GEOTECHNICAL EVALUATION
PROJECT NO. STP-019-6( )
DES. NOS. 8665870, 996587A, 996587B, 996587C & 996587M
US 41 (CALUMET AVENUE) FROM I-80/I-94 TO US 12/20
LAKE COUNTY, INDIANA

Prepared for

INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS & TESTS
120 S. SHORTRIDGE ROAD
INDIANAPOLIS, INDIANA 46219-0389

By

EARTH EXPLORATION, INC.
7770 WEST NEW YORK STREET
INDIANAPOLIS, INDIANA 46214-2988

July 5, 2001

EARTH EXPLORATION INC.

Dalal

Indiana Department of Transportation

Materials and Tests Division
120 South Shortridge Road P.O. Box 19389
Indianapolis, Indiana 46219-0389
Phone: (317) 232-5280 Fax: (317) 356-9351

cc: Errol
Keith

REPORT IN FILE:
1990551-2-32
RQAW CORPORATION Dalal 8-7-01.
JUL 11 2001

July 9, 2001

Mr. Phelps Klika
Chief, Design Division
Room N-642, IGCN

Attention: Ms. Peggy Spears

Subject: Des. No.: 8665870, 996587A, 9965587B, 996587C & 996587M
Project No.: STP-019-6 ( )
Structure No.: None
On U. S. 41 From I-80 / I-94 to U. S. 12 / 20
County – Lake
District: LaPorte

Gentlemen:

The Geotechnical Investigation for the subject project has been completed and copies of the geotechnical report are transmitted herewith.

If you have any questions, please feel free to contact us.

Very truly yours,

Athar Khan, P. E.
Chief Geotechnical Engineer

Reza Asadi.

Steve Morris, P.E. /FOR
Geotechnical Engineering Group Leader

RA
cc: RQAW, Inc – Attn.: Mr. R. Duncan - Attachment
Mr. T. Seeman - Attn.: Mr. F. Abbasi - Attachment
Mr. W. Proud - Attn: Mr. M. Monahan – Attachment (2)
Mr. D. Cohen- Attachment
Mr. N. Zia- - Attachment
Mr. K. Dave - Attachment
Mr. J. Schneider - Attachment
File
Attachment
(RA2000)

Imtiyaz Dalal

THIS APPLIES TO ALL FIVE SECTIONS OF US 41 PROJECTS.

CC: ERRL
ERICKA
FILE: 199-055.1|2|32
Dalal
6-28-05

From: Richard Olson [rolson@earthengr.com]
Sent: Tuesday, June 28, 2005 9:22 AM
To: rasadi@indot.state.in.us
Cc: Imtiyaz Dalal
Subject: US 41 from I-80/94 to US 12/20, Lake County

Reza,

Based on a telephone conversation with you, we understand that the INDOT pavement section is requiring pavement drains for the referenced project. It is our opinion that if pavement drains are used, a geotextile fabric surrounding the drainage medium will not be necessary.

If you have any questions related to this information, please contact me at your convenience.

Thanks,

Rick Olson

Earth Exploration, Inc.
7770 West New York St.
Indianapolis, IN 46214
Phone 317-273-1690
Fax 317-273-2250
rolson@earthengr.com

FAX

INDIANA DEPARTMENT OF TRANSPORTATION
MATERIALS AND TESTS DIVISION
120 SOUTH SHORTRIDGE ROAD
INDIANAPOLIS, INDIANA 46219
TELEPHONE: 317-610-7251 X 258
FAX: 317-356-9351

NUMBER OF PAGES TO FOLLOW: 3

DATE: March 1, 04

TO: Jason Heile (CONTACT NAME)
RQAU (COMPANY NAME)
255-8354 (DEPT. / EXT.)

FROM: J. PATIL (CONTACT NAME)
INDOT (COMPANY NAME)
MAT (610-7251 x 258 (DEPT. / EXT.)

EARTH EXPLORATION, Inc.
7770 West New York Street
Indianapolis, IN 46214-2988
(317)273-1690
(317)273-2250 (FAX)

FACSIMILE TRANSMISSION

Sheet 1 of 3

Fax No.: 356-9351

Date: February 25, 2004

To: Nayyar Zia

Company: Indiana Department of Transportation

From: Rick Olson

Project/Subject: Subgrade Improvement Recommendations
US 41 in Lake County

Remarks:

Please call if you have any questions.

Jason Haile
255-8354

Please call 317-273-1690 if any sheets are missing or copies are illegible.

EARTH EXPLORATION INC

7770 West New York Street
Indianapolis, IN 46214-2988
317-273-1690 (FAX) 317-273-2250

4310-C Technology Drive
South Bend, IN 46628
574-233-8820 (FAX) 574-233-8242

February 25, 2004

Mr. Nayyar Zia, P.E.
Indiana Department of Transportation
Division of Materials & Tests
120 South Shortridge Road
Indianapolis, IN 46219-0389

Re: Subgrade Improvement
US 41 from I-80/94 to US 12/20
Project No. STP-019-6( )
Lake County, Indiana
EEI Project No. 1-6437

Dear Mr. Zia:

This letter is in response to your recent inquiry into recommendations for subgrade improvement made in our geotechnical report for the referenced project dated July 5, 2001. During our exploratory services, we encountered existing fill containing rubble and soils containing a relatively high organic content. In our opinion, these conditions may be detrimental to the longevity of the proposed pavement. Therefore, we recommended that consideration be given to removing these materials to a depth of at least 0.6 m and replacement with compacted engineered fill. However, the final decision of removal or other treatment should be made at the time of construction, after these conditions are exposed.

Having said this, we also understand that from a contractual standpoint, it would be helpful to have approximate quantities for the contractor to include in the bid. Therefore, in the following table we have provided approximate limits of removal and/or other treatment for this purpose. These limits should be used a guideline only and should not be considered as a substitute for field decisions. In addition, the recommendations could vary based on final subgrade elevations.

Test Boring Designation	Subgrade Condition	Approximate Limits[1]	Recommended Treatment
RB-7	Sandy Loam with concrete and cinder fragments	4+520 to 4+680	Removal to Elev. 182.1
RB-22 & 23	Sandy Loam with brick, concrete and cinders	9+800 to 10+070	Removal to Elev. 177.8
RB-32	Sandy Loam with concrete and organic matter underlain by silty loam with some organic matter	12+730 to 13+170	Removal to Elev. 177.2 and replace with geogrid and at least 0.3 m of crushed stone
RB-37 & 38	Sand with organic silty loam seam and some organic matter	13+700 to 13+960	Removal to Elev. 177.3 and replace with geogrid and at least 0.3 m of crushed stone[2]
RB-43 & 44	Sandy Loam with concrete and brick fragments	14+555 to 14+860	Removal to Elev. 177.4

Mr. Nayyar Zia, P.E.
Indiana Department of Transportation
Division of Materials & Tests

Test Boring Designation	Subgrade Condition	Approximate Limits[1]	Recommended Treatment
RB-46	Sandy Loam with little organic matter	15+020 to 15+330	Removal to Elev. 177.3 and replace with geogrid and at least 0.3 m of crushed stone
RB-50	Sandy Loam with little organic matter	15+650 to 15+790	Removal to Elev. 177.4
RB-53 & 54	Sandy Loam with wood, steel and glass fragments	16+080 to 16+300	Removal to Elev. 177.5

[1] Based on mid-way point to adjacent boring or limits of sections.
[2] Dewatering will be required at this location.

If you have any questions about this information, please contact us at your convenience.

Sincerely,

EARTH EXPLORATION, INC.

Richard D. Olson, P.E.
Principal Engineer

EARTH EXPLORATION INC.

7770 West New York Street
Indianapolis, IN 46214-2988
317-273-1690
317-273-2250 (FAX)

July 5, 2001

Mr. Athar Khan, P.E.
Indiana Department of Transportation
Division of Materials & Tests
120 S. Shortridge Road
Indianapolis, IN 46219-0389

Re: Geotechnical Evaluation
Project No. STP-019-6( )
Des. Nos. 8665870, 996587A,
996587B, 996587C & 996587M
U.S. 41 from I-80/I-94 to U.S. 12/20
Lake County, Indiana
EEI Project No. 1-6437

Dear Mr. Khan:

We are pleased to submit our geotechnical evaluation for the above-referenced project. This final report presents the results of our subsurface exploratory program and provides geotechnical recommendations for the proposed roadway and drainage improvements. A draft copy of this evaluation was sent to your office for review and comment on June 18, 2001. We have incorporated your comments into the report, as appropriate.

We appreciate the opportunity to provide our services to you on this project. Please contact our office if you have any questions or need further assistance with the project.

Sincerely,

EARTH EXPLORATION, INC.

Richard D. Olson, P.E.
Principal Engineer

RICHARD D. OLSON REGISTERED No. 880631 STATE OF INDIANA PROFESSIONAL ENGINEER

Scott J. Ludlow/jmg

Scott J. Ludlow, Ph.D., P.E.
Principal Engineer

SCOTT J. LUDLOW REGISTERED No. 910185 STATE OF INDIANA PROFESSIONAL ENGINEER

TABLE OF CONTENTS

LIST OF APPENDICES

SUMMARY OF RECOMMENDATIONS[1]

PROJECT NO. STP-019-6( )
DES. NOS. 8665870, 996587A,
996587B, 996587C & 996587M
US 41 FROM I-80/I-94 TO US 12/20
LAKE COUNTY, INDIANA
EEI PROJECT NO. 1-6437

Earthwork

In areas to be reconstructed or widened, all topsoil, highly organic soils, rubble fill and existing pavement components should be removed from within the construction limits. Although organic matter was observed only at isolated locations, careful observation of these conditions should be made during the sewer installation and subgrade preparation activities. We recommend that soils containing an abundance of organic matter (i.e., in excess of 8 percent) or rubble be removed to a depth of at least 0.6 m below the pavement subgrade and replaced with compacted engineered fill. This may be necessary in the vicinity of test borings RB-7, 22, 23, 32, 37, 38, 43, 44, 46, 50, 53 and 54. At several of these locations only traces of rubble were encountered and, therefore removal may not be required. In addition, at some locations, conditions may be more severe and more than 0.6 m of removal would be recommended. The final decision regarding removal should be made by an EEI representative after rough grades are established.

The soils encountered at the boring locations (particularly within the depth of influence for the pavement section) consisted exclusively of granular soils. Consequently, following the removal activities, we recommend that these soils (where deemed suitable) be thoroughly compacted with a heavy vibratory compactor with a minimum static weight of 90 kN. Given the urban setting, consideration should also be given to the effect of vibrations from compaction during construction, especially in those areas where structures are located within 10 m of earthwork activities.

Embankment Construction

Assuming the subgrade is adequately prepared, the existing soils conditions should be generally adequate to support the proposed embankments having slopes of 3H:1V or flatter as currently proposed. However, one area of concern is within Section 4 where the embankments extend into the adjacent lakes and canals. Several hand auger soundings were performed at these locations to determine the sediment thickness. Based on these soundings, it appears that the sediment thickness varies from approximately 0.1 to as much as 2.2 m and averages about 0.6 m. Based on the thickness of the sediment, where embankments extend into the water, we recommend that the sediment be dredged to at least 1 m beyond the limits of the toe of slope. In this case, since the fill will be placed below the water table, we recommend that No 2 crushed stone be used for the fill to a height of at least 0.3 m above the water level. A geotextile fabric should be used above the No. 2 stone to avoid migration of fine-grained soils into the open-graded aggregate.

In addition, along a section of the lake from approximately Station 11+557 to 11+619, an old timber retaining wall was observed. At this location, the water was approximately 1.6 m deep and the sediment at this location extended to approximately 1.1 to 2.2 m below the lake bottom. Due to the unknown condition of the wall, we recommend that an aggregate berm, like that described above, be constructed on the outside of the wall to avoid future distress to the roadway. To reduce the limits of the removal and replacement, we recommend that consideration be given to providing a 2H:1V slope on the berm.

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[1]The purpose of this summary is to provide an abbreviated discussion of our recommendations contained in the attached evaluation. In our opinion, the recommendations in this summary are the "most significant" geotechnical issues affecting the proposed construction. For additional discussion and recommendations, our geotechnical report should be consulted and/or Earth Exploration, Inc. should be contacted.

Cut Sections

Throughout the majority of the cut sections, adequate subgrade preparation, as described above, should be adequate to support the proposed pavement. However, at several locations (i.e., RB-4, 5, 6, 7, 8, 33, 40 and 43) groundwater was encountered within 0.6 m of the final subgrade and at Boring RB-41 was above the final subgrade. At these locations, dewatering of the area may be required to achieve a stable subgrade. Consideration may also be given to raising the grade in these areas (if feasible) to avoid the condition.

Pavement Design Considerations

The pavement subgrades are generally anticipated to consist of very loose to medium dense granular soils or engineered fill, i.e., used to raise the existing grades, similar to the naturally-occurring granular soils. Due to the granular nature of these soils, a California Bearing Ratio (CBR) test was not performed. However, based on the soil conditions encountered, we recommend that the existing soils be undercut to a depth of at least 300 mm below the pavement section, the resulting subgrade be densified via vibratory compaction and the soils be replaced with No. 53 crushed stone compacted in accordance with the ISS. As an alternative, consideration may be given to chemical modification (e.g., cement stabilization) of the subgrade soils to a depth of 300 mm. Based on these procedures, we recommend using a CBR value of 4 for the pavement design. It should also be noted that a relatively high groundwater table was noted at several of the test boring locations. This condition should be taken into account in the pavement design. In addition, due to the anticipated granular nature of these soils, it is our opinion that subsurface drains will generally not be necessary.

Within the section that is planned for an overlay, a relatively significant crack was observed on the west side of the pavement from just south of 12+600 to just north of Station 12+900. Therefore, we recommend that consideration be given to some full-depth replacement be performed in this area and any other areas where distress is observed prior to placing the overlay. During the full-depth replacement, consideration should be given to addressing the underlying subgrade condition so that future distress is minimized. In addition, some form of reinforcement should be considered above cracks to minimize reflective cracking.

Storm Sewers

From our understanding, the invert depths for the pipes and structures are anticipated to range from about 1 to 7½ m below the existing ground surface. Based on the information obtained at the test boring locations and the anticipated depth of the sewers, it appears that the pipes will be established in soft to stiff cohesive soils in Section 1 south of Station 4+800. In the remainder of this section, Section 3 and south of Station 13+600 in Section 4, very loose to medium dense granular soils are anticipated. North of this area to the end of the project, medium dense granular soils are generally anticipated to be encountered at the invert elevation. Where soft soils are encountered at the base of the trench, they should be removed and replaced with compacted granular fill to achieve a stable base. If this is not feasible due to the depth of the soft soils, the use of a large-size crushed aggregate may be required to stabilize the subgrade. Where very loose and loose granular soils are encountered, the soil will require compaction with a vibratory compactor. In addition, the sewer will be established up to 4 m below the water level observed at the majority of the test boring locations. Consequently, the contractor should plan an appropriate dewatering scheme prior to commencing any excavation activities. Where cohesive-type soils are encountered at the invert depths, we recommend that a minimum 150-mm thick bedding layer, consisting of granular soils be provided for pipe support. Where granular soils are encountered, a separate bedding layer may not be needed if stability of the subgrade soils is achieved. Since the pipe alignment of the sewer is primarily located within the roadway, the trenches should be backfilled to grade with granular soils. Based on our observations, the granular soils (i.e., with fewer fines such as the sand) are typically suitable for re-use as backfill. Although the sandy loam soils should perform adequately, additional compactive effort will likely be required.

GEOTECHNICAL EVALUATION
PROJECT NO. STP-019-6( )
DES. NOS. 8665870, 996587A,
996587B, 996587C & 996587M
US 41 (CALUMET AVENUE) FROM I-80/I-94 TO US 12/20
LAKE COUNTY, INDIANA

1. INTRODUCTION

This report presents the results of our subsurface exploratory program for roadway and drainage improvements to be constructed along US 41 (Calumet Avenue) from I-80/I-94 to US 12/20 in Lake County. This report also provides design and construction recommendations related to these improvements from a geotechnical standpoint. The work for this project was formally authorized by the Indiana Department of Transportation, Division of Materials and Tests (INDOT) via a letter dated February 1, 2001, and was performed in accordance with a consultant agreement with INDOT dated September 7, 1999.

The opinions and recommendations submitted herein are based, in part, on the interpretation of the subsurface conditions revealed by the test borings at the locations shown on attached plans. Understandably, this report does not reflect variations in the subsurface conditions between or beyond these locations. Variations in soil conditions can be expected between the boring locations, and fluctuation of groundwater levels may occur with time. The nature and extent of the variations may not become evident until the time of construction. If subsurface variations become apparent at a later date, it may be necessary for EEI to re-evaluate the recommendations of this report. Important information regarding this evaluation is contained in Appendix A.

2. PROJECT DESCRIPTION

We understand that the project is planned to consist of making improvements to US 41 from I-80/I-94 to US 12/20 in Lake County. The improvements are anticipated to include: the removal of the existing four-lane pavement; construction of a five-lane asphaltic concrete pavement with curb and gutter; embankment fills; earth cuts; and drainage improvements via the installation of storm sewers. In addition, a short section near the center of the project is anticipated to be overlayed. Refer to Drawing Nos. 1-6437.B1 and 1-6437.B2 in Appendix C for the project location. The project is planned to be constructed in five sections as follows:

Section No.	Designation No.	Location	Project Limits Line "A"	Total Length, km
1	8665870	175th Street to 165th Street	3+870 - 5+931	2.1
2	996587A	Michigan Street Intersection	8+420 - 8+600	0.2
3	996587B	Hoffman Street to Huehn Street	9+330 - 10+070	0.7
4	996587C	I-90 Toll Road to Sheffield Avenue	11+320 - 14+555	3.3
5	996587M	Sheffield Avenue to US 12/20	14+555 - 16+300	1.8

Based on the limits of each section as described above, the total length of the project is anticipated to be on the order of 8.1 km. Due to the proposed grade changes, maximum cuts and fills along the roadway are anticipated to be on the order of 1 and 1½ m, respectively. Within Section 4 of the project, several bodies of water consisting of lakes and canals are adjacent to the roadway. In these areas, fill is anticipated to be placed within the water area to widen the embankment.

The drainage improvements are planned to consist of a storm sewer system along the majority of the route with the exception of Section 2 and portions of Section 4. The new storm sewer is anticipated to consist of 375- to 1,350-mm diameter pipe established

at depths typically ranging between approximately 1 and 5 m below the existing ground surface, but as deep as 7½ m at the south end of the project. In conjunction with the sewer, several manholes and related structures are proposed. Furthermore, a cut-and-cover method of sewer installation is anticipated to be utilized over the majority of the project. Additionally, we understand that pipe jacking may be utilized at railroad crossings at Stations 9+775 and 9+850, located just south of Goslin Street. In addition, we anticipate that other methods such as directional drilling may be employed at the deep sewer installation at the south end of the project.

Due to the preliminary nature of the design, specific project information such as construction schedule was not available at the time of this report. In the event that the nature, design or location of the proposed construction changes, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions are modified or confirmed in writing by EEI.

3. PURPOSE AND SCOPE OF WORK

The general purpose of this evaluation was to develop geotechnical recommendations to aid in the design and construction of the project. Our scope of services included:

1. Performing test borings, pavement cores and hand auger soundings along the project to observe the subsurface conditions at the respective locations;

2. Evaluating the physical properties of the soils by performing field and laboratory tests;

3. Summarizing the results of the subsurface exploratory program;

4. Analyzing the data from the field and laboratory tests to provide geotechnical recommendations; and

5. Preparing an engineering report containing information on the subsurface conditions and conclusions and recommendations regarding:

   a) Site preparation, including recommendations for improvement of in-situ soils;

   b) Pavement design considerations;

   c) Pipe bedding and installation;

   d) Suitability of existing soils for reuse as embankment and pipe backfill; and

   e) Potential construction problems due to subsurface conditions (e.g., excavations and dewatering).

4. FIELD EXPLORATION AND LABORATORY TESTING

4.1 General

Subsurface conditions for the improvements were explored by performing 57 test borings along the roadway (designated RB-1 through RB-54 and PC-1 through PC-3) to depths ranging between 3 and 9 m below the existing ground surface. In addition to the borings, pavement cores (designated PC-1 through PC-3) and hand auger soundings (designated S-1 through S-28) were performed. A description of the cores and soundings are included in a Summary of Pavement Cores and Summary of Soundings, respectively, in Appendix D. Refer to Drawing Nos. 1-6437.B1 and 1-6437.B2 in Appendix C for the location of the borings and pavement cores. The number, location and depth of the borings were selected by EEI. The test borings were located in the field referencing identifiable features shown on plans provided by INDOT (prepared by RQAW Corporation). In addition, elevations at the boring locations were interpolated from the profiles, cross sections and other topographic information shown on the plans.

The boring locations and elevations should be considered accurate only to the degree implied by the methods used.

4.2 Exploratory Methods and Sample Collection

Exploratory activities were performed by EEI during the period of March 2 through 16, 2001, using hollow stem augers to advance the boreholes. Representative samples of the soil conditions were obtained using Standard Penetration Test (SPT) (AASHTO T 206) procedures. After final water level observations were made, the test borings were backfilled with auger cuttings and a bentonite chip plug near the surface. In addition, a concrete patch was placed at locations where borings were performed in the roadway. Due to the volume of traffic and granular nature of the soils, the borings were backfilled immediately after completion. Additional details of the drilling and sampling procedures are provided in Appendix B.

4.3 Laboratory Testing

Following the exploratory activities, the soil samples were visually classified by an engineering technician and later reviewed by a geotechnical engineer. Representative samples were then selected for index property testing. These tests included: moisture content (AASHTO T 265), grain size analysis (AASHTO T 88); Atterberg limits (AASHTO T 89 and T 90), soil pH and loss-on-ignition (AASHTO T 267). The results of the tests are provided on the boring logs in Appendix D and/or respective summary sheets in Appendix E.

Following the completion of the laboratory testing, final boring logs were then prepared. Soil descriptions on the boring logs are in general accordance with the

AASHTO system [AASHTO designation, e.g., A-6(17)] and the INDOT Standard Specifications (ISS[2]) (textural classification, e.g., clay). The final boring logs represent our interpretation of the individual samples and field logs and results of the laboratory tests. In addition, the stratification lines on the boring logs represent the approximate boundary between soil types; although, the transition may actually be gradual.

5. SITE CONDITIONS

5.1 Surface Conditions

The project area is within an urban setting consisting of commercial buildings, light to heavy industrial and single-family residences. The topography along the project route is generally flat to gently sloping with the greatest relief occurring at the south end of the project due to the ramps over I-80/I-94 and within Section 4 due to lakes and canals adjacent to the roadway. We understand that these lakes and canals are hydraulically connected with Lake Michigan, which is located just north of the project. Furthermore, the existing roadway consists primarily of Portland cement concrete, generally with an asphaltic concrete overlay and appears to be in fair to poor condition.

5.2 Soil Conditions

The soils encountered along the project primarily consisted of granular deposits (i.e., sand) with layers of cohesive soils (clay) observed less frequently, but more typically near the south end of the project. At the borings performed within the roadway, asphaltic concrete was typically encountered to depths of 0.1 to 0.2 m and was underlain by Portland cement concrete to depths of 0.3 to 0.4 m. In many cases, the pavement

[2] References the Indiana Department of Transportation (INDOT) Standard Specifications, 1999 Edition.

was underlain by a crushed stone subbase to a depth of about 0.5 m. In addition, full depth asphaltic or Portland cement concrete was encountered to a depth of about 0.4 and 0.3 m, respectively at some locations, and at one location, topsoil was encountered to a depth of about 0.1 m.

The granular soils encountered below the pavement components primarily consisted of sand and sandy loam to depths ranging between 1 and 4 m (approximately Elevation 181) at Test Borings RB-1 through RB-12 and to the maximum depth explored at the remainder of the borings. At several locations, the granular soils appeared to be fill and in some cases contained organic matter, cinders, brick, concrete, wood, steel or glass. In addition, a petroleum odor was noted at Boring RB-5 to a depth of about 2 m. In general, the relative density of the granular soils was very loose to medium dense with SPT N-values on the order of 3 to 22 blows/0.3 m. Based on loss-on-ignition tests performed on several of the granular soils, organic contents (where encountered) varied from 2 to 24 percent.

The cohesive soils encountered at the south end of the project generally consisted of clay, silty clay, silty loam and silty clay loam. At Boring RB-1 clay loam fill (i.e., as a result of the I-80/I-94 embankment) was encountered from 2 to 5½ m. The consistency of the naturally-occurring cohesive soils was typically medium to very stiff based on N-value criteria established by INDOT. Penetrometer readings of these soils were typically on the order of 100 to 400 kPa and moisture contents generally ranged from 20 to 27 percent.

5.3 Groundwater Conditions

Groundwater level observations made during and shortly after the completion of the borings are noted at the bottom of the logs. From our observations, groundwater was encountered at approximately 1 to 3 m (Elevation 181 to 182) below the existing ground surface in Section 1. Along the remainder of the improvements, groundwater was observed at depths ranging from ½ to 2 m (176 to 178 m). Based on our observations, it appears that the water levels encountered within the granular soils reflect the groundwater level in the area. In addition, the groundwater levels encountered at Sections 2 through 5 are consistent with the level of Lake Michigan (Elevation 176.8). It should be noted that groundwater levels can fluctuate due to changes in precipitation, infiltration, run-off, pumping rates of nearby wells (if any) and other hydrogeological characteristics.

6. DISCUSSION AND RECOMMENDATIONS

In our opinion, the most-significant geotechnical issues affecting the design and construction are: 1) the presence of isolated areas of organic matter and soil fill; and 2) the existence of very loose to loose saturated granular soils at elevations near and above the sewer inverts. Therefore, subgrade preparation for the roadway and sewer installation techniques (i.e., excavation bracing, dewatering and subgrade preparation for sewers) are anticipated to be critical for the project. Recommendations regarding these and other issues related to the construction are discussed in detail in the following paragraphs.

6.1 Earthwork

6.1.1 Site Preparation

In areas to be reconstructed or widened, all topsoil, highly organic soils, rubble fill and existing pavement components should be removed from within the construction limits. Although organic matter was observed only at isolated locations, careful observation of these conditions should be made during the sewer installation and subgrade preparation activities. We recommend that soils containing an abundance of organic matter or rubble be removed to a depth of at least 0.6 m below the pavement subgrade and replaced with compacted engineered fill. This may be necessary in the vicinity of test borings RB-7, 22, 23, 32, 37, 38, 43, 44, 46, 50, 53 and 54. At several of these locations only traces of rubble were encountered and, therefore removal may not be required. In addition, at some locations, conditions may be more severe and more than 0.6 m of removal would be recommended. The final decision regarding removal should be made by an EEI representative after rough grades are established.

The soils encountered at the boring locations (particularly within the depth of influence for the pavement section) consisted exclusively of granular soils. Consequently, following the removal activities, we recommend that these soils (where deemed suitable) be thoroughly compacted with a heavy vibratory compactor with a minimum static weight of 90 kN. Given the urban setting, consideration should also be given to the effect of vibrations from compaction during construction, especially in those areas where structures are located within 10 m of earthwork activities. In these areas, a survey of the structures may be appropriate to evaluate the existing conditions. In addition, if any unsuitable soils are encountered during the densification process, they should be removed and replaced with engineered fill.

6.1.2 Fill Placement and Compaction

Engineered fill for the project should be placed in loose lift thicknesses not exceeding 200 mm and compacted to 95 percent of the maximum density obtained in accordance with AASHTO T-99 and as specified in the ISS. In our opinion, those soils with the exception of topsoil and soils containing a high quantity of organic matter or rubble, are suitable for reuse as engineered fill. We also recommend that EEI be present during any fill placement to perform periodic field density tests to determine the adequacy of compactive effort.

6.2 Embankment Construction

Based on the information provided, embankment fills are anticipated to be on the order of 1½ m (i.e., near the north end of the project). Assuming the subgrade is prepared as discussed above, the existing soils conditions should be generally adequate to support the proposed embankments having slopes of 3H:1V or flatter as currently proposed. However, one area of concern is within Section 4 where the embankments extend into the adjacent lakes and canals. Several hand auger soundings were performed at these locations to determine the sediment thickness. Based on these soundings, it appears that the sediment thickness varies from approximately 0.1 to as much as 2.2 m and averages about 0.6 m. Based on the thickness of the sediment, where embankments extend into the water, we recommend that the sediment be dredged to at least 1 m beyond the limits of the toe of slope. In this case, since the fill will be placed below the water table, we recommend that No 2 crushed stone be used for the fill to a height of at least 0.3 m above the water level. A geotextile fabric should

be used above the No. 2 stone to avoid migration of fine-grained soils into the open-graded aggregate.

In addition, along a section of the lake from approximately Station 11+557 to 11+619, an old timber retaining wall was observed. At this location, the water was approximately 1.6 m deep and the sediment at this location extended to approximately 1.1 to 2.2 m below the lake bottom. Due to the unknown condition of the wall, we recommend that an aggregate berm, like that described above, be constructed on the outside of the wall to avoid future distress to the roadway. To reduce the limits of the removal and replacement, we recommend that consideration be given to providing a 2H:1V slope on the berm.

6.3 Cut Sections

We understand that up to 1 m of cut will be required to establish final grade. Throughout the majority of the cut sections, adequate subgrade preparation, as described above, should be adequate to support the proposed pavement. However, at several locations (i.e., RB-4, 5, 6, 7, 8, 33, 40 and 43) groundwater was encountered within 0.6 m of the final subgrade and at Boring RB-41 was above the final subgrade. At these locations, dewatering of the area may be required to achieve a stable subgrade. Consideration may also be given to raising the grade in these areas (if feasible) to avoid the condition.

6.4 Pavement Design Considerations

The pavement subgrades are generally anticipated to consist of very loose to medium dense granular soils or engineered fill, i.e., used to raise the existing grades,

similar to the naturally-occurring granular soils. Due to the granular nature of these soils, a California Bearing Ratio (CBR) test was not performed. However, based on the soil conditions encountered, we recommend that the existing soils be undercut to a depth of at least 300 mm below the pavement section, the resulting subgrade be densified via vibratory compaction and the soils be replaced with No. 53 crushed stone compacted in accordance with the ISS. As an alternative, consideration may be given to chemical modification (e.g., cement stabilization) of the subgrade soils to a depth of 300 mm. Based on these procedures, we recommend using a CBR value of 4 for the pavement design. It should also be noted that a relatively high groundwater table was noted at several of the test boring locations. This condition should be taken into account in the pavement design. In addition, due to the anticipated granular nature of these soils, it is our opinion that subsurface drains will generally not be necessary.

Within the section that is planned for an overlay, a relatively significant crack was observed on the west side of the pavement from just south of 12+600 to just north of Station 12+900. Therefore, we recommend that consideration be given to some full-depth replacement be performed in this area and any other areas where distress is observed prior to placing the overlay. During the full-depth replacement, consideration should be given to addressing the underlying subgrade condition so that future distress is minimized. In addition, some form of reinforcement should be considered above cracks to minimize reflective cracking.

6.5 Storm Sewers

6.5.1 Excavations

Prior to excavating trenches for the storm sewers, we recommend that all underground utilities within the project limits be relocated or temporarily removed, if necessary. Following relocation/removal of utilities, excavation may then proceed.

From our understanding, the invert depths for the pipes and structures are anticipated to range from about 1 to 7½ m below the existing ground surface. Based on the information obtained at the test boring locations and the anticipated depth of the sewers, it appears that the pipes will be established in soft to stiff cohesive soils in Section 1 south of Station 4+800. In the remainder of this section, Section 3 and south of Station 13+600 in Section 4, very loose to medium dense granular soils are anticipated. North of this area to the end of the project, medium dense granular soils are generally anticipated to be encountered at the invert elevation.

Where soft soils are encountered at the base of the trench, they should be removed and replaced with compacted granular fill to achieve a stable base. If this is not feasible due to the depth of the soft soils, the use of a large-size crushed aggregate may be required to stabilize the subgrade.

Where very loose and loose granular soils are encountered (including after disturbance during the excavation process), the soil will require compaction with a vibratory compactor. In addition, the sewer will be established up to 4 m below the water level observed at the majority of the test boring locations. Consequently, the contractor should plan an appropriate dewatering scheme prior to commencing any excavation activities. Due to the granular nature of the soils encountered at many of the boring locations, it is also essential that the water level be maintained below the excavation at

all times. This will reduce the risk "piping" or "heaving" (subgrade instability at the base of the trench) which can cause a quick condition in the latter case. Refer to Section 7.3 regarding more specific recommendations related to dewatering of excavations. Proper site drainage will also help minimize unwanted surface water runoff to the excavation during the construction process.

6.5.2 Pipe Bedding and Backfill

Where cohesive-type soils are encountered at the invert depths, we recommend that a minimum 150-mm thick bedding layer, consisting of granular soils be provided for pipe support. Where granular soils are encountered, a separate bedding layer may not be needed if stability of the subgrade soils is achieved. Since the pipe alignment of the sewer is primarily located within the roadway, the trenches should be backfilled to grade with granular soils. Based on our observations, the granular soils (i.e., with fewer fines such as the sand) are typically suitable for re-use as backfill. Although the sandy loam soils should perform adequately, additional compactive effort will likely be required. In our opinion, the backfill should be compacted to 95 percent of maximum dry density obtained in accordance with AASHTO T 99 and ISS. Hand- or remote-guided vibratory compactors are recommended for compacting the bedding material and backfill on either side of the pipe. Additionally, the first several lifts of backfill over the pipe should also be compacted with small vibratory compactors to assure proper compaction is achieved and to prevent damage to the pipe from heavier, high-energy compactors.

7. CONSTRUCTION CONSIDERATIONS

7.1 Excavations

As noted previously, we anticipate that the majority of sewer installation will involve cut-and-cover techniques. Excavations made for the project will require: 1) cut slopes adequate enough to prevent cave-ins/subsidence; or 2) bracing for safe construction operation. Along the majority of the route, the sewers will be located within the limits of the existing roadway. Therefore, bracing will likely be required due to space constraints and anticipated excavation depths. Bracing may include sheeting, soldier-pile and lagging or trench boxes. Once the contractor has selected an earth retention system, EEI should be retained to aid in the review of the design.

We also recommend that all excavations conform with Occupational Safety and Health Administration (OSHA) requirements (i.e., 29 CFR Part 1926). From our observations, the soils would typically be classified as Type C according to OSHA for the full depth of the excavation.

With the increase in excavation depth, added weight near the edge of the excavation from machinery, excavated soil and the decrease in support resulting from the removal of soil, the potential for slope instability is greater. In our opinion, sheeting or boxes used in pipe trenches should be placed in a manner not to disturb the embedment material. In addition, appropriate site drainage is recommended prior to commencing any excavation.

7.2 Pipe Jacking

Where the sewer crosses under the railroad tracks, we understand that a pipe jacking method of sewer installation will likely be utilized. At this location (Test Boring

RB-9), loose to medium dense sand was encountered at the invert elevation. In addition, at the time of our field activities, the water level in the test borings was observed at a depth of about 0.3 to 0.6 m above the pipe invert elevation. In general, the conditions appear to be suitable for this method. However, please note that the appropriateness of such methods is a function of the contractor's techniques. Due to the saturated nature of the soils, care should be taken so as to not "wash" soils into the pipe during the jacking operation. This will require installing the pipe with a plug. As an alternative, consideration may also be given to other methods such as microtunneling or directional drilling.

7.3 Groundwater Control

It appears that excavations for the sewers will be slightly below the observed water levels at several locations. Therefore, dewatering (although varied) will be required throughout the project. In areas where granular soils are encountered, it is essential the water level be maintained below the invert elevation of the sewer for those reasons previously discussed.

Considering the granular nature of the soils, groundwater control should be initiated prior to excavating below the water level. For excavations that extend only to a minimal depth below the water table, dewatering by means of installing 8- to 10-in. diameter slotted casings, surrounding the casing with a filtered granular material and installing a submersible pump to control the groundwater level may be feasible. However, as excavation depths below the water table increase, dewatering by means of installing a series of well points along the route may become necessary. It should be

noted that any dewatering program should consider the potential for damage to existing structures in the vicinity.

8. CONCLUDING REMARKS

In closing, we recommend that EEI be provided the opportunity to review the final design and project specifications to confirm that earthwork and foundation requirements have been properly interpreted and implemented in the design and specifications. We also recommend that EEI be retained to provide construction observation services during the earthwork phases of the project. This will allow us to verify that the construction proceeds in compliance with the design concepts, specifications and recommendations. It will also allow design changes to be made in the event that subsurface conditions differ from those anticipated.

This evaluation has been conducted in accordance with generally accepted soil and foundation engineering practices. The recommendations in this report are based on the subsurface information from the few, widely-spaced borings performed for the project. It is important to recognize that subsurface conditions can vary over relatively short distances. If unanticipated conditions are encountered during construction, we recommend that EEI be contacted to re-evaluate the conclusions and recommendations contained in this report.

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

Important Information About Your Geotechnical Engineering Report

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

The following information is provided to help you manage your risks.

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 such risks, 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.*

Rely on Your Geotechnical Engineer for Additional Assistance

Membership in ASFE 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 your ASFE-member geotechnical engineer for more information.

ASFE

8811 Colesville Road Suite G106 Silver Spring, MD 20910

Telephone: 301-565-2733 Facsimile: 301-589-2017

email: info@asfe.org www.asfe.org

UGER1000.10M

APPENDIX B

FIELD METHODS FOR EXPLORATION AND SAMPLING SOILS

FIELD METHODS FOR EXPLORATION AND SAMPLING SOILS

A. Boring Procedures Between Samples

The boring is extended downward, between samples, by a hollow stem auger (AASHTO* Designation T251-77), a continuous flight auger, driven and washed-out casing, or rotary boring with drilling mud or water.

B. Penetration Test and Split-Barrel Sampling of Soils
(AASHTO* Designation: T206-87)

This method consists of driving a 51-mm outside diameter split-barrel sampler using a 63.5 Kg weight falling freely through a distance of 760 mm. The sampler is first seated 150 mm into the material to be sampled and then driven 305 mm. The number of blows required to drive the sampler the final 305 mm is known as the Standard Penetration Resistance or N-Value. The blow counts are reported on the Test Boring Records per 150 mm increment. Recovered samples are first classified as to texture by the driller. Later, in the laboratory the driller's classification is reviewed by a soils engineer who examines each sample.

C. Thin-walled Tube Sampling of Soils
(AASHTO* Designation: T207-87)

This method consists of pushing a 51- or 76-mm outside diameter thin wall tube by hydraulic or other means into soils, usually cohesive types. Relatively undisturbed samples are recovered.

D. Soil Investigation and Sampling by Auger Borings
(AASHTO* Designation: T203-82)

This method consists of augering a hole and removing representative soil samples from the auger flight or bucket at 1.5-m intervals or with each change in the substrata. Relatively disturbed samples are obtained and its use is therefore limited to situations where it is satisfactory to determine approximate subsurface profile.

E. Diamond Core Drilling for Site Investigation
(AASHTO* Designation: T225-83)

This method consists of advancing a hole in bedrock or other hard strata by rotating downward a single tube or double tube core barrel equipped with a cutting bit. Diamond, tungsten carbide, or other cutting agents may be used for the bit. Wash water is used to remove the cuttings. Normally, a 76-mm outside diameter by 51-mm inside diameter coring bit is used unless otherwise noted. The rock or hard material recovered within the core barrel is examined in the field and laboratory. Cores are stored in partitioned boxes and the length of recovered material is expressed as a percentage of the actual distance penetrated.

* American Association of State Highway and Transportation Officials, Washington D.C.

APPENDIX C

GENERAL SITE PLAN - SECTIONS 1, 2 and 3 (Drawing No. 1-6437.B1)

GENERAL SITE PLAN - SECTIONS 4 and 5 (Drawing No. 1-6437.B2)

VICINITY MAP
N.T.S.

PROJECT LOCATION SHOWN BY

LEGEND

RB-1 ● Test Boring Location and Designation

NOTES

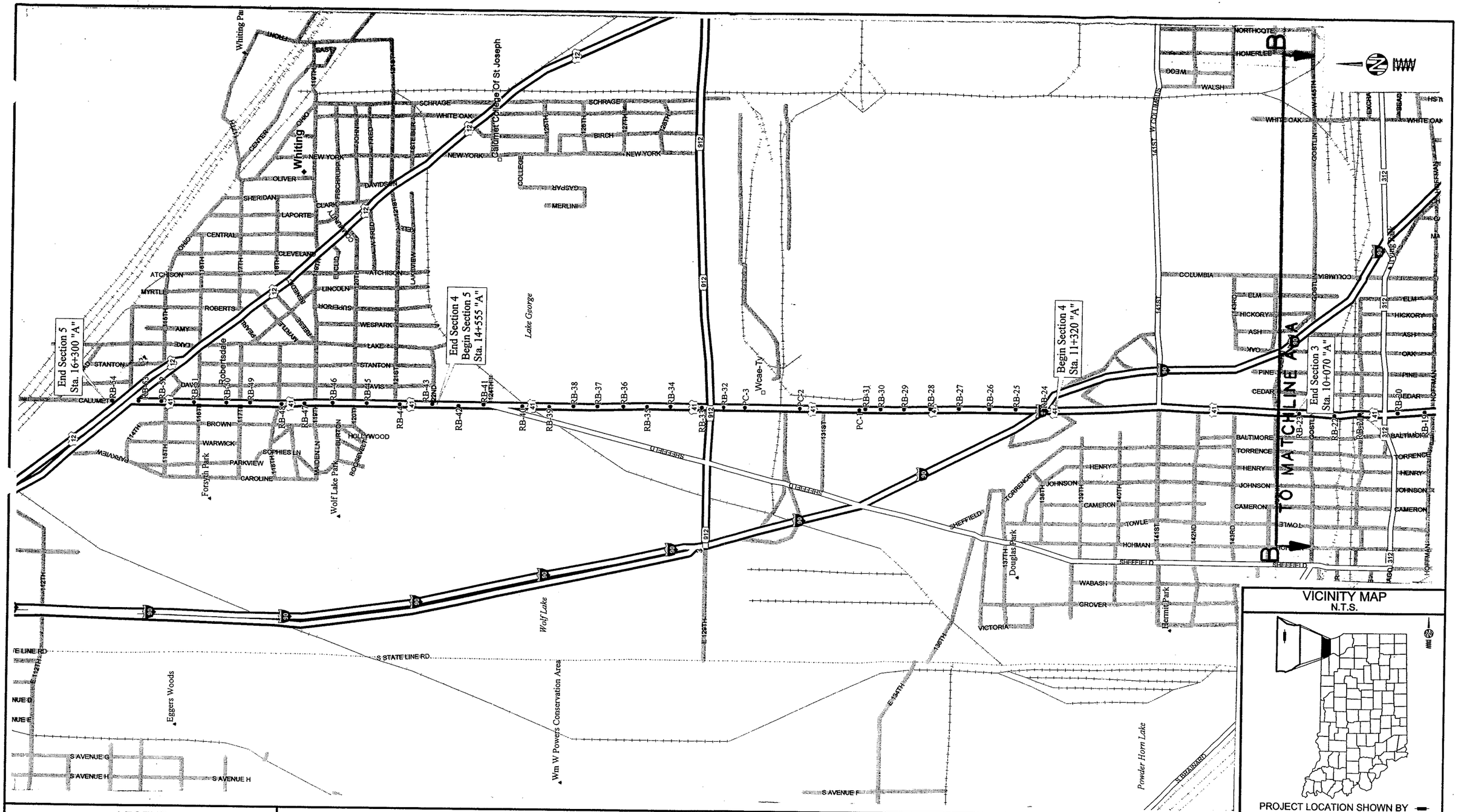
1. Base map generated using commercially-available software by DeLorme (Street Atlas USA ver. 7.0).
2. Refer to the Log of Test Boring (57) in Appendix C for a description of the subsurface conditions encountered at the test boring locations.
3. Borings were located in the field by Earth Exploration, Inc.
4. Boring locations are approximate.

GENERAL SITE PLAN - Sections 1,2, and 3

PROJECT:	US 41 (Calumet Avenue) from I-80/I-94 to US 12/20
PROJECT NO.:	STP-019-6( )
LOCATION:	Lake County, Indiana
CLIENT:	Indiana Department of Transportation
EEI PROJECT NO.:	1-6437
SCALE:	1:18,750 (1" = 0.30 mi.)

PROJECT ENGINEER: RDO	
APPROVED BY: SJL	
DRAWN BY: AJH	
DATE AND TIME: 04-09-01 08:04:24	
DRAWING NUMBER: 1-6437.B1	

EARTH EXPLORATION, INC.
7770 West New York Street
Indianapolis, IN 46214-2988
317-273-1890
(FAX) 317-273-2250



VICINITY MAP
N.T.S.

PROJECT LOCATION SHOWN BY

LEGEND

RB-1 ● Test Boring Location and Designation

NOTES

1. Base map generated using commercially-available software by DeLorme (Street Atlas USA ver. 7.0).
2. Refer to the Log of Test Boring (57) in Appendix C for a description of the subsurface conditions encountered at the test boring locations.
3. Borings were located in the field by Earth Exploration, Inc.
4. Boring locations are approximate.

GENERAL SITE PLAN - Sections 4 and 5

PROJECT:	US 41 (Calumet Avenue) from I-80/I-94 to US 12/20
PROJECT NO.:	STP-019-6( )
LOCATION:	Lake County, Indiana
CLIENT:	Indiana Department of Transportation
EEI PROJECT NO.:	1-6437
SCALE:	1:18,750 (1" = 0.30 mi.)

PROJECT ENGINEER:	RDO
APPROVED BY:	SJL
DRAWN BY:	AJH
DATE AND TIME:	04-09-01 08:18:48
DRAWING NUMBER:	1-6437.B2

EARTH EXPLORATION, Inc.
7770 West New York Street
Indianapolis, IN 46214-2988
317-273-1890
(FAX) 317-273-2250

APPENDIX D

LOG OF TEST BORING - GENERAL NOTES

LOG OF TEST BORING (57)

SUMMARY OF PAVEMENT CORES

SUMMARY OF SOUNDINGS

LOG OF TEST BORING - GENERAL NOTES

DESCRIPTIVE SOIL CLASSIFICATION

GRAIN SIZE TERMINOLOGY

Soil Fraction		Particle Size	US Standard Sieve Size
Boulders		Larger than 75 mm	Larger than 75 mm
Gravel		4.76 mm to 75 mm	#10 to 75 mm
Sand:	Coarse	2.00 to 4.76 mm	#40 to #10
	Fine	0.075 to 0.42 mm	#200 to #40
Silt		0.002 to 0.075 mm	Smaller than #200
Clay		Smaller than 0.002 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

GENERAL TERMINOLOGY

Physical Characteristics
- Color, moisture, grain shape, fineness, etc.

Major Constituents
- Clay, silt, sand, gravel

Structure
- Laminated, varved, fibrous, stratified, cemented, fissured, etc.

Geologic Origin
- Glacial, alluvial, eolian, residual, etc.

RELATIVE PROPORTIONS OF COHESIONLESS SOILS

Term	Defining Range by % of Weight
Trace	1 - 10%
Little	11 - 20%
Some	21 - 35%
And	36 - 50%

ORGANIC CONTENT BY COMBUSTION METHOD

Soil Description	LOI
w/ trace organic matter	1 - 6%
w/ little organic matter	7 - 12%
w/ some organic matter	13 - 18%
Organic Soil (A-8)	19 - 30%
Peat (A-8)	More than 30%

RELATIVE DENSITY

Term	"N" Value
Very loose	0 - 5
Loose	6 - 10
Medium dense	11 - 30
Dense	31 - 50
Very Dense	51+

CONSISTENCY

Term	"N" Value
Very soft	0 - 3
Soft	4 - 5
Med stiff	6 - 10
Stiff	11 - 15
Very Stiff	16 - 30
Hard	31+

PLASTICITY

Term	Plastic Index
None to slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High/Very High	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 150-mm penetrations of the 50-mm split-barrel sampler. The sampler is driven with a 64-kg weight falling 760 mm and is seated to a depth of 150 mm before commencing the standard penetration test.

SYMBOLS

DRILLING AND SAMPLING

AS - Auger Sample
BS - Bag Sample
C - Casing: Size 64 mm, NW; 100 mm, HW
COA - Clean-Out Auger
CS - Continuous Sampling
CW - Clear Water
DC - Driven Casing
DM - Drilling Mud
FA - Flight Auger
FT - Fish Tail
HA - Hand Auger
HSA - Hollow Stem Auger
NR - No Recovery
PMT - Borehole Pressuremeter Test
PT - 75 mm O.D. Piston Tube Sample
PTS - Peat Sample
RB - Rock Bit
RC - Rock Coring
REC - Recovery
RQD - Rock Quality Designation
RS - Rock Sounding
S - Soil Sounding
SS - 50 mm O.D. Split-Barrel Sample
2ST - 50 mm O.D. Thin-Walled Tube Sample
3ST - 75 mm O.D. Thin-Walled Tube Sample
VS - Vane Shear Test
WPT - Water Pressure Test

LABORATORY TESTS

qp - Penetrometer Reading, kPa
qu - Unconfined Strength, kPa
W - Moisture Content, %
LL - Liquid Limit, %
PL - Plastic Limit, %
PI - Plasticity Index
SL - Shrinkage Limit, %
LOI - Loss on Ignition, %
γ - Dry Unit Weight, kg/m^3
pH - Measure of Soil Alkalinity/Acidity

WATER LEVEL MEASUREMENT

BF - Backfilled upon Completion
NW - No Water Encountered

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

EARTH EXPLORATION INC.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-1
Elevation 187.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 2

Proj. No.	STP-019-6( )	Station	3+649	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	33.5 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						TOPSOIL (visual)							
SS-1		100	4 5 6			**SAND,** medium dense to very loose, moist, black (possible foundry sand; fill; visual)							
SS-2		100	2 2 2	5	1								
SS-3		100	2 2 3		2		380 220			19.0			
SS-4		65	10 14 23	10	3		290 >430			15.4			
						CLAY LOAM, soft to hard, moist, gray, with trace organics and cinders below 4 m (fill; visual)							
SS-5		100	5 16 13	15	4 5		290 340			14.7			
SS-6		45	5 6 9	20	6	**SILTY LOAM,** stiff, moist, black, with trace organics and roots (possible buried topsoil; visual)	340 290			28.6			
						CLAY, stiff, moist, brown and gray, A-6, Lab No. 4153SL							

Continued Next Page

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	NW	NW	BF
Depth to Cave-in		5.5	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/16/01 End 3/16/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings and bentonite chip plug near surface.

EARTH EXPLORATION Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-1
Elevation 187.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 2 of 2

Proj. No.	STP-019-6( )	Station	3+649	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	33.5 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
				7									
SS-7		100	3 5 6	25	8	**CLAY,** stiff, moist, brown and gray, A-6, Lab No. 4153SL	380 290			22.9			
SS-8		100	3 5 6	30	9	**SILTY CLAY,** stiff, moist, gray (visual)	190			20.2			
						End of Boring at 9.1 m							
				35	10								
				40	11								
				45	12								
					13								
					14								

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

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7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-2
Elevation 183.8
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	3+766	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	28 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						PORTLAND CEMENT CONCRETE							
SS-1		100	5 7 9			GRANULAR SUBBASE (crushed stone; visual)							
						SAND, loose, moist, black (possible foundry sand; fill; visual)							
SS-2		100	3 4 5	5	1								
SS-3		100	3 6 7		2	SAND, medium dense to loose, moist to wet, brown, A-3, Lab No. 4156SL							
SS-4		100	3 3 4	10	3								
SS-5		100	3 4 6		4	CLAY, medium dense, moist, brownish gray, A-6, Lab No. 4153SL	290			22.3			
				15	5	End of Boring at 4.6 m							
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	2.7	NW	BF
Depth to Cave-in		3.3	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/16/01 End 3/16/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-3
Elevation 182.4
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	3+960	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	5 m Lt. "A"	Temp.	39 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft / m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m³	W %	LL %	PL %	PI %
					PORTLAND CEMENT CONCRETE							
SS-1		85	6 6 5		**SAND,** medium dense, moist, brown, A-3, Lab No. 4155SL							
				1								
SS-2		100	2 1 2	5	**SILTY CLAY LOAM,** very soft, moist, gray (visual)	190 140			19.7			
SS-3		100	4 6 6	2	**CLAY,** stiff, moist, brownish gray, A-6(17), Lab No. 4153SL	290 380			20.6	37	19	18
SS-4		100	4 5 6	10 3		190 380			21.3			
					End of Boring at 3.0 m							
				4								
				15								
				5								
				20 6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	NW	NW	BF
Depth to Cave-in		1.6	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/15/01 End 3/15/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

EARTH EXPLORATION INC
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-4
Elevation 182.6
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	4+140	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	6.5 m Lt. "A"	Temp.	39 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						PORTLAND CEMENT CONCRETE							
SS-1		65	7 8 9			**SANDY LOAM,** medium dense, moist, black, with trace cinders (fill)							
				▽	1								
SS-2		65	2 3 4			**SAND,** loose, moist, brown, A-3, Lab No. 4156SL	70			25.5			
				5 ▼									
SS-3		0*	4 4 5		2	**SILTY CLAY LOAM,** stiff, moist, gray (visual)							
SS-4		65	3 4 4			**CLAY,** medium stiff, moist, brownish gray, A-6, Lab No. 4153SL	410 >430			16.9			
				10	3	End of Boring at 3.0 m							
						*Driving on rock.							
						Test boring originally started at 9 m Rt., but was terminated at 1 m due to telephone line.							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	1.6	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/15/01 End 3/15/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-5
Elevation 182.8
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	4+280	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	10 m Lt. "A"	Temp.	39 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		100	4 4 4			**SAND,** loose to very loose, wet, gray and brown, with trace organics and petroleum odor, A-3, Lab No. 4155SL							
				▽	1								
SS-2		100	4 2 3										
				5									
SS-3		100	2 3 5		2		20 260			22.0			
SS-4		35*	2 3 4	▼		**CLAY,** medium stiff to stiff, moist, brownish gray, A-6, Lab No. 4153SL	220			23.0			
				10	3								
SS-5		100	3 5 6				290 240			21.8			
					4	End of Boring at 3.7 m *Two attempts.							
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	2.7	BF
Depth to Cave-in		2.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/15/01 End 3/15/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-6
Elevation 183.0
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	4+440	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	7 m Lt. "A"	Temp.	39 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		10*	12 15 18			**GRANULAR SUBBASE** (crushed stone; visual)							
				▽	1	**SANDY LOAM,** with some gravel, dense, moist, black (fill; visual)							
SS-2		65	5 7 6	5		**SAND,** medium dense, moist, brown, A-3, Lab No. 4155SL							
SS-3		35*	2 1 2		2	**CLAY,** very soft to medium stiff, moist, brownish gray, A-6, Lab No. 4153SL	310			26.0			
SS-4		65	2 3 3	10	3		360 310			25.4			
						End of Boring at 3.0 m							
						*Two attempts.							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	NW	BF
Depth to Cave-in		2.1	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/15/01 End 3/15/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION, Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-7
Elevation 182.8
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	4+592	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	9 m Lt. "A"	Temp.	39 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		60	9 18 17			GRANULAR SUBBASE (crushed stone; visual)							
						SANDY LOAM, dense, moist, black, with concrete and cinder fragments (fill; visual)							
					1								
SS-2		65	4 4 3			SAND, loose, wet, brown, A-3, Lab No. 4155SL							
				5									
SS-3		65	2 2 2		2	CLAY, soft to medium stiff, moist, grayish green to brownish gray below 2.4 m, A-6, Lab No. 4153SL	100			30.7			
SS-4		90	2 3 4				100 140			26.8			
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	NW	BF
Depth to Cave-in		2.1	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/15/01 End 3/15/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-8
Elevation 182.9
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	4+760	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	6.5 m Lt. "A"	Temp.	39 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		100	7 8 5			GRANULAR SUBBASE (crushed stone; visual)							
						SANDY LOAM, medium dense, moist, black (fill; visual)							
					1								
SS-2		100	3 5 5	5		SAND, loose, wet, brown, A-3, Lab No. 4156SL							
SS-3		85	1 2 3		2	SILTY CLAY, soft to medium stiff, moist, gray (visual)	140 190			21.4			
SS-4		65	2 3 3				120 310			21.0			
				10	3								
						End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	1.9	BF
Depth to Cave-in		2.0	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/15/01 End 3/15/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-9
Elevation 183.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	4+885	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	7 m Lt. "A"	Temp.	40 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	9 4 4			GRANULAR SUBBASE (crushed stone; visual)							
						SANDY LOAM, with some gravel, loose, moist, black (fill; visual)							
					1								
SS-2		10*	4 6 6	▽									
				5		SAND, loose to very loose, moist, brown to gray below 1.8 m, A-3, Lab No. 4156SL							
SS-3		45	3 2 1	▼	2								
SS-4		65	3 3 3			SILTY CLAY, medium stiff, moist, gray (visual)	50 120			26.0			
				10	3								
						End of Boring at 3.0 m							
						*Two attempts.							
					4								
				15									
					5								
					6								
				20									

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.4	2.0	BF
Depth to Cave-in		2.0	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-10
Elevation 183.3
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	5+040	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	10 m Lt. "A"	Temp.	40 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	5 5 6										
					1								
SS-2		65	4 5 6	▽		SAND, medium dense to very loose, wet, brown to gray below 4', A-3, Lab No. 4156SL							
				5									
				▼									
SS-3		85	3 1 1		2								
						SAND, very loose, wet, gray, A-3, Lab No. 4155SL							
SS-4		90	2 3 3			SILTY CLAY, medium stiff, moist, gray (visual)	120 290			21.4			
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	1.7	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-11
Elevation 183.9
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	5+200	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	8.5 m Lt. "A"	Temp.	40 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m³	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		100	5 6 6			**GRANULAR SUBBASE** (crushed stone; visual)							
					1								
SS-2		45	2 2 2	5		**SAND,** medium dense to very loose, moist to wet at 1.8 m, brown, A-3, Lab No. 4156SL							
				▽									
SS-3		55	5 5 6		2	**GRAVELLY SAND,** medium dense, wet, brown (visual)							
						SAND, very loose, wet, gray, A-3, Lab No. 4155SL							
SS-4		55	1 1 1	▼ 10	3		120			26.7			
SS-5		65	1 2 2			**SILTY CLAY,** very soft to soft, moist, gray (visual)	100 240			23.7			
					4								
SS-6		45	2 2 2	15			140 70			22.5			
					5	End of Boring at 4.6 m							
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	2.7	BF
Depth to Cave-in		2.9	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks **Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.**

LOG OF TEST BORING

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-12
Elevation 184.4
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	5+365	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	9 m Lt. "A"	Temp.	40 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	5 7 12			GRANULAR SUBBASE (crushed stone; visual)							
					1								
SS-2		65	2 2 2			SAND, medium dense to very loose, moist, brown (possible fill; visual)							
				5									
					2								
SS-3		65	3 2 3			SAND, very loose to loose, wet, brown to gray below 2.4 m, A-3, Lab No. 4156SL							
SS-4		65	3 3 3										
				10	3								
SS-5		65	2 1 2			SAND, very loose, wet, gray, A-3, Lab No. 4155SL							
					4								
SS-6		55	2 3 3			SILTY CLAY, medium stiff, moist, gray (visual)	70 190			21.9			
				15									
					5	End of Boring at 4.6 m							
					6								
				20									

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	2.5	BF
Depth to Cave-in		2.7	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc.

LOG OF TEST BORING

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-13
Elevation 184.7
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	5+496.5	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	8.5 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft / m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
					ASPHALTIC CONCRETE							
					PORTLAND CEMENT CONCRETE							
SS-1		65	3 4 6		GRANULAR SUBBASE (crushed stone; visual)							
				1	SANDY LOAM, loose, moist, black (fill; visual)							
SS-2		65	3 4 4									
				5								
SS-3		65	5 7 9	2	SAND, loose to medium dense, moist to wet below 1.8 m, brown to gray below 2.4 m, A-3, Lab No. 4156SL							
SS-4		65	3 5 5	10 3								
SS-5		65	5 6 7									
				4	End of Boring at 3.7 m							
				15								
				5								
				20 6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	2.2	BF
Depth to Cave-in		2.3	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-14
Elevation 185.0
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	5+620	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	9 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft / m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
					ASPHALTIC CONCRETE							
					PORTLAND CEMENT CONCRETE							
SS-1		100	2 3 4		GRANULAR SUBBASE (crushed stone; visual)							
				1	SANDY LOAM, loose, moist, black (fill; visual)							
SS-2		65	2 4 5	5								
SS-3		65	2 3 5	2	SAND, loose to medium dense, moist to wet below 1.8 m, brown, A-3, Lab No. 4156SL							
SS-4		65	4 6 9	10 3								
SS-5		65	6 8 10									
				4	End of Boring at 3.7 m							
				15 5								
				20 6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	2.0	2.2	BF
Depth to Cave-in		2.3	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-15
Elevation 186.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	5+762.5	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	9 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1	X	100	5 6 7			**GRANULAR SUBBASE** (crushed stone; visual)							
					1								
SS-2	X	100	2 2 2										
				5									
SS-3	X	100	2 3 3		2	**SAND,** medium dense to very loose, moist to wet below 2.4 m, brown, A-3, Lab No. 4156SL							
				▽									
SS-4	X	100	3 2 4										
				10	3								
					4								
SS-5	X	100	6 8 10			**SAND,** with some gravel, medium dense, wet, brown (visual)							
				15									
					5	End of Boring at 4.6 m							
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	2.4	NW	BF
Depth to Cave-in		2.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks **Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.**

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-16
Elevation 186.4
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	5+878	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	9.5 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		20*	10 18 16										
					1								
SS-2		100	4 5 5										
				5									
SS-3		100	3 4 5		2								
				▽		SAND, loose to medium dense, moist to wet after 2.4 m, brown, A-3, Lab No. 4156SL							
SS-4		100	5 6 6										
				10	3								
				▼									
					4								
SS-5		100	10 13 14										
				15		End of Boring at 4.6 m							
					5	*Two attempts.							
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	2.4	3.2	BF
Depth to Cave-in		3.3	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-17
Elevation 179.9
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	8+443	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	6 m Rt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		65	7 8 9		1	SAND, medium dense, moist, brown (fill; visual)							
				5		End of Boring at 1.2 m Auger refusal at 1.2 m							
				10	3								
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	NW	---	BF
Depth to Cave-in			

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-17A
Elevation 179.8
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	8+444.5	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	6 m Rt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1	X	0*	9 50/0.2		1	SAND, medium dense, moist, brown (fill; visual)							
				5		CONCRETE (former road)							
SS-2	X	100	2 3 5		2	SAND, loose, moist, brown, A-3, Lab No. 4156SL							
						End of Boring at 2.3 m *Two attempts.							
				10	3								
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	NW	NW	BF
Depth to Cave-in		2.0	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-18
Elevation 179.4
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	8+602	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	10 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1	X	65	5 5 5										
					1								
SS-2	X	65	3 3 4			SAND, loose, moist, brown, A-3, Lab No. 4156SL							
				5									
SS-3	X	35*	5 6 7		2								
						SAND, medium dense, wet, brown, A-3, Lab No. 4155SL							
						End of Boring at 2.3 m							
				10	3	*Two attempts.							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	2.1	NW	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/14/01 End 3/14/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-19
Elevation 178.6
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	9+398	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	5 m Lt. "A"	Temp.	33 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		100	4 5 6										
					1								
SS-2		100	5 7 7			SAND, medium dense to loose, moist to wet below 1.8 m, brown, A-3, Lab No. 4156SL							
				5									
					2								
SS-3		65	4 4 5										
						End of Boring at 2.3 m							
				10	3								
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

	Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water		1.8	NW	BF
Depth to Cave-in			1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/13/01 End 3/13/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-20
Elevation 178.6
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	9+548	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	9 m Rt. "A"	Temp.	33 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
SS-1		100	7 7 5			SANDY LOAM, medium dense, moist, black (fill; visual)							
					1	▽							
SS-2		100	3 2 3	5									
						SAND, very loose to medium dense, moist to wet below 1.1 m, brown to gray below 2.4 m, A-3, Lab No. 4156SL							
SS-3		65	4 5 6		2								
SS-4		60	4 9 11	10	3								
						End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	NW	BF
Depth to Cave-in		1.7	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/13/01 End 3/13/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION, Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-21
Elevation 179.0
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	9+751.5	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	4.5 m Lt. "A"	Temp.	33 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
SS-1		100	4 5 5										
					1								
SS-2		100	3 2 2	5									
						SAND, medium dense to very loose, moist to wet below 1.8 m, brown to gray below 2.4 m, A-3, Lab No. 4156SL							
SS-3		100	1 1 2		2								
				▽									
SS-4		80	4 5 6	10	3								
SS-5		100	5 6 9										
					4	End of Boring at 3.7 m							
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	2.4	NW	BF
Depth to Cave-in		2.1	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/13/01 End 3/13/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-22
Elevation 178.6
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	9+870	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	7 m Lt. "A"	Temp.	33 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft / m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
					ASPHALTIC CONCRETE							
SS-1		45	12 15 15		SANDY LOAM, medium dense, moist, dark brown, with trace brick and concrete (fill)							
				1								
SS-2		90	3 4 4	5								
					SAND, loose to medium dense, wet, brown to gray below 1.8 m, A-3, Lab No. 4156SL							
SS-3		45	6 5 5	2								
SS-4		35*	7 7 9	10 3								
					End of Boring at 3.0 m							
					*Two attempts.							
				4								
				15								
				5								
				20 6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	1.8	BF
Depth to Cave-in		1.9	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/13/01 End 3/13/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-23
Elevation 178.6
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	10+026.5	Weather	Cloudy, Snow	Driller	E.D.
Struct. No.	---	Offset	4.5 m Lt. "A"	Temp.	33 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
SS-1		80	3 3 3			SANDY LOAM, loose, moist, black and brown, with trace brick and cinders (fill; visual)							
					1								
SS-2		80	2 2 3			SAND, very loose, moist to wet below 1.8 m, brown, A-3, Lab No. 4156SL							
				5									
SS-3		80	3 5 5		2								
						End of Boring at 2.3 m							
				10	3								
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	NW	BF
Depth to Cave-in		2.0	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/13/01 End 3/13/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-24
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	11+410	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	1.5 m Rt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		80	2 2 3			**SAND,** very loose, wet, brown, A-3, Lab No. 4156SL							
					1								
SS-2		100	1 2 2										
				5		**ORGANIC SILTY LOAM,** very soft, wet, black (visual) SS-2: LOI = 24.3%				81.0			
SS-3		100	3 2 2		2	**SAND,** very loose to loose, wet, brown to gray below 2.4 m, with trace organic matter and wood fragments, A-3, Lab No. 4156SL							
S-4		100	2 3 6										
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	0.9	BF
Depth to Cave-in		1.1	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/2/01 End 3/2/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-25
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	11+560	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	5.5 m Rt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	2 3 3			**GRANULAR SUBBASE** (crushed stone; visual)							
					1								
SS-2		65	2 3 3	▽ ▼									
				5		**SAND,** loose to very loose, moist to wet below 1.1 m, brown to gray below 1.1 m, A-3, Lab No. 4156SL							
SS-3		100	2 3 1		2								
SS-4		100	1 1 1										
				10	3								
SS-5		100	6 7 8			**SAND,** medium dense, wet, gray, A-3, Lab No. 4156SL							
					4	End of Boring at 3.8 m							
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	1.2	BF
Depth to Cave-in		1.5	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/2/01 End 3/2/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-26
Elevation 178.3
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	11+700	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	1.5 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	5 6 7			GRANULAR SUBBASE (crushed stone; visual)							
					1								
SS-2		100	3 5 6	▽									
				5									
SS-3		100	5 6 7		2	SAND, medium dense, moist to wet below 1.2 m, brown to gray below 1.2 m, A-3, Lab No. 4156SL							
SS-4		100	8 9 10										
				10	3								
						End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	NW	BF
Depth to Cave-in		1.2	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/5/01 End 3/5/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-27
Elevation 178.3
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No. STP-019-6( ) | Station 11+849 | Weather Cloudy | Driller E.D.
Struct. No. --- | Offset 2 m Rt. "A" | Temp. 30 Deg F | Inspector R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1	X	100	3 3 3										
				1									
SS-2	X	100	3 2 2										
				5		**SAND,** loose to medium dense, moist to wet below 1.2 m, brown to gray below 1.2 m, A-3, Lab No. 4156SL							
SS-3	X	40	5 7 9		2								
SS-4	X	100	6 7 7										
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	1.2	BF
Depth to Cave-in		1.4	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/5/01 End 3/5/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-28
Elevation 178.3
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	12+000	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	1.5 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		65	5 6 6										
					1								
SS-2		100	2 3 3										
				5		**SAND,** medium dense to loose, moist to wet below 1.2 m, brown to dark gray, with trace organic matter below 1.8 m, A-3(0), Lab No. 4154SL							
SS-3		40	3 5 3		2						NP	NP	NP
SS-4		85	3 4 5			SS-4: LOI = 2.1%							
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	1.2	BF
Depth to Cave-in		1.2	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/5/01 End 3/5/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-29
Elevation 178.3
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No. STP-019-6( ) | Station 12+140 | Weather Cloudy | Driller E.D.
Struct. No. --- | Offset 2 m Rt. "A" | Temp. 30 Deg F | Inspector R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		85	5 6 6										
					1								
SS-2		85	4 3 4			**SAND,** very loose to medium dense, moist to wet below 1.2 m, brown to gray below 1.2 m, with occasional silt seams, A-3, Lab No. 4156SL							
				5									
SS-3		40	1 2 3		2								
S-4		15*	8 10 12										
				10	3	End of Boring at 3.0 m *Two attempts.							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	1.2	BF
Depth to Cave-in		1.2	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/5/01 End 3/5/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-30
Elevation 178.4
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	12+280	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	1 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		80	12 15 15			**GRANULAR SUBBASE** (crushed stone; visual)							
				▽	1								
SS-2		65	2 2 3	5		**SAND,** very loose to medium dense, moist to wet below 1.1 m, brown to dark gray below 1.1 m, with trace organic matter, A-3, Lab No. 4156SL							
SS-3		55	2 3 3		2								
SS-4		55	4 5 6	10	3								
						End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	⧩ After Drilling
Depth to Water	1.1	NW	BF
Depth to Cave-in		1.5	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/13/01 End 3/13/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-31
Elevation 178.3
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	12+360	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	5.5 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m³	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		80	5 5 5			SAND, loose to medium dense, wet, brown, with concrete fragments (fill; visual)							
SS-2		80	6 6 5		1	▽ ▼							
SS-3		80	4 6 7	5	2	SAND, medium dense, wet, dark gray, with trace organic matter, A-3, Lab No. 4156SL							
SS-4		100	4 5 7	10	3								
						End of Boring at 3.0 m							
				15	4								
				20	5								
					6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	1.2	BF
Depth to Cave-in		1.2	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/5/01 End 3/5/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-32
Elevation 177.9
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+100	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	9.5 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
SS-1	X	65	50/0.5*			SANDY LOAM, very dense, moist, black, with trace concrete fragments and organic matter (fill; visual)							
					1	SILTY LOAM, very soft, wet, black, with some organic matter (visual)							
SS-2	X	45	3 2 2			SS-2: LOI = 17.4%				120.5			
				5		SAND, very loose, wet, brown, A-3, Lab No. 4155SL							
SS-3	X	55	1 1 4		2	SAND, very loose to loose, wet, gray, with trace organics, A-3, Lab No. 4156SL							
SS-4	X	55	3 5 5	10	3	End of Boring at 3.0 m							
						*Seating Increment							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.0	1.1	BF
Depth to Cave-in		1.7	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/7/01 End 3/7/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-33
Elevation 178.0
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+240	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	5 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1	X	35*	6 7 9			**GRANULAR SUBBASE** (crushed stone; visual)							
						SAND AND GRAVEL, medium dense, moist, dark gray (fill; visual)							
SS-2	X	45	1 1 1	5	1	SS-2: LOI = 22.5%				31.6			
						ORGANIC SANDY LOAM, very loose, wet, black and gray (visual)							
SS-3	X	35*	3 5 6		2	SS-3: LOI = 4.6%							
						SAND, loose, wet, gray, with trace organic matter to 2.4 m, A-3, Lab No. 4156SL							
S-4	X	45	2 3 5	10	3	End of Boring at 3.0 m							
						*Two attempts.							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	0.3	0.2	BF
Depth to Cave-in		1.4	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/12/01 End 3/12/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-34
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+380	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	2 m Rt. "A"	Temp.	28 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		70	7 8 6			GRANULAR SUBBASE (crushed stone; visual)							
						SANDY LOAM, medium dense, wet, gray, with trace concrete fragments (fill; visual)							
SS-2		80	3 2 3	5	1								
SS-3		80	4 5 7		2	SAND, very loose to medium dense, wet, gray, A-3, Lab No. 4156SL							
SS-4		80	5 8 10	10	3								
						End of Boring at 3.0 m							
					4								
				15	5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	0.6	0.5	BF
Depth to Cave-in		0.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/6/01 End 3/6/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-35
Elevation 178.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+526	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	5 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	7 7 8	▽ ▼		GRANULAR SUBBASE (crushed stone; visual)							
						SAND AND GRAVEL, medium dense, wet, gray (fill; visual)							
					1								
SS-2		45	4 2 2										
				5									
SS-3		45	1 2 1		2	SAND, very loose to medium dense, wet, gray, A-3, Lab No. 4156SL							
SS-4		55	4 5 6										
				10	3								
						End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	0.6	0.6	BF
Depth to Cave-in		1.2	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/12/01 End 3/12/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-36
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+640	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	2.5 m Rt. "A"	Temp.	29 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		50	5 5 5			GRANULAR SUBBASE (crushed stone; visual)							
					1								
SS-2		50	3 4 4	5		**SAND,** loose to medium dense, wet, brown to gray below 1.1 m, A-3, Lab No. 4156SL							
SS-3		65	5 6 7		2								
SS-4		55	6 8 10	10	3	**SAND,** medium dense, wet, gray, A-3, Lab No. 4155SL							
					4								
SS-5		65	5 8 11	15		**SAND,** medium dense, wet, brown, A-3, Lab No. 4156SL							
SS-6		65	6 9 11		5								
				20	6	End of Boring at 5.3 m							

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	0.6	0.6	BF
Depth to Cave-in		0.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/6/01 End 3/6/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-37
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+760	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	1.5 m Rt. "A"	Temp.	29 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	2 3 4			GRANULAR SUBBASE (crushed stone; visual)				85.9			
						SS-1: LOI = 22.5%							
					1								
SS-2		65	6 4 7	5									
SS-3		65	4 5 6		2								
						SAND, loose to medium dense, wet, gray, with organic silty loam seam near 0.8 m, A-3, Lab No. 4156SL							
S-4		100	4 4 5	10	3								
					4								
SS-5		100	4 6 6										
				15		End of Boring at 4.6 m							
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	0.9	0.6	BF
Depth to Cave-in		0.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/6/01 End 3/6/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-38
Elevation 178.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+890	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	2 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		100	5 4 3			GRANULAR SUBBASE (crushed stone; visual)							
						SAND, loose, wet, gray, some organic matter near 0.8 m, A-3, Lab No. 4156SL				77.0			
					1	SS-1: LOI = 12.8%							
SS-2		65	3 4 5								NP	NP	NP
				5		**SAND,** loose, wet, gray, A-3(0), Lab No. 4155SL							
SS-3		65	5 6 6		2								
SS-4		100	6 7 8										
				10	3	**SAND,** medium dense, wet, gray, A-3, Lab No. 4156SL							
					4								
SS-5		100	6 7 7										
				15		End of Boring at 4.6 m							
					5								
					6								
				20									

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	0.6	0.6	BF
Depth to Cave-in		0.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/6/01 End 3/6/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-39
Elevation 178.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	14+020	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	5 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		100	7 8 8	▽ ▼		**GRANULAR SUBBASE** (crushed stone; visual)							
						SAND, medium dense, wet, gray (possible fill; visual)							
SS-2		100	8 8 8	5	1	**GRAVELLY SAND,** medium dense, wet, brown (visual)							
SS-3		65	6 6 7		2								
SS-4		35*	3 5 5	10	3	**SAND,** with some gravel, loose to medium dense, wet, gray, A-3, Lab No. 4156SL							
SS-5		80	5 7 7		4								
				15		End of Boring at 4.6 m							
					5	*Two attempts.							
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	0.6	0.6	BF
Depth to Cave-in		0.9	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/12/01 End 3/12/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-40
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	14+180	Weather	Cloudy, Rain	Driller	E.D.
Struct. No.	---	Offset	5 m Lt. "A"	Temp.	35 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		55	9 10 12			SANDY LOAM, with some gravel, medium dense, wet, dark gray (fill; visual)							
					1								
SS-2		65	3 4 4			SAND, loose, wet, dark gray, with trace organic matter, A-3, Lab No. 4155SL							
				5									
SS-3		15	2 3 3		2								
						SAND, loose to medium dense, wet, brown, A-3(0), Lab No. 4156SL							
SS-4		100	4 5 6								NP	NP	NP
				10	3								
SS-5		100	5 6 7										
					4	End of Boring at 3.7 m							
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

	Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water		0.6	0.6	BF
Depth to Cave-in			1.5	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/12/01 End 3/12/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-41
Elevation 178.0
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	14+320	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	6.5 m Rt. "A"	Temp.	29 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
						GRANULAR SUBBASE (crushed stone; visual)							
SS-1	X	10*	2 2 3	5	1	SANDY LOAM, very loose to medium dense, wet, gray (fill; visual)							
SS-2	X	10*	9 9 11	10	3	SAND, medium dense, wet, gray, A-3, Lab No. 4156SL							
S-3	X	55	6 6 5										
						End of Boring at 3.0 m							
						*Two attempts.							

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	0.8	BF
Depth to Cave-in		1.1	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/6/01 End 3/6/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-42
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	14+480	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	1.5 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1	X	65	6 7 5			GRANULAR SUBBASE (crushed stone; visual)							
						SANDY LOAM, with some gravel, medium dense, moist, gray (fill; visual)							
SS-2	X	55	4 6 6	5	1	SAND, medium dense, wet, gray, with trace organic matter, A-3, Lab No. 4156SL							
SS-3	X	65	9 10 11	10	2	SAND AND GRAVEL, medium dense to loose, wet, gray (visual)							
SS-4	X	100	5 7 8		3	SAND, medium dense, wet, gray, A-3, Lab No. 4156SL							
						End of Boring at 3.0 m							
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	NW	BF
Depth to Cave-in		1.2	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/9/01 End 3/9/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-43
Elevation 178.0
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	14+640	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	9 m Rt. "A"	Temp.	29 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		65	7 10 10			SANDY LOAM, medium dense, moist, brown, with concrete and brick fragments (fill; visual)							
SS-2		50	8 12 13	5	1								
SS-3		35	3 4 5			SAND, loose to medium dense, wet, gray, A-3, Lab No. 4156SL							
SS-4		100	8 10 12	10	3								
SS-5		100	3 5 7	15	5	SAND, medium dense to loose, wet, gray, with trace organic matter, A-3, Lab No. 4156SL							
SS-6		100	4 4 6	20	6								
						End of Boring at 6.1 m							

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	0.9	BF
Depth to Cave-in		1.1	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/6/01 End 3/6/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-44
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	14+780	Weather	Cloudy	Driller	E.D.
Struct. No.	---	Offset	1 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	6 5 5			GRANULAR SUBBASE (crushed stone; fill; visual)							
						SAND, with some gravel, loose, moist, brown and black, with concrete and brick fragments (fill; visual)							
SS-2		65	5 7 7	5	1	SAND AND GRAVEL, medium dense, moist, brown (visual)							
SS-3		65	4 5 6		2								
SS-4		65	4 5 6	10	3								
						SAND, medium dense, wet, gray, A-3, Lab No. 4156SL							
SS-5		65	5 6 7	15	4 5								
SS-6		65	5 7 8	20	6								
						End of Boring at 6.1 m							

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.7	1.7	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/9/01 End 3/9/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-45
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	14+940	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	7 m Rt. "A"	Temp.	38 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE PORTLAND CEMENT CONCRETE							
SS-1		45	4 5 5			GRANULAR SUBBASE (crushed stone; visual)							
						SANDY LOAM, loose, moist, dark gray, with concrete fragments (fill; visual)							
SS-2		45	4 3 3	5	1								
SS-3		100	3 5 5		2								
SS-4		100	4 7 9	10	3								
						SAND, loose to medium dense, wet, brown to gray below 1.8 m, A-3, Lab No. 4156SL							
SS-5		100	6 7 8	15	4								
					5								
SS-6		100	6 8 10	20	6								
						End of Boring at 6.1 m							

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	NW	BF
Depth to Cave-in		1.5	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/7/01 End 3/7/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc

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LOG OF TEST BORING

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-46
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	15+100	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	8 m Rt. "A"	Temp.	38 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		60	4 2 1			**SANDY LOAM,** very loose, moist, black, with stone fragments and little organic matter (fill; visual) SS-1: LOI = 14.5%				41.1			
					1								
SS-2		65	3 4 5	▽5									
SS-3		80	4 6 7		2								
SS-4		100	7 9 11	10	3	**SAND,** loose to medium dense, wet, brown to gray below 4 m, A-3, Lab No. 4156SL							
					4								
SS-5		100	3 4 4	15									
					5								
SS-6		100	6 7 7										
				20	6	End of Boring at 5.3 m							

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.5	NW	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/7/01 End 3/7/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION Inc

LOG OF TEST BORING

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-47
Elevation 178.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	15+260	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	1.5 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		65	5 6 4			SANDY LOAM, loose, moist, dark gray, with rock fragments (fill; visual)							
SS-2		100	2 3 3	5	1								
SS-3		65	3 4 6		2								
SS-4		65	6 7 8	10	3	SAND, loose to medium dense, wet, brown to gray below 4 m, A-3, Lab No. 4156SL							
SS-5		65	5 6 7	15	4								
					5	End of Boring at 4.6 m							
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	2.0	BF
Depth to Cave-in		2.1	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/8/01 End 3/8/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-48
Elevation 178.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	15+396	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	1.5 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		85	8 9 10			SANDY LOAM, black (fill; visual)							
					1	SAND, loose, moist, brown, A-3, Lab No. 4156SL							
SS-2		85	6 8 10	5		GRAVELLY SAND, medium dense, wet, brown (visual)							
						▽							
SS-3		100	7 10 11		2								
SS-4		100	7 10 12	10	3	SAND, medium dense, wet, brown to gray below 2.4 m, A-3, Lab No. 4156SL							
					4								
SS-5		100	6 9 9										
				15		End of Boring at 4.6 m							
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	NW	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/8/01 End 3/8/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-49
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	15+583	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	7 m Rt. "A"	Temp.	38 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		50	3 3 3			SANDY LOAM, with some gravel, loose, moist, dark gray, with large stone fragments (fill; visual)							
					1								
SS-2		70	4 5 6	▽									
				5									
SS-3		100	5 7 7		2								
SS-4		100	4 7 9			SAND, medium dense, wet, brown to gray below 4 m, A-3, Lab No. 4156SL							
				10	3								
					4								
SS-5		100	6 8 10										
				15		End of Boring at 4.6 m							
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.4	NW	BF
Depth to Cave-in		1.7	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/7/01 End 3/7/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-50
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	15+720	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	7 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		100	3 4 4			**GRANULAR SUBBASE** (crushed stone; visual)				35.4			
						SANDY LOAM, loose, moist, brown and black, with little organic matter (fill; visual) SS-1: LOI = 7.8%							
SS-2		100	3 4 5	5	1								
SS-3		40	3 4 4		2	**SAND,** loose to medium dense, wet, brown, A-3, Lab No. 4156SL							
SS-4		100	4 6 8	10	3								
SS-5		90	5 7 9										
					4	End of Boring at 3.7 m							
				15	5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	NW	BF
Depth to Cave-in		1.7	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/8/01 End 3/8/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-51
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	15+860	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	7 m Rt. "A"	Temp.	38 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1		100	3 4 5			**GRANULAR SUBBASE** (crushed stone; visual)							
						SANDY LOAM, moist, black (fill; visual)							
					1	**SAND,** loose, moist, brown, A-3, Lab No. 4156SL							
SS-2		100	6 7 8	5		**GRAVELLY SAND,** medium dense, moist, brown (visual)							
						▽							
SS-3		100	5 7 7		2	**SAND,** medium dense, moist to wet, brown, A-3, Lab No. 4156SL							
S-4		100	5 8 9	10	3								
SS-5		100	6 9 11										
					4	End of Boring at 3.7 m							
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	NW	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/8/01 End 3/8/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION Inc
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-52
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	16+020	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	7 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m³	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1	X	65	3 3 2			**GRANULAR SUBBASE** (crushed stone; visual)							
					1	**SANDY LOAM,** very loose, moist, black, with stone fragments (fill; visual)							
SS-2	X	65	3 4 4	5									
						SAND, loose to medium dense, moist to wet, brown to gray below 1.8 m, A-3, Lab No. 4156SL							
SS-3	X	65	3 6 6		2								
SS-4	X	35*	8 10 12	10	3	**SAND,** with some gravel, medium dense, wet, gray, A-3, Lab No. 4156SL							
						End of Boring at 3.0 m							
						*Two attempts.							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	NW	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/8/01 End 3/8/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. RB-53
Elevation 178.3
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	16+140	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	7 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
						PORTLAND CEMENT CONCRETE							
SS-1	X	100	5 4 3			GRANULAR SUBBASE (crushed stone; visual)							
						SANDY LOAM, loose, moist, black, with wood, steel and glass fragments (fill; visual)							
SS-2	X	100	4 6 6	5	1								
						SAND, loose to medium dense, wet, brown, A-3, Lab No. 4156SL							
SS-3	X	65	4 5 5		2								
SS-4	X	65	5 8 11	10	3								
						End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.8	NW	BF
Depth to Cave-in		2.0	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/8/01 End 3/8/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. RB-54
Elevation 178.2
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	16+277	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	8 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m3	W %	LL %	PL %	PI %
						ASPHALTIC CONCRETE							
SS-1		100	3 3 3			**SANDY LOAM,** loose, moist, black, with trace cinders and asphalt (fill; visual)							
					1								
SS-2		100	6 8 9	▽		**SAND AND GRAVEL,** medium dense, wet, brown (visual)							
				5 ▼									
SS-3		100	5 6 7		2	**SAND,** medium dense, wet, brown, A-3, Lab No. 4156SL							
SS-4		100	5 6 7										
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.2	1.5	BF
Depth to Cave-in		1.6	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/8/01 End 3/8/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

EARTH EXPLORATION, Inc.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. PC-1
Elevation 178.4
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	12+400	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	1.5 m Lt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						PORTLAND CEMENT CONCRETE							
SS-1		80	10 15 14			SAND AND GRAVEL, medium dense, moist, gray (fill; visual)							
					1								
SS-2		65	5 6 6										
				5									
SS-3		65	4 5 6		2	SAND, medium dense, wet, brown to gray below 0.9 m, A-3, Lab No. 4156SL							
SS-4		100	4 6 6										
				10	3								
						End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	1.7	BF
Depth to Cave-in		1.8	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/13/01 End 3/13/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Project: US 41 (Calumet Ave), I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation

Boring No. PC-2
Elevation 178.4
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	12+700	Weather	Snow	Driller	E.D.
Struct. No.	---	Offset	11.5 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						PORTLAND CEMENT CONCRETE							
SS-1		65	26 21 19										
					1	**SANDY LOAM,** with some gravel, dense, moist, brown (fill; visual)							
SS-2		65	27 18 15										
				5									
SS-3		65	5 2 2		2	**SAND,** very loose, wet, dark gray, with trace organic matter, A-3, Lab No. 4155SL							
						SAND, very loose to loose, wet, dark gray, with trace organic matter, A-3, Lab No. 4156SL							
SS-4		65	3 4 5										
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	2.0	1.7	BF
Depth to Cave-in		2.0	

The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/7/01 End 3/7/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

LOG OF TEST BORING

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

EARTH EXPLORATION, Inc.
7770 West New York Street · Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

Boring No. PC-3
Elevation 178.1
Datum USC&GS
EEI Proj. No. 1-6437
Sheet 1 of 1

Proj. No.	STP-019-6( )	Station	13+000	Weather	Sunny	Driller	E.D.
Struct. No.	---	Offset	6 m Rt. "A"	Temp.	30 Deg F	Inspector	R.O.

SAMPLE No.	Type	Rec %	Blow Counts	Depth ft	Depth m	DESCRIPTION/CLASSIFICATION and REMARKS	q_p kPa	q_u kPa	γ_d kg/m^3	W %	LL %	PL %	PI %
						PORTLAND CEMENT CONCRETE							
SS-1	X	65	26 15 16			GRANULAR SUBBASE (crushed stone; visual)							
				▽ ▼ 1		SANDY LOAM, with some gravel, dense to medium dense, wet, black, with trace organic matter (fill; visual)							
SS-2	X	35	3 6 5			SS-2: LOI = 6.1%				23.2			
				5									
SS-3	X	55	3 2 3		2								
						SAND, loose to medium dense, wet, gray, A-3, Lab No. 4156SL							
S-4	X	80	5 5 7										
				10	3	End of Boring at 3.0 m							
					4								
				15									
					5								
				20	6								

WATER LEVEL OBSERVATIONS

Depth m	▽ While Drilling	▼ Upon Completion	▽ After Drilling
Depth to Water	1.1	1.1	BF
Depth to Cave-in		1.2	

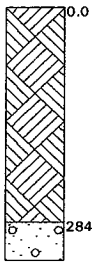
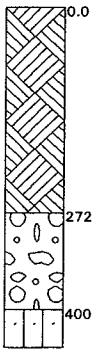
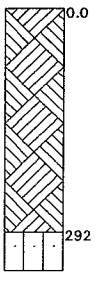
The stratification lines represent the approximate boundary between soil/rock types and the transition may be gradual.

GENERAL NOTES

Start 3/7/01 End 3/7/01 Rig CME 75
Drilling Method 83 mm I.D. HSA Truck
Remarks Backfilled with auger cuttings, bentonite chip plug and concrete patch at surface.

SUMMARY OF PAVEMENT CORES

Project No.: STP-019-6( )
Project: US 41 (Calumet Ave.) from I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation
EEI Project No.: 1-6437

CORE NO.	STATION	OFFSET	DEPTH	CORE DESCRIPTION	SKETCH
PC-1	12+400	1.5 m Lt. "A"	0 - 284 mm Subgrade	Portland Cement Concrete (19 mm maximum steel slag aggregate) Sand and Gravel, medium dense, moist, gray (fill)	
PC-2	12+700	11.5 m Rt. "A"	0 - 272 mm 272 - 400 mm Subgrade	Portland Cement Concrete (19-mm maximum steel slag aggregate) Granular Subbase (crushed stone) Sandy Loam, with some gravel, dense, moist, gray (fill)	
PC-3	13+000	6 m Rt. "A"	0 - 292 mm Subgrade	Portland Cement Concrete (19-mm maximum steel slag aggregate), with 32-mm diameter steel bar at 165 mm and 6-mm diameter bar at bottom of core Sandy Loam, dense to medium dense, wet, black, with trace organic matter (fill)	

[1] Pavement core and soil descriptions based on visual observation only. Subgrade conditions based on test borings performed at core locations.

SUMMARY OF SOUNDINGS

Project No.: STP-019-6( )
Project: US 41 (Calumet Ave.) From I-80/94 to US 12/20
Location: Hammond, Indiana
Client: Indiana Department of Transportation
EEI Project No.: 1-6437

Method: Hand auger sounding

Sounding No.	Station	Offset	Elevation	**Description** - All Classifications are visual
S-1	11+560	12.5 m Rt. "A"	175.2	Water Depth: 1.6 m 0.0 - 2.2 m Sediment 2.2 - 2.5 m Sand, loose to medium dense
S-2	11+600	12.5 m Rt. "A"	175.2	Water Depth: 1.6 m 0.0 - 1.1 m Sediment 1.1 - 1.4 m Sand, medium dense
S-3	11+840	10 m Lt. "A"	176.8	Water Depth: 0.7 m 0.0 - 0.5 m Sediment 0.5 - 0.8 m Sand, loose to medium dense
S-4	11+880	12.5 m Rt. "A"	176.4	Water Depth: 0.5 m 0.0 - 0.8 m Sediment 0.8 - 1.1 m Sand, loose to medium dense
S-5	11+920	10.5 m Lt. "A"	177.1	Water Depth: 0.3 m 0.0 - 0.5 m Sediment 0.5 - 0.8 m Sand, loose
S-6	11+920	12 m Rt. "A"	176.5	Water Depth: 0.3 m 0.0 - 0.7 m Sediment 0.7 - 1.0 m Sand, loose
S-7	12+020	10 m Lt. "A"	177.1	Water Depth: 0.4 m 0.0 - 0.4 m Sediment 0.4 - 0.7 m Sand, loose
S-8	12+020	12.5 m Rt. "A"	176.6	Water Depth: 0.3 m 0.0 - 0.9 m Sediment 1.9 - 1.2 m Sand, loose
S-9	12+050	12.5 m Rt. "A"	176.6	Water Depth: 0.3 m 0.0 - 0.4 m Sediment 0.4 - 0.7 m Sand, loose
S-10	12+120	10.5 m Lt. "A"	177.2	Water Depth: 0.3 m 0.0 - 0.3 m Sediment 0.3 - 0.6 m Sand, loose

SUMMARY OF SOUNDINGS

Project No.: STP-019-6( )
Project: US 41 (Calumet Ave.) From I-80/94 to US 12/20
Location: Hammond, Indiana
Client: Indiana Department of Transportation
EEI Project No.: 1-6437

Method: Hand auger sounding

Sounding No.	Station	Offset	Elevation	**Description** - All Classifications are visual
S-11	12+120	12.5 m Rt. "A"	175.9	Water Depth: 0.9 m 0.0 - 0.3 m Sediment 0.3 - 0.6 m Sand, loose
S-12	12+180	12 m Rt. "A"	176.3	Water Depth: 0.5 m 0.0 - 0.8 m Sediment 0.8 - 1.1 m Sand, loose
S-13	12+220	13 m Rt. "A"	176.1	Water Depth: 0.7 m 0.0 - 0.4 m Sediment 0.4 - 0.7 m Sand, loose to medium dense
S-14	12+260	12.5 m Rt. "A"	176.6	Water Depth: 0.2 m 0.0 - 0.5 m Sediment 0.5 - 0.8 m Sand, loose to medium dense
S-15	12+260	10 m Lt. "A"	177.3	Water Depth: 0.2 m 0.0 - 0.9 m Sediment 0.9 - 1.2 m Sand, loose to medium dense
S-16	12+320	13 m Rt. "A"	176.4	Water Depth: 0.4 m 0.0 - 0.9 m Sediment 0.9 - 1.2 m Sand, medium dense
S-17	13+100	9 m Lt. "A"	177.4	Water Depth: 0.2 m 0.0 - 0.8 m Sediment 0.8 - 1.1 m Sandy loam, loose, black
S-18	13+340	9.5 m Lt. "A"	177.2	Water Depth: 0.2 m 0.0 - 0.1 m Sediment Hand auger refusal at 0.1 m
S-19	13+340	13.5 m Rt. "A"	177.5	Water Depth: 0.8 m 0.0 - 0.3 m Sediment 0.3 - 0.6 m Sandy loam, medium dense, dark gray
S-20	13+400	9 m Lt. "A"	177.4	Water Depth: 0.2 m 0.0 - 0.8 m Sediment 0.8 - 1.1 m Sandy loam, loose, dark gray

SUMMARY OF SOUNDINGS

Project No.: STP-019-6( )
Project: US 41 (Calumet Ave.) From I-80/94 to US 12/20
Location: Hammond, Indiana
Client: Indiana Department of Transportation
EEI Project No.: 1-6437

Method: Hand auger sounding

Sounding No.	Station	Offset	Elevation	**Description** - All Classifications are visual
S-21	13+400	12.5 m Rt. "A"	177.4	Water Depth: 0.4 m 0.0 - 0.1 m Sediment 0.1 - 0.4 m Sand and gravel, medium dense, dark gray
S-22	13+440	12 m Rt. "A"	177.4	Water Depth: 0.5 m 0.0 - 0.3 m Sediment 0.3 - 0.6 m Sand and gravel, medium dense, dark gray
S-23	13+500	12 m Rt. "A"	177.4	Water Depth: 0.2 m 0.0 - 0.7 m Sediment 0.7 - 1.0 m Sand, loose
S-24	13+560	10 m Lt. "A"	177.6	Water Depth: 0.05 m 0.0 - 0.6 m Sediment 0.6 - 0.9 m Sandy loam, medium dense, dark gray
S-25	13+560	11.5 m Rt. "A"	177.5	Water Depth: 0.2 m 0.0 - 1.0 m Sediment 1.0 - 1.3 m Sand, loose, gray
S-26	13+620	10 m Lt. "A"	177.5	Water Depth: 0.2 m 0.0 - 0.7m Sediment 0.7 - 1.0 m Sand, loose
S-27	13+620	11.5 m Rt. "A"	177.3	Water Depth: 0.2 m 0.0 - 0.8 m Sediment 0.8 - 1.1 m Sandy loam, loose, dark gray
S-28	13+880	9 m Lt. "A"	177.5	Water Depth: 0.2 m 0.0 - 0.2 m Sediment 0.2 - 0.5 m Sandy loam, loose, dark gray

Note: Due to saturated/very loose nature of sediment causing little or no recovery on hand auger flights, soil descriptions are typically based on hand auger resistance.

APPENDIX E

SUMMARY OF SPECIAL LABORATORY TEST RESULTS

SUMMARY OF CLASSIFICATION TEST RESULTS

GRAIN SIZE DISTRIBUTION CURVE (4)

SUMMARY OF SPECIAL LABORATORY TEST RESULTS

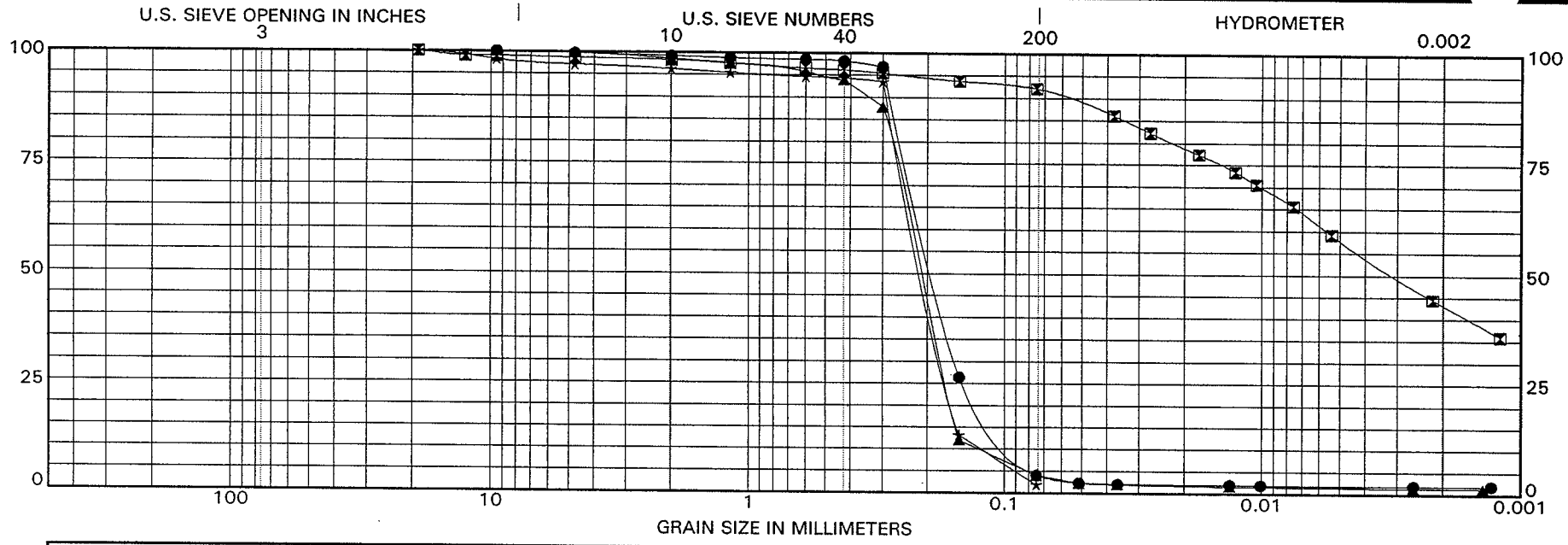
Project No.: STP-019-6( )
Project: US 41 (Calumet Avenue) from I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation
EEI Project No.: 1-6437

Laboratory Number	Test Boring No.	Sample Number	Sample Interval Depth	Moisture Content, %	pH	LOI, %
4157SL	RB-1	SS-3	1.8 - 2.3 m	19.0		
4157SL		SS-4	2.6 - 3.0 m	15.4		
4157SL		SS-5	4.1 - 4.6 m	14.7		
4157SL		SS-6	5.6 - 6.1 m	28.6		
4157SL		SS-7	7.2 - 7.6 m	22.9		
4157SL		SS-8	8.7 - 9.1 m	20.2		
4157SL	RB-2	SS-5	4.1 - 4.6 m	22.3		
4157SL	RB-3	SS-2	1.1 - 1.5 m	19.7		
4153SL		SS-3	1.8 - 2.3 m	20.6	7.2	
4157SL		SS-4	2.6 - 3.0 m	21.3		
4157SL	RB-4	SS-2	1.1 - 1.5 m	25.5		
4157SL		SS-4	2.6 - 3.0 m	16.9		
4157SL	RB-5	SS-3	1.8 - 2.3 m	22.0		
4157SL		SS-4	2.6 - 3.0 m	23.0		
4157SL		SS-5	3.4 - 3.8 m	21.8		
4157SL	RB-6	SS-3	1.8 - 2.3 m	26.0		
4157SL		SS-4	2.6 - 3.0 m	25.4		
4157SL	RB-7	SS-3	1.8 - 2.3 m	30.7		
4157SL		SS-4	2.6 - 3.0 m	26.8		
4157SL	BR-8	SS-3	1.8 - 2.3 m	21.4		
4157SL		SS-4	2.6 - 3.0 m	21.0		
4157SL	RB-9	SS-4	2.6 - 3.0 m	26.0		
4157SL	RB-10	SS-4	2.6 - 3.0 m	21.4		
4157SL	RB-11	SS-4	2.6 - 3.0 m	26.7		
4157SL		SS-5	3.4 - 3.8 m	23.7		
4157SL		SS-6	4.1 - 4.6 m	22.5		
4157SL	RB-12	SS-6	4.1 - 4.6 m	21.9		
4157SL	RB-24	SS-2	1.1 - 1.5 m	81.0		24.3
4154SL	RB-28	SS-3	1.8 - 2.3 m	---	6.4	

SUMMARY OF SPECIAL LABORATORY TEST RESULTS

Project No.: STP-019-6( )
Project: US 41 (Calumet Avenue) from I-80/94 to US 12/20
Location: Lake County, Indiana
Client: Indiana Department of Transportation
EEI Project No.: 1-6437

Laboratory Number	Test Boring No.	Sample Number	Sample Interval Depth	Moisture Content, %	pH	LOI, %
4157SL	RB-28	SS-4	2.6 - 3.0 m			2.1
4157SL	RB-32	SS-2	1.1 - 1.5 m	120.5		17.4
4157SL	RB-33	SS-2	1.1 - 1.5 m	31.6		22.5
4157SL		SS-3	1.8 - 2.3 m			4.6
4157SL	RB-37	SS-1	0.3 - 0.8 m	85.9		22.5
4157SL	RB-38	SS-1	0.3 - 0.8 m	77.0		12.8
4155SL		SS-2	1.1 - 1.5 m	---	7.0	
4156SL	RB-40	SS-4	2.6 - 3.0 m	---	7.0	
4157SL	RB-46	SS-1	0.3 - 0.8 m	41.1		14.5
4157SL	RB-50	SS-1	0.3 - 0.8 m	35.4		7.8
4157SL	PC-3	SS-2	1.1 - 1.5 m	23.2		6.1



BOULDERS	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

	Lab No.	Boring	Station/Offset/Line	Sample No.	Depth m	Classification	% Passing			% Gravel	% Sand	% Silt	% Clay	% Coll.	LL	PL	PI	Opt. Moist.	γ_{max} kg/m³	* CBR at	
							No.10	No.40	No.200											93%	97%
●	4154SL	RB-28	12+000 1.5 m Rt. "A"	SS-3	1.8 - 2.3	SAND A-3 (0)	99.1	98.1	4.1	0.9	95.0	2.2	1.9	1.3	NP	NP	NP				
⊠	4153SL	RB-3	3+960 5 m Lt. "A"	SS-3	1.8 - 2.3	CLAY A-6 (17)	98.2	96.1	92.1	1.8	6.1	48.9	43.2	33.5	37	19	18				
▲	4155SL	RB-38	13+890 2 m Rt. "A"	SS-2	1.1 - 1.5	SAND A-3 (0)	98.5	93.9	4.0	1.5	94.5	2.6	1.4	0.9	NP	NP	NP				
★	4156SL	RB-40	14+180 5 m Lt. "A"	SS-4	2.6 - 3.0	SAND A-3 (0)	96.2	94.3	1.9	3.8	94.3		1.9		NP	NP	NP				

EARTH EXPLORATION, Inc.

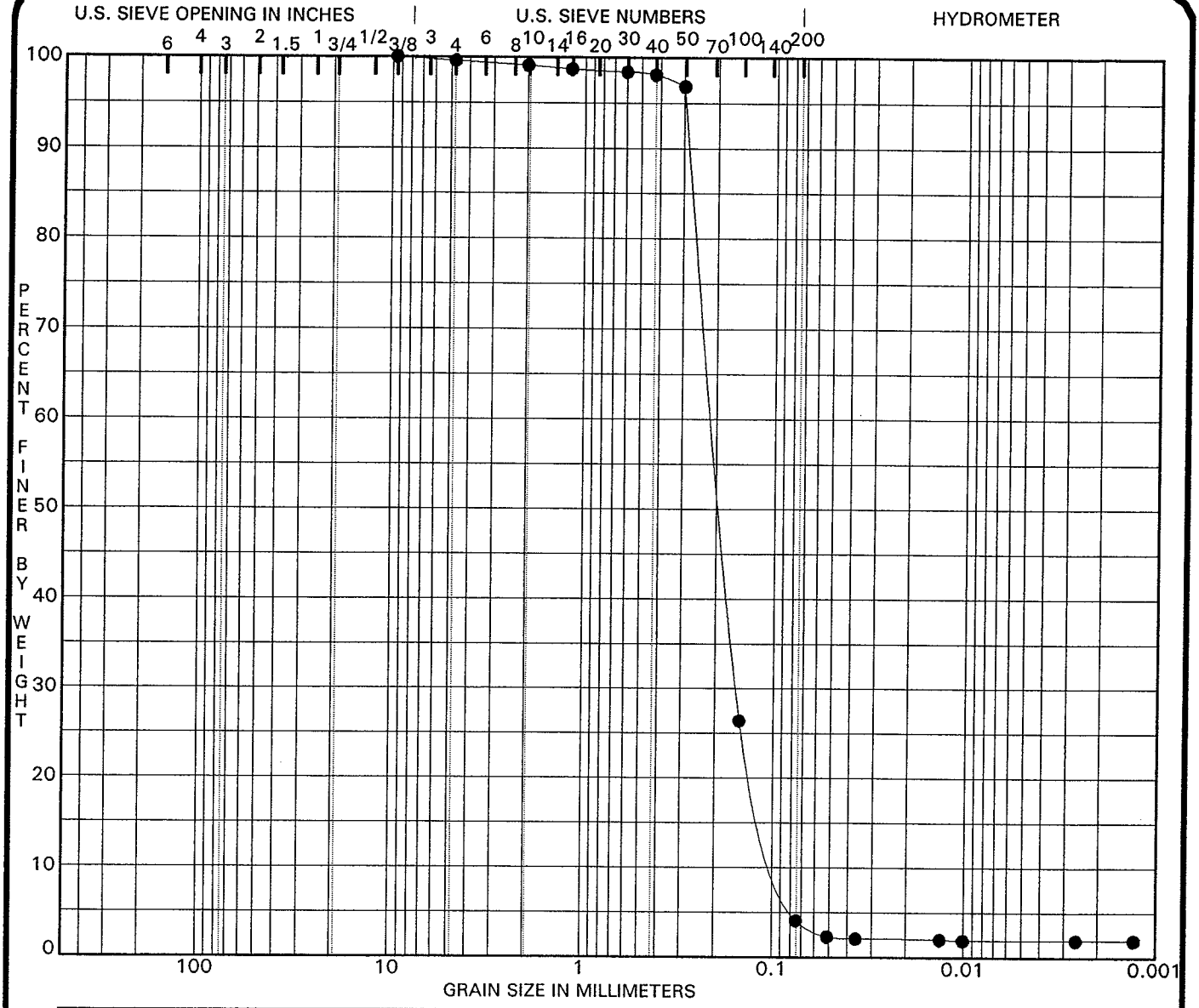
Project No. STP-019( )
Structure No. ---
EEI Project No. 1-6437

Project Location US 41 (Calumet Ave), I-80/94 to US 12/20
Lake County, Indiana
Client Indiana Department of Transportation

SUMMARY OF CLASSIFICATION TEST RESULTS

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)

* See text for recommended values.



BOULDERS	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

	Sample Identification	Station / Offset / Line	Depth, m.	Elevation, USCGS
●	RB-28 SS-3	12+000 1.5 m Rt. "A"	1.8 - 2.3	176.5 -176.0

Lab No.	Classification	pH	%Gravel	%Sand	%Silt	%Clay	MC%	LL	PL	PI
4154SL	SAND A-3 (0)	6.4	0.9	95.0	2.2	1.9	---	NP	NP	NP

Remarks:

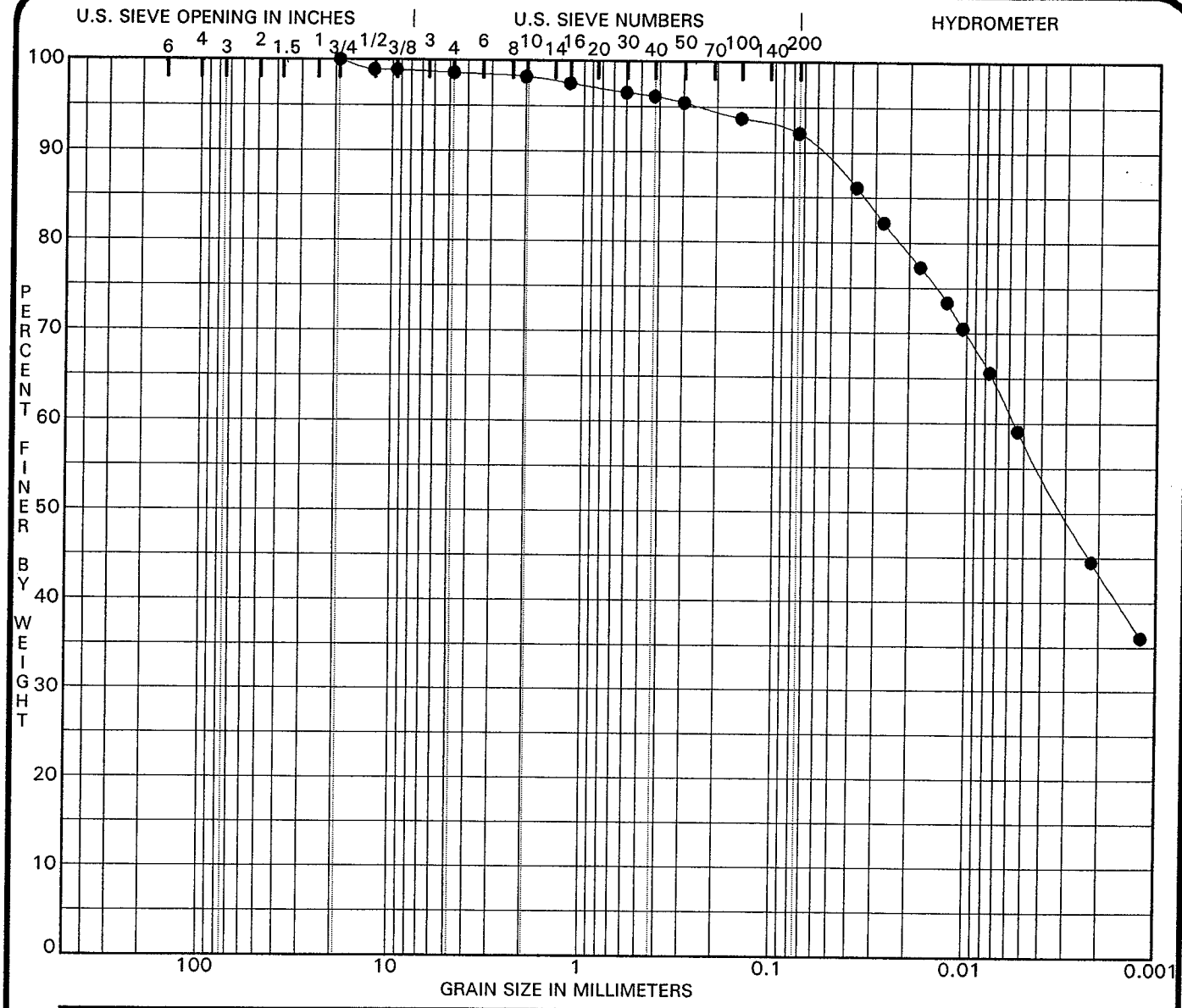
EARTH EXPLORATION Inc

Project No. STP-019( )
Structure No. ---
EEI Proj. No. 1-6437

Project US 41 (Calumet Ave), I-80/94 to US 12/20
Location Lake County, Indiana
Client Indiana Department of Transportation

GRAIN SIZE DISTRIBUTION CURVE

Earth Exploration, Inc.
7770 West New York Street Indianapolis, Indiana 46214
317-273-1690 / 317-273-2250 (Fax)



BOULDERS	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

Sample Identification		Station / Offset / Line	Depth, m.	Elevation, USCGS
● RB-3	SS-3	3+960 5 m Lt. "A"	1.8 - 2.3	180.6 -180.1

Lab No.	Classification	pH	%Gravel	%Sand	%Silt	%Clay	MC%	LL	PL	PI
4153SL	CLAY A-6 (17)	7.2	1.8	6.1	48.9	43.2	20.6	37	19	18

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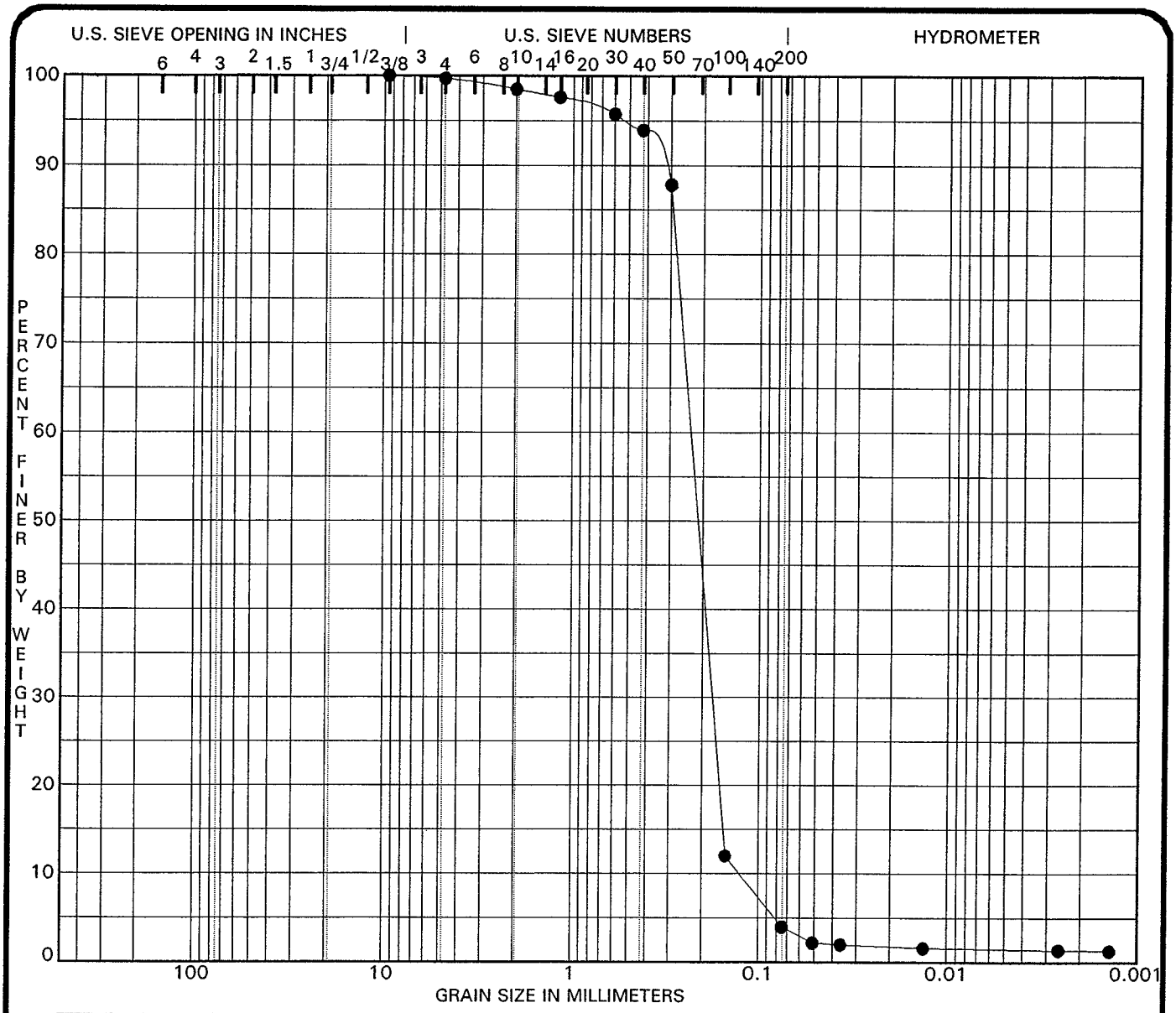

BOULDERS	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

	Sample Identification		Station / Offset / Line	Depth, m.	Elevation, USCGS
●	RB-38	SS-2	13+890 2 m Rt. "A"	1.1 - 1.5	177.0 -176.6

Lab No.	Classification	pH	%Gravel	%Sand	%Silt	%Clay	MC%	LL	PL	PI
4155SL	SAND A-3 (0)	7.0	1.5	94.5	2.6	1.4	---	NP	NP	NP

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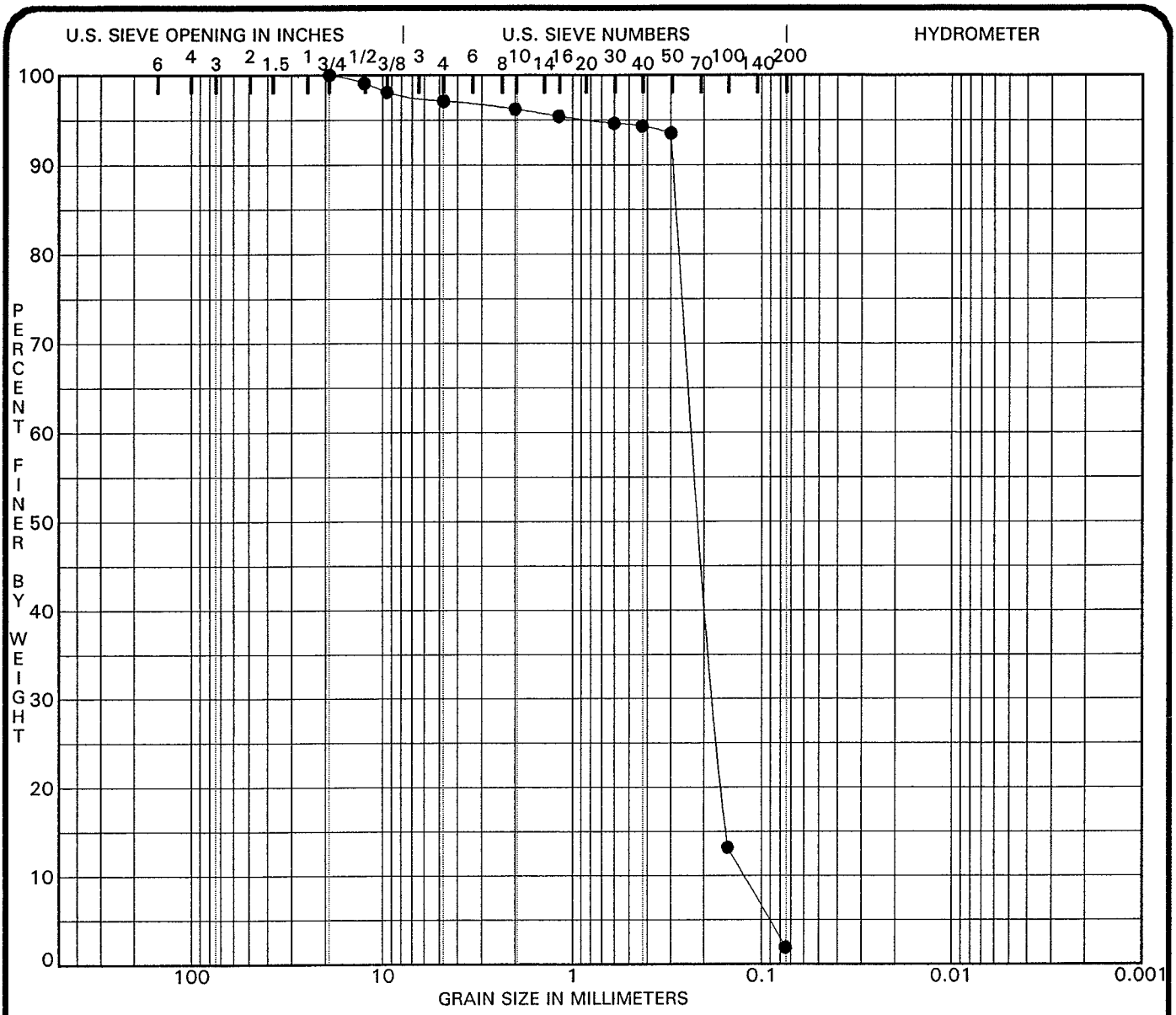

BOULDERS	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

Sample Identification		Station / Offset / Line	Depth, m.	Elevation, USCGS
● RB-40	SS-4	14+180 5 m Lt. "A"	2.6 - 3.0	175.6 -175.1

Lab No.	Classification	pH	%Gravel	%Sand	%Silt	%Clay	MC%	LL	PL	PI
4156SL	SAND A-3 (0)	7.0	3.8	94.3	1	9	---	NP	NP	NP

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Structure No. --- **Location** Lake County, Indiana

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