

**Geotechnical Exploration Program**

Proposed Walgreens  
141 Carmichael Road  
Hudson, Wisconsin  
Project Number: 011-0007-4016

**Prepared for:**

Nova Consulting Group, Inc.  
1107 Hazeltine Boulevard, Suite 400  
Chaska, MN 55318

May 16, 2011

***GEO Engineering Consultants Inc***

**GEO Engineering Consultants Inc**

PO Box 21490 Minneapolis MN 55421

Phone 763 502 9945 Fax 763 502 9946

May 16, 2011

Nova Consulting Group, Inc.  
1107 Hazeltine Boulevard, Suite 400  
Chaska, MN 55318

Attn: Mr. Mark Perry

RE: Geotechnical Exploration Program  
Proposed Walgreens  
141 Carmichael Road  
Hudson, Wisconsin  
Project Number: 011-0007-4016

Dear Mr. Perry:

We have completed the geotechnical exploration and engineering analysis for the above referenced project. This report presents the results of our field exploration and laboratory review programs, and provides recommendations concerning the soil and groundwater conditions as they relate to the proposed construction.

The soil samples will be retained in our laboratory for 30 days and then will be discarded, unless we receive a written request from you to hold them for a longer period.

We are pleased to be of service to you in this important phase of the project. If there are any questions regarding the information contained in this report or if we can be of further service to you, please call us at (763) 502-9945.

Respectfully,



Ahsanur R. Siddique, P.E.  
Geotechnical Engineer

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# **GEOTECHNICAL EXPLORATION PROGRAM**

## **PROPOSED WALGREENS**

### **141 CARMICHAEL ROAD**

#### **HUDSON, WISCONSIN**

**PROJECT NUMBER: 011-0007-4016**

## **1.0 INTRODUCTION**

We have completed the geotechnical exploration program for the Proposed Walgreens in Hudson, Wisconsin. Geo Engineering Consultants, Inc. (Geo) was retained by Nova Consulting Group, Inc. (Nova) to perform this exploration. This report presents the results of the field exploration and laboratory review and our geotechnical review and recommendations.

### **1.1 Project Description**

The proposed project consists of construction of a new retail building. The construction site is located at 141 Carmichael Road in Hudson, Wisconsin. The approximate location of the new construction is shown on the Boring Location Plan included in the Appendix of this report.

### **1.2 Service Scope**

The scope of our services for this project is limited to the following:

- Explore the subsurface soil and groundwater conditions by performing seven exploration borings to depths of 10 to 20 feet at the proposed building and paved areas.
- Visually classify the extracted soil samples and perform laboratory review on selected samples.
- Prepare an engineering report which will include the field and laboratory review data, and our recommendations for:
  - ◆ Grading procedures for the building and paved areas.
  - ◆ Foundation types and depths, allowable soil bearing pressures with estimates of foundation settlement.
  - ◆ Support for floor slabs.

***Geo Engineering Consultants Inc***

- ◆ Pavement design alternatives for the parking and driveway areas.

Our services performed for this project were for geotechnical purposes only, and not for documenting the presence or extent of any potential environmental contaminants at the site.

## **2.0 FIELD TESTING PROGRAM**

A total of seven exploratory test borings were performed on April 29, 2011. The number, depths and locations of the soil borings were determined and located in the field by Geo. The approximate boring locations are shown on the Boring Location Plan included in the Appendix of this report. The ground surface elevations shown on the boring logs were interpolated from the lot survey provided to us by Nova. The surface elevations at boring locations are only approximate and should be verified by the surveyor.

The soil borings were performed with an all-terrain-vehicle mounted drilling equipment using direct push to advance the sampler. Representative soil samples were obtained using continuous sampling procedures. In addition, several dynamic penetration tests were performed. Water level observations were made in the boreholes during and upon completion of the drilling and sampling operations. During the field operations, the drill crew maintained logs of the subsurface conditions including changes in lithology and the observed groundwater levels. The logs are included in the Appendix.

After completion of the drilling operations, the boreholes were backfilled to the existing ground surface.

Classification of soils were performed in general accordance with American Standards for Testing and Materials (ASTM) procedures, and are described in the Appendix.

### **2.1 Site Conditions**

Currently, the site is vacant. Based on the survey, the site is relatively flat and level with ground surface elevations that range from 873.0 to 874.5 at the boring locations.

## **2.2 Subsurface Conditions**

The subsurface conditions encountered at the test boring locations are shown on the test boring logs. The boring logs also indicate the possible geologic origin of the materials encountered. We wish to point out that the subsoil conditions at other times and locations on the site may differ from those found at our test locations. If different conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed.

The soils encountered in the borings consist generally of existing fill underlain by coarse alluvium. In general one foot of fill was found at the surface in the borings. A layer of silty clay was noticed at some boring locations.

The coarse alluvium consists of sand and silty sand. Based on penetration resistance (N values), the densities of the coarse alluvial sands range from loose to dense.

## **2.3 Water Level Conditions**

Water level observations were made at the completion of the drilling operations. Based on this data, water was noticed at borings B-2 and B-3 during our field work. The water level was about 6 feet below the present grade at these boring locations. No water was noticed at borings B-1, B-4, B-5, B-6 and B-7. The variability in measured depth and occurrence suggests the water is perched on less permeable layers and may not be representative of the static water level. In general, water levels may fluctuate throughout the year depending on several factors.

## **3.0 LABORATORY REVIEW PROGRAM**

The soil samples obtained during the drilling operations were logged, labeled, sealed and delivered to our laboratory for further review. The soil samples were classified in general conformance with ASTM Standards by our geotechnical engineer. The data obtained from the field and laboratory review are shown on the boring logs in the Appendix.

## **4.0 ANALYSIS AND RECOMMENDATIONS**

Based on the information obtained from our geotechnical work and our understanding or assumptions of the project data, we made our engineering review which resulted in recommendations which are presented in the following sections. If any of our understanding or assumptions are not correct, or if conditions observed during construction are significantly different than those encountered in our geotechnical work, we should be contacted immediately so we may review our recommendations.

### **4.1 Project Data**

We understand the new construction will consist of a one-story slab-on-grade building. The plan dimensions of the new building are about 105' x 138'.

The building will be of masonry construction with bar-joist roof system. The structure will be supported on load bearing walls and interior columns. Currently, we have no information on actual foundation loadings. However, we anticipate the maximum column load could be on the order of 100 kips and the maximum bearing wall load will not exceed 7.5 kips per lineal foot. We have no information on floor slab elevation. However, we assume the final grade will be about the same as the existing ground surface. We assume the floor loads will not exceed 200 pounds per square foot (psf).

It is also proposed to construct parking lots and drive lanes associated with the proposed building. The parking lot will service light passenger cars and occasional delivery vans. The drive lane will service occasional semi-trucks, in addition to passenger cars and delivery vans.

### **4.2 Discussion**

The soil conditions at boring locations are suitable for site preparation and construction of conventional spread foundations. The sands encountered above silty clay at boring B-2, B-4, B-5 and B-7 may be fill and appeared to be compacted based on penetration resistance.

### **4.3 Site Preparation**

We recommend the site preparation for the planned construction should include removal of the existing fill. The following table indicates the minimum recommended excavation depths at the specific boring locations.

<b>Boring Number</b>	<b>Surface Elevation (ft)</b>	<b>Depth of Excavation (ft)</b>	<b>Estimated Elevation of Excavation (ft)</b>
B-1	874.5	0.5	874.0
B-2	873.5	1.0	872.5
B-3	873.0	1.0	872.0
B-4	874.0	1.0	873.0
B-5	874.0	1.0	873.0
B-6	873.0	1.0	872.0
B-7	874.0	1.0	873.0

Since the depth of unsuitable soil can and often does vary between test boring locations, the excavation should therefore be observed by the geotechnical engineer to document the exposed soils before new fill and footing placement. Some contingency should be provided in the project budgeting for excavation that extends below the average depths of excavation shown in the above table.

Soil at the bottom of excavation should be surface compacted with a large vibratory compactor before the footing placement.

If excavation extends below the bottom elevation of the foundation, we recommend that the excavation at the footing locations be laterally oversized at least one foot for each foot (i.e., 1H:1V lateral oversize) it extends below the bottom of foundation. This lateral oversize is necessary to properly distribute the foundation loads through a new fill. A drawing showing the recommended oversize is included in the Appendix.

Engineered fill should be placed in the excavation to attain the desired final grades. The engineered fill should preferably consist of clean sand (SP) having less than 5 percent fines

passing the #200 sieve. However, inorganic sands may be used above the water if the compaction requirements are achieved.

The fill should be placed in thin lifts not exceeding 12 inches in thickness, and be compacted to at least 98 percent of the Standard Proctor maximum dry density (ASTM D698). The moisture content of the new fill should be maintained within 2 percent of the optimum as determined by the Standard Proctor test.

#### **4.4 Drainage**

Site drainage should be maintained during and after construction. The site should be adequately graded to provide surface runoff away from the proposed building in all directions so surface water does not collect within the excavation bottom or below the spread footing foundation. In addition, the surface of the fill surrounding the building should be capped with less permeable soils to minimize water migration below the building.

#### **4.5 Foundations**

It appears feasible to support the proposed building on spread footings. Upon completion of the site preparation as outlined in Section 4.3, the foundation should bear at normal foundation depth on competent natural soils or on the engineered fill. We recommend that the foundations be designed for a maximum net allowable soil bearing pressure of up to 3000 psf.

A factor of safety of at least 3.0 against foundation shear failure was considered in the above recommended design bearing pressure. Based on the above recommendations, we estimate maximum total settlement of the foundations of approximately 1 inch, and the maximum differential settlement may be approximately 1/2 inch or less.

All perimeter foundations in heated building space should be placed at a minimum depth of 42 inches below exterior grades for frost protection. Interior footings may be placed at any convenient depth below the floor slab. In unheated areas where deeper frost penetration may occur, we recommend that the foundations have a minimum soil cover of 60 inches for frost protection.

#### **4.6 Floor Slabs**

Floor slabs should be placed directly on competent native soils or on engineered fill. Particular attention should be paid to proper compaction of the fill against the foundations and beneath the floor slabs. The floor slabs may be designed to be structurally independent of the building foundations or walls.

We recommend that a minimum 6-inch thick, free-draining granular layer be placed under the floor slabs. This layer should consist of uniformly-graded sand or gravel with less than 8 percent passing the #200 sieve. In addition to facilitating fine grading for easier slab construction, the granular layer provides a capillary break to minimize moisture transmission from the subgrade to the floor slab.

A polyethylene vapor membrane can provide added moisture protection beneath the floor slabs. If moisture-sensitive floor coverings are planned, use of a membrane is recommended. If a membrane is used, it should be placed in accordance with Walgreens specifications.

#### **4.7 Pavement Subgrade Preparation**

We understand that the proposed light duty pavement area will be used primarily for parking and heavy duty pavement for semi trucks and drive lanes. In bituminous pavement design, the critical portion of the subgrade is the upper 3 foot zone. This zone provides the primary strength and stability needed for flexible pavement materials.

Minimum site preparation should include removal of the surface vegetation. The exposed fill should then be proofrolled with a heavy, self propelled compactor or rubber tired vehicle. In those areas where deflection or rutting is obvious, subcutting and replacing or drying and reworking soil should be performed or the site should be prepared as recommended in Section 4.2.

Any additional fill, we recommend granular sand having less than 10 percent fines passing the #200 sieve be used and compacted at least to 100% Standard Proctor maximum dry density (ASTM:D698-91). The moisture content should be within 2% of the optimum as determined by

the Standard Proctor tests. The compaction level can be reduced to 95% below the upper 3 foot zone.

The subgrade should be uniformly sloped to facilitate drainage of the base material within the pavement system, and to avoid any ponding of water beneath the pavement. This is especially important when less permeable soils are below the base material. In areas where drainage is marginal, draitile should also be considered for removal of excess water. Final pavement design should take into considerations for both positive surface and subsurface drainage.

#### **4.8 Pavement Subgrade Modulus**

Assuming the pavement subgrade preparation is performed as recommended in the preceding section, we estimate the sandy fill soils have an R-value on the order of at least 30. Clean sands having less than 5 percent fine material passing the #200 sieve are estimated to have a higher R-value on the order of 50 to 70.

#### **4.9 Flexible Pavement Thickness Design**

Assuming the pavement subgrade preparation is performed as recommended in the preceding section, and the subgrade soils are judged suitable based on proofroll test, we recommend the following pavement design be used:

<b>Pavement Materials</b>	<b>Car Parking Areas</b>	<b>Heavy duty Areas</b>
Bituminous Wear Course	1-1/2"	2"
Bituminous Non-wear Course	2"	2"
Class 5 Aggregate Base	6"	8"

The recommended thickness is based on the assumption of a compacted subgrade. This also assumes that a regular, conscientious maintenance program is performed. It is possible that seal coating may extend the pavement life somewhat. We caution that reduced pavement thicknesses may result in a reduced service life and increased maintenance.

The thicknesses indicated are assumed a minimum for construction. The design also assumed the aggregate base will be compacted to a minimum of 100% of the Standard Proctor density and the bituminous pavement is placed and compacted to 95% of the Marshall Density (ASTM D1559).

#### **4.10 Rigid Pavement Thickness Design**

After subgrade preparation as indicated in Section 4.7, and the subgrade soils are judged suitable based on proofroll test, we recommend the following concrete pavement design be used:

<b>Car Parking Areas</b>	<b>Heavy duty Areas</b>
6"	6"

The Portland cement concrete should have a minimum compressive strength of 4000 pounds per square inch (psi) and flexural strength of 580 psi at 28 days of age. We recommend the pavement be constructed using practices outlined in the American Concrete Institute: ACI 330 - "Guide for Design and Construction of Concrete Parking Lots." Please refer to Walgreens specifications for reinforcement details.

#### **4.11 Underground Utilities**

The native soils encountered in the borings appear to be suitable for the support of typical buried utilities. If the soils in utility trenches become disturbed, they may lose strength. Therefore, if loose fills or disturbed soils are present in the bottom of utility trenches, some subcutting may be necessary. Fill placed as utility bedding should be either crushed rock or a clean, well-graded granular soil.

All backfill in underground utility trenches in building area should be placed and compacted as recommended in Section 4.3 of this report.

#### **4.12 Subsurface Water Control**

As indicated in Section 2.3 of this report, the observed groundwater level in the soil borings depends on normal variations in precipitation and surface runoff amounts. However, based on

the water level measurements and on the soil profile, it is our judgment that the subsurface water at this site exists at a depth that is not anticipated to present construction difficulties for a project of this type. However, surface water should be controlled by maintaining positive surface drainage away from the building.

#### **4.13 General Comments**

We also recommend that all geotechnically related work, including foundation construction, subgrade preparation, and engineered fill placement, be observed by the project geotechnical engineer. The geotechnical engineer will perform appropriate testing to verify the geotechnical conditions which have been anticipated during the preparation of this report.

### **5.0 CONSTRUCTION CONSIDERATIONS**

#### **5.1 Excavation Safety**

All excavations should comply with the requirements of O.S.H.A. 29 CFR, Part 1926, Subpart P, "Excavations and Trenches". This document states that excavation safety is the responsibility of the contractor. Reference to these O.S.H.A. requirements should be included in the project specifications.

#### **5.2 Field Observations and Testing**

As variations in soil conditions may exist at locations and elevations other than those of our borings, we recommend the geotechnical engineer be retained to observe the soil conditions during site preparation. We recommend in-place field density tests be performed on the compacted new fill as detailed in the Appendix.


#### **5.3 Soil Sensitivity**

The silty and clayey soils are susceptible to disturbance from construction traffic, especially in wet conditions. Positive surface drainage should be maintained so water does not pond on site. Care should be exercised so as not to disturb these soils, which may require additional excavation.

## 6.0 REMARKS

Professional judgments and recommendations are presented in this report. They are based partly on evaluation of the technical information gathered, partly on historical reports and partly on our general experience with subsurface conditions in the area. We do not guarantee the performance of the project in any respect other than that our engineering work and the judgment rendered meet the standards and care of our profession. It should be noted that the borings may not represent potentially unfavorable surface conditions between borings. The recommendations presented in this report are applicable only to this specific project. These data should not be used for other purposes.

This report was:

Prepared by   
Ahsanur R. Siddique, P.E.

Reviewed by   
Steven J. Olson, P.E.

**APPENDIX**

**BORING LOCATION PLAN**

**BORING LOGS**

**EXCAVATION OVERSIZING**

**CONSTRUCTION OBSERVATIONS AND TESTING**





CLIENT **Nova Consulting Group, Inc.** ARCHITECT/ENGINEER

SITE **141 Carmichael Road Hudson, Wisconsin** PROJECT **Proposed Walgreens**

**St. Croix County Lot 2, CSM #4553**

Surface Elev.: **874.5 ft.** Datum: **MSL**

GRAPHIC LOG

SAMPLES TESTS

DEPTH (FT.)	BLOWS/FT	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	Qu tsf	ADDITIONAL DATA/ REMARKS
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0.5 FILL - Mixture of silty clay, organic silty clay, dark brown to black

874.0

SAND (SP) with a little gravel, lenses of silty sand, fine to medium grained, moist to wet, medium dense to dense, brown

9  
13  
19  
16  
29  
22  
23  
26

16.0 858.5

End of Boring

**WATER LEVEL OBSERVATIONS**

STARTED 4/29/11 FINISHED 4/29/11

DATE	TIME	HOLE DEPTH	CASING DEPTH	CAVE-IN	WATER LEVEL	NOTE
4/29/11	10:29	16.0	None	15.0	None	

METHOD: Dynamic penetration testing from 0 to 16 feet.

EAST	NORTH
DRILL CO. Geo Eng	DRILL RIG 54 DT
DRILLER SO	ASS'T DRILLER AS

TEST BORING LOG 011-0007-4016.GPJ GECI.GDT 5/16/11

CLIENT **Nova Consulting Group, Inc.** ARCHITECT/ENGINEER

SITE **141 Carmichael Road Hudson, Wisconsin** PROJECT **Proposed Walgreens**

**St. Croix County Lot 2, CSM #4553**

Surface Elev.: **873.5 ft.** Datum: **MSL**

DEPTH (FT.)	BLOWS/FT	SAMPLES			TESTS			ADDITIONAL DATA/REMARKS
		NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	Qu tsf	
1.0		1		29/48 60%				
5.0	5							
6.0	7	2		27/48 56%				
16.0	28							

**WATER LEVEL OBSERVATIONS**

DATE	TIME	HOLE DEPTH	CASING DEPTH	CAVE-IN	WATER LEVEL	NOTE	STARTED	FINISHED
4/29/11	11:24	16.0	None	5.3	None		4/29/11	4/29/11
4/29/11	11:34	8.0	None	7.0	5.5 ▼			

TEST BORING LOG 011-0007-4016.GPJ GECI.GDT 5/16/11

METHOD: Dynamic penetration testing from 0 to 16 feet. Dual tube sampling from 0 to 8 feet.

EAST NORTH  
 DRILL CO. Geo Eng DRILL RIG 54 DT  
 DRILLER SO ASS'T DRILLER AS

CLIENT  
**Nova Consulting Group, Inc.**

ARCHITECT/ENGINEER

SITE  
**141 Carmichael Road  
Hudson, Wisconsin**

PROJECT  
**Proposed Walgreens**

**St. Croix County  
Lot 2, CSM #4553**

Surface Elev.: **873.0 ft.** Datum: **MSL**

DEPTH (FT.)	SAMPLES				TESTS			
	BLOWS/FT	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	Qu tsf	ADDITIONAL DATA/ REMARKS

1.0 FILL - Mixture of silty clay, organic silty clay, dark brown to black 872.0

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SAND (SP) with a little gravel, lenses of silty sand, fine to medium grained, moist to wet, medium dense, brown, may be fill

7.0 866.0

5								
15								
15								

▽

SAND (SP) with a little gravel, fine to medium grained, moist to wet, medium dense, brown

16.0 857.0

12								
24								
18								
24								
20								

End of Boring

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**WATER LEVEL OBSERVATIONS**

STARTED 4/29/11 FINISHED 4/29/11

DATE	TIME	HOLE DEPTH	CASING DEPTH	CAVE-IN	WATER LEVEL	NOTE
4/29/11	12:04	16.0	None	12.0	6.2 ▽	

METHOD: Dynamic penetration testing from 0 to 16 feet.


EAST NORTH  
DRILL CO. Geo Eng DRILL RIG 54 DT  
DRILLER SO ASS'T DRILLER AS

TEST BORING LOG 011-0007-4016.GPJ GECI.GDT 5/16/11

CLIENT **Nova Consulting Group, Inc.** ARCHITECT/ENGINEER

SITE **141 Carmichael Road Hudson, Wisconsin** PROJECT **Proposed Walgreens**

**St. Croix County Lot 2, CSM #4553**

Surface Elev.: **874.0 ft.** Datum: **MSL**

DEPTH (FT.)	BLOWS/FT	SAMPLES				TESTS			ADDITIONAL DATA/REMARKS
		NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	Qu tsf		
1.0									
	6								
	16								
	21								
7.5									
8.5									
	10								
	15								
	21								
	16								
	17								
16.0									
End of Boring									

**WATER LEVEL OBSERVATIONS**

STARTED **4/29/11** FINISHED **4/29/11**

DATE	TIME	HOLE DEPTH	CASING DEPTH	CAVE-IN	WATER LEVEL	NOTE
4/29/11	12:32	16.0	None	15.0	None	
METHOD: Dynamic penetration testing from 0 to 16 feet.						
				EAST		NORTH
				DRILL CO. <b>Geo Eng</b>		DRILL RIG <b>54 DT</b>
				DRILLER <b>SO</b>		ASS'T DRILLER <b>AS</b>

TEST BORING LOG 011-0007-4016.GPJ GECI.GDT 5/16/11

CLIENT **Nova Consulting Group, Inc.** ARCHITECT/ENGINEER

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DEPTH (FT.)	SAMPLES				TESTS			
	BLOWS/FT	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	Qu tsf	ADDITIONAL DATA/ REMARKS
1.0								
7.0								
8.0								
20.0								

**GRAPHIC LOG**

FILL - Mixture of silty clay, organic silty clay, dark brown to black

SAND (SP) with a little gravel, fine to medium grained, moist to wet, loose to medium dense, brown, may be fill

SILTY CLAY (CL-ML), clayey sand, firm, brown to dark brown

SAND (SP) with a little gravel, fine to medium grained, moist to wet, medium dense, brown

End of Boring

**WATER LEVEL OBSERVATIONS**

DATE	TIME	HOLE DEPTH	CASING DEPTH	CAVE-IN	WATER LEVEL	NOTE
4/29/11	11:00	20.0	None	6.0	None	

STARTED 4/29/11 FINISHED 4/29/11

METHOD: Dynamic penetration testing from 0 to 20 feet.

EAST NORTH

DRILL CO. Geo Eng DRILL RIG 54 DT

DRILLER SO ASS'T DRILLER AS

TEST BORING LOG 011-0007-4016.GPJ GECI.GDT 5/16/11

CLIENT  
**Nova Consulting Group, Inc.**

ARCHITECT/ENGINEER

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**Proposed Walgreens**

**St. Croix County  
Lot 2, CSM #4553**

Surface Elev.: **873.0** ft. Datum: **MSL**

DEPTH (FT.)	SAMPLES				TESTS			ADDITIONAL DATA/REMARKS
	BLOWS/FT	NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	Qu tsf	

1.0 FILL - Mixture of silty clay, organic silty clay, dark brown to black 872.0

1				28/48 58%				
---	--	--	--	--------------	--	--	--	--

SAND (SP) with a trace of gravel, fine to medium grained, moist to wet, brown

10.0 863.0

2				27/48 56%				
3				24/24 100%				

End of Boring

10								
----	--	--	--	--	--	--	--	--

**WATER LEVEL OBSERVATIONS**

STARTED 4/29/11 FINISHED 4/29/11

DATE	TIME	HOLE DEPTH	CASING DEPTH	CAVE-IN	WATER LEVEL	NOTE
4/29/11	09:19	10.0	None	10.0	None	

METHOD: Dual tube sampling from 0 to 10 feet.

EAST NORTH  
DRILL CO. Geo Eng DRILL RIG 54 DT  
DRILLER SO ASS'T DRILLER AS

TEST BORING LOG 011-0007-4016.GPJ GECI.GDT 5/16/11

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Surface Elev.: **874.0 ft.** Datum: **MSL**

DEPTH (FT.)	BLOWS/FT	SAMPLES			TESTS			ADDITIONAL DATA/REMARKS
		NUMBER	TYPE	IN. DRIVEN IN. RECOVERED	MOISTURE, %	DRY DENSITY PCF	Qu tsf	
1.0		1		28/48 58%				
5		2		27/48 56%				
8.0								
8.5		3		24/24 100%				
10.0								
End of Boring								

**WATER LEVEL OBSERVATIONS**

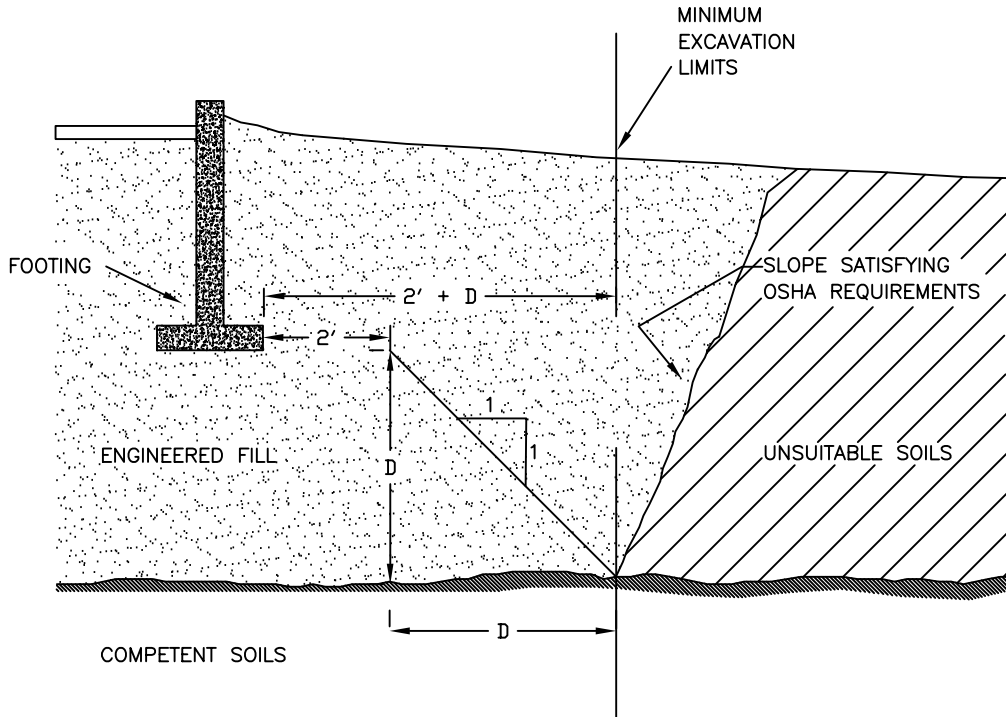
STARTED 4/29/11 FINISHED 4/29/11

DATE	TIME	HOLE DEPTH	CASING DEPTH	CAVE-IN	WATER LEVEL	NOTE	
4/29/11	09:35	10.0	None	10.0	None		
METHOD: Dual tube sampling from 0 to 10 feet.							
				EAST	NORTH		
				DRILL CO. Geo Eng	DRILL RIG 54 DT		
				DRILLER SO	ASS'T DRILLER AS		

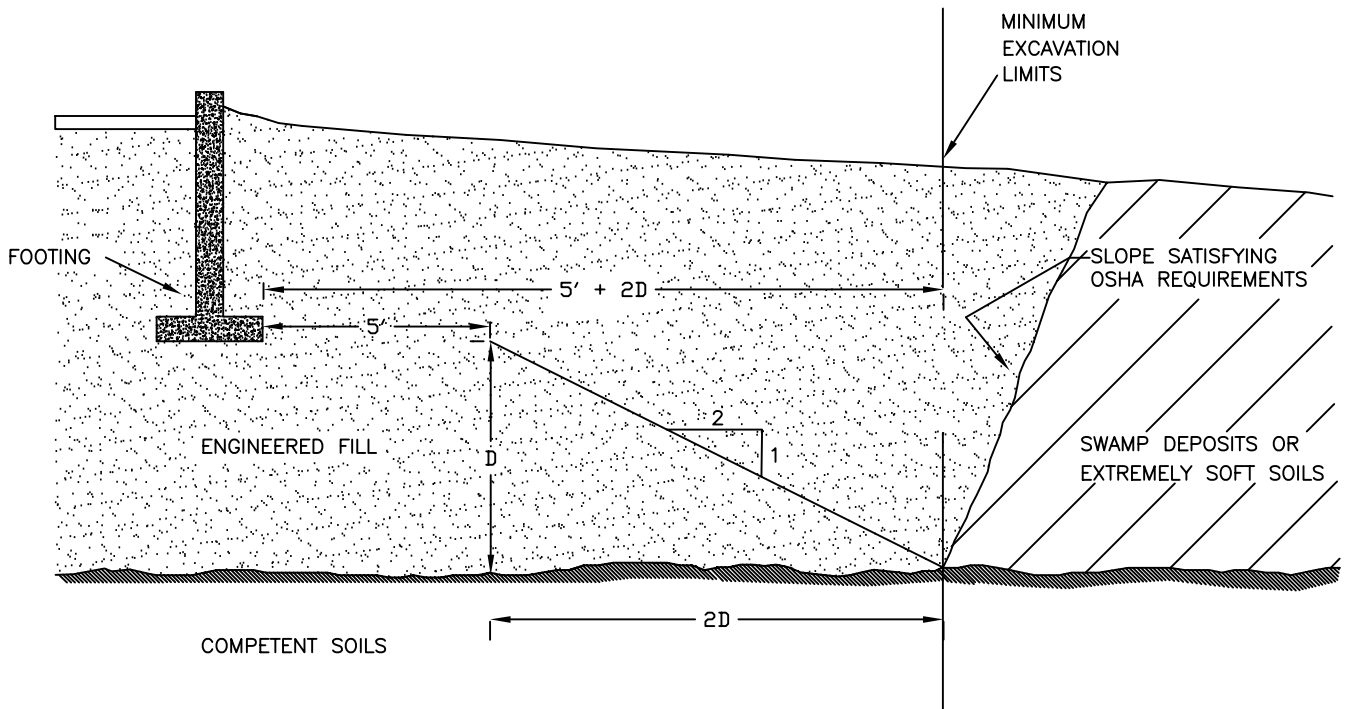
TEST BORING LOG 011-0007-4016.GPJ GECI.GDT 5/16/11

# EXCAVATION OVSERSIZING

## NORMAL EXCAVATION



## SWAMP OR EXTREMELY SOFT SOIL EXCAVATION



## **CONSTRUCTION OBSERVATIONS AND TESTING**

The recommendations made in this report have been made based on the subsurface conditions found in the borings. It is possible that there are soil and water conditions on site that were not represented by those borings. Consequently, on-site observation during construction is considered integral to the successful implementation of the recommendations. We believe that qualified field personnel need to be on site at the following times to observe the site conditions and effectiveness of the construction.

We recommend that the completed excavation and prepared subgrade be observed and tested by a soils engineer/technician prior to fill placement or construction of any foundation elements. These observations would be necessary to judge if all unsuitable materials have been removed from within the planned construction area and that an appropriate degree of lateral oversize has been provided for in those areas where fill will be placed below the bottom of foundation grade.

We recommend a representative number of field density tests be taken in all engineered fill placed to aid in judging its suitability. We suggest that at least one density test be performed for at least every 2500 square feet of engineered fill placed for every 2 feet of fill depth. Additional tests should be taken where confined areas are compacted. Any proposed fill material should be submitted to the laboratory for tests to check compliance with our recommendations and project specifications.