0	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium to rather stiff. (Glacial Till)	9		
				6		
859.0	26.0			9		
			END OF BORING.			
			Water observed at 7 feet while drilling.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING. SP0605871.GPJ BRAUN.CDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-71 RI-1015-01
	LOCATION: N: 210151.469. E: 550929.912 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/25/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
887.3	0.0					
887.1	0.3	PAV	3" of Bituminous			
885.8	1.5	FILL	FILL: Poorly Graded Sand with Silt, fine-grained, trace of Gravel, brown, moist.			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to orange-brown, moist, loose to medium dense. (Lacustrine)	16		
				7		
880.3	7.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brownish-gray to gray, waterbearing, very loose to loose. (Lacustrine)	4	▽	
				10		
875.3	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff to very stiff. (Glacial Till)	25		
				14		
				11		
861.3	26.0		END OF BORING.	11		
			Water observed at 7 feet while drilling.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING: SP0605871.GPJ | BRAUN.GDT | 10/2/07 14:45
 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-72 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>887.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%#200
1	FILL, mixture of silty sand and sand, light brown, brown and dark brown	FILL	6	M	SS	14					
2											
3			3	W	SS	12					
4											
5											
6											
7											
8	SAND WITH SILT, fine to medium grained, a little gravel, brown, waterbearing, loose (SP-SM)	COARSE ALLUVIUM	6	W	SS	14					
9											
10	SAND WITH SILT AND GRAVEL, medium to fine grained, brown, waterbearing, loose (SP-SM)	TILL	5	M	SS	18	16				
11											
12											
13	CLAYEY SAND, a little gravel, gray, firm (CL)		6	M	SS	14	15				
14											
15											
16											
17											
18	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)		9	M	SS	23	17				
19											
20											
21											
22											
23											
24											
25											
26			12	M	SS	23	16				
END OF BORING Northing=210217.1 Easting=551467.5											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/26/07	11:55	6.5	4.5	4.9		4.8	
		6/26/07	12:20	26.5	24.5	26.5		None	
BORING COMPLETED: 6/26/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-73 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>891.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of silty sand, sand with silt and sandy silt, a little gravel, surface roots, trace roots, dark brown, black and gray	FILL	8	M	SS	12					
2											
3			6	M	SS	8					
4	LEAN CLAY WITH ORGANICS, trace roots, black, firm (CL)	TOPSOIL	6	M	SS	14	23				
5											
6	SAND WITH SILT, fine grained, gray and brown mottled, waterbearing, medium dense (SP-SM)	COARSE ALLUVIUM	13	W	SS	16					
7											
8			22	W	SS	17					
9	SAND WITH SILT, a little gravel, fine to medium grained, brown, a little gray mottled, waterbearing, medium dense (SP-SM)		25	W	SS	16					
10											
11	SAND WITH SILT, fine grained, light brownish gray, waterbearing, medium dense (SP-SM)		6	M	SS	15	24				
12											
13	SANDY LEAN CLAY, a little gravel, gray, firm (CL)	TILL	5	M	SS	24	19				
14											
15	CLAYEY SAND, a little gravel, gray, firm (SC)		7	M	SS	17	18				
16											
17	SANDY LEAN CLAY, a little gravel, gray, firm (CL)										
18											
19	END OF BORING Northing=210182.9 Easting=551898.2										

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	
0-9½'	3.25" HSA								
9½'-24½'	RD w/DM	6/21/07	3:00	11.5	9.5	10.0		9.0	
BORING COMPLETED: 6/21/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-74 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>891.8</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of sand with silt and silty sand, a little gravel, surface roots, trace roots, brown	FILL	15	M	SS	15						
2	FILL, mixture of clayey sand and silty sand, a little gravel, trace roots, brown											
3			14	M	SS	18	15					
4												
5	SAND WITH SILT, a little gravel, fine to medium grained, light brown, waterbearing, loose to medium dense, laminations of silty sand (SP-SM)	COARSE ALLUVIUM	6	M	SS	13						
6												
7												
8					13	W	SS	15				
9												
10												
11	SAND WITH SILT, a little gravel, fine to medium grained, gray, medium dense (SP-SM)	TILL	19	W	SS	19						
12	CLAYEY SAND, a little gravel, gray, firm to very stiff (SC)											
13				7	M	SS	18	17				
14												
15												
16			10	M	SS	17	13					
17												
18	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)											
19												
20												
21					10	M	SS	14	17			
22												
23												
24												
25												
26			13	M	SS	24	14					
END OF BORING Northing=210212.8 Easting=552416.8												

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	
0-24½'	3.25" HSA	6/7/07	3:05	6.5	4.5	4.8		None	
		6/27/07	3:10	9.0	7.0	7.0		6.4	
BORING COMPLETED:	6/27/07	6/27/07	3:35	26.5	24.5	26.5		None	
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-75 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 898.8 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%#200	
1	SAND WITH SILT, fine to medium grained, a little gravel, surface roots, trace roots, brown (SP-SM) (possible fill)	COARSE ALLUVIUM OR FILL	8	M	SS	10						
2												
3												
4	CLAYEY SAND, a little gravel, brown, light brown and gray mottled, firm, lenses and laminations of sand with silt (SC)	MIXED ALLUVIUM	15	M	SS	10						
5												
6	SAND WITH SILT, a little gravel, trace roots, brown, waterbearing, loose (SP-SM)	COARSE ALLUVIUM	7	W/M	SS	14	14					
7												
8	SANDY SILT, a little gravel, trace roots, gray, wet, medium dense (ML)	FINE ALLUVIUM	12	W	SS	NR						
9												
10	CLAYEY SAND, a little gravel, brownish gray, stiff (SC)	TILL	10	W	SS	13	14					
11												
12	SANDY LEAN CLAY, a little gravel, dark gray, firm to stiff (CL)		7	W	SS	21	19					
13												
14												
15												
16					10	W	SS	18	18			
17												
18												
19												
20												
21			12	M	SS	18	16					
22												
23												
24												
25												
26			13	M	SS	17	11					
END OF BORING Northing=210184.0 Easting=552897.6												

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	
0-4½'	3.25" HSA								
4½'-24½'	RD w/DM	6/25/07	10:30	6.5	4.5	4.9		4.3	
BORING COMPLETED: 6/25/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871
Geotechnical Evaluation
TCAAP Redevelopment
NE of Highway 10 and Highway 96
Arden Hills, Minnesota

BORING: **RI-4001-02 ST-76**
LOCATION: N: 210133.678, E: 553362.349 See attached sketch.

DRILLER: K. Keck

METHOD: 3 1/4" HSA, Autohmr

DATE: 7/23/07

SCALE: 1" = 4'

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
907.0	0.0					
906.0	1.0	FILL	FILL: Silty Sand, fine-grained, with Organics and Gravel, dark brown, moist.			
		FILL	FILL: Silty Sand, fine- to coarse-grained, with Gravel, brown, moist.			
			Petroleum odor at 5 1/2 feet.	19		
				32		
900.0	7.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, medium to rather stiff. (Glacial Till)	8		
				9		
				9		
893.0	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium. (Glacial Till)	7		
				7		
				7		
881.0	26.0		END OF BORING.			
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP-06-05871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-77 LOCATION: N: 209775.961, E: 550699.340 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/26/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
892.4	0.0					
891.4	1.0	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.			
		FILL	FILL: Silty Sand, fine-grained, trace of Gravel, dark brown to brown, moist.	9		
				8		
885.4	7.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown to grayish-brown, moist, loose to medium dense. (Lacustrine)	12		
881.4	11.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brownish-gray to gray, wet, very loose to loose. (Lacustrine)	7	▽	
				4		
				5		
				10		
870.4	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff. (Glacial Till)			
866.4	26.0		END OF BORING.	9		
			Water observed at 11 feet while drilling. Boring then grouted.			

Braun Project SP-06-05871				BORING: ST-78				
Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				LOCATION: N: 209684.547, E: 550898.325 See attached sketch.				
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 6/26/07	SCALE: 1" = 4'			
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
886.1	0.0							
884.6	1.5	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.					
		FILL	FILL: Silty Sand, fine-grained, dark brown mixed with light brown and gray, moist.	3				
879.1	7.0	PT	PEAT, fibrous, dark gray, wet, very soft. (Swamp Deposit)	2				
				WH				
				WH		421	61	
872.1	14.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, very loose to loose. (Lacustrine)	WH				
				1				
				4				
860.1	26.0			8				
			END OF BORING.					
			Water observed at 14 feet while drilling.					
			Boring then grouted.					

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-79 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>888.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SILTY SAND, a little gravel, surface roots, trace roots, dark brown, moist, loose (SM) SILTY SAND WITH GRAVEL, trace roots, brown, moist, loose (SM) SAND, fine grained, light brown, moist, loose, laminations of silty sand (SP)	TOPSOIL	10	M	SS	16					
2		COARSE ALLUVIUM									
3				9	M	SS	16				
4	SAND, fine grained, light brown, waterbearing, medium dense to loose (SP)		13	W/M	SS	18					
5											
6											
7											
8											
9	SAND WITH SILT, fine grained, gray, waterbearing, very loose to very dense (SP-SM)		11	W	SS	17					
10											
11											
12											
13	SAND WITH SILT, fine grained, gray, waterbearing, very loose to very dense (SP-SM)		2	W	SS	13					
14											
15											
16	SAND WITH SILT, fine grained, gray, waterbearing, very loose to very dense (SP-SM)		55	W	SS	14					
17											
18	SILTY SAND, a little gravel, gray, waterbearing, very loose (SM)	TILL									
19											
20	SANDY LEAN CLAY, a little gravel, gray, soft to very stiff, laminations of silty sand at 24.5' (CL)		4	W	SS	16	15				
21											
22											
23											
24											
25											
26			17	M	SS	21	16				
END OF BORING Northing=209686.5 Easting=551325.7											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		6/26/07	1:05	9.0	7.0	7.6			7.0
BORING COMPLETED: 6/26/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-80 LOCATION: N: 209689.484, E: 551891.038 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/28/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:45 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
891.1	0.0	FILL	FILL: Silty Sand, very fine- to fine-grained, trace of Gravel, brown, moist.				
889.1	2.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown to brown and gray mixed with rust, wet. (Glacial Till)	5			
884.1	7.0	CL	SANDY LEAN CLAY, trace of Gravel, grayish-brown, wet, rather stiff to medium. (Glacial Till)	9		14	
879.1	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft to medium. (Glacial Till)	5			
				7		16	
865.1	26.0		END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	8			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-81 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>895.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SANDY SILT, a little gravel, surface roots, trace roots, dark brown, moist, loose (ML)	TOPSOIL	10	M	SS	16					
2	SAND WITH SILT, fine grained, a little gravel, trace roots, brown, moist, loose (SP-SM)	COARSE ALLUVIUM									
3			6	M	SS	6					
4	SILTY SAND, trace roots, brown, waterbearing, loose, laminations of lean clay (SM)										
5	SANDY LEAN CLAY, a little gravel, brown and gray mottled, firm (CL)	TILL	7	M	SS	15	16				
6											
7	SANDY LEAN CLAY, a little gravel, brownish gray, a little brown, stiff, laminations of silty sand (CL)		11	M	SS	19	15				
8											
9	CLAYEY SAND, a little gravel, gray, firm (SC)		8	M	SS	22	15				
10											
11	SANDY LEAN CLAY, a little gravel, brownish gray, a little brown, stiff, laminations of silty sand (CL)		13	M	SS	21	16				
12											
13	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL)		8	M	SS	17	15				
14											
15											
16											
17											
18											
19											
20											
21			11	M	SS	20	17				
22											
23											
24											
25											
26			12	M	SS	19	14				
END OF BORING Northing=209624.8 Easting=552198.7											

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	
0-24½'	3.25" HSA	6/26/07	2:55	26.5	24.5	26.0		None	
BORING COMPLETED: 6/26/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-82 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>898.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly sandy silt, surface roots, trace roots, dark brown	FILL	25	M	SS	14					
2	FILL, mixture of silty sand and clayey sand, a little gravel, trace roots, light brown, brown and dark brown										
3			15	M	SS	13					
4											
5											
6				20	M	SS	16				
7	LEAN CLAY WITH ORGANICS, trace roots, gray and black, moist, very stiff, lenses and laminations of silty sand (CL)	TOPSOIL									
8			19	M/W	SS	17	15				
9	SILTY SAND, a little gravel, brownish gray, waterbearing, medium dense (SM)	TILL									
10	CLAYEY SAND, a little gravel, trace roots, gray and brown mottled, soft (SC)		3	M	SS	20	19				
11											
12			4	M	SS	21	17				
13											
14											
15	SANDY LEAN CLAY, gray, firm to stiff (CL)		6	M	SS	21	16				
16											
17											
18											
19											
20											
21			11	M	SS	22	14				
22											
23											
24											
25											
26			15	M	SS	22	15				
<p>END OF BORING Northing=209687.1 Easting=552381.8</p>											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/28/07	8:15	11.5	9.5	11.2		None	
		6/28/07	8:30	26.5	24.5	26.5		None	
BORING COMPLETED: 6/28/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-83 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>903.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of sand with silt and silty sand, gravelly, trace roots, brown to dark brown Hit gas line between 1' to 2'	FILL	25	M	SS	12					
2											
END OF BORING Northing=209676.4 Easting=552900.3											

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	
0-2'	3.25" HSA								
BORING COMPLETED: 6/25/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-83A (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 903.0 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS										
							WC	DEN	LL	PL	%-#200						
1	2.5" Bituminous Pavement	FILL			SU												
2	FILL, mixture of clayey sand and silty sand with gravel, possible cobbles, brown		27	M	SS	6											
3																	
4																	
5	SANDY LEAN CLAY, a little gravel, light brown and gray mottled, stiff, laminations of silty sand (CL)	TILL															
6			9	M	SS	16	17										
7	SANDY LEAN CLAY, a little gravel, brown, very stiff (CL)																
8			18	M	SS	18	16										
9																	
10	SANDY LEAN CLAY, a little gravel, dark gray, stiff to very stiff (CL)																
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
END OF BORING Northing=209676.4 Easting=552900.3																	

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	
0-24½'	3.25" HSA	6/28/07	10:00	26.5	24.5	26.0		None
BORING COMPLETED:	6/28/07							
DR: SG	LG: SB	Rig: 91C						



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-84 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>911.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, a little gravel, surface roots, trace roots, brown	FILL	13	M	SS	14					
2	FILL, mixture of sand with silt and sandy lean clay, a little gravel, trace roots, brown, gray, light gray and light brown										
3			7	M	SS	13	16				
4											
5	SANDY LEAN CLAY, a little gravel, light brown and gray mottled, with gray, firm to stiff (CL)	TILL	7	M	SS	17	19				
6											
7											
8				10	M	SS	20	17			
9											
10	SANDY LEAN CLAY, a little gravel, brown mottled, dark brown, stiff, laminations of silt (CL)			14	M	SS	24	15			
11											
12	SANDY LEAN CLAY, a little gravel, dark gray, stiff to very stiff (CL)			14	M	SS	19	15			
13											
14				15	M	SS	16	15			
15											
16											
17											
18											
19											
20											
21			19	M	SS	16	14				
22											
23											
24											
25											
26			21	M	SS	18	16				
END OF BORING Northing=209598.8 Easting=553354.1											

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	
0-24½'	3.25" HSA	7/18/07	3:35	26.5	24.5	26.5		None	
BORING COMPLETED:	7/18/07								
DR: SG	LG: SB/BRig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: **22-00081** LOG OF BORING NO. **ST-85 (p. 1 of 1)**
 PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>892.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of silty sand and sand with silt, a little gravel, surface roots, trace roots, brown	FILL	13	M	SS	15					
2	CLAYEY SAND, a little gravel, trace roots, dark brown, very stiff (SC)	TILL	23	M	SS	17	8				
3											
4	SILTY SAND, trace roots, fine to medium grained, moist, very loose, laminations of sand with silt (SM)		4	M	SS	18					
5											
6											
7	CLAYEY SAND, a little gravel, trace roots, gray and brown mottled, firm (SC)		5	M	SS	18	19				
8											
9											
10											
11	CLAYEY SAND, a little gravel, trace roots, dark gray, firm to stiff (SC)		5	M	SS	23	17				
12											
13											
14											
15											
16	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)		10	M	SS	23	14				
17											
18											
19			9	M	SS	24	19				
20											
21											
22											
23											
24											
25											
26	14	M	SS	22	15						
END OF BORING Northing=209496.7 Easting=551939.7											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		6/27/07	9:35	9.0	7.0	8.2			None
		6/27/07	10:05	26.5	24.5	26.5			None
BORING COMPLETED: 6/27/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-86 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>897.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%#200
1	SAND WITH SILT, fine grained, a little gravel, trace roots, brown, moist, medium dense (SP-SM)	COARSE ALLUVIUM	22	M	SS	15					
2											
3											
4	SILTY SAND, a little gravel, brown and gray, moist, medium dense (SM)	COARSE ALLUVIUM	22	M	SS	19					
5											
6											
7	SANDY LEAN CLAY, a little gravel, gray, firm to stiff, lenses of lean clay with sand at 8' (CL)	WEATHERED TILL	6	M	SS	17					
8											
9											
10	SANDY LEAN CLAY, a little gravel, brown and gray mottled, stiff to firm, laminations of silty sand (CL)	TILL	9	M	SS	20	17				
11											
12											
13	SANDY LEAN CLAY, a little gravel, dark gray, a little brown, stiff, laminations of silty sand (CL)	TILL	8	M	SS	22	15				
14											
15											
16	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)	TILL	9	M	SS	24	17				
17											
18											
19	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)	TILL	13	M	SS	21	14				
20											
21											
22	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)	TILL	15	M	SS	20	15				
23											
24											
25	END OF BORING Northing=209336.2 Easting=552138.3										
26											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/26/07	3:40	9.0	7.0	9.0		8.1	
BORING COMPLETED: 6/26/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-87 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>898.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of silty sand, clayey sand and sand with silt, a little gravel, surface roots, trace roots, dark brown and black	FILL	19	M	SS	14	7					
2	SANDY LEAN CLAY, a little gravel, trace roots, brown and gray mottled, firm (CL)	TILL	8	M	SS	14	17					
3												
4												
5												
6												
7												
8												
9												
10												
11												
12	SANDY LEAN CLAY, a little gravel, light brown and gray mottled, stiff (CL)		11	M	SS	19	16					
13	SANDY LEAN CLAY, a little gravel, brownish gray, a little brown, stiff, laminations of silty sand (CL)		14	M	SS	21	15					
14	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)		11	M	SS	22	14					
15			14	M	SS	20	15					
16			15	M	SS	21	14					
17			14	M	SS	19	15					
18												
19												
20												
21												
22												
23												
24												
25												
26												
END OF BORING Northing=209443.6 Easting=552400.6												

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½' 3.25" HSA		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/26/07	9:20	26.5	24.5	26.0		None	
BORING COMPLETED: 6/26/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-88
	LOCATION: N: 209329.011, E: 550811.898 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/28/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
889.7	0.0	FILL	FILL: Silty Sand, very fine- to fine-grained, trace of Gravel, trace of Roots at 5' sample depth, mixed dark brown to brown, moist.			
				16		
883.7	6.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brown, moist, loose. (Lacustrine)	24		
881.7	8.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, brownish-gray to gray, waterbearing, loose to medium dense. (Lacustrine)	6	▽	
				15		
				6		
				10		
871.7	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft to rather stiff. (Glacial Till)	10		
863.7	26.0		END OF BORING. Water observed at 8 feet while drilling. Boring then grouted.	4		

BRAUN BASIC LOG OF BORING SP0605871.GPJ: BRAUN.GDT: 10/2/07 14:45
 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-89 LOCATION: N: 209181.170, E: 550895.450 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/27/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
890.4	0.0					
890.2	0.2	PAV FILL	2" of Bituminous FILL: Silty Sand, fine-grained, trace of Gravel, mixed dark brown to brown, moist.	21		
883.4	7.0	SP- SM	POORLY GRADED SAND with SILT, fine-grained, brown, waterbearing, medium dense. (Lacustrine)	14 10 11 11	▽	
872.4	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft. (Glacial Till)	4		
864.4	26.0		END OF BORING. Water observed at 7 feet while drilling Boring then grouted..	5		

BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-90 LOCATION: N: 209183.404, E: 551399.923 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/26/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
891.0	0.0					
889.0	2.0	SM	SILTY SAND, very fine- to fine-grained, trace of Roots, dark brown, moist. (Topsoil)			
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, loose to medium dense. (Lacustrine)	9		
885.0	6.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, grayish-brown with rust, waterbearing, medium dense. (Lacustrine)	11	▽	
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose to medium dense. (Lacustrine)	15		
880.0	11.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose to medium dense. (Lacustrine)	14		
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose to medium dense. (Lacustrine)	11		
		SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose to medium dense. (Lacustrine)	10		
874.0	17.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)	6		
865.0	26.0		END OF BORING. Water observed at 6 feet while drilling. Boring then grouted.	7		



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-91 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>893.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly sandy silt, a little gravel, surface roots, trace roots, dark brown	FILL	13	M	SS	16					
2	FILL, mixture of silty sand and sand with silt, a little gravel, pieces of brick, brown and black										
3			26	M	SS	21					
4											
5											
6				28	M	SS	23				
7											
8				14	M	SS	18				
9	ORGANIC CLAY, trace roots, trace shells, black, stiff to very soft (OL/OH)	SWAMP DEPOSIT					89				
10	BOGLIME, trace roots, gray, a little black, moist, very soft to firm, lense of sapric peat (OL)						118				
11			2	M	SS	23	149				
12											
13			7	W	SS	20					
14	SAND WITH SILT, a little gravel, gray, waterbearing, loose (SP-SM)	COARSE ALLUVIUM TILL									
15	CLAYEY SAND, a little gravel, gray, very soft to stiff (SC/CL)		2	M	SS	18	17				
16											
17											
18											
19											
20											
21			6	M	SS	17	15				
22											
23											
24											
25											
26			9	M	SS	18	14				
END OF BORING Northing=209184.1 Easting=551898.2											

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	
0-24½'	3.25" HSA	6/27/07	11:05	14.0	12.0	12.5		12.0	
BORING COMPLETED: 6/27/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-92 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>898.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DEN	LL	PL	%#200				
1	1.5" Bituminous Pavement	FILL			SU										
2	FILL, mixture of silty sand and clayey sand, a little gravel, pieces of bituminous, brown		26	M	SS	3		7							
3	ORGANIC CLAY, a little gravel, black, a little gray, stiff, laminations of sandy lean clay (OL/OH)	SWAMP DEPOSIT	10	M	SS	17		13							
4	ORGANIC CLAY, trace roots, black, soft (OL/OH)														
5															
6			4	M	SS	17		46							
7															
8	CLAYEY SAND, a little gravel, gray, soft, laminations of sand with silt (SC)	TILL	3	M	SS	18		18							
9															
10	CLAYEY SAND, a little gravel, trace roots, brown and gray mottled, soft to firm (SC)		4	M	SS	17		16							
11															
12															
13			8	M	SS	23		16							
14															
15	SANDY LEAN CLAY, a little gravel, brownish gray, a little black, stiff, laminations of silty sand (CL)		10	M	SS	23		16							
16															
17															
18															
19	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)		10	M	SS	24		13							
20															
21															
22															
23															
24															
25															
26			15	M	SS	21		14							
END OF BORING Northing=209185.3 Easting=552151.9															

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	
0-24½'	3.25" HSA	6/27/07	12:25	26.5	24.5	26.0		None	
BORING COMPLETED: 6/27/07									
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-93 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>901.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of sand with silt and silty sand, surface roots, trace roots, dark brown	FILL	14	M	SS	16					
2	FILL, mixture of clayey sand and silty sand, a little gravel, trace roots, brown and dark brown										
3			8	M	SS	14					
4	CLAYEY SAND, a little gravel, brown, firm to stiff (SC)	TILL					13				
5							17				
6				8	M	SS	20				
7											
8				9	M	SS	23	16			
9											
10	SANDY LEAN CLAY, a little gravel, light brown to brown, firm to stiff (CL)		7	M	SS	22	16				
11											
12			11	M	SS	24	16				
13											
14			13	M	SS	24	18				
15											
16	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)		11	M	SS	22	16				
17											
18			11	M	SS	23	16				
19											
20											
21											
22											
23											
24											
25											
26			11	M	SS	23	16				
END OF BORING Northing=209104.1 Easting=552534.6											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		6/27/07	2:10	26.5	24.5	26.5			None
BORING COMPLETED: 6/27/07									
DR: SG	LG: SB	Rig: 91C							

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-94
	LOCATION: N: 209180.273, E: 552902.330 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/11/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
922.9	0.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)				
918.9	4.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown, wet, rather soft to medium. (Glacial Till)	8 5 5 7 8 7		16	
904.9	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium to rather stiff. (Glacial Till)	11			
893.9	29.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium. (Glacial Till)	7			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-94 (cont.) LOCATION: N: 209180.273, E: 552902.330 See attached sketch.			
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/11/07		SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
890.9	32.0		SANDY LEAN CLAY, trace of Gravel, gray, moist, medium. (Glacial Till) (continued)				
				7			
881.9	41.0		END OF BORING. Water not observed with 39 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	7			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-95 LOCATION: N: 209184.739, E: 553397.793 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/11/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
924.0	0.0					
922.0	2.0	FILL	FILL: Silty Sand, trace of Roots, trace of Roots, dark brown, moist.			
		FILL	FILL: Sandy Lean Clay, mixed light brown, brown and dark brown, moist.	6		
917.0	7.0	SC	CLAYEY SAND, trace of Roots, dark gray, moist. (Buried Topsoil)	9		
915.0	9.0	CL	SANDY LEAN CLAY, trace of Gravel, greenish gray to light brown, wet. (Glacial Till)	10		
				5		
				4	▽	
				5		
907.0	17.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff to stiff. (Glacial Till)			
				13		
898.0	26.0			10		
			END OF BORING.			
			Water observed at 13 feet while drilling.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-96 LOCATION: N: 208934.186, E: 550891.188 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/27/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
892.3	0.0	FILL	FILL: Sandy Lean Clay, dark brown to light brown, wet.			
888.3	4.0	PT	PEAT, dark gray, wet, rather soft to soft. (Swamp Deposit)	10		
883.3	9.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose to medium dense. (Lacustrine)	5 3 7 8 12	▽	
869.3	23.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)	8		
866.3	26.0		END OF BORING. Water observed at 9 feet while drilling. Boring then grouted.	8		



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-97 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>891.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of sand with silt, silty sand and clayey sand, a little gravel, surface roots, trace roots, dark brown and black	FILL	14	M	SS	17	12					
2												
3	SAND WITH SILT, fine grained, a little gravel, brown, moist, medium dense (SP-SM)	COARSE ALLUVIUM	26	M	SS	10	9					
4												
5												
6					12	▼	SS	9				
7												
8					2	W	SS	14				
9												
10	SILTY SAND, a little gravel, trace roots, fine to medium grained, gray, waterbearing, very loose to medium dense (SM)		2	W	SS	10						
11												
12												
13					22	W	SS	17				
14												
15					23	W	SS	17				
16												
17												
18	SANDY SILT, dark gray, waterbearing, medium dense, laminations of lean clay at 20' (ML)	FINE ALLUVIUM										
19												
20					16	W	SS	15	24			
21												
22												
23	CLAYEY SAND, a little gravel, dark gray, firm (SC)	TILL										
24												
25												
26					7	M	SS	19	16			
END OF BORING Northing=208912.1 Easting=551143.1												

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	
0-9½'	3.25" HSA								
9½'-24½'	3.25" HSA	7/25/07	8:05	9.0	7.0	7.0		6.1	
BORING COMPLETED: 7/11/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-98		
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 6/26/07		SCALE: 1" = 4'
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
892.8	0.0	FILL	FILL: Sandy Lean Clay, dark brown, moist.			
				11		
				5		
885.8	7.0	PT	PEAT, dark gray, wet, medium. (Swamp Deposit)		▽	
883.8	9.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, with Gravel, light brown to gray with rust at 12' sample depth, waterbearing, medium dense to dense. (Glaciofluvium)	*		* 50 blows for 5 inches
				26		
876.8	16.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)			
				18		
				7		
866.8	26.0			7		
			END OF BORING. Water observed at 8 feet while drilling. Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-99				
DRILLER: K. Keck				METHOD: 3 1/4" HSA, Autohmr				
DATE: 6/27/07				SCALE: 1" = 4'				
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
892.8	0.0	FILL	FILL: Clayey Sand, trace of Gravel, mixed dark gray to brown, moist to wet.	13				
				5				
				4				
				5		17	43	LL = 30% PI = 15
880.8	12.0	PT	PEAT, dark gray, wet, rather soft. (Swamp Deposit)	4	∇			
				4		322		OC = 69
874.8	18.0	SM	SILTY SAND, fine-grained, gray to brownish-gray, waterbearing, very loose to loose. (Lacustrine)	4				
866.8	26.0		END OF BORING. Water observed at 12 feet while drilling. Boring then grouted.	7				

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:46 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-100			
DRILLER: K. Keck				METHOD: 3 1/4" HSA, Autohmr		DATE: 6/26/07	SCALE: 1" = 4'
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes	
895.7	0.0	FILL	FILL: Clayey Sand, fine- to medium-grained, trace of Gravel, dark brown to brown, moist.				
				9			
				6			
889.7	6.0	PT	PEAT, Fibrous, dark gray, wet, rather stiff. (Swamp Deposit)				
				11			
886.7	9.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, gray, waterbearing, loose to medium dense. (Glacial Till)		▽		
				12			
				14			
				6			
873.7	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)				
				6			
869.7	26.0		END OF BORING.				
			Water observed at 9 feet while drilling.				
			Boring then grouted.				

BRAUN BASIC LOG OF BORING. SP0605871.GPJ BRAUN.CDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-101 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>897.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of sand with silt, silty sand and clayey sand, a little gravel, surface roots, trace roots, brown	FILL	28	M	SS	12						
2												
3			5	M	SS	13	10					
4												
5	CLAYEY SAND, a little gravel, trace roots, dark gray, a little black, very soft, laminations of organic clay (SC)	MIXED ALLUVIUM OR TOPSOIL	1	W/M	SS	4						
6												
7	SANDY LEAN CLAY, a little gravel, trace roots, dark gray, very soft to firm, a lense of sand with silt at 9.5' to 9.9' (CL)	TILL	1	M	SS	2	15					
8												
9												
10			5	M	SS	10	18					
11	CLAYEY SAND, a little gravel, trace roots, gray and brown, stiff (SC)											
12												
13			10	M	SS	19	14					
14	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)											
15												
16			10	M	SS	19	14					
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
END OF BORING Northing=208686.2 Easting=551895.0												

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
0-24½'	3.25" HSA	6/29/07	9:40	9.0	7.0	7.1			None
		6/29/07	9:45	11.5	9.5	10.5			10.4
BORING COMPLETED: 6/29/07		6/29/07	10:00	26.5	24.5	26.5		None	
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-102 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>902.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mostly sandy silt, a little gravel, surface roots, trace roots, dark brown, possible cobbles	FILL	10	M	SS	3						
2			FILL, mosly clayey sand, a little gravel, trace roots, brown, dark brown and a little gray	5	M	SS	6	12				
3												
4												
5												
6												
7	CLAYEY SAND, a little gravel, dark gray, firm to stiff (SC)	TILL	16	M	SS	7	16					
8			10	M	SS	19	13					
9												
10			8	M	SS	17						
11												
12												
13			9	M	SS	20	15					
14												
15			9	M	SS	21	16					
16												
17												
18	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)											
19												
20												
21			9	M	SS	21	16					
22												
23												
24												
25												
26			10	M	SS	21	15					
END OF BORING Northing=208692.0 Easting=552395.5												

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
0-24½'	3.25" HSA	6/29/07	9:00	26.5	24.5	26.0			None
BORING COMPLETED: 6/29/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-103 RI-1007-07 LOCATION: N: 208804.674, E: 552906.273 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/19/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING: SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
924.9	0.0						
923.9	1.0	FILL	FILL: Silt, dark brown, moist.				
		FILL	FILL: Lean Clay, brown to dark brown, dry.				
920.9	4.0	CL	SANDY LEAN CLAY, gray with iron staining, moist to wet, rather soft to rather stiff. (Glacial Till)	18			
				8			
				5			
				4		18	
				7			
				10			
906.9	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till)				
				8			
				8			
				15			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING ST-103 RI-1007-07 (cont.) LOCATION: N: 208804.674, E: 552906.273 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/19/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
892.9	32.0	[Hatched Box]	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to stiff. (Glacial Till) <i>(continued)</i>	11			
884.9	40.0	[Hatched Box]	END OF BORING. Water not observed with 38 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	13			

BRAUN BASIC LOG OF BORING, SP0605871.GPJ, BRAUN.GDT, 10/2/07 14:42
 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4003-01 ST-104 LOCATION: N: 208682.011, E: 552906.273 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/23/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
934.9	0.0					
934.4	0.5	FILL	FILL: Silty Sand, fine-grained, dark brown, moist.			
		FILL	FILL: Silty Sand, fine- to coarse-grained, trace of Gravel, with Clay layers, brown, moist.			
930.9	4.0	FILL	FILL: Silty Sand, fine-grained, mixed with Clay, black, moist.	11		
927.9	7.0	OL	ORGANIC CLAY, black wet, very soft to rather soft. (Swamp Deposit)	8		
				2		
				5		
922.9	12.0	CL	SANDY LEAN CLAY, bluish-gray, wet, soft to rather soft. (Lacustrine)	5		
				3		
916.9	18.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, medium. (Glacial Till)	7		
911.9	23.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium. (Glacial Till)	6		
908.9	26.0		END OF BORING.			
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-105 LOCATION: N: 208435.237, E: 551147.610 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/27/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
899.1	0.0					
		FILL				
			FILL: Clayey Sand, fine- to medium-grained, trace of Gravel, grayish-brown, moist.	13		
895.1	4.0					
		FILL				
			FILL: Silty Sand, fine-grained, dark brown, moist.	13		
892.1	7.0					
		SP-SM				
			POORLY GRADED SAND with SILT, fine-grained, light brown, moist, loose. (Lacustrine)	6		
890.1	9.0				▽	
		SP-SM				
			POORLY GRADED SAND with SILT, fine-grained, light brown to grayish-brown, waterbearing, loose to medium dense. (Lacustrine)	8		
				6		
				7		
				13		
877.1	22.0					
		CL				
			SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff. (Glacial Till)			
873.1	26.0					
			END OF BORING. Water observed at 9 feet while drilling. Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-106 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>903.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of clayey sand, silty sand and organic clay, a little gravel, surface roots, trace roots, dark brown, brown and black	FILL	11	M	SS	14	9				
2											
3			26	M	SS	19	15				
4											
5	LEAN CLAY WITH ORGANICS, trace roots, black, stiff, lense of silty sand (CL)	TOPSOIL	14	M	SS	19	8				
6							22				
7	SILTY SAND, a little gravel, fine to medium grained, light brown, medium dense (SM)	COARSE ALLUVIUM	15	M	SS	16					
8											
9											
10	SAND WITH SILT, a little gravel, fine to medium grained, light brown, waterbearing, medium dense (SP-SM)		16	M	SS	17					
11											
12											
13			23	W	SS	16	13				
14	CLAYEY SAND, a little gravel, brown, very stiff to stiff (SC)	TILL									
15											
16	CLAYEY SAND, a little gravel, gray, soft to stiff (SC)		4	M	SS	17	17				
17											
18											
19											
20											
21			7	M	SS	20	14				
22											
23											
24											
25											
26			11	M	SS	23	14				
END OF BORING Northing=208433.1 Easting=551647.6											

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
0-24½'	3.25" HSA	7/11/07	9:20	14.0	12.0	12.4			12.2
		7/11/07	9:30	26.5	24.5	26.4			None
BORING COMPLETED: 7/11/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-107 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>902.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SAND WITH SILT, fine grained, trace roots, light brown, moist, medium dense (SP-SM)	TOPSOIL	11	M	SS	15	4				
2		COARSE ALLUVIUM		14	M	SS	20				
3											
4											
5											
6											
7											
8											
9											
10											
11											
12	SILTY SAND, a little gravel, fine to medium grained, brownish gray, waterbearing, medium dense to very loose, lense of silt with sand at 11' (SM)		11	W/M	SS	19					
13			9	W	SS	15					
14											
15											
16											
17											
18	CLAYEY SAND, a little gravel, gray, stiff to firm (SC)	TILL									
19											
20											
21											
22											
23											
24											
25											
26											
END OF BORING Northing=208260.5 Easting=551137.6											

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
0-24½'	3.25" HSA	7/11/07	10:30	14.0	12.0	12.3			12.1
		7/11/07	10:40	26.5	24.5	24.9			None
BORING COMPLETED: 7/11/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-1011-02 ST-108 LOCATION: N: 208186.939, E: 551402.993 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/24/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
906.6	0.0					
906.4	0.2	PAV FILL	2" of Bituminous FILL: Silty Sand, fine- to medium-grained, dark brown, moist.			
902.6	4.0	SP	POORLY GRADED SAND, fine-grained, brown with iron staining, moist, loose to medium dense. (Glacial Outwash)	26		
897.6	9.0	SP	POORLY GRADED SAND, fine-grained, brown, wet to waterbearing, medium dense. (Glacial Outwash)	5		
				11		
				15		
				12	▽	
				22		
888.6	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft. (Glacial Till)			
				5		
880.6	26.0		END OF BORING. Water observed at 12 1/2 feet while drilling. Boring then grouted.	5		



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-109 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>904.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mostly silty sand, a little gravel, surface roots, trace roots, dark brown FILL, mixture of sand with silt, silty sand and clayey sand, a little gravel, trace roots, dark brown and light brown	FILL	11	M	SS	12						
2							15					
3			7	M	SS	11						
4												
5								16				
6					11	M	SS	21				
7	SANDY LEAN CLAY, a little gravel, gray, a little brown, stiff to firm, laminations of silty sand (CL)	TILL										
8			12	M	SS	19	16					
9												
10			8	M	SS	14	17					
11												
12												
13	SANDY LEAN CLAY, a little gravel, dark gray, firm to stiff (CL)		9	M	SS	24	16					
14												
15												
16			7	M	SS	17	17					
17												
18												
19												
20												
21			8	M	SS	22	16					
22												
23												
24												
25												
26			10	M	SS	20	17					
END OF BORING Northing=208177.9 Easting=551886.3												

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/18/07	9:40	26.5	24.5	24.9		None	
BORING COMPLETED: 7/18/07									
DR: SG LG: SB/BRig: 91C									

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-1007-05 ST-110 LOCATION: N: 208182.321, E: 552397.605 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/24/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING. SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
913.2	0.0					
912.2	1.0	FILL	FILL: Silty Sand, fine-grained, trace of Gravel, dark brown, moist.			
		CL	SANDY LEAN CLAY, trace of Gravel, brown with iron staining, wet, rather soft to medium. (Glacial Till)	6		
				5		
				8		
904.2	9.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist, medium to rather stiff. (Glacial Till)	9		
				8		
				8		
				8		
887.2	26.0		END OF BORING.	12		
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-1007-06 ST-111 LOCATION: N: 208184.910, E: 552896.448 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/24/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
922.1	0.0					
921.1	1.0	FILL	FILL: Silty Sand, fine-grained, with Roots, trace of Gravel, dark brown, moist.			
		FILL	FILL: Organic Clay, with Silty Sand layer, black to dark brown, moist.			
918.1	4.0			11		
		SP	POORLY GRADED SAND, fine-grained, brown, wet, loose. (Glacial Outwash)	8		
915.1	7.0					
		CL	SANDY LEAN CLAY, trace of Gravel, brown, wet, rather soft. (Glacial Till)	4		
913.1	9.0					
		CL	SANDY LEAN CLAY, trace of Gravel, brown and gray, moist, medium to rather stiff. (Glacial Till)	8		
				9		
908.1	14.0					
		CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)	7		
				7		
				6		
893.6	28.5			6		
			END OF BORING.			
			Water not observed with 27 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-112 LOCATION: N: 208188.459, E: 553395.319 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/29/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
936.8	0.0							
936.7	0.1	PAV	2" Bituminous Pavement.					
935.8	1.0	FILL SM	FILL: Poorly Graded Sand with Silt, trace of Gravel, brown, moist. POORLY GRADED SAND with SILT, fine- to medium-grained, trace of Gravel, reddish brown, moist, loose to medium dense. (Glacial Outwash)	7				
				24		4	9	
				28				
927.8	9.0	SP	POORLY GRADED SAND, fine- to medium-grained, reddish brown, moist, medium dense. (Glacial Till)	27				
924.8	12.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense to dense. (Glacial Till)	32				
918.8	18.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, dense to very dense.	39				
910.8	26.0			50		2		
			END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.					

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-113 LOCATION: N: 208182.505, E: 553828.508 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/29/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
941.8	0.0	SC	CLAYEY SAND, trace of roots, dark brown, moist. (Topsoil)			
939.5	2.3	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense. (Glacial Till)	17		
929.8	12.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, medium dense to dense. (Glacial Outwash)	16		
915.8	26.0		END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	33		



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-114 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>913.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of clayey sand and sandy silt, a little gravel, surface roots, trace roots, black and brown	FILL	8	M	SS	6	8					
2												
3	ORGANIC CLAY, trace roots, black, a little gray, firm, laminations of silty sand (OL/OH)	SWAMP DEPOSIT	7	M	SS	15	38					
4							24					
5	LEAN CLAY, gray, very stiff (CL)	FINE ALLUVIUM		▼			44					
6	SANDY SILT, a little gravel, trace roots, gray, a little dark gray, wet, medium dense, laminations of lean clay (ML)		19	M	SS	12	28					
7												
8	SILTY SAND, a little gravel, fine to medium grained, gray, waterbearing, very loose (SM)	TILL	3	W	SS	16	19					
9												
10	SANDY LEAN CLAY, a little gravel, gray, soft to very stiff (CL)		3	M	SS	15	18					
11												
12												
13			9	M	SS	16	16					
14												
15			11	M	SS	16	17					
16												
17												
18												
19												
20			14	M	SS	24	16					
21												
22												
23												
24												
25												
26			17	M	SS	24	16					
END OF BORING Northing=207847.6 Easting=552482.9												

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
0-24½'	3.25" HSA	7/18/07	11:40	9.0	7.0	7.0			5.2
		7/18/07	12:05	26.5	24.5	26.5			None
BORING COMPLETED: 7/18/07									
DR: SG	LG: SB/BRig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-115 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>908.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mostly silty sand, surface roots, trace roots, dark brown	FILL	15	M	SS	21						
2	FILL, mixture of clayey sand and sand with silt, trace roots, brown and black		20	M	SS	20						
3												
4												
5	SAND WITH SILT, a little gravel, medium to fine grained, brown, moist to wet, medium dense (SP-SM)	COARSE ALLUVIUM	12	M	SS	18						
6			18	M	SS	19						
7			11	W/M	SS	17	15					
8			11									
9												
10												
11	CLAYEY SAND, a little gravel, dark brown, stiff (SC)	TILL	4	M	SS	19	17					
12	CLAYEY SAND, a little gravel, dark gray, soft to stiff (SC)		7	M	SS	21	16					
13			8	M	SS	23	13					
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
END OF BORING Northing=207758.9 Easting=551498.2												

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	
0-24½'	3.25" HSA	7/11/07	11:20	11.5	9.5	10.1		None	
		7/11/07	11:40	26.5	24.5	24.5		None	
BORING COMPLETED: 7/11/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-116 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>913.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SILTY SAND, a little gravel, surface roots, trace roots, brown and dark brown, moist, medium dense (SM)	TOPSOIL	13	M	SS	17					
2	SILTY SAND, trace roots, fine to medium grained, brown, medium dense, lense of clayey sand at 3.5' (SM)	COARSE ALLUVIUM	20	M	SS	18	14				
3											
4	CLAYEY SAND, a little gravel, light brownish gray and gray mottled, very stiff (SC)	TILL			SS	19	18				
5	CLAYEY SAND, a little gravel, gray and brown mottled, firm to stiff (SC)										
6											
7											
8											
9											
10	SANDY LEAN CLAY, a little gravel, gray, firm to stiff (CL)										
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
END OF BORING Northing=207685.1 Easting=551917.3											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
<u>0-24½'</u>	<u>3.25" HSA</u>	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		<u>7/11/07</u>	<u>1:00</u>	<u>26.5</u>	<u>24.5</u>	<u>24.5</u>			<u>None</u>
BORING COMPLETED: <u>7/11/07</u>									
DR: <u>SG</u> LG: <u>SB</u> Rig: <u>91C</u>									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-117 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>914.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS									
							WC	DEN	LL	PL	%-#200					
1	4" Bituminous Pavement	FILL COARSE ALLUVIUM			SU											
1-2	FILL, mixture of clayey sand, sandy silt and sand with silt, a little gravel, pieces of bituminous, brown, gray and black		18	M	SS	12	8									
3	SAND WITH SILT, fine grained, gray, medium dense (SP-SM)		19	▼	SS	15										
4	SAND WITH SILT, fine to medium grained, brownish gray, medium dense (SP-SM)															
5																
6				13	W	SS	16									
7																
8				15	W	SS	17									
9																
10	SANDY LEAN CLAY, a little gravel, dark gray, firm to stiff (CL)	TILL	8	M	SS	14	17									
11																
12																
13				8	M	SS	16	16								
14																
15																
16				9	M	SS	22	16								
17																
18																
19																
20																
21			10	M	SS	24	17									
22																
23																
24																
25																
26			12	M	SS	24	17									
END OF BORING Northing=207683.1 Easting=552397.2																

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	
0-24½'	3.25" HSA	7/18/07	10:30	6.5	4.5	6.5		3.6
		7/18/07	10:55	26.5	24.5	26.5		None
BORING COMPLETED: 7/18/07								
DR: SG LG: SB/BRig: 91C								

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-118 LOCATION: N: 207677.923, E: 552643.604 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/10/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
914.9	0.0	OL	ORGANIC CLAY, trace of Roots, dark gray, wet. (Topsoil)	7		
910.9	4.0	SM	SILTY SAND, fine-grained, gray, wet, very loose. (Lacustrine)	3	▽	
905.9	9.0	PT	PEAT, dark gray, wet. (Swamp Deposit)	2		
900.9	14.0	SM	SILTY SAND, fine-grained, gray, waterbearing, very loose. (Lacustrine)	2		
892.9	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)	3		
888.9	26.0		END OF BORING. Water observed at 6 feet while drilling. Boring then grouted.	7		

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-119 LOCATION: N: 207678.910, E: 552897.340 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/9/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
929.7	0.0					
929.2	0.5	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.			
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, brown, moist to wet.			
				20		
				13		
				12		
920.7	9.0	CL	SANDY LEAN CLAY, light brown to brown with gray and rust, wet, rather soft to rather stiff. (Glacial Till)			
				5		
				8		
				9		
				19		
907.7	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)			
				8		*NR Suspected Cobble or Boulder
903.7	26.0		END OF BORING.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-120 LOCATION: N: 207684.634, E: 553359.506 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/29/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
940.8	0.0							
940.3	0.5	SM CL	SILTY SAND, trace of roots, dark brown, moist. SANDY LEAN CLAY, trace of Gravel, yellowish brown, moist, rather stiff to medium. (Glacial Till)					
				7				
				5				
				9				
931.8	9.0	CL	LEAN CLAY with Sand, reddish brown, moist, very stiff. (Glaciofluvium)			16	73	LL = 26% PI = 10%
				21				
				21				
				18				
922.8	18.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense to dense. (Glacial Till)					
				48				
				27				
911.8	29.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to very dense. (Glacial Till)					
				23				

INTERTEC

Braun Project SP-06-05871
Geotechnical Evaluation
TCAAP Redevelopment
NE of Highway 10 and Highway 96
Arden Hills, Minnesota

BORING: ST-120 (cont.)
 LOCATION: N: 207684.634, E: 553359.506 See attached sketch.

DRILLER: K. Keck METHOD: 3 1/4" HSA, Autohmr DATE: 6/29/07 SCALE: 1" = 4'

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
908.8	32.0		SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to very dense. (Glacial Till) <i>(continued)</i>					
904.8	36.0		No sample recovery at 35 1/2 feet.	*				* 70 blows for 12 inches
		SP	POORLY GRADED SAND, fine- to medium-grained, brown, moist, dense. (Glacial Till)					
898.8	42.0			29				
		SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, brown, moist, very dense. (Glacial Outwash)					
894.8	46.0			53				
			END OF BORING. Water not observed with 44 1/2 feet of hollow-stem auger in the ground. Boring then grouted.					

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-121 LOCATION: N: 207682.711, E: 553899.659 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/2/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
944.6	0.0	FILL	FILL: Silty Sand, trace of Gravel, trace of roots in upper foot, mixed light brown to brown, moist.			
940.6	4.0	CL	SANDY LEAN CLAY, trace of Gravel, grayish brown to brown, with rust, wet, rather soft to rather stiff. (Glacial Till)	24		
935.6	9.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown to brown, rather soft to rather stiff. (Glacial Till)	13		
930.6	14.0	CL-ML	SILTY CLAY, reddish brown, wet. (Glaciofluvium)	4		
918.6	26.0		END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	4		

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-122 LOCATION: N: 207684.411, E: 554279.817 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/28/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
959.5	0.0					
		FILL	FILL: Silty Sand, with Gravel, brown, moist.			
957.5	2.0					
		CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, rather soft to medium. (Glacial Till)	5		
				5		
				7		
				7		
945.5	14.0					
		SP	POORLY GRADED SAND, fine- to medium-grained, reddish-brown, moist, medium dense. (Glacial Outwash)	32		
941.5	18.0					
		SC	CLAYEY SAND, trace of Gravel, reddish-brown, moist, very stiff. (Glacial Till)	25		
937.5	22.0					
		SM	SILTY SAND, fine- to medium-grained, reddish-brown, moist, very dense. (Glaciofluvium)	70		
933.5	26.0					
			END OF BORING.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-1007-03 ST-123
	LOCATION: N: 207468.088, E: 552331.548 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/24/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
913.4	0.0					
912.4	1.0	FILL	FILL: Silty Sand, fine- to medium-grained, dark brown, moist.			
		FILL	FILL: Sandy Lean Clay, trace of Gravel, brown, moist.			
				12		
				12		
907.4	6.0		No sample recovery at 5 1/2 feet.			
		CL	SANDY LEAN CLAY, trace of Gravel, gray, moist to wet, rather soft to medium. (Glacial Till)			
				7		
				6		
				5		
				6		
				6		
				6		
				7		
887.4	26.0		END OF BORING.			
			Water observed at 25 feet while drilling.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4009-01 ST-124 LOCATION: N: 207429.899, E: 552647.857 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/24/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
923.8	0.0					
922.8	1.0	FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, dark brown, moist.			
		FILL	FILL: Sandy Lean Clay, brown, moist to wet.			
				7		
				12		
				6		
914.8	9.0	OL	ORGANIC CLAY, black, wet. (Swamp Deposit)			
				5		
911.8	12.0	CL	SANDY LEAN CLAY, trace of Gravel, grayish-brown, wet, soft. (Lacustrine)			
				3		
909.8	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)			
				7		
				6		
897.8	26.0		END OF BORING.	6		
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-125 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>932.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS														
							WC	DEN	LL	PL	%-#200										
1	FILL, mixture of silty sand and silty clay, surface roots, trace roots, possible cobbles, dark brown	FILL	27	M	SS	9	7														
2	FILL, mostly clayey sand with gravel, possible cobbles, trace roots, brown		31	M	SS	11	7														
3																					
4																					
5				12	M	SS	8	9													
6				6	M	SS	4	10													
7																					
8																					
9																					
10	CLAYEY SAND, a little gravel, trace roots, brown, firm (SC)	TILL	7	M	SS	6	10														
11																					
12																					
13			7	M	SS	11	10														
14	SAND WITH GRAVEL, trace roots, well graded, light brownish gray, moist, medium dense (SW)	COARSE ALLUVIUM TILL	13	M	SS	16	14														
15																					
16	CLAYEY SAND, a little gravel, light brownish gray, stiff (SC)																				
17																					
18	CLAYEY SAND, a little gravel, possible cobbles, brown, very stiff (SC)																				
19																					
20																					
21				20	M	SS	21	10													
22																					
23	SAND WITH SILT, a little gravel, fine to medium grained, brown, moist, very dense (SP-SM)	COARSE ALLUVIUM	66	M	SS	NR															
24																					
25																					
26																					
END OF BORING Northing=207429.3 Easting=552897.4																					

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/6/07	10:30	26.5	24.5	26.5		None	
BORING COMPLETED: 7/6/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-125A (p. 1 of 2)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>932.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	No samples taken to 29.5', Refer to Log of Boring ST-125										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											

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
0-39½'	3.25" HSA	7/25/07	1:20	41.5	39.5	41.5			None
BORING COMPLETED: 7/25/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-125A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
30	SAND, a little gravel, fine to medium grained, light brown, moist, medium dense to dense (SP)	COARSE ALLUVIUM	31	M		SS	20					
31												
32												
33												
34						SS	19					
35												
36												
37												
38						SS	20					
39												
40												
41												
<p>END OF BORING Northing=207429.3 Easting=552897.4</p>												

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-126 LOCATION: N: 207401.256, E: 554161.240 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/28/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GPT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
957.0	0.0	FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, brown to light brown, moist.			
		OL	ORGANIC CLAY, dark gray, wet, soft to rather soft. (Swamp Deposit)	8 4		
950.0	7.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft to medium. (Glacial Till)	2 4		
945.0	12.0			4 6		
931.0	26.0			9 9		
			END OF BORING. Water observed at 12 feet while drilling. Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-126A (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>957.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	No samples taken to 29.5', Refer to Log of Boring ST-126											
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												

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	
0-39½'	3.25" HSA	7/23/07	11:15	41.5	39.5	41.5		None	
BORING COMPLETED: 7/23/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-126A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
30	SILTY SAND, fine to medium grained, brown, moist, very dense (SM)	COARSE ALLUVIUM TILL	79	M	SS	22	7					
31	LEAN CLAY WITH SAND, brown, hard, lense of sand with silt and gravel at 31 feet (CL)											
32												
33	SILTY SAND WITH GRAVEL, fine to medium grained, brown, moist, very dense (SM)		148	M	SS	15						
34												
35												
36												
37												
38	SILTY SAND, a little gravel, fine to medium grained, brown, a little light brown, moist, very dense, lense of sand with silt and gravel at 41 feet (SM)		63	M	SS	24						
39												
40												
41												
END OF BORING Northing=207401.3 Easting=554161.2												

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-127 RI-4006-21				
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/2/07		SCALE: 1" = 4'		
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
952.8	0.0	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.					
951.8	1.0	FILL	FILL: Clayey Sand, trace of Gravel, dark brown to brown and reddish brown, moist.	8				
946.8	6.0	SC	CLAYEY SAND, Organic, dark gray, wet, soft to medium. (Swamp Deposit)	4				
				4				
				3		35	42	OC = 6
				6				
938.8	14.0	CL	LEAN CLAY, olive gray, wet, rather soft. (Swamp Deposit)	3				
934.8	18.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff. (Glacial Till)	12				
926.8	26.0		END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	11		15		

BRAIN BASIC LOG OF BORING. SP0605871.GPJ BRAUN.GDT 10/2/07 14:43
(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-128 RI-4006-20 LOCATION: N: 207347.078, E: 554700.746 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/2/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
954.1	0.0						
953.1	1.0	FILL	FILL: Silty Sand, trace of roots, dark brown, moist.				
		FILL	FILL: Sandy Lean Clay, trace of Gravel, reddish brown, moist.	10			
				7			
947.1	7.0	CL	SANDY LEAN CLAY, slightly Organic, dark gray to olive gray, soft. (Swamp Deposit)	3			
				2		21	OC = 3%
942.1	12.0	CL	SANDY LEAN CLAY, grayish brown with rust, wet, medium. (Glacial Till)	7			
				7			
936.1	18.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense to dense. (Glacial Till)	26			
928.1	26.0			33*			*Suspect cobble or boulder
			END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.				



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-129 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>915.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of clayey sand, silty sand and sand with silt, a little gravel, surface roots, trace roots, dark brown and brown	FILL	18	M	SS	15	6					
2												
3			12	M	SS	15						
4												
5	CLAYEY SAND, a little gravel, dark brown and brown mottled, firm (SC)	TILL	5	M	SS	19	12					
6	CLAYEY SAND, a little gravel, brown and gray mottled, firm, laminations of silt and sandy lean clay (SC)			8	M	SS	19	16				
7												
8												
9												
10	CLAYEY SAND, a little gravel, brown and brownish gray mottled, stiff (SC)			12	M	SS	18	15				
11												
12	CLAYEY SAND, a little gravel, dark gray, firm to stiff (SC)			5	M	SS	22	16				
13												
14												
15												
16			8	M	SS	24	18					
17												
18												
19												
20												
21			9	M	SS	24	18					
22												
23												
24												
25												
26			11	M	SS	24	18					
END OF BORING Northing=207214.0 Easting=551928.3												

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
0-24½'	3.25" HSA	7/11/07	2:05	26.5	24.5	24.5			None
BORING COMPLETED: 7/11/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-130 LOCATION: N: 207127.116, E: 552428.985 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/13/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
915.1	0.0							
914.8	0.3	FILL	FILL: Silty Sand, fine-grained, dark brown, moist.					
		FILL	FILL: Silt, black, moist.					
				8		9	4	
				5				
908.1	7.0	CL	SANDY LEAN CLAY, brown, wet. (Glacial Till)	5				
906.1	9.0	CL	SANDY LEAN CLAY, trace of Gravel, brown and gray, wet, rather soft to medium. (Glacial Till)	8				
				5				
901.1	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)	6				
				7				
				7				
889.1	26.0		END OF BORING. Water not observed during drilling. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.					



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-131 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>926.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly sandy silt, surface roots, trace roots, grayish brown	FILL	17	M	SS	17	7				
2	FILL, mixture of clayey sand and sandy lean clay, a little gravel, possible cobbles, trace roots, grayish brown and brown						6				
3				11	M	SS	5	11			
4											
5				6	M	SS	19	17			
6								18			
7											
8	FILL, mixture of sand with silt and silty sand, trace roots, brown and black	COARSE ALLUVIUM OR FILL	8	M	SS	12					
9	SILTY SAND, trace roots, fine grained, dark brown, a little brown, moist, loose (SM) (possible fill)										
10	SANDY LEAN CLAY, a little gravel, trace roots, gray, a little brown and black, firm (CL)	WEATHERED TILL	6	M	SS	20					
11							21				
12	SANDY LEAN CLAY, a little gravel, light brownish gray, a little brown, stiff to very stiff, laminations of silty sand (CL)	TILL	12	M	SS	15					
13								17			
14											
15				18	M	SS	19				
16								16			
17											
18	SANDY LEAN CLAY, a little gravel, brownish gray to dark gray, very stiff to stiff (CL)	TILL									
19											
20				23	M	SS	24				
21								16			
22											
23											
24											
25				14	M	SS	24				
26							16				
END OF BORING Northing=207188.3 Easting=552633.8											

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	
0-24½'	3.25" HSA	7/6/07	11:45	26.5	24.5	26.5		None	
BORING COMPLETED: 7/6/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-132 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>936.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS										
							WC	DEN	LL	PL	%-#200						
1	4.25" Bituminous Pavement	FILL			SU												
2	FILL, mixture of clayey sand and sandy lean clay, a little gravel, dark brown, light brownish gray and black			9	M	SS	5	9									
3	SILTY SAND, a little gravel, possible cobbles, brown, medium dense to dense (SM)	TILL			SS	20	11										
4				14	M												
5	CLAYEY SAND, a little gravel, possible cobbles, brown, very stiff (SC)				SS	18											
6				36	M												
7					29	M	SS	19	9								
8							SS	14	10								
9							SS	24	12								
10							SS	24	13								
11	SAND WITH SILT AND GRAVEL, fine to medium grained, light brown, moist, dense (SP-SM)	COARSE ALLUVIUM			SS	13											
12				36	M												
13							SS	15									
14							SS	15									
15							SS	15									
16							SS	15									
17	GRAVELLY SAND WITH SILT, possible cobbles, medium to fine grained, light brown, moist, very dense (SP-SM)				SS	15											
18	END OF BORING Northing=207171.7 Easting=552904.3																

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	
0-24½'	3.25" HSA	7/6/07	9:00	26.5	24.5	25.2		None
BORING COMPLETED: 7/6/07								
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-132A (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>936.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	No samples taken in upper 29.5', Refer to Log of Boring ST-132										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											

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
0-39½'	3.25" HSA	7/25/07	2:47	41.5	39.5	41.0			None
BORING COMPLETED: 7/25/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-132A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SAND, a little gravel, fine to medium grained, light brown, moist, dense to medium dense (SP)	COARSE ALLUVIUM	49	M		19					
31											
32											
33											
34											
35			39	M		23					
36											
37											
38											
39											
40											
41											
END OF BORING Northing=207171.7 Easting=552904.3											

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-133 RI-4007-20
	LOCATION: N: 207181.741, E: 553397.254 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/20/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING, SP-06-05871.GPJ, BRAUN.GDT, 10/2/07 14:43
 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
945.0	0.0						
944.0	1.0	FILL	FILL: Silt, with Roots, dark brown, moist.				
		FILL	FILL: Sand Lean Clay, trace of Gravel, brown, moist.				
941.0	4.0	FILL	FILL: Sandy Lean Clay, reddish-brown, gray and dark brown, moist.	9			
				4			
				3			
				3			
933.0	12.0	FILL	FILL: Silty Sand, fine- to medium-grained, dark brown, wet.	3			
931.0	14.0	SM	SILTY SAND, fine- to medium-grained, reddish-brown, wet, very loose. (Glacial Till)	4			
927.0	18.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, wet, medium. (Glacial Till)	7			
922.0	23.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, wet, stiff. (Glacial Till)	16			
917.0	28.0	SP-SM	POORLY GRADED SAND with SILT, fine- to coarse-grained, trace of Gravel, brown, wet, stiff. (Glacial Till)	15			
913.0	32.0						

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING ST-133 RI-4007-20 (cont.) LOCATION: N: 207181.741, E: 553397.254 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/20/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
913.0	32.0	SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, brown, moist, loose. (Glacial Outwash)				
				7		4	
				10			
899.0	46.0		END OF BORING.	10		3	
			Water not observed with 44 1/2 feet of hollow-stem auger in the ground.				
			Boring then grouted.				

BRAUN BASIC LOG OF BORING: SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-134 RI-4007-22			
DRILLER: K. Keck				METHOD: 3 1/4" HSA, Autohmr		DATE: 7/20/07	SCALE: 1" = 4'
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes	
949.0	0.0						
948.0	1.0	FILL	FILL: Silt, with Root Fibers, dark brown, moist.				
		FILL	FILL: Silty Sand, brown to dark brown, moist.				
			With Roots and pieces of topsoil at 5 1/2 feet.	7			
				4			
942.0	7.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, wet, rather soft to rather stiff. (Glacial Till)	4			
				4			
				10			
935.0	14.0	SM	SILTY SAND, fine- to coarse-grained, trace of Gravel, reddish-brown, wet, medium dense. (Glacial Till)	15			
931.0	18.0	SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, reddish-brown, wet to waterbearing, very loose to medium dense. (Glacial Outwash)	7			
					▽		
				3			
				10			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43
 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-134 RI-4007-22 (cont.)
	LOCATION: N: 207146.617, E: 553719.021 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/20/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
917.0	32.0		POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, reddish-brown, wet to waterbearing, very loose to medium dense. (Glacial Outwash) (continued)			
				4		
				24		
906.0	43.0	SP	POORLY GRADED SAND, fine-grained, brown, waterbearing, loose. (Glacial Till)			
903.0	46.0		END OF BORING. Water down 24 feet with 44 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	7		

BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-135 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>950.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of sand with silt and silty sand, a little gravel, pieces of bituminous, surface roots, trace roots, dark brown	FILL	36	M	SS	15					
2	FILL, mixture of silty sand and clayey sand, a little gravel, trace roots, cinders and clinkers, brown		18	M	SS	13	11				
3											
4											
5	SANDY LEAN CLAY, a little gravel, trace roots, brown, very stiff to hard, laminations of silt (CL)	TILL	20	M	SS	20	14				
6											
7											
8			19	M	SS	23	15				
9											
10			31	M	SS	18	19				
11	CLAYEY SAND WITH GRAVEL, brown, hard, lense of silty sand (SC)						8				
12	SAND WITH GRAVEL, medium to fine grained, brown, moist, very dense (SP)	COARSE ALLUVIUM	56	M	SS	14					
13											
14	GRAVEL WITH SAND, brown, moist, dense (GP)		44	M	SS	4					
15											
16											
17											
18	SAND WITH GRAVEL, medium to fine grained, brown, moist, very dense (SP)		58	M	SS	8					
19											
20											
21											
22											
23											
24											
25			63	M	SS	12					
26											
END OF BORING Northing=207176.8 Easting=553896.4											

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	
0-24½'	3.25" HSA	6/28/07	1:15	26.5	24.5	26.4		None
BORING COMPLETED: 6/28/07								
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-135A (p. 1 of 2)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>950.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	No samples taken in upper 29.5', Refer to Log of Boring ST-135										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
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28											
29											

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
0-44½'	3.25" HSA	7/23/07	9:12	46.5	44.5	46.5			None
BORING COMPLETED: 7/23/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-135A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SAND WITH SILT AND GRAVEL, medium to fine grained, brown, moist, dense (SP-SM)	COARSE ALLUVIUM	39	M	SS	20					
31	SAND WITH SILT, fine grained, light brown, moist, dense (SP-SM)										
32											
33											
34			40	M	SS	18					
35											
36											
37											
38	SAND WITH SILT, a little gravel, medium to fine grained, brown, a little dark brown, moist, medium dense, lenses and laminations of silty sand (SP-SM)		29	M	SS	22					
39											
40											
41											
42			35	M	SS	20					
43											
44											
45											
46											
END OF BORING Northing=207176.8 Easting=553896.4											

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-136 LOCATION: N: 207181.552, E: 554398.416 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 6/28/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
956.7	0.0	FILL	FILL: Clayey Sand, trace of Gravel, brown, moist.					
				9				
				10				
949.7	7.0	OL	ORGANIC SILT, trace of fibers, dark green, wet, rather soft. (Swamp Deposit)					
947.7	9.0	CL	SANDY LEAN CLAY, trace of Gravel, brown and gray with rust, wet, medium. (Glacial Till)					
				7				
				7				
942.7	14.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish brown, moist, medium dense to dense. (Glacial Till)					
				29				
				28		6	25	LL = 13 PI = 1
930.7	26.0			35				
			END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.					

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-137		
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/2/07	SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
956.0	0.0					
955.0	1.0	FILL	FILL: Silty Sand, with Gravel, brown, moist.			
		FILL	FILL: Clayey Sand, trace of Gravel, reddish-brown, moist.			
				7		
				5		
949.0	7.0	OL	ORGANIC CLAY, trace of Roots, dark brown, moist. (Buried Topsoil)			
947.0	9.0			4		
		SM	SILTY SAND, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till)			
				7		
				18		
				44		
939.0	17.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, medium dense. (Glacial Outwash)			
				11		
930.0	26.0			18		
			END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-138 (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>955.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of sand with silt and silty sand, surface roots, trace roots, dark brown	FILL	17	M	SS	14	8					
2	FILL, mixture of clayey sand and sand with silt, a little gravel, trace roots, brown, light brown and gray		13	M	SS	7	10					
3												
4												
5				15	M	SS	12	13				
6												
7												
8				9	W/M	SS	15	14				
9												
10				5	M	SS	14	20				
11												
12												
13				3	W/M	SS	18	15				
14												
15	ORGANIC CLAY, trace roots, black, very soft to soft (OL/OH)	SWAMP DEPOSIT	4	M	SS	20	41					
16												
17												
18			2	W/M	SS	24	28					
19												
20												
21		3	M	SS	18	29						
22												
23	LEAN CLAY WITH SAND, trace roots, pieces of wood, dark gray, firm (CL)	FINE ALLUVIUM	8	W/M	SS	4	38					
24												
25	CLAYEY SAND, a little gravel, dark gray, very soft (SC)	TILL	3	W/M	SS	24	23					
26	CLAYEY SAND, a little gravel, gray, soft, lenses and laminations of silty sand (SC)											
27												
28												

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-29½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/29/07	11:45	26.5	24.5	25.0		24.3	
		6/29/07	11:50	31.5	29.5	31.5		None	
BORING COMPLETED: 6/29/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-138 (p. 2 of 2)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SANDY LEAN CLAY, a little gravel, brown, stiff (CL) (continued)				SI		17				
31	SAND WITH SILT, a little gravel, fine to medium grained, brown, moist, medium dense (SP-SM)		14	M	SS	24					
	END OF BORING Northing=207165.1 Easting=554854.2	COARSE ALLUVIUM									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-139 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>951.8</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of clayey sand, sandy lean clay, silty sand and sand with silt, a little gravel, trace roots, brown and dark brown	FILL	26	M	SS	12	9					
2												
3			21	M	SS	19	8					
4							10					
5												
6												
7												
8					10	M	SS	15	20			
9									18			
10	ORGANIC CLAY, trace roots, pieces of wood, dark gray, firm, lenses and laminations of silty sand (OL/OH)	SWAMP DEPOSIT	5	W	SS	12	20					
11							38					
12	SANDY SILT, pieces of wood, dark gray, wet, very loose, laminations of silty sand (ML)	FINE ALLUVIUM	4	W/M	SS	14	19					
13							18					
14	SILTY SAND, fine grained, gray, waterbearing, very loose (SM)	COARSE ALLUVIUM										
15	SANDY LEAN CLAY, a little gravel, gray and brown mottled, stiff, laminations of silty sand (CL)	TILL	10	M	SS	19	19					
16												
17												
18	SANDY LEAN CLAY, a little gravel, brown, firm, laminations of silty sand (CL)		8	M	SS	21	19					
19												
20												
21												
22												
23												
24												
25	CLAYEY SAND WITH GRAVEL, brown, hard (SC)		54	M	SS	18	11					
26												
	SAND WITH SILT, a little gravel, fine to medium grained, brown, moist, very dense (SP-SM)	COARSE ALLUVIUM										
END OF BORING Northing=206844.7 Easting=553486.0												

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	
0-24 1/2'	3.25" HSA	6/28/07	10:44	11.5	9.5	9.8		9.6
		6/28/07	11:05	26.5	24.5	26.5		None
BORING COMPLETED: 6/28/07								
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081







LOG OF BORING NO. ST-139A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SILTY SAND WITH GRAVEL, medium to fine grained, brown, moist, dense (SM) (possible cobbles)	COARSE ALLUVIUM	40	M		6					
31											
32											
33											
34											
35											
36											
37											
38	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, dense (SP-SM)		33	M		21					
39											
40											
41											
42											
43	SAND, fine grained, light brown, dense (SP)		33	M		20					
44											
45											
46											
END OF BORING Northing=206844.7 Easting=553486.0											

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4006-15 ST-140 LOCATION: N: 206836.519, E: 554906.041 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/2/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
962.9	0.0	CL	 SANDY LEAN CLAY, trace of Gravel, yellowish-brown to brown, moist, medium dense. (Glacial Till)	 8 6 8 17		
951.9	11.0	SM	 SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist. (Glacial Till)	 42 * *		*70 blows for 6" (set) suspected Cobble or Boulder *50 blows for 1" (set) suspected Cobble or boulder
939.9	23.0	SP	 POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, brown, moist, very dense. (Glacial Outwash)	 54		
936.9	26.0		END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-140A (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>962.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	No samples taken in upper 19.5', Refer to Log of Boring ST-140										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20	CLAYEY SAND, a little gravel, brown, hard (SC)		TILL	37	M	SS	20	9			
21	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, dense (SP-SM)		COARSE ALLUVIUM	44	M	SS	16				
22											
23											
24											
25											
26											
27											
27											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-44½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		7/25/07	11:10	41.5	39.5	41.4			None
BORING COMPLETED: 7/25/07									
DR: SG	LG: BR	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-140A (p. 2 of 2)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
29	GRAVELLY SAND WITH SILT, medium to fine grained, light brown, moist, very dense (SP-SM)		116	M	SS	14					
30											
31											
32			79	M	SS	17					
33											
34											
35	GRAVEL WITH SILTY SAND, light brown, moist, very dense (GP)		99	M	SS	16					
36											
37											
38	END OF BORING Northing=206836.5 Easting=554906.0										
39											
40											
41											



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-141 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>913.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of silty sand and sandy silt, a little gravel, surface roots, trace roots, brown FILL, mixture of silty sand, clayey sand and sandy lean clay, a little gravel, trace roots, organic clay, brown, dark brown, gray and black	FILL	17	M	SS	17						
2			19	M	SS	22	10					
3												
4												
5												
6												
7	CLAYEY SAND, a little gravel, trace roots, brown and dark gray, stiff (SC) SANDY LEAN CLAY, a little gravel, dark gray and gray mottled, a little brown, firm, laminations of silty sand and clayey sand (CL) SANDY LEAN CLAY, a little gravel, light brown and gray mottled, stiff, laminations of brown silty sand (CL) CLAYEY SAND, a little gravel, dark gray, stiff to very stiff (SC)	TILL	9	M	SS	17	19					
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
	END OF BORING Northing=206683.1 Easting=552396.6											

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	
0-24½'	3.25" HSA	7/18/07	1:50	26.5	24.5	26.5		26.5	
BORING COMPLETED: 7/18/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-142 (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>933.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly sandy silt, surface roots, trace roots, dark brownish gray	FILL	17	M	SS	10	9				
2	FILL, mostly clayey sand, a little gravel, possible cobbles, trace roots, brown and grayish brown		8								
3			14	M	SS	4	10				
4											
5			8	M	SS	7	13				
6											
7			2	W/M	SS	2	18				
8											
9			18	M	SS	19	20				
10	FILL, mixture of silty sand, clayey sand and sand with silt, a little gravel, dark grayish brown, gray and black										
11											
12											
13											
14											
15	SANDY SILT, trace roots, dark brownish gray, a little gray, moist, loose, lenses and laminations of silty sand (ML)	FINE ALLUVIUM	6	M	SS	18	20				
16											
17	SILT WITH ORGANICS, black, wet, loose (ML)		5	W	SS	23	34				
18											
19											
20	CLAYEY SAND, gray, a little brown, stiff, laminations of wet silty sand (SC)	MIXED ALLUVIUM	9	M/W	SS	19	27				
21											
22											
23	LEAN CLAY, trace roots, gray, a little black, stiff, laminations of fat clay (CL)	FINE ALLUVIUM									
24											
25			11	M	SS	17	20				
26	SILTY SAND, fine grained, gray, wet, medium dense (SM)	COARSE ALLUVIUM									
27	SILTY SAND, a little gravel, fine to medium grained, gray, wet, medium dense (SM)										
28			14	W	SS	20					

DEPTH: <u>0-29½'</u>	DRILLING METHOD: <u>3.25" HSA</u>	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	
		7/5/07	9:35	26.0	24.5	24.8		23.7
		7/5/07	2:00	31.5	29.5	29.9		24.5
BORING COMPLETED: <u>7/5/07</u>								
DR: <u>SG</u> LG: <u>SB</u> Rig: <u>91C</u>								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-142 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
30	SANDY LEAN CLAY, a little gravel, gray, firm (CL)	TILL	5	M	SS	14	19					
31	<p>END OF BORING</p> <p>Northing=206683.8 Easting=552897.3</p>											

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-143 RI-4007-02
	LOCATION: N: 206653.285, E: 553400.699 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/18/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
949.3	0.0					
	0.6	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.			
		FILL	FILL: Clayey Sand, trace of Gravel, mixed light brown and dark brown, moist.			
945.9	4.0			29		
		SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, trace of Gravel, light brown, moist.	18		
940.9	9.0			5		
		CL	SANDY LEAN CLAY, trace of Roots, dark brown, moist. (Buried Topsoil)	4		
937.9	12.0					
		CL	SANDY LEAN CLAY, trace of Gravel, grayish-brown, wet, rather soft to medium. (Glacial Till)	3		
				6		
930.9	19.0					
		CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, wet, rather soft to rather stiff. (Glacial Till)	5		
				10		
921.9	28.0					
		SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till)	21		

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43
 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING ST-143 RI-4007-02 (cont.) LOCATION: N: 206653.285, E: 553400.699 See attached sketch.		
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/18/07	SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
917.9	32.0		SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till) <i>(continued)</i>			
				18		
				35		
903.9	46.0		END OF BORING. Water not observed with 44 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	12		

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43
 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-144 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>955.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS						
							WC	DEN	LL	PL	%-#200		
1	Concrete	FILL			SU								
1-2	FILL, mostly sand with silt, a little gravel, brown		10	M	SS	9							
2-3	FILL, mixture of clayey sand and silty sand, a little gravel, brown		21	M	SS	20							
4-5	SILTY SAND, a little gravel, fine grained, brown, medium dense (SM)	TILL					13						
5-6			12	M	SS	20							
6-8	SILTY SAND, a little gravel, fine to medium grained, brown, medium dense (SM)		15	M	SS	20	13						
8-10	SAND WITH SILT, a little gravel, medium to fine grained, brown, moist, medium dense (SP-SM)	COARSE ALLUVIUM											
10-11			12	M	SS	8							
11-13			15	M	SS	12							
13-15	SAND WITH SILT WITH GRAVEL, medium to fine grained, brown, moist, medium dense to dense (SP-SM)												
15-16			30	M	SS	6							
16-21													
21-22			44	M	SS	14							
22-25													
25-26			40	M	SS	15							
END OF BORING Northing=206618.1 Easting=553935.0													

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
0-24½'	3.25" HSA	7/9/07	8:55	26.5	24.5	26.2			None
BORING COMPLETED: 7/9/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-144A (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>955.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	No samples taken in upper 24.5', Refer to Log of Boring ST-144										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

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	
0-44½'	3.25" HSA	7/24/07	12:02	46.5	44.5	46.0		None	
BORING COMPLETED: 7/24/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-144A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
25	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, dense to very dense (SP-SM)	COARSE ALLUVIUM	35	M		SS	20					
26												
27												
28												
29												
30												
31	SAND WITH SILT, fine to medium grained, light brown, moist, dense to very dense (SP-SM)		51	M		SS	24					
32												
33												
34	SAND WITH SILT, fine to medium grained, light brown, moist, dense to very dense (SP-SM)											
35												
36												
37												
38												
39												
40	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, very dense (SP-SM)		53	M		SS	22					
41												
42												
43	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, very dense (SP-SM)											
44												
45												
46	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, very dense (SP-SM)		57	M		SS	22					
47												
48												
END OF BORING Northing=206618.1 Easting=553935.0												



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-145 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>954.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of clayey sand and silty sand, a little gravel, surface roots, trace roots, light brown	FILL TILL	24	M	SS	16	7					
2	CLAYEY SAND, a little gravel, trace roots, brown, laminations of silty sand, very stiff (SC)		25	M	SS	13	9					
3							12					
4							7					
5							14					
6							14					
7												
8				67/0.9		M	SS	11	7			
9												
10								8				
11						M	SS	12				
12			SAND, a little gravel, medium to fine grained, brown, moist, medium dense to dense (SP)	COARSE ALLUVIUM								
13		18			M	SS	14					
14												
15												
16		33			M	SS	14					
17												
18	GRAVELLY SAND WITH SILT, fine to coarse grained, brown, moist, very dense (SP-SM)											
19												
20												
21			60	M	SS	12						
22												
23	SAND WITH SILT, fine to medium grained, brown, moist, dense (SP-SM)											
24												
25												
26			44	M	SS	15						
END OF BORING Northing=206685.1 Easting=554399.4												

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
0-24½'	3.25" HSA	6/29/07	1:40	26.5	24.5	26.5			None
BORING COMPLETED: 6/28/07									
DR: SG LG: SB Rig: 91C									



AMERICAN
ENGINEERING
TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-145A (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>954.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	No samples taken in upper 29.5', Refer to Log of Boring ST-145											
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												

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
0-39½'	3.25" HSA	7/24/07	9:55	41.5	39.5	40.4			None
BORING COMPLETED: 7/24/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-145A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SAND WITH SILT, fine grained, light brown, a little black, moist, medium dense, laminations of silt at 31 feet (SP-SM)	COARSE ALLUVIUM	25	M	SS	17					
31											
32											
33	SANDY SILT, light brown, moist, dense (ML)	FINE ALLUVIUM	50	M	SS	19					
34											
35											
36											
37											
38	SAND WITH SILT, a little gravel, medium to fine grained, brown, moist, very dense (SP-SM)	COARSE ALLUVIUM	57	M	SS	22					
39											
40											
41											
END OF BORING Northing=206685.1 Easting=554399.4											

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-146 RI-4006-07 LOCATION: N: 206671.599, E: 554897.200 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/2/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
966.0	0.0							
965.5	0.5	SM CL	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)					
			SANDY LEAN CLAY, trace of Gravel, brown, moist. (Glacial Till)	10				
962.0	4.0	CL	SANDY LEAN CLAY, trace of Gravel, yellowish-brown, wet. (Glacial Till)	7				
957.0	9.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, moist, hard. (Glacial Till)	33		22	54	LL = 29 PI = 17
955.0	11.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till)	82				NR Suspected Cobble or Boulder
				46		6	25	
				32				
940.0	26.0		END OF BORING.	32				
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.					
			Boring then grouted.					



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-146A (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>966.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	No samples taken in upper 27', Refer to Log of Boring ST-146										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											

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
0-44½'	3.25" HSA	7/25/07	8:46	46.5	44.5	46.0			None
BORING COMPLETED: 7/25/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-146A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
28	GRAVEL WITH SILTY SAND, light brown, moist, dense to very dense (GP)	COARSE ALLUVIUM	79	M		19					
29											
30											
31											
32											
33											
34											
35											
36			57	M	SS	14					
37											
38	SAND, a little gravel, fine to medium grained, light brown, moist, dense (SP)										
39											
40											
41						40	M	SS	17		
42											
43	GRAVELLY SAND WITH SILT, medium to fine grained, light brown, moist, very dense (SP-SM)										
44											
45											
46						56	M	SS	18		
	END OF BORING Northing=206671.6 Easting=554897.2										

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4006-16 ST-147
	LOCATION: N: 206638.252. E:555108.351 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/2/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
958.6	0.0					
958.1	0.5	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense. (Glacial Till)	20		
				22		
				28		
949.6	9.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, medium dense to very dense. (Glacial Outwash)	22		
				52		Suspected Cobble or Boulder
				34		
				38		
932.6	26.0		END OF BORING.	53		
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-147A (p. 1 of 2)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>958.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	1/2-#200
1	No samples taken in upper 29.5', Refer to Log of Boring ST-147										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											

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		
0-44½'	3.25" HSA	7/24/07	2:20	45.5	44.5	45.4	None	
BORING COMPLETED: 7/24/07								
DR: SG LG: BR Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-147A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	GRAVEL WITH SAND, brown, very dense (GP)	COARSE ALLUVIUM	119	M		16					
31											
32											
33											
34	GRAVELLY SAND WITH SILT, medium to fine grained, brown, moist, very dense (SP-SM)		84/0.8	M		14					
35											
36											
37											
38	GRAVELLY SAND WITH SILT, medium to fine grained, brown, moist, very dense (SP-SM)		100/0.5	M		8					
39											
40											
41											
42	GRAVELLY SAND WITH SILT, medium to fine grained, brown, moist, very dense (SP-SM)		62/0.5	M		8					
43											
44											
45											
END OF BORING Northing=206638.3 Easting=555108.4											



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-148 (p. 1 of 2)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>957.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%-#200			
1	6" Bituminous Pavement	FILL			SU									
2	FILL, mostly gravelly silty sand, brown and light brown		26	M	SS	9								
3	FILL, mixture of sandy lean clay, clayey sand and silty sand, a little gravel, pieces of bituminous, brown, gray, dark gray and brown, a little black		17	M	SS	10	10							
4			20	M	SS	20								
5			1	W	SS	14								
6														
7														
8														
9														
10	ORGANIC CLAY, trace roots, black and dark gray, soft (OL/OH)	SWAMP DEPOSIT			SS									
11	HEMIC PEAT, dark brown, a little gray, laminations of lean clay (PT)		2	M	SS	21	26	182						
12	ORGANIC CLAY, trace roots, black, soft to very soft (OL/OH)		2	M	SS	24	102							
13			1	M	SS	23	31							
14														
15														
16	SILTY CLAY, gray and black, very soft, laminations of silty sand (CL-ML)	FINE ALLUVIUM TILL			SS									
17	CLAYEY SAND, a little gravel, gray and brownish gray, very soft to very stiff (SC)		2	M	SS	16	18							
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30	CLAYEY SAND, a little gravel, dark brown, very stiff (SC)				SS			10						
31					SS	20		15						

DEPTH: 0-39½'	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	
		7/17/07	12:05	9.0	7.0	7.4		7.3
		7/17/07	12:45	36.5	34.5	35.7		33.9
BORING COMPLETED: 7/17/07		7/17/07	12:50	41.5	39.5	40.3		39.9
DR: SG	LG: SB/BRig: 91C							











SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-148 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS						
							WC	DEN	LL	PL	%-#200		
32	SANDY LEAN CLAY, a little gravel, dark brown, a little brown, very stiff, lense of silty sand at 31.5' (CL)												
33													
34	CLAYEY SAND, a little gravel, trace roots, brown, hard to firm (SC)												
35													
36			36	W	SS	16	10						
37													
38													
39													
40			8	W	SS	19	14						
41													
END OF BORING Northing=206425.9 Easting=554458.6													

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota					BORING: ST-149		
DRILLER: K. Keck			METHOD: 3 1/4" HSA, Autohmr		DATE: 7/11/07		SCALE: 1" = 4'
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
990.9	0.0						
989.9	1.0	FILL	FILL: Silty Sand, trace of Roots, moist.				
		FILL	FILL: SANDY LEAN CLAY, trace of GRAVEL, mixed light brown to dark brown, moist.	11			
				7			
				5			
				8			
978.9	12.0	FILL	FILL: Silty Sand, fine- to medium-grained, trace of gravel, reddish-brown to grayish-brown, moist to wet.	7			
				4			
					▽		
				6			
968.9	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet. (Glacial Till)	4			
				4			
				4		23	
958.9	32.0						

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-149 (cont.)
	LOCATION: N: 206391.747, E: 555391.606 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/11/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING .SP0605871.GPJ BRAUN.GDT 10/2/07 14:43
 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
958.9	32.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, wet.				
				*			*50 blows for 6"
952.9	38.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to hard.	30			
				59		7	
939.9	51.0		END OF BORING.	29			
			Water observed at 19 feet while drilling.				
			Boring then grouted.				
			Given moist conditions at depth groundwater appears to be trapped in clay layer.				



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-150 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>927.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly sandy silt, surface roots, trace roots, dark brownish gray	FILL	34	M	SS	12	7				
2	FILL, mixture of clayey sand and silty sand, a little gravel, trace roots, grayish brown and brown		21	M	SS	19					
3											
4											
5	CLAYEY SAND, trace roots, dark brown, firm (SC) (possible fill)	TOPSOIL OR FILL	7	M	SS	3	16				
6											
7	CLAYEY SAND, a little gravel, brown and light gray mottled, stiff (SC/CL)	TILL	10	M	SS	16	17				
8											
9	CLAYEY SAND, a little gravel, light brownish gray, a little brown, stiff, laminations of silty sand (SC/CL)		11	M	SS	21	18				
10											
11											
12											
13			14	M	SS	21	16				
14											
15	SANDY LEAN CLAY, a little gravel, brown and dark brown, very stiff (CL)		16	M	SS	24	14				
16											
17											
18											
19											
20											
21			16	M	SS	24	14				
22											
23	SANDY LEAN CLAY, a little gravel, brown, very stiff, lenses and laminations of sand (CL)		23	M	SS	21	14				
24											
25											
26											
END OF BORING Northing=206182.3 Easting=552896.3											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24 1/2'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/6/07	2:10	26.5	24.5	26.5		None	
BORING COMPLETED: 7/6/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-151 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>922.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of clayey sand and silty sand, surface roots, trace roots, black and brown	FILL	24	M	SS	14	33				
2	CLAYEY SAND, a little gravel, trace roots, brown, very stiff (SC)	TILL	18	M	SS	24	12				
3											
4	SAND WITH SILT, fine to medium grained, a little gravel, brown, wet, medium dense (SP-SM)	COARSE ALLUVIUM	13	W	SS	11					
5											
6	SANDY LEAN CLAY, a little gravel, gray, a little reddish brown, firm to stiff, laminations of silty sand at 7.5' (CL)	TILL	5	M	SS	18	18				
7											
8											
9											
10											
11											
12											
13											
14	LEAN CLAY, brownish gray, a little gray, hard to very stiff, laminations of silt (CL)	FINE ALLUVIUM	10	M	SS	24	16				
15											
16											
17	END OF BORING Northing=206254.2 Easting=553051.5		33	M	SS	21	17				
18											
19											
20											
21			25	M	SS	24	25				
22											
23											
24											
25											
26											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		7/9/07	9:35	6.5	4.5	5.2			5.1
		7/9/07	10:00	26.5	24.5	26.4			None
BORING COMPLETED: 7/9/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-152 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>942.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%-#200			
1	5" Bituminous Pavement	FILL												
	FILL, mostly sand with silt and gravel, brown		21	M	SS	5								
2	FILL, mixture of sandy lean clay and clayey sand, with gravel, brown and gray		16	M	SS	11	15							
3														
4														
5			9	M	SS	5	16							
6			7	M	SS	12	24							
7														
8														
9														
10	SILTY SAND, fine grained, dark brown, wet, very loose (SM) (possible fill)	COARSE ALLUVIUM OR FILL	3	W	SS	14								
11														
12	SAND WITH SILT, fine grained, brownish gray, waterbearing, medium dense (SP-SM)	COARSE ALLUVIUM	11	W	SS	13								
13														
14	SILTY SAND, fine grained, gray, wet, medium dense (SM)		15	W	SS	14								
15														
16	CLAYEY SAND, gray, stiff (SC)	TILL					22							
17	CLAYEY SAND, a little gravel, grayish brown, stiff (SC)		9	M	SS	21	17							
18														
19	CLAYEY SAND, a little gravel, brown and gray mottled, stiff (SC)		12	M	SS	21	17							
20														
21														
22														
23	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)													
24														
25			14	M	SS	8	15							
26														
END OF BORING Northing=206184.0 Easting=553397.6														

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	
0-24 1/2'	3.25" HSA	7/5/07	11:50	14.0	12.0	12.5		12.3	
		7/5/07	12:10	26.5	24.5	26.4		None	
BORING COMPLETED: 7/5/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-153 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>951.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly gravelly silty sand, possible cobbles, surface roots, trace roots, brown	FILL	22	M	SS	12					
2											
3	FILL, mixture of clayey sand and sandy lean clay, a little gravel, brown and dark brown	TILL	25	M	SS	10	13				
4											
5	SANDY LEAN CLAY, a little gravel, brown, a little gray, firm, laminations of sand (CL)		5	M	SS	17	20				
6											
7	CLAYEY SAND, a little gravel, brown mottled, stiff (SC)		12	M	SS	18	17				
8											
9											
10	CLAYEY SAND, a little gravel, light brownish gray, a little brown, mottled, stiff, lenses and laminations of silty sand (SC)		12	M	SS	17	18				
11											
12	SANDY LEAN CLAY, a little gravel, light brownish gray and brown mottled, stiff to very stiff (CL)		14	M	SS	23	15				
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24	CLAYEY SAND, a little gravel, possible cobbles, dark grayish brown to brown, hard (SC)	30	M	SS	22	13					
25			100/0.9	M	SS	12	7				
END OF BORING Northing=206179.7 Easting=553901.3											

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
0-24½'	3.25" HSA	7/5/07	11:05	25.9	24.5	25.3			None
BORING COMPLETED: 7/5/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-153A (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>951.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	No samples taken in upper 29.5', Refer to Log of Boring ST-153										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
<u>0-44½'</u>	<u>3.25" HSA</u>	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		<u>7/23/07</u>	<u>3:07</u>	<u>46.5</u>	<u>44.5</u>	<u>46.4</u>		<u>None</u>	
BORING COMPLETED: <u>7/23/07</u>									
DR: <u>SG</u> LG: <u>BR</u> Rig: <u>91C</u>									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-153A (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SILTY SAND, a little gravel, fine to medium grained, brown, moist, very dense (SM)	TILL	73	M		22					
31											
32											
33											
34	CLAYEY SAND WITH GRAVEL, brown, moist, hard to very stiff, lense of silty sand, a little gravel at 46 feet (SC)		56	M		20	11				
35											
36											
37											
38											
39											
40			34	M		24	9				
41											
42											
43											
44											
45											
46			28	M		24	9				
END OF BORING Northing=206179.7 Easting=553901.3											

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-154 RI-4008-15 LOCATION: N: 206184.030, E: 554408.064 See attached sketch.		
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/17/07		SCALE: 1" = 4'
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
956.7	0.0					
955.7	1.0	FILL	FILL: Silty Sand, brown, moist.			
		FILL	FILL: Sandy Lean Clay, with Sand layer, brown, dark brown and reddish-brown, moist.			
				30		
				21		
			With topsoil lense at 8 feet.	12		
947.7	9.0	FILL	FILL: Sandy Lean Clay, trace of Gravel, brown, moist.			
945.7	11.0	FILL	FILL: Sandy Lean Clay, with topsoil chunks, brown to dark brown, wet.			
				8		
				6		
940.7	16.0	SC	With Organic Clay layer at 15 1/2 feet. CLAYEY SAND, trace of Gravel, brown and gray with iron staining, wet, medium. (Lacustrine)			
				3		
				6		
				7		
928.7	28.0	CL	SANDY LEAN CLAY, trace of Gravel, brown with iron staining, moist, stiff. (Glacial Till)			
				13		

BRAUN BASIC LOG OF BORING. SP0605871.GPJ. BRAUN.CDT. 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BOREHOLE: ST-154 RI-4008-15 (cont.)
	LOCATION: N: 206184.030, E: 554408.064 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/17/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
924.7	32.0		SANDY LEAN CLAY, trace of Gravel, brown with iron staining, moist, stiff. (Glacial Till) <i>(continued)</i>			
				15		
919.7	37.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, dense. (Glacial Till)			
				38		
915.7	41.0		END OF BORING. Water not observed during drilling. Water not observed with 39 1/2 feet of hollow-stem auger in the ground. Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				BORING: ST-157		
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/10/07		SCALE: 1" = 4'
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
995.9	0.0					
994.9	1.0	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.			
		FILL	FILL: Sandy Lean Clay, mixed, light brown to grayish brown, moist.	12		
				7		
				12		
986.9	9.0	FILL	FILL: Silty Sand, fine-grained, trace of Roots at 12' Sample Depth, brown to dark brown, moist.	9		
				6		
981.9	14.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown to brown, moist, medium to very stiff. (Glacial Till)	7		
				18		
				13		
				14		
963.9	32.0					

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43
 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-157 (cont.)
	LOCATION: N: 206185.157, E: 555395.351 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/10/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING . SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
963.9	32.0	SM	SILTY SAND, fine-grained, reddish-brown, moist, dense to very dense. (Glaciofluvium)	38		
				38		
				*		*50 blows to for 5" (set) suspected cobble or boulder
948.9	47.0	SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, very dense. (Glacial Outwash)	74		
				88		
				*		*50 blows for 4" (set)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-157 (cont.)
	LOCATION: N: 206185.157, E: 555395.351 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/10/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
931.9	64.0		POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, light brown, moist, very dense. (Glacial Outwash) (continued)	52		
				68		
				*		*50 blows for 6" (set)
914.9	81.0		END OF BORING. Water not observed with 79 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	58		

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43
 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-158 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>955.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS						
							WC	DEN	LL	PL	%-#200		
1	FILL, mixture of sandy lean clay, clayey sand and silty sand, surface roots, trave roots, brown, light brown and gray	FILL	26	M		SS	14	7					
2													
3						35	M	SS	15	8			
4													
5						7	M	SS	18	14			
6													
7													
8						12	M	SS	17	22			
9													
10						15	M	SS	19	15			
11													
12													
13			FILL, mixture of clayey sand and sandy lean clay, a little gravel, trace roots, brown and gray, a little black, lense of organic clay, laminations of sandy silt			9	M	SS	15	19			
14													
15					8	M	SS	14	20				
16													
17													
18					10	M	SS	24	17				
19													
20			9	M	SS	20	19						
21							24						
22	LEAN CLAY, trace roots, gray and black, stiff, lense of organic clay, lense of silty sand (CL)		FINE ALLUVIUM TILL										
23	CLAYEY SAND, a little gravel, gray, soft (SC)		4	M		SS	24	19					
24													
25	SANDY LEAN CLAY, a little gravel, gray, a little brown, stiff, laminations of lean clay (CL)		11	M	SS	24	21						
26													
END OF BORING Northing=206042.2 Easting=554402.2													

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24 1/2'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/17/07	11:05	26.5	24.5	26.5		None	
BORING COMPLETED: 7/17/07									
DR: SG LG: SB/BRig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-159
	LOCATION: N: 206047.880. E: 554563.240 See attached sketch.

DRILLER: M. Rowland	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/12/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
959.4	0.0	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, trace of Gravel, brown, moist then waterbearing at 20' sample depth. (Lacustrine)			
933.4	26.0		END OF BORING. Water observed at 18 feet while drilling. Boring then grouted.		▽	

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-160 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>920.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DEN	LL	PL	%-#200				
1	FILL, mixture of silty sand and clayey sand, a little gravel, trace roots, surface roots, black and brown	FILL	24	M	SS	13	15								
2							FILL, mixture of sand with silt, clayey sand, and silty sand, a little gravel, trace roots, brown and gray, possible cobbles	21	M	SS	23	10			
3															
4															
5															
6															
7	LEAN CLAY WITH ORGANICS, trace roots, black, firm (CL)	TOPSOIL OR SWAMP DEPOSITS	8	M	SS	20	20								
8															
9	SILTY SAND, trace roots, fine grained, dark gray, loose (SM)	COARSE ALLUVIUM	4	W/M	SS	14									
10	SILTY SAND, trace roots, fine grained, gray, waterbearing, very loose with lenses and laminations of lean clay with sand (SM)														
11	SAND WITH SILT, fine grained, brown, waterbearing, medium dense (SP-SM)		11	W	SS	15									
12															
13	CLAYEY SAND, a little gravel, gray, soft to stiff, laminations of silty sand at 26' (SC)	TILL	4	M	SS	17	16								
14															
15															
16															
17															
18															
19															
20															
21			11	M	SS	4	19								
22															
23															
24															
25															
26			10	M	SS	22	16								
END OF BORING Northing=205865.8 Easting=553115.1															

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
0-24½'	3.25" HSA	7/9/07	10:45	14.0	12.0	12.3			11.8
		7/9/07	11:00	26.5	24.5	26.5			None
BORING COMPLETED: 7/9/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-161 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>926.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly gravelly sand with silt, light grayish brown	FILL	15	M	SS	4					
2	FILL, mixture of sandy lean clay, clayey sand and silty sand, a little gravel, light brownish gray and brown	FILL	15	M	SS	20	12				
3											
4	LEAN CLAY WITH SAND, gray, a little black, firm, laminations of organic clay and silty sand (CL)	FINE ALLUVIUM	7	M	SS	5	13				
5											
6	CLAYEY SAND, a little gravel, gray, stiff (SC)	TILL	10	M	SS	14	18				
7											
8	CLAYEY SAND, a little gravel, light brownish gray and brown mottled, stiff to firm, laminations of silty sand (SC)	TILL	9	M	SS	20	18				
9											
10	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	8	M	SS	21	18				
11											
12	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	12	M	SS	21	18				
13											
14	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	13	M	SS	20	13				
15											
16	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	14	M	SS	21	16				
17											
18	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	14	M	SS	21	16				
19											
20	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	14	M	SS	21	16				
21											
22	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	14	M	SS	21	16				
23											
24	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	14	M	SS	21	16				
25											
26	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	14	M	SS	21	16				
27											
END OF BORING Northing=205683.9 Easting=553397.5											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-24 1/2'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		7/9/07	3:05	26.5	24.5	26.5			None
BORING COMPLETED: 7/9/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-162
	LOCATION: N: 205685.324, E: 553896.610 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/3/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
956.7	0.0					
955.7	1.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		CL	SANDY LEAN CLAY, trace of Gravel, yellowish-brown to brown with rust lenses scattered, moist, medium to stiff. (Glacial Till)	7		
				9		
				13		
				14		
				15		
				16		
				13		
				11		
927.7	29.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, moist, rather stiff. (Glacial Till)	12		

BRAUN BASIC LOG OF BORING. SP0605871.GPI BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-162 (cont.) LOCATION: N: 205685.324, E: 553896.610 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/3/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:43 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
924.7	32.0					
923.7	33.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, dense. (Glacial Till)	35		
918.7	38.0	SP	POORLY GRADED SAND, fine- to coarse-grained, brown, moist, dense. (Glacial Outwash)	40		
910.7	46.0		END OF BORING. Water not observed with 44 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	40		



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-163 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>949.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DEN	LL	PL	%-#200				
1	7.5" Bituminous Pavement	FILL			SU										
2	FILL, mixture of sand with silt, silty sand and clayey sand with gravel, brown and brownish gray		15	M	SS	12									
3	FILL, mixture of clayey sand and sandy lean clay, a little gravel, gray and brown		19	M	SS	12									
4							17								
5			15	M	SS	8									
6							13								
7							16								
8			3	M	SS	8									
9							18								
10							20								
11			10	M	SS	15									
12							17								
13							20								
14			5	M	SS	7									
15	SAPRIC PEAT, black (PT)	SWAMP DEPOSIT													
16	ORGANIC CLAY, trace roots, black, firm (OL/OH)		7	M	SS	20									
17	LEAN CLAY WITH SAND, dark brownish gray, firm, laminations of sand (CL)	FINE ALLUVIUM													
18			5	M	SS	21									
19						25									
20	CLAYEY SAND, a little gravel, gray, soft, laminations of fine grained sand (SC)	TILL													
21			3	W/M	SS	14									
22						18									
23															
24															
25															
26			3	M	SS	24									
END OF BORING Northing=205683.4 Easting=554148.1															

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/2/07	1:55	26.5	24.5	26.4		None	
BORING COMPLETED: 7/2/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081** LOG OF BORING NO. **ST-164 (p. 1 of 1)**
 PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>951.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DEN	LL	PL	%-#200				
1	4.25" Bituminous Pavement	FILL			SU										
2	FILL, mixture of silty sand and clayey sand with gravel, brown and gray		19	M	SS	13	8								
3	SANDY LEAN CLAY, a little gravel, brownish gray and brown, stiff (CL)	TILL													
4															
5			15	M	SS	1	16								
6															
7			15	M	SS	12	14 16								
8															
9	SILTY SAND, trace roots, fine grained, dark brown and gray, moist, loose, lenses and laminations of sand with silt (SM)	COARSE ALLUVIUM													
10															
11	SAND WITH SILT, fine grained, brown and gray, very loose, moist to wet, laminations of lean clay with sand (SP-SM)		4	W/M	SS	12									
12	CLAYEY SAND, a little gravel, gray, firm (SC)	TILL													
13			6	M	SS	22	19								
14															
15	CLAYEY SAND, a little gravel, gray and brown mottled, firm (SC)		5	M	SS	18	17								
16															
17															
18	CLAYEY SAND, a little gravel, brown, stiff (SC)														
19															
20			11	M	SS	24	15								
21															
22															
23	CLAYEY SAND, a little gravel, dark gray, very stiff (SC)														
24															
25			18	M	SS	24	15								
26															
END OF BORING Northing=205683.9 Easting=554395.9															

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	
0-24½'	3.25" HSA	7/5/07	10:00	26.5	24.5	26.5		None	
BORING COMPLETED: 7/5/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871				BORING: ST-165 RI-4008-36		
Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota				LOCATION: N: 205684.892, E: 554894.762 See attached sketch.		
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/16/07	SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
953.1	0.0					
952.8	0.3	PAV	3 1/2" of Bituminous			
		FILL	FILL: Silty Sand, fine-grained, brown, moist.			
951.1	2.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, medium to very stiff. (Glacial Till)	7		
				8		
				13		
				19		
941.1	12.0	ML	SILT, reddish-brown, moist, medium dense. (Glaciofluvium)	24		
940.1	13.0	SP	POORLY GRADED SAND, fine-grained, reddish-brown, moist, medium dense. (Glacial Outwash)	23		
				22		
935.1	18.0	ML	SILT, reddish-brown, moist, medium dense. (Glaciofluvium)			
				39		
930.1	23.0	SM	SILTY SAND, fine-grained, with Cobbles, reddish-brown, moist, dense. (Glacial Till)			
927.1	26.0		END OF BORING.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-166 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>955.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%-#200			
1	4.75" Bituminous Pavement	FILL			SU									
2	FILL, mostly gravelly sand with silt, brown (possible base)		19	M	SS	3								
3	SANDY LEAN CLAY, a little gravel, light grayish brown, a little light brown, stiff to very stiff, laminations of sandy silt (CL)	TILL OR WEATHERED TILL	11	M	SS	7	14							
4														
5			16	M	SS	20	15							
6														
7	SANDY LEAN CLAY, a little gravel, light grayish brown, a little brown and light brown, very stiff, laminations of silty sand and sandy silt (CL)	TILL	20	M	SS	18	15	15						
8														
9			23	M	SS	21	15							
10														
11			20	M	SS	17	15							
12														
13			19	M	SS	21	15							
14														
15														
16														
17														
18	CLAYEY SAND, a little gravel, possible cobbles, brown, a little light brownish gray, hard (SC)													
19			88	▼	SS	14	13							
20														
21														
22														
23	SAND, a little gravel, medium to fine grained, brown, waterbearing, dense (SP)	COARSE ALLUVIUM												
24														
25			41	W	SS	24								
26	SILTY SAND, fine grained, brown, wet, dense (SM)													
END OF BORING Northing=205683.0 Easting=555397.1														

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	
0-24½'	3.25" HSA	7/5/07	8:35	26.5	24.5	24.1		21.2	
BORING COMPLETED: 7/5/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-167 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>945.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS										
							WC	DEN	LL	PL	%-#200						
1	5.75" Bituminous Pavement	FILL			SU												
2	FILL, mostly gravelly sand with silt, brown (possible base)		20	M	SS	8											
3	FILL, mixture of clayey sand, sandy lean clay and silty sand, a little gravel, brown and grayish brown	WEATHERED TILL	9	M	SS	3	9										
4																	
5	SANDY LEAN CLAY, a little gravel, grayish brown, firm (CL)		8	M	SS	12	15										
6																	
7	SANDY LEAN CLAY, a little gravel, gray, firm, lenses and laminations of organic clay and sand (CL)		5	M	SS	9	20										
8																	
9	CLAYEY SAND, gray, a little brown, soft (SC)		TILL														
10																	
11	CLAYEY SAND, a little gravel, gray, a little brown, soft, laminations of silty sand (SC)			3	M	SS	15	24	24								
12																	
13	SANDY LEAN CLAY, a little gravel, brown, soft (CL)	4		M	SS	20	22										
14																	
15	SANDY LEAN CLAY WITH GRAVEL, gray, stiff (CL)	9	M	SS	17	19											
16																	
17																	
18	CLAYEY SAND, a little gravel, gray, stiff (SC)																
19																	
20																	
21				9	WM	SS	19	16									
22																	
23																	
24																	
25																	
26			13	M	SS	22	15										
END OF BORING Northing=205551.6 Easting=553796.8																	

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	
0-24 1/2'	3.25" HSA	7/2/07	8:40	21.5	19.5	21.5		21.2
		7/2/07	8:45	26.5	24.5	26.5		None
BORING COMPLETED: 7/2/07								
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-168 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>947.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	10.5" Bituminous Pavement	FILL			SU							
2	FILL, mostly gravelly sand with silt, brown		M		SS	8						
3	FILL, mostly sandy lean clay, a little sapric peat, trace roots, gray and brown, a little black	WEATHERED TILL	5	M	SS	14	19					
4	SANDY LEAN CLAY, trace roots, light brownish gray and light gray, firm, laminations of silt (CL)						16					
5	SANDY LEAN CLAY, a little gravel, trace roots, light brownish gray, a little light gray, stiff to very stiff, laminations of silt (CL)	FILL	15	M	SS	17	14					
6							15					
7												
8				20	M	SS	19	16				
9												
10												
11				21	M	SS	14	14				
12												
13	SANDY LEAN CLAY, a little gravel, light brownish gray, a little brown, very stiff, laminations of silty sand (CL)			18	M	SS	18	16				
14												
15	CLAYEY SAND, a little gravel, grayish brown, a little brown, very stiff (SC)		29	M	SS	12	14					
16												
17	CLAYEY SAND, a little gravel, brown, very stiff (SC)		21	M	SS	17	15					
18												
19												
20	SANDY LEAN CLAY, a little gravel, brown, very stiff (CL)		24	M	SS	19	16					
21												
22												
23	GRAVELLY SAND, medium grained, brown, moist, medium dense (SP)	COARSE ALLUVIUM										
24												
25												
26				16	M	SS	6					
END OF BORING Northing=205519.6 Easting=554022.3												

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	
0-24½'	3.25" HSA	7/2/07	11:20	26.5	24.5	26.5		None
BORING COMPLETED: 7/2/07								
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-169 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>948.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	10.75" Bituminous Pavement	FILL			SU							
2	FILL, mixture of sand with silt with gravel and clayey sand with gravel, brown		28	M	SS	11	7					
3	FILL, mixture of sand with silt and crushed limestone with gravel, brown and light brown		26	W	SS	6						
4												
5	FILL, mixture of sandy lean clay, clayey sand and silty sand, a little gravel, gray and brown		16	M	SS	12	13					
6												
7												
8				9	M	SS	12	17				
9												
10												
11	ORGANIC CLAY, a little gravel, trace roots, gray, very stiff to soft (OL/OH)	SWAMP DEPOSIT	14	M	SS	19	39					
12							24					
13	SANDY LEAN CLAY, a little gravel, gray, soft (CL/SC)	TILL	3	M	SS	20	22					
14	SANDY LEAN CLAY, a little gravel, gray, a little brown, stiff, laminations of silty sand (CL)											
15			15	M	SS	18	17					
16												
17												
18												
19												
20			14	M	SS	19	16					
21												
22												
23												
24												
25												
26			14	M	SS	22	20					
END OF BORING Northing=205580.7 Easting=554087.9												

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	
0-24½'	3.25" HSA	7/2/07	12:20	26.5	24.5	26.5		None
BORING COMPLETED: 7/2/07								
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-170 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>949.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS						
							WC	DEN	LL	PL	%-#200		
1	6.25" Bituminous Pavement	FILL											
2	FILL, mixture of sand with silt and gravel and clayey sand, brown and brownish gray		14	M		4							
3	FILL, mixture of clayey sand and sandy lean clay, a little gravel, light brownish gray, gray and a little brown		9	M		6	15						
4													
5						17	15						
6													
7													
8						17	14						
9													
10							18						
11	LEAN CLAY WITH ORGANICS, trace roots, black, firm (CL)	TOPSOIL				12	23						
12	SILTY SAND, fine grained, gray and brown mottled, wet, medium dense (SM)	COARSE ALLUVIUM											
13			11			15							
14													
15	SANDY LEAN CLAY, a little gravel, gray, a little brown, firm, laminations of silty sand (CL)	TILL				19	20						
16			5										
17													
18	CLAYEY SAND WITH GRAVEL, gray, a little brown, stiff, laminations of silty sand (SC)												
19													
20													
21			13			21	17						
22													
23	CLAYEY SAND, a little gravel, gray, stiff (SC)												
24													
25													
26			11			5	17						
END OF BORING Northing=205558.5 Easting=554273.5													

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	
0-24½'	3.25" HSA	7/2/07	2:40	14.0	12.0	13.2		12.6	
		7/2/07	2:55	26.5	24.5	26.5		None	
BORING COMPLETED: 7/2/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-171 (p. 1 of 1)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>915.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%-#200			
1	3.25" Bituminous Pavement	FILL			SU									
	FILL, mostly sand with silt and gravel, brown		21	M	SS	14								
2	FILL, mixture of sandy lean clay and clayey sand, a little gravel, light grayish brown to light brownish gray		11	M	SS	8	14							
3							10							
4								16						
5	SAND, a little gravel, medium to fine grained, brown, waterbearing, loose (SP)	TOPSOIL OR COARSE ALLUVIUM	4	M	SS	16	16							
6														
7	SAND, a little gravel, medium to fine grained, brown, waterbearing, loose (SP)	TOPSOIL OR COARSE ALLUVIUM	5	▼	SS	17	20							
8							18							
9	SAND, a little gravel, medium to fine grained, brown, waterbearing, loose (SP)	TOPSOIL OR COARSE ALLUVIUM	3	W	SS	19								
10	SILTY SAND, fine grained, gray and black, wet, very loose, lenses and laminations of organic silt and sand (SM)													
11	CLAYEY SAND, a little gravel, trace roots, gray, very soft, lenses of waterbearing sand with silt (SC)	TILL	1	M	SS	22	18							
12														
13	SANDY LEAN CLAY, a little gravel, gray, a 2" thick fine grained sand lenses at 15.6'	TILL	5	M	SS	24	19							
14														
15	SANDY LEAN CLAY, a little gravel, gray, a 2" thick fine grained sand lenses at 15.6'	TILL	11	M	SS	17	17							
16														
17	SANDY LEAN CLAY, a little gravel, gray, a 2" thick fine grained sand lenses at 15.6'	TILL	12	M	SS	23	19							
18														
19	SANDY LEAN CLAY, a little gravel, gray, a 2" thick fine grained sand lenses at 15.6'	TILL												
20														
21	SANDY LEAN CLAY, a little gravel, gray, a 2" thick fine grained sand lenses at 15.6'	TILL												
22														
23	SANDY LEAN CLAY, a little gravel, gray, a 2" thick fine grained sand lenses at 15.6'	TILL												
24														
25	SANDY LEAN CLAY, a little gravel, gray, a 2" thick fine grained sand lenses at 15.6'	TILL												
26														
END OF BORING Northing=205644.7 Easting=553192.7														

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/6/07	12:50	11.5	9.5	9.5		8.6	
		7/6/07	1:05	26.5	24.5	26.4		None	
BORING COMPLETED: 7/6/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-172 LOCATION: N: 205439.106, E: 553392.375 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/9/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
925.1	0.0							
924.6	0.5	FILL	FILL: Silty Sand, trace of Roots, dark brown, moist.					
		FILL	FILL: Sandy Lean Clay, trace of Gravel, mixed light brown to brown, moist.					
				14				
				9	▽			
918.1	7.0	SC	CLAYEY SAND, Organic, dark gray, wet, soft to rather soft. (Swamp Deposit)	4				
				3				
				2		29	48	LL = 36 PI = 23
911.1	14.0	PT	PEAT, dark gray, soft. (Swamp Deposit)	3				
908.1	17.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, very soft to medium. (Glacial Till)					
				WH				
899.1	26.0		END OF BORING. Water observed at 6 feet while drilling. Boring then grouted.	6				

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-173 LOCATION: N: 205433.823, E: 553574.478 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/9/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
942.9	0.0					
941.9	1.0	SM	SILTY SAND, trace of Roots, dark brown, wet. (Topsoil)			
		CL	SANDY LEAN CLAY, trace of Gravel, light brown, moist, very stiff to hard. (Glacial Till)	19		
				46		*NR Suspected Cobble or Boulder
935.9	7.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown to brown with gray and rust, wet, rather soft to rather stiff. (Glacial Till)	9		
				5		
				7		
				9		
				10		
920.9	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, very stiff. (Glacial Till)			
				17		
916.9	26.0		END OF BORING.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-174 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>944.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of sandy silt and sandy lean clay, a little gravel, possible cobbles, surface roots, trace roots, brown and light brown	FILL	15	M	SS	12	12				
2											
3			17	M	SS	3	13				
4	SANDY LEAN CLAY, a little gravel, possible cobbles, trace roots, gray and brown mottled, a little light gray, very stiff, laminations of sandy silt (CL)	WEATHERED TILL	21	M	SS	19	14				
5											
6	SANDY LEAN CLAY, a little gravel, apparent cobbles, trace roots, light grayish brown, a little brown, very stiff, laminations of sandy silt (CL) (possible fill)	TILL	27	M	SS	16	16				
7											
8			21	M	SS	NR					
9	CLAYEY SAND, a little gravel, grayish brown to gray, very stiff to stiff (SC)		21	M	SS	20	15				
10											
11			19	M	SS	18	16				
12											
13	CLAYEY SAND, a little gravel, apparent cobbles, brown and gray mottled, hard, laminations of sand with silt (SC)		15	M	SS	18	16				
14											
15											
16			32	M	SS	20	13				
17	END OF BORING Northing=205436.5 Easting=553898.8										
18											
19											
20											

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	
0-24½'	3.25" HSA	7/2/07	10:10	26.5	24.5	26.4		None	
BORING COMPLETED: 7/2/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-174
	LOCATION: N: 205436.535, E: 553898.789 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/25/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
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944.9	0.0		Power Auger to 29 feet. No samples obtained.			
915.9	29.0	SM	SILTY SAND, fine-grained, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till)	16		

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-174 (cont.)
	LOCATION: N: 205436.535, E: 553898.789 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/25/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
912.9	32.0		SILTY SAND, fine-grained, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till) <i>(continued)</i>			
				31		
903.9	41.0			27		
			END OF BORING. Water not observed during drilling. Water not observed with 39 1/2 feet of hollow-stem auger in the ground. Boring then grouted.			

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-175 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>948.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of clayey sand and silty sand, a little gravel, surface roots, trace roots, pieces of brick, brown and dark brown	FILL	18	M		SS	15	6				
2												
3	SANDY LEAN CLAY, a little gravel, trace roots, brown, very stiff (CL)	TILL	18	M		SS	19	11				
4								11				
5	CLAYEY SAND, a little gravel, trace roots, brown, stiff (SC)		12	M		SS	17	12				
6												
7	SANDY LEAN CLAY, a little gravel, trace roots, gray, stiff to hard (CL)		30	M		SS	20	15				
8								20				
9	CLAYEY SAND, a little gravel, brown, hard (SC)		10	M		SS	7	16				
10								16				
11	CLAYEY SAND, a little gravel, brownish gray, stiff to firm, laminations of silty sand (SC)		8	M		SS	7	13				
12												
13	LEAN CLAY WITH SAND, gray and brown mottled, firm, laminations of silty sand (CL)		7	W		SS	16	31				
14												
15	SANDY LEAN CLAY, a little gravel, gray, soft, laminations of brown silty sand (CL)		8	M		SS	18	17				
16												
17	SANDY LEAN CLAY, a little gravel, gray, soft (CL)		7	M		SS	16	18				
18												
19	SANDY LEAN CLAY, a little gravel, gray, soft (CL)		7	M		SS	16	18				
20												
21	SANDY LEAN CLAY, a little gravel, gray, soft (CL)		7	M		SS	16	18				
22												
23	SANDY LEAN CLAY, a little gravel, gray, soft (CL)		7	M		SS	16	18				
24												
25	SANDY LEAN CLAY, a little gravel, gray, soft (CL)		7	M		SS	16	18				
26												
END OF BORING Northing=205434.5 Easting=554148.7												

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24 1/2'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/3/07	8:45	16.5	14.5	15.4		15.1	
		7/3/07	8:50	21.5	19.5	20.3		None	
BORING COMPLETED: 7/3/07		7/3/07	9:00	26.5	24.5	26.5		None	
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-176 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>951.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mostly sand with silt, a little gravel, surface roots, trace roots, brown	FILL	17	M	SS	8						
2	FILL, mixture of sand with silt and clayey sand, a little gravel, trace roots, brown, dark brown and gray		23	M	SS	14						
3												
4												
5								16				
6												
7												
8				13	M	SS	10	13				
9												
10	LEAN CLAY WITH ORGANICS, trace roots, black and dark brown, stiff, laminations of silty sand (CL)	TOPSOIL	9	M	SS	17	13					
11							29					
12	SANDY LEAN CLAY, a little gravel, trace roots, gray, a little black, stiff to soft (CL)	WEATHERED TILL	9	M	SS	16	20					
13												
14												
15			3	M	SS	20	23					
16	SANDY LEAN CLAY, a little gravel, gray, soft to stiff (CL)	TILL					22					
17												
18												
19												
20												
21			15	M	SS	22	18					
22												
23	CLAYEY SAND WITH GRAVEL, gray (SC)											
24												
	END OF BORING , Obstructed to SS at 24.8' Northing=205436.4 Easting=554397.8		50/0.3	M	SS	4	16					

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	
0-24½'	3.25" HSA	6/29/07	3:10	24.8	24.5	24.8		None
BORING COMPLETED: 6/29/07								
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-177 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>953.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of sand with silt and silty sand, a little gravel, surface roots, trace roots, piece of metal at 3", brown	FILL	28	M	SS	12						
2												
3			FILL, mixture of sand with silt and clayey sand, a little gravel, trace roots, brown and gray	40	M	SS	17	5				
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14	CLAYEY SAND, trace roots, black and dark brown, a little gray, firm, laminations of silty sand (SC)	WEATHERED TILL OR TOPSOIL TILL	6	M	SS	16	19					
15	CLAYEY SAND, a little gravel, trace roots, gray and brown, stiff, laminations of sandy lean clay (SC)		10	M	SS	9	18					
16												
17												
18												
19												
20	CLAYEY SAND, a little gravel, brown and gray mottled, a little black, stiff, laminations of silty sand (SC)		12	M	SS	24	17					
21												
22												
23												
24												
25												
26												
END OF BORING Northing=205436.7 Easting=555146.5												

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
0-24½'	3.25" HSA	7/3/07	10:15	26.5	24.5	26.5			None
BORING COMPLETED: 7/3/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-178 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>948.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, a little gravel, possible cobbles, brown and grayish brown	FILL	17	M	SS	6					
2											
3	FILL, mixture of sandy lean clay and clayey sand, a little gravel, possible cobbles, trace roots, brown and brownish gray		14	M	SS	18	11				
4											
5											
6											
7											
8			27	M	SS	8	8				
9											
10	ORGANIC SILT, trace roots, black, wet, loose (OL)	SWAMP DEPOSIT	6	W	SS	14	47				
11	CLAYEY SAND, trace roots, dark brown, firm to soft, laminations of silty sand (SC)	WEATHERED TILL									
12											
13	CLAYEY SAND, gray, a little black, soft, laminations of sand (SC)		4	M	SS	15	20				
14											
15	CLAYEY SAND, a little gravel, trace roots, light gray, very soft (SC)	TILL	WH	M	SS	19	15				
16											
17											
18	CLAYEY SAND, a little gravel, gray, firm to stiff (SC)										
19											
20											
21			6	M	SS	24	19				
22											
23											
24											
25											
26			15	M	SS	22	15				
END OF BORING Northing=205431.4 Easting=555363.5											

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	
0-24½'	3.25" HSA	7/3/07	11:50	26.5	24.5	26.5		None	
BORING COMPLETED: 7/3/07									
DR: SG LG: SB Rig: 91C									

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-179
	LOCATION: N: 205297.766, E: 553501.960 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/9/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
929.3	0.0					
928.8	0.5	SM	SILTY SAND, trace of Roots, dark brown, wet. (Topsoil)			
		SM	SILTY SAND, moist, stiff.			
				13		
925.3	4.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown to grayish-brown with rust and dark brown, wet medium to rather stiff. (Glacial Till)			
				8		
				8		
				8		
915.3	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium to rather stiff. (Glacial Till)			
				9		
				8		
				7		
903.3	26.0		END OF BORING.	10		
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-180 LOCATION: N: 205254.843, E: 553896.986 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/3/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
935.9	0.0					
934.9	1.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		CL	SANDY LEAN CLAY, trace of Gravel, yellowish-brown to grayish-brown with rust at 5' sample depth, rather stiff tot very stiff. (Glacial Till)	18		
				12		
				14		
				16		
923.9	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff to stiff. (Glacial Till)	13		
				9		
				10		
909.9	26.0		END OF BORING.	10		
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-181 LOCATION: N: 205262.130, E: 554099.221 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/9/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
935.0	0.0					
934.0	1.0	SM	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
		CL	SANDY LEAN CLAY, light brown, moist, rather stiff to very stiff. (Glacial Till)	11		
				15		
				19		
				19		
923.0	12.0	CL	SANDY LEAN CLAY, trace of Gravel, light brown to brown, wet, stiff to very stiff. (Glacial Till)	13		
				16		
				24		
913.0	22.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown to gray, stiff. (Glacial Till)			
				14		
909.0	26.0		END OF BORING.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-182
	LOCATION: N: 205241.842, E: 554395.289 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/3/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPI BRAUN.GDT 10/2/07 14:44 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
941.8	0.0					
941.3	0.5	SM CL	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil)			
			SANDY LEAN CLAY, trace of Gravel, yellowish-brown to brown, rust lenses scattered, moist, very stiff to hard. (Glacial Till)	22		
				23		
				29		
				22		
				26		
				26		
920.8	21.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense. (Glacial Till)	34		
915.8	26.0			27		
			END OF BORING.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: ST-183
	LOCATION: N: 205240.257, E: 554898.811 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/9/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:44
 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
933.7	0.0					
933.2	0.5	SM CL	SILTY SAND, trace of Roots, dark brown, moist. (Topsoil) SANDY LEAN CLAY, light to brown seams of rust, wet rather soft to rather stiff. (Glacial Till)			
				9		
				8		
				6		
				4		
				6		
				5		
915.7	18.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, waterbearing, medium dense. (Glaciofluvium)		▽	
				12		
907.7	26.0			16		
			END OF BORING. Water observed at 18 feet while drilling. Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-184 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>942.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of silty sand, sand with silt and clayey sand, a little gravel, surface roots, trace roots, dark brown, brown and black	FILL	15	M	SS	14						
2												
3			10	M	SS	1	9					
4												
5	SILTY SAND, fine grained, brown and dark brown to brownish gray, wet, medium dense (SM)	COARSE ALLUVIUM	12	W	SS	16						
6												
7												
8			15	W	SS	15						
9												
10	SANDY LEAN CLAY, a little gravel, brownish gray, stiff, laminations of waterbearing sand (CL)	TILL	9	M/W	SS	18	20					
11												
12	CLAYEY SAND, a little gravel, gray, firm (SC)	TILL	7	M	SS	22	19					
13												
14												
15												
16			6	M	SS	23	18					
17												
18	SANDY LEAN CLAY, a little gravel, gray, stiff (CL)	TILL	13	M	SS	21	15					
19												
20												
21												
22												
23	CLAYEY SAND, a little gravel, gray, very stiff (SC)	TILL	16	M	SS	18	14					
24												
25												
26												
END OF BORING Northing=205236.9 Easting=555364.5												

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
0-24½'	3.25" HSA	7/3/07	12:50	6.5	4.5	5.8			None
		7/3/07	1:15	26.5	24.5	26.5			None
BORING COMPLETED: 7/3/07									
DR: SG LG: SB Rig: 91C									

INTERTEC

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-1001-06 ST-185
	LOCATION: N: 208603.970, E: 552291.002 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/24/07	SCALE: 1" = 4'
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Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
901.0	0.0		Redrill of Geo Probe Hole. Power Auger to 16 feet.			
885.0	16.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, medium. (Glacial Till)			
875.0	26.0		END OF BORING. Water not observed during drilling. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	7	7	

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871
Geotechnical Evaluation
TCAAP Redevelopment
NE of Highway 10 and Highway 96
Arden Hills, Minnesota

BORING: RI-1007-04 ST-186

LOCATION: N: 207579.028, E: 552738.508 See attached sketch.

DRILLER: K. Keck

METHOD: 3 1/4" HSA, Autohmr

DATE: 7/24/07

SCALE: 1" = 4'

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
925.2	0.0					
924.2	1.0	FILL	FILL: Silty Sand, fine-grained, dark brown, moist.			
		FILL	FILL: Silty Sand, fine- to medium-grained, mixed with Lean Clay, brown, moist.			
922.2	3.0	FILL	FILL: Lean Clay, mixed with Silty Sand, brown, moist.	18		
				10		
918.2	7.0	SM	SILTY SAND, with Organic fines, black, moist. (Buried Topsoil)	8		
916.2	9.0	SM	SILTY SAND, fine- to coarse-grained, trace of Gravel, brown, wet, rather stiff. (Glacial Till)	9		
914.2	11.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, wet, medium. (Glacial Till)	8		
911.2	14.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather stiff to stiff. (Glacial Till)	9		
				13		
899.2	26.0			9		
			END OF BORING. Water not observed during drilling. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-1007-08 ST-187 LOCATION: N: 208970.244, E: 552766.455 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/19/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GPT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
914.2	0.0	PT	PEAT, mixed with Sand, black, moist. (Swamp Deposit)			
913.2	1.0	CL	SANDY LEAN CLAY, trace of Gravel, brown with iron staining, moist, medium. (Glacial Till)	8		
				6		
				7		
				7		
902.2	12.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, moist to wet, medium to rather stiff. (Glacial Till)	11		
				10		
				7		
888.2	26.0		END OF BORING. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	7		

Braun Project SP-06-05871		BORING: RI-4003-03 ST-188	
Geotechnical Evaluation		LOCATION: N: 209408.636, E: 552935.915 See attached sketch.	
TCAAP Redevelopment			
NE of Highway 10 and Highway 96			
Arden Hills, Minnesota			

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/23/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:41 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
918.0	0.0					
917.7	0.3	PAV	3" of Bituminous			
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, dark brown, moist.			
				28		
914.0	4.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, medium to rather stiff. (Glacial Till)			
				7		
				9		
907.0	11.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, moist, stiff. (Glacial Till)			
				12		
				16		
904.0	14.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense. (Glacial Till)			
				22		
899.0	19.0	CL	LEAN CLAY, reddish-brown, wet to moist, medium to rather stiff. (Glacial Till)		▽	
				9		
				8		
889.0	29.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, dense. (Glacial Till)			* Water observed at 19 feet while drilling.
				36		Water not observed with 29 1/2 feet of hollow-stem auger in the ground.
887.0	31.0		END OF BORING. *			Boring then grouted.

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4008-35 ST-189 LOCATION: N: 205755.343, E: 554523.702 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/17/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
952.2	0.0					
951.5	0.7	SM CL	SILTY SAND, fine-grained, with Organic fines, dark brown, moist. (Topsoil)			
			SANDY LEAN CLAY, brown, moist, medium to rather stiff. (Glacial Till)	12		
				8		
				19		
943.2	9.0		With Gravel layer at 8 feet.			
		CL	SANDY LEAN CLAY, trace of Gravel, brown with iron staining, moist, very stiff (Glacial Till)	18		
940.2	12.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, stiff. (Glacial Till)	14		
				15		
934.2	18.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, dense. (Glacial Till)	35		
926.2	26.0		END OF BORING. Water not observed during drilling. Water not observed with 24 1/2 feet of hollow-stem auger in the ground. Boring then grouted.	40		

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4008-36 ST-190 LOCATION: N: 205738.823, E: 554735.210 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/17/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
952.8	0.0						
952.5	0.3	PAV	4" of Bituminous				
950.8	2.0	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, trace of Gravel, brown, moist.				
948.8	4.0	SC	CLAYEY SAND, gray with iron staining, moist, stiff. (Glacial Till)	16			
		CL	SANDY LEAN CLAY, trace of Gravel, brown and gray with iron staining, wet, rather soft to medium. (Glacial Till)	6		15	
				6			
				5			
940.8	12.0	CL	SANDY LEAN CLAY, trace of Gravel, brown and gray with iron staining, wet, soft. (Glacial Till)	2			
938.8	14.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, medium to very stiff. (Glacial Till)	8			
				19			
929.8	23.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense. (Glacial Till)				
926.8	26.0		END OF BORING.	26			
			Water not observed during drilling.				
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.				
			Boring then grouted.				

Braun Project SP-06-05871				BORING: RI-4008-40 ST-191		
Geotechnical Evaluation				LOCATION: N: 205745.555, E: 555106.431 See attached sketch.		
TCAAP Redevelopment						
NE of Highway 10 and Highway 96						
Arden Hills, Minnesota						
DRILLER: K. Keck		METHOD: 3 1/4" HSA, Autohmr		DATE: 7/16/07	SCALE: 1" = 4'	
Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
956.3	0.0					
955.3	1.0	FILL	FILL: Silty Sand, fine- to medium-grained, with Organic fines, dark brown, moist.			
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel and Roots, brown, moist.			
952.3	4.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, moist, loose to medium dense. (Glacial Till)	33		
				9		
				17		
				14		
				13		
942.3	14.0	SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till)	23		
				34		
930.3	26.0			25		
			END OF BORING.			
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

BRAUN BASIC LOG OF BORING SP-06-05871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4008-42 ST-192 LOCATION: N: 205926.630, E: 555134.452 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/16/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
959.1	0.0		Soil samples taken with Geoprobe to 6 foot depth.			
953.1	6.0	SM	SILTY SAND, fine-grained, trace of Gravel, reddish-brown, moist, medium dense. (Glacial Till)	16		
948.1	11.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown, moist, loose to medium dense. (Glacial Outwash)	29		
				24		
				8		
941.1	18.0	SM	SILTY SAND, fine-grained, trace of Gravel, reddish-brown, moist, medium dense. (Glacial Till)			
938.1	21.0	SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, brown, moist, medium dense. (Glacial Outwash)	13		
933.1	26.0		END OF BORING.	26		
			Water not observed during drilling.			
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871		BORING: RI-4008-43 ST-193	
Geotechnical Evaluation		LOCATION: N: 206148.097, E: 555162.879 See attached sketch.	
TCAAP Redevelopment			
NE of Highway 10 and Highway 96			
Arden Hills, Minnesota			

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/16/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
961.9	0.0					
		FILL	FILL: Silty Sand, fine- to medium-grained, with Organic fines, trace of Gravel, dark brown, moist.			
957.9	4.0			40		
		SM	SILTY SAND, fine- to medium-grained, trace of Gravel, reddish-brown, moist, medium dense to dense. (Glacial Till)	17		
				44		
			Cobble at 10 1/2 feet.	38		
				37		
			Cobbles at 13 feet.			
945.9	16.0			33		
		SP	POORLY GRADED SAND, fine- to medium-grained, trace of Gravel, brown, moist, medium dense to dense. (Glacial Outwash)			
943.9	18.0					
		SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, brown, moist, medium dense to dense. (Glacial Outwash)			
				34		
				16		
						* Water not observed during drilling.
						Water not observed with 29 1/2 feet of hollow-stem auger in the ground.
						Boring then grouted.
930.9	31.0			30		
			END OF BORING. *			

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4008-44 ST-194
	LOCATION: See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/16/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
0.0					
0.5	FILL	FILL: Silty Sand, fine- to medium-grained, with Organics, dark brown, moist.			
	FILL	FILL: Sandy Lean Clay, brown, moist.			
4.0	FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, reddish-brown, moist.	25		
9.0		With trace of topsoil at 8 feet.	56		
	SM	SILTY SAND, fine- to medium-grained, with Sand layers, trace of Gravel, reddish-brown, moist, very dense. (Glacial Till)	68		
			*		* 50 blows for 6 inches
16.0	SP	POORLY GRADED SAND, fine- to coarse-grained, trace of Gravel, brown, moist, dense. (Glacial Outwash)	83		
			32		
			35		
28.0		END OF BORING. *	33		* Water not observed during drilling.
					Water not observed with 24 1/2 feet of hollow-stem auger in the ground.
					Boring then grouted.

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4009-06 ST-195 LOCATION: N: 206589.315, E: 553291.605 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/18/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
941.9	0.3	PAV FILL	3" of Bituminous FILL: Poorly Graded Sand with Silt, fine-grained, brown, moist.	8			
937.7	4.5	CL	SANDY LEAN CLAY, brown, wet, rather soft. (Lacustrine)	4		15	
933.2	9.0	CL	SANDY LEAN CLAY, trace of Gravel, brown with iron staining, moist, rather stiff. (Glacial Till)	10			
930.2	12.0	CL	SANDY LEAN CLAY, trace of Gravel, reddish-brown, moist, stiff to very stiff. (Glacial Till)	16			
924.2	18.0	CL	SANDY LEAN CLAY, trace of Gravel, grayish-brown, moist, very stiff. (Glacial Till)	17			
921.2	21.0		END OF BORING. Water not observed during drilling. Water not observed with 19 1/2 feet of hollow-stem auger in the ground. Boring then grouted.				

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4009-07 ST-196 LOCATION: N: 206407.349, E: 553441.134 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/18/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
943.4	0.0					
943.1	0.3	PAV	3" of Bituminous			
		FILL	FILL: Poorly Graded Sand with Silt, fine-grained, brown, moist.			
939.4	4.0	FILL	FILL: Sandy Lean Clay, with topsoil chunks, olive, wet.	8		
936.4	7.0	CL	SANDY LEAN CLAY, brown with iron staining, wet, rather soft. (Lacustrine)	4		
931.4	12.0	CL	SANDY LEAN CLAY, trace of Gravel, brown and gray with iron staining, moist, rather soft to stiff. (Glacial Till)	4		
925.4	18.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, wet, stiff. (Glacial Till)	5	▽	
922.4	21.0		END OF BORING. Water observed at 18 feet while drilling. Boring then grouted.	8		
				13		

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4009-08 ST-197
	LOCATION: N: 206255.301, E: 553565.997 See attached sketch.

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/18/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
944.3	0.0	PAV	3" of Bituminous			
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, reddish-brown, moist.	11		
940.3	4.0	FILL	FILL: Sandy Lean Clay, trace of Gravel, brown, gray and olive, moist.	7		
937.3	7.0	OL	ORGANIC CLAY, black, wet. (Swamp Deposit)	2		
935.3	9.0	SM	SILTY SAND, fine-grained, gray, waterbearing, very loose. (Lacustrine)	2	▽	
933.3	11.0	CL	SANDY LEAN CLAY, gray with iron staining, wet, soft. (Lacustrine)	3		
930.3	14.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, wet, soft to medium. (Glacial Till)	3		
923.3	21.0		END OF BORING.	6		
			Water observed at 9 feet while drilling.			
			Water down 9 feet with 19 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			

Braun Project SP-06-05871
Geotechnical Evaluation
TCAAP Redevelopment
NE of Highway 10 and Highway 96
Arden Hills, Minnesota

BORING: RI-4009-09 ST-198

LOCATION: N: 206068.255, E: 553728.185 See attached sketch.

DRILLER: K. Keck

METHOD: 3 1/4" HSA, Autohmr

DATE: 7/17/07

SCALE: 1" = 4'

BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
944.4	0.0							
944.1	0.3	PAV	4" of Bituminous					
		FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, brown, moist.					
				19				
			No sample recovery at 5 1/2 feet.	6				
936.4	8.0	FILL	FILL: Clayey Sand, gray, brown and olive, moist.	1				
				7		17	47	
				5		15		
930.4	14.0	CL	SANDY LEAN CLAY, with Organic fines, black, wet. (Swamp Deposit)	3				
925.4	19.0	CL	SANDY LEAN CLAY, gray, wet, soft. (Lacustrine)	3				
920.4	24.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, very stiff.					
918.4	26.0		(Glacial Till)	19				
			END OF BORING.					
			Water not observed during drilling.					
			Water not observed with 24 1/2 feet of hollow-stem auger in the ground.					
			Boring then grouted.					

Braun Project SP-06-05871 Geotechnical Evaluation TCAAP Redevelopment NE of Highway 10 and Highway 96 Arden Hills, Minnesota	BORING: RI-4009-10 ST-199 LOCATION: N: 205827.000, E: 553879.890 See attached sketch.
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DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/17/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	P200 %	Tests or Notes
944.2	0.0							
943.7	0.5	FILL	FILL: Silt, brown, moist.					
		FILL	FILL: Sandy Lean Clay, brown, dry.					
				20				
940.2	4.0	FILL	FILL: Silty Sand, fine- to medium-grained, brown, moist.					
				4		7	20	
937.2	7.0	CL	SANDY LEAN CLAY, trace of Gravel, brown, wet, medium to stiff. (Glacial Till)					
				8				
				7				
				7				
				11				
923.2	21.0		No sample recovery at 20 1/2 feet. END OF BORING.	16				
			Water not observed during drilling.					
			Water not observed with 19 1/2 feet of hollow-stem auger in the ground.					
			Boring then grouted.					

Braun Project SP-06-05871		BORING: RI-4009-11 ST-200	
Geotechnical Evaluation		LOCATION: N: 205748.933, E: 554156.383 See attached sketch.	
TCAAP Redevelopment			
NE of Highway 10 and Highway 96			
Arden Hills, Minnesota			

DRILLER: K. Keck	METHOD: 3 1/4" HSA, Autohmr	DATE: 7/17/07	SCALE: 1" = 4'
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BRAUN BASIC LOG OF BORING SP0605871.GPJ BRAUN.GDT 10/2/07 14:42 (See Descriptive Terminology sheet for explanation of abbreviations)

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	Tests or Notes
949.2	0.0					
948.0	1.2	FILL	FILL: Silty Sand, fine- to medium-grained, trace of Gravel, dark brown, moist.			
		FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, trace of Gravel, brown, moist.	21		
945.2	4.0	FILL	FILL: Sandy Lean Clay, trace of Gravel and wood, brown to dark brown, wet.	8		
				7		
				5		
935.2	14.0	SC	CLAYEY SAND, black, wet. (Swamp Deposit)			
933.2	16.0	SC	CLAYEY SAND, gray, wet, soft. (Lacustrine)	4		
				2	▽	
927.2	22.0	CL	SANDY LEAN CLAY, trace of Gravel, gray, wet, rather soft. (Glacial Till)			
923.2	26.0			2		
			END OF BORING.			
			Water down 20 feet with 24 1/2 feet of hollow-stem auger in the ground.			
			Boring then grouted.			



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-201/AB-1 (p. 1 of 2)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>956.8</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1-2	FILL, mixture of silty sand and clayey sand, a little gravel, surface roots, trace roots, brown and dark brown	FILL	12	M	SS	7					
3-4	FILL, mixture of sand with silt and clayey sand, a little gravel, brown, a little gray and light brown		14	M	SS	17	7				
5-6	SANDY LEAN CLAY, a little gravel, brown, a little light brown and dark brown, stiff, laminations of silt and silty sand (CL)	WEATHERED TILL	14	M	SS	23	15				
7-8	SANDY LEAN CLAY, a little gravel, brown, a little light brown and dark brown, stiff, laminations of silt and silty sand (CL)		29	M	SS	16	8				
9-10	CLAYEY SAND, a little gravel, brown, a little light brown, very stiff, laminations of silt (SC)		24	M	SS	18	7				
11-13			21	M	SS	22	7				
14-15	SAND WITH SILT AND GRAVEL, medium to fine grained, brown, moist, dense (SP-SM)	COARSE ALLUVIUM	40	M	SS	7					
16-17											
18-21	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, medium dense to dense (SP-SM)		26	M	SS	22					
22-23											
24-26			47	M	SS	19					
27-28											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-34½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/26/07	8:52	31.5	34.5	36.5		None	
BORING COMPLETED: 7/26/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-201/AB- 1 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SAND WITH SILT, a little gravel, fine to medium grained, light brown, moist, medium dense to dense (SP-SM) <i>(continued)</i>		40	M	SS	24					
31											
32											
33											
34											
35			45	M	SS	20					
36											
<p>END OF BORING Northing=206215.3 Easting=554201.0</p>											



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-202/AB-2 (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>955.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, a little gravel, trace roots, brown	FILL	57	M	SS	7					
2											
3	SANDY SILT, a little gravel, brown, moist, medium dense (ML)	TILL	24	M	SS	17	11				
4											
5	CLAYEY SAND, a little gravel, brown, very stiff (SC)										
6	SILTY SAND, a little gravel, possible cobbles, fine to medium grained, brown, moist, medium dense (SM)		19	M	SS	15					
7											
8	SAND, a little gravel, brown, moist, medium dense (SP) (possible fill)	COARSE ALLUVIUM	20	M	SS	16					
9	SAND WITH GRAVEL, medium grained, brown, moist, medium dense (SP)										
10											
11	SAND WITH GRAVEL, possible cobbles, medium to fine grained, brown, moist, dense (SP)		37	M	SS	14					
12											
13	GRAVEL WITH SAND, brown, moist, medium dense (GP)		27	M	SS	8					
14											
15	SAND, fine to medium grained, light brown, moist, dense, laminations of silty sand (SP)		40	M	SS	14					
16											
17											
18											
19	SAND, a little gravel, medium grained, light brown, moist, dense (SP)		43	M	SS	17					
20											
21											
22											
23											
24	SAND, a little gravel, fine to medium grained, light brown, moist, very dense (SP)		51	M	SS	18					
25											
26											
27											
28											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-39 1/2'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/26/07	10:55	41.5	39.5	41.0		None	
BORING COMPLETED: 7/26/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-202/AB- 2 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
30	SAND, a little gravel, medium to fine grained, light brown, moist, very dense (SP) <i>(continued)</i>		55	M		19						
31												
32												
33	SAND, fine grained, light brown, moist, dense, laminations of silt (SP)		48	M		18						
34												
35												
36	SAND WITH GRAVEL, medium grained, brown, moist, very dense (SP)		54	M		19						
37												
38												
39	SAND WITH GRAVEL, medium grained, brown, moist, very dense (SP)		54	M		19						
40												
41												
<p>END OF BORING Northing=206823.0 Easting=554162.7</p>												



SUBSURFACE BORING LOG

AET JOB NO: **22-00081** LOG OF BORING NO. **ST-203/AB-3 (p. 1 of 2)**
 PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>954.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, surface roots, trace roots, dark brown	FILL	8	M	SS	14	10				
2	FILL, mostly clayey sand, a little gravel, trace roots, light brown, dark brown and brown		13	M	SS	24	12				
3											
4											
5	CLAYEY SAND, a little gravel, brown, very stiff (SC)	TILL	22	M	SS	17	11				
6											
7											
8			27	M	SS	19	7				
9											
10											
11			28	M	SS	19	6				
12											
13	SAND WITH SILT AND GRAVEL, medium to fine grained, brown, moist, medium dense to very dense (SP-SM)	COARSE ALLUVIUM	47	M	SS	10	7				
14											
15											
16			26	M	SS	14					
17											
18											
19											
20											
21			33	M	SS	16					
22											
23											
24											
25											
26			74	M	SS	12					
27											
28	SAND, medium to fine grained, brown, moist, medium dense to dense (SP)										

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-49½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		7/27/07	2:47	51.5	49.5	51.5			None
BORING COMPLETED: 7/27/07									
DR: SG LG: BR Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081 LOG OF BORING NO. ST-203/AB-3 (p. 2 of 2)
 PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SAND, medium to fine grained, brown, moist, medium dense to dense (SP) <i>(continued)</i>		24	M		19					
31											
32											
33											
34											
35											
36			39	M	SS	16					
37											
38	SAND WITH GRAVEL, fine to medium grained, light brown, moist, medium dense (SP)		26	M	SS	17					
39											
40											
41											
42											
43											
44											
45											
46			23	M	SS	20					
47											
48											
49											
50	SILTY CLAY, brown, very stiff (CL-ML)						19				
51	SAND WITH SILT, fine to medium grained, brown, moist, medium dense (SP-SM)		23	M	SS	16					
	END OF BORING Northing=206974.8 Easting=553863.2										



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-204/AB- 4 (p. 1 of 2)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>938.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, surface roots, trace roots, brown	FILL	31	M	SS	10	7				
2	FILL, mixture of clayey sand, sandy lean clay and silty sand, a little gravel, trace roots, brown, light brown, dark brown and gray		42	M	SS	18	9				
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18		CLAYEY SAND, a little sandy silt, a little gravel, brown, stiff (SC)	TILL	10	M	SS	17	19			
19											
20	SANDY LEAN CLAY, a little gravel, light brown, a little brown, stiff, laminations of silt (CL)	TILL	11	M	SS	20	27				
21											
22	SAND WITH SILT AND GRAVEL, medium to fine grained, brown, a little dark brown, moist, very dense, lense of clayey sand at 24' very dense to medium dense (SP-SM)	COARSE ALLUVIUM	52	M	SS	14					
23											
24											
25											
26											
27											
28											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-34½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		7/30/07	10:00	14.0	12.0	12.2			None
		7/30/07	10:30	36.5	34.5	36.5			None
BORING COMPLETED: 7/30/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-204/AB- 4 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30	SAND WITH SILT AND GRAVEL, medium to fine grained, brown, a little dark brown, moist, very dense, lense of clayey sand at 24' very dense to medium dense (SP-SM) (continued)	COARSE ALLUVIUM (continued)	18	M	SS	13					
31											
32											
33											
34											
35											
36			21	M	SS	12					
<p>END OF BORING Northing=207058.0 Easting=553053.9</p>											



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-205/AB-5 (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>937.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of clayey sand and silty sand, a little gravel, surface roots, trace roots, brown and light brown	FILL	27	M	SS	12	6				
2											
3			39	M	SS	15	6				
4											
5	SILTY CLAY, brown, very stiff to hard (CL-ML)	FINE ALLUVIUM	22	M	SS	20	13				
6											
7											
8			17	M	SS	24	23				
9											
10			20	M	SS	24	18				
11											
12			20	M	SS	24	17				
13											
14			20	M	SS	24	17				
15											
16	SAND WITH SILT AND GRAVEL, medium to fine grained, brown, moist, dense (SP-SM)	COARSE ALLUVIUM	33	M	SS	14	12				
17											
18											
19											
20											
21			47	M	SS	10					
22											
23	GRAVELLY SAND WITH SILT, medium to fine grained, brown, moist, dense to very dense (SP-SM)										
24											
25											
26			44	M	SS	10					
27											
28											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-44½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/30/07	8:50	46.5	44.5	46.4		None	
BORING COMPLETED: 7/30/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-205/AB-5 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
30	GRAVELLY SAND WITH SILT, medium to fine grained, brown, moist, dense to very dense (SP-SM) <i>(continued)</i>		60	M	SS	14						
31												
32												
33												
34												
35	SAND WITH SILT, fine to medium grained, brown, moist, very dense (SP-SM)		50+	M	SS	8						
36												
37												
38												
39												
40	SAND WITH SILT, fine to medium grained, brown, moist, very dense (SP-SM)		57	M	SS	16						
41												
42												
43												
44												
45	END OF BORING Northing=207537.6 Easting=553124.1		63	M	SS	17						
46												



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-206/AB-6 (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>916.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mostly silty sand, surface roots, trace roots, dark brown	FILL	32	M	SS	14	5				
2	FILL, mixture of clayey sand and silty sand, a little gravel, trace roots, dark brown										
3			26	M	SS	13	12				
4	SANDY LEAN CLAY, a little gravel, gray and brown mottled, a little black, stiff, laminations of silt (CL)	WEATHERED TILL	12	M	SS	17	18				
5											
6											
7	SANDY LEAN CLAY, a little gravel, dark brown and brown mottled, stiff (CL)	TILL	15	M	SS	20	18				
8											
9											
10	SANDY LEAN CLAY, a little gravel, dark brown, very stiff (CL)		16	M	SS	22	16				
11											
12	SANDY LEAN CLAY, a little gravel, dark gray, stiff to very stiff (CL)		15	M	SS	19	14				
13											
14											
15											
16			12	M	SS	20	15				
17											
18											
19											
20											
21			14	M	SS	22	16				
22											
23											
24											
25											
26											
27											
28											

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
0-29½' 3.25" HSA		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
		7/30/07	12:00	31.5	29.5	31.2			None
BORING COMPLETED: 7/30/07									
DR: SG LG: SB Rig: 91C									



AMERICAN
ENGINEERING
TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-206/AB-6 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
30 -	SANDY LEAN CLAY, a little gravel, dark gray, stiff to very stiff (CL) <i>(continued)</i>		18	M	CL SS	23	13					
31 -												
<p>END OF BORING Northing=207925.7 Easting=552804.2</p>												



AMERICAN
ENGINEERING
TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-207/AB-7 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>908.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of clayey sand and silty sand, a little gravel, surface roots, trace roots, dark brown and brown	FILL	33	M	SS	12	4					
2												
3												
4												
5	SANDY LEAN CLAY, a little gravel, dark brown, a little brown, stiff, laminations of silt (CL)	TILL	22	M	SS	9	6					
6												
7												
8												
9	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)		15	M	SS	17	16					
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
END OF BORING Northing=208187.8 Easting=552129.6												

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	
0-24½'	3.25" HSA	7/30/07	1:30	26.5	24.5	24.9		None	
BORING COMPLETED: 7/30/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO. **ST-208/AB- 8 (p. 1 of 2)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>914.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of silty sand and clayey sand, a little gravel, surface roots, trace roots, brown, dark brown and black	FILL	27	M	SS	12	4					
2												
3												
4												
5	SANDY LEAN CLAY, a little gravel, light brown and gray, firm (CL)	WEATHERED TILL	5	M	SS	17	19					
6												
7												
8			7	M	SS	19	16					
9												
10	SANDY LEAN CLAY, a little gravel, brown, stiff (CL)	TILL	10	M	SS	22	15					
11												
12	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL)	TILL	13	M	SS	22	15					
13												
14												
15												
16						9	M	SS	20	15		
17												
18												
19												
20												
21			12	M	SS	23	15					
22												
23												
24												
25												
26			11	M	SS	24	16					
27												
28												

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-34½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/30/07	2:35	36.5	34.5	36.3		None	
BORING COMPLETED: 7/30/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO. ST-208/AB-8 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
30	SANDY LEAN CLAY, a little gravel, dark gray, stiff (CL) (continued)		14	M		20	16					
31												
32												
33												
34												
35												
36												
	END OF BORING Northing=208345.2 Easting=552536.3											



SUBSURFACE BORING LOG

AET JOB NO: **22-00081** LOG OF BORING NO. **ST-209/AB-9 (p. 1 of 1)**
 PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>892.8</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mostly silty sand with gravel, trace roots, brown FILL, mixture of silty sand and clayey sand, a little gravel, trace roots, brown, light brown, dark brown and black	FILL	36	M	SS	13	4					
2												
3												
4	SAND WITH SILT, a little gravel, fine to medium grained, brownish gray, waterbearing, medium dense (SP-SM)	COARSE ALLUVIUM	10	M	SS	16	11					
5												
6												
7												
8	SANDY LEAN CLAY, a little gravel, dark gray, firm to stiff (CL)	TILL	16	W/M	SS	14						
9												
10												
11												
12												
13			7	W	SS	14						
14												
15												
16												
17			6	M	SS	16	16					
18												
19												
20			9	M	SS	20	16					
21												
21	END OF BORING Northing=210352.9 Easting=552356.5											

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	
0-19½'	3.25" HSA	7/31/07	7:46	9.0	7.0	7.9		None
		7/31/07	7:43	11.0	9.5	9.3		9.1
BORING COMPLETED: 7/31/07		7/31/07	7:55	21.5	19.5	20.0		None
DR: SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-210/AB-10 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>898.8</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of silty sand and clayey sand, a little gravel, trace roots, pieces of brick, brown and dark brown	FILL	37	M		15					
2											
3											
4											
5	SILT WITH ORGANICS, trace roots, black, loose (ML)	TOPSOIL	5	W/M		19	19				
6	SILTY SAND, fine grained, trace roots, dark gray, waterbearing, loose to medium dense (SM)	COARSE ALLUVIUM	11	W		2					
7	SANDY LEAN CLAY, a little gravel, brown and gray mottled, a little dark brown, firm, laminations of silt (CL)	WEATHERED TILL	6	W		16	14				
8											
9											
10	SANDY LEAN CLAY, a little gravel, dark gray, stiff to very stiff (CL)	TILL	9	M		16	14				
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
20			20	M		19	15				
21											
END OF BORING Northing=210578.9 Easting=553291.9											

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	
		7/31/07	8:35	6.5	4.5	4.9		None	
		7/31/07	8:50	21.5	19.5	21.5			
BORING COMPLETED: 7/31/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-211/AB-11 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>892.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	FILL, mixture of silty sand, clayey sand and sandy silt, surface roots, trace roots, brown, dark brown and gray	FILL	20	M	[Symbol]	15					
2											
3			14	M		14					
4											
5											
6			12	M		18	19				
7											
8			17	W		18	20				
9	SILTY CLAY, brown, very stiff (CL-ML)	FINE ALLUVIUM TILL									
10	CLAYEY SAND, a little gravel, dark gray, stiff to firm (SC)		10	M	14	13					
11											
12											
13											
14											
15	SANDY LEAN CLAY, a little gravel, dark gray, stiff to firm (CL)		9	M	23	17					
16											
17											
18											
19											
20											
21			8	M	22	16					
END OF BORING Northing=210737.1 Easting=552615.0											

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
		7/31/07	9:30	9.0	7.0	11.8			7.6
		7/31/07	9:40	21.5	19.5	21.5			None
BORING COMPLETED: 7/31/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO ST-212/AB-12 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>895.1</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%-#200			
1	3.5" Bituminous pavement	FILL			SU									
	FILL, mostly silty sand with gravel, brown		26	M	SS	14								
2	FILL, mixture of clayey sand and silty sand, a little gravel, organic clay, brown, dark brown, gray and black						5							
3			25	M	SS	15	10							
4														
5														
6				23	W/M	SS	16	11						
7														
8				33	W	SS	NR							
9														
10	SILT WITH ORGANICS, trace roots, black, moist, very loose (ML)	SWAMP DEPOSIT OR TOPSOIL						25						
11	LEAN CLAY WITH ORGANICS, trace roots, black, very soft to soft (CL)		2	M	SS	17	23							
12							26							
13	SILTY SAND, trace roots, fine grained, dark gray, waterbearing, loose (SM)	COARSE ALLUVIUM	5	W/M	SS	16	114							
14														
15														
16			9	W	SS	7								
17														
18	CLAYEY SAND, a little gravel, dark gray, firm (SC)	TILL												
19														
20														
21			8	M	SS	16	17							
END OF BORING Northing=211046.0 Easting=553106.0														

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/31/07	10:50	9.0	7.0	8.1		7.3	
		7/31/07	11:10	21.5	19.5	19.5		18.9	
BORING COMPLETED: 7/31/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO ST-213/AB-13 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>890.2</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of silty sand, sandy silt and clayey sand, a little gravel, surface roots, trace roots, brown, dark brown and black	FILL	26	M	SS	16	4					
2												
3												
4												
5												
6	SAND WITH SILT, fine to medium grained, brownish gray, a little gray, waterbearing, loose, laminations of sandy silt (SP-SM)	COARSE ALLUVIUM	10	M	SS	16	18					
7												
8	SILTY SAND, a little gravel, gray, a little dark gray, waterbearing, medium dense, lenses and laminations of lean clay and sandy lean clay (SM)	TILL	12	W	SS	14	24					
9												
10	SANDY LEAN CLAY, a little gravel, dark gray, loose, lense of medium to fine grained silty sand at 10', laminations of sand with silt (CL)	TILL	8	M/W	SS	15	19					
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21			4	M	SS	20	18					
END OF BORING Northing=211044.1 Easting=552565.3												

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
		8/2/07	9:45	9.0	7.0	7.2			7.1
		8/2/07	10:00	21.5	19.5	19.5			None
BORING COMPLETED: 8/2/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-214/AB-14 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>884.9</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1-9	FILL, mixture of sandy silt, clayey sand, silty sand and sand with silt, a little gravel, surface roots, trace roots, brown, dark brown, gray and black	FILL	51	M	SS	10	6				
10-11	SAND WITH SILT, fine grained, gray, a little dark gray, waterbearing, medium dense, laminations of silty sand (SP-SM)	COARSE ALLUVIUM	WH	W	SS	17					
12-14	SILTY SAND, trace roots, fine grained, dark gray, a little black, waterbearing, loose, lense of organic clay at 15.5' (SM)		5	W	SS	14					
15-16	SAND WITH SILT, fine grained, gray, waterbearing, medium dense (SP-SM)		12	W	SS	17					
17-18	SAND WITH SILT AND GRAVEL, medium to fine grained, dark gray, waterbearing, medium dense (SP-SM)										
19-21	SANDY LEAN CLAY, a little gravel, gray, firm (CL)	TILL	6	M	SS	15	18				
END OF BORING Northing=211075.3 Easting=551748.2											

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	
0-19½'	3.25" HSA	8/2/07	8:15	11.5	9.5	9.5		None	
		8/2/07	8:20	14.0	12.0	12.0		None	
BORING COMPLETED: 8/2/07		8/2/07	8:25	16.0	14.5	14.5		12.7	
DR: SG LG: SB Rig: 91C		8/2/07	8:30	21.5	19.5	19.5		18.7	



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-215/AB-15 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>894.5</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, surface roots with silty sand, dark brown	FILL	5	M	SS	1	11					
2	FILL, mostly sand with silt, a little gravel, trace roots, light brown											
3												
4												
5	FILL, mixture of silty sand, clayey sand and sandy lean clay, a little gravel, trace roots, dark brown, brown, light brown and gray	TOPSOIL	21	M	SS	0						
6												
7												
8												
9												
10	LEAN CLAY, trace roots, organics, black, a little dark gray, stiff, laminations of silty sand (CL)	COARSE ALLUVIUM	9	M	SS	15	21					
11												
12												
13	SILTY SAND, a little gravel, fine to medium grained, gray, a little dark gray, waterbearing, loose, laminations of lean clay (SM)	TILL	17	W	SS	12						
14												
15												
16												
17		TILL	5	M	SS	16	17					
18												
19												
20	SANDY LEAN CLAY, a little gravel, gray, firm (CL)											
21												
END OF BORING Northing=211443.2 Easting=553634.2												

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	
		8/1/07	12:15	11.5	9.5	9.9		9.3	
		8/1/07	12:34	21.5	19.5	20.0		18.3	
BORING COMPLETED: 8/1/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081** LOG OF BORING NO: **ST-216/AB-16 (p. 1 of 1)**
 PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>895.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS										
							WC	DEN	LL	PL	%-#200						
1	3" Bituminous pavement	FILL															
1	FILL, mostly silty sand with gravel, brown		32	M	SS	14	8										
2	FILL, mixture of clayey sand, sandy lean clay and silty sand, a little gravel, pieces of concrete, brown, dark brown, gray and black																
3			36	M	SS	17	8										
4																	
5																	
6			46	M	SS	15	6										
7																	
8																	
9																	
10																	
11																	
12	ORGANIC CLAY, trace roots, black, stiff (OL/OH)	SWAMP DEPOSIT															
13	ORGANIC CLAY, trace roots, pieces of wood, black, a little gray, stiff, laminations of silty sand (OL/OH)		15	W	SS	18	74										
14	SAND WITH SILT, fine grained, gray, waterbearing, medium dense to very loose (SP-SM)	COARSE ALLUVIUM															
15			7	W	SS	19											
16																	
17																	
18																	
19																	
20																	
21	CLAYEY SAND, a little gravel, dark gray, soft (SC)	TILL	3	M	SS	17	16										
END OF BORING Northing=211426.9 Easting=553105.1																	

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	
		8/1/07	11:00	11.5	9.5	11.8		None	
		8/1/07	11:10	14.0	12.0	12.0		None	
BORING COMPLETED: 8/1/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-217/AB-17 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>899.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS								
							WC	DEN	LL	PL	%#200				
1	CLAYEY SAND, surface roots, trace roots, dark brown, moist, medium dense (SC)	TOPSOIL													
2	SAND WITH SILT, fine grained, light brown, a little brown, moist, medium dense, laminations of silt (SP-SM)	COARSE ALLUVIUM	14	M	SS	15									
3			17	M	SS	16									
4			28	M	SS	15									
5	SAND WITH SILT, fine grained, gray, a little brown, waterbearing, medium dense, laminations of silt (SP-SM)														
6	CLAYEY SAND, a little gravel, dark gray, firm (SC)	TILL													
7			8	M	SS	14	13								
8			10	M	SS	13	14								
9			8	M	SS	17	15								
10			10	M	SS	16	16								
11	CLAYEY SAND, a little gravel, brown, stiff (SC)														
12	CLAYEY SAND, a little gravel, dark gray, firm to stiff (SC)														
13			8	M	SS	17	15								
14			10	M	SS	16	16								
15															
16															
17															
18															
19															
20															
21			11	M	SS	24	15								
END OF BORING Northing=211423.6 Easting=552556.4															

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	
		8/2/07	9:00	9.0	7.0	7.0		3.3	
		8/2/07	9:10	21.5	19.5	20.9		None	
BORING COMPLETED: 8/2/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-218/AB-18 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>885.7</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS					
							WC	DEN	LL	PL	%-#200	
1	FILL, mixture of sand with silt and silty sand, a little gravel, trace roots, brown, light brown and dark brown	FILL	22	M	SS	4						
2												
3												
4												
5												
6												
7	SILTY SAND, fine to medium grained, brownish gray, waterbearing, loose (SM)	COARSE ALLUVIUM	10	W	SS	17						
8												
9	SANDY LEAN CLAY, a little gravel, brown, a little light brown, firm, laminations of silty sand (CL)	TILL	7	M	SS	18	17					
10												
11												
12												
13	CLAYEY SAND, a little gravel, dark gray, stiff (SC)		9	M	SS	19	13					
14												
15												
16												
17												
18												
19												
20												
21			9	M	SS	24	16					
END OF BORING Northing=211416.5 Easting=552009.6												

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
		8/1/07	2:05	9.0	7.0	7.4			None
		8/1/07	2:20	21.5	19.5	19.8			None
BORING COMPLETED: 8/1/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-219/AB-19 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>891.3</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS							
							WC	DEN	LL	PL	%-#200			
1	SILTY SAND, surface roots, trace roots, light brown and brown, moist, dense (SM) SAND WITH SILT, fine grained, brown, moist, loose to medium dense (SP-SM)	TOPSOIL												
2		COARSE ALLUVIUM	37	M	SS	15								
3			18	M	SS	14								
4														
5														
6				9	M	SS	16							
7														
8				18	M	SS	18							
9														
10				16	M	SS	18							
11														
12	SILTY SAND, fine grained, grayish brown, a little brown, waterbearing, medium dense, laminations of silt (SM)													
13			14	W	SS	16								
14														
15				23	W	SS	14							
16														
17														
18	SAND WITH SILT, fine grained, gray, waterbearing, dense (SP-SM)													
19														
20														
21				31	W	SS	19							
22														
23														
24														
25														
26				36	W	SS	21							
END OF BORING Northing=211642.1 Easting=551067.3														

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-24½'	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		7/30/07	12:15	14.0	12.0	12.5		None	
		7/30/07	12:25	16.5	14.5	15.0		15.0	
BORING COMPLETED:	7/30/07	7/30/07	1:00	26.5	24.5	24.5		23.1	
DR:	SG LG: SB Rig: 91C								



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-220/AB-20 (p. 1 of 2)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: <u>897.0</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SILTY SAND WITH GRAVEL, surface roots, trace roots, light brown, brown and dark brown, moist, medium dense (SM)	TOPSOIL	18	M	SS	14					
2		COARSE ALLUVIUM	20	M	SS	14					
3	SAND WITH SILT, fine grained, light brown, moist, medium dense (SP-SM)		19	M	SS	14					
4			17	M	SS	20					
5			14	M	SS	19					
6	SILTY SAND, fine grained, brown, waterbearing, medium dense to loose (SM)		10	M	SS	18					
7		15	W	SS	17						
8		7	W	SS	16						
9		12	W	SS	17	30					
10	SILT, gray, wet, medium dense (ML)	FINE ALLUVIUM									
11		COARSE ALLUVIUM									

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
DEPTH	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
0-29½'	3.25" HSA	8/1/07	9:05	16.5	14.5	14.6		None	
		8/1/07	9:10	21.5	19.5	19.5		17.8	
BORING COMPLETED:	8/1/07	8/1/07	9:25	31.5	29.5	29.5		26.3	
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO ST-220/AB-20 (p. 2 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
30 -	SILTY SAND, fine grained, gray, waterbearing, very loose (SM) <i>(continued)</i>	COARSE ALLUVIUM <i>(continued)</i>	4	W	SI SS	20					
31 -											
END OF BORING Northing=211992.3 Easting=550710.8											



SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-221/AB-21 (p. 1 of 1)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

DEPTH IN FEET	SURFACE ELEVATION: 899.0 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%-#200
1	SILTY SAND, a little gravel, surface roots, trace roots, brown, dark brown and black, moist, medium dense (SM)	TOPSOIL	19	M	SS	16					
2		COARSE ALLUVIUM	9	M	SS	15					
3											
4											
5											
6	SAND WITH SILT, fine grained, light brown, moist, loose (SP-SM)	COARSE ALLUVIUM	13	M	SS	18					
7											
8											
9											
10											
11	SILT WITH SAND, light brown, a little brown, wet, medium dense, laminations of lean clay (ML)	FINE ALLUVIUM	10	M	SS	17					
12											
13											
14											
15	SILTY SAND, fine grained, brown, waterbearing, loose (SM)	COARSE ALLUVIUM	17	W	SS	17	26				
16											
17											
18	SILTY SAND, fine grained, brown, waterbearing, loose (SM)	COARSE ALLUVIUM	10	W	SS	17					
19											
20											
21											
22	CLAYEY SAND, a little gravel, dark gray, stiff (SC)	TILL	9	M	SS	8	15				
23											
24											
25											
26	END OF BORING Northing=212465.7 Easting=550556.0										

DEPTH: DRILLING METHOD		WATER LEVEL MEASUREMENTS						NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG	
DEPTH	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL		WATER LEVEL
0-24½'	3.25" HSA	8/1/07	7:55	16.5	14.5	14.5			None
		8/1/07	8:00	21.5	19.5	19.2			18.3
BORING COMPLETED:	8/1/07	8/1/07	8:10	26.5	24.5	24.5			23.9
DR: SG	LG: SB	Rig: 91C							



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO ST-222/AB-22 (p. 1 of 1)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>898.6</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%#200
1	FILL, mostly silty sand, a little gravel, trace roots, dark brown	FILL	21	M	SS	15					
2											
3											
4			7	M	SS	14					
5											
6			4	M	SS	16					
7											
8	FILL, mixture of clayey sand and silty sand, trace roots, brown and light brown		9	M	SS	14	11				
9											
10	SAND WITH SILT, fine grained, trace roots, light brown and brown, moist, medium dense (SP-SM)	COARSE ALLUVIUM	14	M	SS	16					
11											
12	SAND WITH SILT, fine grained, light brown, moist, medium dense (SP-SM)		27	M	SS	19					
13											
14											
15	SILTY SAND, fine grained, brown, waterbearing, medium dense to loose (SM)		30	W/M	SS	24					
16											
17											
18											
19											
20											
21			6	W	SS	16					
END OF BORING Northing=212964.6 Easting=550545.4											

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	
		7/31/07	3:22	21.5	19.5	20.0		18.9	
BORING COMPLETED: 7/31/07									
DR: SG LG: SB Rig: 91C									



SUBSURFACE BORING LOG

AET JOB NO: 22-00081

LOG OF BORING NO ST-223/AB-23 (p. 1 of 2)

PROJECT: TCAAP Redevelopment; Arden Hills, MN

DEPTH IN FEET	SURFACE ELEVATION: <u>908.4</u> MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	DEN	LL	PL	%#200
1	FILL, mostly silty sand, surface roots, trace roots, pieces of wood at 5', brown, light brown and dark brown	FILL	27	M	SS	15					
2											
3											
4											
5											
6											
7											
8											
9											
10	SAND WITH SILT, fine grained, light brown, a little brown, moist, loose to medium dense, laminations of silt (SP-SM)	COARSE ALLUVIUM	5	M	SS	15					
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23	SAND, fine to medium grained, light brown, a little brown and gray, moist, medium dense, laminations of silt and silty sand (SP)		27	M	SS	19					
24											
25											
26											
27											
28											

DEPTH: 0-34½'	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	
		7/31/07	2:15	31.5	29.5	29.5		28.9
		7/31/07	2:25	36.5	34.5	34.5		33.9
BORING COMPLETED: 7/31/07								
DR: SG LG: SB Rig: 91C								






SUBSURFACE BORING LOG

AET JOB NO: **22-00081**

LOG OF BORING NO **ST-223/AB-23 (p. 2 of 2)**

PROJECT: **TCAAP Redevelopment; Arden Hills, MN**

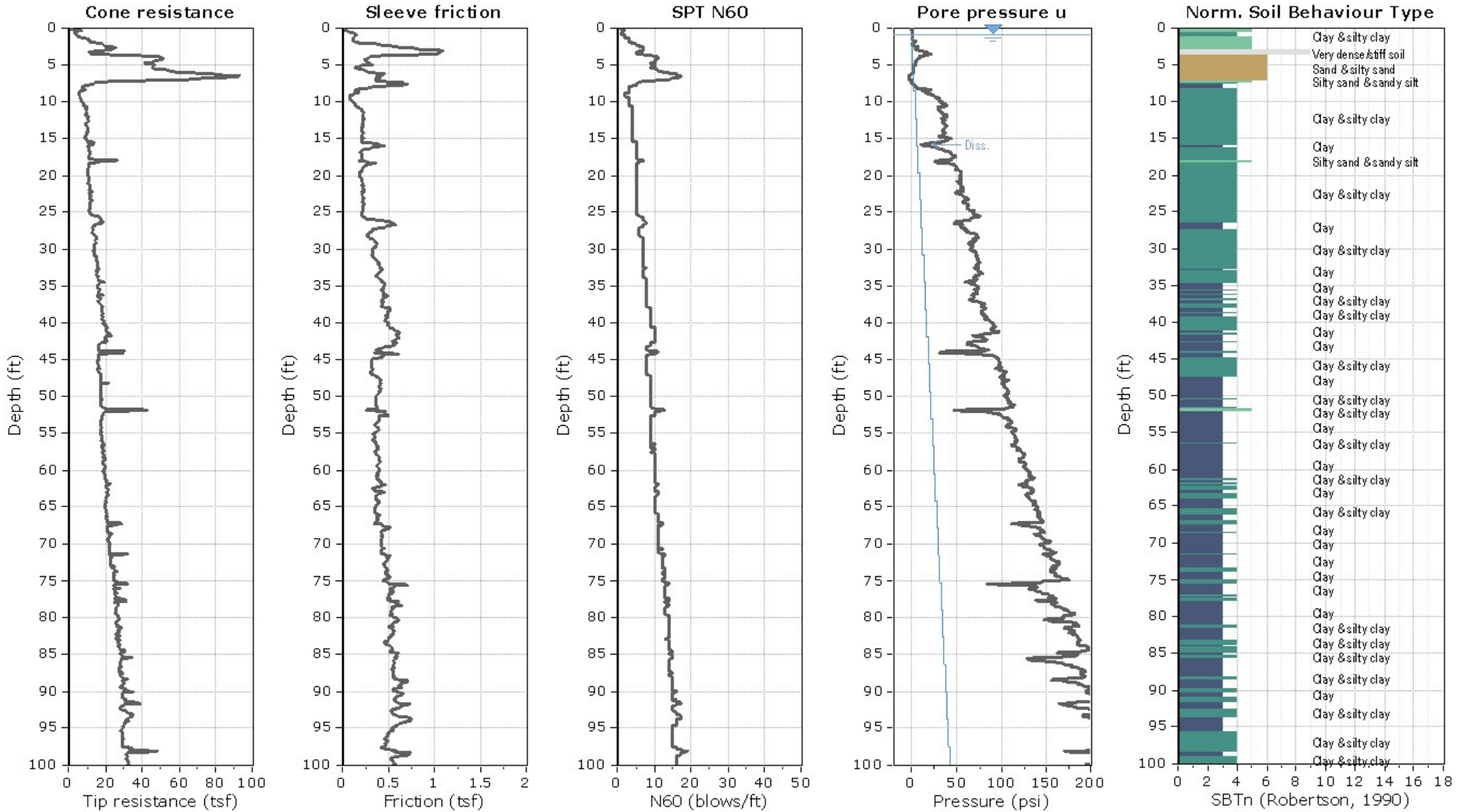
DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS											
							WC	DEN	LL	PL	%-#200							
30	SAND, fine to medium grained, gray, waterbearing, loose (SP) <i>(continued)</i>																	
31															9	W	SS	17
32																		
33	CLAYEY SAND, a little gravel, dark gray, firm (SC)	TILL																
34																		
35																		
36			6	M	SS	23	18											
END OF BORING Northing=213465.1 Easting=550540.6																		

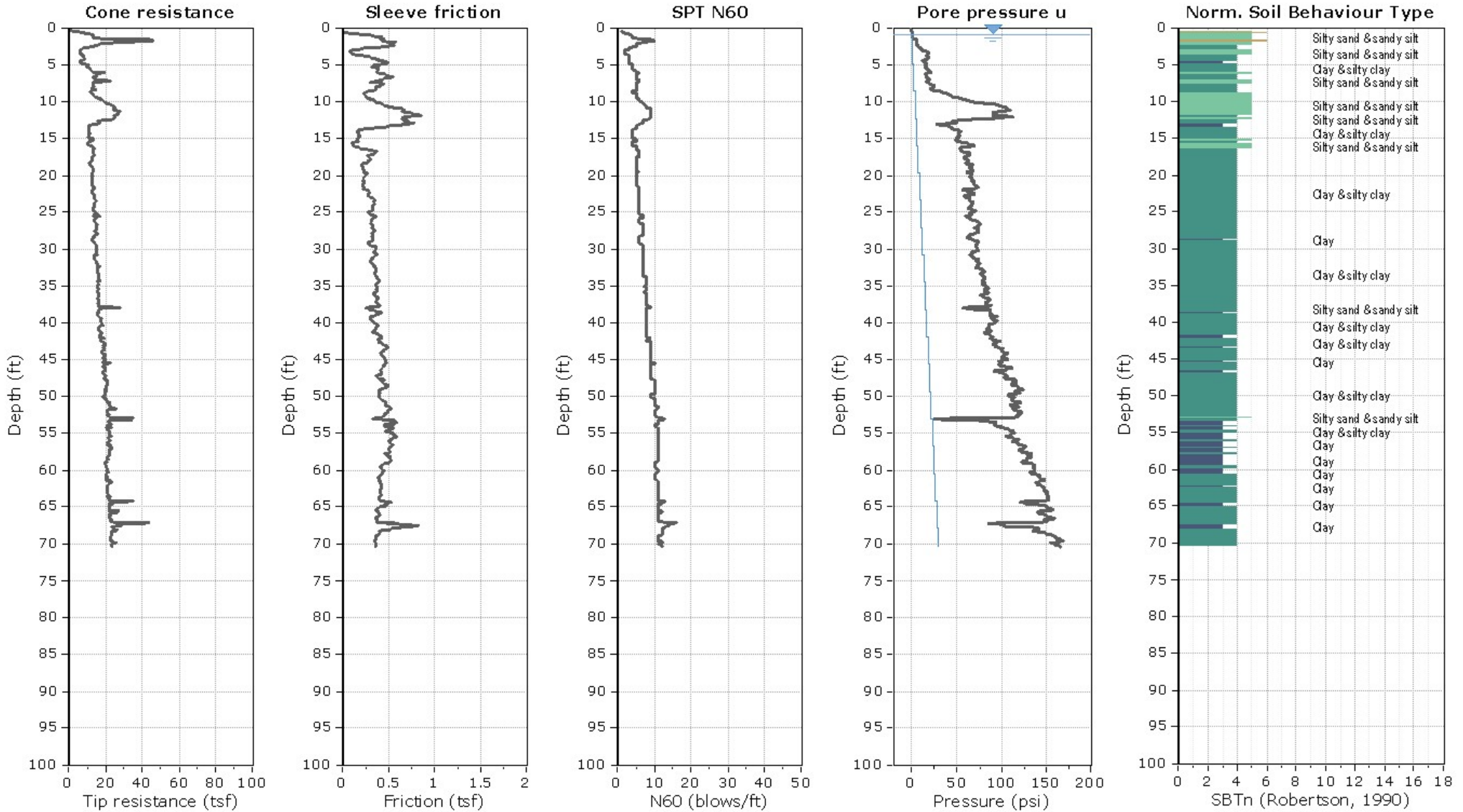
Appendix C

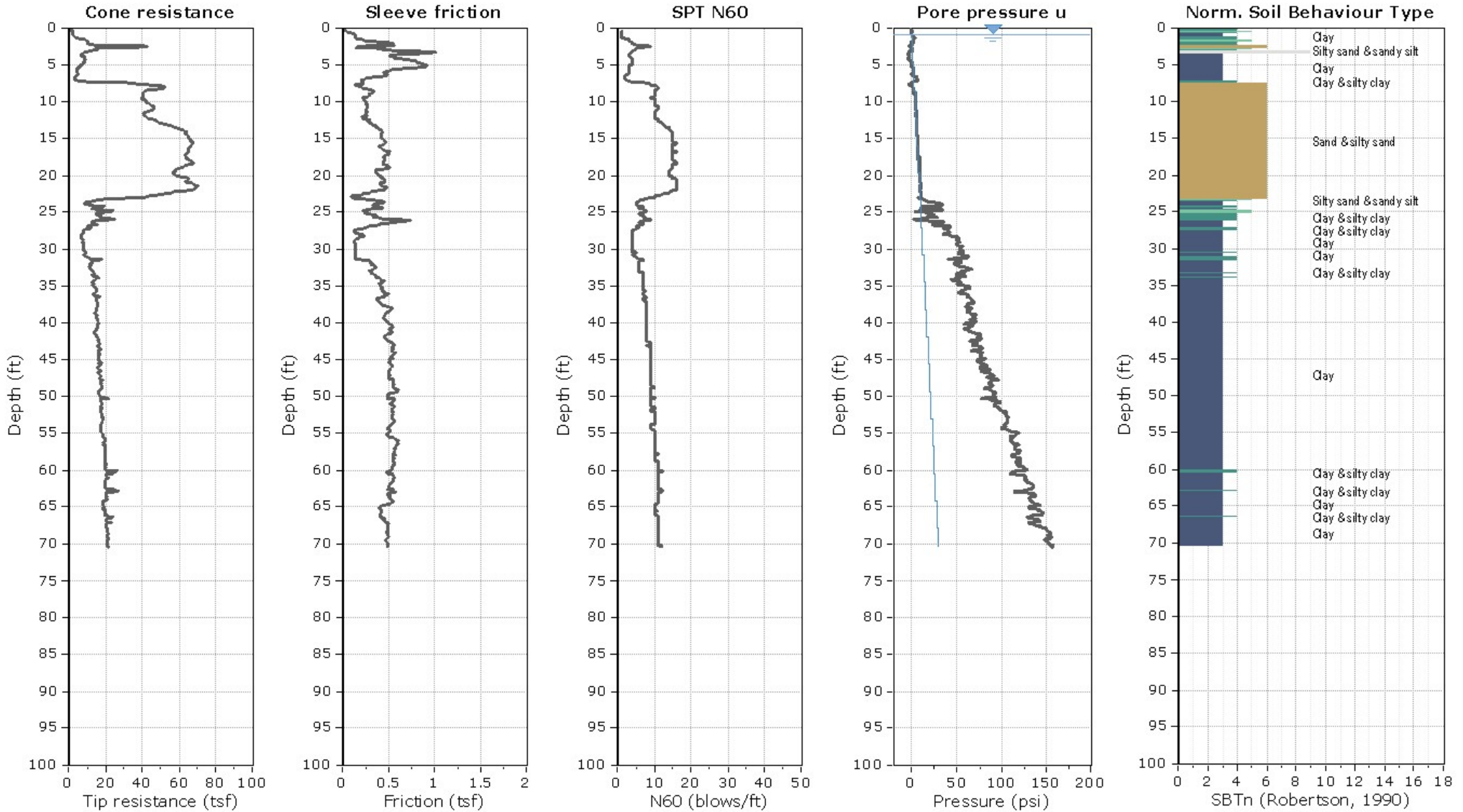
Log of CPT Sounding Sheets

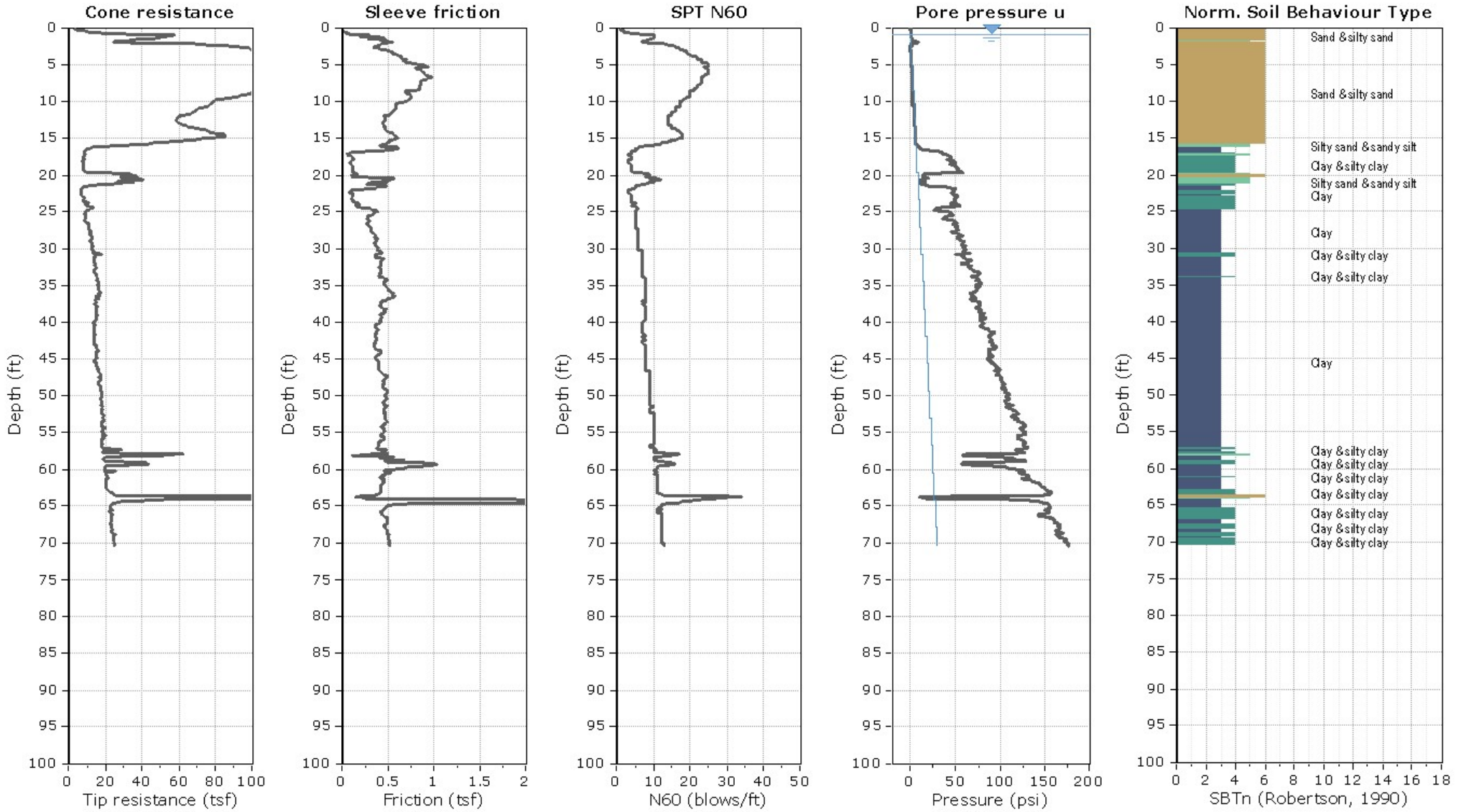
2018 Braun Intertec Corporation
CPT-1 through CPT-6

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Appendix D

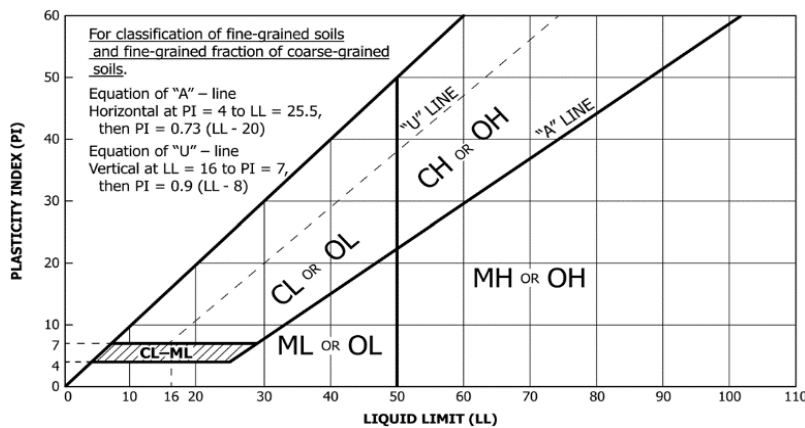
Descriptive Terminology

Descriptive Terminology of Soil
Descriptive Terminology Cone Penetration Test

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Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A			Soil Classification		
			Group Symbol	Group Name ^B	
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines ^C)	$C_u \geq 4$ and $1 \leq C_c \leq 3^D$	GW	Well-graded gravel ^E
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$) ^D	GP	Poorly graded gravel ^E
		Gravels with Fines (More than 12% fines ^C)	Fines classify as ML or MH	GM	Silty gravel ^{EFG}
			Fines Classify as CL or CH	GC	Clayey gravel ^{EFG}
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines ^H)	$C_u \geq 6$ and $1 \leq C_c \leq 3^D$	SW	Well-graded sand ^I
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$) ^D	SP	Poorly graded sand ^I
		Sands with Fines (More than 12% fines ^H)	Fines classify as ML or MH	SM	Silty sand ^{FGI}
			Fines classify as CL or CH	SC	Clayey sand ^{FGI}
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silt and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean clay ^{KLM}
			PI < 4 or plots below "A" line ^J	ML	Silt ^{KLM}
		Organic	Liquid Limit - oven dried	OL	Organic clay ^{KLMN}
			Liquid Limit - not dried < 0.75	OL	Organic silt ^{KLMN}
	Silt and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{KLM}
			PI plots below "A" line	MH	Elastic silt ^{KLM}
		Organic	Liquid Limit - oven dried	OH	Organic clay ^{KLMNP}
			Liquid Limit - not dried < 0.75	OH	Organic silt ^{KLMNQ}
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor		PT	Peat	

- A. Based on the material passing the 3-inch (75-mm) sieve.
- B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- C. 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
- D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
- E. If soil contains $\geq 15\%$ sand, add "with sand" to group name.
- F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
- G. If fines are organic, add "with organic fines" to group name.
- H. 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
- I. If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
- J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
- K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
- L. If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
- M. If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
- N. PI ≥ 4 and plots on or above "A" line.
- O. PI < 4 or plots below "A" line.
- P. PI plots on or above "A" line.
- Q. PI plots below "A" line



Laboratory Tests			
DD	Dry Density, pcf	OC	Organic content, %
WD	Wet Density, pcf	q_p	Pocket penetrometer strength
P200	% Passing #200 sieve	MC	Moisture content, %
		PL	Plastic limit, %
		LL	Liquid limit, %
		PI	Plasticity Index, %

Particle Size Identification

- Boulders..... over 12"
- Cobbles..... 3" to 12"
- Gravel
 - Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
 - Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
- Sand
 - Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
 - Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
 - Fine..... No. 200 to No. 40
(0.075 mm to 0.425 mm)
- Silt..... No. 200 (0.075 mm) to .005 mm
- Clay..... < .005 mm

Relative Proportions^{L, M}

- trace..... 0 to 5%
- little..... 6 to 14%
- with..... $\geq 15\%$

Inclusion Thicknesses

- lens..... 0 to 1/8"
- seam..... 1/8" to 1"
- layer..... over 1"

Apparent Relative Density of Cohesionless Soils

- Very loose 0 to 4 BPF
- Loose 5 to 10 BPF
- Medium dense..... 11 to 30 BPF
- Dense..... 31 to 50 BPF
- Very dense..... over 50 BPF

Consistency of Cohesive Soils **Blows Per Foot** **Approximate Unconfined Compressive Strength**

- Very soft..... 0 to 1 BPF..... < 1/4 tsf
- Soft..... 2 to 4 BPF..... 1/4 to 1/2 tsf
- Medium..... 5 to 8 BPF 1/2 to 1 tsf
- Stiff..... 9 to 15 BPF..... 1 to 2 tsf
- Very Stiff..... 16 to 30 BPF..... 2 to 4 tsf
- Hard..... over 30 BPF..... > 4 tsf

Moisture Content:

- Dry:** Absence of moisture, dusty, dry to the touch.
- Moist:** Damp but no visible water.
- Wet:** Visible free water, usually soil is below water table.

Drilling Notes:

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6 inches into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6-inch increments, and added to get BPF.

Partial Penetration: If the sampler cannot be driven the full 12 inches beyond the initial 6-inch set, the number of blows for that partial penetration is shown as "No./X" (i.e., 50/2"). If the sampler cannot be advanced beyond the initial 6-inch set, the depth of penetration will be recorded in the Notes column as "No. to set X" (i.e., 50 to set 4").

WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

WL: WL indicates the water level measured by the drillers either while drilling or following drilling.

This document accompanies Cone Penetration Test Data. Please refer to the Boring Log Descriptive Terminology Sheet for information relevant to conventional v. Cone Penetration Test (CPT) boring logs.

Cone Penetration Test (CPT) sounding was performed in general accordance with ASTM D 5778 and consistent with the ordinary degree of care and skill used by reputable practitioners of the same discipline currently practicing under similar circumstances and in the same locality. No warranty, express or implied, is made.

Since subsurface conditions outside each CPT sounding are unknown, and soil, rock and pore water conditions cannot be relied upon to be consistent or uniform, no warranty is made that conditions adjacent to each sounding will necessarily be the same as or similar to those shown on this log. Braun Intertec is not responsible for any interpretations, assumptions, projections or interpolations of the data made by others.

Pore water pressure measurements and subsequently interpreted water levels shown on CPT logs should be used with discretion as they represent dynamic conditions. Dynamic pore water pressure measurements may deviate substantially from hydrostatic conditions, especially in cohesive soils. In cohesive soils, pore water pressures often take an extended time to reach equilibrium and thus reflect their true field level. Groundwater levels can be expected to vary both seasonally and yearly. The absence of notations on this log regarding water does not necessarily mean that groundwater is not present to the depth explored, or that a contractor will not encounter groundwater during excavation or construction.

CPT Terminology

- CPT..... Cone Penetration Test
- CPTU..... Cone Penetration Test with Pore Pressure measurements
- SCPTU..... Cone Penetration Test with Pore Pressure and Seismic measurements
- Piezocone...Common name for CPTU test
- Q_T normalized cone resistance
- B_q pore pressure ratio
- F_r normalized friction ratio
- σ_{vo} overburden pressure
- σ'_{vo} effective overburden pressure

q_T TIP RESISTANCE

The resistance at the cone corrected for water pressure. Data is from cone with a 60 degree apex angle and a 15 cm² end area.

f_s SLEEVE FRICTION RESISTANCE

The resistance along the sleeve of the penetrometer.

F_r Friction Ratio

Ratio of sleeve friction over corrected tip resistance.
 $F_r = f_s/q_t$

V_s Shear Wave Velocity

A measure of the speed at which a seismic wave travels through soil/rock.

SBT SOIL BEHAVIOR TYPE

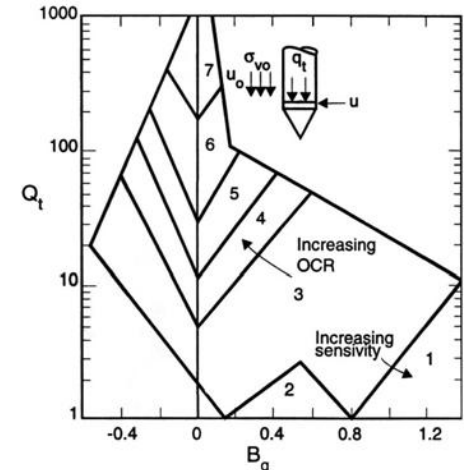
Soil Identification methods for the Cone Penetration Test are based on correlation charts developed from observations of CPT data and conventional borings. Please note that these identification charts are provided as a guide to Soil Behavior Type and should not be used to infer a soil classification based on grain size distribution.

Engineering judgment and comparison with augered borings is especially important in the proper interpretation of CPT data in certain geo-materials.

The following charts provide a Soil Behavior Type for the CPT Data. The numbers corresponding to different regions on the charts represent the following soil behavior types:

Soil Behavior Type based on pore pressure

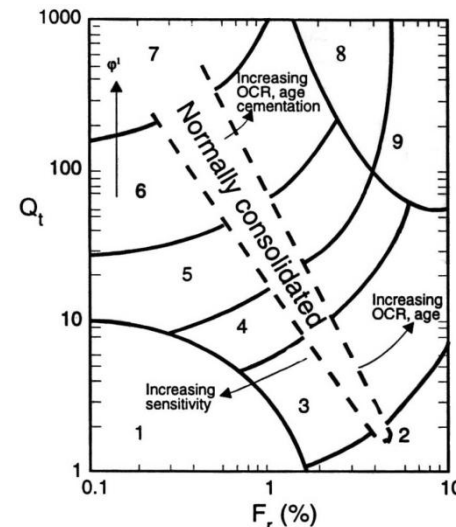
Soil Behavior Type based on pore pressure



$$Q_t = \frac{q_t - \sigma_{vo}}{\sigma'_{vo}} \quad B_q = \frac{u_2 - u_o}{q_t - \sigma_{vo}}$$

Robertson CPT 1990

- 1 Sensitive, Fine Grained
- 2 Organic Soils - Peat
- 3 Clays - Clay to Silty Clay
- 4 Silt Mixtures - Clayey Silt to Silty Clay
- 5 Sand Mixtures - Silty Sand to Sandy Silt
- 6 Sands - Clean Sand to Silty Sand
- 7 Gravelly Sand to Sand
- 8 Very Stiff Sand to Clayey Sand
- 9 Very Stiff, Fine Grained

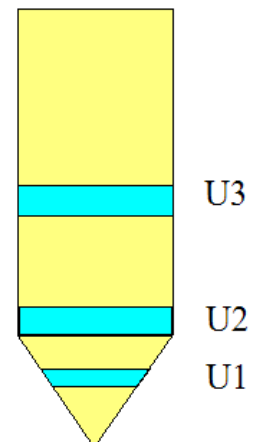


$$Q_t = \frac{q_t - \sigma_{vo}}{\sigma'_{vo}} \quad F_r = \frac{f_s}{q_t - \sigma_{vo}} \times 100\%$$

Robertson CPT 1990

U2 PORE WATER MEASUREMENTS

Pore water measurements reported on CPT logs are representative of pore water pressures measured at the U2 location, just behind the cone tip, prior to the sleeve, as shown in the figure below. These measurements are considered to represent dynamic pore water pressures due to the local disturbance caused by the cone tip. Dynamic pore water pressure decay and static pore water pressure measurements are reported on a Pore Water Pressure Dissipation Graph.



Appendix E

Geotechnical Data Tabulations

Table E1. Topsoil

Table E2. Organic Swamp Deposits

Table E3. Buried Topsoil

Table E4. Existing Fill

Table E5. Unsuitable Soil

Table E6. Groundwater

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Table E1. Topsoil

Boring Number	Surface Elevation	Topsoil /Organic Soil	
		Approximate Depth (feet)	Estimated Bottom Elevation
2018 Braun Intertec Borings			
P/ST-2	898.4	4	894
P/ST-3	901.5	4	897
P/ST-4	895.2	2	893
P-ST-5	890.7	1	889
P/ST-6	894.5	4	890
P/ST-7	955.8	1 1/2	954
ST-1001	903.9	1	902
ST-1004	900.9	1	899
ST-1005	893.1	3	890
ST-1007	889.8	1	888
ST-1008	890.7	1	889
ST-1009	890.7	2	888
ST-1010	888.1	1	887
ST-1017	911.7	1 1/2	910
ST-1018	928.5	2	926
ST-1020	946.0	1	945
2015 Wenck Borings			
BR-603	833.3	1	832
SR-200	925.2	1/2	924
SR-201	951.1	1/2	950
SR-202	955.3	1/2	954
SR-205	951.0	1/2	950
SR-211	907.4	1/2	906
SR-217	886.1	1	885
SR-220	884.3	1/2	883
SR-221	892.0	1/2	891
SR-222	897.2	1/4	896
SR-223	898.5	1/4	898
SR-224	899.9	1/4	899
SR-225	899.0	1	897
WM-400	965.8	3/4	965
WM-402	951.6	3/4	950
WM-403	907.7	1/2	907
WM-404	907.3	1	906
WM-405	899.4	3/4	898
WM-406	891.7	1/2	891
WM-410	877.0	1/2	876
NR-101	914.1	3/4	913
NR-102	915.4	1/2	914
NR-103	924.8	1/2	924
NR-106	939.9	1	938

Table E1. Topsoil

Boring Number	Surface Elevation	Topsoil /Organic Soil	
		Approximate Depth (feet)	Estimated Bottom Elevation
NR-108	915.9	1/2	915
NR-109	916.8	1/2	916
NR-110	919.9	1/2	919
NR-111	919.0	1/2	918
NR-112	923.3	3/4	922
NR-114	921.7	3/4	920
NR-115	913.0	1/4	912
NR-116	911.4	1/4	911
NR-118	Not Provided	1	---
NR-119	Not Provided	1/2	---
NR-122	886.0	3	883
NR-128	912.5	2	910
NR-129	903.1	2	901
NR-130	915.5	3/4	914
NR-131	906.2	1/2	905
NR-132	894.4	3/4	893
NR-134	949.8	1/4	949
TR-302	956.3	3/4	955
TR-303	943.7	1/2	943
TR-305	933.8	1/2	933
TR-306	907.6	1/4	907
TR-307	898.9	1/2	898
TR-308	894.4	1/2	893
TR-309	890.4	1/2	
DE-801	899.4	1/2	898
DE-808	892.3	1/2	891
DE-810	890.4	1/4	890
DE-823	889.2	3/4	888
2007 AET / Braun Intertec Borings			
ST-25	895.9	1	894
ST-26	896.2	1/2	895
ST-27	893.3	1	892
ST-53	885.5	2	883
ST-66	888.9	1/2	888
ST-67	888.7	1/2	888
ST-76	907.0	1	906
ST-77	892.4	1	891
ST-78	886.1	1 1/2	884
ST-79	888.9	1/2	888
ST-80	891.1	2	889
ST-81	895.1	1	894
ST-82	898.6	1	897

Table E1. Topsoil

Boring Number	Surface Elevation	Topsoil /Organic Soil	
		Approximate Depth (feet)	Estimated Bottom Elevation
ST-84	911.0	1/2	910
ST-85	892.1	2	890
ST-86	897.0	1/2	896
ST-87	898.3	2	896
ST-90	891.0	2	889
ST-91	893.1	1/2	892
ST-93	901.2	1	900
ST-94	922.9	4	918
ST-95	924.0	2	922
ST-97	891.0	2 1/2	888
ST-102	902.2	2	900
ST-103	924.9	1	923
ST-104	934.9	1/2	934
ST-107	902.7	1	901
ST-109	904.5	1/2	904
ST-110	913.2	1	912
ST-111	922.1	1	921
ST-113	941.8	2 1/4	939
ST-115	908.2	1 1/2	906
ST-116	913.0	1/2	912
ST-118	914.9	4	910
ST-119	929.7	1/2	929
ST-120	940.8	1/2	940
ST-121	944.6	1	943
ST-123	913.4	1	912
ST-125	932.7	2	930
ST-127	952.8	1	951
ST-128	954.1	1	953
ST-129	915.9	1	914
ST-130	915.1	1/4	914
ST-131	926.9	1/2	926
ST-133	945.0	1	944
ST-134	949.0	1	948
ST-135	950.5	1/2	950
ST-137	956.0	1	955
ST-138	955.9	1	954
ST-140	962.9	1	961
ST-141	913.3	1/2	912
ST-142	933.7	1/2	933
ST-143	949.9	1/2	949
ST-145	954.7	1/2	954
ST-146	966.0	1/2	965

Table E1. Topsoil

Boring Number	Surface Elevation	Topsoil /Organic Soil	
		Approximate Depth (feet)	Estimated Bottom Elevation
ST-147	958.6	1/2	958
ST-149	900.9	1	899
ST-150	927.0	1/2	926
ST-151	922.3	2	920
ST-153	951.2	2 1/2	948
ST-154	956.7	1	955
ST-157	995.9	1	994
ST-160	920.2	1 1/2	918
ST-162	956.7	1	955
ST-172	925.1	1/2	924
ST-173	942.9	1	941
ST-174	944.9	---	---
ST-175	948.1	3	945
ST-176	951.0	2	949
ST-177	953.6	1/2	953
ST-178	948.4	---	---
ST-179	929.3	1/2	928
ST-180	935.9	1	934
ST-181	935.0	1	934
ST-182	941.8	1/2	941
ST-183	933.7	1/2	933
ST-186	925.2	1	924
ST-187	914.2	1	913
ST-188	934.5	3/4	933
ST-191	956.3	1	955
ST-201	956.8	2 1/2	954
ST-202	955.0	2 1/2	952
ST-203	954.4	1 1/2	952
ST-204	938.6	1/2	938
ST-206	916.0	1/2	915
ST-209	892.8	1	891
ST-215	894.5	1/2	894
ST-217	889.3	1	888

Table E2. Existing Fill

Boring Number	Surface Elevation	Existing Fill	
		Approximate Depth (feet)	Estimated Bottom Elevation
2018 Braun Intertec Borings			
P/ST-1	898.0	4	894
P-ST-5	890.7	4	886
P/ST-6	894.5	4	890
ST-1001	903.9	14	889
ST-1003	895.8	9	886
ST-1004	900.9	4	896
ST-1008	890.7	4	886
ST-1018	928.5	12	916
ST-1021	944.0	1 1/2	942
ST-1022	944.0	12	932
2015 Wenck Borings			
BR-600	884.7	12	872
BR-601	884.8	12	872
BR-602	884.4	12	872
SR-200	925.2	10	915
SR-201	951.1	3	948
SR-202	955.3	2	953
SR-203	956.0	7	949
SR-206	942.3	4 1/2	937
SR-207	938.5	3	935
SR-208	935.6	4	931
SR-209	911.4	3	908
SR-210	913.6	2	911
SR-211	907.4	3	904
SR-213	890.8	4	886
SR-214	890.3	1 1/2	888
SR-217	886.1	1	885
SR-218	883.7	10	873
SR-220	884.3	15	869
SR-221	892.0	4	888
RC-500	883.8	3	880
RC-501	884.4	8	876
RC-502	884.2	5	879
RC-503	882.0	12	870
WM-401	954.6	3	951
WM-402	951.6	3	948
WM-403	907.7	3	904
WM-404	907.3	4	903
WM-406	891.7	3	888
WM-407	889.1	5	884
WM-408	888.7	4	884

Table E2. Existing Fill

Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
WM-409	886.9	6	880
NR-101	914.1	10	904
NR-102	915.4	11	904
NR-104	932.6	4	928
NR-105	936.2	3	933
NR-107	933.1	5	928
NR-108	915.9	5	910
NR-109	916.8	6	910
NR-110	919.9	7	912
NR-111	919.0	5	914
NR-113	900.7	5	895
NR-114	921.7	4	917
NR-115	913.0	3	910
NR-117	908.8	2	906
NR-118	Not Provided	2	---
NR-119	Not Provided	2	---
NR-120	885.1	4	881
NR-121	884.1	4	880
NR-122	886.0	10	876
NR-123	885.8	4	881
NR-124	885.2	1 1/2	883
NR-125	886.0	11	875
NR-126	883.7	8	875
NR-127	885.6	15	870
NR-133	887.8	13	874
NR-134	949.8	4	945
TR-300	955.2	2	953
TR-301	960.7	7	953
TR-302	956.3	1 1/2	954
TR-303	943.7	3 1/2	940
TR-307	898.9	5	893
TR-308	894.4	7	887
DE-800	900.7	3 1/2	897
DE-801	899.4	4 1/2	894
DE-804	897.5	4 1/2	893
DE-805	893.4	6	887
DE-808	892.3	3 1/2	#REF!
DE-810	890.4	7	883
DE-811	897.5	3	894
DE-812	891.8	6	885
DE-813	888.1	8 1/2	879
DE-814	888.1	6	882
DE-815	892.7	6	886

Table E2. Existing Fill

Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
DE-816	903.9	5	898
DE-817	902.0	4	898
DE-818	897.3	4 1/2	892
DE-819	894.3	10	884
DE-820	894.3	10 1/2	883
DE-821	888.5	6	882
DE-822	890.4	3	887
DE-823	889.2	3	886
DE-824	888.5	4 1/2	884
DE-825	893.6	4 1/2	889
2007 AET / Braun Intertec Borings			
ST-52	885.9	12	873
ST-53	885.5	7	878
ST-54	888.9	4 1/2	884
ST-55	892.4	2	890
ST-60	883.9	14	869
ST-61	885.9	7	878
ST-64	883.5	9	874
ST-65	886.2	2 1/2	883
ST-66	888.9	2	886
ST-67	888.7	3	885
ST-68	895.0	7	888
ST-69	894.8	1	893
ST-71	887.3	1 1/2	885
ST-72	887.4	7	880
ST-73	891.3	4	887
ST-74	891.8	5	886
ST-75	898.8	4	894
ST-76	907.0	7	900
ST-77	892.4	7	885
ST-78	886.1	7	879
ST-80	891.1	2	889
ST-82	898.6	7	891
ST-83	903.0	4 1/2	898
ST-83A	903.0	4 1/2	898
ST-84	911.0	4 1/2	906
ST-87	898.3	2	896
ST-88	889.7	6	883
ST-89	890.4	7	883
ST-91	893.1	8 1/2	884
ST-92	898.4	2	896
ST-93	901.2	3 1/2	897
ST-95	924.0	7	917

Table E2. Existing Fill

Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
ST-96	892.3	4	888
ST-97	891.0	2 1/2	888
ST-98	892.3	7	885
ST-99	892.8	12	880
ST-100	895.7	6	889
ST-101	897.9	4 1/2	893
ST-102	902.2	7	895
ST-103	924.9	4	920
ST-104	934.9	7	927
ST-105	899.1	7	892
ST-106	903.4	5	898
ST-108	906.6	4	902
ST-109	904.5	7	897
ST-111	922.1	4	918
ST-112	936.8	1	935
ST-114	913.1	2 1/2	910
ST-115	908.2	4 1/2	903
ST-117	914.4	2 1/2	911
ST-119	929.7	9	920
ST-121	944.6	4	940
ST-122	959.5	2	957
ST-123	913.4	6	907
ST-124	923.8	9	914
ST-125	932.7	9 1/2	923
ST-126	957.0	7	950
ST-127	952.8	6	946
ST-128	954.1	7	947
ST-129	915.9	4 1/2	911
ST-130	915.1	7	908
ST-131	926.9	9 1/2	917
ST-132	936.0	3	933
ST-133	945.0	12	933
ST-134	949.0	7	942
ST-135	950.5	4 1/2	946
ST-136	956.7	7	949
ST-137	956.0	7	949
ST-138	955.9	14 1/2	941
ST-139	951.8	9 1/2	942
ST-141	913.3	7	906
ST-142	933.7	15	918
ST-143	949.9	4	945
ST-144	955.0	4 1/2	950
ST-148	957.9	6	951

Table E2. Existing Fill

Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
ST-149	900.9	22	878
ST-150	927.0	4 1/2	922
ST-151	922.3	2	920
ST-152	942.0	12	930
ST-153	951.2	4 1/2	946
ST-154	956.7	16	940
ST-157	995.9	14	981
ST-158	955.5	21 1/2	934
ST-159	959.4	25	934
ST-160	920.2	7	913
ST-161	926.7	4 1/2	922
ST-163	949.2	14 1/2	934
ST-164	951.0	2	949
ST-165	953.1	2	951
ST-166	955.0	2	953
ST-167	945.0	4 1/2	940
ST-168	947.2	3	944
ST-169	948.1	10 1/2	937
ST-170	949.7	10 1/2	939
ST-171	915.0	9 1/2	905
ST-172	925.1	7	918
ST-174	944.9	4	940
ST-175	948.1	3	945
ST-176	951.0	10	941
ST-177	953.6	13	940
ST-178	948.4	9 1/2	938
ST-184	942.1	4 1/2	937
ST-186	925.2	7	918
ST-188	934.5	4	930
ST-190	952.8	2	950
ST-191	956.3	4	952
ST-193	961.9	4	957
ST-195	942.2	4 1/2	937
ST-196	943.4	7	936
ST-197	944.3	7	937
ST-198	944.4	14	930
ST-199	944.2	7	937
ST-200	949.2	14	935
ST-201	956.8	4 1/2	952
ST-202	955.0	2 1/2	952
ST-203	954.4	4 1/2	949
ST-204	938.6	18	920
ST-205	937.1	4 1/2	932

Table E2. Existing Fill

Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
ST-206	916.0	4	912
ST-207	908.5	4 1/2	904
ST-208	914.5	4 1/2	910
ST-209	892.8	7	885
ST-210	898.8	4 1/2	894
ST-211	892.3	8 1/2	883
ST-212	895.1	9 1/2	885
ST-213	890.2	5 1/2	884
ST-214	884.9	9 1/2	875
ST-215	894.5	9	885
ST-216	895.0	11 1/2	883
ST-218	885.7	7	878
ST-224	938.6	4	934

Table E3. Organic Swamp Deposits

Organic Swamp Deposits						
		Upper Boundary		Lower Boundary		
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Elevation	Approximate Depth (feet)	Estimated Elevation	Estimated Thickness (feet)
2018 Braun Intertec Borings						
ST-1011	888.2	0	888	7	881	7
2015 Wenck Borings						
SR-200	925.2	9.5	916	17 1/2	907	8
SR-218	883.7	9.5	875	14 1/2	869	5
WM-406	891.7	3	889	12 1/2	879	10
NR-101	914.1	9 1/2	905	13 1/2	900	4
NR-122	886.0	9 1/2	877	14 1/2	871	5
NR-123	885.8	12	874	17	868	5
NR-126	883.7	8	876	13	870	5
NR-133	887.8	13	875	19 1/2	868	7
DE-818	897.3	12 1/2	885	16	881	4
2007 AET / Braun Intertec Borings						
ST-60	883.9	14	870	17	866	3
ST-73	891.3	4	888	7	884	3
ST-78	886.1	7	880	14	872	7
ST-91	893.1	8 1/2	885	13 1/2	879	5
ST-92	898.4	2	897	7	891	5
ST-96	892.3	4	889	9	883	5
ST-98	892.3	7	886	9	883	2
ST-99	892.8	12	881	18	874	6
ST-100	895.7	6	890	9	886	3
ST-104	934.9	7	928	12	922	5
ST-118	914.9	9	906	14	900	5
ST-124	923.8	9	915	12	911	3
ST-126	957.0	7	950	12	945	5
ST-127	952.8	6	947	18	934	12
ST-128	954.1	7	948	12	942	5
ST-138	955.9	14 1/2	942	22	933	8
ST-139	951.8	9 1/2	943	12	939	3
ST-148	957.9	9.5	949	16	941	7
ST-163	949.2	14 1/2	935	17	932	3
ST-169	948.1	10 1/2	938	12 1/2	935	2
ST-172	925.1	14	912	17	908	3
ST-212	895.1	9 1/2	886	13	882	4
ST-216	895.0	11 1/2	884	14	881	3

Table E4. Buried Topsoil

		Buried Topsoil					
		Upper Boundary		Lower Boundary			
Boring Number	Surface Elevation	Approxiamte Depth (feet)	Estimated Elevation	Approxiamte Depth (feet)	Estimated Elevation	Estimated Thickness (feet)	
2018 Braun Intertec Borings							
ST-1004	900.9	4	897	7	893	3	
ST-1018	928.5	12	917	14	914	2	
2015 Wenck Borings							
BR-600	884.7	12	873	14 1/2	870	2 1/2	
BR-601	884.8	12	873	14 1/2	870	2 1/2	
NR-102	915.4	10 1/2	905	12	903	1 1/2	
NR-109	916.8	5 1/2	912	6	910	1/2	
NR-110	919.9	7	913	9 1/2	910	2 1/2	
NR-118	Not Provided	2	---	4 1/2	---	2 1/2	
NR-125	886.0	10 1/2	876	12 1/2	873	2	
NR-134	949.8	3 1/2	947	4	945	1/2	
TR-308	894.4	7	888	8	886	1	
DE-819	894.3	10	885	11	883	1	
DE-820	894.3	10	885	13	881	3	
2007 AET / Braun Intertec Borings							
ST-61	885.9	7	879	8	877	1	
ST-64	883.5	9	875	10 1/2	873	1 1/2	
ST-68	895.0	7	888	9	886	2	
ST-82	898.6	7	892	8 1/2	890	1 1/2	
ST-95	924.0	7	917	9	915	2	
ST-101	897.9	4 1/2	894	7	890	2 1/2	
ST-106	903.4	5	899	7	896	2	
ST-114	913.1	2 1/2	911	4 1/2	908	2	
ST-136	956.7	7	950	9	947	2	
ST-137	956.0	7	949	9	947	2	
ST-143	949.9	9	941	12	937	3	
ST-150	927.0	4 1/2	923	7	920	2 1/2	
ST-160	920.2	7	914	9	911	2	
ST-170	949.7	10 1/2	940	12	937	1 1/2	
ST-176	951.0	10	941	12	939	2	
ST-177	953.6	13	941	14 1/2	939	1 1/2	
ST-178	948.4	9	940	10	938	1	
ST-186	925.2	7	919	9	916	2	
ST-197	944.3	7	938	9	935	2	
ST-200	949.2	14	936	16	933	2	
ST-210	898.8	4 1/2	895	6	892	1 1/2	
ST-215	894.5	9	886	11	883	2	
ST-224	938.6	4	935	6	932	2	

Table E5. Unsuitable Soils

Unsuitable Soils			
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
2018 Braun Intertec Borings			
P/ST-1	898.0	4	894
P/ST-2	898.4	4	894
P/ST-3	901.5	4	897
P/ST-4	895.2	2	893
P-ST-5	890.7	4	886
P/ST-6	894.5	4	890
P/ST-7	955.8	1 1/2	954
ST-1001	903.9	14	889
ST-1003	895.8	9	886
ST-1004	900.9	7	893
ST-1005	893.1	3	890
ST-1007	889.8	1	888
ST-1008	890.7	4	886
ST-1009	890.7	2	888
ST-1010	888.1	1	887
ST-1011	888.2	7	881
ST-1017	911.7	1 1/2	910
ST-1018	928.5	14	914
ST-1020	946.0	1	945
ST-1021	944.0	1 1/2	942
ST-1022	944.0	12	932
2015 Wenck Borings			
BR-600	884.7	14 1/2	870
BR-601	884.8	14 1/2	870
BR-602	884.4	12	872
BR-603	833.3	1	832
SR-200	925.2	17 1/2	907
SR-201	951.1	3	948
SR-202	955.3	2	953
SR-203	956.0	7	949
SR-204	954.6	1	953
SR-205	951.0	1/2	950
SR-206	942.3	4 1/2	937
SR-207	938.5	3	935
SR-208	935.6	4	931
SR-209	911.4	3	908
SR-210	913.6	2	911
SR-211	907.4	3	904
SR-213	890.8	4	886
SR-214	890.3	1 1/2	888
SR-217	886.1	1	885

Table E5. Unsuitable Soils

Unsuitable Soils			
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
SR-218	883.7	14 1/2	869
SR-220	884.3	15	869
SR-221	892.0	4	888
SR-222	897.2	1/4	896
SR-223	898.5	1/4	898
SR-224	899.9	1/4	899
SR-225	899.0	1	897
RC-500	883.8	3	880
RC-501	884.4	8	876
RC-502	884.2	5	879
RC-503	882.0	12	870
WM-400	965.8	3/4	965
WM-401	954.6	3	951
WM-402	951.6	3	948
WM-403	907.7	3	904
WM-404	907.3	4	903
WM-405	899.4	3/4	898
WM-406	891.7	12 1/2	879
WM-407	889.1	5	884
WM-408	888.7	4	884
WM-409	886.9	6	880
WM-410	877.0	0.5	876
NR-101	914.1	13 1/2	900
NR-102	915.4	12	903
NR-103	924.8	1/2	924
NR-104	932.6	4	928
NR-105	936.2	3	933
NR-106	939.9	1	938
NR-107	933.1	5	928
NR-108	915.9	5	910
NR-109	916.8	6	910
NR-110	919.9	9 1/2	910
NR-111	919.0	5	914
NR-112	923.3	3/4	922
NR-113	900.7	5	895
NR-114	921.7	4	917
NR-115	913.0	3	910
NR-116	911.4	1/4	911
NR-117	908.8	2	906
NR-118	Not Reported	4 1/2	---
NR-119	Not Reported	2	---
NR-120	885.1	4	881

Table E5. Unsuitable Soils

Unsuitable Soils			
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
NR-121	884.1	4	880
NR-122	886.0	14 1/2	871
NR-123	885.8	17	868
NR-124	885.2	1 1/2	883
NR-125	886.0	12 1/2	873
NR-126	883.7	13	870
NR-127	885.6	15	870
NR-128	912.5	2	910
NR-129	903.1	2	901
NR-130	915.5	3/4	914
NR-131	906.2	1/2	905
NR-132	894.4	3/4	893
NR-133	887.8	19 1/2	868
NR-134	949.8	4	945
TR-300	955.2	2	953
TR-301	960.7	7	953
TR-302	956.3	1 1/2	954
TR-303	943.7	3 1/2	940
TR-304	944.0	0	944
TR-305	933.8	1/2	933
TR-306	907.6	1/4	907
TR-307	898.9	5	893
TR-308	894.4	8	886
TR-309	890.4	1/2	889
DE-800	900.7	3 1/2	897
DE-801	899.4	4 1/2	894
DE-804	897.5	4 1/2	893
DE-805	893.4	6	887
DE-808	892.3	3 1/2	888
DE-810	890.4	7	883
DE-811	897.5	3	894
DE-812	891.8	6	885
DE-813	888.1	8 1/2	879
DE-814	888.1	6	882
DE-815	892.7	6	886
DE-816	903.9	5	898
DE-817	902.0	4	898
DE-818	897.3	16	881
DE-819	894.3	11	883
DE-820	894.3	13	881
DE-821	888.5	6	882
DE-822	890.4	3	887

Table E5. Unsuitable Soils

Unsuitable Soils			
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
DE-823	889.2	3	886
DE-824	888.5	4 1/2	884
DE-825	893.6	4 1/2	889
2007 AET / Braun Intertec Borings			
ST-25	895.9	1	894
ST-26	896.2	1/2	895
ST-27	893.3	1	892
ST-52	885.9	12	873
ST-53	885.5	7	878
ST-54	888.9	4 1/2	884
ST-55	892.4	2	890
ST-60	883.9	17	866
ST-61	885.9	8	877
ST-64	883.5	10 1/2	873
ST-65	886.2	2 1/2	883
ST-66	888.9	2	886
ST-67	888.7	3	885
ST-68	895.0	9	886
ST-69	894.8	1	893
ST-71	887.3	1 1/2	885
ST-72	887.4	7	880
ST-73	891.3	7	884
ST-74	891.8	5	886
ST-75	898.8	4	894
ST-76	907.0	7	900
ST-77	892.4	7	885
ST-78	886.1	14	872
ST-79	888.9	1/2	888
ST-80	891.1	2	889
ST-81	895.1	1	894
ST-82	898.6	8 1/2	890
ST-83	903.0	4 1/2	898
ST-83A	903.0	4 1/2	898
ST-84	911.0	4 1/2	906
ST-85	892.1	2	890
ST-86	897.0	1/2	896
ST-87	898.3	2	896
ST-88	889.7	6	883
ST-89	890.4	7	883
ST-90	891.0	2	889
ST-91	893.1	13 1/2	879
ST-92	898.4	7	891

Table E5. Unsuitable Soils

Unsuitable Soils			
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
ST-93	901.2	3 1/2	897
ST-94	922.9	4	918
ST-95	924.0	9	915
ST-96	892.3	9	883
ST-97	891.0	2 1/2	888
ST-98	892.3	9	883
ST-99	892.8	18	874
ST-100	895.7	9	886
ST-101	897.9	4 1/2	893
ST-102	902.2	7	895
ST-103	924.9	4	920
ST-104	934.9	12	922
ST-105	899.1	7	892
ST-106	903.4	7	896
ST-107	902.7	1	901
ST-108	906.6	4	902
ST-109	904.5	7	897
ST-110	913.2	1	912
ST-111	922.1	4	918
ST-112	936.8	1	935
ST-113	941.8	2 1/4	939
ST-114	913.1	4 1/2	908
ST-115	908.2	4 1/2	903
ST-116	913.0	1/2	912
ST-117	914.4	2 1/2	911
ST-118	914.9	14	900
ST-119	929.7	9	920
ST-120	940.8	1/2	940
ST-121	944.6	4	940
ST-122	959.5	2	957
ST-123	913.4	6	907
ST-124	923.8	12	911
ST-125	932.7	9 1/2	923
ST-126	957.0	12	945
ST-127	952.8	18	934
ST-128	954.1	12	942
ST-129	915.9	4 1/2	911
ST-130	915.1	7	908
ST-131	926.9	9 1/2	917
ST-132	936.0	3	933
ST-133	945.0	12	933
ST-134	949.0	7	942

Table E5. Unsuitable Soils

Unsuitable Soils			
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
ST-135	950.5	4 1/2	946
ST-136	956.7	9	947
ST-137	956.0	9	947
ST-138	955.9	22	933
ST-139	951.8	12	939
ST-140	962.9	1	961
ST-141	913.3	7	906
ST-142	933.7	15	918
ST-143	949.9	12	937
ST-144	955.0	4 1/2	950
ST-145	954.7	1/2	954
ST-146	966.0	1/2	965
ST-147	958.6	1/2	958
ST-148	957.9	16	941
ST-149	900.9	22	878
ST-150	927.0	7	920
ST-151	922.3	2	920
ST-152	942.0	12	930
ST-153	951.2	4 1/2	946
ST-154	956.7	16	940
ST-157	995.9	14	981
ST-158	955.5	21 1/2	934
ST-159	959.4	25	934
ST-160	920.2	9	911
ST-161	926.7	4 1/2	922
ST-162	956.7	1	955
ST-163	949.2	17	932
ST-164	951.0	2	949
ST-165	953.1	2	951
ST-166	955.0	2	953
ST-167	945.0	4 1/2	940
ST-168	947.2	3	944
ST-169	948.1	12 1/2	935
ST-170	949.7	12	937
ST-171	915.0	9 1/2	905
ST-172	925.1	17	908
ST-173	942.9	1	941
ST-174	944.9	4	940
ST-175	948.1	3	945
ST-176	951.0	12	939
ST-177	953.6	14 1/2	939
ST-178	948.4	10	938

Table E5. Unsuitable Soils

Unsuitable Soils			
Boring Number	Surface Elevation	Approximate Depth (feet)	Estimated Bottom Elevation
ST-179	929.3	1/2	928
ST-180	935.9	1	934
ST-181	935.0	1	934
ST-182	941.8	1/2	941
ST-183	933.7	1/2	933
ST-184	942.1	4 1/2	937
ST-185	901.0	0	901
ST-186	925.2	9	916
ST-187	914.2	1	913
ST-188	934.5	4	930
ST-189	952.2	0	952
ST-190	952.8	2	950
ST-191	956.3	4	952
ST-192	959.1	0	959
ST-193	961.9	4	957
ST-195	942.2	4 1/2	937
ST-196	943.4	7	936
ST-197	944.3	9	935
ST-198	944.4	14	930
ST-199	944.2	7	937
ST-200	949.2	16	933
ST-201	956.8	4 1/2	952
ST-202	955.0	2 1/2	952
ST-203	954.4	4 1/2	949
ST-204	938.6	18	920
ST-205	937.1	4 1/2	932
ST-206	916.0	4	912
ST-207	908.5	4 1/2	904
ST-208	914.5	4 1/2	910
ST-209	892.8	7	885
ST-210	898.8	6	892
ST-211	892.3	8 1/2	883
ST-212	895.1	13	882
ST-213	890.2	5 1/2	884
ST-214	884.9	9 1/2	875
ST-215	894.5	11	883
ST-216	895.0	14	881
ST-217	889.3	1	888
ST-218	885.7	7	878
ST-224	938.6	6	932

Table E6. Groundwater

Boring Number	Surface Elevation or Top of Riser	Approximate Depth (feet)	Groundwater	
			Corresponding Estimated Elevation	2018 Reading Date
2018 Braun Intertec Borings				
P/ST-1	898.0	2.0	896.0	5/3/2018
P/ST-2	898.4	13.0	885.4	5/4/2018
P/ST-2 (P)	898.4	5.0	893.4	6/1/2018
P/ST-2 (P)	904.1	8.3	895.8	8/17/2018
P/ST-3	901.5	Not Observed	---	---
P/ST-3 (P)	901.5	10.1	891.4	6/1/2018
P/ST-3 (P)	905.5	7.3	898.2	8/17/2018
P/ST-4	895.2	2.3	892.9	5/4/2018
P-ST-5	890.7	4.0	886.7	5/2/2018
P/ST-5 (MW)	890.7	1.9	888.8	6/1/2018
P/ST-5 (MW)	894.0	7.6	886.4	8/17/2018
P/ST-5 (P)	890.7	2.1	888.6	6/1/2018
P/ST-5 (P)	893.6	7.2	886.4	8/17/2018
P/ST-6	894.5	2.6	891.9	5/7/2018
P/ST-6 (MW)	894.5	3.3	891.2	6/1/2018
P/ST-6 (MW)	898.2	8.7	889.5	8/17/2018
P/ST-6 (P)	894.5	3.2	891.3	6/1/2018
P/ST-6 (P)	898.5	8.9	889.6	8/17/2018
P/ST-7	955.8	Not Observed	---	---
ST-1001	903.9	Not Observed	---	---
ST-1003	895.8	2.0	893.8	5/11/2018
ST-1004	900.9	Not Observed	---	---
ST-1005	893.1	2.5	890.6	5/8/2018
ST-1007	889.8	1.5	888.3	5/10/2018
ST-1008	890.7	4.0	886.7	5/2/2018
ST-1008 (MW)	890.7	2.1	888.6	6/1/2018
ST-1008 (MW)	894.1	7.1	887.0	8/17/2018
ST-1008 (P)	890.7	2.7	888.0	6/1/2018
ST-1008 (P)	893.7	6.7	887.0	8/17/2018
ST-1009	890.7	4.0	886.7	5/1/2018
ST-1010	888.1	3.0	885.1	5/9/2018
ST-1011	888.2	2.0	886.2	5/9/2018
ST-1017	911.7	5.0	906.7	5/4/2018
ST-1018	928.5	Not Observed	---	---
ST-1020	946.0	Not Observed	---	---
ST-1021	944.0	Not Observed	---	---
ST-1022	944.0	7.0	937.0	5/8/2018
2015 Wenck Borings				
BR-600	884.7	17.3	867.4	---
BR-601	884.8	4.0	880.8	---
BR-602	884.4	17.0	867.4	---

Table E6. Groundwater

BR-603	833.3	Not Observed	---	---
SR-200	925.2	14.0	911.2	---
SR-201	951.1	Not Observed	---	---
SR-202	955.3	Not Observed	---	---
SR-203	956.0	Not Observed	---	---
SR-204	954.6	Not Observed	---	---
SR-205	951.0	Not Observed	---	---
SR-206	942.3	Not Observed	---	---
SR-207	938.5	Not Observed	---	---
SR-208	935.6	Not Observed	---	---
SR-209	911.4	Not Observed	---	---
SR-210	913.6	4.5	909.1	---
SR-211	907.4	Not Observed	---	---
SR-213	890.8	12.0	878.8	---
SR-214	890.3	9.5	880.8	---
SR-217	886.1	7.0	879.1	---
SR-218	883.7	14.5	869.2	---
SR-220	884.3	Not Observed	---	---
SR-221	892.0	15.3	876.7	---
SR-222	897.2	17.7	879.5	---
SR-223	898.5	17.2	881.3	---
SR-224	899.9	16.0	883.9	---
SR-225	899.0	Not Observed	---	---
RC-500	883.8	4.5	879.3	---
RC-501	884.4	9.5	874.9	---
RC-502	884.2	7.0	877.2	---
RC-503	882.0	Not Observed	---	---
WM-400	965.8	Not Observed	---	---
WM-401	954.6	Not Observed	---	---
WM-402	951.6	12.0	939.6	---
WM-403	907.7	7.5	900.2	---
WM-404	907.3	12.0	895.3	---
WM-405	899.4	9.5	889.9	---
WM-406	891.7	12.0	879.7	---
WM-407	889.1	6.3	882.8	---
WM-408	888.7	5.0	883.7	---
WM-409	886.9	7.0	879.9	---
WM-410	877.0	7.0	870.0	---
NR-101	914.1	Not Observed	---	---
NR-102	915.4	12.0	903.4	---
NR-103	924.8	Not Observed	---	---
NR-104	932.6	Not Observed	---	---
NR-105	936.2	Not Observed	---	---
NR-106	939.9	Not Observed	---	---
NR-107	933.1	Not Observed	---	---
NR-108	915.9	Not Observed	---	---

Table E6. Groundwater

NR-109	916.8	Not Observed	---	---
NR-110	919.9	19.5	900.4	---
NR-111	919.0	Not Observed	---	---
NR-112	923.3	Not Observed	---	---
NR-113	900.7	7.0	893.7	---
NR-114	921.7	Not Observed	---	---
NR-115	913.0	Not Observed	---	---
NR-116	911.4	Not Observed	---	---
NR-117	908.8	12.0	896.8	---
NR-118	Not Reported	2.0	---	---
NR-119	Not Reported	2.6	---	---
NR-120	885.1	Not Observed	---	---
NR-121	884.1	7.0	877.1	---
NR-122	886.0	14.5	871.5	---
NR-123	885.8	8.5	877.3	---
NR-124	885.2	8.5	876.7	---
NR-125	886.0	11.0	875.0	---
NR-126	883.7	12.0	871.7	---
NR-127	885.6	8.0	877.6	---
NR-128	912.5	2.0	910.5	---
NR-129	903.1	Not Observed	---	---
NR-130	915.5	Not Observed	---	---
NR-131	906.2	Not Observed	---	---
NR-132	894.4	12.5	881.9	---
NR-133	887.8	6.0	881.8	---
NR-134	949.8	Not Observed	---	---
TR-300	955.2	Not Observed	---	---
TR-301	960.7	Not Observed	---	---
TR-302	956.3	Not Observed	---	---
TR-303	943.7	Not Observed	---	---
TR-304	944.0	Not Observed	---	---
TR-305	933.8	7.0	926.8	---
TR-306	907.6	12.0	895.6	---
TR-307	898.9	5.0	893.9	---
TR-308	894.4	9.5	884.9	---
TR-309	890.4	4.0	886.4	---
DE-800	900.7	12.0	888.7	---
DE-801	899.4	6.5	892.9	---
DE-804	897.5	Not Observed	---	---
DE-805	893.4	6	887.4	---
DE-808	892.3	3.5	888.8	---
DE-810	890.4	9.5	880.9	---
DE-811	897.5	Not Observed	---	---
DE-812	891.8	8	883.8	---
DE-813	888.1	9.5	878.6	---
DE-814	888.1	4.5	883.6	---

Table E6. Groundwater

DE-815	892.7	5	887.7	---
DE-816	903.9	Not Observed	---	---
DE-817	902.0	4.5	897.5	---
DE-818	897.3	7	890.3	---
DE-819	894.3	5	889.3	---
DE-820	894.3	5	889.3	---
DE-821	888.5	7	881.5	---
DE-822	890.4	7	883.4	---
DE-823	889.2	9.5	879.7	---
DE-824	888.5	4.5	884.0	---
DE-825	893.6	Not Observed	---	---
2007 AET / Braun Intertec Borings				
ST-25	895.9	17.0	878.9	---
ST-26	896.2	19.0	877.2	---
ST-27	893.3	12.0	881.3	---
ST-52	885.9	10.9	875.0	---
ST-53	885.5	10.3	875.2	---
ST-54	888.9	4.5	884.4	---
ST-55	892.4	9.5	882.9	---
ST-60	883.9	8.0	875.9	---
ST-61	885.9	9.4	876.5	---
ST-64	883.5	10.2	873.3	---
ST-65	886.2	10.0	876.2	---
ST-66	888.9	10.0	878.9	---
ST-67	888.7	6.0	882.7	---
ST-68	895.0	5.2	889.8	---
ST-69	894.8	4.0	890.8	---
ST-71	887.3	7.0	880.3	---
ST-72	887.4	4.8	882.6	---
ST-73	891.3	9.0	882.3	---
ST-74	891.8	6.4	885.4	---
ST-75	898.8	4.3	894.5	---
ST-76	907.0	14.0	893.0	---
ST-77	892.4	11.0	881.4	---
ST-78	886.1	7.0	879.1	---
ST-79	888.9	7.0	881.9	---
ST-80	891.1	12.0	879.1	---
ST-81	895.1	9.5	885.6	---
ST-82	898.6	14.5	884.1	---
ST-83	903.0	9.5	893.5	---
ST-83A	903.0	9.5	893.5	---
ST-84	911.0	12.0	899.0	---
ST-85	892.1	9.5	882.6	---
ST-86	897.0	8.1	888.9	---
ST-87	898.3	12.0	886.3	---
ST-88	889.7	8.0	881.7	---

Table E6. Groundwater

ST-89	890.4	7.0	883.4	---
ST-90	891.0	6.0	885.0	---
ST-91	893.1	12.0	881.1	---
ST-92	898.4	18.0	880.4	---
ST-93	901.2	18.0	883.2	---
ST-94	922.9	18.0	904.9	---
ST-95	924.0	13.0	911.0	---
ST-96	892.3	9.0	883.3	---
ST-97	891.0	6.1	884.9	---
ST-98	892.3	8.0	884.3	---
ST-99	892.8	12.0	880.8	---
ST-100	895.7	9.0	886.7	---
ST-101	897.9	7.0	890.9	---
ST-102	902.2	7.0	895.2	---
ST-103	924.9	18.0	906.9	---
ST-104	934.9	23.0	911.9	---
ST-105	899.1	9.0	890.1	---
ST-106	903.4	12.2	891.2	---
ST-107	902.7	12.1	890.6	---
ST-108	906.6	12.5	894.1	---
ST-109	904.5	12.0	892.5	---
ST-110	913.2	9.0	904.2	---
ST-111	922.1	14.0	908.1	---
ST-112	936.8	Not Observed	---	---
ST-113	941.8	Not Observed	---	---
ST-114	913.1	5.2	907.9	---
ST-115	908.2	12.0	896.2	---
ST-116	913.0	9.5	903.5	---
ST-117	914.4	9.5	904.9	---
ST-118	914.9	6.0	908.9	---
ST-119	929.7	22.0	907.7	---
ST-120	940.8	Not Observed	---	---
ST-121	944.6	Not Observed	---	---
ST-122	959.5	Not Observed	---	---
ST-123	913.4	25.0	888.4	---
ST-124	923.8	14.0	909.8	---
ST-125	932.7	Not Observed	---	---
ST-126	957.0	12.0	945.0	---
ST-127	952.8	18.0	934.8	---
ST-128	954.1	Not Observed	---	---
ST-129	915.9	11.5	904.4	---
ST-130	915.1	14.0	901.1	---
ST-131	926.9	18.0	908.9	---
ST-132	936.0	Not Observed	---	---
ST-133	945.0	Not Observed	---	---
ST-134	949.0	24.0	925.0	---

Table E6. Groundwater

ST-135	950.5	Not Observed	---	---
ST-136	956.7	Not Observed	---	---
ST-137	956.0	Not Observed	---	---
ST-138	955.9	14.5	941.4	---
ST-139	951.8	9.5	942.3	---
ST-140	962.9	Not Observed	---	---
ST-141	913.3	18.0	895.3	---
ST-142	933.7	15.0	918.7	---
ST-143	949.9	Not Observed	---	---
ST-144	955.0	Not Observed	---	---
ST-145	954.7	Not Observed	---	---
ST-146	966.0	Not Observed	---	---
ST-147	958.6	Not Observed	---	---
ST-148	957.9	7.3	950.6	---
ST-149	900.9	19.0	881.9	---
ST-150	927.0	Not Observed	---	---
ST-151	922.3	5.1	917.2	---
ST-152	942.0	12.3	929.7	---
ST-153	951.2	23.0	928.2	---
ST-154	956.7	Not Observed	---	---
ST-157	995.9	Not Observed	---	---
ST-158	955.5	22.0	933.5	---
ST-159	959.4	18.0	941.4	---
ST-160	920.2	11.8	908.4	---
ST-161	926.7	18.0	908.7	---
ST-162	956.7	Not Observed	---	---
ST-163	949.2	17.0	932.2	---
ST-164	951.0	23.0	928.0	---
ST-165	953.1	Not Observed	---	---
ST-166	955.0	21.2	933.8	---
ST-167	945.0	21.2	923.8	---
ST-168	947.2	Not Observed	---	---
ST-169	948.1	12.5	935.6	---
ST-170	949.7	12.6	937.1	---
ST-171	915.0	8.6	906.4	---
ST-172	925.1	6.0	919.1	---
ST-173	942.9	Not Observed	---	---
ST-174	944.9	Not Observed	---	---
ST-175	948.1	15.1	933.0	---
ST-176	951.0	16.0	935.0	---
ST-177	953.6	Not Observed	---	---
ST-178	948.4	18.0	930.4	---
ST-179	929.3	14.0	915.3	---
ST-180	935.9	12.0	923.9	---
ST-181	935.0	Not Observed	---	---
ST-182	941.8	Not Observed	---	---

Table E6. Groundwater

ST-183	933.7	18.0	915.7	---
ST-184	942.1	12.0	930.1	---
ST-185	901.0	Not Observed	---	---
ST-186	925.2	14.0	911.2	---
ST-187	914.2	12.0	902.2	---
ST-188	934.5	19.0	915.5	---
ST-189	952.2	Not Observed	---	---
ST-190	952.8	Not Observed	---	---
ST-191	956.3	Not Observed	---	---
ST-192	959.1	Not Observed	---	---
ST-193	961.9	Not Observed	---	---
ST-195	942.2	Not Observed	---	---
ST-196	943.4	18.0	925.4	---
ST-197	944.3	9.0	935.3	---
ST-198	944.4	19.0	925.4	---
ST-199	944.2	Not Observed	---	---
ST-200	949.2	20.0	929.2	---
ST-201	956.8	Not Observed	---	---
ST-202	955.0	Not Observed	---	---
ST-203	954.4	Not Observed	---	---
ST-204	938.6	Not Observed	---	---
ST-205	937.1	Not Observed	---	---
ST-206	916.0	12.0	904.0	---
ST-207	908.5	9.0	899.5	---
ST-208	914.5	12.0	902.5	---
ST-209	892.8	9.1	883.7	---
ST-210	898.8	12.0	886.8	---
ST-211	892.3	7.6	884.7	---
ST-212	895.1	7.3	887.8	---
ST-213	890.2	7.1	883.1	---
ST-214	884.9	12.7	872.2	---
ST-215	894.5	9.3	885.2	---
ST-216	895.0	13.5	881.5	---
ST-217	889.3	3.0	886.3	---
ST-218	885.7	12.0	873.7	---
ST-224	938.6	Not Observed	---	---

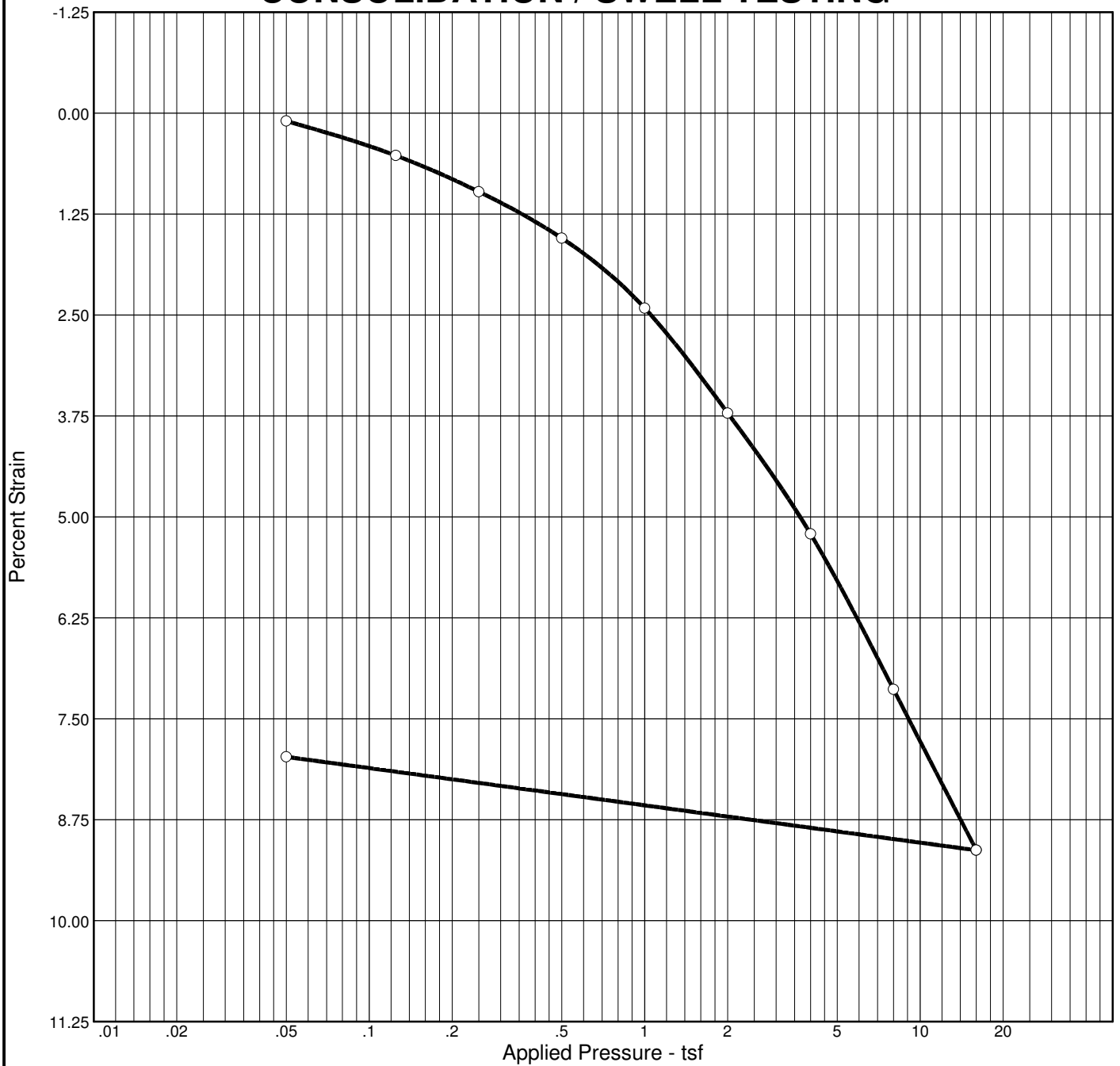
Appendix F

Consolidation Tests

2018 Braun Intertec Corporation

Boring P/ST-6, 14 1/2 feet
Boring ST-1013, 19 1/2 feet
Boring ST-1013, 59 1/2 feet
Boring ST-1007, 19 1/2 feet
Boring ST-1009, 13 feet

CONSOLIDATION / SWELL TESTING



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Swell Press. (tsf)	Swell %	e ₀
Sat.	Moist.											
96.2 %	15.5 %	117.5			2.70		1.36	0.09	0.01			0.434

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY SAND, brown (SC)	SC	

Project No. B1706398 Client: Kimley-Horn and Associates, Inc. Project: TCAAP Redevelopment - Mass Grading NE of US Hwy 10 and Hwy 96, Arden Hills, MN Source: Sample No.: P/ST-6 Elev./Depth: 14.5-16.5'	Remarks: ASTM D 2435

Figure

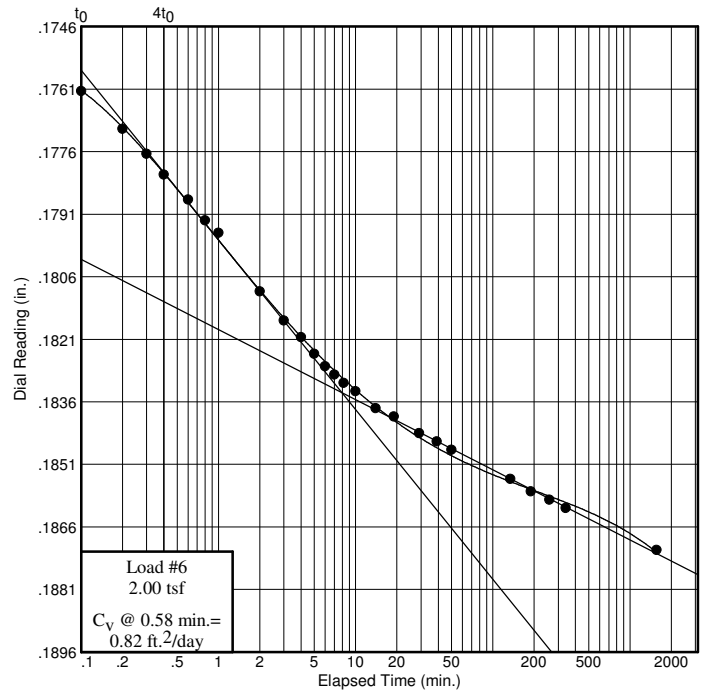
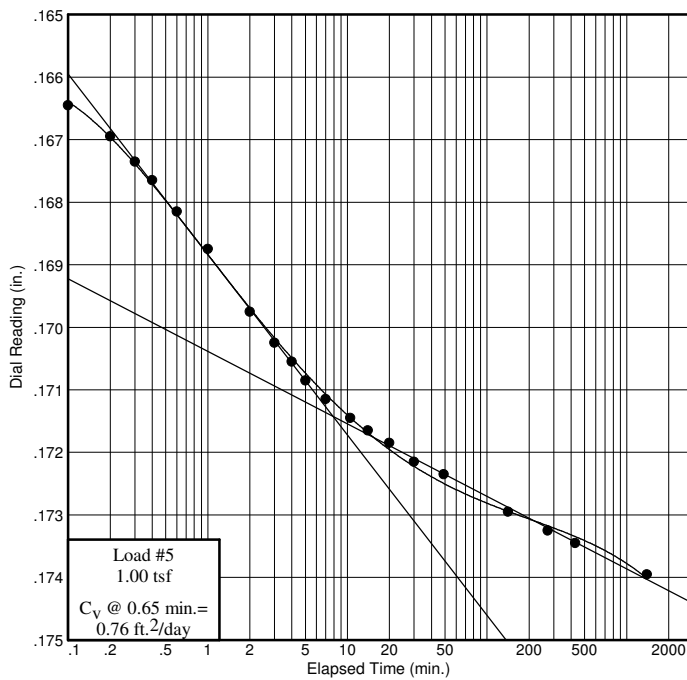
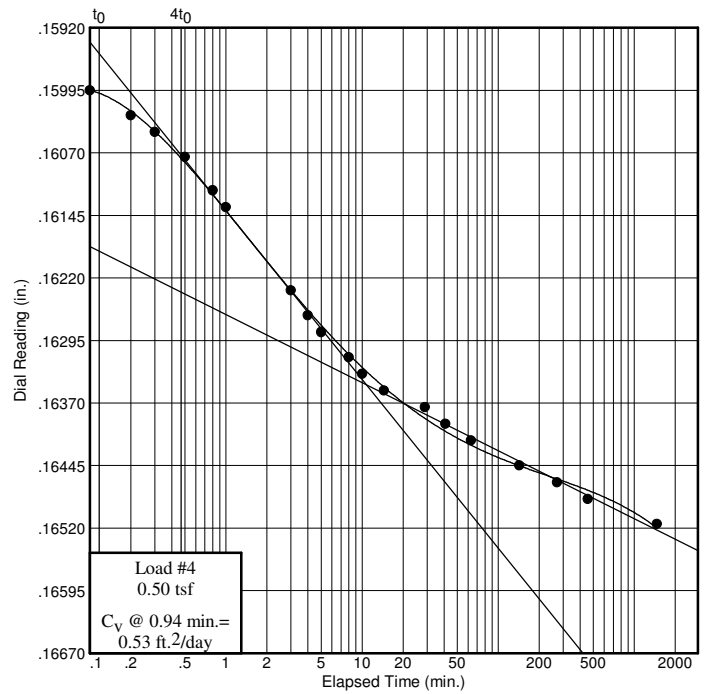
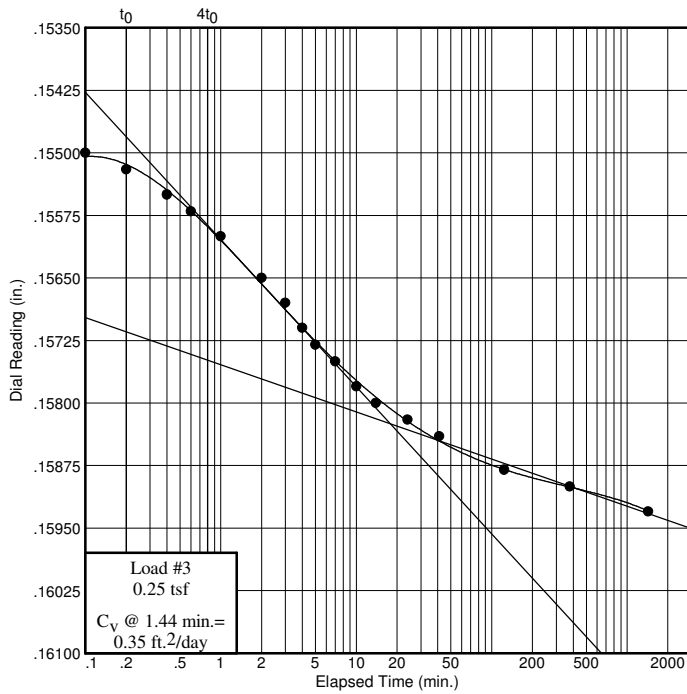
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: P/ST-6

Elev./Depth: 14.5-16.5'



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Figure

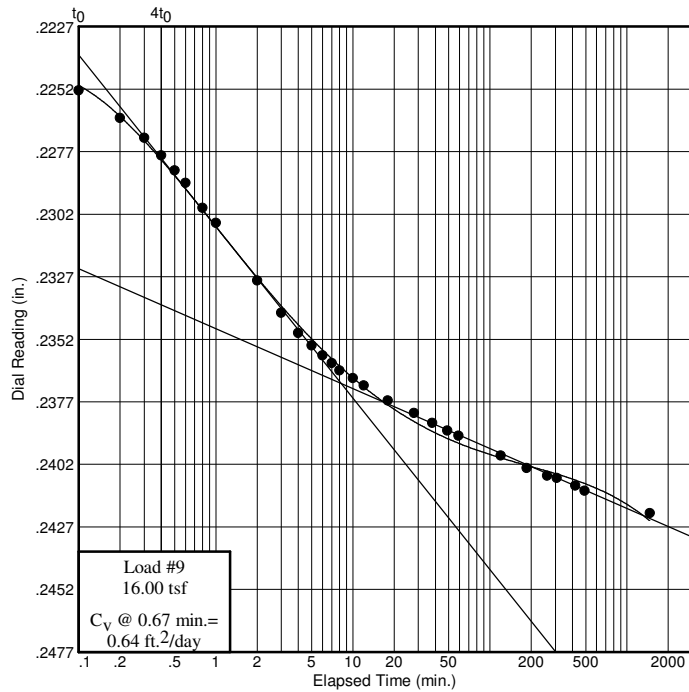
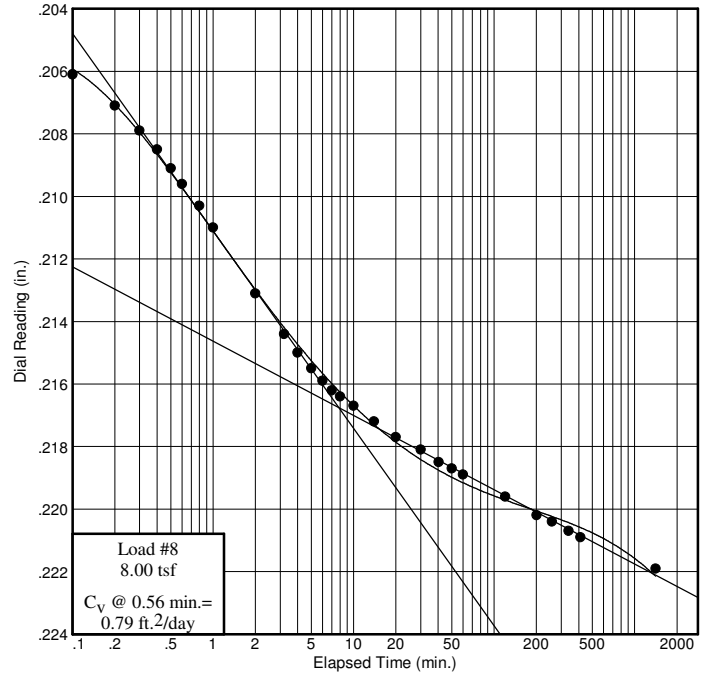
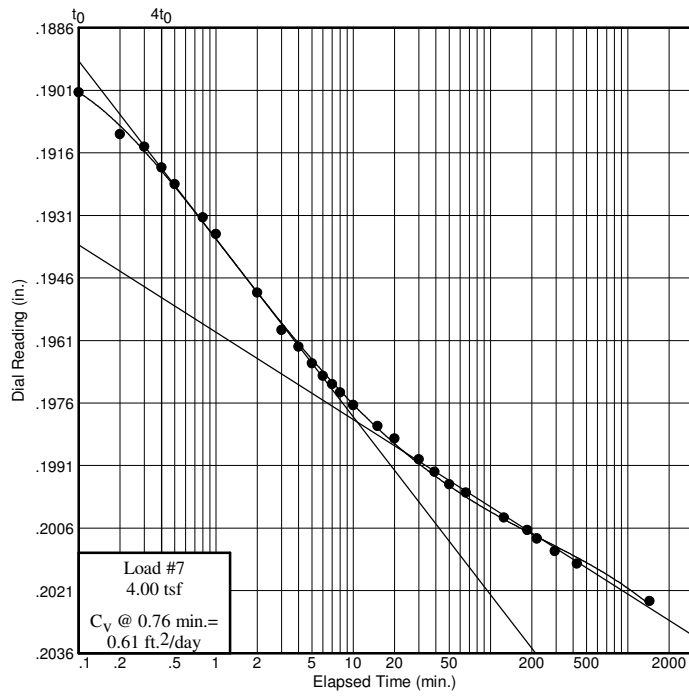
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: P/ST-6

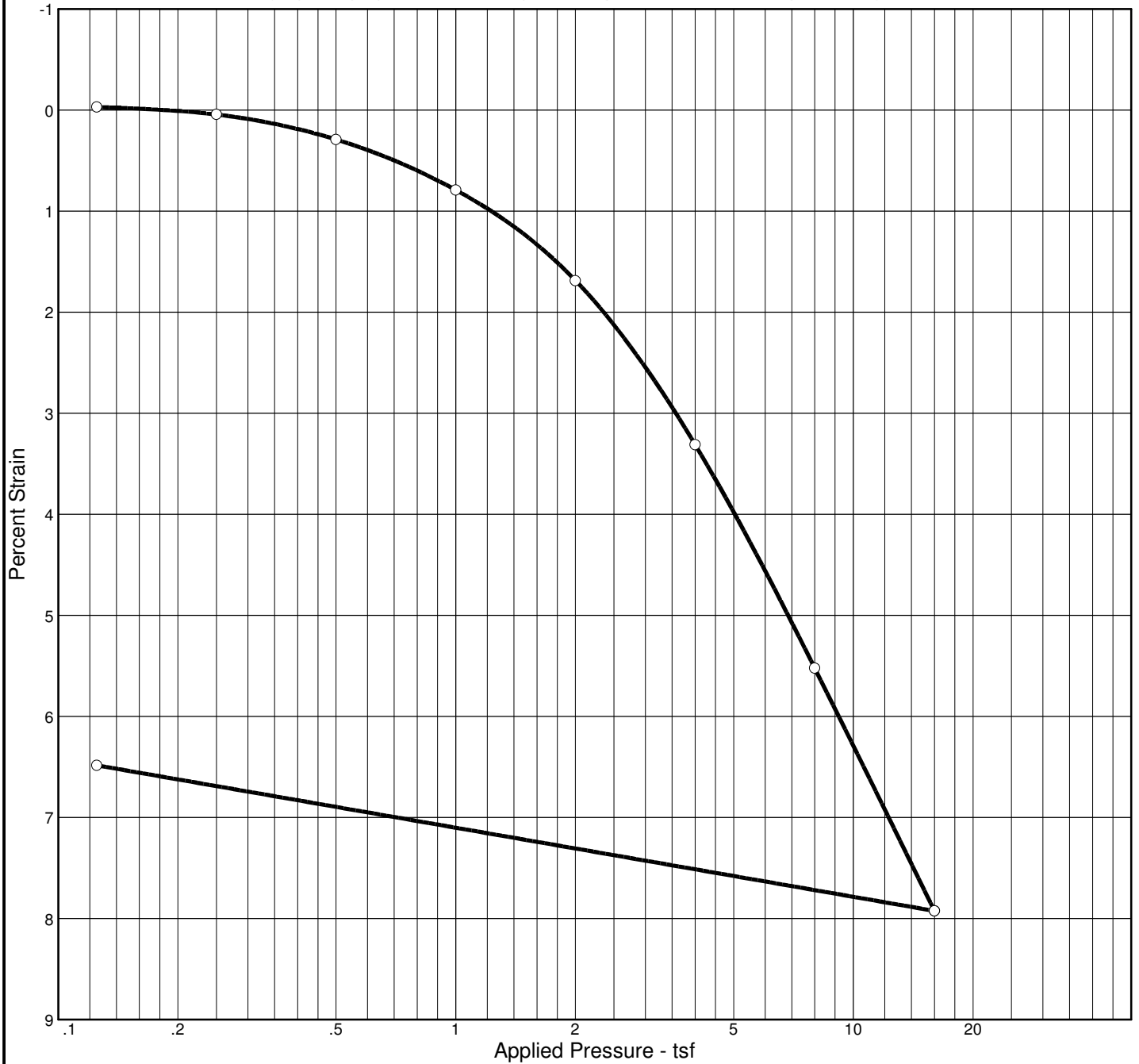
Elev./Depth: 14.5-16.5'



BRAUNSM
INTERTEC


Figure

CONSOLIDATION / SWELL TESTING



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_0
Sat.	Moist.											
91.7 %	14.9 %	117.2			2.70		2.27	0.11	0.01			0.438

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY SAND, brown (SC)	SC	

Project No. B1706398 Project: TCAAP Redevelopment - Mass Grading NE of US Hwy 10 and Hwy 96, Arden Hills, MN Source:	Client: Kimley-Horn and Associates, Inc. Sample No.: ST-1003 Elev./Depth: 19.5-21.5'	Remarks: ASTM D 2435
		Figure

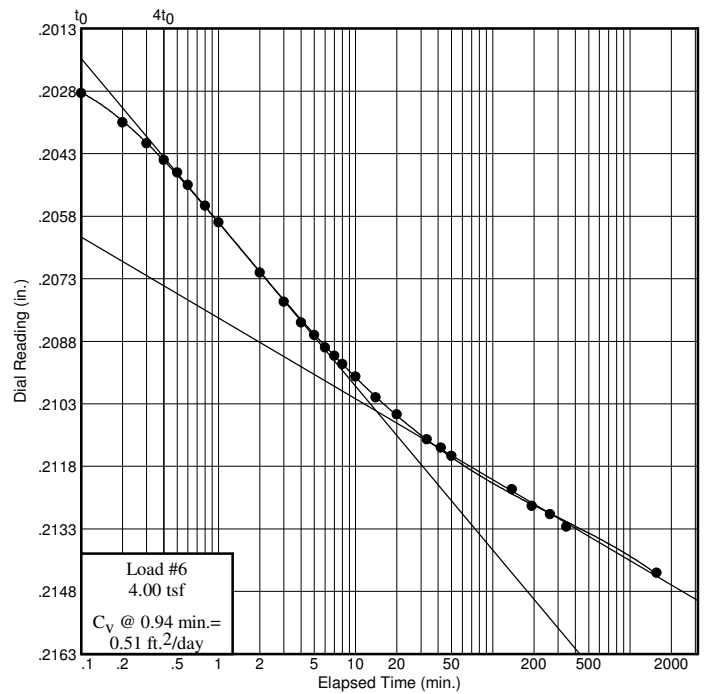
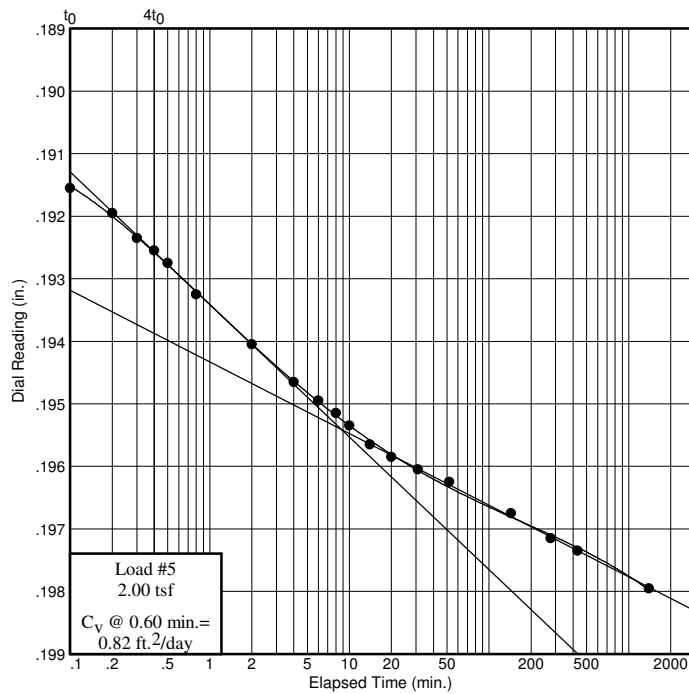
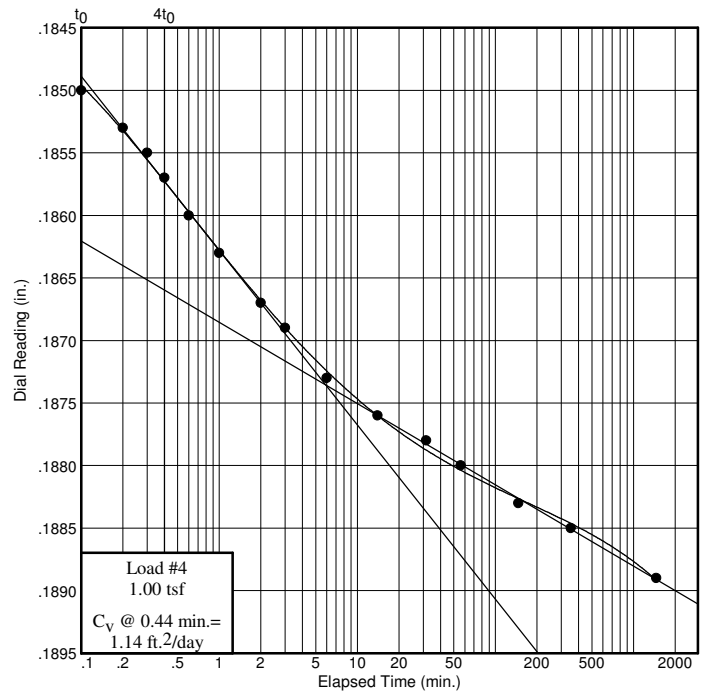
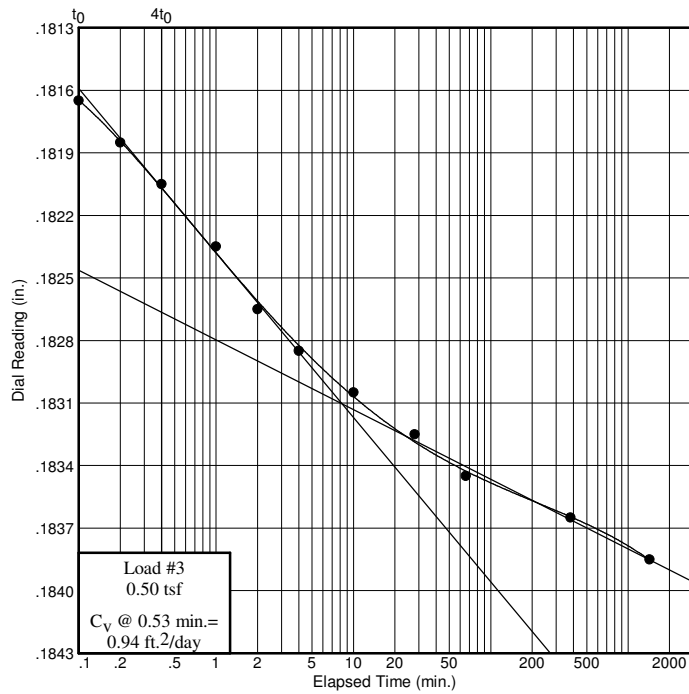
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1003

Elev./Depth: 19.5-21.5'



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Figure

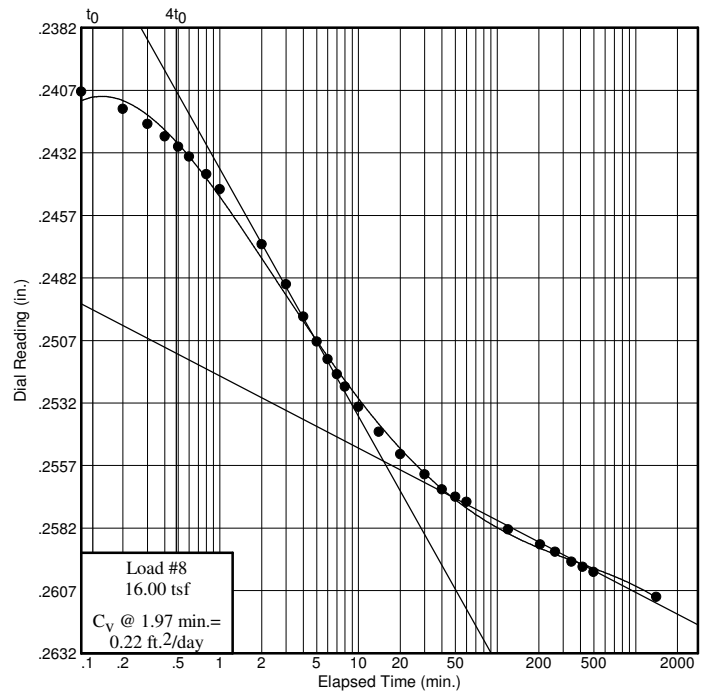
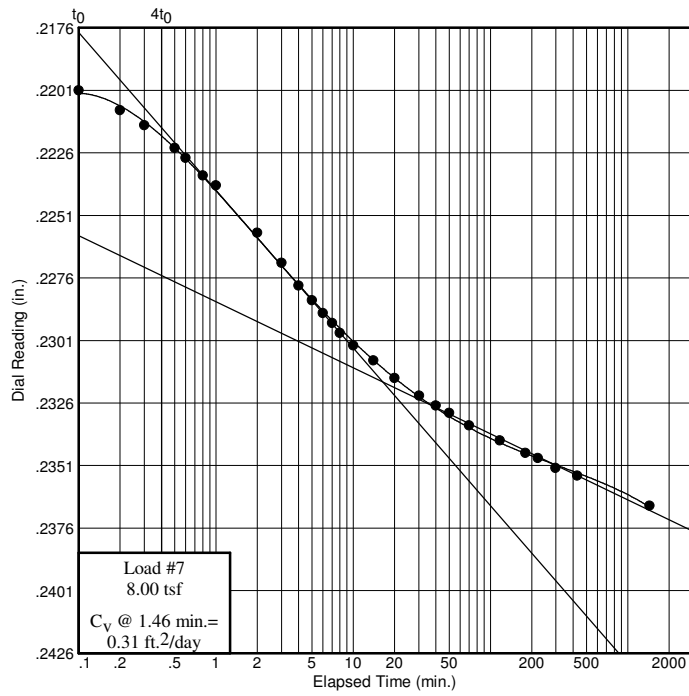
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1003

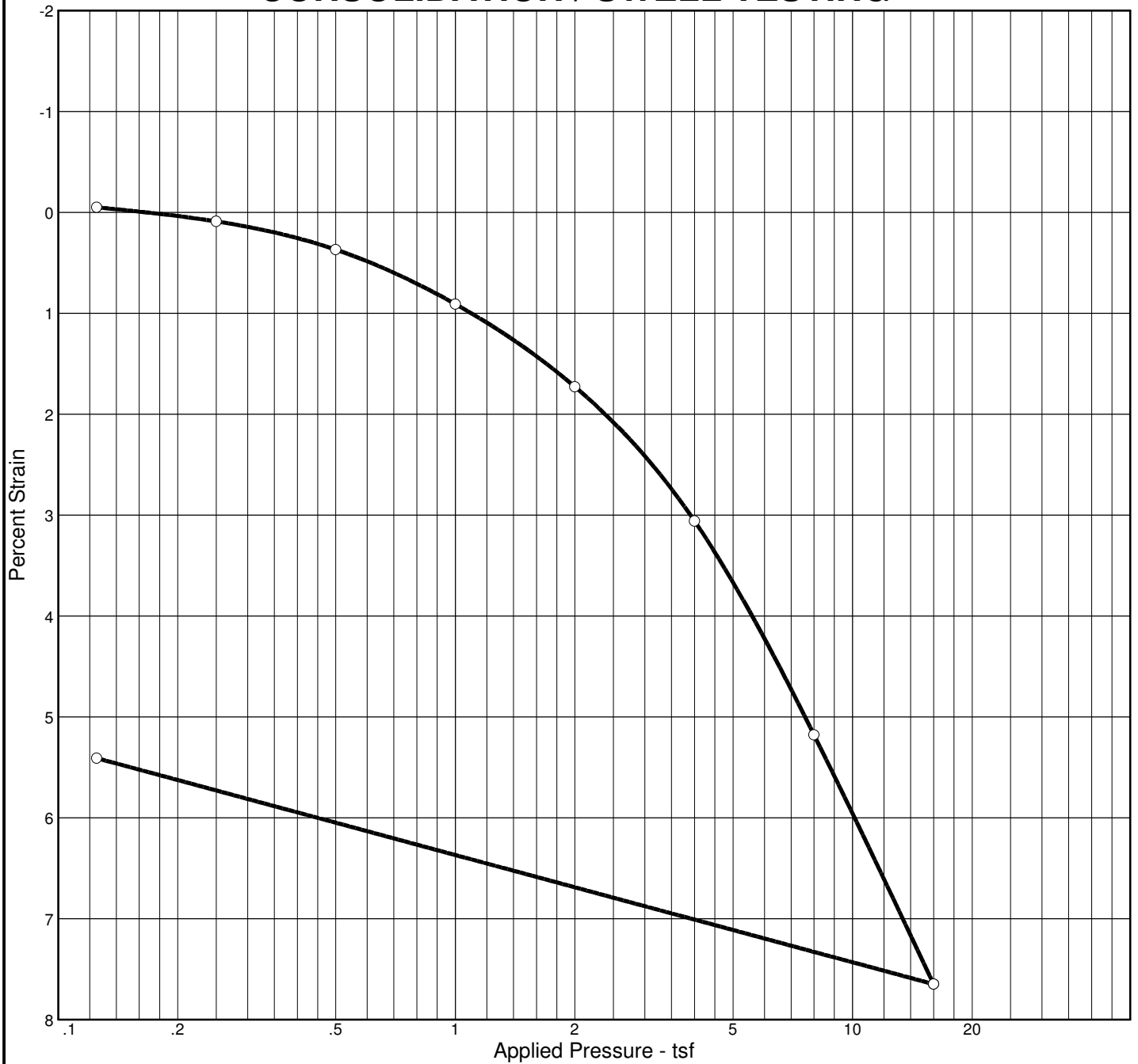
Elev./Depth: 19.5-21.5'



BRAUNSM
INTERTEC

Figure

CONSOLIDATION / SWELL TESTING



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Swell Press. (tsf)	Swell %	e ₀
Sat.	Moist.											
98.7 %	15.6 %	118.1			2.70		4.14	0.12	0.02			0.428

MATERIAL DESCRIPTION	USCS	AASHTO
SANDY LEAN CLAY, brown (CL)	CL	

Project No. B1706398 Project: TCAAP Redevelopment - Mass Grading NE of US Hwy 10 and Hwy 96, Arden Hills, MN Source:	Client: Kimley-Horn and Associates, Inc. Sample No.: ST-1003 Elev./Depth: 59.5-61.5'	Remarks: ASTM D 2435
		Figure

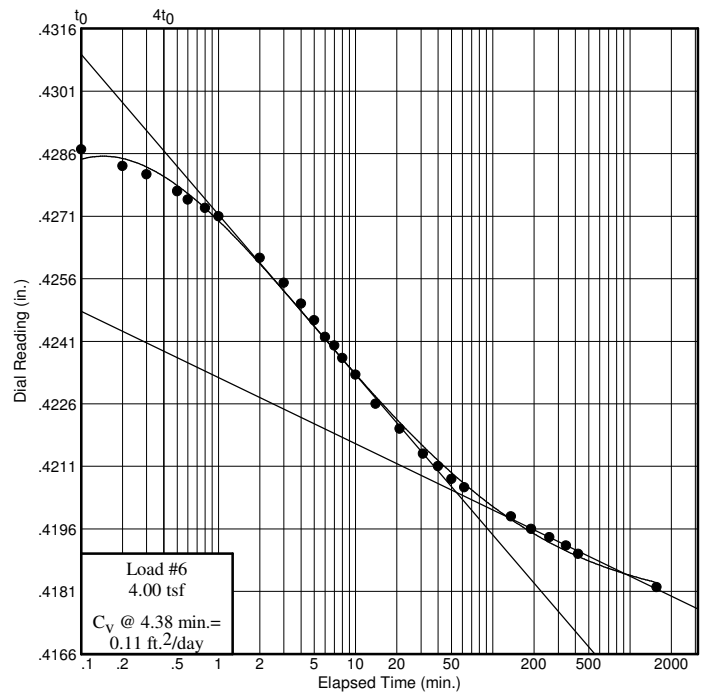
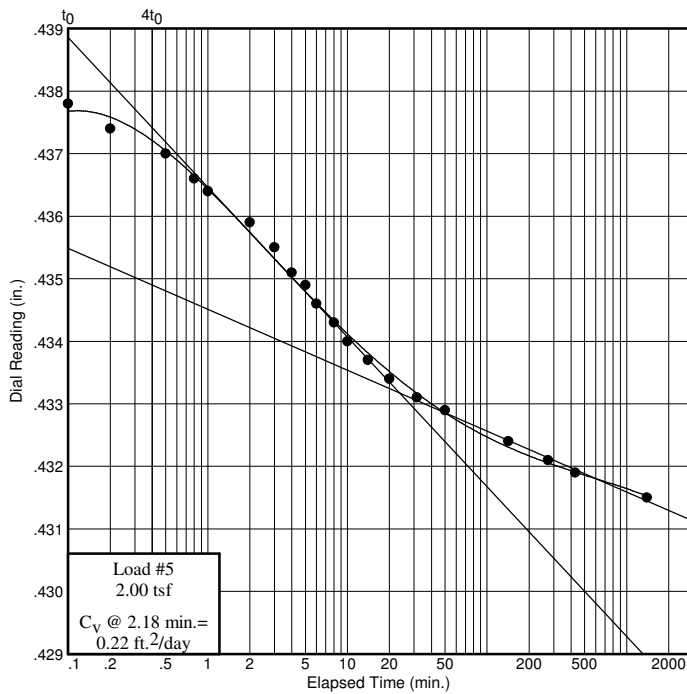
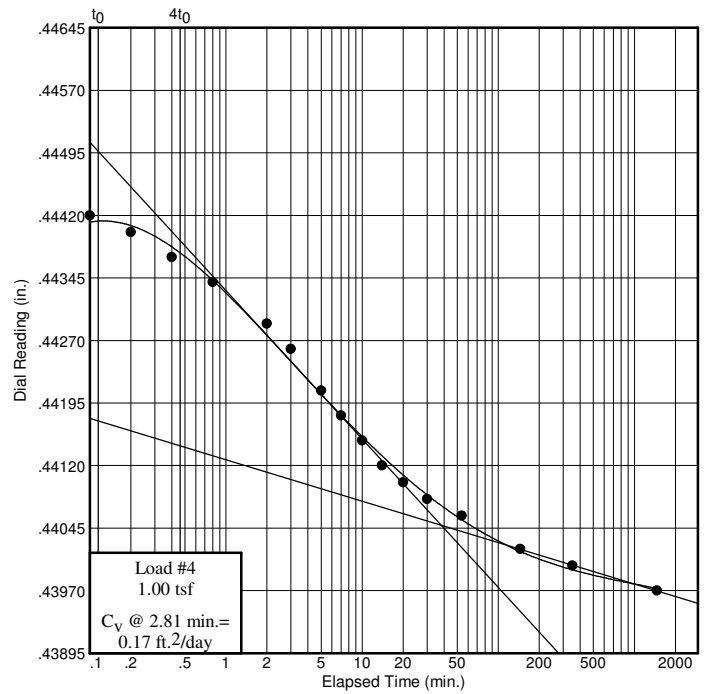
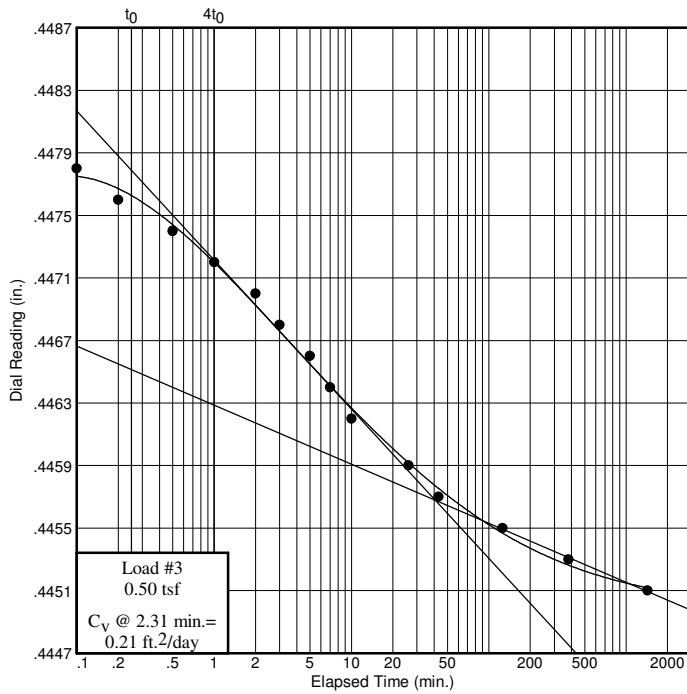
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1003

Elev./Depth: 59.5-61.5'



BRAUNSM
INTERTEC

Figure

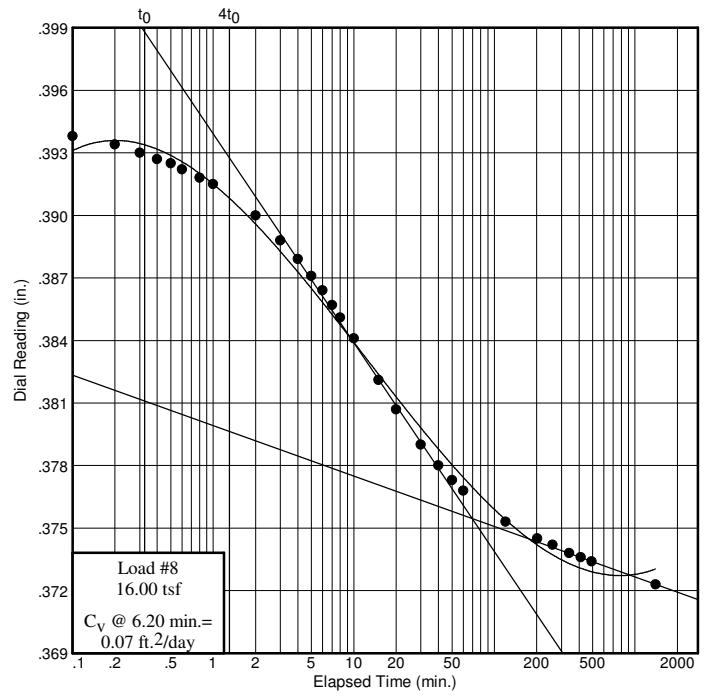
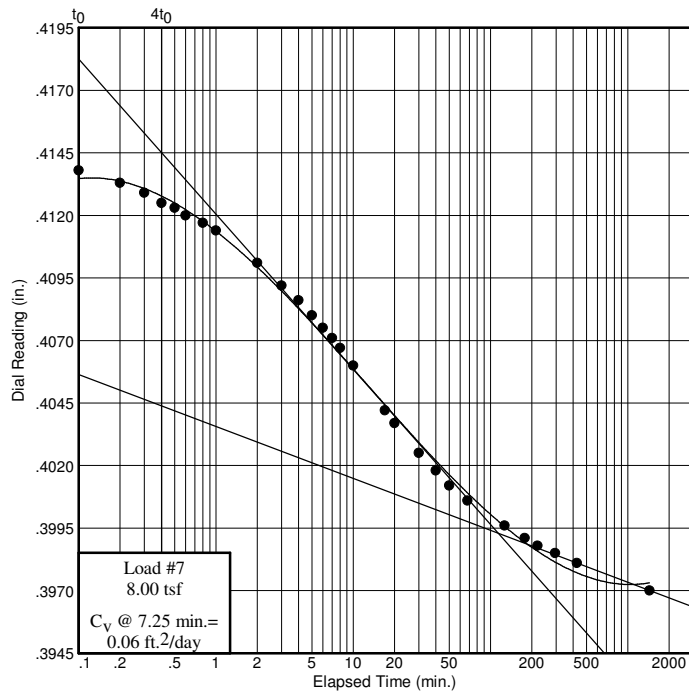
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1003

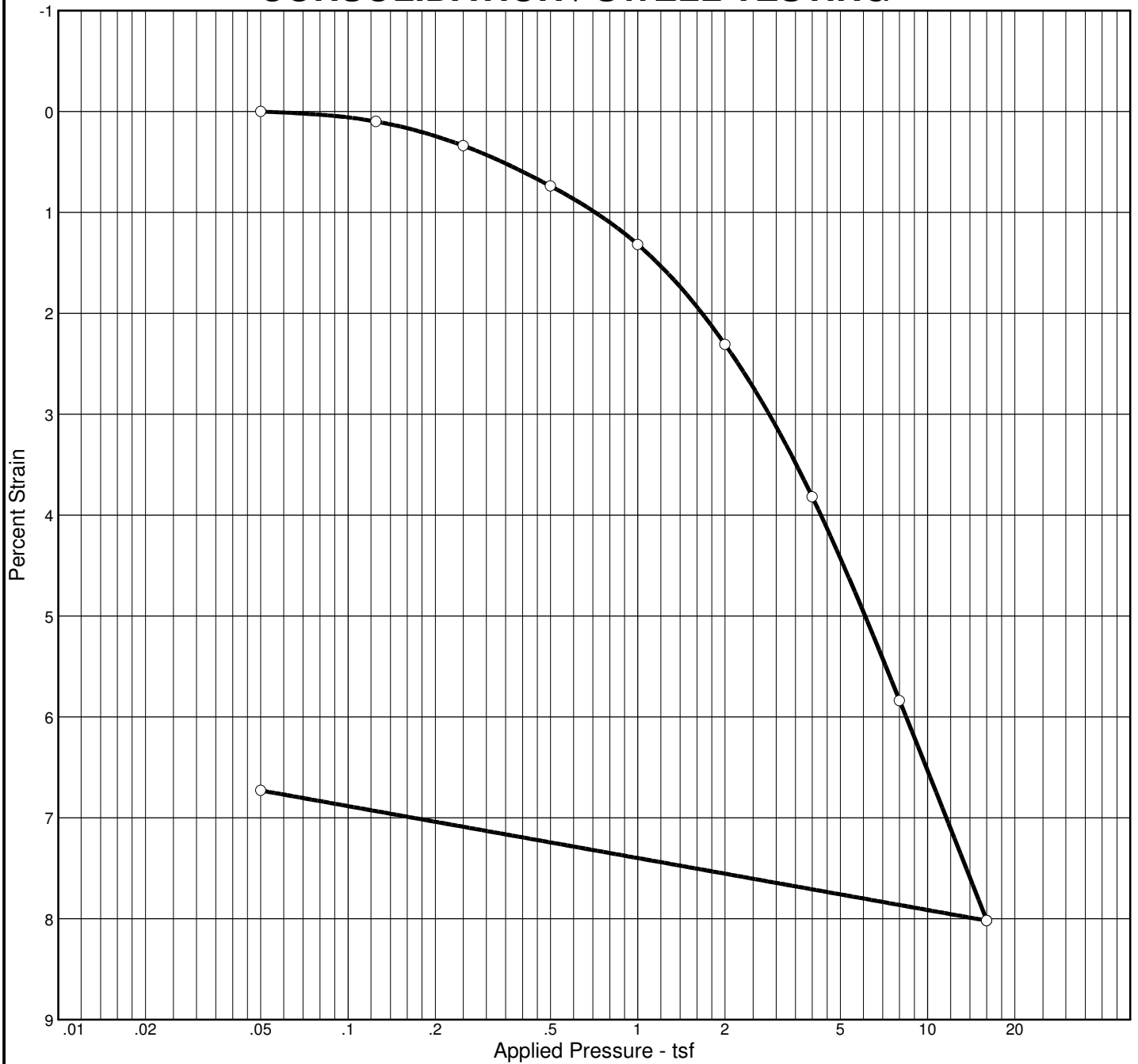
Elev./Depth: 59.5-61.5'



BRAUNSM
INTERTEC

Figure

CONSOLIDATION / SWELL TESTING



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Swell Press. (tsf)	Swell %	e ₀
Sat.	Moist.											
97.4 %	14.9 %	119.4			2.70		1.44	0.10	0.01			0.412

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY SAND, brown (SC)	SC	

Project No. B1706398 Project: TCAAP Redevelopment - Mass Grading NE of US Hwy 10 and Hwy 96, Arden Hills, MN Source:	Client: Kimley-Horn and Associates, Inc. Sample No.: ST-1007 Elev./Depth: 19.5-21.5	Remarks: ASTM D 2435
		Figure

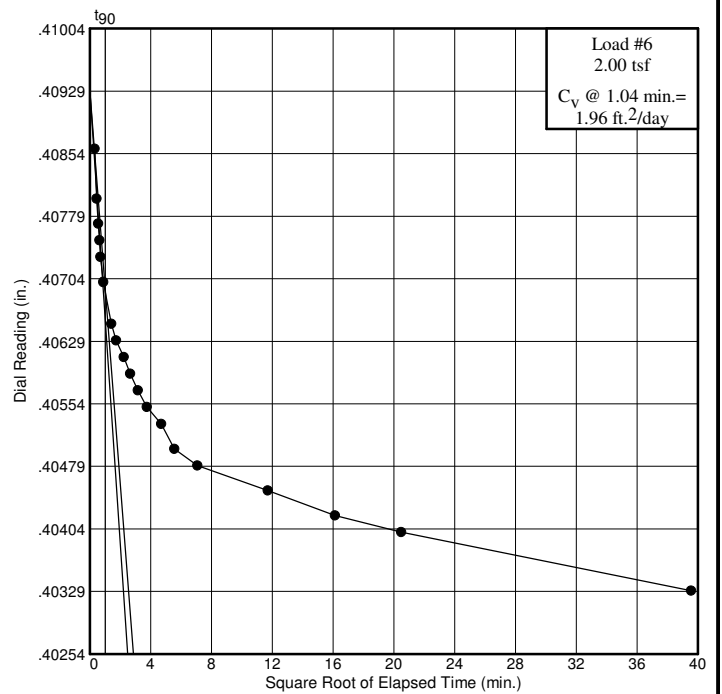
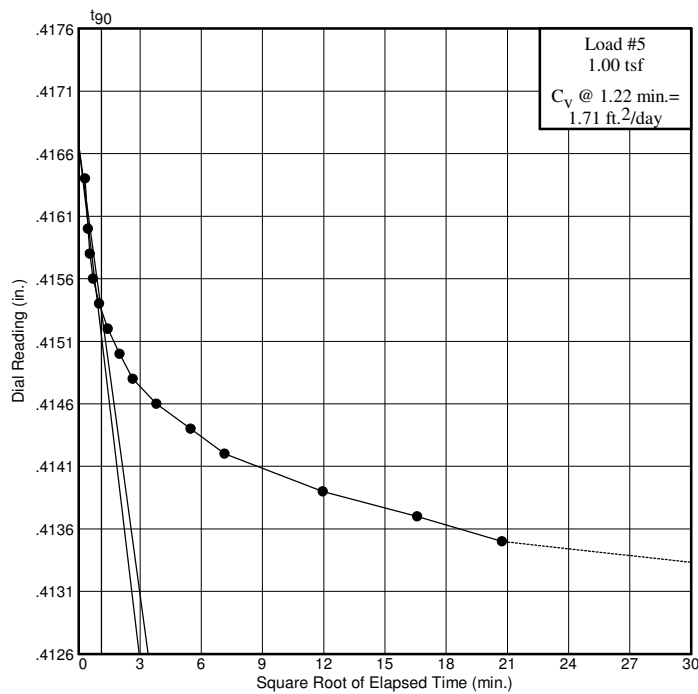
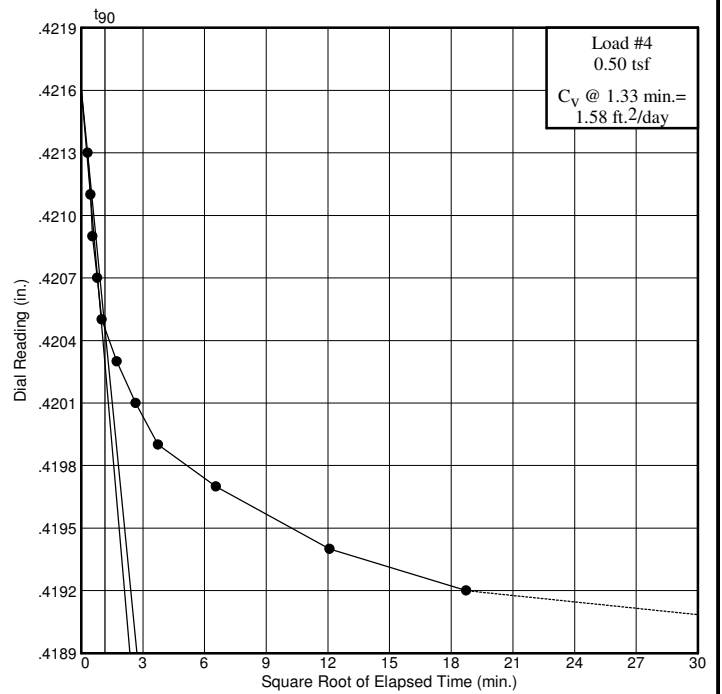
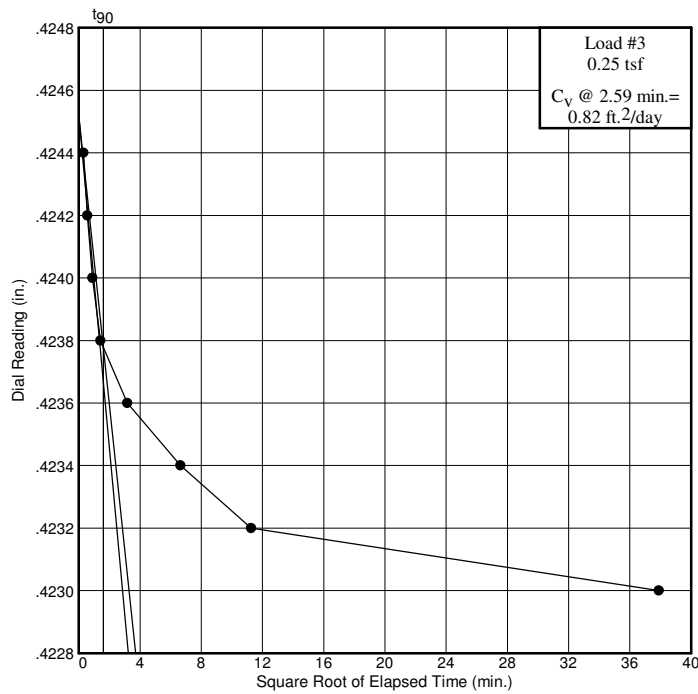
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1007

Elev./Depth: 19.5-21.5



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INTERTEC

Figure

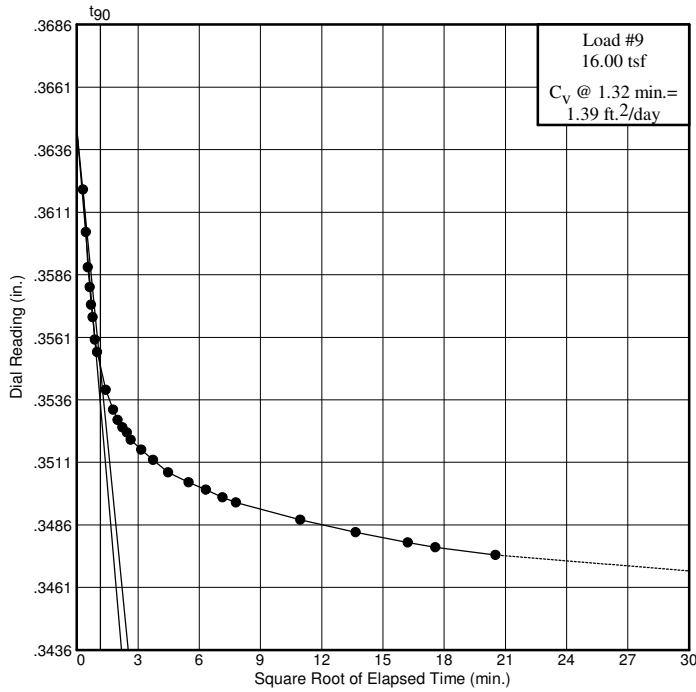
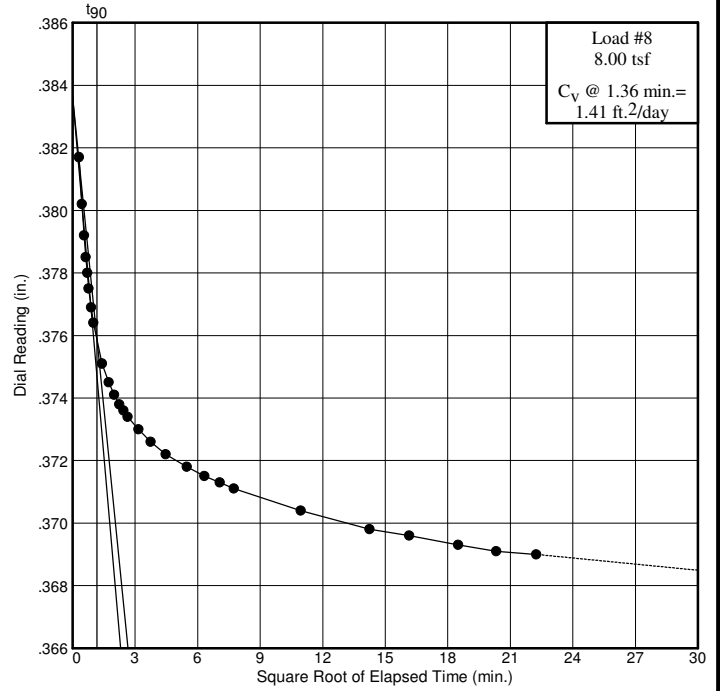
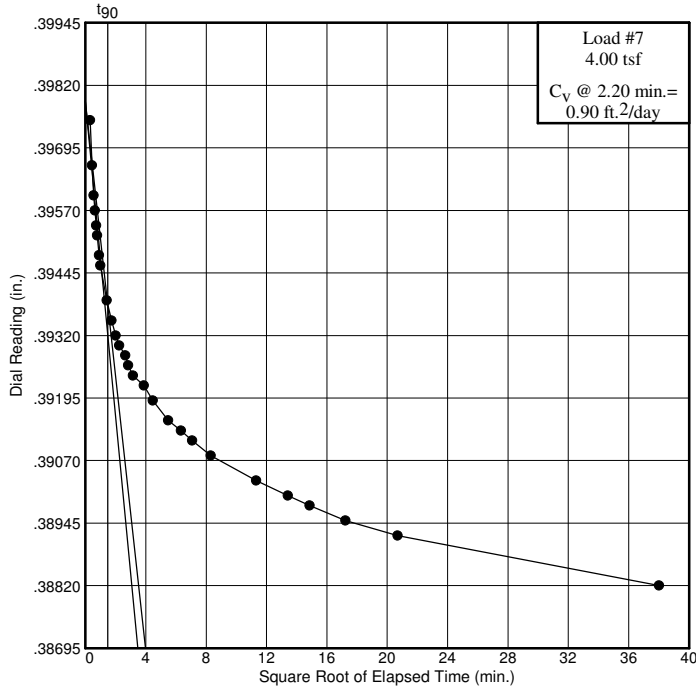
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1007

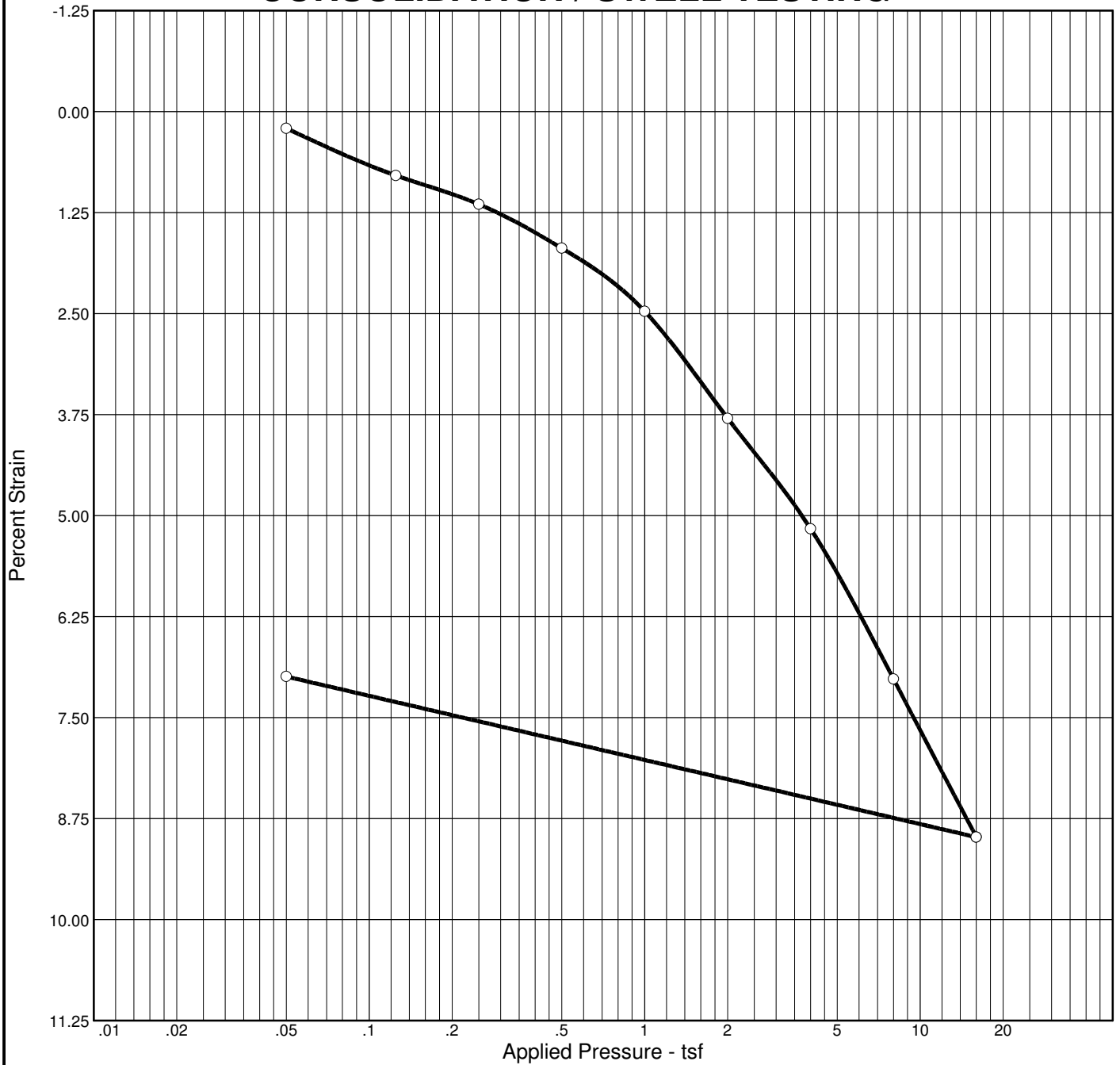
Elev./Depth: 19.5-21.5



BRAUNSM
INTERTEC

Figure

CONSOLIDATION / SWELL TESTING



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Swell Press. (tsf)	Swell %	e ₀
Sat.	Moist.											
93.0 %	13.9 %	120.0			2.70		1.90	0.09	0.01			0.405

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY SAND, brown (SC)	SC	

Project No. B1706398 Project: TCAAP Redevelopment - Mass Grading NE of US Hwy 10 and Hwy 96, Arden Hills, MN Source:	Client: Kimley-Horn and Associates, Inc. Sample No.: ST-1009 Elev./Depth: 13-13.5'	Remarks: ASTM D 2435
		Figure

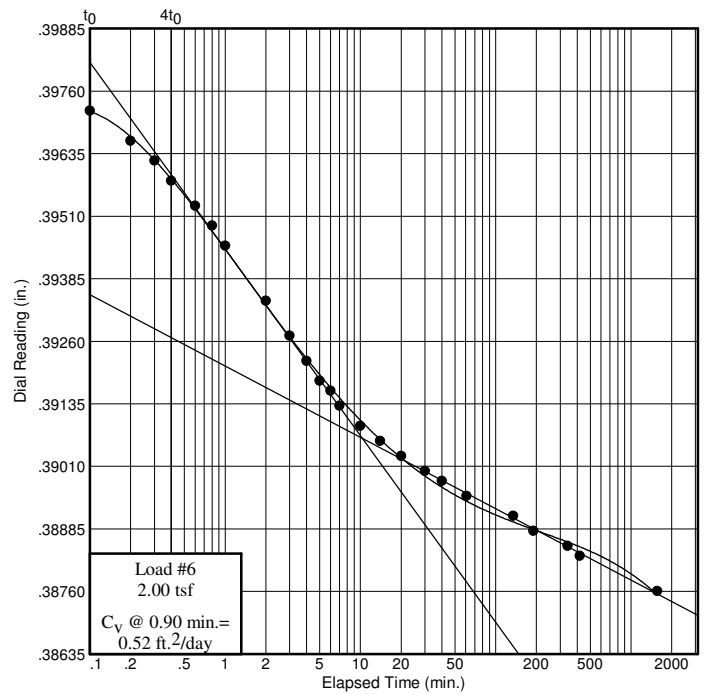
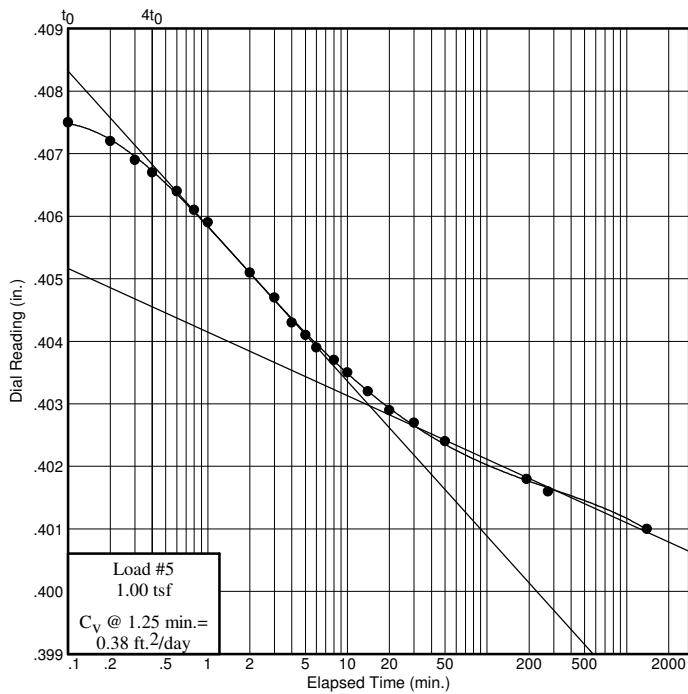
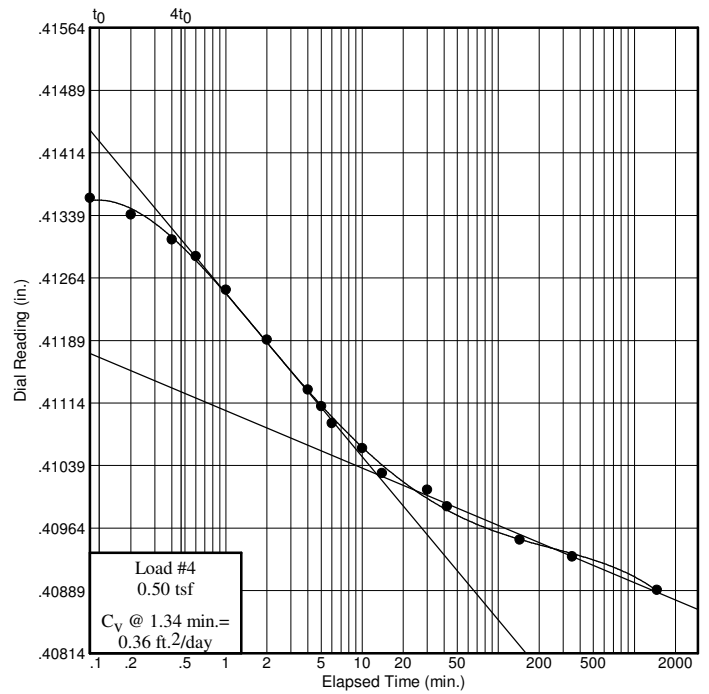
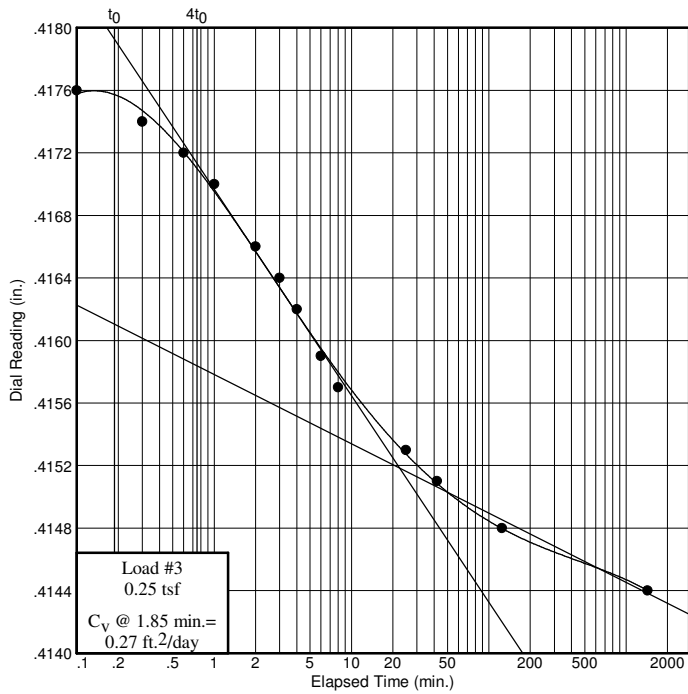
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1009

Elev./Depth: 13-13.5'



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INTERTEC

Figure

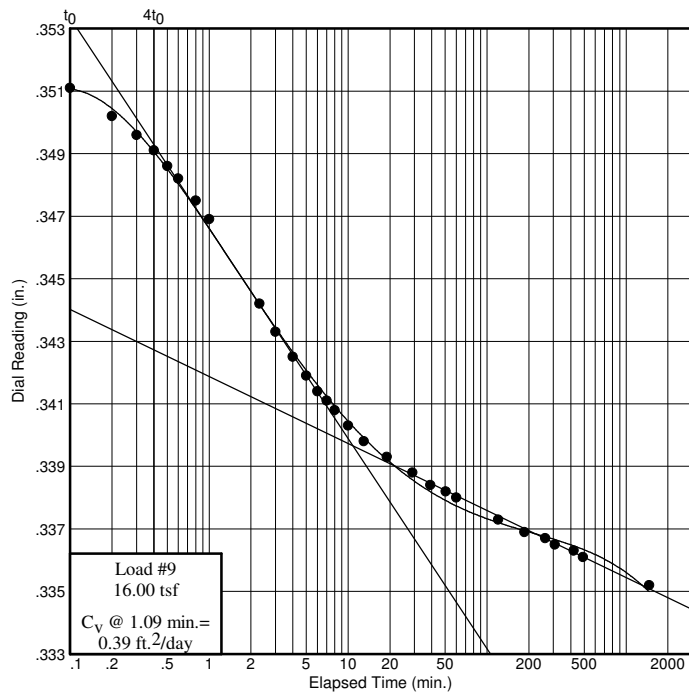
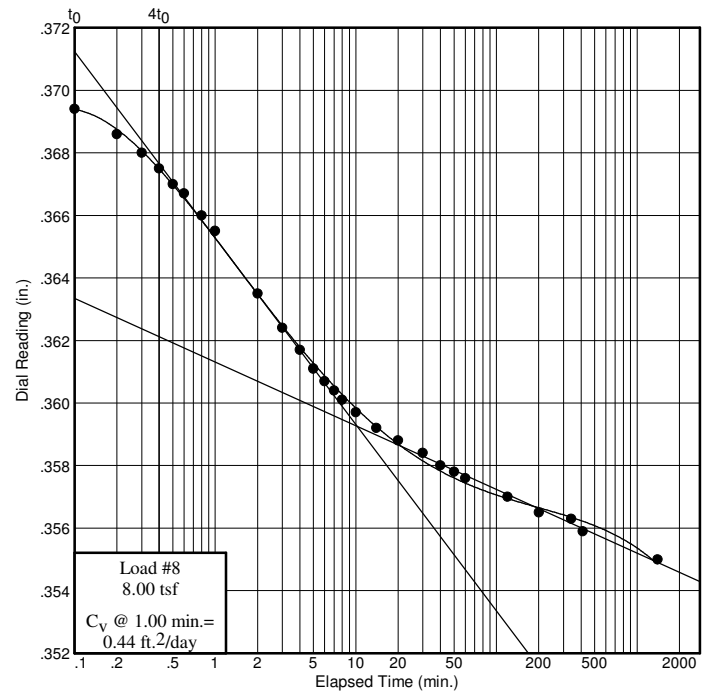
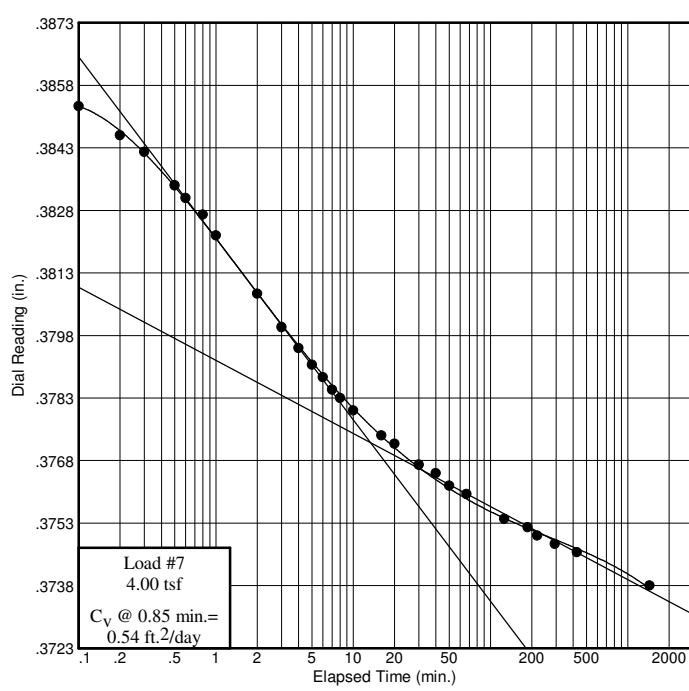
Dial Reading vs. Time

Project No.: B1706398

Project: TCAAP Redevelopment - Mass Grading
NE of US Hwy 10 and Hwy 96, Arden Hills, MN

Source: Sample No.: ST-1009

Elev./Depth: 13-13.5'



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Figure

Appendix G

Stormwater Infiltration

Figure G1: Area 4

Figure G2: Area 3

DRAFT

Appendix H

Groundwater Level Data

Figure H1: North
Figure H2: North Central
Figure H3: South Central
Figure H4: South
Figure H5: 2018 Comparison

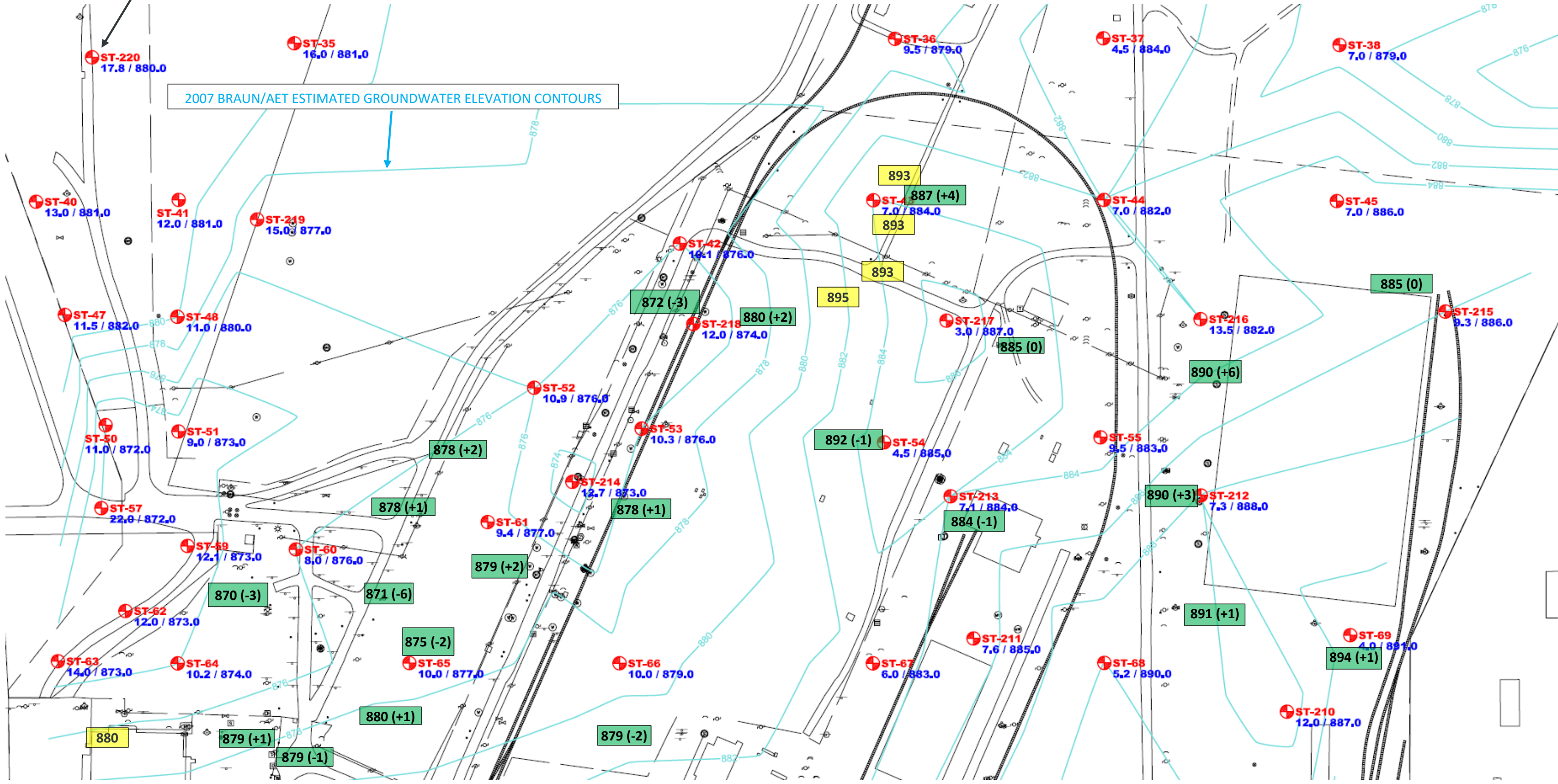
DRAFT

Groundwater Level Desktop Review
TCAAP Redevelopment
May 8, 2018

TCAAP Northern Portion
Figure H1
Braun Project B1706398

APPROXIMATE LOCATION OF 2007 BRAUN/AET SOIL BORING
DEPTH TO GROUNDWATER / CORRESPONDING ELEVATION

2007 BRAUN/AET ESTIMATED GROUNDWATER ELEVATION CONTOURS



XXX APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (AECOM 2011)

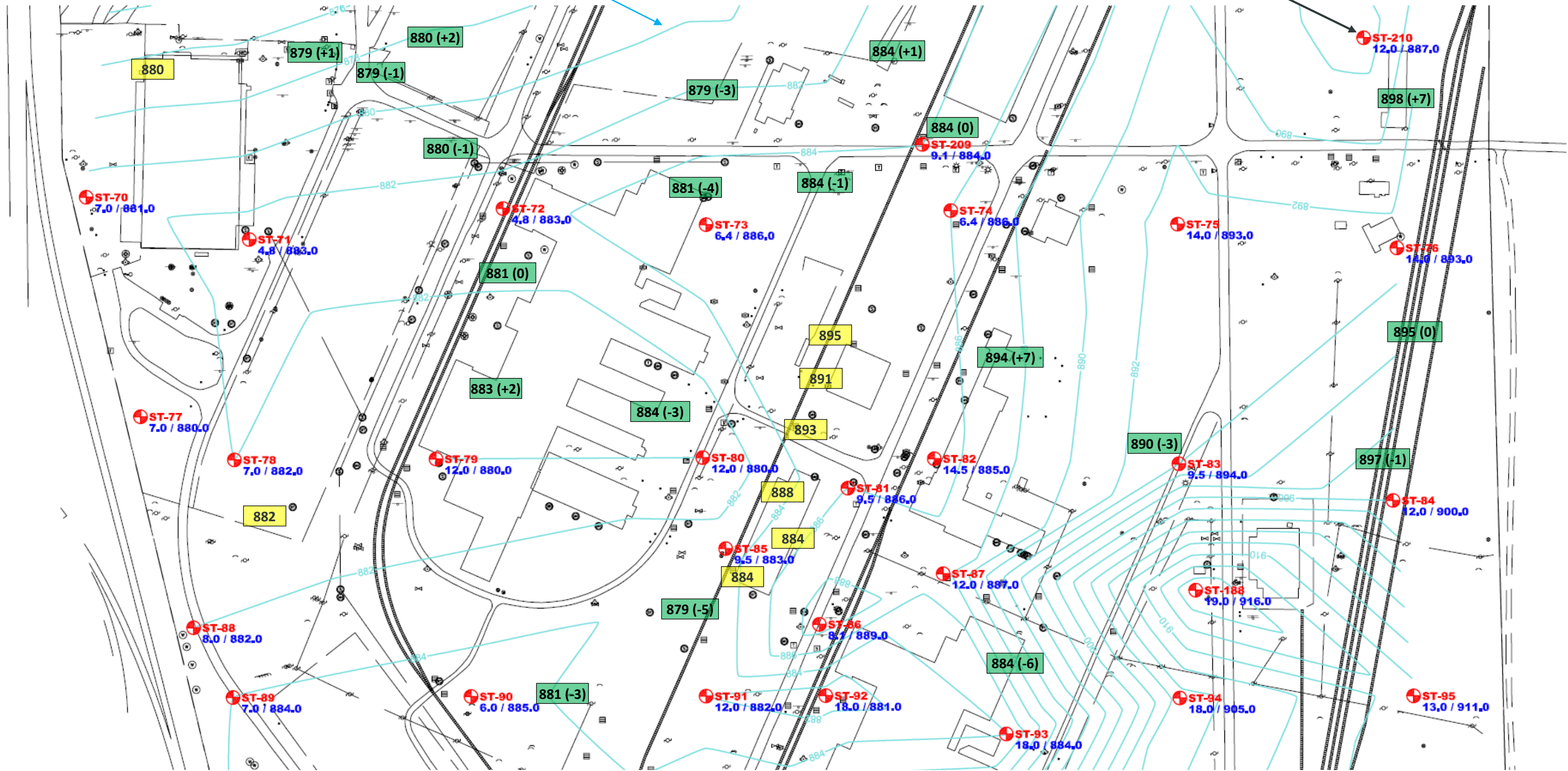
XXX (± Y) APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (WENCK 2015)
(± Y): DELTA (FT) COMPARED TO 2007 BRAUN/AET ESTIMATED GROUNDWATER ELEVATION CONTOURS

Groundwater Level Desktop Review
TCAAP Redevelopment
July 17, 2018

TCAAP North Central Portion
Figure H2
Braun Project B1706398

2007 BRAUN/AET ESTIMATED GROUNDWATER ELEVATION CONTOURS

APPROXIMATE LOCATION OF 2007 BRAUN/AET SOIL BORING
DEPTH TO GROUNDWATER / CORRESPONDING ELEVATION



XXX APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (AECOM 2011)

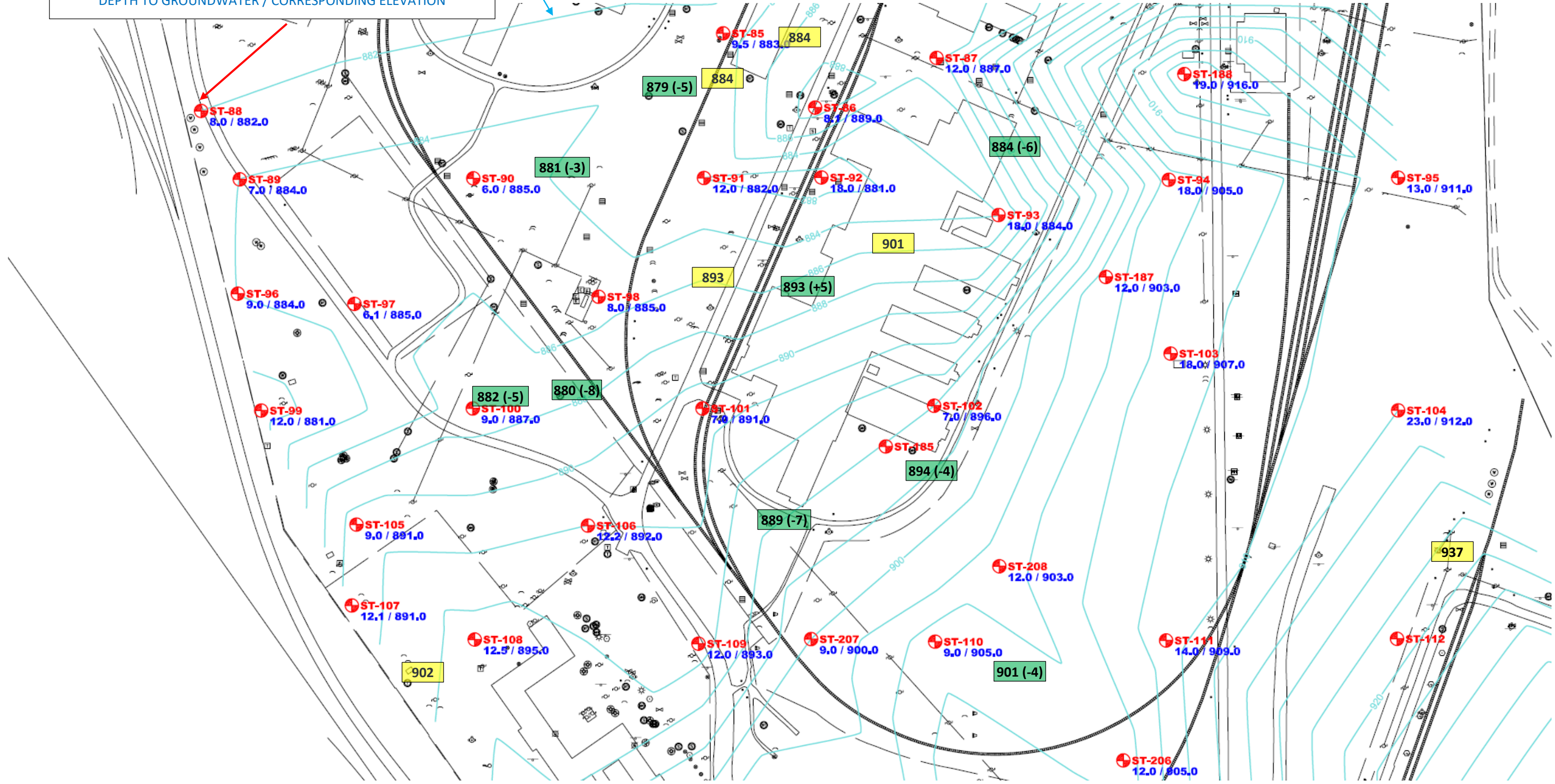
XXX (± Y) APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (WENCK 2015)
(± Y): DELTA (FT) COMPARED TO 2007 BRAUN/AET ESTIMATED GROUNDWATER ELEVATION CONTOURS

2007 BRAUN/AET ESTIMATED GROUNDWATER ELEVATION CONTOURS

Groundwater Level Desktop Review TCAAP Redevelopment May 8, 2018

TCAAP South Central Portion
Figure H3
Braun Project B1706398

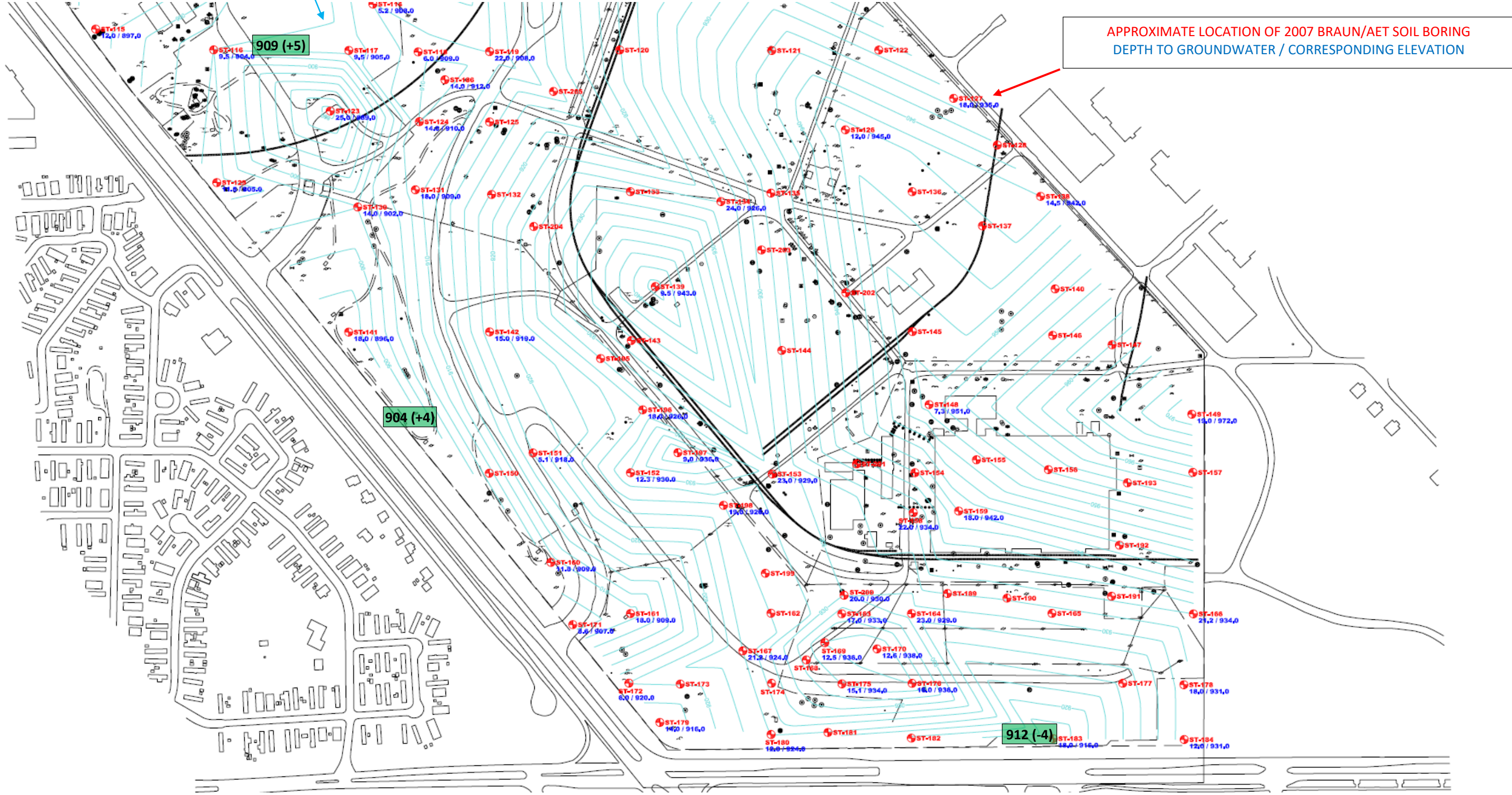
APPROXIMATE LOCATION OF 2007 BRAUN/AET SOIL BORING
DEPTH TO GROUNDWATER / CORRESPONDING ELEVATION



XXX APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (AECOM 2011)

XXX (± Y) APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (WENCK 2015)
(± Y): DELTA (FT) COMPARED TO 2007 BRAUN/AET ESTIMATED GROUNDWATER ELEVATION CONTOURS

Groundwater Level Desktop Review
TCAAP Redevelopment
May 8, 2018



XXX APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (AECOM 2011)

XXX (± Y)

XXX: APPROXIMATE LOCATION OF GROUNDWATER LEVEL MEASUREMENT (WENCK 2015)
(± Y): DELTA (FT) COMPARED TO 2007 BRAUN/AET ESTIMATED GROUNDWATER ELEVATION CONTOURS

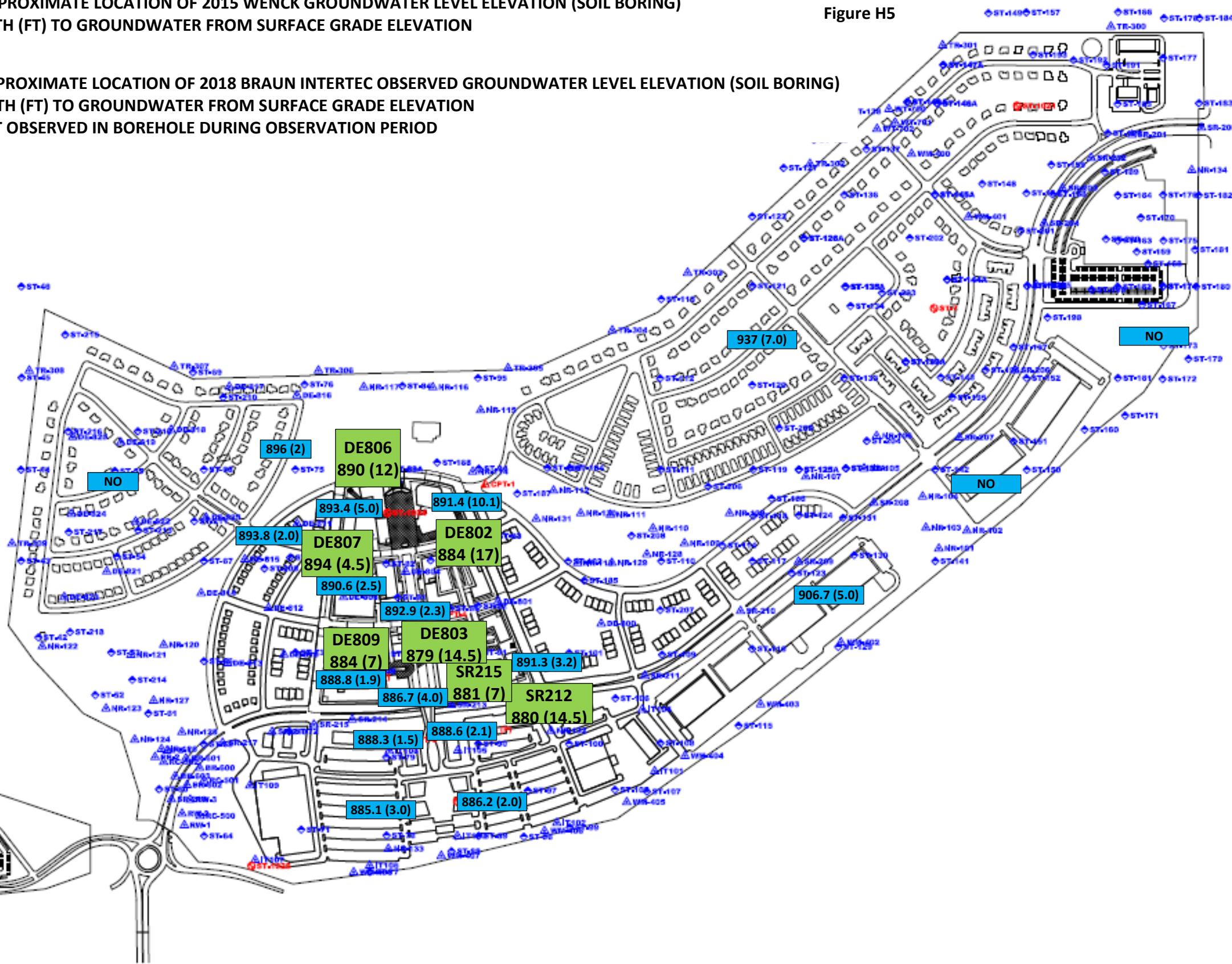
XXX (± Y)

XXX: APPROXIMATE LOCATION OF 2015 WENCK GROUNDWATER LEVEL ELEVATION (SOIL BORING)
(Y): DEPTH (FT) TO GROUNDWATER FROM SURFACE GRADE ELEVATION

Figure H5

XXX (Y)

XXX: APPROXIMATE LOCATION OF 2018 BRAUN INTERTEC OBSERVED GROUNDWATER LEVEL ELEVATION (SOIL BORING)
(Y): DEPTH (FT) TO GROUNDWATER FROM SURFACE GRADE ELEVATION
NO: NOT OBSERVED IN BOREHOLE DURING OBSERVATION PERIOD



- DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING
- P = PIEZOMETER
- MW = MONITORING WELL
- CPT = CONE PENETRATION TEST SOUNDING
- ▲ DENOTES APPROXIMATE LOCATION OF CONE PENETRATION TEST SOUNDING

- ◆ DENOTES APPROXIMATE LOCATION OF PREVIOUS SOIL BORING PERFORMED BY AET / BRAUN INTERTEC
- ▲ DENOTES APPROXIMATE LOCATION OF PREVIOUS SOIL BORING PERFORMED BY WENCK



300' 0 600'
SCALE: 1" = 600'

Base Drawing Provided By
Alliant Engineering, Inc.



Drawing Information	
Project No:	B1706398
Drawing No:	B1706398
Drawn By:	BJB
Date Drawn:	4/23/18
Checked By:	JCK
Last Modified:	5/7/18

Project Information
TCAAP Redevelopment -
Mass Grading
Northeast of US Highway
10 and Highway 96
Arden Hills, Minnesota

Soil Boring and
CPT Sounding
Sketch