City of Dearborn

INVITATION TO BID (ITB) FOR POOL CONSTRUCTION AT THE FORD WOODS PARK

CONTROL No. 122972
ADDENDUM No. 5

ISSUE DATE: 12/4/17

DUE DATE: 12/13/17 AT 3:00 p.m. Local Time

This addendum is being issued to answer questions submitted by the question deadline and to distribute a revised bid price form.

ANSWERS TO SUBMITTED QUESTIONS:

1. Is there a projected date to commence construction?
   The City intends to award the contract by the end of January. The project is to begin immediately following the notice to proceed.

2. What is the open for operation target date?
   The target date is mid-August. It is the intent to have the facility open before the end of the summer 2018.

3. Division 131100 1.3.A.1 Quality Assurance states that we refer to section 002113 for bonding requirements. I cannot find this section. Under the Invitation to Bid – Special Instructions, Terms and Conditions #2 and #3 state the bonding requirements for the Contractor. Do you require a Performance Surety and Payment Surety from the pool subcontractor?
   The City only requires payment and performance sureties from the general contractor.

4. Division 131100 1.3.A.2 requires we be on a pre-approved list of Contractors. How do we find out if we are on this list? If required do we submit this to you for review and approval?
   This verbiage was deleted as part of Addendum No. 2, dated November 16, 2017.

5. To find out who the General Contractors are on this project would you be willing to issue a sign in sheet of attendees after the pre-bid meeting?
   Yes, the sign-in sheet has been posted to the MITN site.

6. The fence specifications are vague regarding post spacing. What is the typical or maximum spacing allowed?
   Refer to sheet L1.0 for fence post spacing dimensions.

THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE RESPONSE FORM IN THE ITB

7. What is the construction budget for this project?
   The City does not share this information.

8. Can we be included in the Pre-approved list of contractors?
   There is not a list of pre-approved contractors.

9. Are wage requirements – Union, prevailing wage, or open?
   There are no wage requirements on this project.

10. Spec section 089000 Louvers and Vents call out Ruskin Manuf. model EME820DD for louvers in masonry. These louvers are a triangular shape and not available in that model number. We propose the use of model EME520DD (5" depth) in lieu of.
    Yes, this is an acceptable substitution for louvers at masonry locations.

11. Are there any soil borings for this project?
    A soil boring demolition/soil compaction inspection report is currently being completed by Intertek/PSI. The City of Dearborn's DPW Engineering Division will forward upon completion.

12. Do you need a bid bond for this project?
    A bid bond is not required.

13. Where does the alternate price go on the bid form?
    A revised bid price form is included with this addendum.

14. The control gates do not appear to be powered. Are they meant to be powered?
    No, the control gates are not meant to be powered.

15. Is it acceptable if the subcontractor forms are turned in post bid?
    Yes, subcontractor forms will need to be submitted within 24 hours post-bid.

16. Do you know the permit cost?
    You may contact the Permit office or search the City's website for any permit fees associated with this project.

17. Is the project tax exempt?
    The City is tax-exempt.

18. 112 Break Room looks like it has countertops, however there are no elevations or details on it. Please advise.
    Refer to sheet A9.1 for cabinet sizes and mounting heights. Refer to specification section 064023 "Interior Architectural Woodwork" for countertop material requirements and specification section 123204 "Prefabricated Casework" for casework requirements.

19. Does the city of Dearborn have a list of preferred Pool Contractors?
    The City does not have a list of preferred pool contractors.

THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE RESPONSE FORM IN THE ITB

20. Is there a geotechnical report for this project?
    A geotechnical report was prepared by PSI on February 5, 2016 (PSI Project No. 0381899) – See Attached.

21. Regarding masonry units:
    Unit Color 1 – is this Ground Face or Split Face?
    CMU type 1 is to be Ground Face
    Unit Color 2 – is this Ground Face or Split Face?
    CMU type 2 is to be Split Face

22. Finish Floor plan indicates pre-faced CMU, this is what type of unit?
    Interior pre-faced CMU is to be Ground Face block, CMU type 1.

23. In regards to the glazed block in the specs. Where does this apply, as the interior block seems to be painted?
    Glazed block is not part of this project. References to glazed block in the mortar portions of the specification may be omitted. Interior faces of block walls are painted, unpainted ground face, or unpainted split face block. Refer to sheet A10.1 for areas designated to be painted block and unpainted block.

24. Who designed the pool?
    Counsilman-Hunsaker is the pool designer and consultant for this project.

25. Floor Plan states SR Sheet Rubber on print A10.1. The specs list Altro Aquarius Safety Flooring. Is the material used throughout the project?
    In reference to sheet A10.1, areas with floor finish of "SR" are to be sheet rubber flooring as specified in section 096516 "Resilient Sheet Flooring."

26. Are we to include irrigation?
    No.

27. Do all of the mulch beds require fabric per the specification (or just stone mulch which does not apply to this project)?
    No fabric is required for bark mulch.

28. I checked with the City, they said that plan review had not been done yet for 5700 Greenfield. Has this plan review been submitted yet? Should we be figuring all the costs of plan review and engineering review in our bid?
    The Contractor is responsible for all plan reviews and approvals. Contractors should include all fees in their bid submitted.

29. Will all of the restoration be the Seed Mix specified in the Restoration Note on Sheet C1.4 or do some of the areas get the School Seed Mix as specified in the Turf and Grasses Spec Section? If there are going to be (2) different types of seed mixes on this project, please clarify limits of each seed.
    Refer to the Turf and Grasses specification for all seeding.

30. If only (1) type of seed is to be used, which seed type would you like us to bid?

THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE RESPONSE FORM IN THE ITB

Refer to the Turf and Grasses specification for all seeding.

31. Do we bid 3" of Imported Top Soil per the Restoration Note on Sheet C1.4 or do we bid 4" of Imported Top Soil per the Sheet L2.0 Landscape Note #1?
    Refer to Landscape sheets for all restoration.
32. Will the landscape beds be left at the correct sub-grade to receive 12" of Planting Mix & 3" of mulch or do we include excavation, haulage & disposal of the planting areas in or bid
    The 12" of planting mix and 3" of mulch are a requirement of the project. The means and methods of excavation / rough grading should be coordinated with the general contractor.

33. What is the estimated schedule for the landscape portion of this project?
    The City does not disclose estimated costs.

34. On print A10.1 it states SR Sheet Rubber, but does not give the manufacturer or what style it is.
    Refer to specification section 096516 "Resilient Sheet Flooring" for manufacturer and style of SR Sheet Rubber flooring.

35. Who is responsible for material testing? (i.e. Density testing, concrete testing, concrete cylinder test, grout tests, sieve testing.)
    The Contractor is responsible for all materials testing.

36. Requesting specification for underwater pool lights, I'm not finding any info for them.
    Refer to specification section 131100 "Swimming Pools", Paragraph 2.21 "Underwater Lights."

All other Terms & Conditions remain unchanged.

Carrie Darkowski
Buyer
City of Dearborn
cdarkowski@ci.dearborn.mi.us

THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE RESPONSE FORM IN THE ITB

REVISED BID PRICE FORM

Failure to complete this form may result in your Bid being deemed Non-responsive and rejected without any further evaluation.

LUMP SUM PRICE: $_____

ALTERNATE PRICING:

1. **76' Poolside Waterslide, item #65-370 $_____**
2. **Stainless steel lockers $_____**

Project is guaranteed to be completed within _____calendar days after notice to proceed.

You must submit your response as stated in the submission requirements.

A tabulation of bids will be made available within 3 business days after the due date. Tabulations are posted on the MITN system. The lowest bid may not necessarily be the successful bid.

THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE RESPONSE FORM IN THE ITB

Information To Build On

Engineering • Consulting • Testing

GEOTECHNICAL EXPLORATION AND ENGINEERING REPORT

FOR THE PROPOSED:

FORD WOODS PARK POOL
5601 MEAD STREET
CITY OF DEARBORN
WAYNE COUNTY, MICHIGAN

Information To Build On
Engineering • Consulting • Testing

February 5, 2016

Mr. Al Loebach, P.E., Assistant City Engineer
City of Dearborn
16901 Michigan Avenue
Dearborn, Michigan 48126

RE: Geotechnical Exploration and Engineering Report
Proposed Pool Replacement
5601 Mead Street
City of Dearborn, Wayne County, Michigan
PSI Project No. **0381899**

Dear Mr. Loebach:

PSI has completed our geotechnical exploration and engineering report for the proposed swimming pool replacement within the existing Ford Woods Park located at 5601 Mead Street in City of Dearborn, Wayne County, Michigan. This report presents the results of our observations and analysis and our recommendations for the proposed site development.

PSI appreciates the opportunity to perform this geotechnical study and to assist you and the design team on this project. If you have any questions regarding this report, or if we may be of further service, please contact our office.

Respectfully,
PROFESSIONAL SERVICE INDUSTRIES, INC.,

Kevin F. Dubnicki, P.E.
Project Engineer

Arif Cekic, Ph.D., P.E.
Geotechnical Department Manager

2 cc: Enc.
1 pc: Via PDF

GEOTECHNICAL EXPLORATION
AND
ENGINEERING REPORT

FOR THE PROPOSED:

FORD WOODS PARK POOL
5601 MEAD STREET
CITY OF DEARBORN
WAYNE COUNTY, MICHIGAN

PREPARED FOR:

CITY OF DEARBORN
16901 MICHIGAN AVENUE
DEARBORN, MICHIGAN 48126

BY:

PROFESSIONAL SERVICE INDUSTRIES, INC.
45749 HELM STREET
PLYMOUTH, MICHIGAN 48170
(734) 453-7900

FEBRURAY 5, 2016

PSI PROJECT NO. 0381899

psi Information To Build On
Engineering • Consulting • Testing

TABLE OF CONTENTS

GEOTECHNICAL EXPLORATION AND ENGINEERING REPORT
PROPOSED FORD WOODS PARK POOL REPLACEMENT
CITY OF DEARBORN, WAYNE COUNTY, MICHIGAN

EXECUTIVE SUMMARY

Professional Service Industries, Inc. (PSI) has completed our geotechnical exploration and engineering report for the proposed swimming pool replacement within the existing Ford Woods Park located at 5601 Mead Street in City of Dearborn, Wayne County, Michigan. PSI understand that the proposed swimming pool will be approximately 120 feet by 79 feet in plan area with a depth up to 20 feet within the existing Ford Woods Park located at 5601 Mead Street in City of Dearborn, Wayne County, Michigan. In addition, PSI understands that a small bath house may be constructed at the project site. Specific details regarding loading were not provided. For the purposes of our analysis, PSI assumes that the loads for the building structure may be supported on the perimeter continuous spread footing foundations may be on the order of 2 to 3 kips per lineal foot (klf). A total of four (4) soil test borings were performed within the proposed development area and selected samples were tested in the laboratory.

Approximately 4.5 to 8 inches of dark brown clayey topsoil covered the surface at the boring locations performed. A stratum of native mottled brown and yellowish brown to brown silty clay with occasional to frequent silt and sand lens and seams was encountered below the topsoil at each of the boring locations performed. The mottled silty clay stratum extended to depths ranging from approximately 11 to 11.5 feet below the existing ground surface. A stratum of mottled gray and yellowish gray to gray silty clay was encountered below the mottled brown silty clay stratums at each of the boring locations performed. The gray silty clay stratum extended through the explored depth of the borings of approximately 35 to 40 feet below the existing ground surface.

Following proper site preparation as outlined in Section 3.1 of this report, PSI recommends that proposed building be supported on conventional spread footing foundations designed for a net allowable soil bearing pressure of up to **2,000 pounds per square foot (psf)** bearing on suitable native silty clay soils on newly placed and properly compacted engineered fill materials.

PSI understand that the proposed swimming pool will be approximately 120 feet by 79 feet in plan area. In addition, PSI was not provided anticipated weights or a final pool elevations at the time of this report. For design purposes, PSI assumes the pool may be up to 20 feet deep. As indicated above, groundwater or perched water was not encountered during drilling. However, the depth at which the soil color changes from brown to gray is often an indication of the long-term piezometric level in this area. Based on the boring logs and color changes, PSI generally anticipates water levels to be predominantly between 11 to 11.5 feet below the ground surface. In addition, vibrations associated with construction within approximately 2 to 3 feet of the groundwater table can cause the water table to rise

resulting in subgrade instability, especially when removal of significant amounts of overburden soils is considered. **Therefore, difficulty with groundwater seepage and/or saturated and unstable silty clay soils is anticipated during excavation and backfilling operations associated with the proposed pool construction.**

In addition, structures constructed below the water table are subjected to hydrostatic uplift. During initial construction, periods of maintenance when the pool may be emptied and drainage during winter months, the pool can be subjected to these uplift forces. The hydrostatic uplift is determined by taking the volume of water displaced by the pool and multiplying it by 62.4 pcf and adding an appropriate factor of safety. The weight of the pool structure must exceed this value or weight must be added by placing a thicker pool floor section, addition of deadman anchors or helical piers structurally tied into the pool section to resist uplift or installation of a permanent underdrain system designed to maintain the ground water elevation below the bottom of the pool elevation. To accurately define the water table for resistance of hydrostatic uplift forces, PSI strongly recommends that groundwater monitoring wells be installed. In lieu of groundwater data, PSI recommends using an elevation of approximately 9 feet below the existing ground surface for design to allow for seasonal fluctuations.

Difficulty with saturated and unstable silty clay soils should be anticipated during excavation and construction of the pool. To minimize the potential for bottom instability, PSI recommends that the groundwater level be maintained approximately 2 to 3 feet below the excavation bottom (if possible) to facilitate pool subgrade preparation, pool construction and backfilling operation to take place under relatively dry conditions. Groundwater seepage may be removed from within the excavation through large diameter casing wells or sump pits placed within and/or around the perimeter of the excavation. Depending on the soil and ground water conditions at the time of construction, PSI anticipates it may be necessary to stabilize the prepared pool subgrade with a layer or layers of woven geotextile, geogrid and/or a layer of well graded crushed concrete or well graded coarse aggregate such as MDOT 4AA, 6AA or 21AA. The need for the use of geotextile and the thickness and gradation requirements of the crushed aggregate layer required should be determined at the time of the pool subgrade preparation, based on the condition of the exposed subgrade at the time of construction but should be a minimum of 12 inches within shallower end of the proposed pool and may be up to 16 to 24 inches in the deep end. The subgrade should be stabilized prior to commencement of pool construction. PSI recommends that the Contractor verify the actual groundwater and seepage conditions at the time of the construction activities and propose a groundwater control methods for the Engineer's approval, including the disposal of discharge water.

This Executive Summary should not be considered separately from the entire text of this report with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are given in the following sections of this report.

1.0 PROJECT INFORMATION

1.1 Project Authorization

Professional Service Industries, Inc. (PSI) has completed our geotechnical exploration and engineering report for the proposed swimming pool replacement within the existing Ford Woods Park located at 5601 Mead Street in City of Dearborn, Wayne County, Michigan. PSI's work was authorized by Mr. Al Loebach, P.E., Assitent City Engineer for the City of Dearborn on January 6, 2016 and was performed in general accordance with PSI's Proposal for "Testing and Geotechnical Services, Control No. 106301" dated March 16, 2011.

1.2 Project Description

Limited project information was provided by Mr. Al Loebach, P.E. of City of Dearborn in a request for proposal via email on January 8, 2016. The information provided included an undated and untitled hand drawn site plan showing proposed boring locations. Additional project information was provided by Mr. Loebach through phone conversation on February 5, 2016. PSI understand that the proposed swimming pool will be approximately 120 feet by 79 feet in plan area with a depth up to 20 feet within the existing Ford Woods Park located at 5601 Mead Street in City of Dearborn, Wayne County, Michigan. In addition, PSI understands that a small bath house may be constructed at the project site. Specific details regarding loading were not provided. For the purposes of our analysis, PSI assumes that the loads supported on the perimeter continuous spread footing foundations may be on the order of 2 to 3 kips per lineal foot (klf).

Neither a topographic drawing, site grading plan, nor the finished floor elevation of the proposed building was provided. Based on visual observations of the existing site topography, PSI anticipates that the finished floor elevation of the proposed building may be established at or near the existing site grades. Accordingly, PSI anticipates that up to approximately 1 to 2 feet of cut/engineered fill may be required to achieve the proposed final grades (exclusive of any additional cut/fill associated with removal of unsuitable soil sections).

The geotechnical recommendations presented in this report are based on the available project information, and the results of our geotechnical exploration described in this report. If any of the noted information is considered incorrect or is changed, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

1.3 Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to provide the geotechnical parameters required to prepare recommendations for the design and construction of the foundations and pool replacement. PSI's authorized scope of services included drilling a total of four (4) soil test borings, laboratory testing of selected samples, an engineering evaluation of the data generated, and the preparation of a geotechnical report.

This report presents available project information, briefly outlines the testing procedures, describes the site and supplementary subsurface conditions, and provides recommendations regarding the following:

- Earthwork considerations for site development.
- Foundation type, depth, net allowable bearing pressure and estimate of potential settlement.
- Criteria for building and pool subgrade preparation and support.
- Comments regarding geotechnical factors that may impact earthwork, foundation construction, subgrade preparation, and performance of the proposed foundations and pool construction.

The geotechnical scope of services did not include an environmental assessment for determining the presence or absence of wetlands, hazardous or toxic materials in the soil, bedrock, surface water, groundwater or air on, below or around this site. Any statement in this report or on the Boring Logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. Prior to the development of any site, an environmental assessment is advisable.

PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminates in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. The City of Dearborn acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The City of Dearborn further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 Site Location and Description

The project site is located at the northeast corner of Greenfield Road and Ford Road at the

existing Ford Woods Park (5601 Mead Street) in City of Dearborn, Wayne County, Michigan. The general site location is shown on the Site Vicinity Map in the Appendix as Figure No. 1.

At the time of PSI's geotechnical exploration, the proposed pool area consisted of generally level manicured lawn and located approximately 60 feet south of the existing pool. The elevation of the existing surface within the proposed pool footprint was relatively flat. The ground surface exhibited a total difference in topography across the proposed site of approximately 1 foot or less based on visual observations.

2.2 Field and Laboratory Services

The field exploration program consisted of drilling a total of four (4) soil borings. Two boring were completed to a depth of approximately 35 feet below the existing ground surface and two borings were completed to a depth of approximately 40 feet below the ground surface within or near the proposed pools footprint. The City of Dearborn selected the number, depths and general locations of the borings. The boring locations were staked in the field by City of Dearborn personnel prior to PSI's arrival. The approximate boring locations are provided on the Boring Location Diagram, Figure No. 3 in the Appendix, which was prepared by PSI based on the previously referenced site plan provided by the City of Dearborn.

The drilling operations were performed on January 14, 2016. An All-Terrain Vehicle (ATV) -mounted drill rig was used to perform the soil borings utilizing 3¼ -inch diameter continuous flight hollow-stem augers to advance the boreholes. Standard Penetration Tests (SPT) were conducted and soil samples were obtained using split spoon sampling procedures at regular intervals not exceeding five (5) feet. Drilling and sampling techniques were performed in general accordance with ASTM Standard D1586. After completion of the drilling operations, the borings were backfilled with auger cuttings.

The elevation of the ground surface at the boring locations was not provided nor was a detailed topographic drawing from which to estimate the ground surface elevations at the boring locations provided. Prior to final design and construction, an actual field measurement at the boring locations should be made by a professional land surveyor. References to depths in this report and on the attached Boring Logs are from the existing ground surface unless otherwise noted.

Selected soil samples were tested in the laboratory to determine soil properties for PSI's engineering evaluation. Laboratory testing on the soil samples obtained during the field exploration included natural moisture content, Atterberg limits, unit weight, unconfined compression and estimating the unconfined compressive strength of the cohesive soils encountered using a calibrated hand penetrometer. The results of the unconfined compressive strength tests are included in the Appendix. The moisture content, Atterberg Limits, unit weight, unconfined compressive strength and hand penetrometer test results are

indicated on the Boring Logs opposite the depths at which the samples were obtained. The laboratory tests were performed in general accordance with applicable ASTM procedures. The unused portions of the recovered soil samples obtained during PSI's geotechnical exploration will be placed in storage at PSI's Plymouth Township facility. Unless otherwise requested in writing, the samples will be discarded after 60 days from the submission of the final report.

2.3 Subsurface Conditions

Approximately 4.5 to 8 inches of dark brown clayey topsoil covered the surface at the boring locations performed. A generalized soil description encountered in the borings, beginning at the bottom of the topsoil and proceeding downward, is as follows:

Stratum 1: Mottled Silty Clay. A stratum of native mottled brown and yellowish brown to brown silty clay with occasional to frequent silt and sand lens and seams was encountered below the topsoil at each of the boring locations performed. The mottled silty clay stratum extended to depths ranging from approximately 11 to 11.5 feet below the existing ground surface. Standard Penetration Resistance (N) values ranged from 4 to 11 blows per foot. The unconfined compressive strength of the mottled silty clay stratum ranged from approximately 3.0 tsf to 0.75 tsf, indicating consistencies of very stiff to medium stiff. In general, the soils became softer at deeper depths. The moisture contents of the tested soil samples from the mottled brown silty clay stratum ranged from 22 to 29 percent. The soils visually appeared to be in a moist condition when examined in the laboratory.

Stratum 2: Gray Silty Clay. A stratum of mottled gray and yellowish gray to gray silty clay was encountered below the mottled brown silty clay stratums at each of the boring locations performed. The gray silty clay stratum extended through the explored depth of the borings of approximately 35 to 40 feet below the existing ground surface. Standard Penetration Resistance (N) values ranged from hammer weight (0) to 5 blows per foot. The unconfined compressive strength of the gray silty clay stratum ranged from 0.6 to less than 0.5 tsf, indicating consistencies of medium stiff to very soft. The moisture content of the tested soil samples from the gray silty clay stratum typically ranged from 21 to 32 percent with higher values of between 39 and 42 percent located within interbedded strata of gray clay at the locations of Boring B-1 through B-3. The soils visually appeared to be in a moist condition when examined in the laboratory.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The Boring Logs should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratification, penetration resistance, location of the samples, and laboratory test data. The soil Boring Logs are presented in the Appendix.

The stratification shown on the Boring Logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratification represents the approximate boundary between subsurface materials; however, the actual transition may be gradual. Water level information obtained during field operations is also shown on the Boring Logs. The Boring Logs were prepared on the basis of the laboratory testing and supplemental visual engineering classification, as well as the field logs of the soil conditions encountered.

2.4 Groundwater Information

The driller visually looked for indications of groundwater seepage both during and after the drilling operations. Groundwater or perched water was not encountered during PSI's geotechnical investigations.

It is possible for the groundwater table to vary within the depths explored during other times of the year depending upon climatic conditions (seasonal fluctuation). Groundwater monitoring wells are required to accurately define the position and fluctuation of the groundwater table, especially if a boring is drilled in cohesive soil, where several days or weeks may be required for the groundwater to reach a static level. The installation of such monitoring wells was not included in the scope of services for this project. However, the depth at which the soil color changes from brown to gray is often an indication of the long-term piezometric level in this area. Based on the boring logs and color changes, PSI generally anticipates water levels to be predominantly between 11 to 11.5 feet below the ground surface.

2.5 Site Seismic Classification

Wayne County, Michigan lies in the Central Stable Tectonic Region and in the Seismic Zone 1 of probable seismic activity of the Building Officials Congress of America (BOCA), National Building Code (1999) and the Uniform Building Code (UBC), as indicated on the Earthquake Hazard Risk Map included as Figure No. 2 in the Appendix. This zone indicates that minor damages due to occasional earthquakes might be expected in this area. In the 2009 Michigan Building Code (MBC), the State of Michigan has adopted the provisions of the International Building Code (IBC). The Site Class is based on a weighted average of known or estimated soil properties for the uppermost 100 feet of the subsurface profile. Soil borings at the project site extended to a maximum depth of approximately 30 feet below the existing ground surface. Based on regional geologic mapping and past experience in the general project area, PSI anticipates that the subsurface conditions below the explored depth may generally consist of lacustrine clay and silt consistent with the soils encountered through the depth explored underlain by the Traverse Group bedrock formation at a depth of approximately 100 feet or greater. Based on our review of the available data, knowledge of regional geology, the Standard Penetration Test (SPT) N-values and unconfined compressive strength tests, we recommend that the seismic design for this project be based on **Site Class D** as defined in the 2012 IBC Section 1613.3.2. To properly determine the

seismic site class, additional soil borings would be required extending to a depth of 100 feet.

The 2002 USGS NEHRP probabilistic ground motion values for the site interpolated between the nearest four grid points from latitude 42.331735 and longitude -83.193166, are as follows (based on Site Class D):

Period (seconds)	2% Probability of Event in 50 years* (%g)	Site Coefficients	Max. Spectral Acceleration Parameters	Design Spectral Acceleration Parameters	
0.2 (S_s)	9.6	$F_a = 1.60$	$S_{ms} = 0.153$	$S_{Ds} = 0.102$	$T_0 = 0.147$
1.0 (S_1)	4.7	$F_v = 2.40$	$S_{m1} = 0.113$	$S_{D1} = 0.075$	$T_s = 0.735$
			$S_{ms} = F_a S_s$	$S_{Ds} = 2/3 * S_{ms}$	$T_0 = 0.2 * S_{D1}/S_{Ds}$
			$S_{m1} = F_v S_1$	$S_{D1} = 2/3 * S_{m1}$	$T_s = S_{D1}/S_{Ds}$

The site coefficients F_a and F_v were interpolated from the 2012 IBC Tables 1613.3(1) and 1613.3(2) as a function of the site classification and the mapped spectral response acceleration at the short (S_s) and 1 second (S_1) periods.

Based on the spectral response acceleration coefficients S_{Ds} and S_{D1} above, the Seismic Design Category for this site is **Category B** for occupancy categories I, II and III and **Category C** for occupancy category IV as prescribed by 2012 IBC Tables 1613.3.5(1) and 1613.3.5(2). According to IBC 2012, Section 1803.5.11 also require sites supporting structures in Design Category "C" be evaluated for the potential of slope instability, liquefaction and surface rupture due to faulting or lateral spreading. Detailed study of these effects is beyond the PSI base scope of services. However, its PSI's opinion that the risk of liquefaction occurring at this site is **relatively low** based on the site being located in a relatively low seismic activity area.

3.0 EVALUATION AND RECOMMENDATIONS

PSI has made our analysis based on the information developed during this exploration. The resulting recommendations are given in the following sections. If our estimations or understandings of the project are considered incorrect or if conditions during construction are significantly different from those described in this report, please contact PSI immediately in writing so that we may amend our recommendations presented in this report if appropriate and if desired by the client.

3.1 General Site Preparation and Fill Placement

Prior to site grading activities or excavation for foundation elements, existing underground utilities should be identified and rerouted or properly abandoned in-place. Existing underground utilities that are not re-routed or abandoned should be adequately marked and

protected to minimize the potential for damage during construction activities. Depressions resulting from the removal of these items should be backfilled with engineered fill or specified materials, such as lean concrete or grout, to the final design grade.

After site stripping and prior to the placement of new engineered fill or backfill at this site, the exposed soils should be thoroughly proof rolled/compacted with a large, heavy rubber-tired vehicle. Areas that exhibit instability or are observed to rut or deflect excessively under the moving load should be further undercut, stabilized by aeration, drying (if wet) and additional compaction to attain a stable finished subgrade. The proof rolling/compacting and undercutting activities should be performed during a period of dry weather and should be performed under the supervision of PSI.

Where subgrade conditions are not improved through aeration, drying and compaction, or where undercut and replacement is considered impractical due to the underlying soil and groundwater conditions, it may be necessary to stabilize localized areas of subgrade instability with a woven geotextile, and/or a layer of well graded crushed concrete or well graded coarse aggregate such as MDOT 4AA, 6AA or 21AA. The need for the use of geotextile and the thickness and gradation requirements of the crushed aggregate layer required should be determined at the time of the subgrade preparation, based on the condition of the exposed subgrade at the time of construction. The subgrade should be stabilized prior to placement of engineered fill or aggregate base course.

New fill supporting at-grade structures should be an environmentally clean material, free of organic matter, frozen soil, or other deleterious material. The material proposed to be used as engineered fill should be evaluated and approved for use by a PSI geotechnical engineer or his representative prior to placement in the field. Fill materials should be placed in maximum horizontal lifts of 8 inches of loose material and should be compacted within the range of ±2% of the optimum moisture content value. Moisture contents should be adjusted to the proper levels prior to placement and compaction. Adequate compaction will not be achieved if the fill is in a saturated condition. Wet soils may require drying or mixing with dry soil to facilitate compaction. If water must be added to dry soil, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying prior to compaction.

The structural fill and backfill should be compacted to 95% of the Modified Proctor maximum dry density as determined by ASTM D1557. Each lift of engineered fill should be tested for conformance to the project density requirements by a representative of PSI prior to placement of subsequent lifts. A minimum of one test per 2,500 square feet of building area and one test per 5,000 square feet of parking area should be performed for each lift, unless otherwise specified by the engineer. The moisture/density relationship (Proctor) of the material to be used as engineered fill should be evaluated by a PSI geotechnical engineer or his representative prior to placement in the field. PSI recommends one Proctor test for every 5,000 cubic yards (cyds) of fill up to 25,000 cyds and one test per each 50,000 cyds of fill thereafter or change of material.

PSI recommends that imported granular soils conform to the gradation requirements of MDOT Class II granular material. In addition, free-draining, non-plastic granular material such as MDOT Class II granular material is recommended for use as backfill against foundations and below grade walls. PSI recommends that imported cohesive soils used as engineered fill below at-grade structural elements have a liquid limit less than 40 percent and a plasticity index in the range of 10 to 25. A sheep's foot roller is recommended for compaction if cohesive soils are used. Vibratory compaction equipment should be used for compaction in granular soils. Small, hand-operated compaction equipment should be used in confined spaces and against below-grade walls and foundations.

Organic soils, old fill and other deleterious materials, which are removed or uncovered during site grading and subgrade undercut operations, foundation and utility excavations at this site, must be wasted in non-load bearing areas such as landscaped areas or removed from the site as directed by the project's engineer and should not be reused as engineered fill in other areas of the site.

3.2 Foundation Recommendations

Limited project information was provided to PSI regarding the proposed structure. Based on a phone conversation with the City of Dearborn, PSI understands that a single-story bath house with slab-on-grade floor slab may be constructed at the project site. Specific details relative to the associated loads were not provided. For the purposes of our analysis, PSI assumes that the loads supported on the perimeter continuous spread footing foundations may be on the order of 2 to 3 kips per lineal foot (klf).

Following proper site preparation as outlined above and in Section 3.1 of this report, PSI recommends that proposed building be supported on conventional spread footing foundations designed for a net allowable soil bearing pressure of up to **2,000 pounds per square foot (psf)** bearing on very native silty clay soils or on newly placed and properly compacted engineered fill materials. PSI estimates that total settlement of the native soils and properly compacted engineered fill may be on the order of 1 inch or less due to loads exerted by the proposed building foundations. Differential settlement between two, newly constructed adjacent columns bearing on similar soils may be up to approximately 50% of the total settlement.

Exterior footings and footings in unheated areas should be located at a minimum depth of 42 inches below the final exterior grade for proper protection against frost during normal winters. Interior footings may be supported at a shallower depth, while providing necessary clearance for pavement and utility construction, provided they are bearing on suitable, undisturbed native soils or properly placed and compacted engineered fill. A minimum depth of 24 inches is recommended for stability. If the structures are to be constructed during the winter months or if footings will likely be subjected to freezing temperatures after foundation construction, then all footings should be adequately protected from freezing.

Minimum dimensions of 30 inches for column footings and 24 inches for continuous footings and trench footings should be used in foundation design to minimize the possibility of a local bearing capacity failure. In addition, PSI recommends that continuous footings be suitably reinforced to make them as rigid as possible.

PSI recommends that exposed foundation excavation inverts be observed and tested by a representative of PSI prior to steel or concrete placement to document that the observed conditions are consistent with the geotechnical report. The foundation excavation should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture.

3.3 Floor Slab-on-Grade Recommendations

Prior to the placement of slab-on-grade concrete floors the subgrade should be prepared as outlined previously in the "Site Preparation" section of this report. PSI anticipates that the proposed building floor slab may be grade-supported on the existing moderate-plasticity mottled silty clay soils or on newly placed and properly compacted engineered fill, provided they are stable at the time of construction. PSI recommends that the vertical subgrade modulus, k be limited to 125 pounds per cubic inch, as determined by a 1-foot by 1-foot plate load test, in floor slab-on-grade design calculations.

PSI recommends that a minimum of 4 inches of free-draining, compacted aggregate be placed beneath the floor slab-on-grade to facilitate fine grading and provide increased support for the slabs-on-grade as well as to provide a capillary break below the floor slab. The aggregate should comply with the recommendations of the current version of ACI 302.1, "Concrete and Slab Construction." In areas with carpet, tile or other moisture-sensitive floor finishes, a vapor retarder should be placed in accordance with ACI 302.1, local building codes and the flooring manufacturer's recommendations.

The floor slab should have an adequate number of joints to reduce cracking resulting from any differential movement and volume changes during curing. The floor slab should not be rigidly connected to columns, walls, or foundations.

Proper joints should be provided at the junctions of the slab and foundation system so that a limited amount of independent movement can occur without causing distress. In areas of the floor slab that will be supporting live loads, PSI recommends that the floor slab joints be doweled to permit the proper transfer of loads across the joints. The floor slab should be suitably reinforced to make it as rigid as practical.

3.4 Pool Recommendations

PSI understand that the proposed swimming pool will be approximately 120 feet by 79 feet in plan area. In addition, PSI was not provided anticipated weights or a final pool elevations at the time of this report. For design purposes, PSI assumes the pool may be up to 20 feet deep. As indicated above, groundwater or perched water was not encountered during drilling. However, the depth at which the soil color changes from brown to gray is often an indication of the long-term piezometric level in this area. Based on the boring logs and color changes, PSI generally anticipates water levels to be predominantly between 11 to 11.5 feet below the ground surface. In addition, vibrations associated with construction within approximately 2 to 3 feet of the groundwater table can cause the water table to rise resulting in subgrade instability, especially when removal of significant amounts of overburden soils is considered. **Therefore, difficulty with groundwater seepage and/or saturated and unstable silty clay soils is anticipated during excavation and backfilling operations associated with the proposed pool construction.**

In addition, structures constructed below the water table are subjected to hydrostatic uplift. During initial construction, periods of maintenance when the pool may be emptied and drainage during winter months, the pool can be subjected to these uplift forces. The hydrostatic uplift is determined by taking the volume of water displaced by the pool and multiplying it by 62.4 pcf and adding an appropriate factor of safety. The weight of the pool structure must exceed this value or weight must be added by placing a thicker pool floor section, addition of deadman anchors or helical piers structurally tied into the pool section to resist uplift or installation of a permanent underdrain system designed to maintain the ground water elevation below the bottom of the pool elevation. To accurately define the water table for resistance of hydrostatic uplift forces, PSI strongly recommends that groundwater monitoring wells be installed. In lieu of groundwater data, PSI recommends using an elevation of approximately 9 feet below the existing ground surface for design to allow for seasonal fluctuations.

Difficulty with saturated and unstable silty clay soils should be anticipated during excavation and construction of the pool. To minimize the potential for bottom instability, PSI recommends that the groundwater level be maintained approximately 2 to 3 feet below the excavation bottom (if possible) to facilitate pool subgrade preparation, pool construction and backfilling operation to take place under relatively dry conditions. Groundwater seepage may be removed from within the excavation through large diameter casing wells or sump pits placed within and/or around the perimeter of the excavation. Depending on the soil and ground water conditions at the time of construction, PSI anticipates it may be necessary to stabilize the prepared pool subgrade with a layer or layers of woven geotextile, geogrid and/or a layer of well graded crushed concrete or well graded coarse aggregate such as MDOT 4AA, 6AA or 21AA. The need for the use of geotextile and the thickness and gradation requirements of the crushed aggregate layer required should be determined at the time of the pool subgrade preparation, based on the condition of the exposed subgrade at the time of construction but should be a minimum of 12 inches within

shallower end of the proposed pool and may be up to 16 to 24 inches in the deep end. The subgrade should be stabilized prior to commencement of pool construction. PSI recommends that the Contractor verify the actual groundwater and seepage conditions at the time of the construction activities and propose a groundwater control methods for the Engineer's approval, including the disposal of discharge water.

3.5 Lateral Earth Pressure Recommendations

Lateral earth pressure for use in the design of below-grade walls will vary depending on the type of wall, the type of backfill material, how the backfill is compacted and the drainage provisions employed.

Clean granular soil, similar to MDOT Class II sand, is recommended as the backfill material against retaining structures to minimize lateral earth pressures. Based on the use of MDOT Class II sand, an active earth pressure coefficient of 0.33 and a passive earth pressure coefficient of 3.0 may be used for free standing retaining walls (free head). For restrained walls (fixed head), an at-rest earth pressure coefficient of 0.50 may be used.

The equivalent fluid unit weights presented below provides recommended lateral earth pressures for the design of these walls. The table assumes the use of hand compacted MDOT Class II sand placed on a level surface directly behind the wall and having a moist unit weight of 125 pcf and an internal friction angle of 30 degrees. The values do not include the influence of excess structural compaction or surcharge loads from heavy compaction equipment operating immediately adjacent to the wall, adjacent foundations or other surface loads in or adjacent to the wall backfill, as well as sloped backfill surfaces. Retaining walls should also be designed to resist these surcharge loads, if present. PSI can provide assistance in evaluating the magnitude of design surcharge loads, if requested.

Equivalent Fluid Pressure

Backfill Type	Fixed-Head (At-Rest Condition) Walls (pcf)	Free-Head (Active Condition) Walls (pcf)
Granular Material With drainage	60	40
Granular Material Without drainage	90	80

Backfill of foundation walls and retaining walls must consist of free draining granular materials, conforming to the requirements of MDOT Class II granular material. The backfill materials should be placed in 8-inch thick loose layers and compacted to 95 percent of the Modified Proctor maximum dry density as determined per ASTM D1557.

PSI recommends that the backfill directly behind the walls be compacted with light, hand-held

compactors. Heavy compactors and grading equipment should not be allowed to operate within 5 to 10 feet of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures. A reduction in the lift size may be necessary to achieve proper compaction with hand-operated compactors. PSI recommends that a representative of the geotechnical engineer be present to monitor the wall foundation excavations and fill placement.

PSI recommends that below grade walls and retaining walls be provided with positive foundation drainage. A typical below-grade wall, retaining wall or foundation drain would consist of a minimum 4-inch flexible or rigid perforated pipe, protected by a proper filter medium (clean, coarse granular fill), and a non-woven geotextile fabric for long-term protection against siltation. The non-woven filter fabric should encircle or wrap the entire system, not the perforated pipe itself. In addition, below-grade walls should have an exterior waterproofing substance or bentonite panels applied to the wall prior to backfilling and should contain a water stop between the poured walls and the foundation base slab.

4.0 CONSTRUCTION CONSIDERATIONS

4.1 Drainage, Groundwater and Related Considerations

The driller visually looked for indications of groundwater seepage both during and after the drilling operations. The driller visually looked for indications of groundwater seepage both during and after the drilling operations. Groundwater or perched water was not encountered during PSI's geotechnical investigations. However, the depth at which the soil color changes from brown to gray is often an indication of the long-term piezometric level in this area. Based on the boring logs and color changes, PSI generally anticipates water levels to be predominantly between 11 to 11.5 feet below the ground surface. Therefore, some difficulty with groundwater seepage and foundation bearing surface instability should be anticipated during excavation associated with foundation excavation and swimming pool construction when extending past an elevation of approximately 11 feet. The contractor should be prepared to perform site-dewatering measures to allow foundation and pool construction to take place under relatively dry conditions.

It is possible for the groundwater table to vary within the depths explored during other times of the year depending upon climatic conditions (seasonal fluctuation) which may affect construction of the proposed underground tanks. PSI recommends that the Contractor verify the actual groundwater and seepage conditions at the time of the construction activities and propose a groundwater control methods for the Engineer's approval, including the disposal of discharge water.

Water should not be allowed to collect in shallow foundation excavations or other prepared subgrades of the construction area, either during or after construction. Water accumulation

should be removed from excavations by pumping from sump pits placed around the perimeter of the excavation.

Every effort should be made to keep the excavations and any other prepared subgrades dry if water is encountered or if rainfall or snowmelt occurs during construction. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather. Positive site surface drainage should be provided to reduce infiltration of surface water. The grades should be sloped away from the proposed building structure and surface drainage should be collected and discharged.

4.2 Excavation Safety Considerations

Typically, soils penetrated by augers can be removed with conventional earthmoving equipment (backhoe and/or trencher). However, subsurface excavation equipment varies, and field refusal conditions may vary as well. Therefore, it is possible that difficult excavation conditions may be encountered at the proposed site location between the boring locations.

Excavation near any existing structure or utility must be performed with the utmost of care and under the supervision of the geotechnical engineer's representative. Locations of all underground utilities within the proposed site must be verified by the Contractor prior to excavation.

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the Owner and the Contractor could be liable for substantial penalties. The Contractor is solely responsible for designing and constructing stable, safe, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The Contractor's "responsible person", as defined in 29 CFR Part 1926, must evaluate the soil exposed in the excavations as part of the Contractor's safety procedures.

The angle of the excavation side slopes must strictly be decided based on the soil type and unconfined compressive strength of the excavated soil per OSHA requirements. For Type A soils, such as clay above water table having unconfined compressive strength values equal to or more than 1½ ton per square foot (tsf), the maximum allowable slope for excavations up

to 20 feet deep is ¾ (Horizontal) :1 (Vertical). For Type B soils, such as clay above water table having unconfined compressive strength values between ½ to 1½ ton per square foot (tsf), or angular gravel, the maximum allowable slope for excavations up to 20 feet deep is 1 (Horizontal) :1 (Vertical). For Type C soils, such as clay above water table having unconfined compressive strength values less than ½ ton per square foot (tsf), or granular soils such as gravel and sand, and all submerged soils, the maximum allowable slope for excavations up to 20 feet deep is 1½ (Horizontal) :1 (Vertical). The Contractor should be aware that slope height, slope inclination, and excavation depth should not exceed the specified local, state, and federal regulations.

Earthwork, subgrade preparation, and foundation construction operations must be conducted in strict accordance with the project specifications and under the supervision of the geotechnical engineer or his representative. PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulation.

5.0 REPORT LIMITATIONS

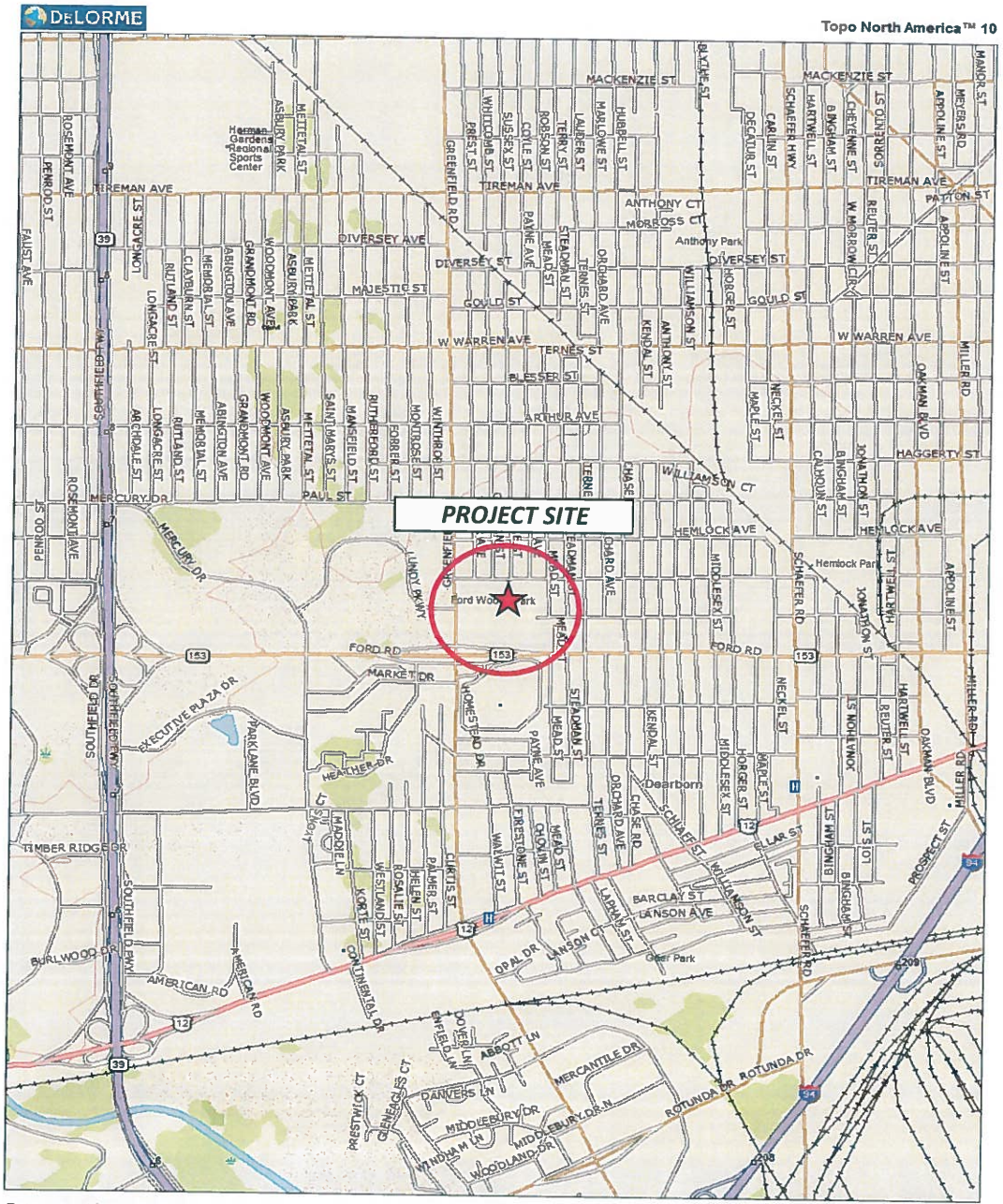
The recommendations submitted in this report are based on the available subsurface information obtained by PSI and the project information furnished by the City of Dearborn. If there are any revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the earthwork, subgrade preparation and foundation design parameter recommendations are required. If PSI is not notified of such changes, PSI will not be responsible for the impact of those changes on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional engineering practices in the local area. No other warranties are implied or expressed.

This report has been prepared for the exclusive use of City of Dearborn and their authorized representatives. This report is intended for the specific application to the proposed swimming pool replacement within the existing Ford Woods Park located at 5601 Mead Street in City of Dearborn, Wayne County, Michigan.

APPENDIX

SITE VICINITY MAP



N

PROJECT NAME:	PROJECT NUMBER	Figure No.
Proposed Ford Woods Park Pool 5601 Mead Street City of Dearborn, Wayne County, Michigan	381899	1
	Date: February 4, 2016	psi

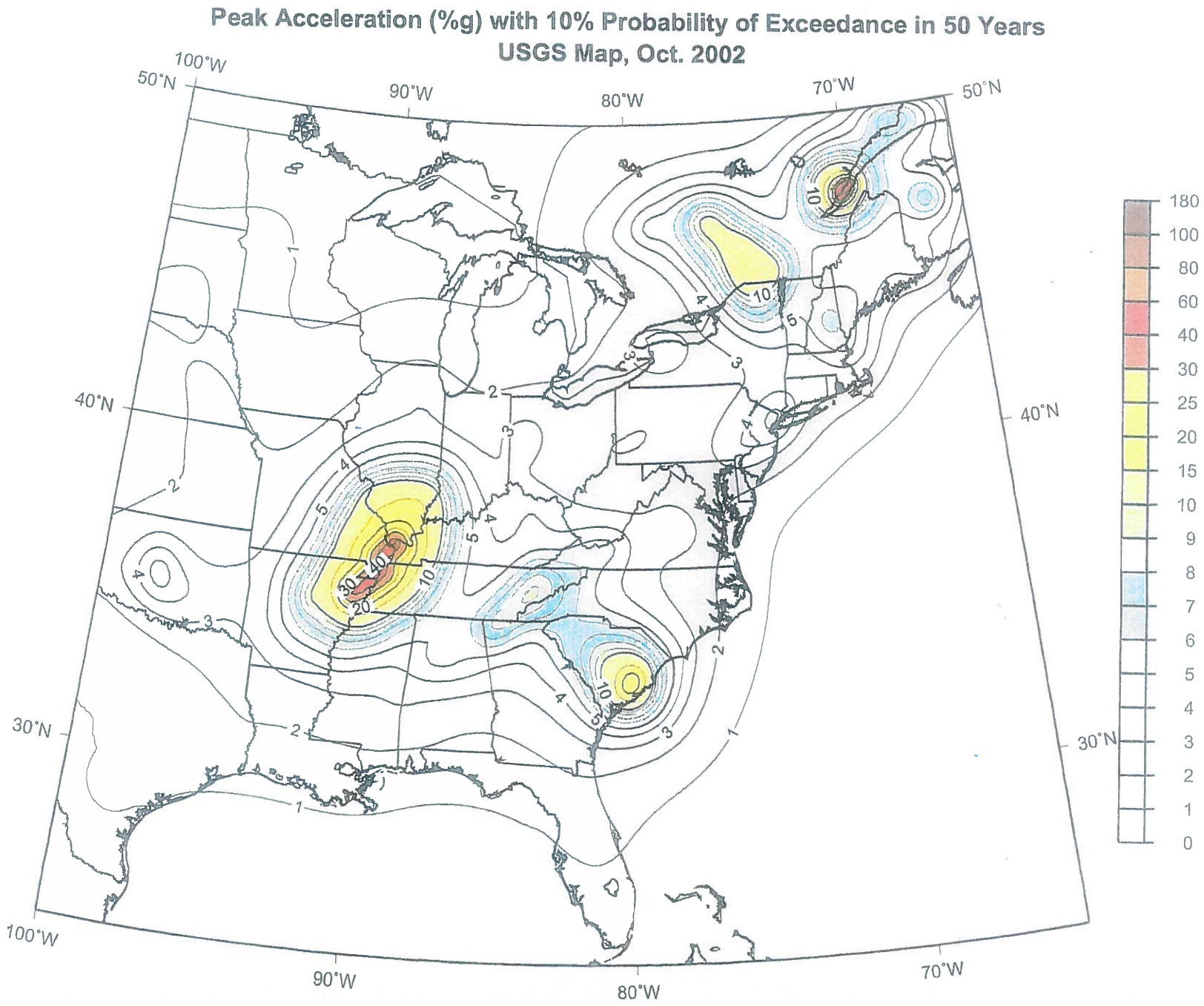
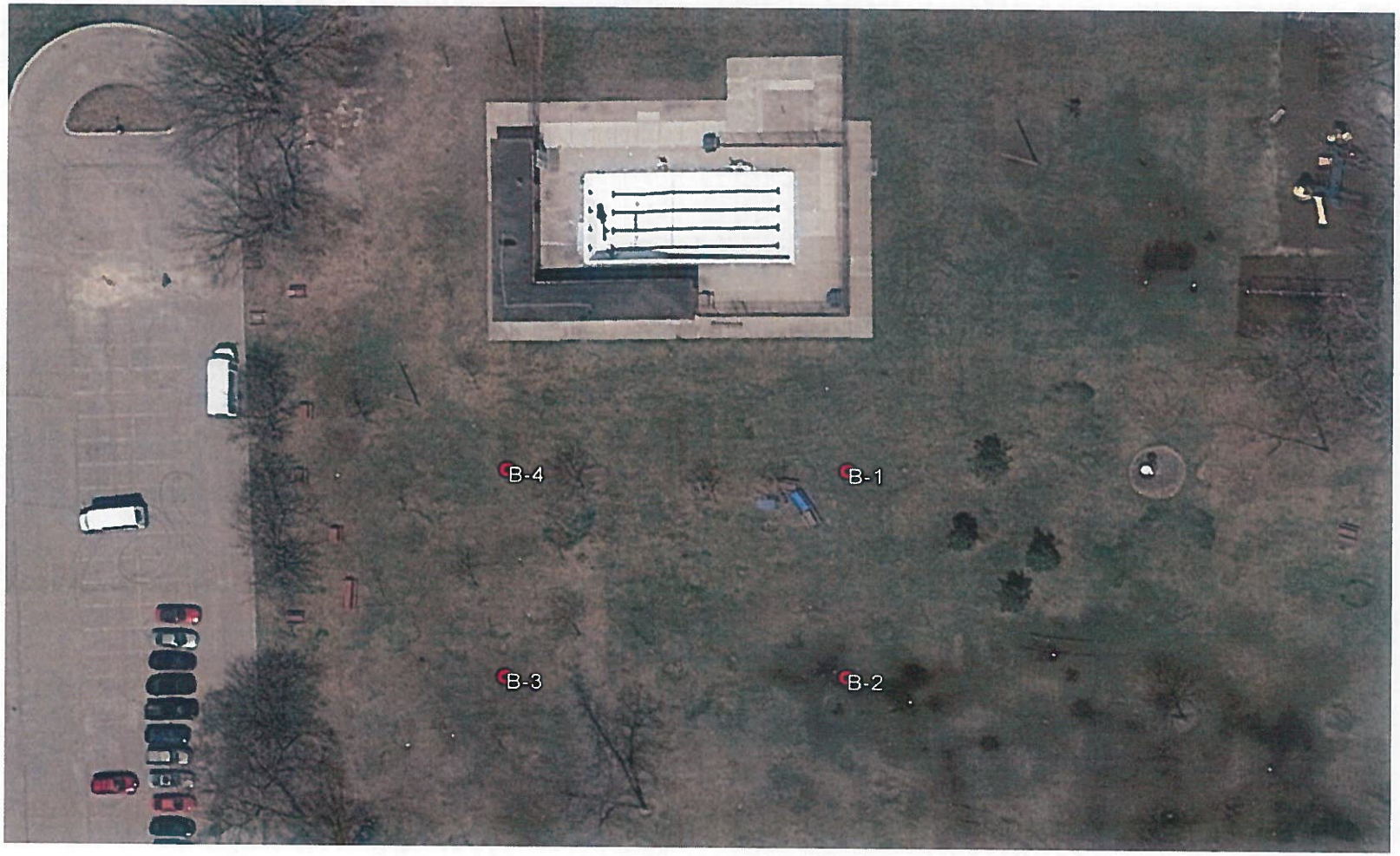


FIGURE NO. 2

Earthquake Hazard Risk Map

Source: http://earthquake.usgs.gov/hazmaps/

BORING LOCATION PLAN



N

LEGEND:

- APPROXIMATE BORING LOCATION

PROJECT NAME: Proposed Ford Woods Park Pool 5601 Mead Street City of Dearborn, Wayne County, Michigan	Prepared by PSI for use in the geotechnical exploration and report	PROJECT NUMBER 381899	Figure No. 3
		Date: February 4, 2016	psi

BORING B-1

DATE STARTED:	1/14/16
DATE COMPLETED:	1/14/16
COMPLETION DEPTH	35.5 ft
BENCHMARK:	N/A
ELEVATION:	N/A
LATITUDE:	
LONGITUDE:	
STATION: N/A	OFFSET: N/A
DRILL COMPANY:	PSI, Inc.
DRILLER: N. Wilson	LOGGED BY: K. Dubnicki
DRILL RIG:	D-50
DRILLING METHOD:	3.25" HSA
SAMPLING METHOD:	2" SS
HAMMER TYPE:	Automatic
EFFICIENCY	80%
REVIEWED BY:	A. Cekic

Water

While Drilling	Dry
Upon Completion	Dry
Delay	Cave @ 10 feet

BORING LOCATION: See Boring Location Plan

REMARKS: Borehole backfilled with auger cuttings upon completion

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Approximately 4.5" of dark brown CLAYEY TOPSOIL, trace sand and gravel				
		1	10	SILTY CLAY - trace sand, occasional silt seams, mottled brown and yellowish brown, moist, very stiff	CL	3,4,6 N=10	22	Qp = 3.0 tsf
	5	2	16			3,3,5 N=8	23	Qp = 2.25 tsf
		3	18	SILTY CLAY - trace sand, frequent silt seams, mottled brown and yellowish brown, moist, stiff to medium stiff	CL	3,3,3 N=6	28	DD = 95 pcf Q_u = 1.0 tsf Qp = 1.5 tsf
	10	4	18			2,2,3 N=5	28	Qp = 0.75 tsf
		5	18	SILTY CLAY - mottled gray and yellowish gray, wet, medium stiff	CL	2,2,3 N=5	27	Qp = 0.75 tsf
	15	6	18			2,2,2 N=4	27	Qp = 0.5 tsf
	20	7	18	SILTY CLAY - gray with red mottling, wet, soft to very soft	CL	1,1,1 N=2	42	Qp = <0.5 tsf
	25	8	18	SILTY CLAY - gray, wet, soft to very soft		1,1,1 N=2	28	LL = 37 PL = 18 Qp = <0.5 tsf
	30	9	18		CL	1,1,1 N=2	25	Qp = <0.5 tsf
	35	10	18			1,1,2 N=3	21	Qp = <0.5 tsf
				End of Boring				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Professional Service Industries, Inc.
45749 Helm Street
Plymouth, MI 48170
Telephone: (734) 453-7900

PROJECT NO.: 0381899
PROJECT: Proposed Ford Woods Park Pool
LOCATION: 5601 Mead Street, City of Dearborn, Wayne County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-2

DATE STARTED:	1/14/16
DATE COMPLETED:	1/14/16
COMPLETION DEPTH	40.5 ft
BENCHMARK:	N/A
ELEVATION:	N/A
LATITUDE:	
LONGITUDE:	
STATION: N/A	OFFSET: N/A
DRILL COMPANY:	PSI, Inc.
DRILLER: N. Wilson	LOGGED BY: K. Dubnicki
DRILL RIG:	D-50
DRILLING METHOD:	3.25" HSA
SAMPLING METHOD:	2" SS
HAMMER TYPE:	Automatic
EFFICIENCY	80%
REVIEWED BY:	A. Cekic

Water

While Drilling	Dry
Upon Completion	Dry
Delay	Cave @ 11 feet

BORING LOCATION: See Boring Location Plan

REMARKS: Borehole backfilled with auger cuttings upon completion

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA (N in blows/ft ◎; × Moisture; ◪ PL; ✚ LL; 0–25–50) / STRENGTH, tsf (▲ Qu; ✳ Qp; 0–2.0–4.0)	Additional Remarks
	0					Approximately 5.5" of dark brown CLAYEY TOPSOIL, trace sand and gravel					
			SS	1	18	SILTY CLAY - trace sand, mottled brown and yellowish brown, moist, stiff	CL	4,3,5 N=8	26		Qp = 1.75 tsf
	5		SS	2	18	SILTY CLAY - trace sand and hair roots, mottled brown and yellowish brown, moist, stiff	CL	3,3,4 N=7	29		Qp = 1.25 tsf
			SS	3	18	SILTY CLAY - trace sand, frequent silt seams, mottled brown and yellowish brown, moist, stiff	CL	3,3,4 N=7	25		Qp = 1.0 tsf
	10		SS	4	18	SILTY CLAY - trace sand, frequent silt seams, brown, moist, medium stiff	CL	2,2,2 N=4	25		Qp = 0.75 tsf
			SS	5	18	SILTY CLAY - occasional silt seams, mottled gray and yellowish gray, wet, medium stiff	CL	2,2,2 N=4	29		DD = 92 pcf Q_u = 0.6 tsf Qp = 0.75 tsf
	15		SS	6	18	SILTY CLAY - gray, wet, very soft	CL	2,2,2 N=4	41		Qp = <0.5 tsf
			SS	7	18	SILTY CLAY - gray, wet, very soft to soft		1,1,1 N=2	25		Qp = <0.5 tsf
	20		SS	8	18			HW,HW,HW	24		LL = 29 PL = 15 Qp = <0.5 tsf
	25		SS	9	18		CL	1,1,1 N=2	32		Qp = <0.5 tsf
	30		SS	10	18			1,1,2 N=3	22		Qp = <0.5 tsf
	35		SS	11	18			2,2,3 N=5	22		Qp = <0.5 tsf
	40					End of Boring					

Professional Service Industries, Inc.
45749 Helm Street
Plymouth, MI 48170
Telephone: (734) 453-7900

PROJECT NO.: 0381899
PROJECT: Proposed Ford Woods Park Pool
LOCATION: 5601 Mead Street, City of Dearborn, Wayne County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-3

DATE STARTED:	1/14/16
DATE COMPLETED:	1/14/16
COMPLETION DEPTH	35.5 ft
BENCHMARK:	N/A
ELEVATION:	N/A
LATITUDE:	
LONGITUDE:	
STATION: N/A	OFFSET: N/A
DRILL COMPANY:	PSI, Inc.
DRILLER: N. Wilson	LOGGED BY: K. Dubnicki
DRILL RIG:	D-50
DRILLING METHOD:	3.25" HSA
SAMPLING METHOD:	2" SS
HAMMER TYPE:	Automatic
EFFICIENCY	80%
REVIEWED BY:	A. Cekic

Water

While Drilling	Dry
Upon Completion	Dry
Delay	Cave @ 10 feet

BORING LOCATION: See Boring Location Plan

REMARKS: Borehole baclfilled with auger cuttings upon completion

Elevation (feet)	Depth, (feet)	Sample No.	Sample Type	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0				Approximately 8" of dark brown CLAYEY TOPSOIL, trace sand and gravel				
		1	SS	18	SILTY CLAY - trace sand, mottled brown and yellowish brown, moist, very stiff	CL	4,5,6 N=11	22	Qp = 3.25 tsf
	5	2	SS	18	SILTY CLAY - trace sand, frequent silt seams, mottled brown and yellowish brown, moist, stiff	CL	4,3,3 N=6	27	Qp = 2.0 tsf
		3	SS	18			2,3,3 N=6	26	LL = 31 PL = 17 Qp = 1.0 tsf
	10	4	SS	18			2,2,3 N=5	24	Qp = 1.0 tsf
		5	SS	18	SILTY CLAY - gray, wet, very soft	CL	2,1,2 N=3	39	Qp = <0.5 tsf
	15	6	SS	18	SILTY CLAY - gray, wet, soft to very soft		1,1,1 N=2	24	Qp = <0.5 tsf
	20	7	SS	18			HW,1,1 N=2	25	Qp = <0.5 tsf
	25	8	SS	18		CL	1,1,1 N=2	29	Qp = <0.5 tsf
	30	9	SS	18			1,1,1 N=2	22	Qp = <0.5 tsf
	35	10	SS	18			1,1,1 N=2	22	Qp = <0.5 tsf
					End of Boring				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Professional Service Industries, Inc.
45749 Helm Street
Plymouth, MI 48170
Telephone: (734) 453-7900

PROJECT NO.: 0381899
PROJECT: Proposed Ford Woods Park Pool
LOCATION: 5601 Mead Street
City of Dearborn
Wayne County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-4

DATE STARTED:	1/14/16
DATE COMPLETED:	1/14/16
COMPLETION DEPTH	40.5 ft
BENCHMARK:	N/A
ELEVATION:	N/A
LATITUDE:	
LONGITUDE:	
STATION: N/A	OFFSET: N/A
DRILL COMPANY:	PSI, Inc.
DRILLER: N. Wilson	LOGGED BY: K. Dubnicki
DRILL RIG:	D-50
DRILLING METHOD:	3.25" HSA
SAMPLING METHOD:	2" SS
HAMMER TYPE:	Automatic
EFFICIENCY	80%
REVIEWED BY:	A. Cekic

Water

While Drilling	Dry
Upon Completion	Dry
Delay	Cave @ 9 feet

BORING LOCATION: See Boring Location Plan

REMARKS: Borehole backfilled with auger cuttings upon completion

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Approximately 5.5" of dark brown CLAYEY TOPSOIL, trace sand and gravel					
				1	10	SILTY CLAY - trace sand, occasional to frequent silt and sand seams, mottled brown and yellowish brown, moist, very stiff to stiff		3,4,5 N=9	23	× Qp = 2.5 tsf	
	5			2	12		CL	3,3,3 N=6	26	× Qp = 1.75 tsf	
				3	18			3,2,3 N=5	27	× Qp = 1.25 tsf	
	10			4	18			3,3,3 N=6	24	▲ × DD = 101 pcf, Q_u = 1.0 tsf, Qp = 1.25 tsf	
				5	18	SILTY CLAY - trace sand, frequent silt seams, gray, moist, medium stiff	CL	2,2,2 N=4	25	× Qp = 0.75 tsf	
	15			6	18	SILTY CLAY - gray, wet, soft to very soft		1,1,1 N=2	29	× Qp = <0.5 tsf	
	20			7	18		CL	1,1,1 N=2	33	× Qp = <0.5 tsf	
	25			8	18			1,1,1 N=2	33	× Qp = <0.5 tsf	
	30			9	18	SILTY CLAY - gray, wet, medium stiff to soft		2,2,2 N=4	21	× Qp = <0.5 tsf	
	35			10	18		CL	2,2,2 N=4	21	▲ × DD = 105 pcf, Q_u = 0.6 tsf, Qp = <0.5 tsf	
	40			11	18			1,2,2 N=4	23	× Qp = <0.5 tsf	
						End of Boring					

Professional Service Industries, Inc.
45749 Helm Street
Plymouth, MI 48170
Telephone: (734) 453-7900

PROJECT NO.: 0381899
PROJECT: Proposed Ford Woods Park Pool
LOCATION: 5601 Mead Street, City of Dearborn, Wayne County, Michigan

The stratification lines represent approximate boundaries. The transition may be gradual.

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
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

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

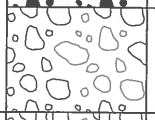
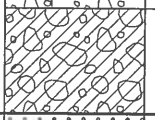
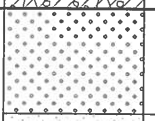
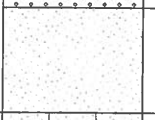
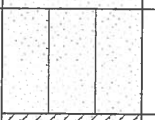
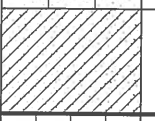
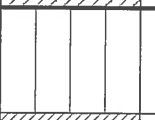
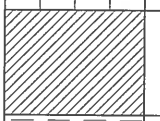
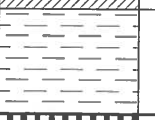
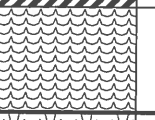
Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.

Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.

Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

psi

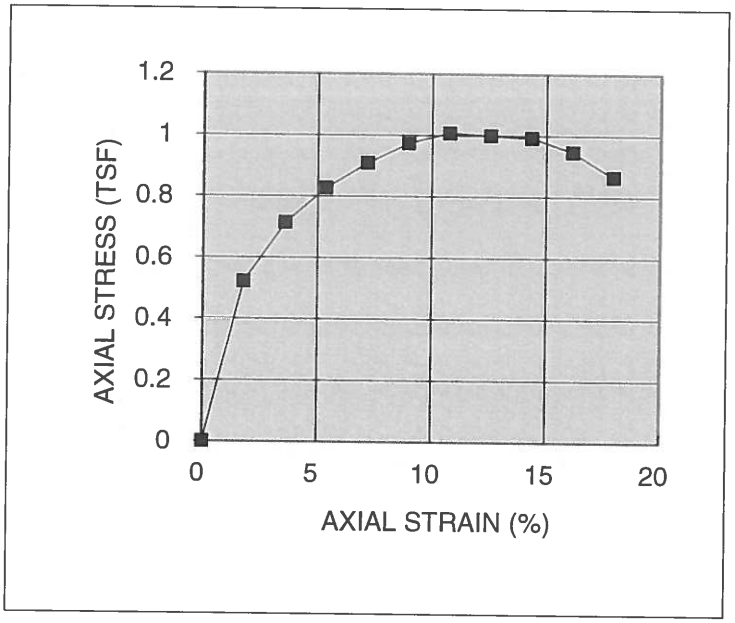
UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

Project Name: Proposed FordWoods Park Pool
Location: City of Dearborn, Wayne County, Michigan
Project No.: 0381899
Source: B-1; 3SS **Sample Depth:** 6.5'-8.0'
Description: SILTY CLAY (CL), trace sand, mottled brown and yellowish brown
Qp (tsf): 1.50
Wet Weight (gm): 132.25
Date Tested: 2/3/2016
Tested By: EM

Height:	2.785 inches	70.75 mm	
Diameter:	1.380 inches	35.06 mm	
Moisture Content:	28%	**Saturation (%):**	
Ht.-Diameter Ratio:	2.02	**Specific Gravity:**	
Dry Density:	95 pcf		

READING NUMBER	DEFORM. (in.)	LOAD DIAL READING	LOAD (lbs)	STRAIN (%)	CORRECTED AREA (in^2)	AXIAL STRESS (tsf)
0	0.000	0	0.0	0.00	1.496	0.00
1	0.050	35	11.0	1.80	1.524	0.52
2	0.100	49	15.4	3.59	1.552	0.71
3	0.150	58	18.2	5.39	1.582	0.83
4	0.200	65	20.4	7.18	1.612	0.91
5	0.250	71	22.2	8.98	1.644	0.97
6	0.300	75	23.5	10.77	1.677	1.01
7	0.350	76	23.8	12.57	1.711	1.00
8	0.400	77	24.1	14.36	1.747	0.99
9	0.450	75	23.5	16.16	1.785	0.95
10	0.500	70	21.9	17.95	1.824	0.87
11	0.550					
12	0.600					
13	0.650					
14	0.700					
15	0.750					
16	0.800					
17	0.850					
18	0.900					
19	0.950					
20	1.000					

Qu = 1.01 tsf 96.48 kPa, Strain 10.77%



Failure Sketch

psi

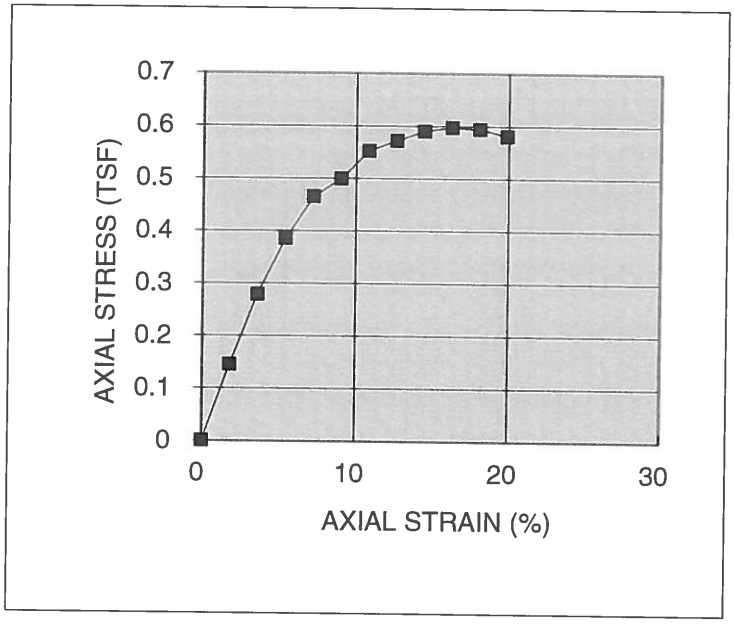
UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

Project Name: Proposed FordWoods Park Pool
Location: City of Dearborn, Wayne County, Michigan
Project No.: 0381899
Source: B-2; 5SS **Sample Depth:** 11.5'-13.0'
Description: SILTY CLAY (CL), occasional silt seams, mottled gray and yellowish gray
Qp (tsf): 0.75
Wet Weight (gm): 164.23
Date Tested: 2/3/2016
Tested By: EM

Height:	2.766 inches	70.26 mm	
Diameter:	1.555 inches	39.49 mm	
Moisture Content:	29%	**Saturation (%):**	
Ht.-Diameter Ratio:	1.78	**Specific Gravity:**	
Dry Density:	92 pcf		

READING NUMBER	DEFORM. (in.)	LOAD DIAL READING	LOAD (lbs)	STRAIN (%)	CORRECTED AREA (in^2)	AXIAL STRESS (tsf)
0	0.000	0	0.0	0.00	1.898	0.00
1	0.050	12	3.9	1.81	1.933	0.15
2	0.100	24	7.6	3.62	1.970	0.28
3	0.150	34	10.7	5.42	2.007	0.39
4	0.200	42	13.2	7.23	2.046	0.47
5	0.250	46	14.5	9.04	2.087	0.50
6	0.300	52	16.3	10.85	2.129	0.55
7	0.350	55	17.3	12.65	2.173	0.57
8	0.400	58	18.2	14.46	2.219	0.59
9	0.450	60	18.8	16.27	2.267	0.60
10	0.500	61	19.1	18.08	2.317	0.59
11	0.550	61	19.1	19.88	2.369	0.58
12	0.600					
13	0.650					
14	0.700					
15	0.750					
16	0.800					
17	0.850					
18	0.900					
19	0.950					
20	1.000					

Qu = 0.59 tsf 56.50 kPa, Strain 15.00%



Failure Sketch

psi

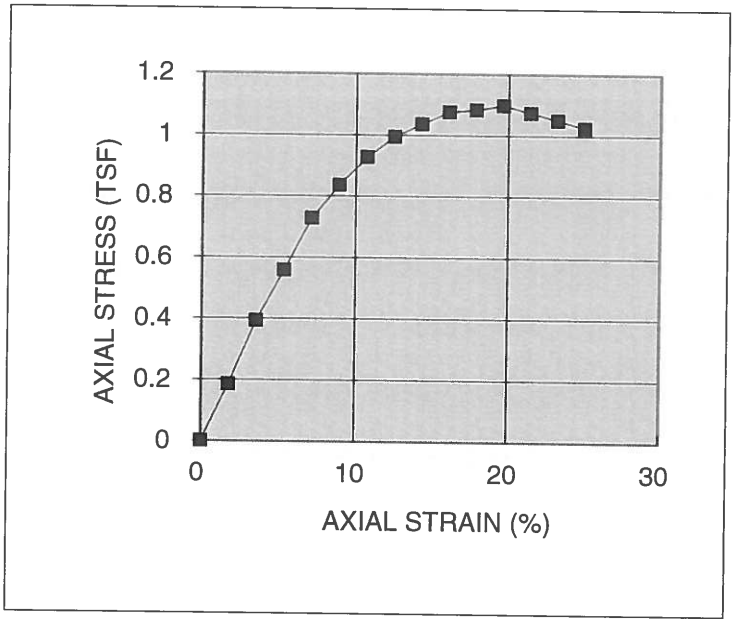
UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

Project Name: Proposed FordWoods Park Pool
Location: City of Dearborn, Wayne County, Michigan
Project No.: 0381899
Source: B-4; 4SS **Sample Depth:** 9'-10.5'
Description: SILTY CLAY (CL), trace sand, occasional silt seams, mottled brown and yellowish b
Qp (tsf): 1.25
Wet Weight (gm): 168.25
Date Tested: 2/3/2016
Tested By: EM

Height:	2.797 inches	71.05 mm	
Diameter:	1.531 inches	38.89 mm	
Moisture Content:	24%	**Saturation (%):**	
Ht.-Diameter Ratio:	1.83	**Specific Gravity:**	
Dry Density:	101 pcf		

READING NUMBER	DEFORM. (in.)	LOAD DIAL READING	LOAD (lbs)	STRAIN (%)	CORRECTED AREA (in^2)	AXIAL STRESS (tsf)
0	0.000	0	0.0	0.00	1.841	0.00
1	0.050	15	4.8	1.79	1.874	0.19
2	0.100	33	10.4	3.57	1.909	0.39
3	0.150	48	15.1	5.36	1.945	0.56
4	0.200	64	20.1	7.15	1.983	0.73
5	0.250	75	23.5	8.94	2.022	0.84
6	0.300	85	26.6	10.72	2.062	0.93
7	0.350	93	29.1	12.51	2.104	0.99
8	0.400	99	30.9	14.30	2.148	1.04
9	0.450	105	32.8	16.09	2.194	1.08
10	0.500	108	33.7	17.87	2.242	1.08
11	0.550	112	35.0	19.66	2.291	1.10
12	0.600	112	35.0	21.45	2.344	1.07
13	0.650	112	35.0	23.24	2.398	1.05
14	0.700	112	35.0	25.02	2.455	1.03
15	0.750					
16	0.800					
17	0.850					
18	0.900					
19	0.950					
20	1.000					

Qu = 1.04 tsf 99.25 kPa, Strain 15.00%



Failure Sketch

psi

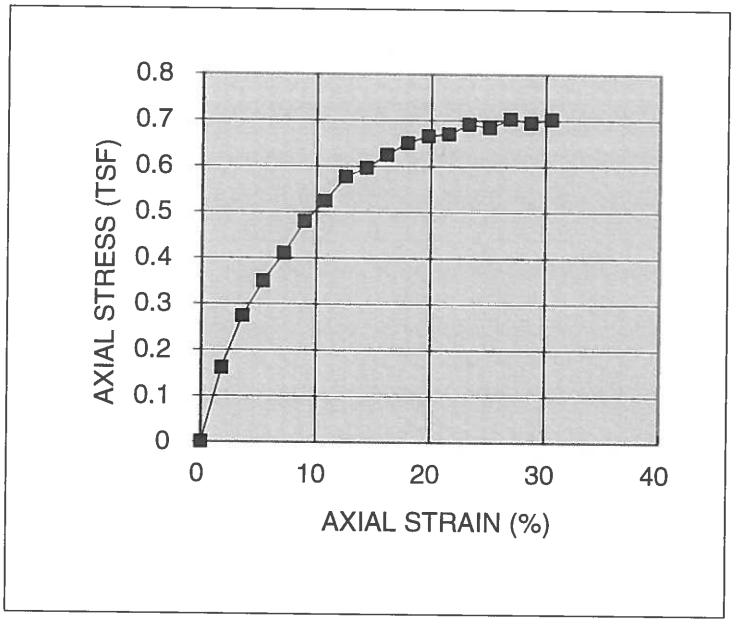
UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

Project Name: Proposed FordWoods Park Pool
Location: City of Dearborn, Wayne County, Michigan
Project No.: 0381899
Source: B-4; 10SS **Sample Depth:** 34.0'-35.5'
Description: SILTY CLAY (CL), gray
Qp (tsf): 0.50
Wet Weight (gm): 171.82
Date Tested: 2/3/2016
Tested By: EM

Height:	2.786 inches	70.76 mm	
Diameter:	1.534 inches	38.96 mm	
Moisture Content:	21%	**Saturation (%):**	
Ht.-Diameter Ratio:	1.82	**Specific Gravity:**	
Dry Density:	105 pcf		

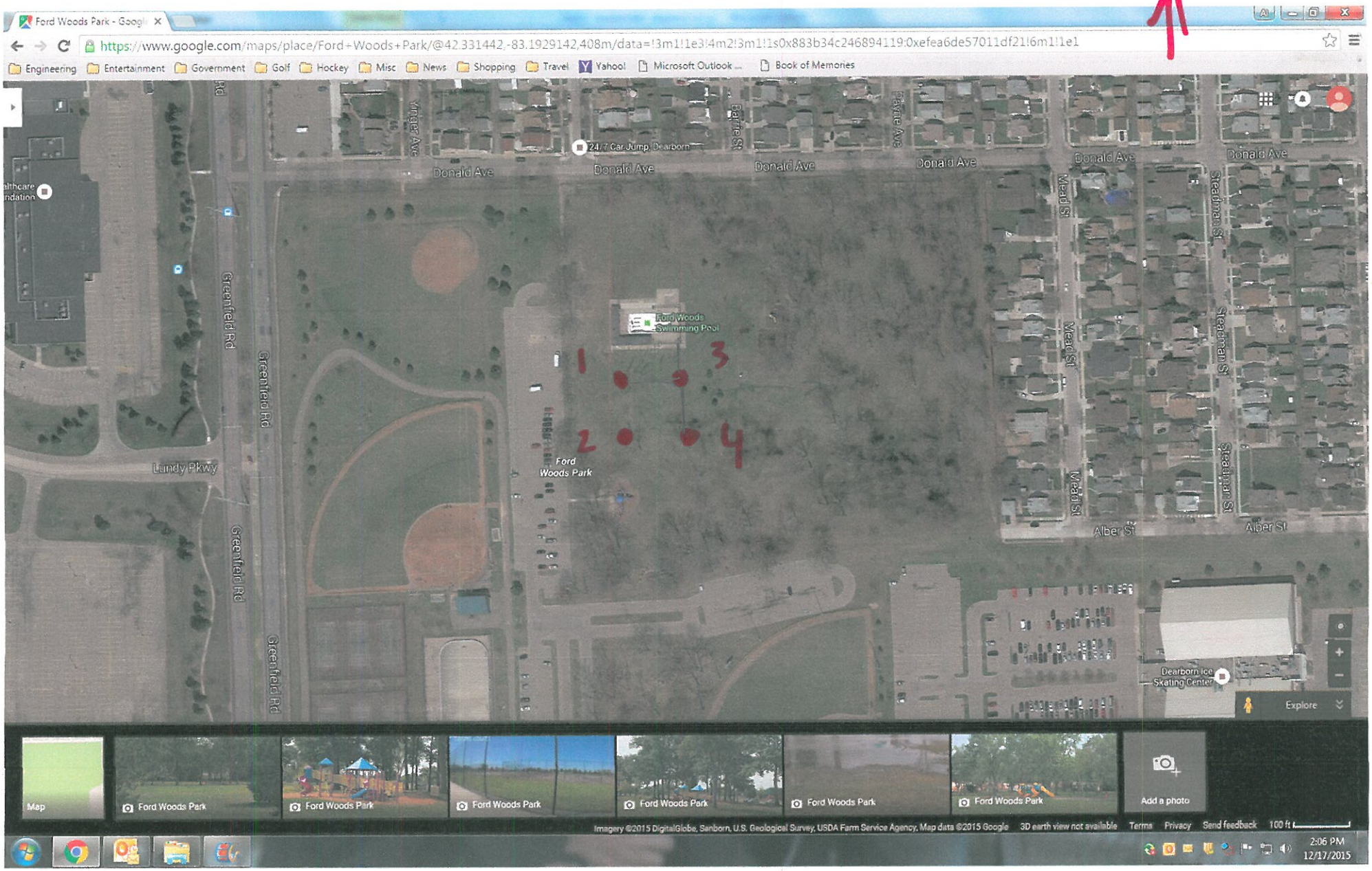
READING NUMBER	DEFORM. (in.)	LOAD DIAL READING	LOAD (lbs)	STRAIN (%)	CORRECTED AREA (in^2)	AXIAL STRESS (tsf)
0	0.000	0	0.0	0.00	1.848	0.00
1	0.050	13	4.2	1.79	1.882	0.16
2	0.100	23	7.3	3.59	1.917	0.27
3	0.150	30	9.5	5.38	1.953	0.35
4	0.200	36	11.4	7.18	1.991	0.41
5	0.250	43	13.5	8.97	2.030	0.48
6	0.300	48	15.1	10.77	2.071	0.52
7	0.350	54	16.9	12.56	2.114	0.58
8	0.400	57	17.9	14.36	2.158	0.60
9	0.450	61	19.1	16.15	2.204	0.62
10	0.500	65	20.4	17.95	2.252	0.65
11	0.550	68	21.3	19.74	2.303	0.67
12	0.600	70	21.9	21.54	2.356	0.67
13	0.650	74	23.2	23.33	2.411	0.69
14	0.700	75	23.5	25.13	2.468	0.68
15	0.750	79	24.7	26.92	2.529	0.70
16	0.800	80	25.0	28.72	2.593	0.69
17	0.850	83	26.0	30.51	2.660	0.70
18	0.900					
19	0.950					
20	1.000					

Qu = 0.60 tsf 57.11 kPa, Strain 15.00%

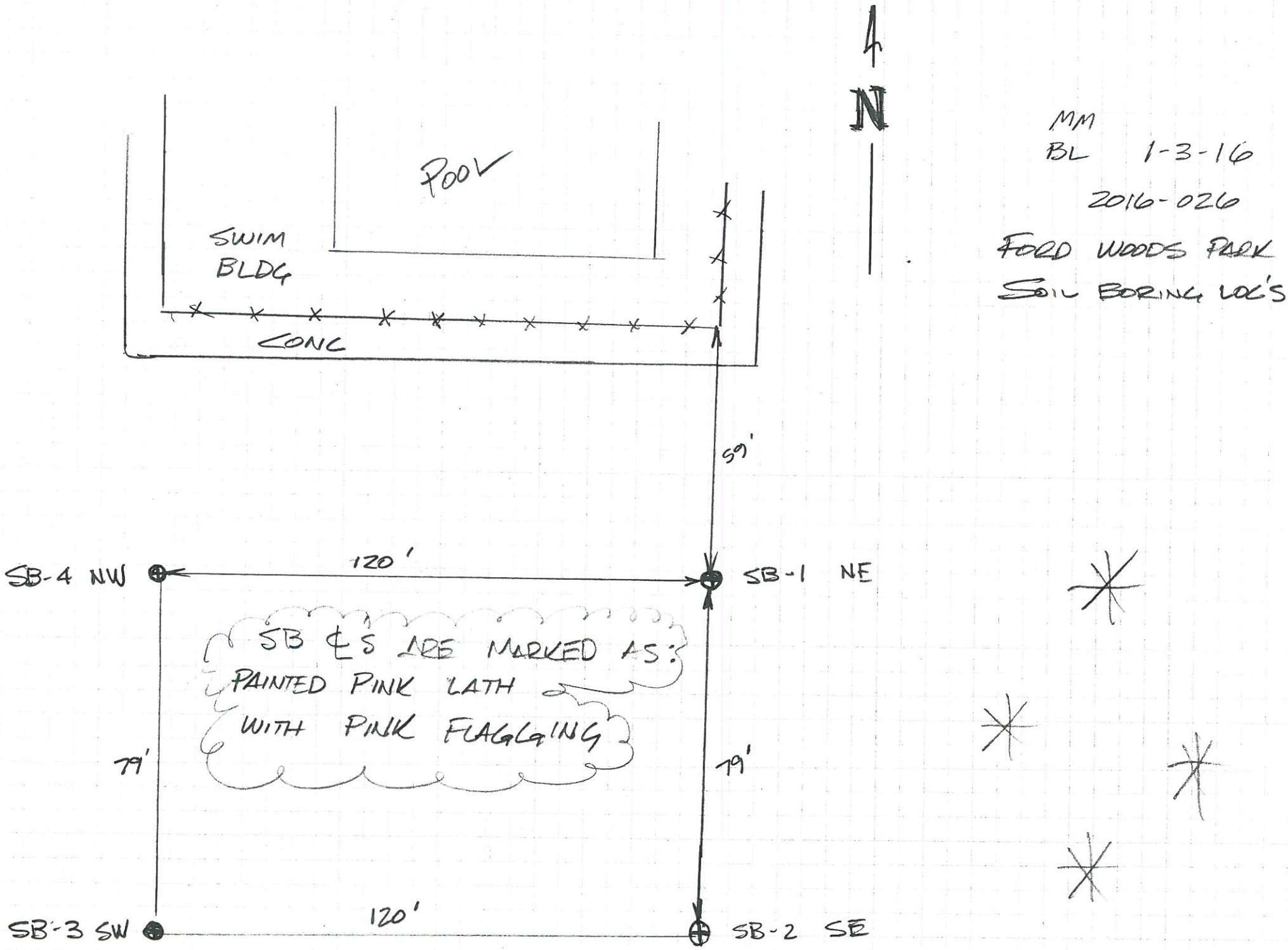


Failure Sketch


psi



SOIL BORINGS



MM
BL 1-3-16

2016-026

FORD WOODS PARK
SOIL BORING LOC'S