Geotechnical Engineering Exploration and Analysis

Proposed East Haertel Street Reconstruction
Portage, Wisconsin

Prepared for:

City of Portage, Wisconsin

February 19, 2007
Project No. 1G-0701010

GILES
ENGINEERING ASSOCIATES, INC.

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

• Atlanta, GA
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February 19, 2007

City of Portage
115 W. Pleasant Street
Portage, Wisconsin, 53901

Attention: Mr. Jeff Grothman
Mayor

Subject: Geotechnical Engineering Exploration and Analysis
Proposed East Haertel Street Reconstruction
Portage, Wisconsin
Project No. 1G-0701010

Dear Mr. Grothman:

As requested, Giles Engineering Associates, Inc. ("*Giles*") conducted a *Geotechnical Engineering Exploration and Analysis* for the proposed project. The accompanying report describes the services that were conducted for the project and it provides geotechnical-related findings, conclusions and recommendations that were derived from those services.

We sincerely appreciate the opportunity to provide geotechnical engineering consulting services for the proposed project. Please contact the undersigned if there are questions concerning the report or if we may be of further service.

Very truly yours,

GILES ENGINEERING ASSOCIATES, INC.

Jeffrey Scott Miller, P.E.
Sr. Project Manager

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Geotechnical Division Manager

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PORTAGE, WISCONSIN
PROJECT NO. 1G-0701010

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GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED EAST HAERTEL STREET RECONSTRUCTION
PORTAGE, WISCONSIN
PROJECT NO. 1G-0701010

EXECUTIVE SUMMARY

This Executive Summary provides limited geotechnical information regarding the proposed project. Since this Executive Summary is abbreviated, it must be read in complete context with the following report.

The existing road distress consists of a depression of the entire road surface that gradually decreases then increases in elevation along the roadway length. Three geotechnical engineering test borings were performed along the distressed portion of the existing roadway. Firm to loose density sandy existing fill was encountered below the pavement to depths of 6½± to 9± feet at Test Boring Nos. 1 and 2 near either end of the distress and to 24½± feet in depth at Test Boring No. 3 drilled near the middle of the distressed portion. Underlying soil consisting of medium stiff fibrous peat and organic clayey silt was found at Test Boring No. 3 to 29± feet in depth. Beneath the existing fill at Test Boring Nos. 1 and 2, and beneath the organic soils at Test Boring No. 3, loose to firm density sand was encountered to at least the 16± to 41± foot exploration depths. It is estimated that the water table was 8± to 12± feet below ground at the time of the exploration.

The proposed reconstruction is currently planned to consist of raising and widening the existing roadway, adding curbs, and adding a sidewalk behind one of the curbs. It also includes repair of the existing culvert that transverses the bottom of the embankment. The proposed reconstruction creates a problem of road surface differential settlement. The new roadway surface overlying the existing roadway alignment could settle less than the road surface portion that extends laterally beyond the existing road surface.

Consideration of two options for road reconstruction is recommended. One option of reconstruction consists of raising and widening the road surface as desired using soil fill. However, repair of the culvert, additional soil fill placement or another reconstruction of the road will be needed in the future. Another option that is considered to have a higher initial cost consists of raising and widening the road surface and repair of the culvert as desired, but using lightweight fill materials to construct the raised and widened embankment for the new road surface so that the differential settlement is reduced. A moderately low risk is included with this option. The risk is that reconstruction of the road may be required and another culvert repair may be needed in the future due to a potential for continual or residual settlement of the existing fill currently in place, but is considered less than the risk associated with the soil embankment option.

General design and construction recommendations for both options are presented in this report. An additional test boring exploration and analysis is recommended to provide information for more specific recommendations.

GILES ENGINEERING ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED EAST HAERTEL STREET RECONSTRUCTION
PORTAGE, WISCONSIN
PROJECT NO. 1G-0701010

1.0 SCOPE OF SERVICES

This report provides the results of the *Geotechnical Engineering Exploration and Analysis* that Giles Engineering Associates, Inc. (*"Giles")* conducted and provides recommendations for design and construction of the proposed road reconstruction. The *Geotechnical Engineering Exploration and Analysis* included several separate, but related, service areas referenced hereafter as the Geotechnical Subsurface Exploration Program, Geotechnical Laboratory Services, and Geotechnical Engineering Services. The scope of each service area was narrow and limited, as directed by our client and in consideration of the proposed project. The scope of each service area is briefly explained later. Environmental-related services are not included in the scope.

2.0 SITE DESCRIPTION

The portion of East Haertel Street planned for reconstruction is located east of S.T.H. 51, over a area with marsh-type vegetation south of Mud Lake, and is distressed. The existing road distress consists of a depression of the entire road surface that gradually decreases then increases in elevation along an approximate 150 feet length of the roadway. The pavement surface elevations were measured to vary by 4.2± feet in the general area of the depression distress. The road is flanked on both sides with a descending slope to a creek surrounded by vegetation, 4± to 8± feet below the road surface. The creek flows through a culvert located beneath the road. During the time that the test borings were being drilled, the water level on both sides of the roadway rose above the ice surface, and the water level subsided below the ice within about one hour.

Mr. Kory Anderson of General Engineering Co. indicated that the road was constructed about 10 years ago, the surface of the roadway has subsided, and that the culvert may have severed. Mr. Scott Moss, the Street Superintendent of the City of Portage Wisconsin explained that the embankment for the roadway was constructed by placement of a layer of concrete sidewalk slabs and curbs with "breaker run" crushed rock prior to placement and compaction of soil fill. He also said that the depression was noticed about 5 years ago. Mr. Tom Pinnion, the former Director of Public Works for the City of Portage said that the vegetation was stripped from the embankment subgrade, but not too much existing soil, prior to placement of a thin layer of the slabs and curbs, and fill embankment. He said that the road surface was designed with a low point near the center along the length of the alignment, and that a nearby stormwater lift station and/or an industrial facility water discharge may be the source of the rising water during test boring drilling.

3.0 PROJECT DESCRIPTION

The proposed road reconstruction is planned to consist of reconstructing the existing rural section roadway as an urban section. This consists of replacing the existing culvert, and widening the current 22± foot wide road surface to a 41± foot wide asphalt pavement with curbs, and a 5 foot wide pedestrian concrete sidewalk and raising the surface to about the original pavement elevation. The centerline of the widened roadway alignment is not finalized. It could be concentric, or offset relative to the current roadway.

4.0 GEOTECHNICAL SUBSURFACE EXPLORATION PROGRAM

The purpose of the Geotechnical Subsurface Exploration Program was to explore the subsurface conditions by drilling three geotechnical test borings along the distressed portion of the existing roadway on January 18, 2007. The test borings were drilled to 21± feet, 11± feet, and 41± feet in depth, respectively. The *Records of Subsurface Exploration* are enclosed in Appendix A. The test borings were drilled at the approximate locations shown on the *Test Boring Location Plan*, Figure 1 enclosed in Appendix A.

The ground elevations at the test boring locations and certain other locations were determined as part of the Geotechnical Subsurface Exploration Program using a level survey, relative to the temporary benchmark shown on Figure 1 enclosed. The test boring elevations are noted on the *Records of Subsurface Exploration*. The elevations are considered accurate within 1± foot.

Samples were collected from the test borings, at certain depths, using a split-barrel sampler during Standard Penetration Testing (SPT), and undisturbed tube sampling, which are described in Appendix B, along with descriptions of other field procedures. Immediately after sampling, select portions of the samples were transferred from the sampler and retained in containers that were labeled at the site for identification. The retained samples were transported to *Giles*' geotechnical laboratory as part of the Geotechnical Subsurface Exploration Program.

5.0 GEOTECHNICAL LABORATORY SERVICES

Retained soil samples were classified by the *Giles* geotechnical engineer author of this report using the descriptive terms and particle-size criteria shown on the *General Notes* in Appendix D, and by using the Unified Soil Classification System (ASTM D 2488-75) as a general guide. The classifications are shown on the *Records of Subsurface Exploration*, along with horizontal lines that show supposed depths of material change. Field-related information pertaining to the test borings is also shown on the *Records of Subsurface Exploration*. The terms and symbols used on the *Records of Subsurface Exploration* are defined on the *General Notes*.

6.0 SUBSURFACE CONDITIONS

Since material sampling at the test borings was discontinuous, it was necessary for *Giles* to suppose conditions between sample intervals. The supposed conditions at the test borings are briefly discussed in this section and are described in more detail on the *Records of Subsurface Exploration*. Also, the conclusions and recommendations in this report are based on the supposed conditions.

6.1. Ground Surface Materials

Asphalt pavement 4± inches thick was encountered at the surface of each test boring. A sand and crushed gravel base course ranging from 11± to 12± inches in thickness was encountered below the asphalt.

6.2. Existing Fill

Firm to loose density existing fill was encountered below the pavement to depths of 9± and 6½± feet at Test Boring Nos. 1 and 2, respectively, near either end of the distress, and to 24½± feet in depth at Test Boring No. 3 drilled near the middle of the distressed portion. The existing fill encountered is composed of fine sand and silty sand, containing gravel, gravel-sized concrete and slag fragments, and wood and metal fragments. The existing fill at Test Boring No. 3 contains mixed-in fibrous peat at 20± feet in depth, and organic odor at 16± and 23± feet.

6.3. Native Soil

Medium stiff organic clayey silt was found at Test Boring No. 3 underlying the existing fill to 29± feet in depth. Beneath the existing fill at Test Boring Nos. 1 and 2, and beneath the organic clayey silt at Test Boring No. 3, loose to firm density sand was encountered to at least the maximum depths explored of 11± to 41± feet.

7.0 GROUNDWATER CONDITIONS

Free water was encountered at depths of 8± to 12± feet in depth below the surface during the exploration. Due to the permeability of the sand fill, the water level of the adjacent creek, and the water levels measured, it is estimated that the water table was 8± to 12± feet below the pavement at the time of the exploration. A fluctuation in the water table level may occur, depending on the water level in the creek.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1. Road Reconstruction Design Considerations

The proposed reconstruction creates a problem of road surface differential settlement. The new roadway surface overlying the existing roadway alignment could settle less than the road surface portion that extends laterally beyond the existing road surface. The depression distress of the roadway is considered due to the settlement of the soils underlying the embankment that was constructed for the roadway, and possibly aggravated by water inundation from the creek. The depression rate is not known, but based on the length of time since road construction, and the engineering properties of the subsoils encountered, the rate of depression is believed to be either decreasing with time relative to the previous rate, or has decreased to a small amount. Raising the existing road surface with soil fill probably will reactivate settlement due to the added weight of the new fill and compressibility of the underlying existing fill and organic soils. Widening the roadway will require construction of a wider embankment, either on both sides of the existing roadway or on either side. The weight of earth fill to construct the embankment will activate a similar settlement that caused the existing roadway depression and culvert distress. The settlement amount is not known but is expected to be greater than the settlement of the new road surface overlying the existing road alignment.

8.2. General Road Reconstruction Design Recommendations

Consideration of two options for road reconstruction are recommended. One option of reconstruction consists of raising and widening the road surface as desired using soil fill. However, distress of the planned new culvert beneath the road may also occur. Repair of the culvert, additional soil fill placement or another reconstruction of the road will be needed in the future, probably within 5 to 10 years based on the performance of the existing roadway. The future repair or reconstruction will be needed due to the reactivated settlement over lying the existing roadway, estimated to be about 1 foot, and the anticipated greater magnitude settlement of the widened embankment portion of the new roadway. If acceptable, delaying the concrete curb and sidewalk construction, and the top layer of asphalt construction for a period of at least one year will allow some of the expected settlement to occur prior to completing the construction, and reduce the amount of future repair and reconstruction. General recommendations for this option are presented below.

Another option that is considered to have a higher initial cost consists of raising and widening the road surface and repair of the culvert as desired, but using lightweight fill materials to construct the raised and widened embankment for the new road surface so that the differential settlement is reduced. Lightweight fill materials generally are expensive, and consist of

shredded tires, or wood chips, or expanded polystyrene (EPS) "geofoam." Shredded tires are the heaviest, and may not be available for use. Wood chips are lighter in weight than the shredded tires, but also may not be available. Geofoam is the lightest in weight, at about 1 pound per cubic foot, and is available from a Wisconsin manufacturer. A moderately low risk is included that reconstruction of the road may be required and another culvert repair may be needed in the future due to a potential for continual or residual settlement caused by the weight of the existing fill currently in place, or by water inundation from the creek. The risk is considered less than the risk associated with the soil embankment option. General recommendations for this option are also presented below.

Recommended Additional Test Boring Exploration and Analysis

The recommendations for raising and widening the existing roadway presented below are general. More specific recommendations can be provided after an additional test boring exploration and analysis is performed in the area where the road widening is planned to occur. The additional test borings are recommended to characterize the subsurface soil conditions adjacent to the embankment so that design and construction recommendations specific to the subsurface conditions can be developed. The adjacent area was not compressed by the embankment weight. The subsoil engineering properties beneath the widened embankment may affect the stability of the new embankment during and after the construction. Embankment soil reinforcement, or shallow side slope or stabilization berm construction, or staged soil fill construction, or a combination of these may be needed.

The slopes and vegetation present restrict access to the areas adjacent to the existing roadway. Temporary access ramps and benches are anticipated to be needed for drill rig access to perform the additional test borings.

Culvert Removal and Replacement

The removal and replacement of the existing distressed culvert is recommended as part of the initial reconstruction work. Temporary diversion of the creek is recommended and dewatering the subgrade with sump pumps may be needed so that the culvert removal and replacement, and the initial portion of new embankment construction can be performed in relatively dry conditions.

The soil excavated for culvert removal is recommended to be stockpiled and reused as the excavation backfill. The excavation is recommended to be sloped for safety in accordance with OSHA requirements. The culvert subgrade is recommended to be prepared by compacting the unexcavated soil surface to a density of at least 95% of the Standard Proctor Compaction Test

(ASTM D-698) maximum density. If the subgrade is or becomes unstable during the surface compaction, overexcavation of the unstable soil, possibly requiring dewatering, placement of coarse crushed aggregate compacted into the subgrade, and replacement with well graded crushed sand and gravel aggregate may be needed, depending on the existing subgrade conditions revealed. The new culvert bedding material, placement, and backfill is recommended to be performed in accordance with the original construction specifications. In addition, the sloped excavation is recommended to be benched during backfill placement to aid compaction. The excavated soils for removal of the culvert may be reused as the structural compacted backfill, however, some moisture modification and/or sorting out of deleterious matter may be needed if present. Granular imported soil may also be used. Fill material selection, placement, and compaction is recommended to be in accordance with the Guide Specifications enclosed in Appendix A.

Soil Fill Embankment Option

Preparation of the subgrade for the soil fill material embankment is recommended to consist of removal of the existing pavement throughout the distressed area and extending along the roadway alignment an additional 10± feet into non-distressed pavement. The preparation is also recommended to include removal of the vegetation on the side slopes of the existing embankment where the new fill is needed to widen the roadway. Depending on the subsurface conditions encountered at the recommended additional test borings, leaving the existing vegetation in the flat areas adjacent to the existing embankment in-place, or placement of geogrid reinforcement, or a layer of coarse crushed aggregate may aid in new fill placement and compaction stability.

For this option, the new fill material for embankment raising and widening is recommended to be selected in accordance with Item No. 4 of the enclosed Guide Specifications, such as granular soils classified as SP, SP-SW, or SW. The fill material may consist of fine sand, similar to the sand existing fill used to construct the existing embankment, or other granular fill material if suitable.

The new fill material is recommended to be placed and compacted to at least 95% of the maximum Standard Proctor Compaction Test (ASTM D-698) in accordance with the Guide Specifications enclosed in Appendix A. Benching of the existing sloped embankment is recommended to be performed in accordance with the Guide Specifications during the new fill placement. Soil removed for the benches that does not have a deleterious material content can be mixed with the new fill for embankment construction.

The side slope angle is recommended to be equal to or at a shallower slope than the existing embankment. A specific recommendation can be provided after the recommended additional test boring exploration and analysis. The stable side slope angle depends on the engineering properties of the subsoils below the widened embankment.

The new pavement may consist of an asphaltic concrete surface and an aggregate base course. The pavement surface and base thickness is recommended to be designed for the projected traffic. The thickness may be in accordance with the original construction specifications if the projected traffic load for the new roadway is not greater than the traffic load used in the original design.

Lightweight Fill Material Embankment Option

Preparation of the subgrade for the lightweight fill material embankment is recommended to consist of removal of the existing pavement throughout the distressed area and extending along the roadway alignment an additional 10± feet into non-distressed pavement. The preparation is also recommended to include removal of the vegetation on the side slopes of the existing embankment where the new fill is needed to widen the roadway. Depending on the subsurface conditions encountered at the recommended additional test borings, leaving the existing vegetation in the flat areas adjacent to the existing embankment in-place, or placement of geogrid reinforcement, or a layer of coarse crushed aggregate may aid in lightweight fill embankment stability.

Benching of the existing sloped embankment is recommended to be performed in accordance with the Guide Specifications prior to placement of the lightweight fill material. Soil removed for the benches is recommended to be stockpiled for placement as a side slope surface cover over the lightweight fill material.

The lightweight fill material is recommended to consist of shredded vehicle tires if available, or wood chips if available, or geofoam. The use of geofoam is considered preferable to the other materials because it weighs less. The embankment constructed with geofoam will settle less than the embankment constructed with the other light weight materials.

Specific placement and compaction recommendations for either shredded tire or wood chip materials can be provided when the material is selected. In general, they can be placed with earth grading equipment, with compaction. The side slope angle is recommended to be equal to or at a shallower slope than the existing embankment. A specific recommendation can be

provided after the recommended additional test boring exploration and analysis. The stable side slope angle depends on the engineering properties of the subsoils below the widened embankment.

If the geofoam material is selected, the geofoam blocks are recommended to be placed on a level plane. The placement is recommended to begin at the benched embankment, with either additional soil removal or geofoam cutting to fit. The outside slope of the geofoam material embankment is recommended to be developed by staggering the blocks to form benches. The slope may be steeper than the existing embankment, and limited to the slope needed for the soil cover and reestablishment and maintenance of the vegetation.

The new pavement may consist of an asphaltic concrete surface and an aggregate base course. The pavement surface and base thickness is recommended to be designed for the projected traffic. The thickness may be in accordance with the original construction specifications if the projected traffic load for the new roadway is not greater than the traffic load used in the original design.

Other Embankment Options

Other options for the raised and widened embankment may be feasible. A load surcharge of the subsoils beneath the widened embankment may be used to pre-compress the subsoils prior to pavement and sidewalk construction. The load surcharge material will need to be normal weight soil that is placed and compacted as recommended for the Soil Fill Embankment Option. The surcharge will require a waiting period, possibly one to four years, to compress the underlying soil, prior to completing the roadway embankment. The waiting period time frame could be more accurately estimated using the information from the recommended additional test boring exploration and analysis. Another option consists of the use of segmental retaining walls or geogrid reinforced steepened soil slopes to reduce the width of the embankment base and therefore the volume of fill needed. Specific recommendations can be provided for these options after the recommended additional test boring exploration and analysis.

8.3. Recommended Construction Materials Testing Services

This report was prepared assuming that *Giles* will perform Construction Materials Testing ("CMT") services during construction of the proposed embankment. It might be necessary for *Giles* to provide supplemental geotechnical recommendations based on the results of CMT services and specific details of the project not known at this time.

8.4. Basis of Report

This report is strictly based on the project description given earlier in this report. *Giles* must be notified if any parts of the project description or our assumptions are not accurate so that this report can be amended, if needed. This report is based on the assumption that the project will be designed and constructed according to the codes that govern construction at the site.

The conclusions and recommendations in this report are based on the encountered and assumed subsurface conditions as shown on the *Records of Subsurface Exploration*. *Giles* must be notified if the subsurface conditions that are encountered during construction of the proposed development differ from those shown on the *Records of Subsurface Exploration* because this report will likely need to be revised. General comments and limitations of this report are given in the appendix.

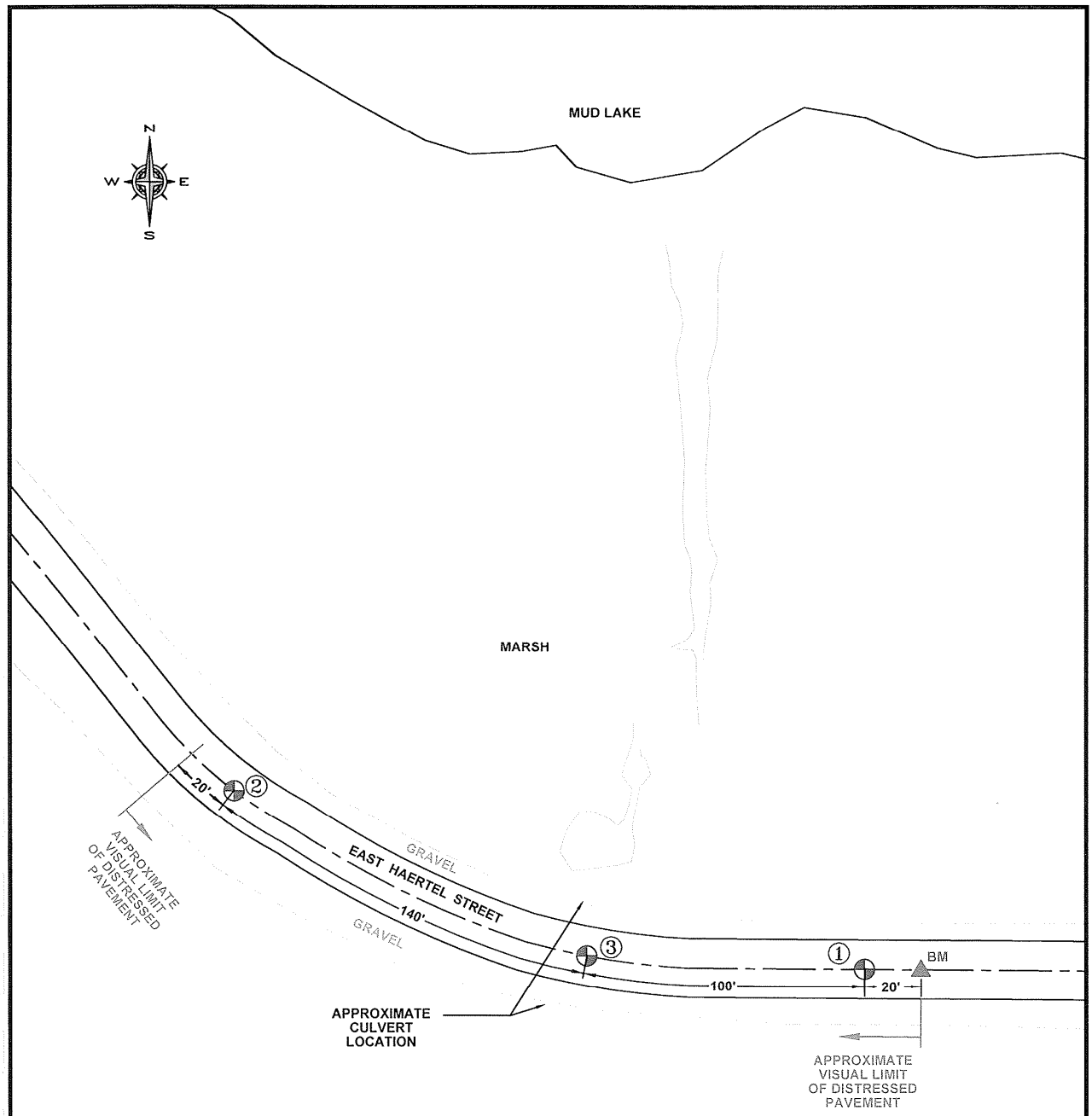
1g0701010-Report/07Geo01/jsm/se

APPENDIX A

FIGURES AND TEST BORING LOGS

The Boring Location Plan contained herein was prepared based upon information supplied by Giles' client, or others, along with Giles' field measurements and observations. The diagram is presented for conceptual purposes only and is intended to assist the reader in report interpretation.

The Test Boring Logs and related information enclosed herein depict the subsurface (soil and water) conditions encountered at the specific boring locations on the date that the exploration was performed. Subsurface conditions may differ between boring locations and within areas of the site that were not explored with test borings. The subsurface conditions may also change at the boring locations over the passage of time.



LEGEND:

① GEOTECHNICAL TEST BORING

BM BENCHMARK: CENTER OF ROAD AT END OF DISTRESS AREA. ASSUMED ELEVATION = 100.0'

NOTES:

1.) BASE MAP DEVELOPED FROM AERIAL PHOTOGRAPHY.

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FIGURE 1
TEST BORING LOCATION PLAN
PROPOSED ROAD RECONSTRUCTION
EAST HAERTEL STREET
PORTAGE, WISCONSIN

DESIGNED	DRAWN	SCALE	DATE	REVISED
JSM	JSZ	approx.1"=50'	02-16-07	--
PROJECT NO.: 1G-0701010			CAD No. 1g0701010-blp	

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION: 1	PROJECT: Proposed Road Reconstruction
SURFACE ELEVATION: 99.7	PROJECT LOCATION: East Haertel Street
COMPLETION DATE: 1/18/07	Portage, Wisconsin
FIELD REPRESENTATIVE: Beauford Jones	GILES PROJECT NUMBER: 1G-0701010

GILES ENGINEERING ASSOCIATES, INC.
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Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	w (%)	PID	NOTES
4"± Asphalt Pavement		1-SS	50/3"						(a)
12"± Brown fine to coarse Sand and Gravel (Base Course) - Damp		2-SS	18						
Dark Brown fine Sand, some Gravel, metal, and wood fragments (contains Gravel-sized slag and concrete fragments at 6± feet) (Fill) - Damp	5	3-SS	27						
Dark Brown Silty fine Sand, little Gravel (Fill) - Damp		4-SS	7						
Orange-Brown fine Sand - Moist	10	5-SS	7						
Gray fine Sand - Wet		6-SS	6						
	15	7-SS	6						
		8-SS	6						
	20	9-SS	6						

Boring terminated at 21 feet

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: 12.5 ft.	(a) Possibly frozen to 1± feet
▼	WATER LEVEL AFTER REMOVAL: 12.5 ft.	
	CAVE DEPTH AFTER REMOVAL: 12.5 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

NORMAL BORING LOGS 1G0701010.GPJ GIL_CORP.GDT 2/16/07

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION: 2	PROJECT: Proposed Road Reconstruction
SURFACE ELEVATION: 98.4	PROJECT LOCATION: East Haertel Street
COMPLETION DATE: 1/18/07	Portage, Wisconsin
FIELD REPRESENTATIVE: Beauford Jones	GILES PROJECT NUMBER: 1G-0701010

GILES ENGINEERING ASSOCIATES, INC.
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Madison Dallas Atlanta
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MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
4"± Asphalt Pavement		1-SS	36						(a)
11"± Brown fine to coarse Sand and Gravel (Base Course) - Damp		2-SS	27						
Orange-Brown fine Sand, trace Gravel (Fill) - Damp									
Orange-Brown and Dark Brown fine Sand (Fill) - Damp to Moist	5	3-SS	27						
Gray fine Sand - Damp		4-SS	16						
Brown fine Sand - Wet	▽ 10	5-SS	10						

Boring terminated at 11 feet

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: 10.0 ft.	(a) Possibly frozen to 1½± feet
▼	WATER LEVEL AFTER REMOVAL: None	
	CAVE DEPTH AFTER REMOVAL: 7.5 ft.	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

NORMAL BORING LOGS 1G0701010.GPJ GIL_CORP.GDT 2/16/07

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION: 3	PROJECT: Proposed Road Reconstruction
SURFACE ELEVATION: 95.8	PROJECT LOCATION: East Haertel Street
COMPLETION DATE: 1/18/07	Portage, Wisconsin
FIELD REPRESENTATIVE: Beauford Jones	GILES PROJECT NUMBER: 1G-0701010

GILES ENGINEERING ASSOCIATES, INC.
Milwaukee Los Angeles
Madison Dallas Atlanta
Washington, D.C. Orlando

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	W (%)	PID	NOTES
4"± Asphalt Pavement		1-SS	74						(a)
12"± Brown fine to coarse Sand and Gravel (Base Course) - Damp		2-SS	29						
Dark Orange-Brown fine Sand (Fill) - Moist	5	3-SS	22						
		4-SS	10						
Black Silty fine Sand (Fill) - Wet									
Gray-Brown and Black Silty fine to coarse Sand and Gravel (Fill) - Wet	10	5-SS	12						
Gray Silty fine to coase Sand and Gravel - sized concrete fragments (Fill) - Moist to Wet		6-SS	10						
Dark Gray to Black Silty fine to coarse Sand and Gravel (contains organic odor at 16± feet) (Fill) - Wet	15	7-SS	6						
		8-SS	14						
Gray and Black mixed Silty fine Sand and fine fibrous Organic Matter Peat (Fill) - Moist to Wet	20	9-SS	11				298		
Dark Gray Silty fine Sand (contains organic odor) (Fill) - Wet		10-SS	6						
Dark Gray Organic Clayey Silt, some shell fragments (Lake Marl) - Moist	25	11-SS	8	0.8	0.5	0.3	89		LL = 156, PL = 43
		12-ST	--						(b)
Gray fine Sand - Wet	30	13-SS	4						
		14-SS	16						
	35	15-SS	14						
		16-SS	10						
Gray Silty fine Sand - Wet	40	17-SS	10						
Boring terminated at 41 feet									

WATER OBSERVATION DATA	REMARKS
WATER ENCOUNTERED DURING DRILLING: 8.0 ft.	(a) Possibly frozen to 2± feet
WATER LEVEL AFTER REMOVAL: 8.0 ft.	(b) Sample 12ST no recovery
CAVE DEPTH AFTER REMOVAL: 8.0 ft.	
WATER LEVEL AFTER HOURS:	
CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

NORMAL BORING_OGS 1G0701010.GPJ GIL_CORP.GDT 2/16/07