RIVER VALLEY TESTING CORP.

Marinette, Wisconsin

REPORT OF GEOTECHNICAL EXPLORATION

PROPOSED HALL AVENUE STREET PROJECT
UNDERGROUND UTILITY AND STREET RECONSTRUCTION
C.T.H. "T" / ROOSEVELT ROAD TO STATE STREET
MARINETTE, WISCONSIN

PROJECT NO.: 2007-10
RVT #G07-110

Prepared for:

MR. BRIAN MILLER
CITY OF MARINETTE
ENGINEERING DEPARTMENT

MARCH 19, 2007

RIVER VALLEY TESTING CORP.

2193 Starr Court
Green Bay, WI 54303
Telephone: 920/497-9395
FAX: 920/497-9396

March 19, 2007

Mr. Brian Miller
City of Marinette
Engineering Department
1905 Hall Avenue
Marinette, WI 54143-0135

Subj: Report of Geotechnical Exploration
Proposed Hall Avenue Street Project
Underground Utility and Street Reconstruction
C.T.H. "T" / Roosevelt Road to State Street
Marinette, Wisconsin
Project No. 2007-10
RVT #G07-110

Mr. Miller:

In compliance with your instructions, River Valley Testing Corp (RVT) has conducted a soils exploration program for the above referenced project. We have included the results of this exploration, together with our recommendations, in the attached report. We have transmitted two (2) copies (one (1) bound and one (1) unbound) of this report to you. You authorized these services on February 7, 2007.

Portions of the soil samples will be held at RVT for a period of 30 days from the date of this report and then will be discarded unless requested to ship them to a location designated by you.

RVT has expressed its opinions in this report based on the conditions observed at the test boring locations. If the construction encounters different conditions than at the test boring locations, RVT requests notification so we can perform a review of these new conditions.

Respectfully Submitted,

RIVER VALLEY TESTING CORP.

Mark E. King, P.E.
Branch Manager

MEK/JPF/tls
Attachments

EXECUTIVE SUMMARY

We have prepared this executive summary solely to provide a general overview. ***Do not rely on this executive summary*** for any purpose except that for which it was prepared. ***Rely on the full report*** for information about findings, recommendations, and other concerns.

The results of the subsurface exploration program indicate the site has generally suitable subsurface conditions to support the proposed underground utility lines. However, existing/possible fill and very loose soils encountered in most of borings present a concern for the proposed utility construction. Please see the "Underground Utility Discussion" section of this report for additional details. Further, the presence of relatively shallow hard/extremely dense soil may require the use of special excavation equipment, and possibly blasting, where utility installation will extend into the hard/extremely dense soil layer, or below auger refusal depths. Please refer to the "Excavation of Hard/Extremely Dense Soils" section of this report for additional information concerning the removal of hard/extremely dense soil material.

The results of the exploration program also indicate that the site is generally suitable for the intended roadway reconstruction. However, concerns for the pavement performance include the presence of existing and possible fill, some of which contained organic soils, and frost susceptible soils. The risk of reduced pavement performance associated with these concerns is discussed in the "Pavement Discussion" section of this report. Based on the anticipated acceptable risk level of the owner, River Valley Testing Corp. (RVT) anticipates the existing fill will remain in place unless the near surface soils contain more than 5% organics or proof-rolling operations indicate rutting or deflections in excess of 1". However, we recommend the pavement preparation include removal of soils that do not have adequate strength and soils which contain more than 5% organics (AASHTO "A-8" soil). Consideration should also be given to providing Excavation Below Subgrade (EBS) in areas where the exposed subgrade soils have an AASHTO "A-4" classification. The over-excavated material should then be replaced with compacted non-frost susceptible sand sub-base fill.

RVT ***strongly*** recommends proof-rolling the exposed subgrade prior to placement of additional sub-base and base course material to document isolated soft areas. Soft areas should be subcut and replaced with sub-base fill. Other recommendations concerning subgrade preparation and the intended construction are contained within this report.

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1.0 INTRODUCTION

This report presents the results of the soil exploration program for the proposed underground utility and street reconstruction project located in Marinette, Wisconsin. In fulfillment of the requested scope of services, RVT:

1. Performed seventeen (17) standard penetration test soil borings in the vicinity of the proposed construction. Further, we extended the borings to a maximum depth of between 10' and 20' below the existing grade or to auger refusal. The depth to auger refusal ranged from 7½' to 12½' below the existing grade.

2. Classified the soils encountered in the soil borings and prepared soil boring logs illustrating the soil strata.

3. Performed a limited number of laboratory tests, as we deemed necessary, to aid in classifying the soils and in estimating their engineering properties.

4. Prepared a written report documenting the results of the field and laboratory test programs. We included the following in the report;

    a. Soil boring logs which document the encountered subsurface conditions.

    b. Our recommendations regarding underground utility installation and suitable pavement design parameters.

    c. Construction considerations relative to the subsurface conditions.

The purpose of this report was to determine the various soil profile components, the engineering characteristics of the materials encountered, and to provide criteria for use by the design professionals in preparing the pavement and utility design plans and cost analysis.

2.0 DESCRIPTION OF SITE

Site Location

The proposed roadway and utility construction, upon which this soils exploration has been made, is located in Marinette, Wisconsin. Specifically, the site of the proposed reconstruction is located on Hall Avenue between C.T.H. "T"/Roosevelt Road and State Street.

3.0 FIELD EXPLORATION

Drilling and Sampling Procedures

RVT conducted the soil borings on February 27 and 28, and March 5 through March 7, 2007, with a truck mounted rotary drilling rig utilizing continuous flight hollow stem augers (HSA). Mr. Brian Miller of the City of Marinette Engineering Department, determined the general boring locations and depths. City of Marinette personnel located the borings in the field and determined the surface elevation at the boring locations. We assumed the boring elevations to be referenced to the National Vertical Geodetic Datum (1929). The "Table of Pavement Design Parameters" and "SCS Soil Survey Map" included in the Appendix note the soil boring locations.

Field Penetration Tests

The drilling crew obtained field soil samples in accordance with American Associates of State Highway and Transportation Officials (AASHTO): T206. Using this procedure, a 140 pound weight falling 30" drives a two inch outside diameter (OD) split barrel sampler into the soil using either a safety type manual hammer (MH) or an automatic hammer (AH). The "Method Section" of the boring logs indicates the hammer type in parentheses. After an initial set of six (6) inches, the standard penetration resistance or N-value describes the number of blows required to drive the sampler an additional 12 inches. The N-value provides an index of the relative density of cohesionless soils or the consistency of cohesive soils. This provides additional information as to the relative strength and compressibility characteristics of the subsoil.

Field Classification Tests

The drill crew chief visually and manually classified the samples in the field in accordance with AASHTO: T206. Field personnel then collected representative soil samples and returned them to the laboratory for further examination and verification of the field classification. The soil boring logs located in the Appendix describe the depth and identification of the various strata, the N-value, the groundwater level and other pertinent information.

4.0 SUBSURFACE CONDITIONS

General

The stratification of the soils shown on the boring logs represent the soil conditions in the actual boring locations, however, other variations may occur between the borings. Lines of demarcation represent the approximate boundary between the soil types, but the transition may be gradual.

It should be pointed out, the subsurface conditions at other times and locations on the site may differ from those found at the test locations. If the contractor encounters different site conditions during construction, the design engineer or the contractor should request RVT review our recommendations in relation to the new information.

Subsurface Conditions

The soil boring logs in the Appendix illustrate the encountered soil and groundwater conditions at the test boring locations. The logs also indicate other pertinent information which includes the drilling method, sampling techniques, and laboratory testing.

The generalized soil profile indicated by the borings consisted of a 15" to 18" pavement section, which contained a 3" to 6" asphalt pavement overlying 3" to 10" of concrete pavement and 3" to 10" of gravel base course. Below this pavement section, the borings encountered a combination of existing fill and possible fill to a depth of between 2½' and 6' below the existing grade. The existing fill consisted of silty sand with varying amounts of gravel, pieces of asphalt, steel, lean clay, and

organics, while the possible fill consisted of sand with silt. Below the existing fill and possible fill strata, the borings encountered outwash and glacial till soils that extended to the boring termination depths. The outwash soils consisted of sand, sand with silt, and silty sand. The glacial till soils contained sand, sand with silt and gravel, silty sand and sandy silt with varying amounts of gravel and cobbles, and silt. An exception to this profile occurred in Boring 14-07 and 17-07, which did not encounter existing fill or possible fill soils below the pavement section.

In addition, auger refusal occurred in Boring 10-07 and 11-07 at a depth of 12½' and 7½', respectively, below the surface. A 5' rock core would be necessary to document if refusal occurred on bedrock, boulders, or other obstruction. We wish to note, hard/extremely dense soils can have special construction considerations. Please see the "Excavation of Hard/Extremely Dense Soils" section of this report for further recommendations.

Standard penetration N-values generally indicated a medium to very stiff consistency for the silty soils, but the borings also contained hard strata. Further, the standard penetration N-values generally indicated a loose to very dense relative density for the sand soils, but the borings also contained very loose and extremely dense strata. The boring logs in the Appendix indicate the standard penetration N-values in the column titled "Total (N)".

Soil Series (Pedological Name)

RVT performed a review of local Soil Conservation Survey maps of the project areas. The maps indicated the surficial soils of the alignments belong in the "Wainola - Deford" Association. Further, the soil survey classifies the surficial soils being predominantly in the "Shawano" and "Wainola" Series. The most probable Soil Series for each boring is included in the "Table of Design Parameters" included in the Appendix. The generalized natural soil profile of these series is documented to consist of well drained to somewhat poorly drained sand and loam ground moraines and outwash plains overlying glacial lake basins. The encountered soils in the borings generally match the soils noted in the published soil maps.

Water Level Information

The drill crew conducted water level observations during and at the completion of drilling operations. The crew observed a measurable groundwater level in Boring 2-07 through 10-07, 16-07, and 17-07, and noted it at a depth of between 5' and 10' during drilling. However, only Boring 8-07, 16-07, and 17-07 contained a measurable groundwater level after drilling and it was noted at a depth of between 9' and 13' below the existing grade. Further, none of the remaining borings contained a measurable groundwater level either during or after the completion of drilling.

The soils encountered in the borings have a mixture of relatively free draining and poorly draining characteristics. In addition, glacial till soils can contain groundwater "perched" within more permeable soil zones. Therefore, in our opinion, the observed groundwater level, or the lack of

observed groundwater, in the borings may not be reasonable approximations of the static groundwater level at the time of this exploration program. However, where the borings encountered loose to dense sandy soils, the noted depths to groundwater should be a reasonable approximation of either a static or perched groundwater level at the time of drilling. It should be noted that groundwater levels can fluctuate with time due to seasonal variations in precipitation, lateral drainage conditions and from location to location. The time of year and the weather history during the advancement of the borings should be considered when estimating groundwater levels at other points in time.

5.0 LABORATORY TESTING PROGRAM

After completion of the field exploration, a Geotechnical Engineer visually and manually classified the samples in the laboratory in accordance with the Unified Soil Classification System (USCS) and the AASHTO Classification System. The classification included the major and minor soil type, grain-size, color, moisture content and consistency/relative density. The square-bracketed text after the classification indicates the AASHTO Classification, and the square-bracketed text below the classification indicates the probable geographic origin.

The laboratory testing program also included tests for in-situ moisture content (W), organic content (Org), mechanical analysis (MA*), and the percentage of material passing the #200 sieve (P200). The test results can be found on the boring logs in the Appendix, adjacent to the

number of the tested sample. Further, the mechanical analysis results can be found on the "Report of Mechanical Analysis of Soil" also included in the Appendix.

6.0 ENGINEERING REVIEW

Project Information

The following information represents RVT's understanding and assumptions of the proposed construction. It comprises an important part of our engineering review. If any changes occur in the nature, design, grades or locations of the proposed construction, after the completion of this report, the conclusions and recommendations in this report should not be considered valid unless we review these changes.

RVT understands the proposed project includes the underground utility construction and roadway reconstruction of Hall Avenue, between C.T.H. "T" / Roosevelt Road and State Street, in the City of Marinette, Wisconsin. Further, the project will include a complete reconstruction of the roadway and installation of underground water main, sanitary sewer, and storm sewer. In general, the final pavement grades will approximately be at the existing surface elevations.

Where the borings encounter subsurface conditions that might be detrimental to the support of the proposed utilities or pavements, RVT has assumed the owner will have an acceptable risk level if the detrimental material remains in place. With this in mind, this report assumes the owner would only

be willing to accept a low risk for excessive utility line settlement, but might be willing to accept a moderate risk for a reduced pavement performance. *If these assumptions concerning the owner's acceptable risk level are incorrect, then we should be immediately contacted so we can review our recommendations in light of the changed acceptable risk level.*

Underground Utilities Discussion

Based primarily on information obtained from the soil borings, in RVT's opinion, the subsurface soil can provide suitable support for the proposed utility lines. However, the existing and possible fill and soft soils encountered in the borings presents a concern for the support of utility lines.

Existing and Possible Fill

The presence of existing and possible fill soils, some of which contained some organic soils, encountered in all of the borings except Boring 14-07 and 17-07, provides a concern for the support of underground utilities. Although we anticipate most of the utilities will extend through the existing and possible fill layers, encountering deeper fill in seven of the borings increases the likelihood that deeper existing and possible fill may be present in other areas of the site. With this in mind, the owner should be aware of the risk for total and/or differential settlement in excess of 2" with constructing underground utilities on undocumented fill. Undocumented fill has a risk for increased settlement because of potential variations in the density of this material. The risk also increases where the existing fill contains more than 5% organics, because the organic material can be highly compressible and will continue to decay throughout time.

Based primarily on the Standard Penetration N-values, in our opinion the risk of total and/or differential settlement in excess of 2" for underground utilities associated with the existing and possible fill at this site would be low to moderate where no more than 2' of remaining fill material will be present below the utility grade, and moderate to high where existing fill will extend more than 2' below the bearing elevations of the utilities. If the owner cannot accept these risks, then RVT recommends removing all encountered existing fill from below utilities lines, and replacing it with a compacted structural fill in accordance with the "Site Preparation/Excavations/Backfill" section of this report.

Very Loose Soils

The very loose (N < 5 bpf) soils encountered in Boring 3-07 and 4-07, at a depth of between 6' and 12½' below the existing grade provides another concern for the support of underground utilities. The owner should be aware that very loose soil is highly compressible, would be subject to general shear failure at very light loadings, and have a very high susceptibility to disturbance by construction activity. Because of these factors, this site has a moderate to high risk that total settlement could exceed 1" for utilities constructed on very loose (N < 5 bpf) soil. In addition, if construction will include "bore and jack" installation techniques, then a moderate risk of borehole collapse will exist if it extends through a very loose soil zone.

If the owner cannot accept this risk for total settlement in excess of 1", then we recommend over-excavating the very loose soils within 5' of utility lines and then refilling the over-excavation with structural fill in accordance with the "Site Preparation/Excavations/Backfill" section of this report.

Summary

Based on the above discussion, and our understandings outlined in the "Project Information" section of this report, RVT recommends the following:

1. Subcut all existing and possible fill from below the utility lines and replace it with compacted structural fill in accordance with the "Site Preparation/Excavations/Backfill" section of this report. However, if site observations indicate the possible fill is actually native soils, these soils may remain in place as long as they have suitable strength to support the proposed utility lines.

2. Over-excavate all soils containing more than 5% organics and very loose soils from within 5' below utility lines.

RVT wishes to note, excavations subcut below the proposed pipe elevation should be oversized one foot horizontally in each direction for every foot of structural fill placed below the pipe, to a maximum oversize of 3' on each side of the pipe. In addition, RVT ***strongly*** recommends a Geotechnical Engineer document the material exposed in the excavations does not exhibit obvious characteristics that would adversely affect the performance of the underground utilities.

Pavement Discussion

Based on the results of this exploration, in our opinion, the sites have generally suitable conditions for support of a pavement section and the anticipated traffic loadings. However, the soil borings encountered two potential concerns for the pavement performance which include existing and possible fill and highly frost susceptible soils.

Existing and Possible Fill

The presence of existing and possible fill (some of which contained some organic soils) encountered in all the borings, with the exception of Boring 14-07 and 17-07, presents a concern for the performance of the pavement system. This material extended as deep as 6' below the existing grade. For the possible fill, the absence of deleterious materials can make it difficult to distinguish the difference between undocumented fill and native soils. However, a risk exists for reduced pavement performance associated with constructing pavements on undocumented fill. The reduced pavement performance is associated with potential variations in the density of undocumented fill. Because of natural soil variability, every construction site has at least a very low risk for reduced pavement performance. In addition, this risk tends to increase with the presence of organic soils (more than 5% organics). Further, laboratory tests performed on collected samples of the existing fill indicated an organic content of 3.7%.

Based on the Standard Penetration N-values, and the organic content tests of the existing fill, in RVT's opinion, the risk at this site would be low as long as the existing fill does not contain more

than 5% organics and proof-rolling does not indicate rutting or deflections in excess of 1". If the owner cannot accept this risk for reduced pavement performance, then we recommend removing all encountered existing fill and replacing it with sub-base fill specified in the "Pavement Design Parameters" section of this report.

Frost Susceptible Soil

The frost susceptible silty soil encountered in the borings provides another concern for the pavement system. RVT wishes to note, a risk for reduced pavement performance exists with the construction of pavements on frost susceptible soil. The reduced pavement performance may occur because of potential detrimental frost heaving and spring thaw weakening. The risk associated with frost susceptible soils can be reduced by the removal all frost susceptible soils within 3' of the final grade. In our opinion, the risk at this site related to the frost susceptible soils would be low for the sand and sand with silt (AASHTO "A-3", "A-1-a", and "A-1-b"), and moderate for moderately silty sand (AASHTO classification "A-2-4"). Further, very silty sand, sandy silt, and silt soils having an AASHTO "A-4" classification would have a high risk. If the owner cannot accept these risks, then we recommend removing all frost susceptible soils in accordance with current Wisconsin Department of Transportation (WDOT) practice.

Summary

Based on the above discussion, and our understandings outlined in the "Project Information" section of this report, RVT recommends the following:

1. Subcut all soils present within 5' of the finished grade that have more than 5% organics (AASHTO "A-8" classification).

2. Non-organic existing fill could remain in place where proof-rolling operations indicate ***no*** rutting or deflections in excess of 1". Where proof-rolling indicates rutting or deflections in excess of 1", then provide Excavation Below Subgrade (EBS) in accordance with WDOT standard practice.

3. If the construction encounters soils having an "A-4" AASHTO classification, then we recommend EBS be performed in accordance with current WDOT practice. However, we anticipate the encountered low to moderately frost susceptible soils will remain in place below the pavement section.

Pavements Design Parameters

The "Table of Subgrade Design Parameters" included in the Appendix provides values for the soil strata for the first suitable bearing layer at each of the boring locations. RVT obtained the values for the Soil Support Value and Design Group Index from the WDOT Pavement Design Manual and Frost Index values from the frost susceptibility classifications according to the U.S. Army Corps of Engineer's criteria. We estimated the Subgrade and Resilient Modulus values based on historical testing of similar soils. For grading work and drainage design, the soil series names (Pedology) have been noted on the "Table of Pavement Design Parameters" included in the Appendix.

Based on the results of our soil borings, RVT recommends the use of the pavement design parameters noted in Table 1. In addition, for grading work and drainage design, shrinkage should be in the range of 10% to 20% for the sandy soils and 20% to 35% for silty soils. These values correlate to expansion factors of 11% to 25% for the sandy soils and 25% to 55% for the silty soils. Further, the soils would generally be classified as being in Hydrologic Series Group A, with some portions of the alignment being in Hydrologic Series Group C.

Table 1 - Recommended Pavement Design Parameters

Design Parameter	Recommended Value
Subgrade Reaction Modulus (psi/in)	200
Resilient Modulus (psi)	3,600
Frost Index	F3
Soil Support Number	4.2
Design Group Index	12

After completion of the subgrade preparation, the finished subgrade should be thoroughly compacted and test rolled with a large vibratory roller in sandy soils and a loaded tandem axle dump truck in silty soils. We recommend providing Excavation Below Subgrade (EBS) in areas where subgrade deflections or rutting exceed 1". Please see the "Excavation Below Subgrade" section of this report for additional details.

Sub-base fill used to achieve final grades should consist of relatively clean sand with 100% passing the 3" sieve and less than 15% passing the #200 sieve. Compaction tests should be completed on fill

exceeding 2' in depth. Fill should be placed in 8" maximum loose lifts and compacted to at least 95% of AASHTO T180 (Modified Proctor). In RVT's opinion, only the sand, and sand with silt, (AASHTO "A-3", "A-1-a", and "A-1-b") soils encountered in the borings would meet our recommendations for sub-base fill. We wish to note, we do not recommend using very silty sand or silt soils (AASHTO "A-4") for sub-base fill because of the potential for pumping and frost action. Where possible, the existing base course material encountered in the borings may be salvaged for later re-use as long as it has not been mixed with the existing silty subgrade soils.

The owner should be aware there is a risk of construction delays due to the increased difficulty of working with silty soils, which are sensitive to changes in moisture content. In our opinion the risk would be moderate to low during hot and dry times of the year, such as during the months of July and August. However, the risk would be high during cool and wet times of the year, such as during the spring and fall months. If the native soils are used, the moisture contents should be within 3%, plus or minus, of the optimum Modified Proctor moisture content. Based primarily on limited in-situ moisture content tests and visual observations of the collected samples, in our opinion, the moisture content on some of the native soils vary more than 3% above the optimum moisture. Therefore, we anticipate moisture conditioning (either drying or wetting) may be necessary in some areas of the alignment.

Excavation Below Subgrade

Design professionals normally employ Excavations Below Subgrade (EBS) to reduce the potential for detrimental frost effects. However, concerns for subgrade stability and premature pavement failure associated with the presence of deleterious materials (such as organic soils having an AASHTO "A-8" classification) can require "over excavation". EBS (other than for organic soils) should not extend more than 18" below subgrade without consultation with RVT. Areas with EBS for soft/very loose soils should be backfilled with a predominantly granular fill.

In areas requiring EBS for detrimental frost concerns, RVT recommends constructing transition zones, which are wedges of backfilled soil used to mask the distinct difference between the native soils and the backfilled area (such as trenches for utilities). The transition zone should start at the trench walls, and a depth of 3' below the finished pavement, and rise at a slope of 1V:3H as it extends perpendicular to the trench. However, transition zones would not be necessary in areas where subcuts are backfilled with soils similar to the native soils, or where the native soils contain less than 30% material passing the #200 sieve.

Stub Drains and Underdrains

Where the exposed subgrade soils consist of very silty sand or silt soils (AASHTO "A-4"), RVT recommends the use of stub drains to limit seepage from collecting in the impervious subgrade. Further, stub drains would be utilized only in areas containing curb and gutter. Where no curb and gutter is present, the subgrade should be sloped toward the ditches. In the Appendix is a

"Sketch of Typical Stub Drain Detail" which applies to catch basins as well as manholes where no catch basin is convenient. Under most circumstances, we do not recommend compromising the integrity of manholes by the installation of stub drains. It is preferred to install stub drains at catch basins. Further, consideration should be given to the use of an underdrain system where the construction encounters silt and very silty sand subsoils (AASHTO "A-4") and the subgrade cannot be suitably sloped towards the ditches.

Additional Pavement Recommendations

The recommendations made in this report have been based on the subsurface conditions found in the borings. However, other soil conditions not represented by these borings may be encountered during construction. Therefore, we recommend RVT be on site to observe the finished subgrade test rolling and borrow material placement. RVT should also perform an adequate number of density tests on the fill during placement to document compliance with compaction specifications.

If construction will occur during the winter months, we wish to note that excessive settlement may occur if the contractor incorporates frozen material in the embankment fill. Therefore, we recommend wasting any material which freezes prior to compaction.

7.0 CONSTRUCTION CONSIDERATIONS

Site Preparation/Excavations/Backfill

Except as noted in the "Underground Utility Discussion" and "Pavement Discussion" sections, the soil borings indicate a moderate amount of special subgrade preparation and dewatering will be necessary prior to placement of the proposed utilities and pavements. This special preparation will include the removal and replacement of existing and possible fill and very loose soils from below the utility lines. Further, the special preparation could include removal of existing and possible fill that does not meet support requirements and removal of highly frost susceptible (AASHTO classification "A-4") soils from below pavements. In addition, RVT anticipates special equipment designed for ripping hard/extremely dense soils, and possibly blasting, may be required to remove extremely dense/hard soils if excavations need to be extended into the extremely dense/hard soil, or below auger refusal depth (below a depth of 12½' in Boring 10-07 and 7½' in Boring 11-07). Please refer to the "Excavation of Hard/Extremely Dense Soils/Bedrock" section of this report for additional details.

For the general site preparation, we recommend topsoil, and other near surface soil having more than 5% organics (AASHTO classification "A-8"), be removed from below utility lines and pavements. Care should be taken during the removal of the undesirable soils to properly grade the final subgrade to promote drainage away from the roadway. After the initial site preparation, RVT recommends pavement areas be proof-rolled with a large vibratory roller in sandy soils and a loaded tandem axle dump truck in silt soils. We recommend conducting EBS in accordance with the

"Excavation Below Subgrade" section of this report where subgrade areas exhibit rutting or deflections greater than 1", contain soft/very loose soils, or consist of AASHTO "A-4" soils.

Because the native silty soils exhibit a high sensitivity to strength loss when wet or when disturbed by construction activity, RVT recommends maintaining site drainage away from excavations to minimize the amount of water entering or ponding in the excavations. Saturated or disturbed soil should be removed and replaced with compacted structural fill.

The structural fill used to refill the over-excavations below utility lines should consist of a granular material having 100% passing the 3" sieve and less than 15% passing the #200 sieve. The structural fill should be compacted to at least 95% of the Modified Proctor dry density in all areas. If the selected fill material has less than 5% material passing the #200 sieve size, then it should be compacted to at least 65% Relative Density (ASTM D4253/D4254). As an alternative, the native soil could be reused as backfill in the trenches in non-structural areas (such as in lawn areas). If utilized, this material should be placed and compacted the same as our recommended structural fill.

Since we assume the excavations will extend deeper than four feet, RVT recommends maintaining excavation side slopes at a ratio no steeper than 1½' horizontal to 1' vertical. In addition, please note other OSHA, state, and local requirements concerning excavation bracing may apply.

Excavation of Extremely Dense/Hard Soil

The excavation of extremely dense/hard soil is dependant on several factors including the nature of the material; moisture content, and strength; and the type of equipment used to excavate it. Based on historical data and conversations with excavation contractors, in our opinion the standard penetration "N" values should be used only as a general indicator as to the rippability of extremely dense material. Soils having standard penetration "N" values less than 50 bpf can usually be excavated with standard construction techniques. Soils/bedrock with N-values above 50 bpf and where auger refusal has not yet been met can usually be excavated with larger machinery equipped for ripping rock. Some of the likely attachments would include heavy shanks (ripping teeth), shank protectors, and narrow track shoes if the tractor is used for full-time rock work. Extremely dense/hard soils where auger refusal has been met may require blasting or drilling with diamond-studded bits to remove the material.

We anticipate removing extremely dense material could significantly slow the rate of excavation. If the contractors have concerns about the excavation process, then we recommend they conduct additional test pits and obtain at least two (2) 5' rock core samples during the bidding phase of the project.

Groundwater Control

Where excavations extend more than 2' below either a perched or static groundwater level, controlling the groundwater may require a substantial dewatering system (such as a temporary well point system). However, initial attempts to control groundwater could include a series of sump pumps and pits. Should a well-point system become necessary, we recommend utilizing the values of estimated hydraulic conductivities in Table 2 when designing the dewatering system.

Table 2 - Estimated Hydraulic Conductivity Values

Soil Type	Hydraulic Conductivity	
	cm/sec	ft/min
SAND (SP) and SAND with Silt(SP-SM) [A-3, A-1-a, A-1-b]	0.05 – 0.1	0.1 – 0.2
SILTY SAND (SM) [A-2-4, A-4]	$1x10^{-4} - 1x10^{-2}$	$2x10^{-4} - 2x10^{-2}$
SANDY SILT, SILT (ML) [A-4]	$1 \times 10^{-5} - 1 \times 10^{-4}$	$2 \times 10^{-5} - 2 \times 10^{-4}$

We wish to emphasize that the hydraulic conductivity values noted above are based on historical testing of similar soils. If the dewatering design requires a more accurate estimate, then we recommend conducting hydraulic conductivity tests. In addition, lowering the static groundwater level can have detrimental effects on nearby structures and existing utilities. With this in mind, RVT recommends any dewatering schemes be reviewed by a contractor who specializes in this type of work prior to its implementation.

Testing and Observations

Because some of the borings encountered existing and possible fill, some of which contained organic soils, very loose, and frost susceptible soils, we ***strongly*** recommend the owner retain RVT to observe the completed excavations before placement of sub-base fill, structural fill, or pavement components. This will provide the necessary documentation of the complete removal of all unsuitable soil. RVT should also document the soils encountered in the excavations have similar characteristics as those noted in the soil borings. Density tests should be taken during fill placement to document the achievement of our recommended compaction.

8.0 STANDARD OF CARE

The recommendations contained in this report represent our opinions arrived at in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

This report was prepared by,

RIVER VALLEY TESTING CORP.

Jacob P. Franzmeier, E.I.T.
Staff Engineer

This report was reviewed by,

Mark E. King, P.E.
Branch Manager

JPF/MEK/tls

APPENDIX

Table of Pavement Design Parameters

SCS Soil Survey Map

Soil Boring Logs

Unified Soil Classification System

Report of Mechanical Analysis of Soil

Sketch of Typical Stub Drain Detail

Important Information About Your
Geotechnical Engineering Report

PROPOSED HALL AVENUE STREET PROJECT:
UNDERGROUND UTILITY AND STREET RECONSTRUCTION
C.T.H. "T" / ROOSEVELT ROAD TO STATE STREET
MARINETTE, WISCONSIN
PROJECT NO. 2007-10
RVT #G07-110

TABLE OF PAVEMENT DESIGN PARAMETERS[1,2]

BORING NUMBER	BORING LOCATION	SOIL CLASSIFICATION		SUBGRADE REACTION MODULUS (PSI/I)	RESILIENT MODULUS (PSI)	FROST INDEX	SOIL SUPPORT NUMBER	DESIGN GROUP INDEX	PEDOLOGICAL SERIES
		USCS	AASHTO						
1	Hall Avenue, C.T.H. "T" Intersection	SP-SM (Fill)[4]	A-1-b	275	6,000	F2	5.2	4	Shawano
2	Hall Avenue, 200'E of C.T.H. "T"	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Shawano
3	Hall Avenue, 500'E of C.T.H. "T"	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Shawano
4	Hall Avenue, 500'W of McAllister Street	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Shawano
5	Hall Avenue, 250'W of McAllister Street	SP-SM (Fill)[4]	A-3	275	6,000	F2	5.2	4	Shawano
6	Hall Avenue, McAllister Street Intersection	SM (Fill)[4]	A-4	200	3,600	F4	4.2	12	Shawano
7	Hall Avenue, Michaelis Street Intersection	SM (Fill)[4]	A-4	200	3,600	F4	4.2	12	Wainola
8	Hall Avenue, Dawes Street Intersection	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Wainola
9	Hall Avenue, Coolidge Street Intersection	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Wainola

REMARKS:

1. All design parameters are estimates only, and are based on historical data for similar soil types. If more accurate values are required, additional testing should be performed.
2. Design parameters are for the first suitable soil strata encountered in the borings. If more than 2' of sub-base fill material is placed, the characteristics of the fill will govern the pavement design.
3. Denotes existing and possible fill which, accepting the risks noted in the "Pavement Discussion" section of this report, is suitable to support proposed pavement section, with the exception of the very loose soils.

PROPOSED HALL AVENUE STREET PROJECT:
UNDERGROUND UTILITY AND STREET RECONSTRUCTION
C.T.H. "T" / ROOSEVELT ROAD TO STATE STREET
MARINETTE, WISCONSIN
PROJECT NO. 2007-10
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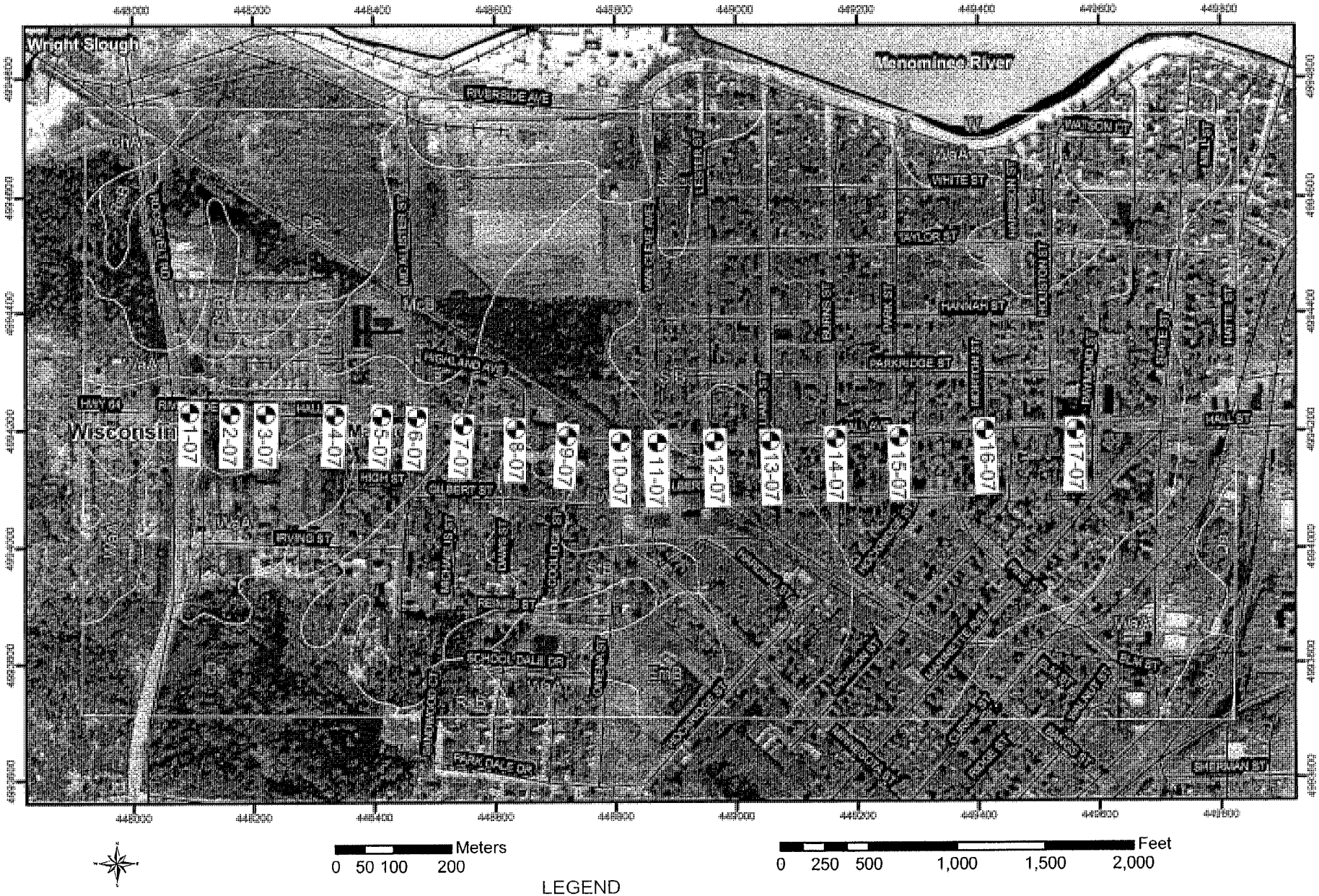
TABLE OF PAVEMENT DESIGN PARAMETERS[1,2]

BORING NUMBER	BORING LOCATION	SOIL CLASSIFICATION		SUBGRADE REACTION MODULUS (PSI/I)	RESILIENT MODULUS (PSI)	FROST INDEX	SOIL SUPPORT NUMBER	DESIGN GROUP INDEX	PEDOLOGICAL SERIES
		USCS	AASHTO						
10	Hall Avenue, Owena Street Intersection	SM (Fill)[4]	A-4	200	3,600	F4	4.2	12	Wainola
11	Hall Avenue, Van Cleve Street Intersection	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Wainola
12	Hall Avenue, Lester Street Intersection	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Wainola
13	Hall Avenue, Williams Street Intersection	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Wainola
14	Hall Avenue, Burns Street Intersection	SM	A-2-4	225	4,300	F3	4.6	10	Shawano
15	Hall Avenue, Park Street Intersection	SP-SM (Fill)[4]	A-1-b	275	6,000	F2	5.2	4	Shawano
16	Hall Avenue, Morton Street Intersection	SM (Fill)[4]	A-2-4	200	3,600	F3	4.2	12	Shawano
17	Hall Avenue, 100'E of Houston Street	SP	A-3	250	5,000	F2	5.2	4	Shawano

REMARKS:

1. All design parameters are estimates only, and are based on historical data for similar soil types. If more accurate values are required, additional testing should be performed.
2. Design parameters are for the first suitable soil strata encountered in the borings. If more than 2' of sub-base fill material is placed, the characteristics of the fill will govern the pavement design.
3. Denotes existing and possible fill which, accepting the risks noted in the "Pavement Discussion" section of this report, is suitable to support proposed pavement section, with the exception of the very loose soils.

SOIL SURVEY OF MARINETTE COUNTY, WISCONSIN



LEGEND

SOIL BORING LOCATION

USDA Natural Resources Conservation Service

3/19/2007

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	621.8'	**Scale:** 1" = 4'	**Boring No:** 1-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/27/07 Completed: 2/27/07 Driller: JL/LR Method: 3 1/4" HSA 0' to 11' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				6" ASPHALT PAVEMENT 5" GRAVEL BASE COURSE	No WLD No WLA							
17"	11	12		6" CONCRETE PAVEMENT		1A	SS					
	11	5	23	FILL, mostly Sand, with Silt, fine grain, brown, frozen to moist, dense (SP-SM) [A-1-b]		1B	SS					
	11	17	28	[FILL]		2	SS					
	9	11										
	15	15	26	NOTE: 3" seam of recycled asphalt pavement encountered at Elevation 619.3'.		3	SS					
6	8	10		SILTY SAND, with a little Gravel, reddish brown with grey, moist, dense to extremely dense (SM) [A-4]								
	15		25			4	SS	9				P200 =40%
		39		[GLACIAL TILL]								
	20	21	41			5	SS					
	16	80/11"	80/11"			6	SS					
13				End of Boring at 13'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	620.3'	**Scale:** 1" = 4'	**Boring No:** 2-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

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WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/27/07 Completed: 2/27/07 Driller: JL/LR Method: 3 1/4" HSA 0' to 11' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4 1/2" ASPHALT PAVEMENT 4" GRAVEL BASE COURSE								
16.5"	8	10		8" CONCRETE PAVEMENT		1A	SS					
2½	9	8	19	FILL, mostly Silty Sand, with Gravel, and some Organics, greyish brown with brown, frozen to		1B	SS					
	8	7	15	moist, medium dense (SM) [A-2-4]		2	SS	8				MA*
	5	8		[FILL]								
	8		16	SAND, with Silt, fine grain, brown, moist, medium dense (SP-SM) [A-3]		3	SS					
6	4	5		[POSSIBLE FILL]								
	8		13	SAND, with Silt, fine grain, brown, moist to water bearing, medium dense to loose (SP-SM) [A-3]		4	SS					
		4		[OUTWASH]								
	4	5	9		WLD	5	SS					
	4	4										
	5		9			6	SS					
13				End of Boring at 13'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	618.1'	**Scale:** 1" = 4'	**Boring No:** 3-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/27/07 Completed: 2/27/07 Driller: JL/LR Method: 3 1/4" HSA 0' to 13 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4 1/2" ASPHALT PAVEMENT 4" GRAVEL BASE COURSE								
16.5"	10	11		8" CONCRETE PAVEMENT		1A	SS					
	10	6	21	FILL, mostly Silty Sand, with a little Gravel and pieces of Steel, grey and brown, frozen to		1B	SS					
	8	11	19	moist, dense to medium dense (SM) [A-2-4]		2	SS					
4				[FILL]								
	4	6		SAND, fine grain, brown, moist to water								
	6	7	12	bearing, medium dense to very loose (SP) [A-3]		3	SS					
	3	4		[OUTWASH]								
	4		8			4	SS					
		2										
	2	2	4			5	SS					
$10\frac{1}{2}$					WLD							
	1	0		SILTY SAND, dark brown, water bearing, very loose to medium dense (SM) [A-2-4]								
	1		1	[OUTWASH]		6	SS					
		4										
	6	6	12			7	SS	22				P200 =29%
15				End of Boring at 15'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	617.3'	**Scale:** 1" = 4'	**Boring No:** 4-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 11' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4" ASPHALT PAVEMENT 10" CONCRETE PAVEMENT 4" GRAVEL BASE COURSE		1A 1B	NSR NSR					
18"	10	50/5"	50/5"									
		10		FILL, mostly Silty Sand, yellowish brown, frozen to moist, medium dense (SM) [A-2-4] [FILL]								
	10	8	18			2	SS					
4												
	4	5		SAND, with Silt, fine grain, light brown, moist, medium dense (SP-SM) [A-1-b] [POSSIBLE FILL]								
	5	4	10			3	SS					
6												
	2	2		SILTY SAND, brown, water bearing, very loose to medium dense (SM) [A-4] [OUTWASH]								
	2		4			4	SS					
		2			WLD							
	3	2	5			5	SS					
	5	5										
	6		11			6	SS					
13				End of Boring at 13'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	616.3	**Scale:** 1" = 4'	**Boring No:** 5-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 9' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4" ASPHALT PAVEMENT 9" CONCRETE PAVEMENT								
17"	13	22		4" GRAVEL BASE COURSE		1A	SS	16				Org =3.7%
2												
2½	23	7	45	FILL, mostly Silty Sand, with some Organics, black with brown, frozen (SM) [A-4] [FILL]		1B	SS					
	15	16	31			2	SS					
4												
	3	5		FILL, mostly Sand, with Silt, fine grain, moist, brown, very dense (SP-SM) [A-3] [FILL]								
	5	5	10			3	SS					
6												
	3	3		FILL, mostly Sand, with Silt, Gravel, and pieces of Asphalt, brown and greyish brown, moist, very dense (SP-SM) [A-1-a] [FILL]	WLD							
	4	4	7			4	SS					
				SAND, with Silt, fine grain, brown, moist, medium dense (SP-SM) [A-1-b] [OUTWASH]								
	4	8										
	11	14	19	SILTY SAND, brown, water bearing, loose to medium dense (SM) [A-4] [OUTWASH]		5	SS					
11												
				End of Boring at 11'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	615.5'	**Scale:** 1" = 4'	**Boring No:** 6-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
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P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 8 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Lab Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
16.5"	26	50/8"	50/8"	4 1/2" ASPHALT PAVEMENT 8" CONCRETE PAVEMENT 4" GRAVEL BASE COURSE		1A 1B	SS SS					
2½		19		FILL, mostly Silty Sand, with a little Gravel, and traces of Organics, brown with greyish brown and black, frozen to moist, dense (SM) [A-4]								
	14	9	23	[FILL]		2	SS					
4	3	3		SAND, with Silt, fine grain, brown, moist, dense (SP-SM) [A-3]								
	4	6	7	[OUTWASH]		3	SS					
	4	4		SILTY SAND, brown, moist to water bearing, loose to medium dense (SM) [A-2-4]	WLD							
	4		8			4	SS					
		3		[OUTWASH]								
	4	9	13			5	SS					
10				End of Boring at 10'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	612.3'	**Scale:** 1" = 4'	**Boring No:** 7-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
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Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
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Water Level Symbol:
WLD = Water Level During Drilling
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WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 8 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4" ASPHALT PAVEMENT 9" CONCRETE PAVEMENT								
18"	12	20		5" GRAVEL BASE COURSE		1A	SS					
	12	12	32	FILL, mostly Silty Sand, with Gravel and some Organics, frozen to moist, very dense to loose (SM) [A-4]		1B	SS					
	5	3	8			2	SS					
4				[FILL]								
	5	5										
	6	7	11	FILL, mostly Sand, with Silt and pieces of Lean Clay, fine grain, brown and reddish brown, moist, medium dense (SP-SM) [A-1-b]		3	SS					
6					WLD							
	5	5		[FILL]								
	6		11	SILTY SAND, brown, water bearing, medium dense (SM) [A-4]		4	SS					
		5										
				[OUTWASH]								
	6	6	12			5	SS					
10				End of Boring at 10'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	609.6'	**Scale:** 1" = 4'	**Boring No:** 8-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
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3T = 3" Shelby Tube
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Water Level Symbol:
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WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 3/6/07 Completed: 3/6/07 Driller: JL/CH Method: 3 1/4" HSA 0' to 11' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4" ASPHALT PAVEMENT 4" GRAVEL BASE COURSE								
18"	5	7		10" CONCRETE BASE COURSE		1A	SS					
	11	5	18	FILL, mostly Silty Sand, dark brown to brown, moist, medium dense (SM) [A-2-4]		1B	SS					
	6	5	11	[FILL]		2	SS					
4												
	4	8		SAND, with Silt, fine grain, brown, moist, medium dense (SP-SM) [A-1-b]								
	8	8	16	[POSSIBLE FILL]		3	SS					
6												
	4	6		SILTY SAND, brown to greyish brown, moist to water bearing, medium dense to loose (SM) [A-4]	WLD							
	7		13			4	SS					
		3		[OUTWASH]								
	3	6	9		WLA	5	SS					
	3	5										
$12\frac{1}{2}$	6		11			6	SS					
				End of Boring at 12.5'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	608.5'	**Scale:** 1" = 4'	**Boring No:** 9-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 11' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Lab Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4" ASPHALT PAVEMENT 8 1/2" CONCRETE PAVEMENT								
16.5"	20	50/11"	50/11"	4" GRAVEL BASE COURSE		1A 1B	SS SS					
2½		16		FILL, mostly Silty Sand, brown, frozen (SM) [A-2-4]								
	14	11	25	[FILL]		2	SS					
4	6	7		SAND, with Silt, fine grain, brown, moist, dense (SP-SM) [A-1-b]								
	7	6	14	[OUTWASH]		3	SS					
	2	6		SILTY SAND, brown, moist to water bearing, medium dense to loose (SM) [A-4]								
	3		9	[OUTWASH]	WLD	4	SS					
8		3		SAND, medium to fine grain, brown, water bearing, medium dense (SP) [A-1-b]								
	11	4	15	[OUTWASH]		5	SS					
10½				SILTY SAND, with Gravel, greyish brown , water bearing, very dense (SM) [A-4]								
	11	16		[GLACIAL TILL]								
12½	24		40	End of Boring at 12.5'		6	SS					

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	610.8'	**Scale:** 1" = 4'	**Boring No:** 10-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 12.5' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4" ASPHALT PAVEMENT 8 1/2" CONCRETE PAVEMENT								
16.5"	16	11		4" GRAVEL BASE COURSE		1A	SS					
	12	7	23	FILL, mostly Silty Sand, brown, frozen to moist, dense to medium dense (SM) [A-4]		1B	SS					
	7	7	14	[FILL]		2	SS					
4	6	5		SILTY SAND, with Gravel, grey, moist to water bearing, medium dense to extremely dense (SM) [A-4]	WLD							
	5	8	10			3	SS					
	5	7		[GLACIAL TILL]								
	11		18			4	SS					
		17										
	50/7"		50/7"			5	SS					
	50/1"		50/1"			6	SS					
12.5				Auger Refusal at 12.5' End of Boring at 12.5'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	609.9'	**Scale:** 1" = 4'	**Boring No:** 11-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 7.5' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Lab Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				4 1/2" ASPHALT PAVEMENT 4 1/2" GRAVEL BASE COURSE	No WLD No WLA							
18"	26	19		9" CONCRETE PAVEMENT								
2½	13	11	32	FILL, mostly Silty Sand, with Gravel, brown, frozen (SM) [A-2-4]		1	SS					
	12	8	20	[FILL]		2	SS					
	8	10		SANDY SILT, with Gravel and Cobbles, brown, moist, stiff to hard (ML) [A-4]								
	13	17	23	[GLACIAL TILL]		3	SS					
	24	50/1"	50/1"			4	SS					
7.5				Auger Refusal at 7.5' End of Boring at 7.5'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	609.9'	**Scale:** 1" = 4'	**Boring No:** 11A-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 2/28/07 Completed: 2/28/07 Driller: JL/JG Method: 3 1/4" HSA 0' to 13 1/2' (AH)

Depth (ft)	Blow Counts 0/6	Blow Counts 6/12	Blow Counts Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				Blind Drilled.	No WLD No WLA							
7½				SANDY SILT, with Gravel, reddish brown, moist, hard (ML) [A-4]								
	50/9"		50/9"	[GLACIAL TILL]		1	SS					
	18	50/8"	50/8"			2	SS					
	50/1"		50/1"			3	NSR					
15				End of Boring at 15'								
				NOTE: Boring was offset 5'E of Boring 11-07.								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	607.9'	**Scale:** 1" = 4'	**Boring No:** 12-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 3/5/07 Completed: 3/5/07 Driller: JL/CH Method: 3 1/4" HSA 0' to 15' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				3" ASPHALT PAVEMENT 9" CONCRETE PAVEMENT	No WLD No WLA							
16"	5	12		4" GRAVEL BASE COURSE		1A	SS					
	14	7	26	FILL, mostly Silty Sand, brown, moist, dense (SM) [A-2-4]		1B	SS					
	10	12	22	[FILL]		2	SS					
4	17	11		SAND, with Silt, fine grain, brown, moist, dense (SP-SM) [A-1-b]								
	14	15	25	[OUTWASH]		3	SS					
6	7	7		SILTY SAND, with a little Gravel, light greyish brown, moist, medium dense to extremely dense (SM) [A-4]								
	8		15			4	SS					
		5										
	10	20	30	[GLACIAL TILL]		5	SS	19				P200 =38%
		10										
	11	22	33			6	SS					
	8	50/8"	50/8"			7	SS					
17				End of Boring at 17'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	608.2'	**Scale:** 1" = 4'	**Boring No:** 13-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 3/6/07 Completed: 3/6/07 Driller: JL/CH Method: 3 1/4" HSA 0' to 16 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Lab Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				3" ASPHALT PAVEMENT 10" CONCRETE PAVEMENT	No WLD No WLA							
17"	6	8		4" GRAVEL BASE COURSE		1A	SS					
2½	10	10	18	FILL, mostly Silty Sand, with Gravel, brown, moist, medium dense (SM) [A-2-4]		1B	SS					
	16	14	30	[FILL]		2	SS					
4	10	50/4"	50/4"	FILL, mostly Silty Sand, with Gravel, grey, moist, very dense (SM) [A-2-4] [FILL]		3	SS					
	16	50/7"	50/7"	SILTY SAND, with Gravel, brown, moist, extremely dense (SM) [A-4]		4	SS	9				P200 =36%
		17		[GLACIAL TILL]								
	50/8"		50/8"			5	SS					
	50/10"		50/10"			6	NSR					
		29										
	50/6"		50/6"			7	SS					
18				End of Boring at 18'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	609.0'	**Scale:** 1" = 4'	**Boring No:** 14-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 3/7/07 Completed: 3/7/07 Driller: JL/CH Method: 3 1/4" HSA 0' to 16 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Laboratory Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				3" ASPHALT PAVEMENT 9" CONCRETE PAVEMENT	No WLD No WLA							
16"	6	35		4" GRAVEL BASE COURSE		1A	SS					
	20	7	55	SILTY SAND, with Gravel and Cobbles, dark brown with greyish brown, frozen to moist, dense (SM) [A-2-4]		1B	SS					
	18	11	29			2	SS					
	7	11		[GLACIAL TILL]								
	13	13	24			3	SS					
6	7	14		SILTY SAND, with Gravel and Cobbles, brown and greyish brown, moist, very dense to extremely dense (SM) [A-4]								
	25		39			4	SS					
		17		[GLACIAL TILL]								
	50/8"		50/8"			5	SS					
		14										
	50/7"		50/7"			6	SS					
		17										
	50/8"		50/8"			7	SS					
18				End of Boring at 18'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	610.4'	**Scale:** 1" = 4'	**Boring No:** 15-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 3/6/07 Completed: 3/6/07 Driller: JL/CH Method: 3 1/4" HSA 0' to 17 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Lab Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				3" ASPHALT PAVEMENT 9" CONCRETE PAVEMENT	No WLD No WLA							
16"	5	7		4" GRAVEL BASE COURSE		1A	SS					
	10	3	17	FILL, mostly Sand, with Silt, a little Gravel, and pieces of Asphalt, brown, moist, medium dense to loose (SP-SM) [A-1-b]		1B	SS					
	5	6	11			2	SS					
	6	3		[FILL]								
	3	3	6			3	SS					
6	23	50/9"	50/9"	SILTY SAND, with Gravel and possible Cobbles, brown, moist, extremely dense (SM) [A-4]		4	SS					
		9		[GLACIAL TILL]								
	50/4"		50/4"			5	SS					
		19										
	50/3"		50/3"			6	SS					
17		35		SANDY SILT, with Gravel, greyish brown, moist, hard (ML) [A-4]								
	50/4"		50/4"	[GLACIAL TILL]		7	SS					
19				End of Boring at 19'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	610.4'	**Scale:** 1" = 4'	**Boring No:** 16-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 3/7/07 Completed: 3/7/07 Driller: JL/CH Method: 3 1/4" HSA 0' to 17 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Lab Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
15"	7	14		3" ASPHALT PAVEMENT 9" CONCRETE PAVEMENT 3" GRAVEL BASE COURSE		1A	SS					
2	10	3	24	FILL, mostly Silty Sand, brown, moist, dense (SM) [A-2-4]		1B	SS					
	6	6	12	[FILL]		2	SS	6				P200 =12%
	3	3		Fill, mostly Sand with Silt, Gravel and traces of Organics, medium grain, dark brown, moist to water bearing, dense to loose (SP-SM) [A-1-b]								
	5	7	8	[FILL]		3	SS					
6	7	12		SAND, with Silt and Gravel, medium to fine grain, brown, water bearing, dense (SP-SM) [A-1-a]	WLD							
	17		29			4	SS					
8		7		[GLACIAL TILL]								
	9	8	17	SILT, brown, wet, rather stiff to very stiff (ML) [A-4]		5	SS					
				[GLACIAL TILL]								
					WLA							
		7										
	8	24	32			6	SS	22				P200 =90%
16				SANDY SILT, with Gravel, brown, wet, very stiff (ML) [A-4]								
				[GLACIAL TILL]								
		15										
	15	20	35			7	SS					
20				End of Boring at 20'								

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TEST BORING LOG

Project:	PROPOSED HALL AVENUE STREET PROJECT		
Location:	MARINETTE, WISCONSIN		
RVT File No:	G07-110		**Page:** 1 of 1
Surface Elev:	609.0'	**Scale:** 1" = 4'	**Boring No:** 17-07

GENERAL NOTES

Drilling Method:
HSA = Hollow Stem Auger
FA = Flight Auger
DM = Drilling Mud
_X = AX, BX, or NX Coring

Sampling Method:
SS = Split Spoon
3T = 3" Shelby Tube
F = Flight Auger Sample
B = Bag Sample
P = Test Pit Sample
CR = Core Recovery
NSR = No Sample Recovery
MH = Manual SPT Hammer
AH = Auto SPT Hammer

Water Level Symbol:
WLD = Water Level During Drilling
WLA = Water Level After Drilling
WL = Water Level At 24 Hours
WL__ = Water Level At __ Hours

Laboratory Test Symbols:
LL/PL = Liquid Limit/Plastic Limit
P200 = Percent Passing #200 Sieve
MA* = Mechanical Analysis
Qu = Unconfined Compressive Str
Pq = Hand Penetrometer Reading
DD = Dry Density
W = Moisture Content (by Weight)
RQD = Rock Quality Designation
* = See attached graph

DRILLING NOTES

Started: 3/7/07 Completed: 3/7/07 Driller: JL/CH Method: 3 1/4" HSA 0' to 17 1/2' (AH)

Depth (ft)	Blow Counts 0/6	6/12	Total (N)	Field Classification and Remarks Note: [ ] Indicates Possible Geologic Origin	Water Level Information	Sample No.	Sample Type	Lab Tests W (%)	DD (pcf)	LL PL	Qu (psf)	Other
				3" ASPHALT PAVEMENT 3" CONCRETE PAVEMENT								
16"	7	9		10" GRAVEL BASE COURSE		1A	SS					
	9	7	18	SAND, fine grain, brown, moist to water bearing, medium dense to loose (SP) [A-3]		1B	SS					
	7	8	15	[OUTWASH]		2	SS					
	7	9										
	11	12	20			3	SS					
	7	7										
	10		17			4	SS					
		5			WLD							
	5	6	11			5	SS					
		6			WLA							
	3	6	9			6	SS					
17				SILT, dark brown, wet, medium (ML) [A-4]								
		1		[GLACIAL TILL]								
20	2	3	5			7	SS					
				End of Boring at 20'								

Engineering Resources, Testing Solutions

REPORT OF MECHANICAL ANALYSIS OF SOIL

2193 Starr Court
Green Bay, WI 54303
ph 920-497-9395
fax 920-497-9396
www.rvtcorp.com

Project: **PROPOSED HALL AVENUE STREET PROJECT**
PROJECT NO. 2007-10
MARINETTE, WISCONSIN

Copies:

Client: Mr. Brian Miller
City of Marinette
Engineering Department
1905 Hall Avenue
Marinette, WI 54143-0135

Date: March 15, 2007

RVT File No: G07-110

GENERAL:

Scope of Work: Perform a Mechanical Analysis test on the obtained sample.

Date of Test: 3/8/07
Sampled By: JL/LR

Lab Technician: H Koch
Date Submitted: 2/27/07

RESULTS:

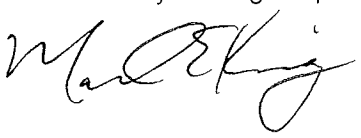
Test Method: ASTM C117 & C136

Boring Number: Sample Number: Sample Depth:	2-07 2 2½' – 4'						
Sample Description:	SP-SM [A-3]						
Sieve Size	% Passing						
#10	100						
#40	90						
#100	18						
#200	6.3						

REMARKS:

A portion of the samples will be held for 30 days after the date of the Geotechnical Exploration Report and then will be discarded unless we are notified to ship them to a given address.

Respectfully Submitted,
River Valley Testing Corp.



UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM: D2487-90

	Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]			Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils: More than 50% retained on #200 sieve	Gravels: More than 50% of coarse fraction retained on #4 sieve	Clean Gravels with less than 5% fines[C]	Cu >= 4 and 1 <= Cc <= 3[E]	GW	Well-graded gravel[F]
			Cu < 4 and/or 1 > Cc > 3[E]	GP	Poorly graded gravel[F]
		Gravels with more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands: 50% or more of coarse fraction passes #4 sieve	Clean Sands with less than 5% fines[D]	Cu >= 6 and 1 <= Cc <= 3[E]	SW	Well-graded sand[I]
			Cu < 6 and/or 1 > Cc > 3[E]	SP	Poorly graded sand[I]
		Sands with more than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,J]
			Fines classify as CL or CH	SC	Clayey sand[G,H,J]
Fine-Grained Soils: 50% or more passes the #200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		Organic[R]	Liquid limit (oven dried) / Liquid limit (not dried) < 0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	Inorganic	PI > 7 and plots on or above "A" line	CH	Fat clay[K,L,M]
			PI < 4 or plots below "A" line	MH	Elastic Silt[K,L,M]
		Organic[R]	Liquid limit (oven dried) / Liquid limit (not dried) < 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soils[S]	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3" (75mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM, well-graded gravel with silt
GW-GC, well-graded gravel with clay
GP-GM, poorly graded gravel with silt
GP-GC, poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM, well-graded sand with silt
SW-SC, well-graded sand with clay
SP-SM, poorly graded sand with silt
SP-SC, poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains >= 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains >= 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty sand.

[K] If soil contains 15 to 29% plus #200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains >= 30% plus #200, predominantly sand, add "sandy" to group name.

[M] If soil contains >= 30% plus #200, predominantly gravel, add "gravelly" to group name.

[N] PI >= 4 and plots on or above "A" line.

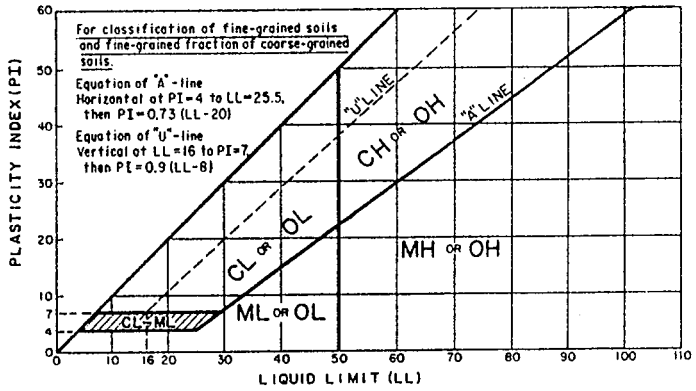
[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

[R] Organic Content > 5% and < = 30%.

[S] Organic Content > 30%.



ADDITIONAL DESCRIPTIVE TERMINOLOGY

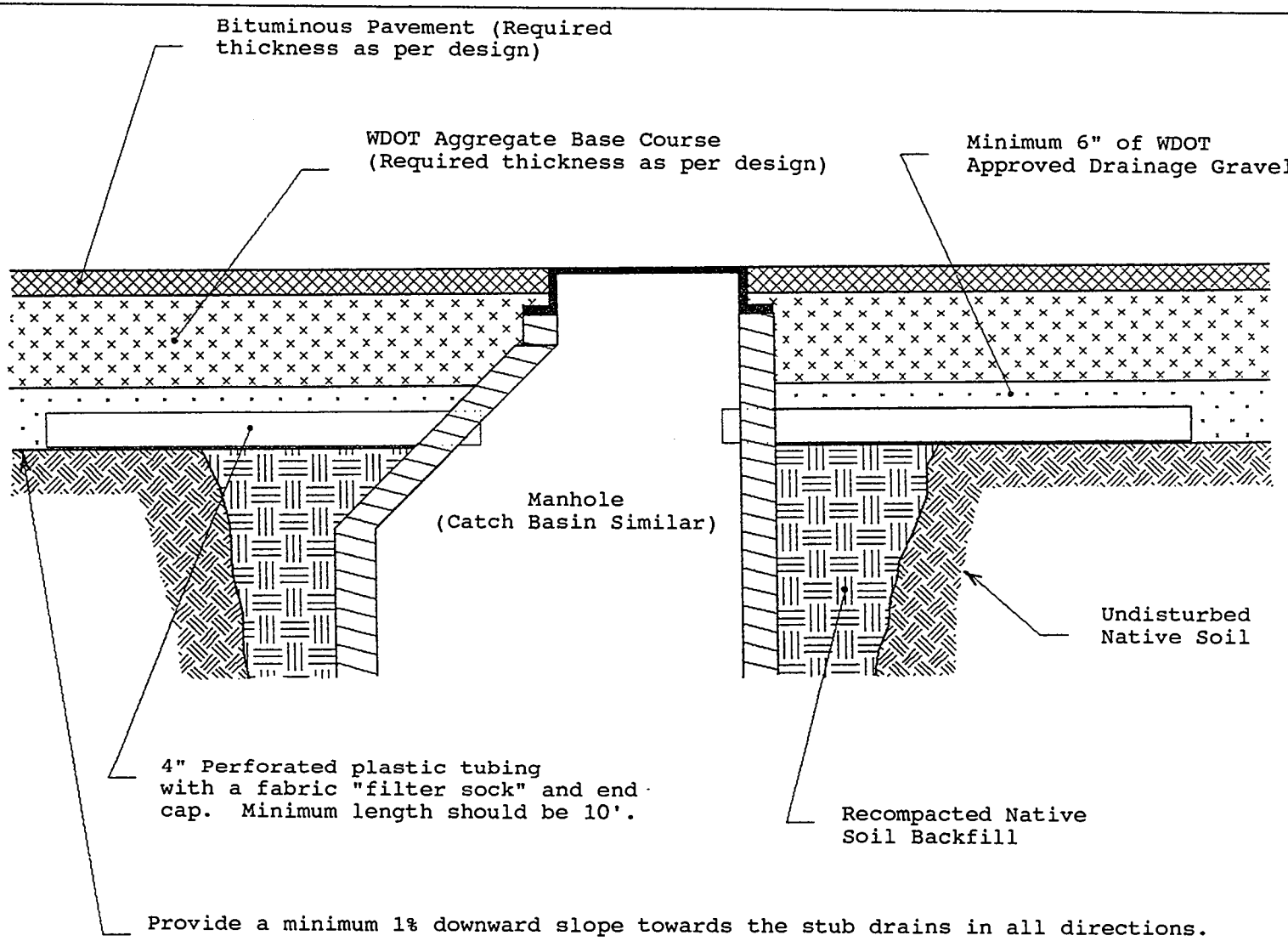
Soil Type	Size Range
Boulder	> 12"
Cobble	12" - 3"
Gravel	3" - #4*
Sand:	
Coarse	#4 - #10
Medium	#10 - #40
Fine	#40 - #200
Silt & Clay	< #200, based on plasticity

*U.S. Standard Sieve Sizes

Relative Gravel Contents	
Descriptive Term	Gravel Content
Sand:	
A Little Gravel	5 - 14%
With Gravel	15 - 49%
Silt & Clay:	
A Little Gravel	5 - 14%
With Gravel	15 - 29%
Gravelly	30 - 49%

Consistency (Clay)	"N" Blows/Ft	Relative Density (Sand)
Soft	0 - 4	Very Loose
Medium	5 - 9	Loose
Rather Stiff	10 - 19	Medium Dense
Stiff	20 - 29	Dense
Very Stiff	30 - 49	Very Dense
Hard	50+	Extremely Dense

Other Descriptive Terms	
Lamination	Stratum up to 1/16" thick
Seam	Stratum 1/16" to 1/2" thick
Layer	Stratum from 1/2" to 6" thick
Lens	Discontinuous stratum or pocket from 1/2" to 6" thick
Varved	Alternating laminations or seams of clay, silt and/or fine grained sand; or alternating colors
Mottled	Mixture of clay, silt and/or fine sand exhibiting no layering; or mixture of colors exhibiting no layering
Moist	Below saturation
Wet	Saturated relatively impervious soils
Waterbearing	Saturated Pervious soils



Note: Two stub drains should be placed at each manhole or catch basin. The stub drains should be placed parallel to the roadway to minimize the potential for "frost bumps" which may occur because of differing depths of fill material. In addition, please note that this sketch is intended as a typical detail only and certain construction considerations may limit its duplication in the field. However, an approximation of these conditions should minimize excessive build-up of water in the area of the manholes and catch basins.

Sketch of Typical Stub Drain Detail		
Drawn By: A Barker	File No:	Date:

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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