



January 7, 2021

Prime AE Group, Inc.
8415 Pulsar Place, Suite 300
Columbus, OH 43240

Attention: Mr. Chris Jackman, PE

Reference: **Geotechnical Paper Study**
15th Street SW Bridge over Nimishillen Creek
Canton, Ohio
S&ME Project No. 1117-20-054

Mr. Jackman:

In accordance with our proposal dated April 21, 2020, which was incorporated into the Prime AE Group, Inc., Subconsultant Agreement executed on December 9, 2020, S&ME, Inc. (S&ME) has completed a Geotechnical Paper Study for the proposed replacement of the bridge carrying 15th Street SW over Nimishillen Creek in Canton, Ohio.

◆ Project Description

S&ME understands that the existing two-span bridge carrying 15th Street SW over Nimishillen Creek in Canton, Ohio, is currently planned for replacement (see Vicinity Map, Figure 1 in the Appendix). At the time of this document, the type of replacement bridge being considered was unknown. Additionally, an existing retaining wall connected to the southwest bridge corner and extending a few hundred feet downstream of the bridge has failed, and we understand that repair/replacement of this wall is also being preliminarily considered. Plate 2 in the Appendix presents an aerial view of this site, and Plates 3 through 5 include various photographs of the existing bridge and surrounding area.

◆ Available Information

At the time of this submission, no existing or proposed plan information had been provided by Prime AE, however, the following information was obtained from public on-line data sources:

- The logs of several nearby historic structure borings from ODOT's Transportation Information Management System (TIMS) database (Plates 12 through 15 in the Appendix);
- The logs of 4 nearby water wells from the ODNR website; and,
- General geologic information of the area from various public sources.

◆ Scope of Services

The scope of services for this Geotechnical Paper Study includes the following 3 steps:



1. Review Available Geologic and Plan Data - Review available geologic literature and geologic maps. Sources of additional information include outside resources, such as ODOT's TIMS data base, and also our in-house resources that may include previous geotechnical explorations/investigations in the area of the subject site.
2. Perform a Site Visit – Perform a site visit by a Geotechnical Engineer to observe, document, and photograph the existing bridge and wall, along with other site features such as nearby structures, embankments, and drainage features for evidence of geotechnical concerns such as foundation failure, slope instability, soft soils, or scour/erosion. This visit was performed on December 23, 2020.
3. Prepare a Summary Letter – Summarize the results of steps 1 and 2 described above in a brief letter report which will include: a review of the available geologic data, field observations, discussion of conceptual bridge foundation support alternatives, and discussion of conceptual retaining wall remediation methods and/or replacement wall types and configurations. Relevant maps, photographs, and available historic boring logs will be included with this submission.

The currently authorized scope of services does not include any borings or other explorations, laboratory testing, geotechnical analyses, or related recommendations. The scope of work also does not include development of a boring and laboratory testing program following guidelines set forth in the ODOT Specifications for Geotechnical Explorations (SGE). We have considered that this work will be performed as part of the next phase of work, or as a modification to the current scope of work.

◆ Literature Review

Geology

This site is located within the Akron-Canton Interlobate Plateau Physiographic Region in the Glaciated Allegheny Section of the Appalachian Plateau Province. The Akron-Canton Interlobate Plateau is characterized by the hummocky area between two converging glacial lobes dominated by kames terraces, eskers, kettles, kettle lakes, and bogs/fens.

The Stark County Soil Survey (accessed through USDA Web Soil Survey website) classify the near surface soils in the project area as Sloan silt loam. Sloan soils are typically found on flood plains or in depressions along streams receiving sediment from areas of Wisconsinan-age glaciation.

Extensive deposits of granular soil, generally of Wisconsinan-age, are located beneath the surficial materials discussed above. The upper portion of these granular materials consists of interbedded sand and gravel that commonly contain thin and discontinuous layers of silt and clay and may contain organics locally, whereas the deeper sands and gravels consist primarily of undifferentiated outwash deposits. A review of available ODNR well logs and bedrock topography mapping indicate that these granular soils may be present to depths of 270 feet below the ground surface near this site. The uppermost bedrock is composed primarily of Pennsylvanian aged shale, siltstone, sandstone, conglomerate, and subordinate amounts of limestone, flint, and coal of the undivided Allegheny and Pottsville Groups.

The "Ohio Karst Areas" map published by ODNR does not show any probable karst features in the immediate vicinity of the site, and the "Abandoned Underground Mines of Ohio" map published by ODNR does not indicate



the presence of underground mines near this site. A review of Ohio Landslide Mapping indicates this site is located within an area of Ohio that has “moderate susceptibility and low incidence” of landslides.

ODNR Well Logs

The logs of four (4) ODNR water well logs located in the vicinity of the subject site were reviewed. These logs ranged in depth from 45 to 88 feet in depth, and 3 of the 4 logs encountered granular soils beginning at a depth ranging from 20 to 26 feet. The fourth log reported “coarse clay” to its termination depth at 45 feet. The uppermost soils encountered in these wells consisted of discontinuous layers of sand, gravel, clay, peat, and existing fill. It should also be noted that two of these well logs indicated the presence of boulders (described as dense sandstone on Well Log No. 2013737). None of these wells encountered bedrock prior to termination.

Plate 6 in the Appendix shows the approximate locations of these wells, and Plates 7 through 10 include copies of the Well Log and Drilling Report for each well.

Historic ODOT Structure Boring Logs

A search of the on-line ODOT Transportation Information Mapping System (TIMS) identified four (4) historic boring logs that were drilled just north of 15th Street in 1968 for the US 30/SR 62/IR 77 interchange project. These borings were extended to depths ranging from 61 to 76 feet and encountered predominantly gravel and sand. No bedrock was encountered in any of these borings. A summary of this historic boring information is presented in the following table.

Historic Boring No.	Project Location Shown on Log of Boring	Soil Types Encountered	Bottom of Boring Depth (Elev.)	30 feet of 30 Blows/ft. Soil Encountered at Termination?
B-3	US 30 WB Ramp to IR 77 SB, Bridge over Market and Cleveland Ave.	A-4a, A-1-b, A-1-a	66' (955.1)	Yes
B-5-6	US 30 EB Ramp to SB IR 77, Rear Abutment – Bridge over Nimishillen Creek	A-1-a, A-1-b	61' (953.3)	No
B-14-6	US 30 EB Ramp to SB IR 77, Fwd Pier – Bridge over Nimishillen Creek	A-1-a, A-1-b	61' (957.4)	No
B-22	US 30 EB Ramp to IR 77, Fwd Abutment – Bridge over Henry Avenue	A-1-a, A-1-b, A-3a	76' (951.8)	No

See Plate 11 in the Appendix for approximate locations of these borings and Plates 12 through 15 for copies of these boring logs.



Although additional historic borings are shown by ODOT TIMS in the area, these explorations appear to be either shallow borings for embankments/pavement, or additional structure borings which are further away from the 15th Street SW bridge.

◆ Site Visit

On December 23, 2020, a Geotechnical Engineer from S&ME performed a field reconnaissance of the existing bridge site. Selected photographs taken during the site visit are presented on Plates 3 through 5 in the Appendix. Several items noted during the reconnaissance include:

- The existing parapet walls and sidewalks have been barricaded at the edge of pavement;
- A construction access entrance is present near the northeast corner of the bridge;
- No exposed bedrock was apparent in the channel banks or creek bed;
- The cast-in-place retaining wall beginning at the southwest corner of the bridge and extending downstream had failed and was overturning towards the channel. Large trees were noted to be growing behind and in contact with the retaining structure;
- The depth of flow adjacent to the wall was deeper than the middle and eastern sides of the downstream channel;
- Debris was noted to have collected on the upstream end of the center pier of the existing bridge;
- Concrete slabs/debris appeared to have been placed as scour protection on the lower portion of both upstream banks of the creek;
- Deposition of streambed material was observed on the downstream end of the center pier;
- An old wooden retaining wall, with wooden piles and lagging, was observed on the eastern bank of the channel, roughly 100 feet downstream of the bridge;
- An apparent drilled shaft and lagging retaining wall was observed on the western downstream bank and downstream of the failing section of cast-in-place concrete retaining wall;
- Numerous underground utilities were noted, including underground gas, storm and sanitary sewers, water lines, and communications cables. These underground facilities were noted on both the north and south sides of the street, and possibly in the middle of the street; and,
- Overhead electric lines were present on the south side of the bridge.

◆ Geotechnical Considerations

Replacement Bridge Foundations

Although the type of replacement bridge being considered is not known, the anticipated presence of predominantly medium-dense to dense granular soils to a significant depth beneath this site indicates that extended foundations consisting of driven, cast-in-place, reinforced concrete (pipe) piles may be capable of supporting the replacement bridge. The required pile lengths of the piles will depend on the load to be applied and the depth of any scour that is anticipated. It is also possible that conical steel pile tips may be necessary, as 2 of the 4 nearby water well logs reported the presence of boulders. Significant settlement of new pile foundations is not anticipated unless the span of the new bridge is less than the current bridge length.

It should also be noted that the type and configuration of the replacement structure will not only impact the depth of scour at the bridge but may also impact the anticipated scour depth at the downstream retaining wall



that is failing. For this reason and regardless of whether the failed wall is to be replaced at the same time as the bridge, S&ME recommends that the scour analyses assess the impact of the replacement bridge on the retaining structure. These analyses should also assess the scour potential along the entire length of the existing wall, or the length of wall to be replaced, as the flow regime along the wall may vary along the length of the project, resulting in varying depths of scour that must be considered during new wall design.

Downstream Retaining Structure

Based on our site reconnaissance, and pending the results of a scour analyses, S&ME presents the following preliminary and conceptual discussions regarding potential types of retaining structures at this site.

- Earthwork Repair

Following the removal of the failed structure, construct a sufficiently flat slope (ranging from 2(H):1(V) to 3(H):1(V)) upward from the creek bank to the surrounding grade. Depending on the results of a scour analysis and the properties of the soils in the slope, the following may also require internal slope reinforcement (e.g., geogrid, geosynthetic), a sheet pile cut-off wall, and rock channel protection.

This approach would significantly impact the entry drive on the private property southwest of the bridge, and likely require acquisition of a portion of this property and reconstruction of a new driveway.

- Drilled Shaft Retaining Wall with Plug Piles

Following the removal of the failed structure, construct a drilled shaft wall including unreinforced plug piles being installed between the primary reinforced drilled shafts which are designed (i.e., diameter, reinforcement, depth, etc.) to resist the loads acting on the shafts. The plug piles will need to extend to a depth greater than the maximum anticipated scour depth. Depending on the scour depth and the anticipated wall loads, it is possible that the reinforced drilled shafts may also require the addition of tie-back anchors into the soil behind (west) of the retaining wall.

This approach would result in significantly less impact to the adjacent property, potentially only requiring a temporary construction easement to complete.

- Soldier-Pile Wall with Lagging

Depending on the maximum anticipated scour depth and the height of the creek bank/retaining wall, it may be possible to construct a soldier-pile wall with precast concrete lagging at this site. Select coarse-grained granular fill and filter fabric will be required immediately behind the wall to prevent loss of material through the joints between the lagging and soldier piles, and either rock channel protection (possibly partially or fully grouted) or a sheet pile cut off wall would be required to extend below the maximum anticipated scour depth between the drilled shafts to prevent loss of material. As with the above drilled shaft alternative, it is possible that tie-back anchors may also be required.

As mentioned previously, the depth of scour along the entire length of the wall should be computed based on the type and configuration of replacement bridge being constructed at 15th Street SW.



◆ Final Considerations

This document has been provided for preliminary planning purposes only and should not be used for final design or construction. Project specific borings/explorations should be performed in accordance with the ODOT SGE as part of the next phase of the project to better determine actual subsurface conditions present at the site.

The discussions and preliminary conceptual recommendations presented for consideration in this Geotechnical Paper Study are based on the project information available at the time of, and observations made during, our field reconnaissance. It should be noted that the conditions observed may change based on the time of year and the weather conditions. It should also be noted that no field explorations, sampling, or laboratory testing were performed during this study, and our descriptions of the typical or anticipated conditions are based on S&ME's experience, available publications, and available well log and boring log information. This report and its contents were prepared to provide conceptual information only and shall not be relied upon during any detailed geotechnical analyses or engineering design.

◆ Closing

We appreciate the opportunity to be of service during this conceptual planning phase of the project. If you have any questions regarding information contained in this document, please do not hesitate to contact our office.

Respectfully,

S&ME, Inc.

A blue ink signature of Brian K. Sears.

Brian K. Sears, P.E.
Project Engineer

A blue ink signature of Richard S. Weigand.

Richard S. Weigand, P.E.
Senior Engineer/Reviewer

Attachments: Appendix (15 sheets)

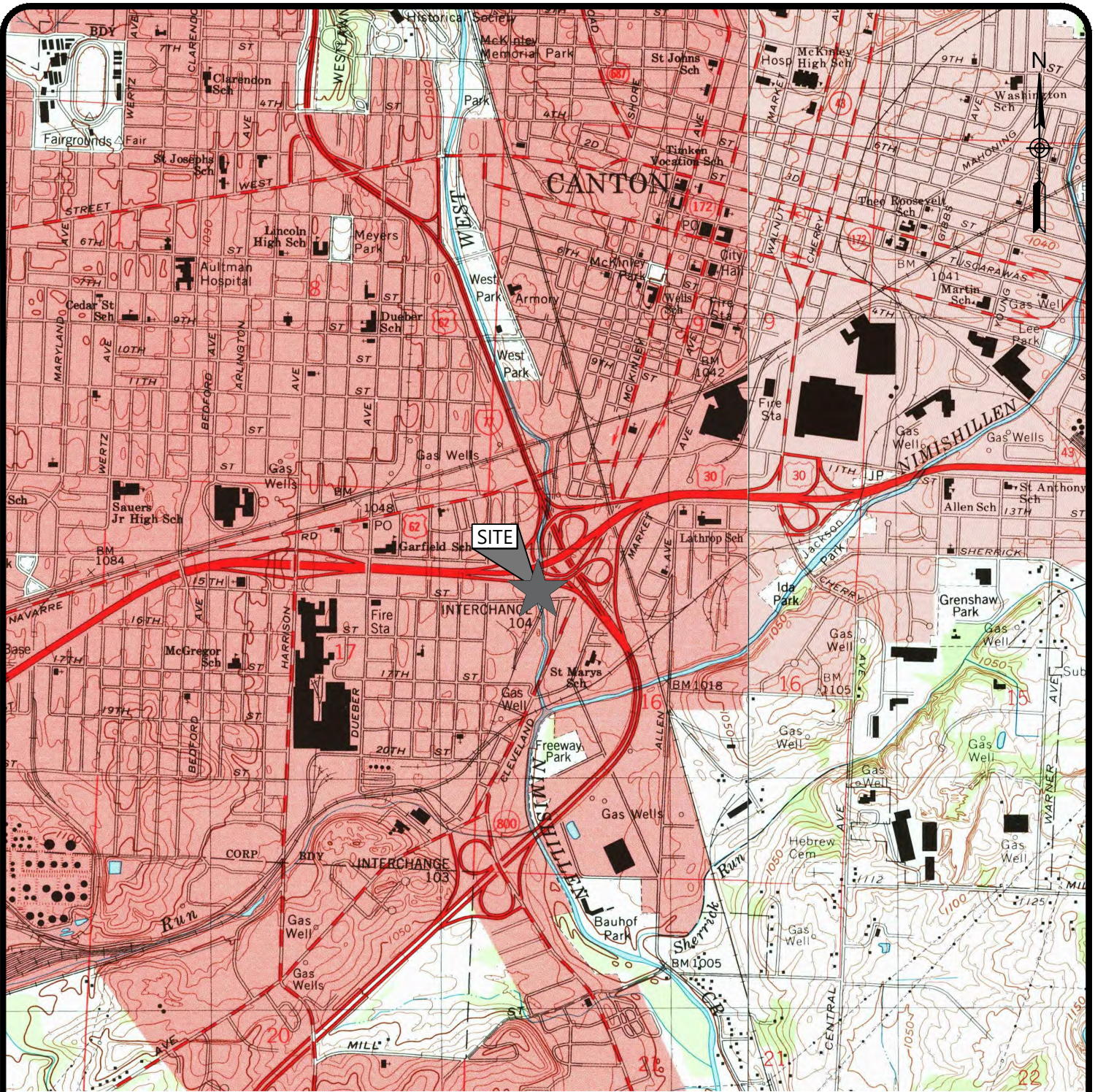
Submitted: Email Copy (cjackman@primeeng.com)

ec: A. Trautman, Prime AE Group, Inc. (atrautman@primeeng.com)



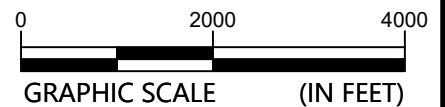
Attachments

Drawing Path: T:\GEO\Projects\2020\1117-20-054_Prime AE - 15th St SW Bridge\Part 1 - Geotechnical Paper Study\CAD\Construction\Vicinity Map.dwg



Project Location
Stark County, Ohio

USGS Mapping:
USGS Canton West, Ohio Quad



GRAPHIC SCALE

(IN FEET)



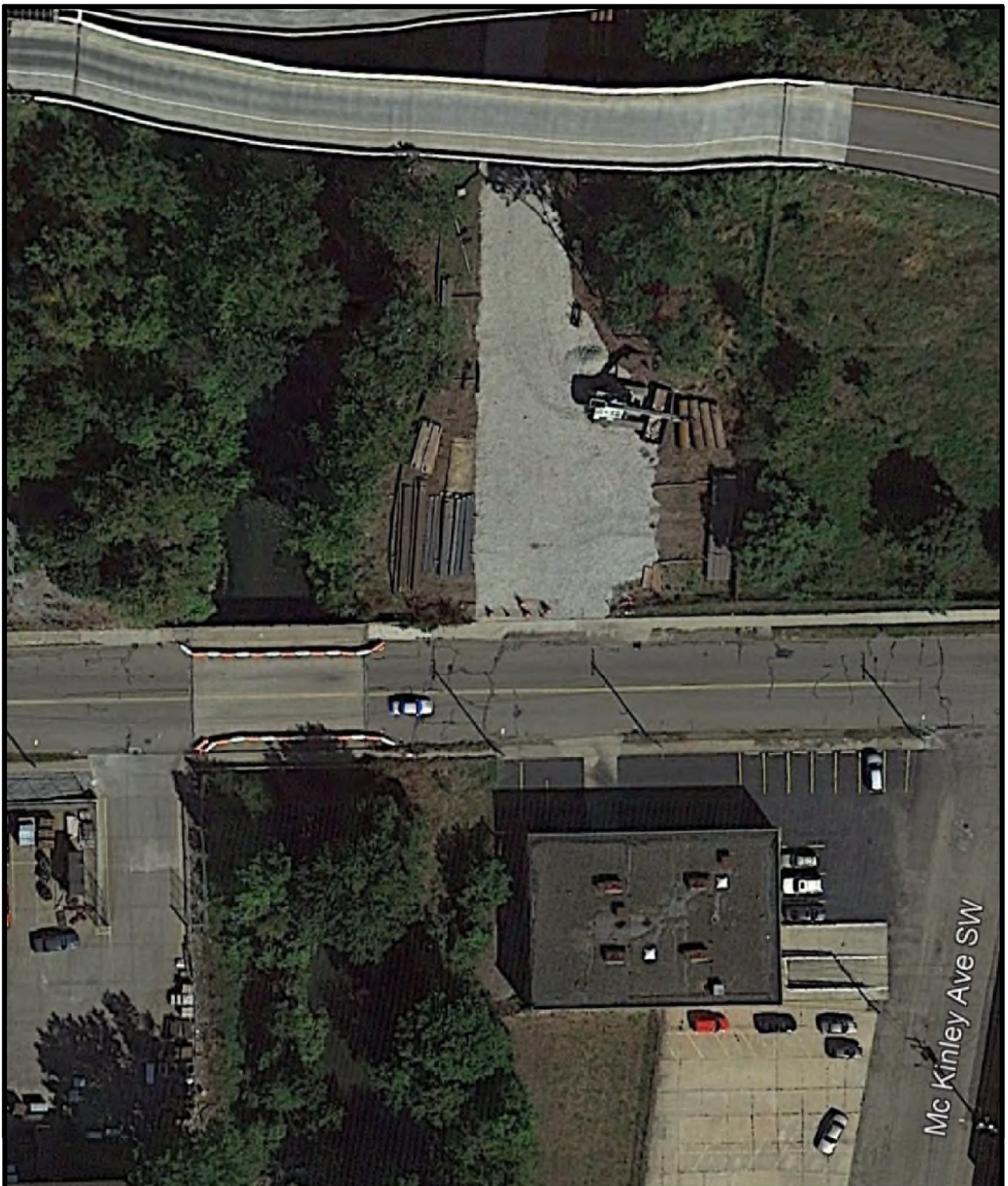
Vicinity Map

15th Street SW Bridge over Nimishillen Creek
Geotechnical Paper Study
Canton, Ohio

SCALE:
SEE GRAPHIC
DATE:
1-5-2021
PROJECT NUMBER
1117-20-054

FIGURE NO.

1



0 60 120

SCALE IN FEET

Site Plan

Geotechnical Paper Study
15th Street SW Bridge over Nimishillen Creek
Canton, Ohio

Project: 1117-20-054

Drawing Date: 1-6-2021

Revision Date: 1-6-2021

Drawn By: AJM

Approved By: RSW

Scale: GRAPHIC



WWW.SMEINC.COM

ENGINEERING LICENSE NO: F-0176


Geotechnical Paper Study
15th Street SW Bridge over Nimishillen Creek

Canton, OH

S&ME Project No. 1117-20-054




1			Date: 12/23/2020
			Photographer: AJM
	Location / Orientation	15th Street SW Bridge looking west	
	Remarks		

2			Date: 12/23/2020
			Photographer: AJM
	Location / Orientation	South face of bridge looking northwest	
	Remarks		

	Date: 12/23/2020	
	Photographer: AJM	
3	Location / Orientation	North face of bridge looking southeast
	Remarks	

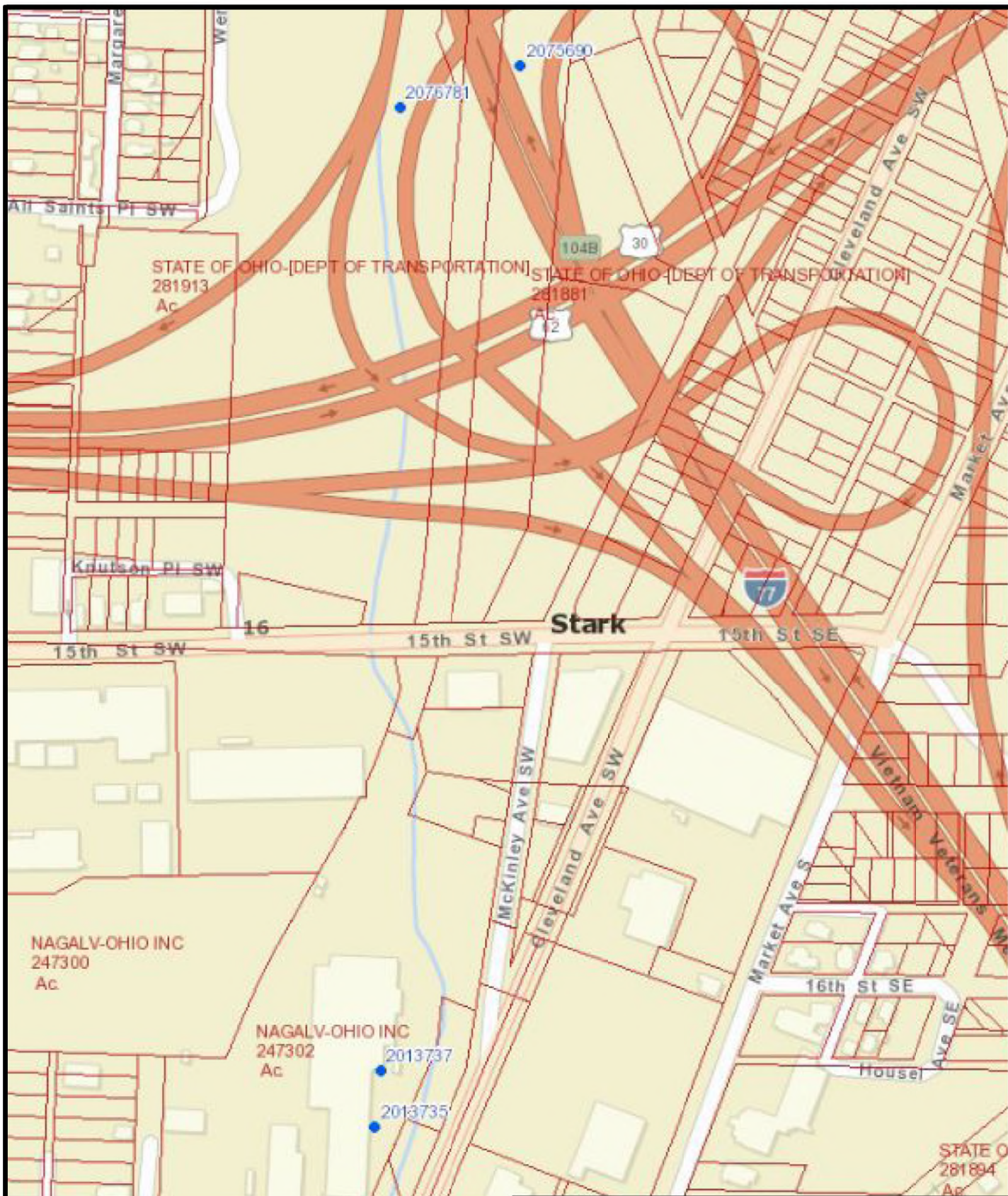
	Date: 12/23/2020	
	Photographer: AJM	
4	Location / Orientation	Looking upstream/NW at failed retaining wall.
	Remarks	Note existing timber retaining structure in right foreground.

5	Location / Orientation	Looking SW at failed retaining wall.	Date: 12/23/2020	Photographer: AJM
	Remarks	Note large trees growing behind wall		



6	Location / Orientation	Looking south (downstream) at failed retaining wall.	Date: 12/23/2020	Photographer: AJM
	Remarks	Note tree pushing/growing against section of retaining wall		





LEGEND

● 2013735 WATER WELL LOG AND LOCATION

Water Well Logs

Geotechnical Paper Study
15th Street SW Bridge over Nimishillen Creek
Canton, Ohio

Project: 1117-20-054

Drawing Date: 1-5-2021

Revision Date: 1-5-2021

Drawn By: AJM

Approved By: RSW

Scale: GRAPHIC



WWW.SMEINC.COM

ENGINEERING LICENSE NO: F-0176

Well Log Number

DNR 7802.05e

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

2013735

Page 1 of 1 for this record.

[illegible]

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Department.

WELL LOG AND DRILLING REPORT

DNR 7802.05e

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

Well Log Number

2013737

Page 1 of 1 for this record.

WELL LOCATION		CONSTRUCTION DETAILS				
County <u>STARK</u> Township <u>CANTON</u>		Drilling Method: <u>AUGER</u>				
<u>GREGORY</u> <u>GALVANIZING</u> Owner/Builder		BOREHOLE/CASING (Measured from ground surface)				
<u>1723 SW CLEVELAND AVE</u> Address of Well Location		1 { Borehole Diameter <u>12</u> inches Depth <u>45</u> ft. Casing Diameter <u>2</u> in. Length <u>35</u> ft. Thickness <u>0.154</u> in.				
City <u>CANTON</u> Zip Code +4 <u>44707</u>		2 { Borehole Diameter _____ inches Depth _____ ft. Casing Diameter _____ in. Length _____ ft. Thickness _____ in.				
Permit No. _____ Section; _____ and/or Lot No. _____		Casing Height Above Ground <u>2</u> ft.				
Use of Well <u>MONITOR</u>		Type { 1: <u>PVC</u> 2: _____				
Coordinates of Well (Use only one of the below coordinate systems)		Joints { 1: <u>Threaded</u> 2: _____				
<u>State Plane Coordinates</u>		SCREEN				
N <input type="checkbox"/> X _____ +/- _____ ft.		Diameter <u>2</u> in. Slot Size <u>0.01</u> in. Screen Length <u>10</u> ft.				
S <input type="checkbox"/> Y _____ +/- _____ ft.		Type <u>MACHINE SLOTTED</u> Material <u>PVC</u>				
<u>Latitude, Longitude Coordinates</u>		Set Between <u>45</u> ft. and <u>35</u> ft.				
Latitude: <u>40.781167</u> Longitude: <u>81.386067</u>		GRAVEL PACK (Filter Pack)				
Elevation of Well in feet: <u>1024</u> +/- <u>26</u> ft.		Material/Size <u>#5</u> Vol/Wt. Used <u>450</u> lbs				
Datum Plane: <input type="checkbox"/> NAD27 <input type="checkbox"/> NAD83 Elevation Source <u>GPS</u>		Method of Installation <u>Poured (gravity)</u>				
Source of Coordinates: <u>GPS</u>		Depth: Placed From: <u>45</u> ft. To: <u>33</u> ft.				
Well location written description: <u>HZW - 02</u>		GROUT				
Comments on water quality/quantity and well construction:		Material <u>Bentonite slurry</u> Vol/Wt. Used <u>400</u> lbs				
		Method of Installation <u>Pumped w/Tremie pipe</u>				
		Depth: Placed From: <u>33</u> ft. To: <u>1</u> ft.				
		DRILLING LOG*				
		FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.				
		Color	Texture	Formation	From	To
		BLACK	DENSE	SAND	0	5
		RED	DRY	SAND	5	10
		BROWN	DENSE	CLAY	10	22
			DENSE	SANDSTONE	22	23
		BROWN	DENSE	CLAY	23	40
		BROWN-GRAY	COARSE	CLAY	40	45
WELL TEST *						
Pre-Pumping Static Level _____ ft. Date _____						
Measured from _____						
Pumping test method _____						
Test Rate _____ gpm Duration of Test _____ hrs.						
Feet of Drawdown _____ ft. Sustainable Yield _____ gpm						
*(Attach a copy of the pumping test record, per section 1521.05, ORC)						
Is Copy Attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Flowing Well? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						
PUMP/PITLESS						
Type of pump _____ Capacity _____ gpm						
Pump set at _____ ft. Pitless Type _____						
Pump installed by _____						
I hereby certify the information given is accurate and correct to the best of my knowledge.						
Drilling Firm <u>FRONTZ DRILLING, INC.</u>						
Address <u>2031 MILLERSBURG RD</u>						
City, State, Zip <u>WOOSTER OH 44691</u>						
Signed <u>Brad Kitchen</u> Date <u>11/14/2007</u>						
(Filed Electronically)						
ODH Registration Number <u>0120</u>						
		Aquifer Type (Formation producing the most water.) <u>CLAY</u>				
		Date of Well Completion <u>9/21/2007</u> Total Depth of Well <u>45</u> ft.				

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Department.

Well Log Number

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

2075690

Page 1 of 1 for this record.

WELL LOCATION		CONSTRUCTION DETAILS																																																			
County <u>STARK</u> Township <u>CANTON</u>		Drilling Method: <u>BUCKET AUGER</u>																																																			
BEAVER EXCAVATING		BOREHOLE/CASING (Measured from ground surface)																																																			
Owner/Builder		1 { Borehole Diameter <u>36</u> inches Depth <u>88</u> ft. Casing Diameter <u>16</u> in. Length <u>85</u> ft. Thickness <u>0.25</u> in.																																																			
NAVARRE		2 { Borehole Diameter _____ inches Depth _____ ft. Casing Diameter _____ in. Length _____ ft. Thickness _____ in.																																																			
Address of Well Location		Casing Height Above Ground _____ ft.																																																			
City <u>CANTON</u> Zip Code +4 <u>44707</u>		Type { 1: <u>Steel</u> 2: _____																																																			
Permit No. _____ Section; _____ and/or Lot No. _____		Joints { 1: <u>Welded</u> 2: _____																																																			
Use of Well <u>DEWATERING WELL</u>		SCREEN																																																			
Coordinates of Well (Use only one of the below coordinate systems)		Diameter <u>16</u> in. Slot Size <u>0.04</u> in. Screen Length <u>40</u> ft.																																																			
State Plane Coordinates		Type <u>LOUVERED</u> Material <u>GALVANIZED STEEL</u>																																																			
N <input type="checkbox"/> X _____ +/- _____ ft.		Set Between <u>48</u> ft. and <u>88</u> ft.																																																			
S <input type="checkbox"/> Y _____ +/- _____ ft.		GRAVEL PACK (Filter Pack)																																																			
Latitude, Longitude Coordinates		Material/Size <u>pea gravel</u> Vol/Wt. _____																																																			
Latitude: <u>40.78625</u> Longitude: <u>-81.385128</u>		Method of Installation <u>Poured (gravity)</u>																																																			
Elevation of Well in feet: _____ +/- _____ ft.		Depth: Placed From: <u>0</u> ft. To: <u>88</u> ft.																																																			
Datum Plane: <input type="checkbox"/> NAD27 <input checked="" type="checkbox"/> NAD83 Elevation Source _____		GROUT																																																			
Source of Coordinates: <u>GLOBAL POSITIONING SYSTEM</u>		Material _____ Vol/Wt. _____																																																			
Well location written description:		Method of Installation _____																																																			
WELL 7		Depth: Placed From: _____ ft. To: _____ ft.																																																			
Comments on water quality/quantity and well construction:		DRILLING LOG*																																																			
SEDIMENT DETERMINED TO BE NOT DETECTABLE BY IMHOFF CONE.		FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.																																																			
		<table><thead><tr><th>Color</th><th>Texture</th><th>Formation</th><th>From</th><th>To</th></tr></thead><tbody><tr><td></td><td></td><td>FILL MATERIAL</td><td>0</td><td>11</td></tr><tr><td></td><td></td><td>PEAT</td><td>11</td><td>14</td></tr><tr><td></td><td>FINE</td><td>SAND</td><td>14</td><td>20</td></tr><tr><td></td><td></td><td>CLAY</td><td>20</td><td>21</td></tr><tr><td></td><td>MEDIUM</td><td>SAND</td><td>21</td><td>26</td></tr><tr><td></td><td>COARSE</td><td>SAND AND GRAVEL</td><td>26</td><td>46</td></tr><tr><td></td><td>GRAVELLY</td><td>SAND</td><td>46</td><td>74</td></tr><tr><td></td><td></td><td>SAND</td><td>74</td><td>88</td></tr><tr><td></td><td></td><td>Water Encountered At</td><td>5</td><td>88</td></tr></tbody></table>		Color	Texture	Formation	From	To			FILL MATERIAL	0	11			PEAT	11	14		FINE	SAND	14	20			CLAY	20	21		MEDIUM	SAND	21	26		COARSE	SAND AND GRAVEL	26	46		GRAVELLY	SAND	46	74			SAND	74	88			Water Encountered At	5	88
Color	Texture	Formation	From	To																																																	
		FILL MATERIAL	0	11																																																	
		PEAT	11	14																																																	
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		CLAY	20	21																																																	
	MEDIUM	SAND	21	26																																																	
	COARSE	SAND AND GRAVEL	26	46																																																	
	GRAVELLY	SAND	46	74																																																	
		SAND	74	88																																																	
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WELL TEST *																																																					
Pre-Pumping Static Level <u>5</u> ft. Date <u>9/20/2019</u>																																																					
Measured from <u>GROUND LEVEL</u>																																																					
Pumping test method <u>PUMPING</u>																																																					
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PUMP/PITLESS																																																					
Type of pump _____ Capacity _____ gpm																																																					
Pump set at _____ ft. Pitless Type _____																																																					
Pump installed by _____																																																					
I hereby certify the information given is accurate and correct to the best of my knowledge.																																																					
Drilling Firm <u>KELLEY DEWATERING & CONSTRUCTION CO</u>																																																					
Address <u>5175 SW CLAY AVE</u>																																																					
City, State, Zip <u>WYOMING MI 49548</u>																																																					
Signed <u>LESTER EHORN</u> Date <u>9/23/2019</u>																																																					
(Filed Electronically)																																																					
ODH Registration Number <u>02571</u>		Aquifer Type (Formation producing the most water.) <u>SAND</u>																																																			
		Date of Well Completion <u>9/20/2019</u> Total Depth of Well <u>88</u> ft.																																																			

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
Distribute copies of this record to Customer, and Local Health Department.

WELL LOG AND DRILLING REPORT

DNR 7802.05e

Ohio Department of Natural Resources
Division of Water, 2045 Morse Road, Columbus, Ohio 43229-6605
Voice (614) 265-6740 Fax (614) 265-6767

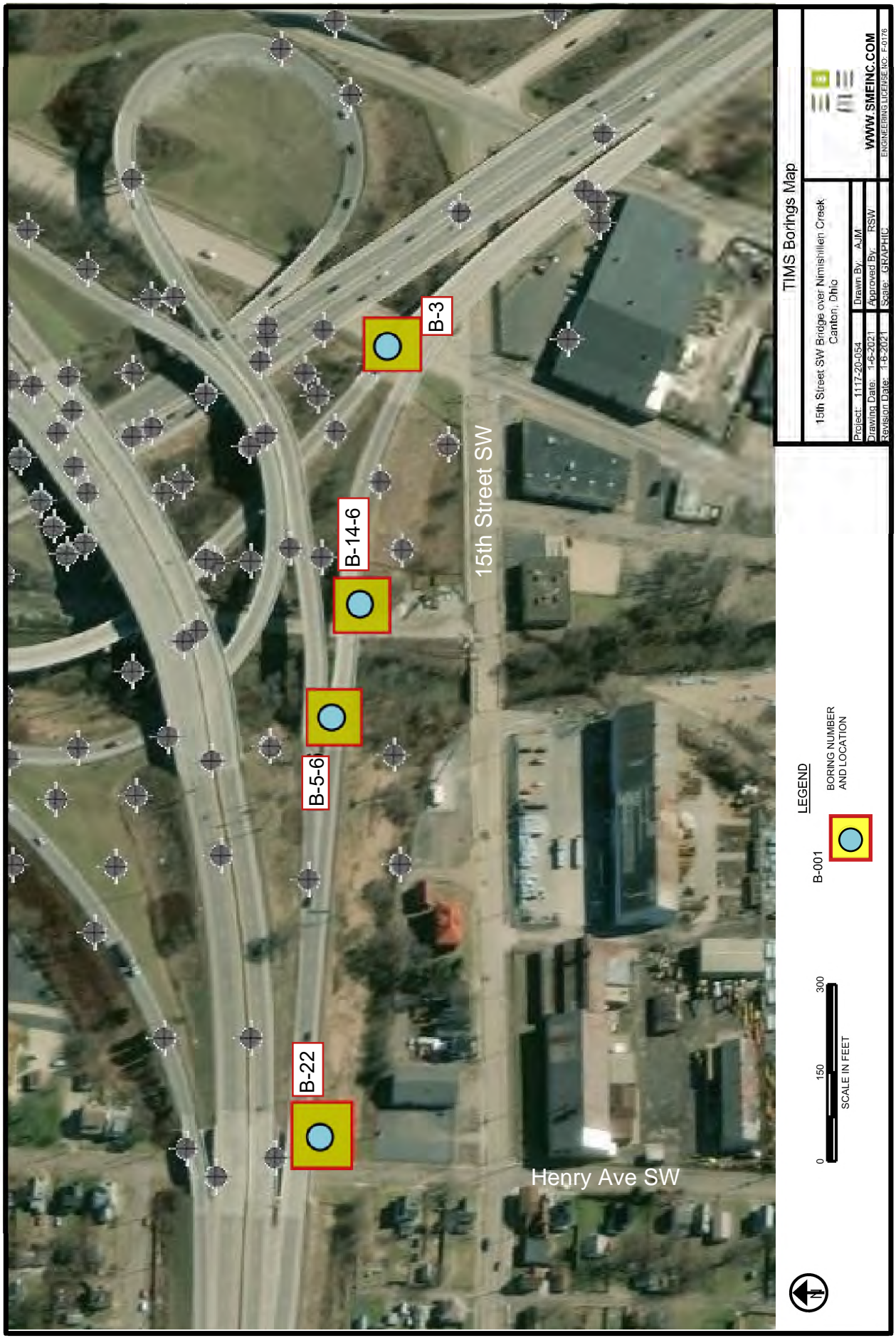
Well Log Number

2076781

Page 1 of 1 for this record.

WELL LOCATION	CONSTRUCTION DETAILS																																													
County <u>STARK</u> Township <u>CANTON</u>	Drilling Method: <u>BUCKET AUGER</u>																																													
Owner/Builder <u>BEAVER EXCAVATING</u>	BOREHOLE/CASING (Measured from ground surface)																																													
<u>NAVARRE</u>	1 { Borehole Diameter <u>36</u> inches Depth <u>85</u> ft. Casing Diameter <u>16</u> in. Length <u>88</u> ft. Thickness <u>0.25</u> in.																																													
Address of Well Location	2 { Borehole Diameter _____ inches Depth _____ ft. Casing Diameter _____ in. Length _____ ft. Thickness _____ in.																																													
City <u>CANTON</u> Zip Code +4 <u>44707</u>	Casing Height Above Ground <u>3</u> ft.																																													
Permit No. _____ Section: _____ and/or Lot No. _____	Type { 1: <u>Steel</u> 2: _____																																													
Use of Well <u>DEWATERING WELL</u>	Joints { 1: <u>Welded</u> 2: _____																																													
Coordinates of Well (Use only one of the below coordinate systems)	SCREEN																																													
State Plane Coordinates	Diameter <u>16</u> in. Slot Size <u>0.04</u> in. Screen Length <u>40</u> ft.																																													
N <input type="checkbox"/> X _____ +/- _____ ft.	Type <u>LOUVERED</u> Material <u>GALVANIZED STEEL</u>																																													
S <input type="checkbox"/> Y _____ +/- _____ ft.	Set Between <u>45</u> ft. and <u>85</u> ft.																																													
Latitude, Longitude Coordinates	GRAVEL PACK (Filter Pack)																																													
Latitude: <u>40.78604</u> Longitude: <u>-81.385937</u>	Material/Size <u>#5 pea gravel</u> Vol/Wt. Used <u>17.96 cy</u>																																													
Elevation of Well in feet: _____ +/- _____ ft.	Method of Installation <u>Poured (gravity)</u>																																													
Datum Plane: <input type="checkbox"/> NAD27 <input checked="" type="checkbox"/> NAD83 Elevation Source _____	Depth: Placed From: <u>0</u> ft. To: <u>85</u> ft.																																													
Source of Coordinates: <u>GLOBAL POSITIONING SYSTEM</u>	GROUT																																													
Well location written description: <u>WELL 12</u>	Material <u>Bentonite dry granular</u> Vol/Wt. Used <u>15 bags</u>																																													
	Method of Installation <u>Poured (gravity)</u>																																													
	Depth: Placed From: <u>9</u> ft. To: <u>10.5</u> ft.																																													
	DRILLING LOG*																																													
Comments on water quality/quantity and well construction: <u>SEDIMENT DETERMINED TO BE NOT DETECTABLE BY IMHOFF CONE</u>	FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.																																													
	<table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Color</th><th>Texture</th><th>Formation</th><th>From</th><th>To</th></tr></thead><tbody><tr><td></td><td></td><td>FILL MATERIAL</td><td>0</td><td>6</td></tr><tr><td></td><td></td><td>CLAY AND SAND</td><td>6</td><td>11</td></tr><tr><td></td><td></td><td>CLAYGRAVELBOULDERS</td><td>11</td><td>26</td></tr><tr><td></td><td>DIRTY</td><td>GRAVEL AND SAND</td><td>26</td><td>39</td></tr><tr><td></td><td>FINE</td><td>SAND AND GRAVEL</td><td>39</td><td>54</td></tr><tr><td></td><td>COARSE</td><td>SAND AND GRAVEL</td><td>54</td><td>66</td></tr><tr><td></td><td>FINE</td><td>SAND AND GRAVEL</td><td>66</td><td>85</td></tr><tr><td></td><td></td><td>Water Encountered At</td><td>4.7</td><td>85</td></tr></tbody></table>	Color	Texture	Formation	From	To			FILL MATERIAL	0	6			CLAY AND SAND	6	11			CLAYGRAVELBOULDERS	11	26		DIRTY	GRAVEL AND SAND	26	39		FINE	SAND AND GRAVEL	39	54		COARSE	SAND AND GRAVEL	54	66		FINE	SAND AND GRAVEL	66	85			Water Encountered At	4.7	85
Color	Texture	Formation	From	To																																										
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	COARSE	SAND AND GRAVEL	54	66																																										
	FINE	SAND AND GRAVEL	66	85																																										
		Water Encountered At	4.7	85																																										
WELL TEST *																																														
Pre-Pumping Static Level <u>4.7</u> ft. Date <u>11/14/2019</u>																																														
Measured from <u>TOP OF CASING</u>																																														
Pumping test method <u>PUMPING</u>																																														
Test Rate _____ gpm Duration of Test _____ hrs.																																														
Feet of Drawdown _____ ft. Sustainable Yield _____ gpm																																														
*(Attach a copy of the pumping test record, per section 1521.05, ORC)																																														
Is Copy Attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Flowing Well? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																														
PUMP/PITLESS																																														
Type of pump _____ Capacity _____ gpm																																														
Pump set at _____ ft. Pitless Type _____																																														
Pump installed by _____																																														
I hereby certify the information given is accurate and correct to the best of my knowledge.																																														
Drilling Firm <u>KELLEY DEWATERING & CONSTRUCTION CO</u>																																														
Address <u>5175 SW CLAY AVE</u>																																														
City, State, Zip <u>WYOMING MI 49548</u>																																														
Signed <u>LESTER EHORN</u> Date <u>11/18/2019</u>																																														
(Filed Electronically)																																														
ODH Registration Number <u>02571</u>	Aquifer Type (Formation producing the most water.) <u>SAND & GRAVEL</u>																																													
	Date of Well Completion <u>11/14/2019</u> Total Depth of Well <u>85</u> ft.																																													

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LOG OF BORING

Date Started 7-25-68

Sampler Type SS Dia 1 3/8"

Water Elev. _____

Date Completed 7-30-68

Casing Length 65' Dia 3 1/2"

Boring No. B-3

Station & Offset 966+47, 60' Lt. (First Pier)

Surface Elev. 1021.1'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics								SMTL Class.
							% Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	
1021.1	0														
	2														
	4														
1016.1	6	4/4			Red Silty Gravelly Sand and Brick Fragments	1	35	27	24	-14	-	NP	NP	12	A-1-b
1013.6	8	4/4			Brown Sandy Silt	2	10	21	27	18	24	NP	NP	20	A-4a
1011.1	10	16/16			Red Gravel and Boulders	3	V	I	S	U	A	L		16	
1008.6	12														
	14	24/16			Brown Sandy Gravel	4	75	11	7	-7	-	NP	NP	5	A-1-a
1006.1	16	14/18			Brown Silty Sandy Gravel	5	71	9	8	3	9	NP	NP	8	A-1-a
1003.6	18	13/18			Brown Silty Sandy Gravel	6	60	13	9	6	12	NP	NP	6	A-1-b
1001.1	20	18/18			Brownish-Gray Silty Sandy Gravel	7	68	11	8	4	9	NP	NP	6	A-1-a
998.6	22														
	24	16/19			Brownish-Gray Silty Sandy Gravel	8	54	20	15	-11	-	NP	NP	6	A-1-a
996.1	26	13/15			Brown Sandy Gravel (Heaved 1.0' in Casing)	9	67	20	7	-6	-	NP	NP	3	A-1-a
	28														
991.1	30	16/17			Gray Sandy Gravel (Heaved 1.0' in Casing)	10	52	28	10	-10	-	NP	NP	10	A-1-a
	32														
986.1	34	17/28			Gray Silty Sandy Gravel (Heaved 1.0' in Casing)	11	41	26	13	9	11	NP	NP	10	A-1-b
	36														
981.1	40	22/29			Gray Gravelly Sand (Heaved 1.0' in Casing)	12	29	39	23	-9	-	NP	NP	10	A-1-b
	42														
976.1	44	22/23			Gray Silty Gravelly Sand (Heaved 1.0' in Casing)	13	38	33	9	-20	-	NP	NP	9	A-1-b
	46														
971.1	50	30/48			Brownish-Gray Silty Sand (Heaved 1.5' in Casing)	14	8	51	25	-16	-	NP	NP	10	A-1-b
	52														
966.1	54	24/32			Brownish-Gray Silty Gravelly Sand (Heaved 1.0' in Casing)	15	15	43	20	-22	-	NP	NP	15	A-1-b
	56														
961.1	60	33/20			Gray Sand (Heaved 1.5' in Casing)	16	0	54	36	-10	-	NP	NP	19	A-1-b
	62														
	64														
956.1	66	27/33			Gray Sand	17	0	60	32	-8	-	NP	NP	23	A-1-b
955.1															

BOTTOM OF BORING

PLATE 12

LOG OF BORING

Date Started 8-28-63Sampler Type SS Dia 1 3/8"

Water Elev. _____

Date Completed 8-29-63Casing Length 60' Dia 3 1/2"Boring No. B-5-60Station & Offset 960+72, 22' Lt. (Rear Pier)Surface Elev. 1014.3'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics									SHTL Class.
							% Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.		
1014.3	0															
1011.8	2															
1009.3	4	7/7			Brown Silty Gravelly Sand, Cinders - Fill Material	1	38	29	22	-11	-	NP	NP	21	A-1-b	
1006.8	6	2/3			Black Gravelly Sand, Cinders - Fill Material	2	40	26	29	-5	-	NP	NP	36	A-1-b	
1004.3	8				No Sample Recovered (Hole Caved in)	V	V	I	S	U	A	L				
1004.3	10	4/5			Black Silty Sandy Gravel, Cinders	3	57	16	15	7	5	NP	NP	18	A-1-a	
1001.8	12															
999.3	14	11/14			Brownish-Gray Sandy Gravel	4	73	10	12	-5	-	NP	NP	7	A-1-a	
996.8	16	10/10			Brown Sandy Gravel	5	-	-	-	-	-	-	-	7	Visual	
994.3	18	10/12			Brownish-Gray Sandy Gravel	6	82	12	4	-2	-	NP	NP	8	A-1-a	
994.3	20	6/7			Gray Gravel	7	84	8	5	-3	-	NP	NP	9	A-1-a	
989.3	24															
989.3	28	6/8			Gray Silty Sandy Gravel	8	47	26	16	-11	-	NP	NP	14	A-1-b	
984.3	30															
984.3	32	14/18			Gray Sandy Gravel	9	65	21	8	-6	-	NP	NP	9	A-1-a	
979.3	34															
979.3	36	5/6			Gray Sandy Gravel	10	71	18	9	-2	-	NP	NP	6	A-1-a	
974.3	38															
974.3	40	6/9			Gray Sandy Gravel	11	78	15	5	-3	-	NP	NP	8	A-1-a	
969.3	42															
969.3	44															
969.3	46	18/21			Gray Sandy Gravel	12	-	-	-	-	-	-	-	3	Visual	
964.3	48															
964.3	50	10/13			Gray Sandy Gravel	13	-	-	-	-	-	-	-	4	Visual	
959.3	52															
959.3	54															
959.3	56	18/23			Gray Gravel	14	85	11	2	-2	-	NP	NP	4	A-1-a	
954.3	58															
953.3	60	14/17			Gray Sandy Gravel	15	56	41	3	-0	-	NP	NP	9	A-1-a	

BOTTOM OF BORING

LOG OF BORING

Date Started 8-26-68Sampler Type SS Dia 1 3/8"

Water Elev. _____

Date Completed 8-28-68Casing Length 60' Dia 3 1/2"Boring No. B-14-6Station & Offset 962+52, 8' Rt. (Forward Pier)Surface Elev. 1018.4'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics								SHTL Class.
							% Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	
1018.4	0														
1015.9	2														
	4	50*			Brown Silty Gravelly Sand, Cinders - Fill Material	1	29	24	27	11	9	NP	NP	17	A-1-b
1013.4		(0.7')													
	6	18/23			Brownish-Gray Silty Gravelly Sand, Cinders - Fill Material	2	22	31	27	11	9	NP	NP	19	A-1-b
1010.9	8				No Sample Recovered (Hole Caved in)		V/	I	3		U		A	L	
1008.4	10														
	12	1/1			Peat	3	-	-	-	-	-	-	-	191	Visual
1005.9	14	7/7			Gray Sandy Gravel	4	43	24	22	3	3	NP	NP	19	A-1-b
1003.4	16	7/9			Gray Gravelly Sand	5	27	53	15	-	5	NP	NP	13	A-1-b
1000.9	18	23/27			Gray Sandy Gravel	6	72	10	9	-	2	NP	NP	12	A-1-a
998.4	20	11/19			Gray Silty Sandy Gravel	7	43	25	15	5	7	NP	NP	7	A-1-b
	22														
	24														
993.4	26	12/14			Gray Sandy Gravel	8	66	27	5	-	2	NP	NP	11	A-1-a
	28														
988.4	30	10/11			Brownish-Gray Sandy Gravel	9	64	17	10	-	9	NP	NP	7	A-1-a
	32														
983.4	34	11/23			Gray Sandy Gravel	10	-	-	-	-	-	-	-	8	Visual
	36														
	38														
978.4	40	8/10			Gray Sand	11	0	61	38	-	1	NP	NP	28	A-1-b
	42														
973.4	44	20/30			Gray Sandy Gravel	12	55	23	9	-	3	NP	NP	12	A-1-a
	46														
	48														
968.4	50	14/22			Gray Sandy Gravel	13	-	-	-	-	-	-	-	8	Visual
	52														
	54														
963.4	56	17/25			Gray Sandy Gravel	14	56	30	12	-	2	NP	NP	14	A-1-a
	58														
958.4	60	15/21			Gray Sandy Gravel	15	59	26	13	-	2	NP	NP	17	A-1-a
957.4															

BOTTOM OF BORING

*Refusal

PLATE 14

LOG OF BORING

Date Started 7-18-68Sampler Type SS Dia 1 3/8"

Water Elev. _____

Date Completed 7-23-68Casing Length 75' Dia 3 1/2"Boring No. B-22Station & Offset 954+06, 25' Rt. (Forward Abutment) Ramp F Surface Elev. 1027.8'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics								SHTL Class.
							% Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	
1027.8	0														
	2														
	4														
1022.8	6	11/15			Brown Gravelly Sand	1	42	29	22	-7	-	NP	NP	10	A-1-b
1020.3	8	9/13			Brown Silty Gravelly Sand with Boulders	2	28	35	9	-28	-	NP	NP	10	A-3a
1017.8	10	16/18			Brown Sandy Gravel	3	49	21	22	-8	-	NP	NP	10	A-1-b
1015.3	12														
	14	19/18			Brown Silty Sandy Gravel	4	48	17	15	-20	-	NP	NP	7	A-1-b
1012.8	16	12/17			Brown Silty Gravelly Sand	5	38	33	13	-16	-	NP	NP	8	A-1-b
1010.3	18	9/16			Brown Sandy Gravel	6	V	I	S	U	A	L		6	
1007.8	20	8/9			Brown Silty Sandy Gravel	7	48	25	13	-14	-	NP	NP	10	A-1-b
1005.3	22														
	24	6/7			Brownish-Gray Sandy Gravel	8	70	18	8	-4	-	NP	NP	6	A-1-a
1002.8	26	8/18			Gray Sandy Gravel with Boulders	9	67	18	9	-6	-	NP	NP	11	A-1-a
	28														
997.8	30	12/12			Gray Gravelly Sand	10	27	53	12	-8	-	NP	NP	16	A-1-b
	32														
	34														
992.8	36	15/15			Brownish-Gray Sandy Gravel	11	63	19	13	-5	-	NP	NP	13	A-1-a
	38														
987.8	40	14/18			Brownish-Gray Silty Sandy Gravel	12	46	28	15	-11	-	NP	NP	10	A-1-b
	42														
	44														
982.8	46	6/7			Brownish-Gray Sandy Gravel	13	59	19	12	-10	-	NP	NP	7	A-1-a
	48														
977.8	50	30/33			Brownish-Gray Sandy Gravel	14	63	19	8	-10	-	NP	NP	8	A-1-a
	52														
	54														
972.8	56	27/22			Brownish-Gray Silty Gravelly Sand	15	43	29	17	-11	-	NP	NP	9	A-1-a
	58														
967.8	60	17/23			Gray Gravelly Sand	16	V	I	S	U	A	L		5	-
	62														
	64														
962.8	66	13/23			Gray Silty Sand	17	8	58	14	-20	-	NP	NP	10	A-1-b
	68														
957.8	70	13/17			Gray Silty Sand	18	9	61	14	-16	-	NP	NP	9	A-1-b
	72														
	74														
952.8 951.8	76	18/18			Gray Silty Gravelly Sand	19	36	33	16	-15	-	NP	NP	7	A-1-b

BOTTOM OF BORING