



Independent Testing Technologies, Inc.

FEBRUARY 26, 2018

**PROJECT 18-009
REPORT OF GEOTECHNICAL EXPLORATIONS**

For

**SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA**

Prepared For:

K JOHNSON CONSTRUCTION



Independent Testing Technologies, Inc.

February 26, 2018

Mr. Kevin Johnson
K Johnson Construction
6870 Highway 10 NW
Sauk Rapids, MN 56379

RE: 18-009 Report of Geotechnical Exploration
 Southview Heights
 St. Joseph, Minnesota

Dear Mr. Johnson:

Independent Testing Technologies, Inc. is pleased to submit this report based on the results of our subsurface investigation program for the proposed planned residential housing development in St. Joseph, Minnesota. This report represents our work for this project as authorized by you. It includes our recommendations regarding earthwork, fill and compaction, foundation design, estimated settlement, wall backfill, floor slab support and pavement design.

The soils on this site are well suited for the proposed building and site improvements. The majority of the soils encountered were poorly graded sands with silt (SP-SM) overlying poorly graded sands (SP) with gravel. Groundwater was observed in four of the borings at depths of 13' 3" to 14' 6" during drilling. Soil samples obtained during our investigation will be stored at our office for thirty days after the date of this report. After that time, they will be disposed of unless you advise otherwise.

Mr. Johnson, it has been our pleasure to work with you on this project. Please contact Patrick Johnson if you have any questions regarding this report. Please contact Daryl Dhein if you would like a proposal for the materials testing services that will be needed during the construction phase.

Sincerely,

A handwritten signature in blue ink that reads "Patrick Johnson".

Patrick A. Johnson, P.E.
MN Registration #22037

A handwritten signature in blue ink that reads "Kevin T. Reller".

Kevin T. Reller
Vice President

CERTIFICATION

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



Patrick A. Johnson

Date: February 26, 2018 Registration No.: 22037

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**GEOTECHNICAL EXPLORATIONS
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA
ITT PROJECT 18-009**

A. Introduction

This report is being prepared for use by our client on this specific project. We intend to present this report and our findings in the same logical manner that led us to arrive at our recommendations. This report is based on some general assumptions regarding the anticipated construction based on experience with similar projects. These assumptions and the entire report should be reviewed immediately upon receipt.

Purpose:

The purpose of our investigation was to evaluate the existing soil and water conditions on this site for purposes of designing and constructing a new senior living building in St. Joseph, Minnesota. The project will consist of construction of a planned unit development consisting of three (3) 8-plex multi-family housing units and 14 duplex and patio homes west of 20th Avenue Southeast and south of Minnesota Street. Public utilities will be installed and private drives will be constructed to provide access. We understand the structures will be one and two-story, slab-on-grade, wood framed buildings on standard cast-in-place, concrete spread footings with appurtenant bituminous parking lot and an expansion of the existing storm water pond on the south end of the project site.

Scope of Services:

Our authorized scope of services included the following:

1. To investigate the subsurface soil and water conditions encountered at eight (8) split-spoon soil boring locations. The borings were planned to be just under fifteen (15) feet deep in the building area. The approximate locations are shown on the boring location plan in Appendix 1.

2. To provide a report of our recommendations regarding earthwork, fill and compaction, utility installation, building pad preparation, foundation design, slab support, soil bearing capacities, wall backfill, storm water pond, parking lot subgrade preparation and pavement design.

General Site Conditions:

The development is on the east side of 20th Avenue SE, just south of Minnesota Street East in St. Joseph, Minnesota. The site is bounded by 20th Avenue on the east, a vacant parcel to the north, a single family residential neighborhood to the west and stormwater pond to the south. The site is relatively flat with slopes of 0 to 2 percent.

Available Subsurface Information:

According to the Geologic Map of Minnesota, Quaternary Geology, prepared by Howard C. Hobbs and Joseph E. Goebel (1982, Minnesota Geological Survey), this site lies within an outwash unit not associated with a particular moraine. It is associated with the Des Moines glaciation of Pleistocene, Late Wisconsinan age. The drift is derived from parent material in North Dakota and Manitoba.

According to the Soil Survey of Stearns County prepared by the Soil Conservation Service, the site lies within the Hubbard-Dickman Soil Association. These consist of nearly level to sloping, excessively drained and well drained, coarse textured and moderately coarse textured soils formed in a sandy or loamy mantle and underlying outwash under savanna vegetation. Most of the individual soils mapped on this site are sandy and have slight limitations for development of commercial building sites.

B. Exploration Program

Eight (8) split-spoon soil borings were conducted on this project. The borings were advanced to just under 15 feet deep using a 3 ¼ inch I.D. hollow stem auger. Samples were obtained every 2 ½ feet for the first 10 feet and every 5 feet thereafter using a 2-inch O.D. split spoon sampler in accordance with the American Society for Testing and Materials (ASTM D1586). Standard penetration values (N-values) were obtained at each sample interval by driving the sampler into the soil using a 140-pound hammer falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler 12 inches is known as the standard penetration resistance or N-value. Where the sampler can not be driven at least 6 inches by 50 blows of the hammer, the total number of blows as well as the distance driven is reported on the boring logs.

Groundwater levels were noted during drilling and immediately after completion. The holes were backfilled with the auger cuttings. Some settlement of the bore holes may be expected. All of the borings were conducted with a truck mounted drill rig. The surface elevations at each boring location was provided by your surveyor.

Exploration Results:

The borings were conducted in the existing open vacant lot. All the borings encountered silty sand (SM) topsoil material from the surface to depths of 10 to 18 inches. Below the topsoil, the borings generally encountered native, poorly graded sands with silt (SP-SM) that changed to poorly graded sand (SP) to termination. Some gravel was present in most of the borings, with some cobbles noted in borings SB2 and SB-4.

Penetration Test Results:

The standard penetration blow counts in the native sandy outwash (SP, SP-SM) soils ranged from 4 to 43, which are low to high, indicating that they are in a loose to very dense condition. Refusal of the spoon occurred in SB-4 on cobbles. Refusal of the auger did not occur in any of the borings. Drilling was relatively easy.

Water Level Observations:

Observations of the subsurface water conditions were made during drilling operations. Groundwater was encountered in borings SB-1, SB-5, SB-6 and SB-8 at depths of 14' 6", 14' 3", 14' 0" and 13' 3" during drilling. Although the water levels were observed over a short period of time, we feel they are an accurate representation of the water conditions on this site at the time of our exploration, due to the high permeability of the native sand soils.

It should be noted that fluctuations in the level of the groundwater can occur due to variations in rainfall, temperature, spring thaw and other factors not evident at the time of our investigation. Mottled soils were not observed. Mottled native soils are a historical indication of a temporarily or seasonally saturated soil condition. Grey soils were also not observed. Grey native soils are an indication of a permanently saturated soil condition.

C. Engineering Review

Discussion:

The proposed buildings will be one and two-story, slab-on- grade, wood framed structures on standard cast-in-place, concrete spread footings. We assume exterior footings will be placed at depths of 2 to 3 feet below the existing ground level and interior footings will be placed at a depth of 1 to 2 feet below existing grade. Foundation loads are expected to be in the range of 4 to 6 kips per linear foot for wall footings and 100-200 kips for interior column loads. The native soils on this site appear suitable for support of the proposed building.

Based on our findings, the soils on this site appear to be well suited for the proposed utility, street and residential building construction. The sandy outwash soils (SP) encountered on this site should be considered excellent for use as roadway and parking lot subgrade material and bituminous pavement support. They are excellent for use as fill and backfill and easily compacted with vibratory compaction equipment. They are also excellent for infiltration for storm water treatment.

D. Recommendations

The following recommendations are based on our understanding of the proposed project. If our understanding of the project is not accurate, or if changes are made to the project scope, please inform us so that our recommendations can be amended, if necessary. We have included recommendations regarding earthwork and construction that may help in cost estimates and aid in design. We should be allowed to review the proposed construction plans to provide further detailed recommendations, if necessary. Without the opportunity to review the final construction plans, the recommendations made in this report may no longer be valid.

Site Grading:

We recommend that the existing topsoil be removed from the building and parking lot areas prior to placing any fill or beginning construction. The topsoil should be removed from the site or stockpiled and re-used for landscaping. We estimate this will require an excavation of 10 to 18 inches across the site. It should be noted that the topsoil is fairly sandy and may not meet MnDot specifications for topsoil borrow.

We recommend the bottom of the excavation be observed by a soils engineer or a qualified technician to verify that native, competent material has been reached prior to placing fill or

foundations. We recommend any excavation to remove unsuitable material from the building areas be oversized one foot for every foot of fill required to reach planned grade (1:1 oversizing). After removal of any unsuitable soils, we recommend clean, mineral fill, meeting the requirements of structural fill, be placed and compacted to bring the building and pavement areas to grade.

Utility Installation:

We recommend that all utility pipes lay in non-organic mineral soils capable of supporting the pipes. Excessive over-excavation beneath the pipes should be avoided. We recommend that 2 to 6 inches of granular bedding material be placed and compacted around the pipe to aid in aligning the sanitary sewer pipe for line and grade. Granular bedding beneath watermain and storm sewer pipe is not as critical. Compaction should be done very carefully by hand to prevent the pipe from shifting. We recommend that the backfill be compacted with a static sheep's foot roller after the backfill is 2 feet above the top of the pipe. Vibratory compaction should only be used on clean sands or silty sands near their optimum moisture content as determined by a standard proctor.

We recommend that excavations slope at a 2:1 (horizontal: vertical) ratio from the bottom of the excavation to the surface, which may be less steep than the minimum requirements for an OSHA "Type C" soil. Stockpiled material should be kept at least 2 feet from the edge of the excavation. This is the minimum required by OSHA. We recommend all construction vehicles be kept at least 5 feet from the edge of the excavation. An escape ladder should be provided at all times while workers are in the excavation. All excavations must meet OSHA standards (29 CFR1926).

We recommend that all utility trench backfill below a depth of three feet from finished roadway subgrade elevation be compacted to at least 95% of standard proctor maximum density. Any utility trench backfill placed in the upper three feet of any roadway should be compacted to at least 100% of standard proctor maximum density. We recommend compaction tests be taken at a rate of one test per 200 linear feet of trench in each of the upper and lower zones.

Construction Dewatering:

Dewatering will not likely be required for utility installation unless utilities are planned at depths

below the groundwater elevations shown on the borings logs. It is our opinion that a series of well points may be best suited in the poorly graded sands at depth. We recommend a dewatering contractor be consulted for design and installation of an adequate system. We recommend that any standing water be removed from the utility trenches prior to backfilling. In addition, we recommend that any utility trench backfill material placed in standing water consist of clean sands with less than 5% passing the number 200 sieve.

Structural Fill:

The native, on-site soils consisting of poorly graded sands (SP) and poorly graded sands with silt (SP-SM) are considered excellent material for use as structural fill. These soils are not susceptible to moisture variations and are easy to work with, even if they become wet. These soils are fairly easy to compact using vibratory compaction equipment, especially when at or near optimum moisture content for compaction. The fill soils can be re-used as structural fill.

We recommend that any imported fill consist of mineral soils meeting the following requirements. No organic soils, roots, stumps, logs, brush, etc. should be used as structural fill below any foundation or pavement section. We recommend that all fill material be free of soft, wet or frozen soils, highly expansive soils, rubble, debris and rocks in excess of 6 inches in diameter. The fill should be as uniform as possible both in composition and moisture content. We recommend all fill be compacted to the minimum relative density levels shown in the table below:

Location	Recommended Compaction (% Std. Proctor)
Below Foundations	100 %
Below Slabs, including interior and exterior wall backfill	95%
Below Pavements, deeper than 3 feet from finished subgrade	95%
Below Pavements within 3 feet of finished subgrade	100%
Landscape Areas	90%

All fill should be compacted at a moisture content within plus or minus 3% of the optimum moisture as determined by a standard proctor. We recommend compaction tests be taken on the building lots during mass grading at a rate of one test per lot per 2-foot lift of fill. We recommend compaction tests be taken on any fill below the foundations in the building area at a

rate of one test per 50 linear feet of strip footings and one per column pad. We recommend compaction tests be taken on any fill in the building area at a rate of one test per vertical foot per 2500 square feet of floor slab area and one test per 50 linear feet of foundation wall backfill. We recommend compaction tests be taken on any fill in the pavement areas at a rate of one test per vertical foot per 2500 square feet parking lot subgrade area.

Foundations:

The N-values recorded in the penetration borings indicate that the existing native soils at anticipated foundation depth on this site are in a medium dense to very dense condition capable of supporting the proposed structure. All exterior footings should be placed at a minimum depth of 42 inches below proposed final grade to provide protection from frost damage. Interior footings in heated areas can be placed at any convenient depth as long as they are on native soils or properly compacted fill. In unheated areas we recommend the footings be placed 60 inches below exterior grade due to increased frost penetration depths in unheated areas.

Any footings placed on native soils or on properly compacted fill should be proportioned for a maximum net allowable soil bearing pressure of 2500 psf. We recommend compaction tests be taken on any fill below the footings at a rate of one test per 50 linear feet for wall footings and one test per column footing. We recommend compaction tests be taken immediately prior to pouring the footings.

The recommended bearing pressure is a net value and represents the actual loads that may be transmitted to the soil independent of overburden pressures. We estimate total settlement to be less than ½ inch with differential settlement about half of this if the recommendations in this report are followed.

We recommend a minimum of 6 inches of clean, free draining washed sand with less than 5% passing a No. 200 sieve be placed beneath the floor slabs. This will provide a capillary break and a uniform level subgrade for the floor slabs. We recommend floor slabs be designed using a modulus of subgrade reaction of 300 pounds per cubic inch. For earthquake load design purposes, we would classify this site as Site Class D- Stiff Soil Profile in accordance with IBC 1615.1.5.

Wall Backfill:

The on-site soils consisting of poorly graded sands (SP) are considered excellent material for wall backfill. All wall backfill should be compacted to at least 95% of standard proctor. We recommend below grade walls be designed using a coefficient of active pressure (K_a) of 0.3, an at-rest coefficient (K_o) of 0.55, a passive coefficient (K_p) of 3.5, and an equivalent fluid pressure of 60 psf for the at-rest condition.

Stormwater Pond:

The native sand soils on this site are suitable for infiltration treatment. According to the *Minnesota Stormwater Manual, November 2005*, prepared by the Minnesota Pollution Control Agency, it is our opinion that the native sands consisting of poorly graded sand (SP) and poorly graded sand with silt (SP-SM) below the topsoil material are in Hydrologic Group “A.” We estimate the native sand soils would have an infiltration rate of approximately 1.0 to 1.5 inches per hour. The pond bottom should be at least three feet above the water level for infiltration basins.

E. Pavement Recommendations

The subgrade sand soils encountered are classified as A-1-b soils in accordance with the American Association of State Highway Transportation Officials (AASHTO) classification system. A-1-b soils are rated excellent material for use as parking lot subgrade material. In no instance should organic soils be used as parking lot subgrade material. Without benefit of a laboratory R-value determination and based on Mn/DOT guidelines, an R-value of 70 can be assumed for these materials.

Based on an assumed R-value of 70, we recommend the following bituminous pavement section for general car and light truck parking lots:

<u>Thickness</u>	<u>Course/Description</u>	<u>G.E.</u>
2.0”	Mn/DOT 2360 SPWEB230 Bituminous	4.5”
2.0”	Mn/DOT 2360 SPNWB230 Bituminous	4.5”
6.0”	Mn/DOT 3138 Class 5 or 6 Aggregate Base	6.0”
10.0”	TOTAL	15.0”

In using the assumed R-value for bituminous pavement design, it is essential that the subgrade be constructed of uniform soils at a moisture content and density in accordance with Mn/DOT specification 2105 and capable of passing a test roll in accordance with Mn/DOT specification 2111. The native, undisturbed soils may need preparation (drying and compacting) to pass a proof roll. If the subgrade is not compacted, uniform and capable of passing a test roll, then we recommend the subgrade be scarified and recompacted or subcut and replaced with geotextile fabric and select granular material meeting Mn/DOT specification 3149. The top of the subgrade should be compacted to a minimum of 100% of standard proctor maximum density. The subgrade should be sloped towards the edges to provide drainage.

F. Closing

Our work was performed for geotechnical purposes only and not to document the presence or extent of any contamination on the site. We can note that our crew did not detect any obvious contamination by sight or smell during drilling operations. However, human senses are limited in terms of contamination detection and, therefore, the lack of detection through human sensing does not preclude the possibility of the presence of contamination of the site.

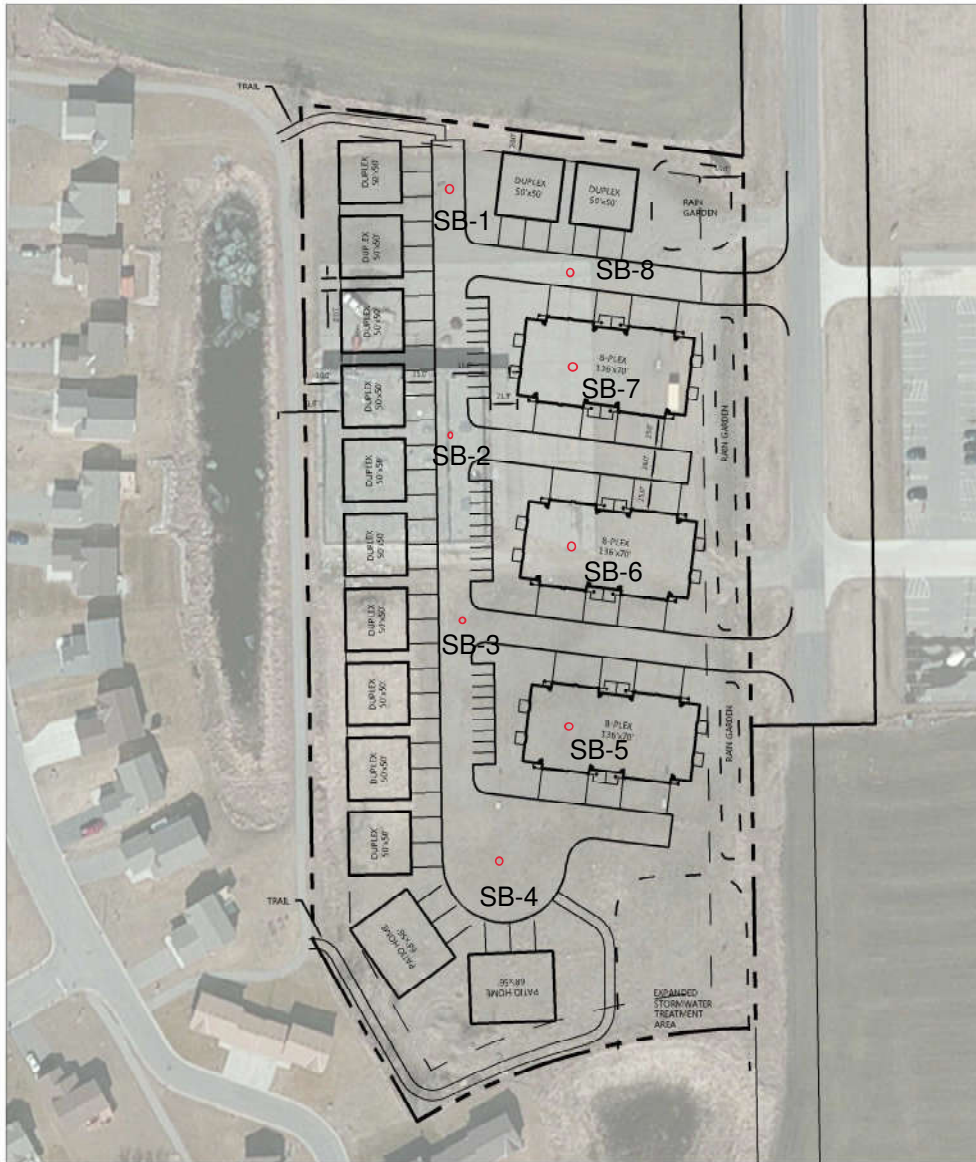
This report represents the result of our subsurface investigation and is based on information gathered at specific locations. Subsurface conditions can change a great deal over short horizontal distances. Also, the actual interface between strata will likely be a gradual transition rather than an abrupt change as represented on the boring logs.

Geotechnical engineering is based extensively on opinion. Therefore, the data contained in this report should be used as a guide, and we recommend that construction monitoring be performed by a qualified geotechnical engineer or technician. Any changes in the subsurface conditions from those found during this geotechnical investigation should be brought to the attention of a soils engineer.

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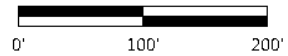
APPENDIX 1

BORING LOCATION PLAN



SITE DEVELOPMENT SUMMARY

• LOT AREA COMBINE	462,000 SQ. FT.
• UNDEVELOPED FOOTPRINT	54,510 SQ. FT.
• PROPERTY AREA	215,448 SQ. FT. (3.02 AC)
• PREVIOUS SURFACE	115,720 SQ. FT.
• IMPROVED SURFACE (PAVED)	147,768 SQ. FT. (3.36 AC)
• BUILDING - SHURFALL TRAILER	10,000 SQ. FT.
• 8-PLEX	1,140 SQ. FT.
• TOTAL	22,148 SQ. FT. (0.51 AC)
• 8-PLEX	22,148 SQ. FT. (0.51 AC)
• 2 BUILDINGS, 4 UNITS	2,400 SQ. FT. (0.055 AC)
• 36x39 1WCH OLIVA	1,140 SQ. FT. (0.026 AC)
• BUILDING SETBACK PER 53 CODE	15'-FRONT 20'-SIDE / 10'-SIDE TO ROW / 10'-TO TO PROXIMATE 40'-REAR / 5'-REAR TO SIDEWALK 75'-POST-10'
• BUILDING SETBACK PROPOSED	15'-FRONT 20'-SIDE / 10'-SIDE TO ROW / 10'-TO TO PROXIMATE 10'-REAR / 30'-REAR TO REARDBANK 50'-NON-10'-W
• PARKING SETBACK	10'
• SWP LEVEL	2' -



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Southview Heights
 St Joseph, MN

Westwood
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 Office: (612) 270-9185 www.westwoodps.com
 Westwood Professional Services, Inc.

Concept G

SHEET NUMBER:	1	OR	1
DATE:	01/02/18		

APPENDIX 2
SOIL BORING LOGS

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/12/18 BORING #: SB-1
START TIME: 10:10 END TIME: 11:15

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1073.8

LOCATION: See Boring Location Plan

Page 1 of 1

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes	
18"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL					
5.0	SP-SM	POORLY GRADED SAND w/ SILT, fine grained, w/ GRAVEL, brown.	1	36	5.4		
10.0	SP	POORLY GRADED SAND, fine to medium grained, w/ GRAVEL, brown.	2	4	3.3		
			3	19	4.8		
		more gravel.	4	20	3.1		
14' 9"			5	11	8.5	V Water encountered at 14' 6" during drilling.	
		Boring complete to 14' 9" Water was encountered at 14' 6" during drilling. No water encountered to cave-in at 6' 8" after drilling.					

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/12/18 BORING #: SB-2
START TIME: 11:20 END TIME: 12:05

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1075.9

LOCATION: See Boring Location Plan

Page 1 of 1

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
16"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL				
5.0	SP-SM	POORLY GRADED SAND w/ SILT, fine grained, w/ GRAVEL, brown.	1	14	6.4	
10.0	SP	POORLY GRADED SAND, fine to medium grained, w/ GRAVEL, brown.	2	13	3.5	
		w/ gravel and cobbles at 8.5 feet.	3	30	3.0	
			4	43	5.6	
14' 9"		w/ a little gravel.	5	15	1.5	
		Boring complete to 14' 9" Water was not encountered during drilling. No water encountered to cave-in at 7' 2" after drilling.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/12/18 BORING #: SB-3
START TIME: 12:45 END TIME: 1:35

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1075.0

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
16"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL				
4.0	SP-SM	POORLY GRADED SAND w/ SILT, fine grained, w/ GRAVEL, brown.	1	23	2.4	
10.0	SP	POORLY GRADED SAND, fine to medium grained, w/ GRAVEL, brown.	2	24	3.4	
			3	21	2.9	
			4	26	2.2	
14' 9"			5	25	3.5	
		Boring complete to 14' 9" Water was not encountered during drilling. No water encountered to cave-in at 5' 10" after drilling.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/12/18 BORING #: SB-4
START TIME: 1:40 END TIME: 2:30

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1074.8

LOCATION: See Boring Location Plan

Page 1 of 1

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
14"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL				
4.0	SP-SM	POORLY GRADED SAND w/ SILT, fine grained, w/ GRAVEL, brown.	1	30	4.1	
10.0	SP	POORLY GRADED SAND, fine to medium grained, w/ GRAVEL, brown.	2	38	3.1	* 50 blows for 5 inches
			3	14	2.0	
		w/ GRAVEL and COBBLES.	4	50*	2.9	
			5	17	3.7	
14' 9"						
		Boring complete to 14' 9" Water was not encountered during drilling. No water encountered to cave-in at 5' 4" after drilling.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/12/18 BORING #: SB-5
START TIME: 2:35 END TIME: 3:10

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1073.8

LOCATION: See Boring Location Plan

Page 1 of 1

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes	
14"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL					
4.0	SP-SM	POORLY GRADED SAND w/ SILT, fine grained, w/ GRAVEL, brown.	1	30	6.2		
10.0	SP	POORLY GRADED SAND, fine to medium grained, w/ GRAVEL, brown.	2	21	2.8		
			3	17	2.4		
			4	23	3.0		
14' 9"		medium to coarse grained.	5	17	7.2	V Water encountered at 14' 3" during drilling.	
		Boring complete to 14' 9" Water encountered at 14' 3" during drilling. No water encountered to cave-in at 5' 6" after drilling.					

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/12/18 BORING #: SB-6
START TIME: 3:15 END TIME: 4:00

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1074.2

LOCATION: See Boring Location Plan

Page 1 of 1

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes	
18"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL					
4.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ GRAVEL, brown.	1	28	10.6		
10.0	SP	POORLY GRADED SAND, fine grained, brown. w/ a trace of GRAVEL.	2	17	3.5		
			3	24	3.7		
			4	28	2.8		
14' 9"		fine to medium grained, w/ GRAVEL.	5	14	11.0	V Water encountered at 14' during drilling.	
		Boring complete to 14' 9" Water encountered at 14' during drilling. No water encountered to cave-in at 5' 6" after drilling.					

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/13/18 BORING #: SB-7
START TIME: 1:35 END TIME: 2:30

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1074.2

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
10"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL				
3.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ GRAVEL, brown.	1	19	10.3	
10.0	SP	POORLY GRADED SAND, fine grained, w/ GRAVEL, brown.	2	20	2.5	
			3	19	3.4	
			4	20	3.1	
14' 9"			5	11	3.1	
			Boring complete to 14' 9" No water encountered during drilling. No water encountered to cave-in at 6' 9" after drilling.			

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 18-009 K JOHNSON CONSTRUCTION
SOUTHVIEW HEIGHTS
ST. JOSEPH, MINNESOTA

DATE: 2/13/18 BORING #: SB-8
START TIME: 2:40 END TIME: 3:30

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: MW/ BH
ELEVATION: 1073.7

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes	
12"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL					
3.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ GRAVEL, brown.	1	34	5.5		
10.0	SP	POORLY GRADED SAND, fine grained, w/ GRAVEL, brown.	2	35	5.5		
			3	22	2.4		
			4	20	4.9		
14' 9"		fine to medium grained.	5	18	12.6	V Water encountered at 13' 3" during drilling.	
		Boring complete to 14' 9" Water encountered at 13' 3" during drilling. No water encountered to cave-in at 6' 2" after drilling.					

Unified Soil Classification (USC) System (from ASTM D 2487)

Major Divisions		Group Symbol	Typical Names
Course-Grained Soils More than 50% retained on the 0.075 mm (No. 200) sieve	Gravels 50% or more of course fraction retained on the 4.75 mm (No. 4) sieve	Clean Gravels	GW Well-graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GP Poorly graded gravels and gravel-sand mixtures, little or no fines
			GM Silty gravels, gravel-sand-silt mixtures
			GC Clayey gravels, gravel-sand-clay mixtures
	Sands 50% or more of course fraction passes the 4.75 mm (No. 4) sieve	Clean Sands	SW Well-graded sands and gravelly sands, little or no fines
		Sands with Fines	SP Poorly graded sands and gravelly sands, little or no fines
			SM Silty sands, sand-silt mixtures
			SC Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the 0.075 mm (No. 200) sieve	Silts and Clays Liquid Limit 50% or less	ML Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
		CL Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays	
		OL Organic silts and organic silty clays of low plasticity	
	Silts and Clays Liquid Limit greater than 50%	MH Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
		CH Inorganic clays or high plasticity, fat clays	
		OH Organic clays of medium to high plasticity	
Highly Organic Soils		PT Peat, muck, and other highly organic soils	

Prefix: G = Gravel, S = Sand, M = Silt, C = Clay, O = Organic

Suffix: W = Well Graded, P = Poorly Graded, M = Silty, L = Clay, LL < 50%, H = Clay, LL > 50%