## **REPORT**

**OF** 

## SUBSURFACE INVESTIGATION

**FOR** 

EMBANKMENTS (STATION 50+23 to 352+00)

PROJECT SCI-823-0.00

PHASE 3 - STAGE I

SCIOTO COUNTY, OHIO

For:

TranSystems Corporation 5747 Perimeter Drive Suite 240 Dublin, Ohio 43017



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# REPORT OF SUBSURFACE EXPLORATION FOR

EMBANKMENTS (STATION 50+23 to 352+00)
PHASE 3 – STAGE I
PROJECT SCI-823-0.00
SCIOTO COUNTY, OHIO

## 1.0 INTRODUCTION

Phase 3 of this project consists of the construction of approximately 5.7 miles of new mainline roadway located in Scioto County, Ohio. The findings and recommendations presented in this document pertain to Phase 3 mainline embankments and soil cuts from Station 50+23 to 352+00 of the SCI-823-0.00 Portsmouth Bypass project only. The findings and recommendations for the rock cut sections and the Phase 1 and Phase 2 embankments for this project will be submitted in separate documents.

The Phase 3 area begins at the U.S. 52 interchange and ends at Station 352+00, approximately feet south of the proposed Shumway Hollow Road interchange. An interchange at S.R. 140 (Webster Street) is also included in Phase 3. The analyses and recommendations pertaining to the interchange areas can be found in the respective interchange reports, which are submitted separately. In addition, the evaluation of the embankments in the Highland Bend area, between approximate Stations 105+75 and 131+54, and the culverts within Phase 3 will be submitted in separate documents. The Highland Bend embankments were analyzed separately because of the high fills and relatively poor soils in that area.

The purpose of this exploration was to 1) determine the subsurface conditions to the depths of the borings, 2) evaluate the engineering characteristics of the subsurface materials, and 3) provide information to assist in designing the roadway embankments and pavements.

The geotechnical engineer has planned and supervised the performance of the geotechnical engineering services, has considered the findings, and has prepared this report in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are made as to the professional advice included in this report.

## 2.0 GENERAL PROJECT INFORMATION

Approximately 2.7 miles of side hill or embankment fills and 2.7 miles of soil and rock cuts are proposed along the centerline of S.R. 823 in Phase 3. A maximum embankment height of 219.4 feet is anticipated near Station 289+25. The maximum depth of cut is anticipated to be 186.3 feet near Station 148+50.

The analyses and recommendations presented in this report have been made on the basis of the foregoing information. If the proposed roadway location or concept is changed or differs from that assumed, DLZ should be informed of the changes so that recommendations and conclusions presented in this report may be revised as necessary.

### 3.0 SUBSURFACE INVESTIGATION

The subsurface investigation for the Phase 3 embankments consisted of drilling a total of 90 borings, excluding those drilled in the Highland Bend area. The 90 borings considered for the roadway embankment analyses consist of 20 culvert borings (C-25 through C-119, non-inclusive) and 70 roadway borings (R-24 through R-205 and R-2118 through R-2184, non-inclusive). The borings were drilled primarily between August 26, 2004 and February 22, 2007. Six of the culvert borings, C-114 through C-119, were drilled between June 20 and July 3, 2007. The borings were extended to depths primarily between 7.0 to 55.0 feet and were drilled with both ATV-mounted and truckmounted drill rigs. One boring, R-143, was drilled to a depth of 100.0 feet. Individual boring logs are included in Appendix A. The locations of the borings are shown on the Boring Location Plan in Appendix A. Information concerning the drilling procedures and the boring log terminology is also presented in Appendix A.

Representatives of Lockwood, Lanier, Mathias and Noland, Inc. (2LMN) generally marked the locations of the roadway borings in the field and representatives of DLZ Ohio, Inc. generally marked the culvert boring locations. Representatives of 2LMN also determined the as-drilled ground surface elevations and locations of most of the boring locations. Boring locations which could not be determined with the survey equipment due to the dense vegetation were estimated from plans. The as-drilled boring locations and ground surface elevations are shown on the individual boring logs in Appendix A.

### 4.0 FINDINGS

### 4.1 General Information

The project is located in the Shawnee-Mississippian Plateau of the unglaciated portion of the Appalachian Plateau Physiographic Region. The project area is relatively underdeveloped, and contains limited secondary roadways. The area is characterized by rough, steep, broken, and severely dissected topography. The natural slopes are generally very steep, rising abruptly from the valley bottoms. The maximum existing topographic relief along the Phase 3 project centerline is approximately 397.5 feet and occurs between a high point near Station 281+50 at elevation 890.0 feet, and a low point near Station 135+50, at elevation 492.5 feet. The maximum vertical relief along the proposed finished grade is approximately 324.0 feet, with the lowest point at approximate Station 350+00 (elevation 548.1 feet) and the highest point near Station 253+00 (elevation 872.1 feet).

## 4.2 Geology of the Site

The genesis of the soils varies across the project location. Residual and colluvial soils are found on the ridge tops and the hillsides across the site. These soils are generally thin to moderately deep, covering moderate to steep slopes. Lacustrine soils, found in the valleys, are commonly known as "Minford Silts" or the Minford Complex. These deposits were formed during the early to middle Pleistocene age when the northward flowing Teays River system was blocked by the southward advance of the Kansan aged ice sheets. As the glaciers advanced, the course of the Teays River was blocked south of Chillicothe and a large lake was formed from the impoundment of the waterways. As a result of the impoundment, vast quantities of sediments were deposited ranging from 10 to 80 feet in thickness, thinning towards the margins. In this area, the Minford Complex is characterized by clays of high plasticity and high compressibility.

Bedrock within the structure area is primarily sandstone of the Logan Formation that is of Mississippian Age. Bedrock of the Pennsylvanian Breathitt Formation can be found at the top of the slopes, roughly above elevation 870.

### 4.3 Soil Conditions

At the ground surface, the borings encountered 1 to 12 inches of topsoil. Beneath the topsoil, the borings encountered primarily stiff to hard sandy silt (A-4a) and silt and clay (A-6a) with lesser amounts of loose to dense gravel with sand (A-1-b), gravel with sand and silt (A-2-4), sandy silt (A-4a), and silt (A-4b) and very stiff to hard clay (A-7-6) to depths of 2.0 to 36.0 feet below the ground surface to the top of severely weathered bedrock. Soils encountered in each of the Phase 3 fill sections are described below. For more detailed information, refer to the boring logs presented in Appendix A.

### Phase 3 Mainline Station 63+00 to 75+00

Borings R-24 to R-27, C-89, and C-90 were evaluated for this fill section and generally encountered stiff to very stiff sandy silt (A-4a), silt (A-4b), and silt and clay (A-6a) to depths ranging from 11.5 to 21.0 feet below the ground surface. Layers of very stiff clay (A-7-6) and loose to medium dense gravel with sand and silt (A-2-4) and sandy silt (A-4a) were also encountered. A 1.0 to 5.0-foot thick layer of severely weathered sandstone was encountered below the soil layers, generally below a depth of 11.0 feet.

### Phase 3 Mainline Station 166+50 to 168+50

Borings R-88 to R-92 were evaluated for this fill section and generally encountered a 1.6 to 1.7-foot thick layer of severely weathered sandstone below the topsoil. Boring R-90 encountered a hard sandy silt (A-4a) to a depth of 3.5 feet below the ground surface.

#### Phase 3 Mainline Station 173+50 to 188+00

Borings R-99 to R-105 and C-114 to C-117 were evaluated for this fill section and generally encountered stiff to hard sandy silt (A-4a), silt (A-4b), and silt and clay (A-6a) to depths ranging from 13.5 to 37.5 feet below the ground surface. The soil layers were 5.0 feet thick or less in Borings R-99, R-101, and R-105. Layers of medium stiff to hard clay (A-7-6) and loose to medium dense sandy silt (A-4a) and silt (A-4b) and very dense gravel (A-1-a) and were also encountered. A 0.5 to 5.3-foot thick layer of severely weathered sandstone was encountered below the soil layers, generally below a depth of 13.5 feet.

### Phase 3 Mainline Station 188+00 to 197+50

Borings R-106, R-106A, and R-107 were evaluated for this fill section and generally encountered medium stiff to hard sandy silt (A-4a) and silt and clay (A-6a) to depths ranging from 8.0 to 15.0 feet below the ground surface. Layers of medium dense sandy silt (A-4a) were also encountered. A 2.0-foot thick layer of severely weathered sandstone was encountered below the soil layers in Borings R-106 and R-107.

### Phase 3 Mainline Station 207+00 to 212+50

Borings R-115 to R-117, C-96, and C-97 were evaluated for this fill section and generally encountered stiff to hard sandy silt (A-4a) and silt and clay (A-6a) to depths ranging from 5.5 to 19.4 feet below the ground surface. Layers of loose to dense gravel with sand and silt (A-2-4), sandy silt (A-4a), and silt (A-4b) were also encountered. A 1.0 to 3.5-foot thick layer of severely weathered sandstone was encountered below the soil layers.

### Phase 3 Mainline Station 227+00 to 257+75

Borings R-126 to R-143, C-118, and C-119 were evaluated for this fill section and generally encountered very stiff to hard sandy silt (A-4a) and silt and clay (A-6a) and loose to medium dense sandy silt (A-4a) to depths ranging from 2.0 to 8.0 feet below the ground surface. Layers of hard silt (A-4b) and medium dense to dense coarse and fine sand (A-3a) and gravel with sand and silt (A-2-4) were also encountered in Boring C-119. A 1.0 to 4.0-foot thick layer of severely weathered sandstone or claystone was encountered below the soil layers. The severely weathered sandstone was 11.5 feet thick in Boring R-143.

## Phase 3 Mainline Station 268+00 to 273+00

Borings R-148 and R-149 were evaluated for this fill section and encountered hard silt and clay (A-6a) and clay (A-7-6) to depths ranging from 7.5 to 24.5 feet below the ground surface. A layer of severely weathered sandstone was encountered below a depth of 5.0 feet in Boring R-149.

## Phase 3 Mainline Station 289+00 to 306+50

Borings R-157 to R-168, R-2154, R-2157, R-2160, R-2168, and C-25 to C-29 were evaluated for this fill section and generally encountered loose to medium dense

gravel with sand (A-1-b), gravel with sand and silt (A-2-4), and silt (A-4b) to depths ranging from 13.0 to 20.5 feet below the ground surface. However, in Borings R-158, R-161, R-165, R-166, and R-2168, the soils extended only to depths of 6.0 feet or less. A 1.0 to 7.8-foot thick layer of severely weathered sandstone was encountered below the soil layers. The severely weathered sandstone was encountered directly below the topsoil in Borings R-2154 and R-2160.

### Phase 3 Mainline Station 308+50 to 324+00

Borings R-171 to R-186, R-2176, R-2183, R-2184, C-30, and C-31 were evaluated for this fill section and generally encountered very stiff to hard sandy silt (A-4a) and silt and clay (A-6a) and loose dense gravel with sand and silt (A-2-4), sandy silt (A-4a), and silt (A-4b) to depths ranging from 2.5 to 14.0 feet below the ground surface. Layers of hard silt (A-4b) and clay (A-7-6) were also encountered. A 1.0 to 6.0-foot thick layer of severely weathered sandstone was encountered below the soil layers. The severely weathered sandstone was encountered directly below the topsoil in Boring R-171.

#### Phase 3 Mainline Station 328+00 to 330+00

Borings R-192, R-193, C-34, and C-35 were evaluated for this fill section and generally encountered very stiff to hard sandy silt (A-4a) and medium dense sandy silt (A-4a) and silt (A-4b) to depths ranging from 3.0 to 5.0 feet below the ground surface. A 2.0 to 8.5-foot thick layer of severely weathered sandstone was encountered below the soil layers.

### Phase 3 Mainline Station 343+50 to 348+00

Borings R-203, R-206, C-98, and C-99 were evaluated for this fill section and generally encountered hard sandy silt (A-4a) and silt and clay (A-6a) and very loose gravel with sand and silt (A-2-4) to depths ranging from 3.0 to 8.1 feet below the ground surface. A 1.0-foot thick layer of severely weathered sandstone was encountered below the soil layers in Boring C-99. The severely weathered sandstone was encountered directly below the topsoil in Boring R-205 to a depth of 4.5 feet.

### 4.4 Bedrock Conditions

Bedrock was encountered in all of the borings and confirmed by coring a minimum of 5 feet of bedrock. Bedrock encountered in the borings corresponds with the available geologic references. The cores obtained consist primarily of medium hard to hard sandstone or sandstone interbedded with shale or siltstone with occasional layers of siltstone, claystone, and shale. A layer of severely weathered to decomposed bedrock was generally encountered immediately above the higher quality rock encountered in the rock cores. The layer of severely weathered rock generally ranged in thickness from 0.5 to 6.0 feet but was as thick as 14.0 feet and 17.0 feet in Borings R-177 and R-101, respectively. Refer to the boring logs presented in Appendix A for more detailed information.

#### 4.5 Groundwater Conditions

Seepage was observed in 33 of the 90 borings at depths ranging from 1.0 to 26.5 feet below the ground surface. In general, groundwater was not encountered prior to rock coring. Borings C-28, C-31, C-117, R-24, R-25, R-2157, and R-2176 encountered groundwater at depths ranging from 6.0 to 34.3 feet below the ground surface prior to rock coring. Final water levels, which included drilling water, were encountered at depths from 0.0 to 23.3 feet below the ground surface. Refer to the boring logs presented in Appendix A for more detailed information.

It should be noted that groundwater levels may fluctuate with seasonal variations and following periods of heavy or prolonged precipitation, and therefore, the readings indicated on the boring logs may not be representative of the long-term groundwater levels. Long-term monitoring would be needed to obtain a more accurate estimate of the groundwater table elevations.

## 4.6 Laboratory Testing

In the laboratory, all samples were examined and visually classified. The moisture contents, grain size analyses, and plasticity characteristics of samples considered representative of the subsurface materials were determined. Index test results are included on the borings logs in Appendix A. Due to the generally stiff to hard consistency of the soils encountered in this area, very few undisturbed Shelby tube samples were obtained for laboratory testing. A summary of the strength testing performed for the Phase 3 embankment fills is presented in Appendix B.

### 5.0 CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 General

At the surface, the borings encountered topsoil ranging in thickness from 1 to 12 inches. All topsoil should be removed prior to placing fill or pavement materials.

Subgrades and embankments should be constructed in accordance with Ohio Department of Transportation Construction and Material Specification (ODOT-CMS) Item 203, "Roadway Excavation and Embankment."

## 5.2 Pavement Design and Group Index

The results of the subgrade evaluations for Phase 3 of this project were submitted in separate documents. However, the conclusions from the proposed State Route 823 Mainline evaluations are presented below. All subgrade treatments should conform to ODOT CMS Item 206. More information concerning the suitability of soils for use as fill material can be found in section 5.6 of this report.

## 5.2.1 Subgrades in Soil

Existing laboratory test results performed as of June 6, 2006 were evaluated to estimate a recommended CBR value for Phase 3 mainline roadway pavement design. A total of 252 samples were tested for particle size and plasticity. For both the proposed Phase 3 mainline alignment and the entire project, it was determined that the pavements be designed based on a CBR value of 7. Areas where it is anticipated that the subgrade will be in soil are listed in the table below and are shown on the Boring Locations Plans in Appendix A.

Anticipated Areas of Soil at Subgrade Level

| Beginning Station | Ending Station |
|-------------------|----------------|
| 75+00             | 77+00          |
| 142+50            | 146+00         |
| 257+75            | 259+50         |
| 348+00            | 349+00         |

It is anticipated that soils in the cut sections will be only a few feet thick and not likely to become unstable. In addition, a few feet of soil will likely be encountered at the transition zones from cut section to fill section. The soils at these transitions are also not likely to be unstable. Consequently, the soil cut sections were not evaluated for stability.

### 5.2.2 Subgrades in Rock

Approximately 2.7 miles of the 9.1-mile long Phase 3 mainline alignment will be constructed in cuts where the subgrade will be in rock. The approximate station limits of these sections are listed in the following table and are shown on the Boring Locations Plans in Appendix A. The station limits are approximate and are based on the materials encountered in the borings drilled near the centerline of construction. Variations in the station limits should be anticipated where the bedrock surface slopes in a transverse direction, such as in sidehill fill/cut areas.

Anticipated Areas of Rock at Subgrade Level

| Begin Station | End Station |
|---------------|-------------|
| 50+23         | 61+00       |
| 77+00         | 105+75      |
| 146+00        | 165+50      |
| 168+50        | 173+50      |
| 197+50        | 207+00      |
| 212+50        | 227+00      |
| 259+50        | 268+00      |
| 273+00        | 289+00      |

Anticipated Areas of Rock at Subgrade Level

| Begin Station | End Station |
|---------------|-------------|
| 306+50        | 308+50      |
| 324+00        | 328+00      |
| 330+00        | 343+00      |
| 349+00        | 352+00      |

For the sections of the alignments with subgrades in rock, excavations 2 feet below the proposed pavement materials will be required for the subgrade preparation in accordance with ODOT CMS Item 204.05.

### 5.3 Culverts

Approximately 13 culverts are presently planned for within the limits of the Phase 3 area. Foundation recommendations and settlement analyses for the culverts are presented for each culvert in a separate report.

#### 5.4 Embankment Evaluations

The following table lists the stations and approximate maximum embankment heights for the embankment sections evaluated for the stability and settlement analyses.

Sidehill Fill / Fill Embankment Sections

| Begin Station | End Station | Approximate<br>Maximum Fill<br>Height (ft.) |
|---------------|-------------|---|
| 63+00         | 75+00       | 32.0  |
| 166+50        | 168+50      | 39.7  |
| 173+50        | 188+00      | 86.0  |
| 188+00        | 197+50      | 39.0  |
| 207+00        | 212+50      | 90.1  |
| 227+00        | 257+75      | 195.6                                       |
| 268+00        | 273+00      | 49.0  |
| 289+00        | 306+50      | 219.4                                       |
| 308+50        | 315+50      | 158.9                                       |
| 315+50        | 324+00      | 94.8  |
| 328+00        | 330+00      | 36.5  |
| 343+50        | 348+00      | 91.1  |

Soil parameters used for the stability and settlement analyses were based on laboratory test results (grain-size and plasticity), visual examination of the preserved samples, hand penetrometer readings, and typical values. Due to the generally very stiff to hard consistency of the soils encountered in this area, very few undisturbed Shelby tube samples were obtained for laboratory testing. Global stability analyses and settlement calculations are presented in Appendix C and D, respectively.

## 5.4.1 Stability Analysis

## 5.4.1.1 Assumptions and Methodology

In accordance with ODOT guidelines, a unit weight of 120 pcf was assumed for the embankment fill materials. Due to the large quantity of rock cut planned for the project, it is anticipated that the embankment fill will consist primarily of cohesionless material ranging in size from fine granular material to rock but will generally be rock fill from adjacent cuts. The friction angle for the anticipated backfill material will likely range from 28 degrees to over 40 degrees. It is anticipated that more of the rock fill will exhibit friction angles in excess of 40 degrees, but a friction angle of 35 degrees was conservatively selected for the embankment fill with no cohesion.

The stability analyses were performed using UTEXAS3 Version 1.204, a slope stability computer program using variations of the method of slices. UTEXAS3 was developed by Dr. Stephen Wright at the University of Texas for the U.S. Army Corps of Engineers. The Simplified Bishop procedure was used for all of the analyses and only circular failure surfaces were considered. All of the procedures use an iterative approach to investigate many failure surfaces until a critical surface is found.

## 5.4.1.2 Summary of Results

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The Phase 3 mainline roadway is comprised of approximately 11 fill sections and 12 cut sections. All fill sections in Phase 3, except for the interchanges and the Highland Bend area, were considered for stability. The analyses and recommendations for the embankment slopes contained in the interchange areas and Highland Bend are presented in separate reports.

A comprehensive review of subsurface conditions and the results of stability analyses indicate that the Phase 3 embankments may be built using slopes listed in the following table.

Sidehill Fill / Fill Embankment Slopes

| Begin Station | End Station | Recommended<br>Design Slope |
|---------------|-------------|-----------------------------|
| 63+00         | 75+00       | 2H:1V                       |
| 166+50        | 168+50      | 2H:1V                       |
| 173+50        | 188+00      | 2.5H:1V                     |
| 188+00        | 197+50      | 2H:1V                       |
| 207+00        | 212+50      | 2H:1V                       |
| 227+00        | 257+75      | 2H:1V                       |

Sidehill Fill / Fill Embankment Slopes

| Begin Station | End Station | Recommended<br>Design Slope |
|---------------|-------------|-----------------------------|
| 268+00        | 273+00      | 2H:1V                       |
| 289+00        | 306+50      | 2H:1V                       |
| 308+50        | 315+50      | 2H:1V                       |
| 315+50        | 324+00      | 2H:1V                       |
| 328+00        | 330+00      | 2H:1V                       |
| 343+50        | 348+00      | 2H:1V                       |

The subsurface profile and embankment geometry between Stations 173+50 and 188+00 had the most critical cross section. The maximum embankment height encountered in this section of 86 feet along with the soils encoutered resulted in a required 2.5H:1V slope for stability.

All other global stability analyses performed for the mainline embankments in this area have indicated that the drained, seismic and undrained stability of the embankments is adequate based on a 2H:1V slope. Factors of safety of at least 1.3 in the undrained condition and 1.5 for the drained condition were obtained for all the analyses, which are considered acceptable. Based on the results of the stability analyses, it is anticipated that staged construction, wick drains, and other special construction techniques will not be required to construct the Phase 3 embankments analyzed for this report. It should be noted, however, that special construction techniques will be required for the Highland Bend area. The recommendations for the Highland Bend embankments are presented in a separate report.

## 5.4.2 Settlement Analysis

# 5.4.2.1 Summary of Results

Settlement has been evaluated for selected locations for the Phase 3 mainline embankments. The following table summarizes the results of the calculations for the consolidation of foundational soils and the anticipated settlement of the associated embankment fill materials.

**Summary of Settlement Analyses** 

| Station | Boring | Approximate<br>Maximum Fill<br>(ft.) | Primary<br>Consolidation<br>(in.) | Anticipated<br>Settlement of Fill<br>Materials (in.) |
|---------|--------|--------------------------------------|-----------------------------------|--|
| 66+00   | R-25   | 32.0                                 | 5.1                               | 4  |
| 175+40  | R-104  | 86.0                                 | 16.7                              | 10   |
| 189+00  | R-107  | 39.0                                 | 4.4                               | 5  |
| 209+50  | R-115  | 90.1                                 | negligible                        | 11   |
| 240+00  | R-132  | 195.6                                | 3.5                               | 24   |

**Summary of Settlement Analyses** 

| Station | Boring | Approximate<br>Maximum Fill<br>(ft.) | Primary<br>Consolidation<br>(in.) | Anticipated<br>Settlement of Fill<br>Materials (in.) |
|---------|--------|--------------------------------------|-----------------------------------|--|
| 271+50  | R-148  | 49.0                                 | 10.0                              | 6  |
| 298+25  | R-168  | 219.4                                | 12.1                              | 26   |
| 312+00  | C-31   | 158.9                                | 5.7                               | 19   |
| 319+75  | R-2183 | 94.8                                 | 13.4                              | 11   |

The settlement evaluations indicate that embankment settlement is not considered a significant concern for Phase 3 embankments outside of the interchange areas. Based upon a comprehensive review of subsurface conditions, a critical soil profile and embankment height was selected for each fill section for the purposes of performing settlement calculations. In addition, time-rate of settlement calculations were also performed. The analyses and results are briefly discussed in the following sections.

### Settlement - Mainline Embankments, Station 66+00

Settlement due to primary consolidation of the foundation soil is expected to be approximately 5.1 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 375 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not investigated.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 4 inches of settlement can be expected for a 32-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

### Settlement – Mainline Embankments, Station 175+40

Settlement due to primary consolidation of the foundation soil is expected to be approximately 16.7 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 765 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not explored.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 10 inches of settlement can be expected for a 86-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

## Settlement - Mainline Embankments, Station 189+00

Settlement due to primary consolidation of the foundation soil is expected to be approximately 4.4 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 144 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not explored.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 5 inches of settlement can be expected for a 39-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

## Settlement - Mainline Embankments, Station 209+50

Settlement due to primary consolidation of the foundation soil is expected to be negligible. Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 11 inches of settlement can be expected for a 90-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

## Settlement – Mainline Embankments, Station 240+00

Settlement due to primary consolidation of the foundation soil is expected to be approximately 3.4 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 26 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not explored.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 24 inches of settlement can be expected for a 196-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

### Settlement - Mainline Embankments, Station 271+50

Settlement due to primary consolidation of the foundation soil is expected to be approximately 10.0 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 510 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not explored.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 6 inches of settlement can be expected for a 49-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

## Settlement – Mainline Embankments, Station 298+25

Settlement due to primary consolidation of the foundation soil is expected to be approximately 12.1 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 357 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not explored.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 26 inches of settlement can be expected for a 219-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

### Settlement - Mainline Embankments, Station 312+00

Settlement due to primary consolidation of the foundation soil is expected to be approximately 5.7 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 144 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not explored.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 19 inches of settlement can be expected for a 159-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

## Settlement – Mainline Embankments, Station 319+75

Settlement due to primary consolidation of the foundation soil is expected to be approximately 13.4 inches. In addition, the time needed to reach 90 percent of primary consolidation is expected to take up to approximately 144 days. Due to the relatively small magnitude of settlement, the use of wick drains or other means of accelerating the consolidation were not explored.

Settlement due to consolidation of the fill material itself was also considered. Consolidation within an embankment will generally range from one to four percent of the embankment height. Assuming one percent consolidation for a well compacted fill, approximately 11 inches of settlement can be expected for a 95-foot high embankment. However, it is anticipated that much of this settlement will occur during construction.

## Settlement - Other Fill Sections Evaluated by Inspection

Embankment fill sections from Stations 166+50 to 168+50, 328+00 to 330+00, and 343+00 to 348+00 were also evaluated. Based on the shallow depth to bedrock and properties of the foundation soils, it was determined by inspection that settlement in these sections would be negligible.

#### 5.4.2.2 Additional Settlement Recommendations

It should be emphasized that the time of consolidation estimates are based on the assumption that the initial embankment construction will consist of at least 6 feet of free-draining granular material placed over the entire fill foundation area, as discussed in section 5.6.3. Groundwater seepage, overexcavation, and removal of unsuitable soils should be anticipated within the interchange areas. Consequently, it may be necessary to utilize additional granular material or end-dumped rock in order to establish a dry and stable fill foundation.

Based on the results of calculations described above, excessive settlements are not anticipated for the Phase 3 embankments analyzed for this report. Although settlement is not a significant concern in this area, general recommendations for accelerating or mitigating settlements are presented below.

The most cost effective method for dealing with the potentially excessive settlement would be to surcharge the embankment foundations prior to construction. Monitoring equipment should be installed to measure the rate/amount of settlement and normal fill operations should begin when an acceptable degree of consolidation is achieved. Other options to either reduce the amount of settlement or to accelerate the time of consolidation within the embankment foundation, such as overexcavation and replacement of the existing soft and/or organic soils or wick drains, are not considered viable options for the fill sections evaluated in this report because significant amounts of soft soils were not encountered in the borings and the soils encountered were generally not soft enough to install wick drains.

## 5.4.3 Potential Areas of Instability

The dominant rock type along the proposed alignment is sandstone of the Mississippian aged Logan Formation. Siltstone and shale are commonly found interbedded with the sandstone. These siltstones and shales generally weather to clay with low shear strength over time. The steeper slopes are prone to gradual movement known as soil creep. The low shear strength of the residual and colluvial soils combined with the steep topography makes some of the hillsides within the proposed limits of construction prone to shallow surficial landslides and soil creep. Generally these conditions are easily corrected by removal of the unstable slope materials. For additional information regarding specific areas of instability encountered along the Phase 3 alignment, refer to the Phase 3 field reconnaissance report, which will be submitted separately.

### 5.5 Rock Cuts

Currently, approximately 6.1 miles of the Phase 3 mainline alignment is anticipated to be located in cuts. A majority of these cuts will be in rock. In accordance with ODOT's Geotechnical Bulletin Number 3 (GB-3) "Rock Cut Slope & "Catchment Design", Phase 3 rock cuts have been evaluated. For specific information pertaining to the rock cut slopes, please refer to the Phase 3 rock cut slopes report, which was submitted separately.

### 5.6 Construction Considerations

#### 5.6.1 General

Based on the provided plans, profiles, and cross sections, the new roadway will consist of several cuts as well as embankment fills. All work should be performed in accordance with ODOT CMS, (Current Edition). Special care should be taken to ensure that the requirements of the CMS are met so that stable embankments are constructed.

### 5.6.2 Subgrade Preparation

Silt (A-4b) was encountered at the existing ground surface at several boring locations in the Phase 3 area. Whenever silt is encountered at the subgrade level, it should be overexcavated to at least three feet below subgrade and replaced with suitable, compacted fill. Additionally, no silt (A-4b) should be placed within three feet of subgrade in embankment fill sections.

#### 5.6.3 New Embankment Construction

ODOT CMS Item 201 "Clearing and Grubbing" should be completed across the entire portion of the embankment foundation. The foundation should be compacted

to at least 95% of the Standard Proctor value as outlined in ODOT CMS section 203.05. Also, it is recommended that the foundation soils be proof rolled (ODOT Item 204.06) prior to placement of any embankment materials. Any soft, yielding areas should be undercut to firm material and replaced with controlled, engineered fill. If seeps are encountered, spring drains should be installed to reduce the potential for the fill to become saturated in the future.

Prior to beginning normal embankment fill operations, it is recommended that the initial embankment construction consist of at least 6 feet of free-draining granular material placed over the entire fill foundation area. This material will allow the drainage of the foundation soils, not inhibit the time-rate of consolidation, and will also provide a stable surface upon which normal fill operations can begin.

Locations of borrow areas are not known at this time. However, if glacial tills are utilized as the fill materials, any large durable cobbles or boulders greater than 8 inches in any dimension that cannot be broken down should be segregated and not be incorporated into the lift. In addition, any soil classified as silt (A-4b) should not be used as fill.

## 5.6.4 Embankment Drainage

All embankments and side hill fills should have a drainage layer in the lower portion of the fill, at the foundation soil-fill interface. This drainage layer should consist of a minimum of six feet of free-draining, durable, rock fill as defined in ODOT CMS, Item 203.6.C and Item 703.16.C.

If springs or seeps are encountered during construction, the flow should be collected within the embankment drainage layer or directed to the embankment drainage layer with a ditch or a trench drain. A typical trench drain should be a minimum of one foot in width, with a depth and grade suitable for positive drainage. Six inches of concrete sand (ODOT Item 703.02) should be placed in the bottom of the trench, then a six-inch diameter, fabric-wrapped, perforated PVC pipe should be placed on top of the sand layer. The trench should then be backfilled to the surface with concrete sand.

All ponds that lie within the footprint of a planned embankment should be drained, and all "muck" and unsuitable material removed. Ponds may require benching as set forth in ODOT CMS Item 203.05 or placement of a spring or seep drain prior to embankment fill placement. Ponds known to have a spring and requiring a spring drain are indicated as spring-fed ponds on the plans.

### 5.6.5 Rock Excavation

It is anticipated that rock excavation will be required for the roadway construction.

In addition, sandstone bedrock was encountered at the subgrade elevations between the stations indicated in Section 5.2. Due to the hardness of the rock and the length of the proposed alignment, blasting will likely be needed to excavate the rock. Rock encountered at the subgrade elevation should be undercut and replaced by controlled, engineered fill as outlined by ODOT CMS Item 204.05.

## 5.6.6 GB-2 Special Benching

The roadway cross-sections were analyzed in accordance with Ohio Department of Transportation's Office of Geotechnical Engineering Geotechnical Bulletin 2 (GB-2), released February 7, 2006. ODOT specifications require that any side hill fill on an existing slope steeper than 8:1 be benched according to the ODOT CMS Item 203.05. The ODOT Office of Geotechnical Engineering recommends special benching on existing slopes 4:1 or steeper. Special benching is used to improve the constructability and stability of the proposed embankment. Special benching is always shown on the cross-sections in the project plans and never on a typical cross-section. Whenever special benching is used, Plan Note G110 from the ODOT Location and Design Manual, Volume 3, needs to be included in the general notes.

Construction along the proposed alignment will consist of side hill fills ranging from less than 2 feet to more than 60 feet. The existing slopes range from nearly flat to steeper than 3H:1V. In some cases, the existing ground surface is steeper than 4H:1V and relatively thin, sliver fills will be placed. The bedrock and overburden interface is a common avenue for water during the wet winter months. In two places along the alignment, relatively thin fills will be placed in areas that will likely experience seepage and ground water infiltration from this interface. These fills are in areas that may be too thin or small to effectively place the free draining durable rock layer. In order to increase the performance of the embankments in these areas, special benching and drainage is recommended at the locations shown in the following table.

Areas requiring special benching

| Beginning Station | End Station |
|-------------------|-------------|
| 63+50             | 65+00       |
| 66+50             | 66+50       |
| 67+00             | 67+00       |
| 105+50            | 107+00      |
| 174+00            | 174+00      |
| 182+00            | 183+50      |
| 185+00            | 186+00      |
| 226+50            | 230+50      |
| 237+00            | 238+50      |
| 242+50            | 245+00      |
| 254+50            | 255+50      |
| 259+00            | 260+50      |
| 271+50            | 273+00      |

Areas requiring special benching

| Beginning Station | End Station |
|-------------------|-------------|
| 284+50            | 285+50      |
| 288+50            | 289+50      |
| 290+00            | 292+00      |
| 296+00            | 299+00      |
| 301+00            | 306+00      |
| 308+50            | 310+50      |
| 314+50            | 317+00      |
| 322+00            | 324+00      |
| 329+50            | 330+00      |
| 333+50            | 333+50      |

All embankment fill should be placed in accordance with ODOT CMS Items 203.6: Spreading and Compacting and 203.7: Compaction and Moisture Requirements. The majority of the material to be excavated from the benching operation should be acceptable material for embankment fill. However, the material may have excessive moisture contents and may require moisture adjustments prior to compaction.

### 5.7 Excavation and Groundwater Considerations

Seepage and groundwater conditions are variable across the Phase 3 alignment. The Contractor should be prepared to keep excavations reasonably dry, such as with sumping and pumping. The Contractor should also be prepared to deal with unexpected seepage and precipitation that enters any excavations. Please refer to section 4.3 of this document, and the boring logs in Appendix A, for more information concerning seepage and groundwater levels.

Excavations deeper than 4 feet must be laid back or braced to protect workers entering the excavations. All excavations should be constructed in accordance with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards (29 CFR Part 1926). Slopes or bracing for excavations 20 feet or more in depth must be designed by a registered professional engineer.

## 5.8 Geotechnical Design Checklists

The geotechnical design checklist applicable to this report is included in Appendix D.

## 6.0 CLOSING REMARKS

You are encouraged to discuss with us any questions you may have concerning the findings, conclusions, and recommendations presented in this report. Please do not hesitate to call if we can be of further assistance.

Sincerely,

DLZ OHIO, INC.

Dorothy A. Adams, P.E.

Senior Geotechnical Engineer

Pete Nix, P.E.

Geotechnical Division Manager

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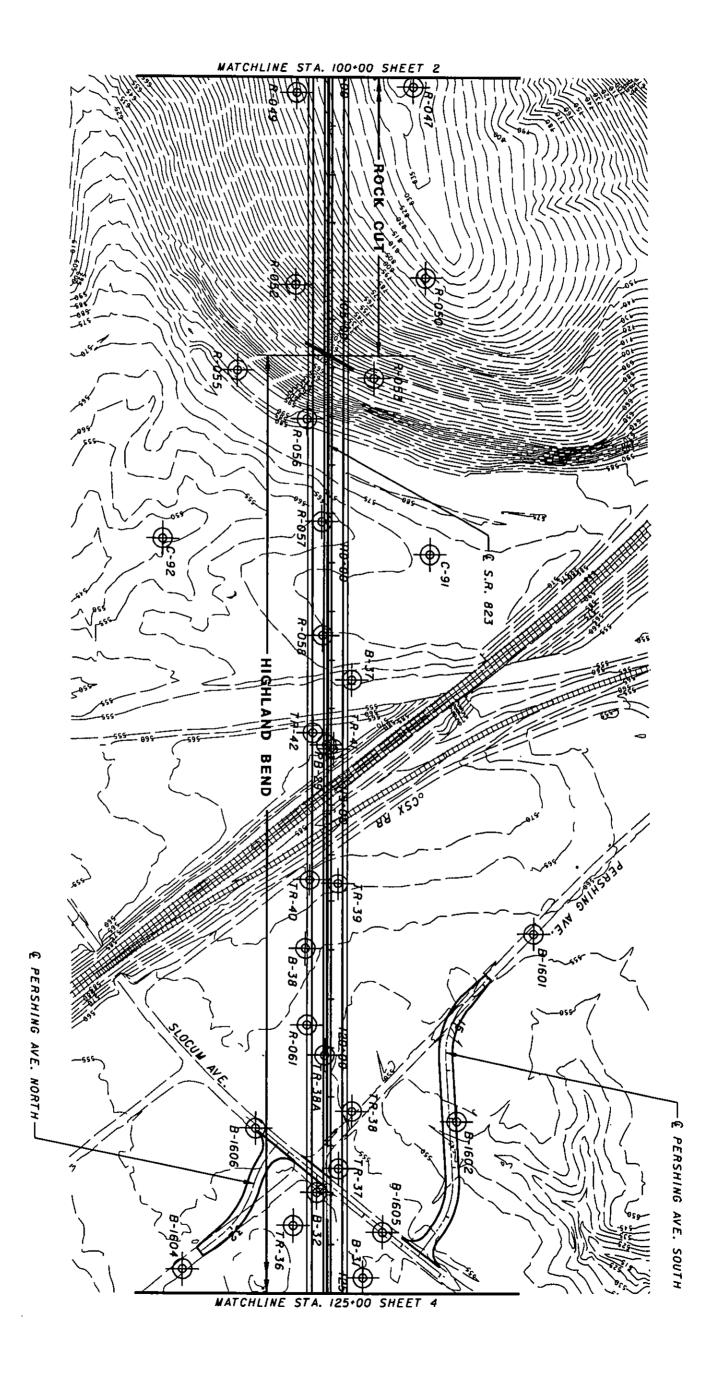
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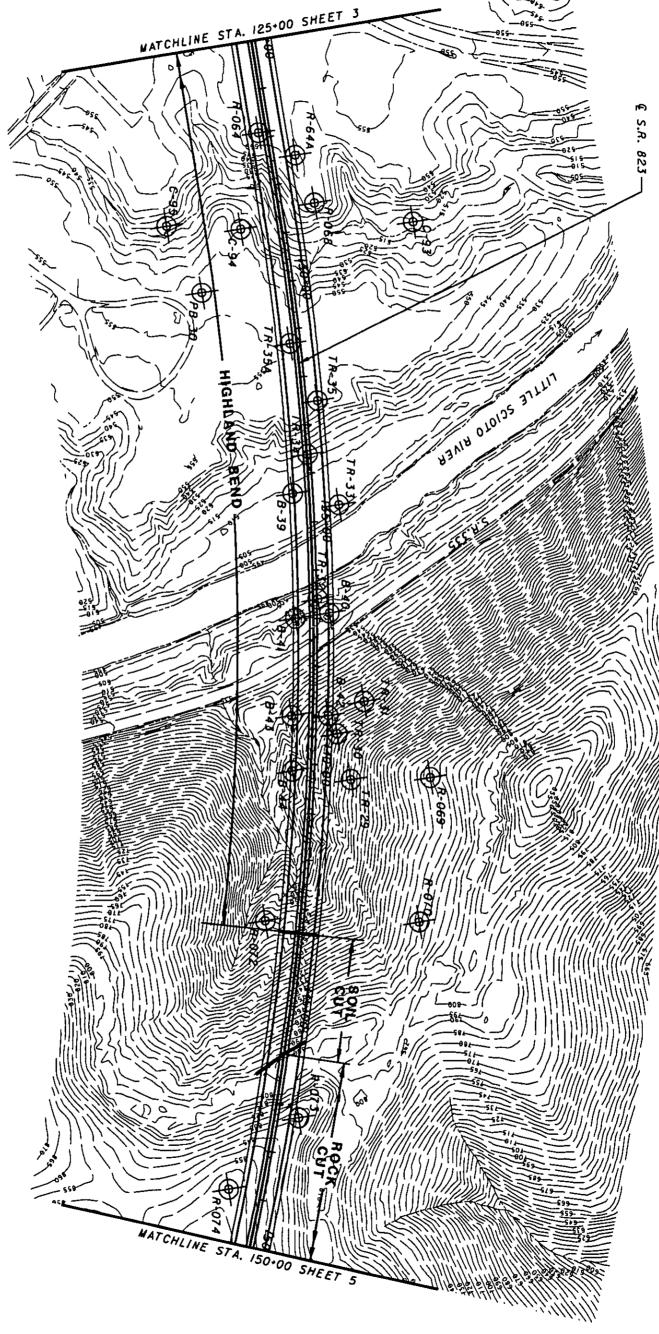
# APPENDIX A

Boring Location Plan
General Information - Drilling Procedures and Logs of Borings
Legend - Boring Log Terminology
Boring Logs - Ninety (90) Borings

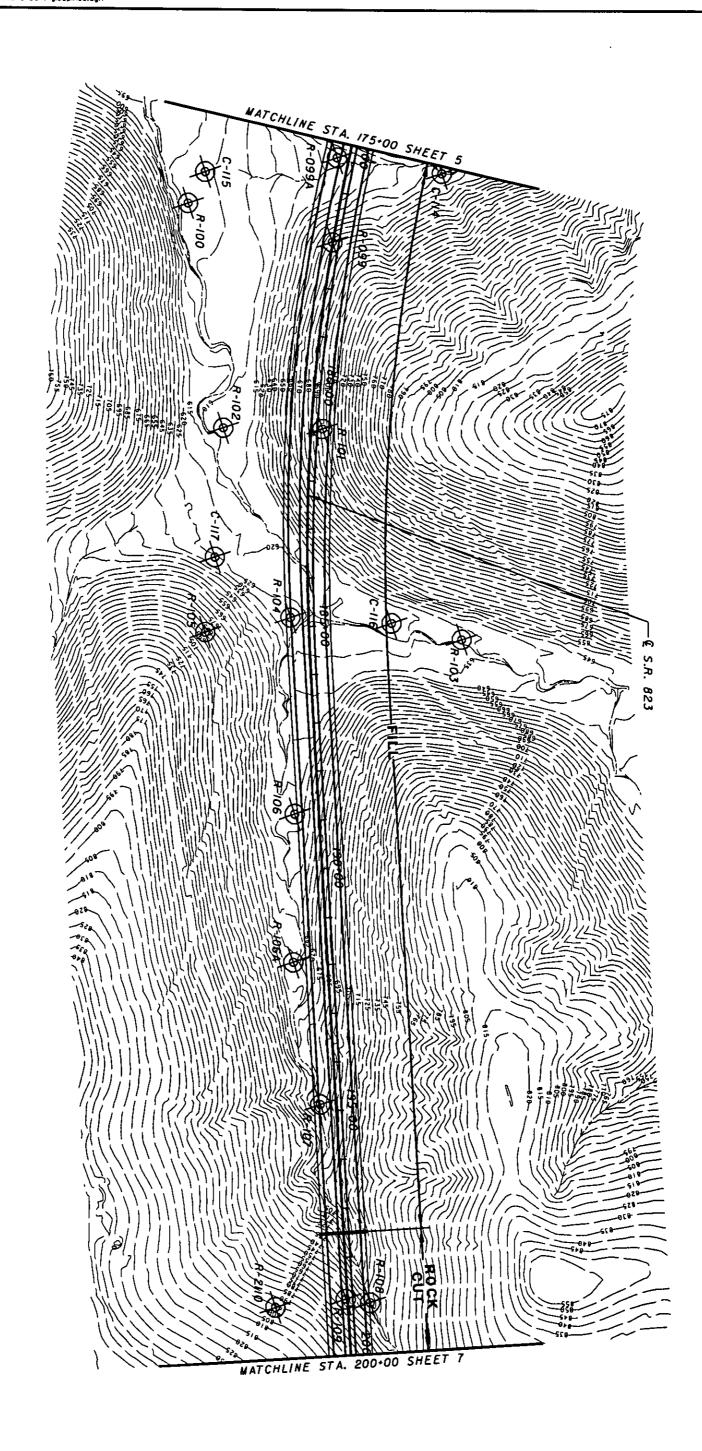
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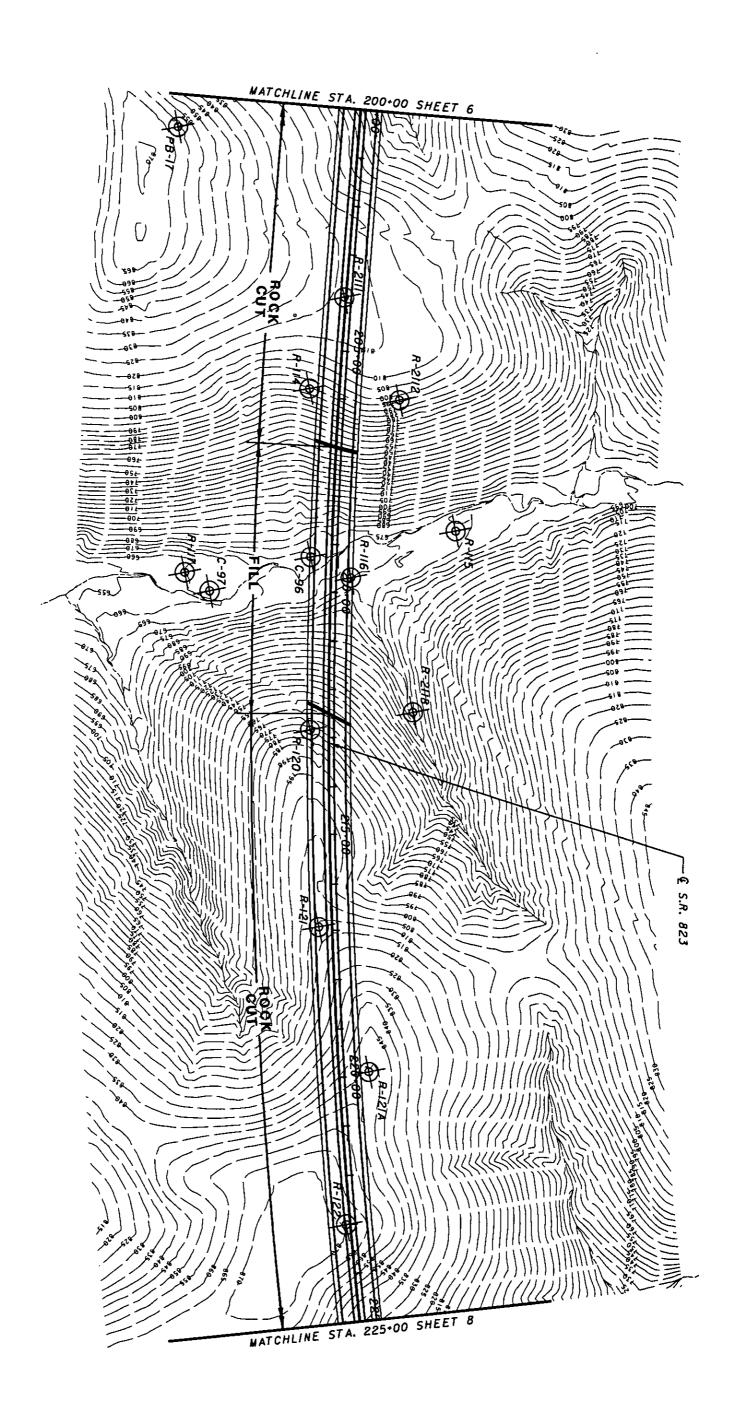


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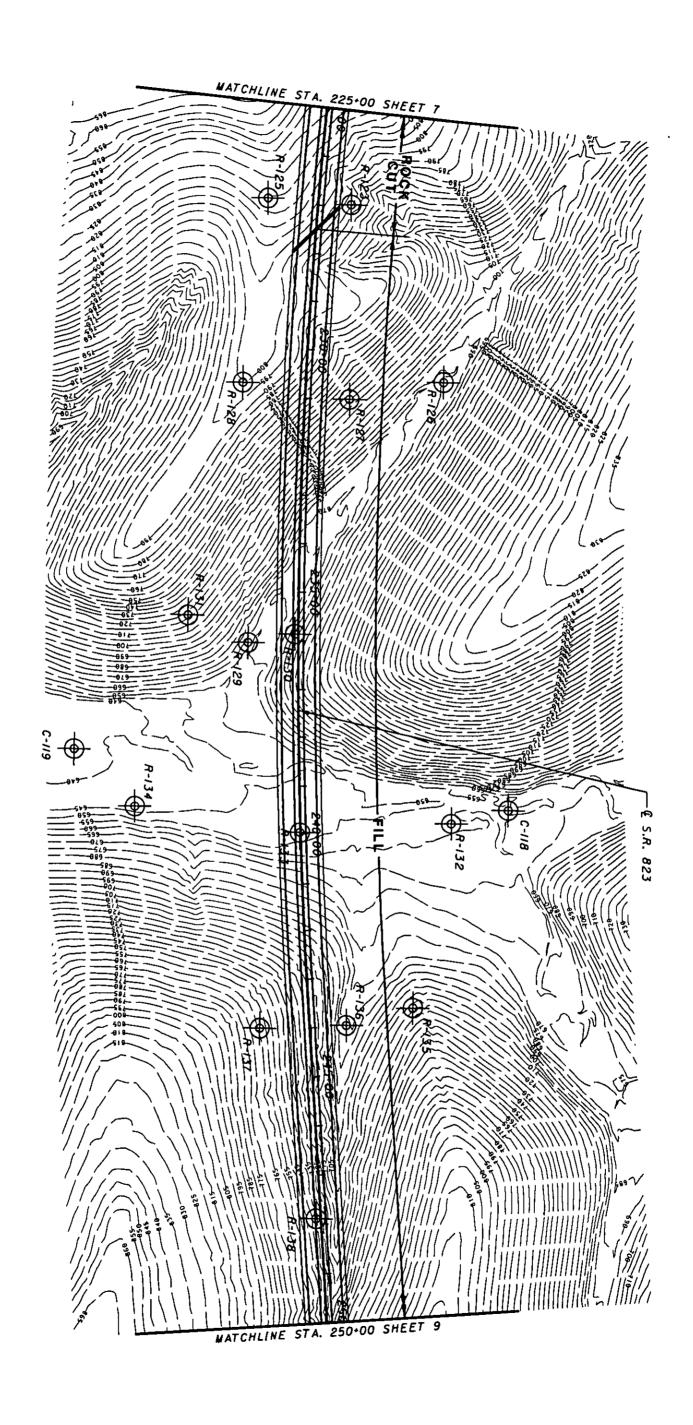
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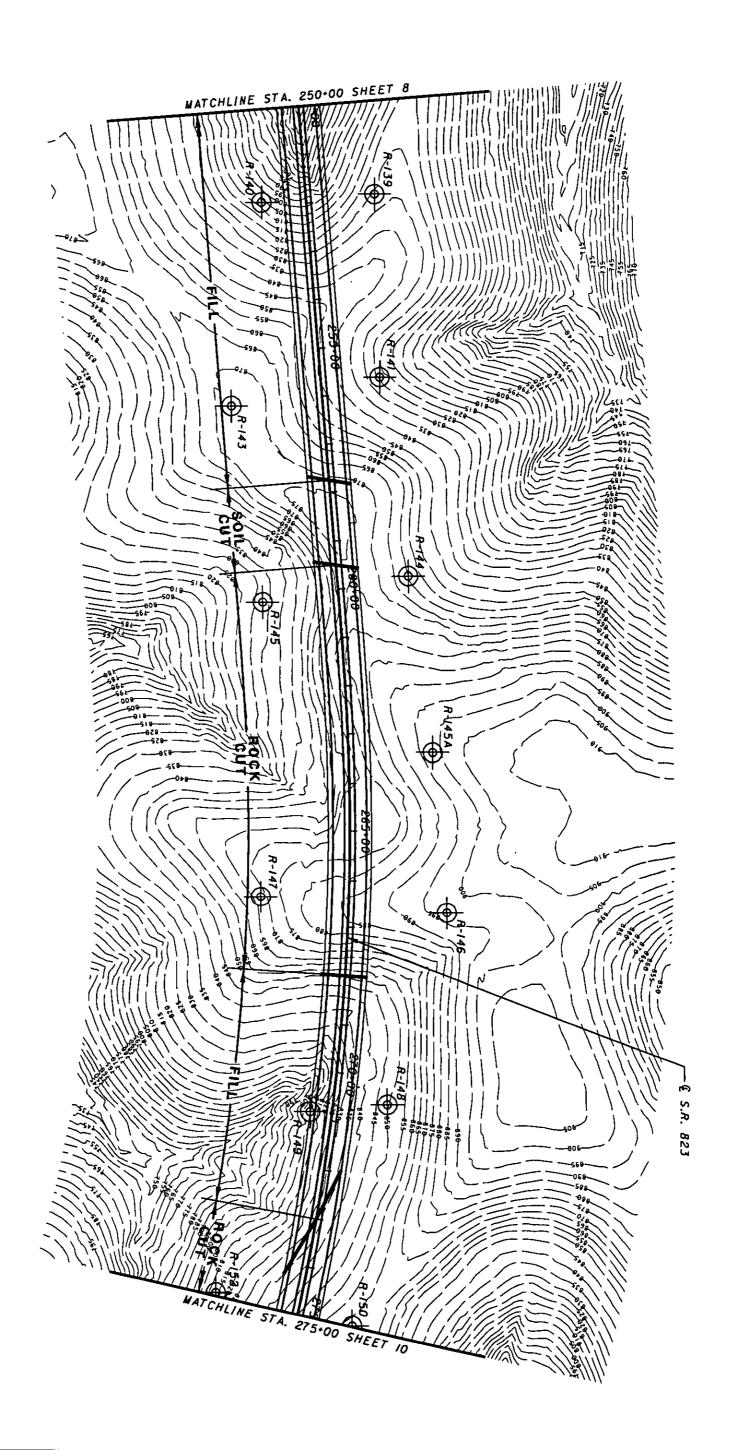


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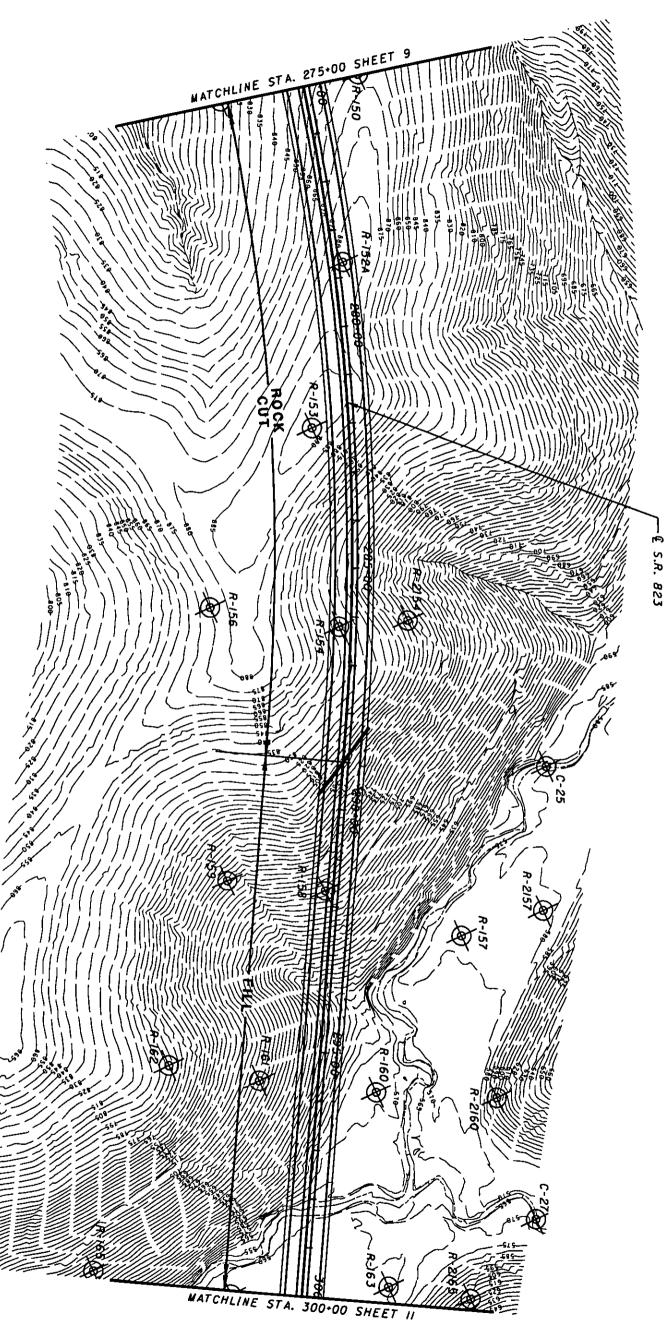
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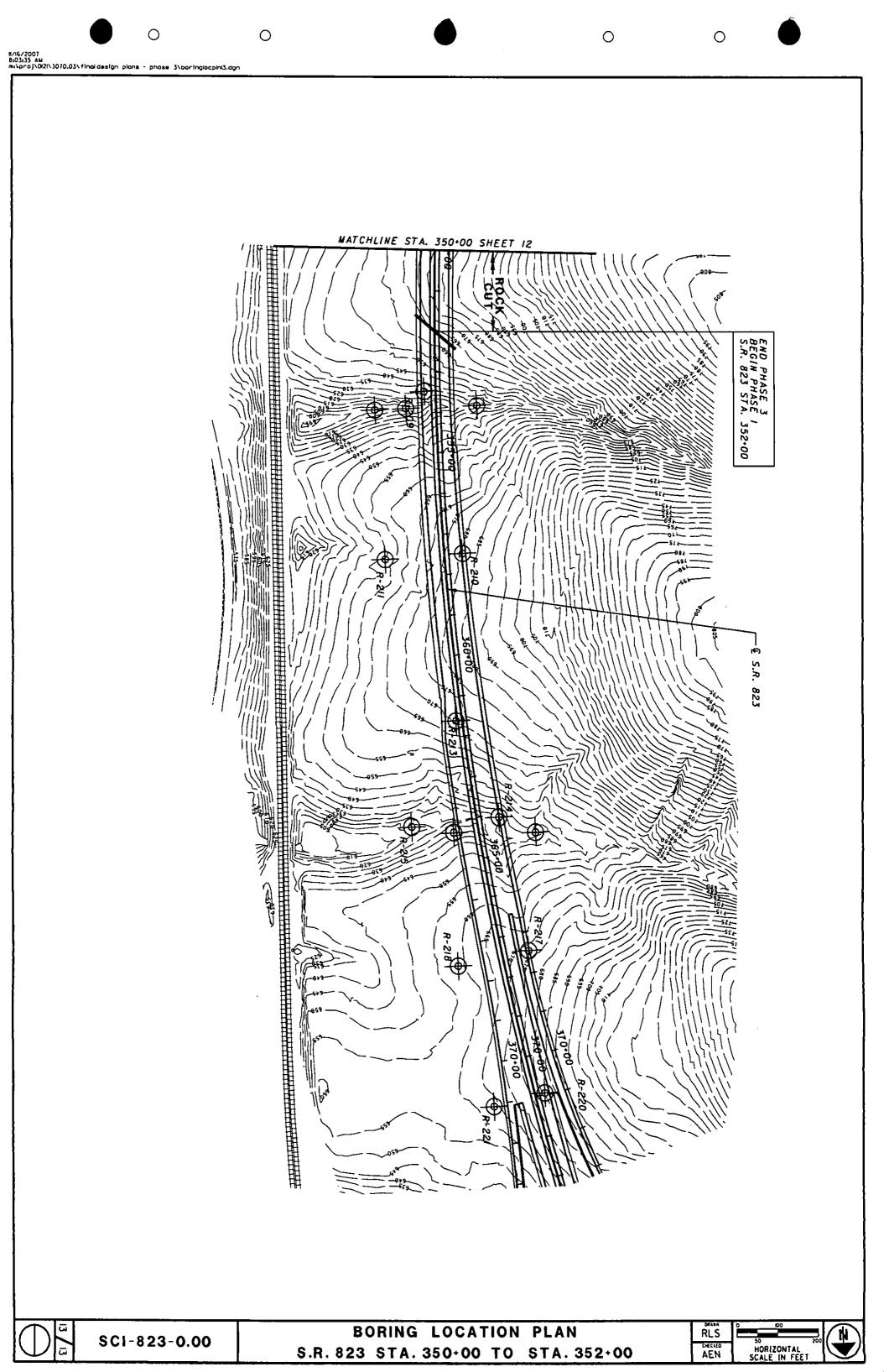
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## GENERAL INFORMATION DRILLING PROCEDURES AND LOGS OF BORINGS

Drilling and sampling were conducted in accordance with procedures generally recognized and accepted as standardized methods of investigation of subsurface conditions concerning geotechnical engineering considerations. Borings were drilled with either a truck-mounted or ATV-mounted drill rig.

Drive split-barrel sampling was performed in 1.5 foot increments at intervals not exceeding 5 feet. In the event the sampler encountered resistance to penetration of 6 inches or less after 50 blows of the drop hammer, the sampling increment was discontinued. Standard penetration data were recorded and one or more representative samples were preserved from each sampling increment.

In borings where rock was cored, NXM or NQ size diamond coring tools were used.

In the laboratory all samples were visually classified by a geotechnical engineer. Moisture contents of representative fine-grained soil samples were determined. A limited number of samples, considered representative of foundation materials present, were selected for performance of grain-size analyses and plasticity characteristics tests. The results of these tests are shown on the boring logs.

The boring logs included in the Appendix have been prepared on the basis of the field record of drilling and sampling, and the results of the laboratory examination and testing of samples. Stratification lines on the boring logs indicating changes in soil stratigraphy represent depths of changes approximated by the driller, by sampling effort and recovery, and by laboratory test results. Actual depths to changes may differ somewhat from the estimated depths, or transitions may occur gradually and not be sharply defined. The boring logs presented in this report therefore contain both factual and interpretative information and are not an exact copy of the field log.

Although it is considered that the borings have disclosed information generally representative of site conditions, it should be expected that between borings conditions may occur which are not precisely represented by any one of the borings. Soil deposition processes and natural geologic forces are such that soil and rock types and conditions may change in short vertical intervals and horizontal distances.

Soil/rock samples will be stored at our laboratory for a period of six months. After this period of time, they will be discarded, unless notified to the contrary by the client.

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## **LEGEND - BORING LOG TERMINOLOGY**

Explanation of each column, progressing from left to right

- Depth (in feet) refers to distance below the ground surface.
- 2. Elevation (in feet) is referenced to mean sea level, unless otherwise noted.
- 3. Standard Penetration (N) -- the number of blows required to drive a 2-inch O.D., 1-3/8 inch I.D., split-barrel sampler, using a 140-pound hammer with a 30-inch free fall. The blows are recorded in 6-inch drive increments. Standard penetration resistance is determined from the total number of blows required for one foot of penetration by summing the second and third 6-inch increments of an 18-inch drive.

50/n - indicates number of blows (50) to drive a split-barrel sampler a certain number of inches (n) other than the normal 6-inch increment.

- 4. The length of the sampler drive is indicated graphically by horizontal lines across the "Standard Penetration" and "Recovery" columns.
- 5. Sample recovery from each drive is indicated numerically in the column headed "Recovery".
- The drive sample location is designated by the heavy vertical bar in the "Sample No., Drive" column.
- 7. The length of hydraulically pressed "Undisturbed" samples is indicated graphically by horizontal lines across the "Press" column.
- 8. Sample numbers are designated consecutively, increasing in depth.
- 9. Soil Description
  - a. The following terms are used to describe the relative compactness and consistency of soils:

## Granular Soils - Compactness

|              | Blows/Foot           |
|--------------|----------------------|
| Term         | Standard Penetration |
| Very Loose   | 0 – 4                |
| Loose        | 4 – 10               |
| Medium Dense | 10 30                |
| Dense        | 30 – 50              |
| Very Dense   | over 50              |
|              |                      |

## Cohesive Soils - Consistency

| Term         | Unconfined<br>Compression<br>tons/sq.ft. | Blows/Foot<br>Standard<br>Penetration | Hand Manipulation                            |
|--------------|--|---------------------------------------|--|
| Very Soft    | less than 0.25                           | below 2                               | Easily penetrated by fist                    |
| Soft         | 0.25 - 0.50                              | 2 – 4                                 | Easily penetrated by thumb                   |
| Medium Stiff | 0.50 - 1.0                               | 4 – 8                                 | Penetrated by thumb with moderate pressure   |
| Stiff        | 1.0 - 2.0                                | 8 <del>-</del> 15                     | Readily indented by thumb but not penetrated |
| Very Stiff   | 2.0 - 4.0                                | 15 – 30                               | Readily indented by thumb nail               |
| Hard         | over 4.0                                 | over 30                               | Indented with difficulty by thumb nail       |

- b. Color If a soil is a uniform color throughout, the term is single, modified by such adjective as light and dark. If the predominant color is shaded by a secondary color, the secondary color precedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled".
- c. Texture is based on the Ohio Department of Transportation Classification System. Soil particle size definitions are as follows:

| Description         | <u>Size</u>                | <u>Description</u>      | <u>Size</u>                              |
|---------------------|----------------------------|-------------------------|--|
| Boulders<br>Cobbles | Larger than 8"<br>8" to 3" | Sand – Coarse<br>– Fine | 2.0 mm to 0.42 mm<br>0.42 mm to 0.074 mm |
| Gravel - Coarse     | 3" to ¾"                   | Silt                    | 0.074 mm to 0.005 mm                     |
| – Fine              | 3/4" to 2.0 mm             | Clav                    | smaller than 0.005 mm                    |

- The main soil component is listed first. The minor components are listed in order of decreasing percentage of particle size.
- Modifiers to main soil descriptions are indicated as a percentage by weight of particle sizes.

0 to 10% trace 10 to 20% little 20 to 35% some 35 to 50% "and"

Moisture content of cohesionless soils (sands and gravels) is described as follows: f.

Term

Relative Moisture or Appearance

Dη

No moisture present

Damp

Internal moisture, but none to little surface moisture

Moist Wet

Free water on surface Voids filled with free water

The moisture content of cohesive soils (silts and clays) is expressed relative to plastic properties.

<u>Term</u>

Relative Moisture or Appearance

Dry

Powderv

Damp

Moisture content slightly below plastic limit

Moist

Moisture content above plastic limit but below liquid limit

Wet

Moisture content above liquid limit

- 10. Rock Hardness and Rock Quality Designation
  - The following terms are used to describe the relative hardness of the bedrock.

Description <u>Term</u>

Very Soft

Permits denting by moderate pressure of the fingers. Resembles hard soil but has rock

structure. (Crushes under pressure of fingers and/or thumb)

Soft

Resists denting by fingers, but can be abraded and pierced to shallow depth by a pencil

point. (Crushes under pressure of pressed hammer)

Medium Hard

Resists pencil point, but can be scratched with a knife blade. (Breaks easily under single

hammer blow, but with crumbly edges.)

Hard

Can be deformed or broken by light to moderate hammer blows. (Breaks under one or two

strong hammer blow, but with resistant sharp edges.)

Very Hard

Can be broken only by heavy and in some rocks repeated hammer blows.

- Rock Quality Designation, RQD This value is expressed in percent and is an indirect measure of rock soundness. It is obtained by summing the total length of all core pieces which are at least four inches long, and then dividing this sum by the total length of the core run.
- 11. Gradation when tests are performed, the percentage of each particle size is listed in the appropriate column (defined in Item 9c).
- 12. When a test is performed to determine the natural moisture content, liquid limit moisture content, or plastic limit moisture content, the moisture content is indicated graphically.
- 13. The standard penetration (N) value in blows per foot is indicated graphically.

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| Client:                       | ranSy               | stems         | , Inc.      |                        |           |                          | Project: SCI-823-0.00  |             |         |        |         |         |          | J               | ob No.        | 0121     | -3070   | .03       |
|-------------------------------|---------------------|---------------|-------------|------------------------|-----------|--------------------------|--|-------------|---------|--------|---------|---------|----------|-----------------|---------------|----------|---------|-----------|
| LOG O                         | F: Bo               | ring          | C-25        |                        |           |                          | . 288+76.4, 421.8 ft. LT of SR 823 CL Date Drilled: 12   | /13         |         |        |         |         |          |                 |               |          |         |           |
| •                             |                     | -             |             | Sam <sub>l</sub><br>No |           | Hand<br>Penetro-         | WATER OBSERVATIONS: Water seepage at: 5.5' - 13.0'   | $\vdash$    | GF      | RAD.   | ATIC    | NC<br>T | $\dashv$ |                 |               |          |         |           |
|                               |                     | .0.           | (in)        |                        | Core      | meter<br>(tsf) /         | Water level at completion: 0.0'  | ate         | P       | þ      | Q       |         |          | STAN<br>Natural |               |          | TRATIC  |           |
| Depth<br>(ft)                 | Elev.<br>(ft)       | Blows per     | Recovery    | Drive                  | Press / C | * Point-Load<br>Strength | DESCRIPTION  | % Aggregate | C. Sand | M Sand | F. Sand | Sitt    | Clay     | PL              | <del></del>   |          | <u></u> |           |
| o —                           | 579.2               | ĕ             | Re          | à                      | ğ         | (psi)                    | <u></u>  | %           | %       | %      | %       | %       | %        | 10              | 2             | <u> </u> | 30      | 40        |
| -                             |                     | 4<br>10<br>10 | 12          | 1                      |           | 2,0                      | \text{Topsoil - 0"/drilled in streambed}  Stiff to very stiff brown SANDY SILT (A-4a), trace clay, trace gravel; contains sandstone fragments; damp.   | 37          | 13      | _      | 13      | 26      | 11       |                 | • •           | <b>,</b> |         |           |
| 3. <del>5 -</del>             | <del>-5</del> 75.7- | 11<br>7<br>4  | 16          | 2                      |           | 3.0                      | Very stiff brown SILT (A-4b), some fine to coarse sand, little clay, trace gravel; damp.   | 3           | 12      | -      | 9       | 61      | 15       |                 |               | <b>,</b> |         |           |
| 5.5                           | <del>5</del> 73.7   | 3 5 4         | 10          | 3                      |           |                          | Loose grayish brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; contains sandstone fragments; moist.  |             |         |        |         | ٠       |          |                 |               |          |         |           |
|                               | <u> </u><br> <br>   | 3 3 6         | 9           | 4                      |           |                          | <u>-</u>   | 62          | 10      | _      | 9       | 1       | 9        | Ĭ,              | •             |          | No      | n-Plastic |
| 10 —                          |                     | 5<br>7        | 11          | 5                      |           |                          |  |             |         |        |         |         |          | Y<br>           | \<br>}.       |          |         |           |
| —13.0—<br>                    | 566.2               |               | 1           | 6                      |           |                          | Severely weathered brown SANDSTONE, argillaceous.  | 1           |         |        |         |         |          |                 | $\mathcal{C}$ | <i>†</i> |         | 50+(      |
| 15 —<br>-<br>—16.5—           | -562.7-             | 50/3          | 1           | 7                      |           |                          | @ 16.0', gray.  Very hard gray SANDSTONE; very fine to fine grained, slightly  |             |         |        |         |         |          |                 |               |          |         | 50+       |
| 200-03 (11/12/2007 12:49 PM ) |                     | Core 120"     | Rec<br>109" | RQ£<br>89%             | R-1       |                          | weathered, argillaceous, micaceous, massive, unfractured to slightly fractured.  @ 16.7', 18.2', low angle fractures.  @ 25.5'-25.6', broken zone.  @ 25.6'-26.5', lost recovery; possible fracture.  @ 18.2'-18.3', calcareous. |             |         |        |         |         |          |                 |               |          |         |           |
| 25 —                          |                     |               |             |                        |           |                          |  |             |         | ļ      |         |         |          |                 |               |          |         |           |

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| Client: 1                             | ransv                  | eteme        | Inc           |             | _   |   | Project: SCI-823-0.00   |             |     |   | _    | _  |        |    | . 101           | h Ma    | <b>0121</b> | -3070  | 03  |
|---------------------------------------|------------------------|--------------|---------------|-------------|-----|---|---|-------------|-----|---|------|----|--------|----|-----------------|---------|-------------|--|-----|
| LOG O                                 |                        |              |               |             | ٦,  | ocation: Sta  | 1. 288+76.4, 421.8 ft. LT of SR 823 CL Date Drilled: 12   | 1/13        | /N5 |   |      |    |        |    | 1 302           | J 17U.  | J (Z I      | 3070   |     |
|                                       | 50                     | ····y        | 3-23          | Sam         | _   |   | WATER   | 1 13        |     | _ | ATIO | ON | Т      |    |                 |         |             |  |     |
| Depth<br>(ft)                         | Elev.<br>(ft)<br>549.2 | Blows per 6" | Recovery (in) | Drive       |     | Hand Penetro- meter (isf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: 5.5' - 13.0' Water level at completion: 0.0'  DESCRIPTION   | % Aggregate |     |   |      |    | % Clay | Na | tural N<br>PL + | Aoistur | e Con       | RATIO<br>tent, %<br>———————————————————————————————————— | - • |
| 30 —<br>—<br>—<br>—<br>—<br>—<br>35 — |                        | Core<br>120" | Rec<br>120"   | RQD<br>100% | R-2 |   | Very hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, massive, unfractured to slightly fractured. |             |     |   |      |    |        |    |                 |         |             |  |     |
|                                       | -542.7-                |              |               |             |     |   |   | ]           | ļ   | - |      | ļ  | il     |    |                 |         |             |  |     |
| - 30.5                                | U14.7                  |              |               |             |     |   | Bottom of Boring - 36.5'  | 1           |     |   | 1    |    |        |    |                 |         |             |  |     |
| 40 —                                  |                        |              |               |             |     |   |   |             |     |   | ,    |    |        |    |                 |         |             |  |     |
| 50 —                                  |                        |              |               |             |     |   |   |             |     |   |      |    |        |    |                 |         |             |  |     |
| 55 —<br>-<br>-<br>-<br>-              |                        |              |               |             |     |   |   |             |     |   |      |    |        |    |                 |         |             |  |     |

FILE: 0121-3070-03 ( 11/12/2007 12:49 PM )



| Client:                       | Tra | nSys         | tems,          | Inc.        |             | _              | ···              | Project: SCI-823-0.00   |             |         |         |         |          |          | <br>Job N       | o. 012         | 1-3070.03                   |
|-------------------------------|-----|--------------|----------------|-------------|-------------|----------------|------------------|---|-------------|---------|---------|---------|----------|----------|-----------------|----------------|-----------------------------|
| LOG                           | OF: | Bor          | ing (          | C-27        |             | L              |                  | . 298+04.2, 472.7 ft. LT of SR 823 CL Date Drilled: 1   | /14/        | -       |         |         |          |          |                 |                |                             |
|                               |     |              |                |             | Samp<br>No. |                |                  | WATER OBSERVATIONS: Water seepage at: 8.5'-12.5'  | $\vdash$    | GF      | RADA    | ATIC    | N        | $\dashv$ |                 |                | :                           |
|                               | 1.  | ļ            | .9             | (i)         |             | Core           | meter<br>(tsf) / | Water level at completion: 0.0'   | ate         | ď       | ٩       | ٦       |          |          |                 |                | TRATION (N)<br>ntent, % - ■ |
| Depth<br>(ft)                 |     | lev.<br>(ft) | Blows'per      | Recovery    | 6           |                | * Point-Load     |   | % Aggregate | C. Sand | M. Sand | F. Sand | ž        | jā,      | PL -            |                | — и                         |
| 0-                            | 56  | 66.5         | Blov           | Rec         | Drive       | Press /        | (psi)            | DESCRIPTION   | %<br>A      | %       | %       | %       | %        | %        | <br>Blows<br>10 | per foot<br>20 | - ()<br>30 <u>40</u>        |
|                               | 4   |              | 4              |             |             |                |                  | \text{Topsoil - 0"/drilled in streambed}  Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4  trace clay contains sandstone fragments; damp  | , ,         |         |         | ا ا     |          | ا۔ا      |                 |                | Mad Division                |
|                               |     | ·            | 6              | 10          | 1           |                | ,                | trace clay; contains sandstone fragments; damp.   | 20          | 28      | -       | 1/      | 30       | ٥        | Ŏ,              |                | Non-Plastic                 |
| —3.5-<br>5-                   | 50  | 63.0         | 10<br>13<br>14 | 16          | 2           |                |                  | Medium dense brown SANDY SILT (A-4a), trace gravel, trace clay; contains sandstone fragments; damp to moist.  | 1           |         |         |         |          |          | •               |                |                             |
|                               |     |              | 3 5            | 16          | 3           |                |                  |   | 9           | 26      | -       | 16      | 42       | 7        | •               |                | Non-Plastic                 |
|                               |     |              | 4              | 16          |             |                |                  |   |             |         |         |         |          |          |                 |                |                             |
| 10                            | - 1 |              | 6 7            | 6           | 4           |                |                  |   |             |         |         |         |          |          | þ               |                |                             |
|                               | -   | 55.5         | 6 7            | 11          | 5           |                |                  | Stiff brown SANDY SILT (A-4a), some gravel, trace clay; contains sandstone fragments; damp.   | 21          | 20      | -       | 11      | 40       | 8        | Ô               | ]              |                             |
| 1                             | 4   |              | 50/5           | 5           | 6           |                |                  | Severely weathered dark gray SANDSTONE, argillaceous.   |             |         |         |         |          | '        |                 |                | 50+(                        |
| 7,5007 15:49 PM               |     | 552.0        | Core<br>120"   | Rec<br>120" | RQD<br>72%  | R-             |                  | Medium hard gray SANDSTONE very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, massive, slightly to moderately fractured.  @ 14.5'-16.6', highly fractured to broken.  @ 15.5', 16.8', 16.9', 17.1', 17.9', 18.6', 18.8', 18.9', 19.1', 20.2' 20.8', 21.4', 22.3', 22.4', 24.0', low angle fractures.  @ 17.4'-17.7', high angle fracture.  @ 17.6',22.7', low angle fractures.  @ 18.7', 18.9'-20.1', clay filled fractures. |             |         |         |         |          |          |                 |                |                             |
| FILE: 0121-3070-03 [ 11/12 25 | -   |              |                |             |             |                |                  |   |             |         |         |         | <u>}</u> |          |                 |                |                             |
| 30                            | -   |              | Core           | Rec         | RQD         | )<br> <br> R-2 | 2                |   |             |         |         |         |          |          |                 |                |                             |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 \* (614)888-0040

| Client:  | TranSy        | stems  | , Inc.   |             |           |  | Project: SCI-823-0.00   |             |       |           |      |           |        |      | Job No.                          | 0121-  | 3070.03 |        |
|--|---------------|--------|----------|-------------|-----------|--|---|-------------|-------|-----------|------|-----------|--------|------|----------------------------------|--------|---------|--------|
|  | F: Bo         |        |          |             |           | ocation: Sta   | a. 298+04.2, 472.7 ft. LT of SR 823 CL Date Drilled:  | 12/14       |       |           |      |           |        |      |                                  |        |         |        |
| Depth  | Elev.         | per 6" | ary (in) | Samp<br>No. | Core      | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER OBSERVATIONS: Water seepage at: 8.5'-12.5' Water level at completion: 0.0'  | regate      |       | RAE       |      |           |        | Natu | NDARD F<br>ral Moistur<br>L 1——— | e Cont |         | )<br>• |
| (ft)   | (ft)<br>536.5 | Blows  | Recovery | Drive       | Press / ( | Strength<br>(psi)                                    | DESCRIPTION   | % Aggregate | 8 0 % | % M. Sand | %F.S | % Sitt    | % Clay |      | Biows pe                         |        |         |        |
| 30 —   |               | 120"   | 120*     | 100%        |           |  | Medium hard gray SANDSTONE very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, massive, slightly to moderately fractured. |             |       |           |      | <br> <br> |        |      |                                  |        |         |        |
| -34.5-<br>355-<br>40-<br>45-<br>55-<br>40-<br>45-<br>55-<br>40-<br>45-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55 | 532.0         |        |          |             |           |  | Bottom of Boring - 34.5'  |             |       |           |      |           |        |      |                                  |        |         |        |

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| Client:        | TranSy         | /stems        | , Inc.       |             | _       |                                  | Project: SCI-823-0.00  |             |       |        |           |        |           |           | Job No. 012                   | 1-3070.03   |
|----------------|----------------|---------------|--------------|-------------|---------|----------------------------------|--|-------------|-------|--------|-----------|--------|-----------|-----------|-------------------------------|-------------|
| LOG            | DF: Bo         | oring         | C-28         |             |         | ocation: Sta                     | . 301+22.3, 9.5 ft. RT of SR 823 CL Date Drilled: 1  | 2/16        |       |        | 4         |        |           |           |                               |             |
|                |                |               |              | Samp<br>No. |         | Hand<br>Penetro-                 | WATER OBSERVATIONS: Water seepage at: 10.5'-15.0'  |             | Gi    | RAD    | ATIC      | NC<br> |           |           |                               |             |
| Depth          | Elev.          | er 6"         | ry (in)      |             | Core    | meter<br>(tsf) /<br>* Point-Load | Water level at completion: 9.8' (prior to coring) 23.3' (includes drilling water)  | egate       | Sand  | and    | pue       |        |           | Natu      | NDARD PENE<br>ral Moisture Co | entent, % - |
| (ft)           | (ft)           | Blows per     | Recovery     | Drive       | Press / | Strength<br>(psi)                | DESCRIPTION  | % Aggregate | S. S. | % M. S | % F. Sand | % Sitt | % Clay    |           | L I <del></del>               |             |
| —0.2̂=         | 561.2<br>561.0 |               |              |             |         |                                  | \Topsoil - 2"  | <u> </u>    |       |        | _         |        |           |           |                               |             |
|                |                | 3 4           | 4            | 1           |         |                                  | Loose to medium dense brown GRAVEL WITH SAND (A-1-b), some silty clay; contains sandstone fragments; damp to moist.        | 54          | 11    | -      | 14        | 2      | <br>1<br> |           | •                             | Non-Plasti  |
|                |                | 8 9           |              | 2 .         |         |                                  |  |             |       |        |           |        |           |           |                               |             |
| 5 <del>-</del> | 555.7          | 5             | 11           | <b>.</b> .  |         |                                  |  |             |       |        |           |        |           |           | \( \)                         |             |
| 5.5            | 333.7          | 3 8           |              | 3           |         |                                  | Medium dense to dense grayish brown SILT (A-4b), some fine to coarse sand, little clay; contains sandstone fragments; damp | )<br>).   0 | 2     | _      | 20        | 64     | 14        |           |                               |             |
|                | _              | 14            | 9            |             |         | !                                | ·  |             |       |        |           |        |           |           |                               |             |
| 10 —           | _              | 2<br>15<br>16 | 10           | 4           |         |                                  | -  |             |       |        |           |        |           |           |                               | 8           |
|                |                | 8             |              | ∐<br>∎ ॄ    |         | į                                | @ 11.0', brown.  |             |       |        |           |        |           |           |                               |             |
|                |                | 11 8          | 8            | 5           |         |                                  |  |             |       |        |           |        |           |           |                               |             |
| 15-            | _              | 8<br>15<br>18 | 8            | 6           |         |                                  |  |             |       |        |           |        |           |           |                               |             |
| 15.5           | 545.7          | <u> </u>      | -            |             | -       |                                  | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous,             | 1           |       |        | -         |        |           |           |                               |             |
| М              |                |               |              |             |         |                                  | micaceous, slightly fractured, massive.  @ 15.5'-17.5', broken, highly weathered to decomposed.                            |             |       |        |           |        |           |           |                               |             |
| 5<br>20 –      |                | Core          | Rec          | POL         |         |                                  | @ 10 5' 10 6' broken zene  |             |       |        |           |        |           | , , , , , |                               |             |
| 72007          | _              | 120"          | 120"         | 78%         | ( R-1   |                                  | @ 19.5'-19.6', broken zone.  |             |       |        |           |        |           |           |                               |             |
| 11/12          |                |               |              |             |         |                                  |  | ŀ           |       |        |           |        |           |           |                               |             |
| 603            | -              |               |              |             |         |                                  |  |             |       |        |           |        |           |           |                               |             |
| 25 -           | 1              | -             | <del> </del> |             | -       |                                  | ·  |             |       |        |           |        |           |           |                               |             |
| 5: 012:        | -              |               |              |             |         |                                  |  |             |       |        |           |        |           |           |                               |             |
| FILE           | _              |               |              |             |         |                                  |  |             |       |        |           |        |           |           |                               |             |
| 20             |                |               |              |             |         | 1                                | ,  | - [         |       |        |           |        | <u>l</u>  |           | <u> </u>                      |             |

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|                             | <u>FranSy</u>          |              |               |             | _            |   | Project: SCI-823-0.00  |             |         |     |         |      |        | · ·          | Job No.                    | 0121-30                                      | 70.03       |
|-----------------------------|------------------------|--------------|---------------|-------------|--------------|---|--|-------------|---------|-----|---------|------|--------|--------------|----------------------------|--|-------------|
| LOG O                       | F: Bo                  | ring         | C-28          | Sam         | _            |   | . 301+22.3, 9.5 ft. RT of SR 823 CL Date Drilled: 1 WATER  | 2/16<br>T   | _       | RAD | ΔΤΙ     |      | - 1    |              |                            |  |             |
| Depth<br>(ft)<br>30         | Elev.<br>(ft)<br>531.2 | Blows per 6" | Recovery (in) | Drive       | Press / Core | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: 10.5'-15.0' Water level at completion: 9.8' (prior to coring) 23.3' (includes drilling water)  DESCRIPTION   | % Aggregate | C. Sand |     | F. Sand | Silt | % Clay | Natura<br>PL | al Moistui<br><br>Blows pe | PENETRAT<br>re Content,<br>rr foot - (<br>30 | % -<br>  LL |
| -<br>-                      |                        | Core<br>120" | Rec<br>120*   | RQE<br>100% | R-2          |   | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, slightly fractured, massive.  @ 32.0'-32.1', calcareous. |             |         |     |         | -    |        |              |                            |  |             |
| 35.5<br>-<br>-<br>-<br>40 — | 525.7-                 |              |               |             |              |   | Bottom of Boring - 35.5'   |             |         |     |         |      |        |              |                            |  |             |
| -<br>-<br>-<br>45 —<br>-    |                        |              |               |             |              |   |  |             |         |     |         |      | į      |              |                            |  |             |
| 50 —                        |                        |              |               |             |              |   |  |             |         |     |         |      |        |              |                            |  |             |
| 55 —                        |                        |              |               |             |              |   |  |             |         |     |         |      |        |              |                            |  |             |
| _                           |                        |              |               |             |              |   |  |             |         |     |         |      |        |              |                            |  |             |

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| Client:            | Trans       | System   | s, Ir    | ıc.         |             | _       |                          | Project: SCI-823-0.00  |                  |        |      |      |        |        |      | Job        | No.         | 012     | 1-307       | 70.03    |         |
|--------------------|-------------|----------|----------|-------------|-------------|---------|--------------------------|--|------------------|--------|------|------|--------|--------|------|------------|-------------|---------|-------------|----------|---------|
|                    | OF: E       |          |          |             |             | L       |                          | . 304+68.4, 482.5 ft. RT of SR 823 CL Date Drilled: 1  | 2/21             |        |      |      |        |        |      |            |             |         |             |          |         |
|                    |             |          |          |             | Samp<br>No. | lθ      |                          | WATER OBSERVATIONS: Water seepage at: 3.5'-5.0', 8.0'-13.0'  | $\vdash$         | GI     | RAD  | ATIC | NC     | $\neg$ |      |            |             |         |             |          | ł       |
|                    |             | .9       |          | (i)         |             | و ا     | meter<br>(tsf) /         | Water level at completion: 0.0'  | ate              |        | 70   | , ,  |        |        |      |            |             |         |             | ION (I   | N)_     |
| Depth              |             | , be     |          | very        |             | / Core  | * Point-Load<br>Strength |  | % Aggregate      | Sand   | Sand | Sand | 11     | Clay   |      | ?L ⊢       |             |         |             | LL       |         |
| (ft)               | (ft)<br>544 | ĝ        |          | Recovery    | Drive       | Press / | (psi)                    | DESCRIPTION  | % <b>A</b> g     | %<br>C | % X. | % F. | % Sitt | %<br>C |      | Blo<br>10  | ws pe<br>20 |         | ) - (<br>30 | )<br>40_ |         |
| 0-                 | _           |          |          |             |             | į       |                          | Topsoil - 0"/drilled in streambed  |                  | Ì      |      |      |        |        |      |            |             |         |             |          |         |
|                    | -           | 5 7      | 6        | 7           | 1           |         | ,                        | Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4 trace clay; contains sandstone fragments; damp to moist.   | <sup>},</sup> 32 | 17     | -    | 22   | 24     | 5      |      | 0          |             |         |             | Non-P    | lastic  |
| 1                  |             | 5 7      | $\dashv$ |             | 2           | į       |                          |  |                  |        |      |      |        |        |      |            |             |         |             |          |         |
| 5. <del>5</del>    | 539         | <b>—</b> | 7        | 13          |             |         |                          |  | _                |        |      |      |        |        |      | ¢          | )           |         |             |          |         |
| 0.0                | _           | 4 4      | 6        | 14          | 3           |         |                          | Stiff brown and gray SILT (A-4b), little to some clay, trace fine coarse sand, trace gravel; contains sandstone fragments; dame to maint   | 0<br>P 4         | 3      | -    | 6    | 67     | 20     |      | <u> </u> / | •           | •       |             |          |         |
| 8.0-               | 536         | .8-      |          |             |             |         |                          | to moist.  Medium dense brown and gray SILT (A-4b), little fine sand,  | 1                |        |      |      |        |        |      | Ĭ,         |             |         |             |          |         |
| 10 -               | 4           | 8        | 10       | 7           | 4           |         |                          | trace clay; contains sandstone fragments; damp.  |                  |        |      |      |        |        |      |            | $\Diamond$  |         |             |          |         |
|                    | -           | 6<br>50  | 5        | 6           | 5           |         |                          |  |                  |        |      | Ç    |        |        |      | •          |             |         | ,           | <b>†</b> | 50+(    |
| —13.0<br>15        | 531         | .8       |          |             |             |         |                          | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, calcareous, massive, slightly fractured.  @ 13.0'-14.8', highly fractured to broken. |                  |        |      |      |        |        |      |            |             |         |             |          |         |
|                    | -           | Co<br>12 |          | Rec<br>120" | RQD<br>85%  | R-1     | <br>                     |  |                  |        |      |      |        |        |      |            |             |         |             |          |         |
| 20                 |             |          |          |             |             |         |                          |  | ł                |        | -    |      |        |        |      |            |             |         |             |          |         |
| 11/12/2007         | -           |          |          |             |             |         |                          |  | 1                |        |      | •    |        | 1.     |      |            |             |         |             |          |         |
| -                  |             |          | $\top$   |             |             | 1.      |                          | @ 23.4'-23.7', argillaceous zone.  |                  |        |      |      |        |        |      |            |             |         |             |          |         |
| FILE: 0121-3070-03 | _           |          |          |             |             |         |                          | @ 24.3'-24.5', calcareous.   |                  |        |      |      |        |        |      |            |             |         |             |          |         |
| E: 01;             | -           | Co       | re       | Rec         | ROD         |         |                          | ET.O ET.O , OCIOCIO COCO.  |                  |        |      |      |        |        |      |            |             |         |             |          |         |
| E                  | <b>-</b>    | 12       | 0        | 120"        | RQD<br>97%  | R-2     | 2                        | ·  |                  |        |      |      |        |        |      |            |             |         |             |          |         |
| .30                | - 1         | 1        |          |             |             | 1       | 1                        |  |                  |        |      |      | į      | 1.     | 1::: | <u> </u>   | : ; ;       | _ ; ; ; | -11-        | <u> </u> | <u></u> |

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| Client:       | ranSy         | stems | , Inc.   |          |            | -                        | Project: SCI-823-0.00  | Job No. 0121-3070.03                                    |
|---------------|---------------|-------|----------|----------|------------|--------------------------|--|---|
| LOG O         |               |       |          |          | L          | ocation: Sta             | 304+68.4, 482.5 ft. RT of SR 823 CL Date Drilled: 12/21/05                                     |   |
|               |               |       |          | Samp     |            | Hand                     | WATER OBSERVATIONS: Water seenage at: 3.5'-5.0', 8.0'-13.0' GRADATION                          | 4   |
|               |               |       |          | No.      |            | Penetro-                 | OBSERVATIONS: Water seepage at: 3.5'-5.0', 8.0'-13.0' Water level at completion: 0.0'          | STANSASS SEMETRATION (A)                                |
| 1             |               | , Q   | (ii)     |          | Core       | meter<br>(tsf) /         |  | STANDARD PENETRATION (N)  Natural Moisture Content, % - |
| Depth<br>(ft) | Elev.<br>(ft) | s per | Very     |          | <b>.</b> . | * Point-Load<br>Strength | Aggrega M Sand Silt Sand Clay  | PL  |
|               | 514.8         | Blows | Recovery | Drive    | Press      | (psi)                    | % Aggregate % C. Sand % M. Sand % Sitt   | Blows per foot - () 10 20 30 40                         |
| 30 —          |               | _     |          |          |            |                          | Medium hard to hard gray SANDSTONE; very fine to fine  |   |
| -             |               |       |          |          |            |                          | grained, slightly weathered, argillaceous, micaceous, calcareous, massive, slightly fractured. |   |
| -33.0-        | 511.8         |       |          |          |            |                          | Bottom of Boring - 33.0'   |   |
|               | 1             |       |          |          |            |                          |  |   |
| 35            | ]             |       |          |          |            |                          |  |   |
|               | ]             |       |          |          |            |                          |  |   |
|               |               |       |          |          |            |                          |  |   |
| _             |               |       |          |          |            |                          |  |   |
| 40 —          |               |       |          |          |            |                          |  |   |
| _             | <u> </u>      |       |          |          |            |                          |  |   |
| -             |               |       |          |          |            |                          |  |   |
| -             | -             |       |          |          |            |                          |  |   |
| -             |               |       |          |          |            |                          |  |   |
| 45 —          | 1             |       |          |          |            |                          |  |   |
| -             | -             |       |          |          |            |                          |  |   |
| -             | -             |       |          |          |            |                          |  |   |
| -<br>-        | 1             |       |          |          |            |                          |  |   |
| £ 50 —        | 1             |       |          | <b>!</b> |            |                          |  |   |
| 30            | 1             |       |          |          |            |                          |  |   |
| 15/2007       |               |       |          |          |            |                          |  |   |
| -             | 1             |       |          |          |            |                          |  |   |
| -  -          | ]             |       |          |          |            |                          |  |   |
| 55            | ]             |       |          |          |            |                          |  |   |
| 55 —          | ]             |       |          |          |            |                          |  |   |
| 55 —          | ]             |       |          |          |            |                          |  |   |
| -             | ]             |       |          |          |            |                          |  |   |
| -             | _             |       |          |          |            |                          |  |   |
| 60            |               | 1     |          | П        |            | 1                        |  |   |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C

MBUS, OHIO 43229 \* (614)888-0040

|                  |           |                                 | stems        |             |            | _     |                         | Project: SCI-823-0.00   |             |       |  |         |            |          |         | Job No          | 0121     | -3070        | .03       |
|------------------|-----------|---------------------------------|--------------|-------------|------------|-------|-------------------------|---|-------------|-------|--|---------|------------|----------|---------|-----------------|----------|--------------|-----------|
| LOG              | OF        | : Bo                            | ring         | C-30        |            | _     | ocation: Sta            | . 310+59.3, 433.3 ft. RT of SR 823 CL Date Drilled: 12  | /21         |       |  |         |            |          |         |                 |          |              |           |
|                  | 1         |                                 |              |             | Samı<br>No |       | Hand                    | WATER OBSERVATIONS: Water seepage at: None  | <u> </u>    | GI    | RAD.   | ATIC    | )N<br>T    | $\dashv$ |         |                 |          |              |           |
|                  |           |                                 | 2            | (in)        | 1          |       | Penetro-<br>meter       | Water seepage at. Notice Water level at completion: 9.2' (includes drilling water)                                  |             |       | -  |         |            |          | ST      | ANDARD          | PENET    | RATIO        | N (N)     |
| Dept             | ,         | Elev.                           | er 6"        | 1 . [       |            | Core  | (tsf) /<br>* Point-Load |   | 3gate       | Sand  | эnd  | pu      |            |          |         | ıral Moist      |          |              |           |
| (ft)             | "丨        | (ft)                            | Blows per    | Recovery    | e          | I 🔪 I | Strength                |   | % Aggregate | C. Sa | % M. Sand                                    | F. Sand | Silt       | Clay     | F       | Plane a         | or foot  |              | LL        |
| ,                | $\perp$   | 573.8                           |              | Rec         | Drive      | Press | (psi)                   | DESCRIPTION   | %           | 0 %   | ۷ %  | % F     | %          | %        |         | Blows p<br>10 2 |          | , O          | 40        |
| 0.3              | 寸         | 573.5                           |              |             | j          |       |                         | Topsoil - 3"  | ļ           |       |  |         |            |          |         |                 |          |              |           |
|                  | 4         |                                 | 2 3 2        | 6           | 1          |       |                         | Loose brown SANDY SILT (A-4a); contains sandstone fragments; damp to moist.   | 16          | 15    | _  | 15      | 42         | 12       |         |                 |          | No           | n Plastic |
|                  | 4         |                                 |              | -           |            |       |                         | @ 0.0'-2.5', contains organics.   | ĺ           |       |  |         |            |          | 0       | 1               | <u>-</u> |              |           |
| <del></del> 4.0  | _         | 569.8-                          | 50/3         | 3           | _2_        |       |                         | @ 3.5', very dense.   | ┨.          |       |  |         |            |          |         |                 |          |              | 50+(      |
| 5                | $\dashv$  |                                 |              |             |            |       |                         | Very hard gray SANDSTONE, very fine to fine grained, slightly weathered, argillaceous, massive, slightly fractured. |             | •     |  |         |            |          |         |                 |          |              |           |
|                  | -         |                                 |              |             |            |       |                         |   |             |       |  |         |            |          |         |                 |          |              |           |
|                  | -         |                                 |              |             |            |       |                         |   | l           |       |  |         |            |          |         |                 |          |              |           |
|                  | 1         |                                 | Core         | Rec         | BOD        |       |                         | •   | 1           |       |  |         |            |          |         |                 |          |              |           |
|                  | 1         |                                 | 120"         | 120"        | RQD<br>98% | R-1   |                         | <u>-</u>  |             |       |  |         |            |          |         |                 |          |              |           |
| 10               | 1         |                                 |              |             |            |       |                         | •   |             |       |  |         |            |          |         |                 |          |              |           |
|                  |           |                                 | :            |             |            | ļ     |                         | @ 9.6'-9.9, high angle fracture.  |             |       |  |         |            |          |         |                 |          |              |           |
| 1                | ╛         |                                 |              | •           |            |       |                         | ·   | İ           | ļ     |  |         |            |          |         |                 |          |              |           |
|                  | 4         |                                 |              |             |            | _     |                         | ·   |             |       |  |         |            |          |         |                 |          |              |           |
| 15               | $\dashv$  |                                 |              |             |            |       |                         |   |             |       | -  |         |            |          |         |                 |          |              |           |
| ı                | 4         |                                 |              |             |            |       |                         | ·   |             |       |  |         |            | <b>i</b> |         |                 |          |              |           |
| _                | $\exists$ |                                 |              |             |            |       |                         | @ 16.5'-16.7',17.9'- 18.2',18.6'-18.7', broken zones with infilling.  |             |       |  |         |            |          |         |                 |          |              |           |
| ž.               | -         |                                 |              |             | 000        |       |                         | @ 18.3',19.9',20.6',21.5', low angle fractures.   |             |       |  |         |            |          |         |                 |          |              |           |
| 20<br>6<br>6     | 4         |                                 | Core<br>120" | Rec<br>120" | RQD<br>96% | R-2   |                         | @ 10.0, 19.9, 20.0, 21.0, low angle fractures.  |             |       |  |         |            |          |         |                 |          |              |           |
| 20               | ᅱ         |                                 |              |             |            |       |                         |   | .           |       |  |         |            |          |         |                 |          |              |           |
| 7/2007           | 7         |                                 |              |             |            | ĺ     |                         |   |             |       |  |         |            | ł        |         |                 |          |              |           |
| 11/1             | ]         |                                 |              |             |            |       |                         |   | [·          |       |  |         |            |          |         |                 |          |              |           |
| ~  <br>g   —24.0 | $\Box$    | <del>-5</del> 49. <del>8-</del> |              | ļ           | <u> </u>   |       |                         |   |             |       |  |         |            |          |         |                 |          |              |           |
| 25               | - 1       | J-43.U                          |              |             |            |       |                         | Bottom of Boring - 24.0'  |             |       | -  |         |            |          |         |                 |          |              |           |
| 21-30            | 4         |                                 |              |             |            |       |                         |   |             |       |  |         |            |          |         |                 |          |              |           |
| : 01             | 4         |                                 |              |             |            |       |                         |   |             |       |  |         |            |          |         |                 |          |              |           |
| FILE             | $\dashv$  |                                 |              |             |            |       |                         |   |             |       |  |         | <b>]</b> . |          |         |                 |          |              |           |
|                  | 4         |                                 |              |             |            |       |                         |   |             |       |  |         |            |          |         |                 |          |              |           |
| 30               | [         |                                 | <u> </u>     | <u>l</u>    | Н          | 1     | I                       | <u> </u>  |             | 1     | <u>.                                    </u> | 1       | 1          |          | 1 1 1 1 | <u> </u>        | 1 : : :  | <u> 1111</u> | <u> </u>  |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C

MBUS, OHIO 43229 \* (614)888-0040

| Client:   | <u> FranSy</u> | stems        | , Inc.       |             |        |                         | Project: SCI-823-0.00   |           |         |      |        |        |          |       | Job No         | o. 012        | 21-3070    | 0.03       |
|---|----------------|--------------|--------------|-------------|--------|-------------------------|---|-----------|---------|------|--------|--------|----------|-------|----------------|---------------|------------|------------|
| LOG C   | F: Bo          | ring         | C-31         |             | ı      | ocation: Sta            | i. 313+03.2, 361.3 ft. LT of SR 823 CL Date Drilled: 12   | /21/      |         |      |        | to     | 1        | 2/22/ | 05             |               |            |            |
|   |                |              |              | Samp<br>No. |        | Hand<br>Penetro-        | WATER OBSERVATIONS: Water seepage at: 11.0'-12.5'   |           | GF      | RAD. | ATK    | NC<br> | $\dashv$ |       |                |               |            |            |
|   |                | .9           | (in)         |             | و      | meter                   | Water level at completion: 6.0' (prior to coring) 8.8' (includes drilling water)  | ate       | _       | ,    |        |        |          |       |                |               | ETRATIC    |            |
| Depth   | Elev.          | per          | /ery         |             | / Core | (tsf) /<br>* Point-Load | ` ,   | Aggregate | Sand    | Sand | Sand   |        | اج       |       |                |               | ontent, %  |            |
| (ft)  | (ft)<br>606.7  | Blows        | Recovery     | Drive       | Press  | Strength<br>(psi)       | DESCRIPTION   | % Ag      | %<br>C) | Z.   | %<br>F | % Sitt | % Clay   |       | Blows          | per foo<br>20 | ot - ()    | 40         |
| 0-  |                | 2 3          |              | 1           |        |                         | Topsoil - 1"  | 14        | 8       | -    | 19     | 53     | 6        | Non-P | astic          |               |            |            |
| 1.0   | 605.7          | 3            | 9            |             |        |                         | Loose gray SILT (A-4b), some fine to coarse sand, little gravel; organic; damp.   |           |         |      |        |        |          | O.    |                |               |            |            |
| 3.0   | 603.7          | 6            |              |             |        |                         | Medium dense to dense brown SANDY SILT (A-4a), little clay,   |           |         |      |        |        |          |       |                |               |            |            |
| 5 —   |                | 13<br>24     | 10           | 2           |        |                         | little gravel; contains sandstone fragments; damp.  |           |         |      |        |        |          |       |                |               | $1 \times$ | 5          |
| -   | _              | 5            |              |             |        | <del>!</del>            |   |           | l       |      |        |        |          |       |                |               | 1          |            |
| -   |                | 6            | 16           | 3           |        |                         |   | 16        | 14      | -    | 15     | 44     | 11       |       | Q <sup>*</sup> | 1             | No.        | in-Plastic |
| -   |                | 2 9          | <del> </del> | 4           |        |                         |   |           |         |      |        |        |          |       | I N            |               |            |            |
| 10 —  |                | 8            | 16_          | 1           |        |                         |   | İ         |         |      |        |        |          |       |                |               |            |            |
| -   | -              | 5<br>7       | 6            | 5           |        |                         |   |           |         |      |        |        |          |       | • }            | 1             |            |            |
| 13.0  | 593.7          |              |              |             |        |                         | Severely weathered brownish gray SANDSTONE, argillaceous.   |           |         |      |        |        |          |       |                | 1             | # #        |            |
| 14.0—14.0—15—15—16—16—16—16—16—16—16—16—16—16—16—16—16— | 592.7-         | Core 120*    | Rec 89"      | RQD 66%     | R-1    |                         | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, thickly bedded to massive, moderately to highly fractured.  @ 14.7'-15.3', 23.3'-23.5', broken and decomposed zones.  @ 15.4'-16.8', 18.3'-19.0', 21.8'-22.2', lost recovery; likely decomposed and argillaceous; possible broken and unfractured zones.  @ 21.2'-21.4', high angle fracture. |           |         |      |        |        |          |       |                |               |            | 507        |
| 25  |                | Core<br>120" | Rec<br>120*  | RQD         | R-2    | 2                       | @ 26.8', 27.3', low angle fractures.  |           |         |      |        |        |          |       |                |               |            |            |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. MBUS, OHIO 43229 \* (614)888-0040

|  | TranSy |              |               |             | 7              |   | Project: SCI-823-0.00 Job No. 0121-3070.03   |
|--|--------|--------------|---------------|-------------|----------------|---|--|
| LOG  | OF: Bo | ring         | C-31          | -           |                |   | 1. 313+03.2, 361.3 ft. LT of SR 823 CL Date Drilled: 12/21/05 to 12/22/05  |
| Depth<br>(ft)  | (ft)   | Blows per 6" | Recovery (in) | Samp<br>No. | Press / Care 📑 | Hand<br>Penetro-<br>meter<br>(Isf) /<br>* Point-Load<br>Strength<br>(psi) | DESCRIPTION    SO   SO   SO   SO   SO   SO   SO   S  |
| 30 -   | 576.7  | 43           | 4             | 7           | F              |   | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, thickly bedded to massive, moderately to highly fractured. |
| -34.0-35-301-300-03 ( 11/15/2001 15:49 PM ) -40-40-40-40-40-40-40-40-40-40-40-40-40- |        |              |               |             |                |   | Bottom of Boring - 34.0'   |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO.

BUS, OHIO 43229 \* (614)888-0040

| _                         | Client: T                      |                     |                  |             |             |              |                                     | Project: SCI-823-0.00  |             |          |              |        |     |      |       | Job No.   | 0121         | -3070   | .03   |
|---------------------------|--------------------------------|---------------------|------------------|-------------|-------------|--------------|-------------------------------------|--|-------------|----------|--------------|--------|-----|------|-------|-----------|--------------|---|-------|
|                           | _OG O                          | F: Bo               | ring             | C-34        |             | _            | ocation: Sta                        | . 328+37.0, 148.1 ft. LT of SR 823 CL Date Drilled: 1/   | 10/0        |          | <b>-</b> 7 - |        |     |      |       |           |              | <del></del> ;                                 |       |
|                           |                                | !                   |                  | (in)        | Samp<br>No. |              | Hand<br>Penetro-<br>meter           | WATER OBSERVATIONS: Water seepage at: None Water level at completion: Not reported   |             |          | RAD          | ATK    | ON_ |      | STA   | NDARD     | PENE:        | ratio   | N (N) |
|                           | Depth<br>(ft)                  | Elev.<br>(ft)       | Blows per 6"     | Recovery (I | 9           | Press / Core | (tsf) /<br>* Point-Load<br>Strength |  | % Aggregate | Sand .   | % M. Sand    | . Sand | #15 | Clay | Natur | al Moisti | ıre Coi      | ntent, %                                      | - •   |
|                           | 0—                             | 713.3               | Blo              | Rec         | Drive       | Pre          | (psi)                               | DESCRIPTION  | %           | %        | %            | %      | %   | %    | 1     | Blows p   | er 1001<br>) | <u>. O</u>                                    | 40    |
| $\mid$                    | - 1                            | <del>-</del> 712.6- | 3 3              |             | 1           |              | 3.5                                 | Topsoil - 8"/12" soil removed before drilling  Very stiff to hard brown SANDY SILT (A-4a), little clay; dry.   |             | <u> </u> |              |        |     |      |       |           |              |   |       |
|                           | <del>-</del>                   |                     | 20               | 8           |             |              | 45.                                 | @ 3.5', contains sandstone fragments.  |             |          |              |        |     |      | ó     | <i>)</i>  |              | <u>, , , , , , , , , , , , , , , , , , , </u> |       |
| $\mid$                    | -5.0<br>-                      | <del>-</del> 708.3- | 20<br>26<br>50/1 | 13          | 2           | •            | 4.5+                                | Severely weathered brown SANDSTONE.  |             |          |              |        |     |      |       |           |              |   | 50+   |
|                           | 10 —                           |                     | Core<br>108"     | Rec<br>30"  | RQD<br>0%   | R1           |                                     | @ 5.7'-12.5', lost recovery.   |             |          |              |        |     |      |       |           |              |   |       |
| 3 [ 11/12/2007 12:49 FM ] | -                              | 698.3-              | Core<br>120*     | Rec<br>120* | RQD<br>92%  | R2           |                                     | Medium hard to hard brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, thickly bedded, highly fractured to broken.  Hard gray SANDSTONE; fine grained, slightly weathered, argillaceous, massive, slightly fractured. |             |          |              |        |     |      |       |           |              |   |       |
| FILE: 0121-3070-03        | 25 —<br>-<br>-<br>-<br>-<br>30 |                     | Core<br>120*     | Rec<br>120* | RQD<br>100% | R3           |                                     |  |             |          |              |        |     |      |       |           |              |   |       |

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|   | TranSy                 |           |          |             |         |                                      | Project: SCI-823-0.00   |             |           |           |           |        |        |          | Job Ne | 012            | 1-3070.03              |
|---|------------------------|-----------|----------|-------------|---------|--------------------------------------|---|-------------|-----------|-----------|-----------|--------|--------|----------|--------|----------------|------------------------|
| LOG   | OF: Bo                 | ring      | C-34     |             |         | ocation: Sta                         | . 328+37.0, 148.1 ft. LT of SR 823 CL Date Drilled:   | /10/        |           |           |           |        |        | <u> </u> |        |                |                        |
|   | Stan                   | gr 6"     | y (in)   | Samp<br>No. |         | Hand<br>Penetro-<br>meter<br>(tsf) / | WATER OBSERVATIONS: Water seepage at: None Water level at completion: Not reported  | gate        |           |           | DATI      |        |        |          |        |                | TRATION (N) ntent, % - |
| Depth<br>(ft)   | Elev.<br>(ft)<br>683.3 | Blows per | Recovery | Drive       | Press / | * Point-Load<br>Strength<br>(psi)    | DESCRIPTION   | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Sitt | % Clay |          |        | per fool<br>20 |                        |
|   | _                      |           |          |             |         |                                      | Hard gray SANDSTONE; fine grained, slightly weathered, argillaceous, massive, slightly fractured.  @ 31.1'-31.7', few argillaceous laminations. |             |           |           |           |        |        |          |        |                |                        |
| -34.0 35 - 35.0 35.0 35 - 35.0 35 - 35.0 35 - 35.0 35 - 35.0 35 - 35.0 35 - 35.0 35.0 35 - 35.0 35 - 35.0 35 - 35.0 35 - 35.0 35 - 35.0 35 - 35.0 |                        |           |          |             |         |                                      | Bottom of Boring - 34.0'  |             |           |           |           |        |        |          |        |                |                        |

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BUS, OHIO 43229 \* (614)888-0040

| Client:                         | TranSy        | stems        | Inc.        |             |         |                          | Project: SCI-823-0.00   |             |        |          |           |         |          | Joi       | No.         | 012 | 1-307              | 0.03   |
|---------------------------------|---------------|--------------|-------------|-------------|---------|--------------------------|---|-------------|--------|----------|-----------|---------|----------|-----------|-------------|-----|--------------------|--------|
| LOG                             | F: Bo         | ring         | C-35        |             | _       | ocation: Sta             | . 329+55.7, 223.5 ft. RT of SR 823 CL Date Drilled: 1/  | 11/0        |        |          |           |         |          |           |             |     |                    |        |
|                                 |               |              |             | Samp<br>No. |         | Hand<br>Penetro-         | WATER OBSERVATIONS: Water seepage at: None  |             | GI     | RAD.     | ATIC      | אכ<br>  | $\dashv$ |           |             |     |                    |        |
|                                 |               | .9.          | (in)        |             | Core    | meter<br>(tsf) /         | Water level at completion: 6.7' (includes drilling water)   | ate         | ٦      | פַ       | ام        |         |          |           |             |     | TRATIO<br>ntent, % | ON (N) |
| Depth<br>(ft)                   | Elev.<br>(ft) | 's per       | Recovery    |             | s/C     | * Point-Load<br>Strength |   | % Aggregate | Sand   | San      | San       |         | <u>6</u> | PL H      |             |     |                    | LL     |
| 0-                              | 646.2         | Blows        | Recc        | Drive       | Press / | (psi)                    | DESCRIPTION   | %<br>A      | %<br>% | × ×      | % F. Sand | S'<br>% | ÿ<br>%   | Blo<br>10 | ws pe<br>20 |     | - C<br>30          | 40     |
| 0. <del>5</del>                 | 645.7         | 3            |             |             |         |                          | Topsoil - 6"  | 1           |        |          |           |         |          |           |             |     |                    |        |
| -                               | -             | 5 3          | 8           | 1           |         | 2.5                      | Very stiff brown SANDY SILT (A-4a), some gravel, little clay; contains sandstone fragments; damp.   |             | <br>   |          |           |         |          | <u></u>   |             |     |                    |        |
|                                 | 644.7         | 50/5         | 6           | 2           |         | 4.0                      |   | 25          | 19     | <b>-</b> | 9         | 36      | 11       | •         | +           | 7   | †                  | 50+    |
| -4.5<br>-<br>-<br>-             | -641.7-       |              | 1           |             |         |                          | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, pyritic, very thickly bedded, slightly fractured.  @ 5.0', 5.1', 7.4'; low angle fractures, iron stained.  @ 7.4'-7.5'; decomposed argillaceous zone. |             |        | į        |           |         |          |           |             |     |                    |        |
| 10 —                            |               | Core<br>112" | Rec<br>112" | RQD<br>97%  | R1      |                          |   |             |        |          |           |         |          |           |             |     |                    |        |
| 15 —                            |               | Core<br>120" | Rec<br>120" | RQD<br>100% | R2      |                          |   |             |        |          |           |         |          |           |             |     |                    |        |
| FILE: 0121-3070-03 (11/12/2007) |               | Core<br>12"  | Rec 12"     | RQD<br>100% | R3      |                          | Bottom of Boring - 24.8'  | _           |        |          |           |         |          |           |             |     |                    |        |
| ه.<br>- 30                      |               |              |             |             |         |                          |   |             |        |          |           |         |          |           |             |     |                    |        |

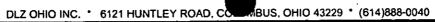
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| Clie               | nt: Ti      | ranSys                          | stems,        | Inc.        |             | _       |                                  | Project: SCI-823-0.00   |             |      |      |            |        |        |           | Job      | No. C   | )121   | -3070                   | .03 |
|--------------------|-------------|---------------------------------|---------------|-------------|-------------|---------|----------------------------------|---|-------------|------|------|------------|--------|--------|-----------|----------|---------|--------|-------------------------|-----|
| LO                 | G O         | F: Bo                           | ring (        | C-89        |             | _       |                                  | . 68+17.2, 43.6 ft. LT of SR 823 CL Date Drilled: 2/2   | 20/0        |      |      |            |        | 1      |           |          |         |        |                         |     |
|                    |             |                                 |               |             | Samp<br>No. | le<br>  | Hand<br>Penetro-                 | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring)  |             | GF   | RAD. | ATIC       | NC     |        |           | <b>.</b> |         |        |                         |     |
| Dej                | oth         | Elev.                           | per 6"        | ery (in)    |             | / Core  | meter<br>(tsf) /<br>* Point-Load | 2.5' (inside hollowstern augers)  | % Aggregate | Sand | Sand | Sand       |        |        | Nat       |          | oisture | e Cont | RATIO<br>tent, %<br>\ l | - • |
| (fi                | 0           | (ft)<br>572.2                   | Blows         | Recovery    | Drive       | Press / | Strength<br>(psi)                | DESCRIPTION   | % Agg       | C    | Σ    | Æ,         | % Sitt | % Clay | · · · · · |          |         | foot   |                         | 40  |
| <b>—</b> о.        | 7—          | <del>-5</del> 71.5              |               |             |             |         |                                  | Topsoil - 8"  |             |      |      |            |        |        |           |          |         |        |                         |     |
|                    | _           |                                 | 3 2           | 7           | 1           |         | ·                                | Loose brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; damp.  |             |      |      |            |        |        | O         |          |         |        |                         |     |
| 3.                 | .0          | -569.2                          | 2<br>3<br>4   | 18          | 2           |         | 1.5                              | Stiff brownish gray SILT AND CLAY (A-6a), trace fine to coarse sand; moist.   | 0-          | 1    |      | 1          | 69     | 29     | ا         |          | -       | •      | -1                      |     |
| 5.                 | 5<br>-      | -566.7-                         | 3<br>5<br>8   | 18          | 3           |         | 3.0                              | Very stiff brown CLAY (A-7-6), some silt, trace fine to coarse sand; moist.   | 0           | 1    | _    | 1          | 26     | 72     | )         |          |         | +      |                         |     |
| <b>—</b> 8.        | .₀—         | -564.2-                         |               |             | Ī           |         | ļ<br>:                           | ·   |             |      |      | 1          |        |        |           | 19       | ;       |        |                         |     |
| 1                  | 0-          |                                 | 7<br>10<br>16 | 18          | 4           |         | 4.25                             | Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; damp.  |             |      |      |            |        |        |           |          |         | ,<br>O |                         |     |
| 11                 | .0-         | -561.2-                         | 16            | _           |             |         |                                  | Severely weathered gray SANDSTONE, micaceous.   | ł           |      |      |            |        |        |           |          |         |        |                         | 1   |
|                    | 2.0         | <del>-5</del> 60.2 <del>-</del> | 50/4          | 8           | 5           |         | ,                                | Soft to medium hard gray SILTSTONE; very fine grained, highly weathered, arenaceous, micaceous, thickly bedded to massive, moderately fractured.                  |             |      |      |            |        |        |           |          |         |        |                         | 50+ |
|                    | 5 —         |                                 | Core          | Rec<br>120" | RQD<br>77%  | R1      |                                  |   |             |      |      |            |        |        |           |          |         |        |                         |     |
| M4 69:             | -<br>-<br>, | 550.7                           |               | ,           |             |         |                                  | @ 18.7'-18.9', broken zone.   |             |      |      |            |        |        |           |          |         |        |                         |     |
| 27 7002/21         | 9.5<br>20 — | <del>-5</del> 52.7-             |               |             | ,           |         | ŀ                                | Medium hard gray SANDSTONE interbedded with SILTSTONE fine grained, slightly weathered, argillaceous, micaceous, medium bedded, slightly to moderately fractured. |             |      | ,    | <br> -<br> |        |        |           |          |         |        |                         |     |
| 03 [ 11/           | -           |                                 |               |             |             |         |                                  |   |             |      |      |            |        |        |           |          |         |        |                         |     |
| -0706-12           | 25          |                                 |               |             |             |         |                                  |   |             |      |      | -          |        |        |           |          |         |        |                         |     |
| FILE: 0121-3070-03 | =           |                                 | Core<br>120"  | Rec<br>120" | 96%         | R2      |                                  | @ 27.6'-27.7', calcareous.  | i           |      |      |            |        |        |           |          |         |        |                         |     |
|                    | an –        |                                 |               |             |             |         |                                  | @ 28.9'-29.1', vuggy.   |             |      |      |            |        |        |           |          |         |        |                         |     |

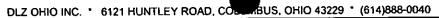
DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO

BUS, OHIO 43229 \* (614)888-0040

| Client:   | FranSvs       | stems        | Inc           | -          |          | ·            | OLZ OHIO INC.       |                                  | SCI-82                          | 3-0.00               |                                     |                      | (014)00     |             |                  |                        |        |                     | Job N    | o. 01.           | 21-30  | 70.03        | 3        |
|---|---------------|--------------|---------------|------------|----------|--------------|---------------------|----------------------------------|---------------------------------|----------------------|-------------------------------------|----------------------|-------------|-------------|------------------|------------------------|--------|---------------------|----------|------------------|--------|--------------|----------|
| LOG   |               |              |               |            | 1        | ocation: Sta | a. 68+17.2, 4       |                                  |                                 |                      |                                     | Date D               | rilled: 2/2 | 20/0        |                  |                        |        |                     |          |                  |        |              |          |
| Depth<br>(ft)   | Elev.<br>(ft) | Blows per 6" | Recovery (in) | Samp<br>No | ole      |              | WATER<br>OBSERVATIO | NS: Wa                           | ter seepag<br>at comple         | e at: None           | side hollov                         | ring)<br>vstem auger | s)          | % Aggregate |                  | % M. Sand<br>% F. Sand | % Clay | <b>Natu</b> i<br>Pi | ral Moi. | D PEN<br>sture C | onteni | ,% -<br>⊣ LL | (N)<br>• |
| 30 —<br>32.0—<br><br>35 —<br><br><br><br>   | 542.2         | BI           | Re            | ď          | <i>H</i> |              | Medium ha           | d, slightly<br>edded <u>, sl</u> | SANDST<br>y weathe<br>ightly to | ONE intered, argilla | rbedded<br>aceous, i<br>ly fracture | micaceous            | STONE;      |             | , and the second |                        | 6      |                     |          |                  | 30     |              |          |
| 45 — 50-0/05-1210 : 50-0/05-1210 : 555 — 55 |               |              |               |            |          |              |                     |                                  |                                 |                      |                                     |                      |             |             |                  |                        |        |                     |          |                  |        |              |          |



| С              | lient: T          | ranSy               | stems            | , Inc.   |             |         |  | Project: SCI-823-0.00  |            |       |        |        |         |        |      | Job No                        | . 012          | 1-3070.             | 03   |
|----------------|-------------------|---------------------|------------------|----------|-------------|---------|--|--|------------|-------|--------|--------|---------|--------|------|-------------------------------|----------------|---------------------|------|
| _              |                   | F: Bo               |                  |          |             | L       |  | . 69+29.2, 163.6 ft. RT of SR 823 CL Date Drilled: 02  | /20        |       |        |        |         |        |      |                               |                |                     |      |
| $\cdot \Gamma$ |                   |                     |                  |          | Samp<br>No. | le      | Hand   | WATER OBSERVATIONS: Water seemen at: None  | $\vdash$   | Gi    | RAD.   | ATIC   | ON<br>T |        |      |                               |                |                     |      |
|                | Depth             | Elev.               | per 6"           | nry (in) |             | Care    | Penetro-<br>meter<br>(tsf) /<br>* Point-Load | Water seepage at: None Water level at completion: 1.5'   | regate     | Sand  | Sand   | Sand   |         |        | Nati | ANDARI<br>ural Mois<br>⊃L ├—— |                | TRATION<br>ntent, % | - •  |
|                | (ft)<br>0 —       | (ft)<br>584.1       | Blows            | Recovery | Drive       | Press / | Strength<br>(psi)                            | DESCRIPTION  | % Aggregat | S C S | % M. S | % F. S | 3       | % Clay |      |                               | per foot<br>20 | -                   | 10   |
| _              | -                 | -583.3 <del>-</del> |                  |          |             | i       |  | Topsoil - 10"  | ┨          | İ     |        |        |         |        |      |                               |                |                     |      |
|                | -                 | 504.4               | <sup>4</sup> 5 6 | 14       | 1           |         |  | Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4) trace clay; damp.   | ,          |       |        |        |         |        |      | Ġ.                            |                |                     |      |
|                | -3.0<br>-         | <del>-5</del> 81.1- | 5<br>13<br>14    | 15       | 2 .         |         | 4.25   | Very stiff to hard brown and gray SILT (A-4b), little fine to coarse sand, trace clay, trace gravel; damp.   |            |       |        |        |         |        |      |                               | }              |                     |      |
|                | 5 —               |                     | 14               | "        |             |         |  |  |            |       |        |        |         |        |      |                               |                |                     |      |
|                | _                 |                     | 6 8              | 13       | 3           |         | 3.0  | •  | !          |       |        |        |         |        |      | ď                             |                |                     |      |
|                | -8.0<br>-         | <del>-5</del> 76.1- | 7<br>12<br>11    | 46       | 4           |         |  | Medium dense to very dense brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); damp.   |            |       |        |        |         |        |      |                               |                |                     |      |
|                | 10 —              |                     | i                | 1        |             |         | <u>.</u>                                     |  |            |       |        |        |         |        |      |                               | 3              | <b>\</b>            |      |
| $\vdash$       | -12.1             | 572.0-              | 9<br>24<br>50/1  | 12       | 5           |         |  | Medium hard to hard gray SANDSTONE interbedded with  | ┨          |       | İ      | .      |         | ļ      |      |                               |                |                     | 50+( |
|                | 15 —              |                     | Core<br>60"      |          | RQD<br>90%  | R1      |  | SILTSTONE; fine grained, unweathered to slightly weathered, argillaceous, micaceous, thickly bedded, slightly fractured.  @ 12.1'-12.4', iron stained. |            |       |        |        |         |        |      |                               |                |                     |      |
| L              | -17.1 <del></del> | 567.0               |                  |          | <b>.</b>    | _       |  | D-0  | 4          | ļ     | 1      | 1      |         | 1      |      |                               |                |                     |      |
| 1:49 PM ]      | -                 |                     |                  | ,        |             |         |  | Bottom of Boring - 17.1'   |            |       |        |        |         |        |      |                               |                |                     |      |
| 12007          | 20 —              |                     |                  |          |             |         |  |  |            |       |        |        |         |        |      |                               |                |                     |      |
| 1 11/12        | -                 |                     |                  |          |             |         |  |  |            |       |        |        |         |        |      |                               |                |                     |      |
| 0121-3070-03   | 25 —              |                     |                  |          |             | -       |  |  |            |       |        |        |         |        |      |                               |                |                     |      |
| FILE:          | - 30              |                     |                  |          |             |         |  |  |            |       |        | 1      |         |        |      |                               |                |                     |      |



| Client:       | FranSv:        | stems.       | Inc.       |            |          |                              | Project: SCI-823-0.00  |            |      |     |      |      |           |   | Job No      | . 0121         | -3070.     | 03    |
|---------------|----------------|--------------|------------|------------|----------|------------------------------|--|------------|------|-----|------|------|-----------|---|-------------|----------------|------------|-------|
|               | F: Bo          |              |            |            | L        | ocation: Sta                 | . 209+28.6, 43.6 ft. RT of SR 823 CL Date Drilled: 02  | /21        |      |     |      |      |           |   |             |                |            | _     |
|               |                | -            |            | Samı<br>No | ole      | Hand                         | WATER OBSERVATIONS: Water seepage at: None   |            | GI   | RAD | ATIC | N    | $\dashv$  |   |             |                |            |       |
|               |                | .9           | (ii)       |            | re       | Penetro-<br>meter<br>(tsf) / | Water level at completion: 4.7'  | ate        | 7    |     | _    |      |           |   |             | PENE           |            | v (N) |
| Depth<br>(ft) | Elev.<br>(ft)  | per          | very       |            | s / Core | * Point-Load<br>Strength     |  | % Aggregal | Sand | San | Sand | Silt | ay        |   | ۲ I         |                | <u>-</u> L | .L    |
| (")           | 669.1          | Blows        | Recovery   | Drive      | Press    | (psi)                        | DESCRIPTION  | %<br>A     | %    | %   | % F. | % S  | %         |   | Blows<br>10 | per foot<br>20 | - ()<br>30 | 10    |
| 0.5           | 668.6          |              |            |            |          |                              | Topsoil - 6"   | 1          |      |     |      | i    | 1         |   |             |                |            |       |
| -             |                | 1<br>2<br>3  | 10         | 1          |          |                              | Loose to medium dense brown SANDY SILT (A-4a), some gravel, little clay; damp.   |            |      |     |      |      | ;         | a |             |                |            |       |
| -             | 1              | 2            |            |            |          | ,                            |  | 27         | 17   |     | 19   | 25   | 12        |   | <b>1</b>    | 1              |            |       |
| 5 —<br>5.5    | 663.6          | 10<br>16     | 16         | 2          |          |                              |  | j          | ] '' |     | '`   |      | -         |   |             | 10             |            |       |
| -             | 1              | 8<br>8<br>10 |            | 3          |          | 4.0                          | Very stiff to hard brown and gray SILT AND CLAY (A-6a), trace fine to coarse sand; damp.                               |            |      |     |      | :    |           |   |             |                |            |       |
| 8.5           | 660.6<br>659.6 | 14           | 7          | 4          |          |                              | Severely weathered brown SANDSTONE, argillaceous.  | 1          |      |     |      |      |           |   |             |                | 7          | 50+   |
| 9.5           | 659.6          | Join         |            |            |          |                              | Hard brown SANDSTONE; fine grained, moderately to highly weathered, argillaceous, very thinly bedded to thinly bedded, | :          |      |     |      |      |           |   |             |                |            |       |
|               | <u> </u>       | Core<br>60"  | Rec<br>60" | RQ0<br>45% | R1       |                              | highly fractured, iron staining. @ 10.6'-10.9', 12.7'-12.9', high angle fractures.                                     |            |      | ,   |      |      |           |   |             |                |            |       |
| 13.2          | 655.9          |              |            |            |          |                              | @ 13.1'-13.2', low angle fracture.   | ╣.         | ŀ    |     |      |      |           |   |             |                |            |       |
| 14.5<br>15    | 654.6          |              |            |            |          |                              | Hard gray SANDSTONE interbedded with SILTSTONE; fine grained, slightly weathered, argillaceous, micaceous, very thinly | ·          |      |     |      |      |           |   |             |                |            |       |
|               | 1              |              |            |            |          |                              | bedded to thinly bedded, slightly fractured, iron staining.  Bottom of Boring - 14.5'                                  | 1          |      | ė   |      |      |           |   |             |                |            |       |
|               | -              |              |            |            |          |                              | ·  |            |      |     |      |      |           |   |             |                |            |       |
| 20 —          | 1              |              |            |            |          |                              |  |            |      |     |      |      |           |   |             |                |            |       |
|               | -              |              |            |            |          |                              |  |            |      |     |      |      |           |   |             |                |            |       |
|               | _              |              |            |            |          |                              |  |            |      |     |      |      |           |   |             |                |            |       |
| 3             | _              |              |            |            |          |                              |  |            |      |     |      |      |           |   |             |                |            |       |
| 25            | _              |              |            |            |          |                              |  |            |      |     |      |      |           |   |             |                |            |       |
| 25            | _              |              |            |            |          |                              |  |            |      |     |      |      |           |   |             |                |            |       |
|               | -              |              |            |            |          |                              |  |            |      |     |      |      |           |   |             |                |            |       |
| 30            | 7              |              |            |            |          |                              |  |            |      |     |      |      | <u> Ш</u> |   | <u> </u>    | <u> </u>       |            |       |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, Co. BUS, OHIO 43229 \* (614)888-0040

| Client:   | Tran        | Syste    | ems.          | Inc.        |            |        |  | Project: SCI-823-0.00  |             |         |      |      |        |        |   | Job No. 0                     | 121-3070 | .03_ |
|---|-------------|----------|---------------|-------------|------------|--------|--|--|-------------|---------|------|------|--------|--------|---|-------------------------------|----------|------|
|   | OF: I       |          |               |             |            | L      | ocation: Sta                                 | i. 210+04.6, 252.0 ft. RT of SR 823 CL Date Drilled: 02i   | 21          | /07     |      |      |        |        |   |                               |          |      |
|   |             |          |               |             | Samp       | le     | Hand   | WATER  |             | GI      | RAD. | ATIO | NC     |        |   |                               |          |      |
| Depth   | - 1         |          | per 6"        | rery (in)   | No.        | / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load | OBSERVATIONS: Water seepage at: None Water level at completion: 3.7'   | % Aggregate | Sand    | Sand | Sand |        | . Y.   | Natu                                    | NDARD PE<br>ral Moisture<br>L |          | - •  |
| (ft)<br>0 -   | (ft)<br>661 | 1.4      | Blows per     | Recovery    | Drive      | Press  | Strength<br>(psi)                            | DESCRIPTION  | % Ag        | %<br>C) | % M. | % F  | % Silt | % Clay | 1                                       | Blows per f                   | oot - () | 40   |
| 0.6   | 660         | 2        | 3 5           | 5           | 1          |        |  | Loose to medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp to moist.   |             |         |      |      |        |        | C                                       |                               |          |      |
| 5-  |             | <b>}</b> | 11<br>16      | 14          | 2          |        |  |  | 35          | 16      | -    | 14   | 24     | 11     |   | • 4                           | Ö        |      |
| 5.5   | - 655<br>   | 4        | 12<br>15      | 12          | 3          | -      | 3.0  | Stiff to very stiff brown and gray SANDY SILT (A-4a), trace clay, trace gravel; contains sandstone fragments; damp.  |             | ļ<br>t  |      |      |        |        |   |                               | ۵        |      |
| 10 -  | -           | 5        | 8 11          | 10          | 4          |        |  | -  |             | į       |      |      | ļ      |        |   |                               |          |      |
|   |             |          | 10<br>11      | 18          | 5          | į      | 1.5  |  |             | ;       |      |      |        |        |   |                               |          |      |
| 15 ·<br>15.5  | 645         | <b>⊢</b> | 5 7           | 10          | 6          |        | 1.5  |  |             |         |      |      |        |        |   | $\alpha(1)$                   |          |      |
| - 13.5  | - 04:       | 3.9      | 0<br>17<br>25 | 16          | 7          | !      |  | Dense gray SILT (A-4b), little fine to coarse sand, trace gravel, trace clay; damp.  | -           |         |      |      |        |        | 1 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |                               | <i>†</i> | 0    |
| 19.4<br>20  |             |          | Core  <br>60" | Rec<br>'60" | RQD<br>45% | R1     |  | Hard gray SANDSTONE interbedded with SILTSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, very thinly bedded to thinly bedded, slightly fractured, @ 19.4'-19.7', 20.4'-20.6', broken zones. |             |         |      |      |        |        |   |                               |          |      |
| 25. 0121-3070-03<br>25. 25. 25. 25. 25. 25. 25. 25. 25. 25. | 63          | 7.0      |               |             |            |        |  | Bottom of Boring - 24.4'   |             |         |      |      | ;      |        |   |                               |          |      |
| 30  | ]_          |          | _             |             |            |        |  |  |             |         |      |      | •      |        |   |                               |          |      |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, O

ABUS, OHIO 43229 \* (614)888-0040

| Client:       | FranSv                 | stems        | Inc           |             |              |   | Project: SCI-823-0.00   |             |           |           |           |        |        |    | Job             | No.    | 0121              | -3070 | .03 |
|---------------|------------------------|--------------|---------------|-------------|--------------|---|---|-------------|-----------|-----------|-----------|--------|--------|----|-----------------|--------|-------------------|-------|-----|
| LOG C         |                        |              |               | 8           | L            | ocation: Sta  | . 212+46.0, 174.8 ft. LT of SR 823 CL Date Drilled: 1/  | 19/0        | 6.        |           |           | _      |        |    |                 |        |                   |       |     |
| 2000          |                        | ing .        |               | Samp<br>No. | le           | Hand  | WATER   | H           |           | RAD       | ATIC      | NC     |        |    | •               |        |                   |       |     |
| Depth<br>(ft) | Elev.<br>(ft)<br>697.8 | Blows per 6" | Recovery (in) | Drive       | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | Water seepage at: None  Water level at completion: None (prior to coring)  15.5' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Sitt | % Clay | Na | tural N<br>PL 🕒 | loistu | re Con<br>er foot |       | - • |
| 0.9 <u>-</u>  | 696.9                  |              |               |             |              |   | Topsoil - 11"  Hard brown SILT AND CLAY (A-6a), little fine to coarse sand; contains sandstone fragments; dry.  |             |           |           | i         |        |        |    |                 |        |                   |       |     |
| -             |                        | 6<br>8<br>10 |               | 1           |              | 4.5+  |   |             |           | į         |           |        |        |    |                 | 0      |                   |       |     |
| 5.0<br>5.5    | 692.8<br>692.3         | 8<br>_50/2   | . 7           | _2_         |              | 4.5+  | Hard brown SANDY SILT (A-4a), some gravel, little clay; contains sandstone fragments; damp.  © 5.5'-6.7', weathered.  | 29          | 13        | -         | 7         | 39     | 12     |    |                 | 1      |                   |       | 50+ |
| 10 —          |                        | Core 120"    | Rec<br>120"   | RQD<br>98%  | R1           | *1465   | Hard gray SANDSTONE; fine grained, slightly to moderately weathered, argillaceous, massive, moderately fractured.  @ 6.0', 6.3', 6.4', 6.6', 7.2', 7.5', 8.9', 9.2', 9.9', 11.7', 15.2', low angle fractures. |             |           |           |           |        |        |    |                 |        |                   |       |     |
| 15.5          | <del>  6</del> 82.3-   |              |               |             |              |   | Bottom of Boring - 15.5'  | ]           |           |           |           |        |        |    |                 |        |                   |       |     |
| 20 —<br>25 —  |                        |              |               |             |              |   |   |             |           |           |           |        |        |    |                 |        |                   |       |     |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. MBUS, OHIO 43229 \* (614)888-0040

| 0: : 3  | Feor Com      | olom:        | Inc           |             |          |              | Project: SCI-823-0.00  |             |           | _         | -       |      |        | Jo                    | b No. 0121-3070.03 |       |
|---|---------------|--------------|---------------|-------------|----------|--------------|--|-------------|-----------|-----------|---------|------|--------|-----------------------|--------------------|-------|
| Client: T   |               |              |               |             | ٦,       | acation: Sta | 1. 345+04.3, 55.9 ft. RT of SR 823 CL Date Drilled:  | 12/22       | /07       |           |         |      |        |                       | <u> </u>           |       |
| 1000  | ,r. 60        | ing (        | U-30          | Samp        | _        |              | WATER Date Diffield. C   | T           |           |           | ATIO    | ON   |        |                       |                    |       |
| Depth<br>(ft)   | Elev.<br>(ft) | Blows per 6" | Recovery (in) | Drive       |          |              | OBSERVATIONS: Water seepage at: 1.0'-2.5' Water level at completion: 1.2'  DESCRIPTION   | % Aggregate | % C. Sand | % M. Sand | F. Sand | Silt | , Clay | Natural<br>PL 1<br>Bl | ows per foot -     | V)    |
| 0   | 585.9         | 8            | 8             | ٥           | <u>a</u> | (pay         | <u></u>  | -   %       | %         | %         | 8       | %    | %      | <u>10</u>             | <u>20 30 40</u>    | 1 1 1 |
| -   | -585.1-       | 3<br>1<br>2  | 6             | 1           |          |              | Topsoil - 9"  Very loose brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; damp.  |             |           |           |         |      |        | Ο                     |                    |       |
| 5   | 582.4         | Core<br>60"  | Rec<br>60*    | RQD<br>100% | R1       |              | Hard gray SANDSTONE interbedded with SILTSTONE; fine grained, unweathered, argillaceous, micaceous, calcareous, thickly bedded, slightly fractured.  @ 3.5'-3.7', brown. |             |           |           |         |      |        |                       |                    |       |
| <del></del> 8.5   | 577.4         | -            | _             |             |          |              | Bottom of Boring - 8.5'  |             |           |           |         |      |        |                       |                    |       |
| 10 — 15 - 11/17/2002 12:49 BM ] 25 - 25 - 25 - 25 - 25 - 25 - 25 - 25 |               |              |               |             |          |              |  |             |           |           |         |      |        |                       |                    |       |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C

BUS, OHIO 43229 \* (614)888-0040

| Client:                    | FranSv:           | stems.   | Inc.          |             |    | _'' 1_"   | Project: SCI-823-0.00   |             |   |   |           |   |      |      | Job No               | 0121        | -3070.03                      |
|----------------------------|-------------------|--|---------------|-------------|----|---|---|-------------|---|---|-----------|---|------|------|----------------------|-------------|-------------------------------|
| LOG C                      |                   |  |               |             | L  | ocation: Sta.                                     | . 344+78.7, 268.3 ft. RT of SR 823 CL Date Drilled: 0   | 2/22        |   |   |           |   |      |      |                      |             |                               |
| Depth<br>(ft)              | Elev.<br>(ft)     | Blows per 6"                                     | Recovery (in) | Samp<br>No. |    | Hand Penetro- meter (tsf) / * Point-Load Strength | WATER OBSERVATIONS: Water seepage at: 1.0'-2.5' Water level at completion: 1.6'  DESCRIPTION  | % Aggregate |   |   | % F. Sand |   | Clay | Natu | ıral Moisi<br>°L ⊢—— | ure Con     | RATION (N)<br>tent, % - ■<br> |
| o —                        | 562.8             | 96   | 8             | ľa.         | ď  | (psi)   |   | %           | % | % | %         | % | %    | 7117 | 10 2                 | <u>20 3</u> | 0 40                          |
| 0. <del>9</del> -          | 561.9             | 1 2  | 5             | 1           |    |   | Topsoil - 11"  Very loose brown and gray GRAVEL WITH SAND AND SILT (A-2-4), trace clay; damp.   |             |   |   |           |   |      | d    |                      |             |                               |
|                            | 559.8<br>558.8    |  | 3             | 2           |    |   | Severely weathered gray SANDSTONE.  | ]           | 1 |   |           |   |      |      |                      |             | 50                            |
| 5 —                        | -                 | Core<br>60"                                      | Rec<br>60"    | RQD<br>95%  | R1 |   | Medium hard gray SANDSTONE interbedded with SILTSTONE fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to medium bedded, slightly fractured, . @ 6.2'-6.3', low angle fracture. @ 6.8', 7.0', clay seams. | <b>;</b>    |   |   |           |   |      |      |                      |             |                               |
| 9.0                        | <del>5</del> 53.8 | <del>                                     </del> |               |             |    |   | Bottom of Boring - 9.0'   | 7           |   |   |           |   |      |      |                      |             |                               |
| 10 —                       |                   |  |               |             |    |   |   |             | : |   |           |   |      |      |                      |             |                               |
| 20 <b>–</b><br>25 <b>–</b> |                   |  |               |             |    |   |   |             |   |   |           |   |      |      |                      |             |                               |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C

| BUS, | OHIO | 43229 | * ( | (614 | )888-( | 040 |
|------|------|-------|-----|------|--------|-----|
|      |      |       |     |      |        |     |

| Client: T       | ranSy                  | stems                      | , Inc.   |             |   |              | Project: SCI-823-0.00   |             | -  |         |      |    |          | Job No. 01  | 21-3070.03     |
|-----------------|------------------------|----------------------------|--|-------------|---|--------------|---|-------------|----|---------|------|----|----------|---|----------------|
| LOG O           | F: Bo                  | ring                       | C-114  | _           | _ |              | prox. Sta. 175+15.1, 195.2 ft. LT of SR 823 CL Date Drilled: 07   | /02         |    |         |      |    | <u> </u> |   |                |
| Depth<br>(ft)   | Elev.<br>(ft)<br>646.4 | Blows per 6"               | Recovery (in)                                    | Samp<br>No. |   |              | WATER OBSERVATIONS: Water seepage at: 22.0' Water level at completion: 6.2' (includes drilling water)  DESCRIPTION  | % Aggregate |    | M. Sand | [uː] |    | % Clay   | STANDARD PEN Natural Moisture C PL Hospital Blows per for 10 20 | Content, % - ● |
| -0.4<br>-<br>-  | 646.0                  | 5<br>8<br>8                | 18   | 1           |   | 4.0          | Topsoil - 5" Hard brown SANDY SILT (A-4a), little gravel, little clay; contains rock fragments and rust stains; damp.                                     |             |    |         |      |    |          | Q   |                |
| 5 <del></del>   |                        | 7<br>8<br>10               | 17   | 2           |   | 4.5+         |   |             |    |         |      |    |          | • 0   |                |
| -<br>-<br>      |                        | 7<br>11<br>12              | 13   | 3           |   | 4.5+         | @ 8.5'-12.5', brown and gray.   |             |    |         |      |    |          |   |                |
| 10 —            | ,                      | 8<br>18<br>6<br>14         |  | 5           |   | 4.5+<br>4.5+ | g old 1210 political and gray.  | 23          | 17 |         | 20   | 27 | 13       | <b>P</b>  | 7              |
| <br>            | <del>-6</del> 32.9     | 16                         | 18   | 6           |   | 4.5          | Very stiff to hard brown SILT (A-4b), little to some fine to coarse sand, trace to little gravel; contains rock fragments and rust stains; damp to moist. | 3           | 7  | -       | 8    | 63 | 19       | <b>1</b>  |                |
| · -             |                        | 8<br>13<br>12              |  | 7           |   | 3.25         |   |             |    |         |      |    |          | ) t   | <b>X</b>       |
| 20              |                        | 18<br>18<br>25<br>10<br>11 | İ  | 8           |   | 4.5+         | @ 21.0'-22.5', brown and gray.  |             |    |         |      |    |          |   |                |
| -<br>23.5<br>-  | 622.9                  | 16<br>29                   | ) 10   | 9           |   | 4.5+         | Severely weathered brown and gray SANDSTONE,  |             |    |         | ,    |    | ,        |   |                |
| 25 <del>-</del> | 1                      | 19<br>35<br>42             | <del>"                                    </del> | 11          |   |              | argillaceous.   |             |    |         |      |    |          |   | О78<br>О77     |
| <br>28.8<br>30  | 617.6                  | İ                          | 3  | 12          | 1 |              | Hard gray SANDSTONE; very fine to fine grained.   |             |    |         |      |    |          |   | 50             |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO

| BUS. | оню | 43229 | • | (614)888-0040 |  |
|------|-----|-------|---|---------------|--|
| BUS, |     | 47772 |   | (017)000 0070 |  |

| Client: `     | ranSy                           | stems        | Inc.          |             | <br>  | Project: SCI-823-0.00  | Job No. 0121-3070.03   |
|---------------|---------------------------------|--------------|---------------|-------------|---|--|--|
| LOG 0         |                                 |              |               |             | ocation: Ap   | rox. Sta. 175+15.1, 195.2 ft. LT of SR 823 CL Date Drilled: 07/02/07   |  |
| Depth<br>(ft) | Elev.<br>(ft)                   | Blows per 6" | Recovery (in) | Samp<br>No. | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | 1 №  | STANDARD PENETRATION (N) atural Moisture Content, % - PL   LL Blows per foot - 10 20 30 40 |
| 30 —          | 616.4                           | Core<br>60"  | Rec<br>58*    | RQD<br>66%  |   | Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, massive, moderately fractured. @ 28.8'-31.1', broken. |  |
| 35 —          | 012.0                           |              |               |             |   | Bottom of Boring - 33.8'   |  |
| 45 —          | -<br>-<br>-<br>-<br>-<br>-<br>- |              |               |             |   |  |  |
| 50            |                                 |              |               |             |   |  |  |

FILE: 0121-3070-03 ( 11/12/2007 9:37 PM )

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. BUS, OHIO 43229 \* (614)888-0040

| Client:         | FranSv:                          | stems           | . Inc.        |            | _            |   | Project: SCI-823-0.00  |             |           |           |           | -        |        | Π,           | lob No.                 | 0121     | -3070.                                       | 03  |
|-----------------|----------------------------------|-----------------|---------------|------------|--------------|---|--|-------------|-----------|-----------|-----------|----------|--------|--------------|-------------------------|----------|--|-----|
| LOG O           |                                  |                 |               |            | Īι           | ocation: Api  | prox. Sta. 176+12.5, 286.9 ft. RT of SR 823 CL Date Drilled: 0   | 7/02        | /07       |           | _         |          | _      |              | -                       | _        | _  |     |
|                 |                                  |                 |               | Samp       | ole          |   | WATER  | L           |           |           | ATIC      | )N       |        |              |                         |          |  |     |
| Depth<br>(ft)   | Elev.<br>(ft)                    | Blows per 6"    | Recovery (in) | Drive      | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: None Water level at completion: 4.8' (includes drilling water)  DESCRIPTION                          | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt   | % Clay | Natura<br>PL | l Moistu<br><br>Blows p | ire Cor  | TRATION                                      | - • |
| 0.5             | 603.8<br>603.3                   | - 9             | <u> </u>      | 3          | -            |   | _Topsoil - 6"  | ┪           | l"        | <u> </u>  |           | <u> </u> | *      |              |                         |          | <u> </u>                                     |     |
| 0.5 _           | 003.3                            | 5 4 7           | 16            | 1          |              |   | Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4 some fine to coarse sand; contains rock fragments; damp.                         | ).<br>      |           |           |           |          | :      | Ç            | )<br>)                  |          |  |     |
| —3.5—<br>5 —    | -600.3                           | 6<br>5<br>4     | 15            | 2          |              |   | Very stiff to hard brown and gray SANDY SILT (A-4a), trace to little gravel; contains rock fragments; damp to moist.                 | 6           | 19        | -         | 19        | 39       | 17     | d            | • 1                     |          |  |     |
| -               |                                  | 5<br>7<br>14    | 18            | 3          | :            | 3.5   |  |             |           |           |           |          |        |              |                         | <b>)</b> |  |     |
| 10 —            |                                  | 3<br>3<br>5     | 17_           | 4          |              | 2.25  | •<br>•   | 0           | 2         | -         | 30        | 43       | 25     | q            | 1                       | •        |  |     |
| -               | -<br>-                           | 4<br>6<br>6     | 18            | 5          |              | 2.25  |  |             |           | ;         | ļ.<br>ļ   |          |        | (            | 2,                      |          |  |     |
| —13.5—<br>15 —  | 590.3                            | 5<br>9<br>15    | 13            | 6          |              |   | Severely weathered gray SANDSTONE, argillaceous, wet.  |             |           |           |           |          |        |              | <i></i>                 | ζ,       |  |     |
| -<br>-<br>-17.5 | -<br>586.3-                      | 6<br>36<br>50/3 | 12            | 7          |              |   |  | _           |           |           |           |          |        |              |                         |          | <i>,                                    </i> | 50+ |
| 20 —            |                                  | Core<br>60"     | Rec<br>60"    | RQD<br>79% | R-1          |   | Hard gray SANDSTONE; very fine to fine grained, moderately highly weathered, argillaceous, micaceous, massive, moderately fractured. | to .        |           |           |           |          |        |              |                         |          |  |     |
| 25 -            | <del>- 5</del> 81.3 <del>-</del> |                 |               |            | ,            |   | Bottom of Boring - 22.5'   |             |           |           |           |          |        |              |                         |          |  |     |
| 30              |                                  |                 |               | -          |              |   |  |             |           |           | 1         |          |        |              |                         |          |  |     |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. BUS, OHIO 43229 \* (614)888-0040

| Client: T          |                        |                |               |               |              |   | Project: SCI-823-0.00 Job No. 0121-3070.03  |
|--------------------|------------------------|----------------|---------------|---------------|--------------|---|---|
| LOG O              | F: Bo                  | ring           | C-116         |               | _            | ocation: Ap   | prox. Sta. 184+99.6, 172.0 ft. LT of SR 823 CL  |
| Depth<br>(ft)      | Elev.<br>(ft)<br>629.1 | Blows per 6"   | Recovery (in) | Sample<br>No. | Press / Core | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | WATER OBSERVATIONS: Water seepage at: 18.5' - 18.7' Water level at completion: 7.7' (includes drilling water)  DESCRIPTION  GRADATION  STANDARD PENETRATION (N) Natural Moisture Content, % - PL   Blows per foot - 10 20 30 40 |
| -                  |                        | <sup>2</sup> 4 | 15            | 1             |              | ·   | Very stiff to hard brown SANDY SILT (A-4a), trace gravel; damp. @ 1.0'-5.0', contains rock fragments and rust stains.   |
| 5—                 |                        | 4 4            | 16            | 2             |              | 3.25  |   |
| -                  |                        | 5<br>8<br>6    |               | 3             |              | 3.0   |   |
| 10 —               |                        | 9 10           | 18            | 4             |              | 3.75  | @ 11.0'-27.5', gray.  |
| -<br>-<br>-<br>15  |                        | 3<br>2<br>3    | 16            | 6             | ST1          | 2.5<br>1.75   | @ 13.5'-27.5', contains rock fragments.   |
| ? -                |                        | 3<br>6<br>13   | 18            | 7             |              | 4.5+  |   |
| 20 —               |                        | 4<br>7<br>3    | 12            | 8             |              | 4.5+ .  |   |
|                    |                        | 4 5            | 16            | 9             |              |   | @ 23.5'-25.0', stiff.   |
| 25 <del></del><br> |                        | 6<br>11<br>13  |               | 10            |              | 1.5<br>3.25   | 11 12 - 10 49 19 19 19 19 19 19 19 19 19 19 19 19 19  |
|                    |                        | 1              | 1             | 12            |              |   | Severely weathered gray SANDSTONE fragments,  |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. BUS, OHIO 43229 \* (614)888-0040

|                | TranSy                 |              |               |            | 7 |   | Project: SCI-823-0.00   | 0/00        |           |     | <br>         |          | 20/07/2 |               | 21-3070.03                            |
|----------------|------------------------|--------------|---------------|------------|---|---|---|-------------|-----------|-----|--------------|----------|---------|---------------|---------------------------------------|
| <u>.06</u> 0   | F: Bo                  | ring         | C-116         | Sam        |   |   | prox. Sta. 184+99.6, 172.0 ft. LT of SR 823 CL Date Drilled: 0  | 6/20<br>    |           | RAD | <br>to<br>ON | $\dashv$ | 06/25/0 | 7             | · · · · · · · · · · · · · · · · · · · |
| Depth<br>(ft)  | Elev.<br>(ft)<br>599.1 | Blows per 6" | Recovery (in) | Drive      |   | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: 18.5' - 18.7' Water level at completion: 7.7' (includes drilling water)                                 | % Aggregate | % C. Sand |     | % Sitt       | % Clay   |         | al Moisture ( | LL                                    |
| 30 —           |                        | Core<br>60"  | Rec<br>60"    | RQD<br>71% |   |   | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, massive, moderately to highly fractured. |             |           |     | J.           | 5        |         |               | 30 40                                 |
|                | 595.1-                 |              |               |            |   |   | Bottom of Boring - 34.0'  | $\dashv$    |           |     |              |          |         |               |                                       |
| 35 —<br>-<br>- |                        |              |               |            | , |   |   | :           |           |     |              |          |         |               |                                       |
| 40 —           | ]<br> <br> -<br> -     |              |               |            |   |   |   |             |           |     |              |          |         |               |                                       |
| 45 —           | -                      |              |               |            |   |   |   |             |           |     |              |          |         |               |                                       |
| 50 —           |                        |              |               |            |   |   |   |             |           |     |              |          |         |               |                                       |
| -              |                        |              |               |            |   |   |   |             |           |     |              |          |         |               |                                       |
| 55 —           | -                      |              |               |            |   |   |   |             |           |     |              |          |         |               |                                       |

- DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C BUS, OHIO 43229 \* (614)888-0040

| Client:             | ranSys                 | stems         | , Inc.        |             |     |   | Project: SCI-823-0.00  | - 00        |      |         |           |        |        | ].         | Job No                            | . 012             | 1-307     | 0.03 |
|---------------------|------------------------|---------------|---------------|-------------|-----|---|--|-------------|------|---------|-----------|--------|--------|------------|-----------------------------------|-------------------|-----------|------|
| LOG O               |                        |               |               |             | I   | ocation: Ap   | prox. Sta. 183+57.1, 192.0 ft. RT of SR 823 CL Date Drilled: 07  | /02         | 07   |         |           |        |        |            |                                   |                   |           |      |
| Depth<br>(ft)       | Elev.<br>(ft)<br>626.4 | Blows per 6"  | Recovery (in) | Samp<br>No. | ole | Hand<br>Penetro-<br>meter<br>(Isf) /<br>* Point-Load<br>Strength<br>(psi) | WATER OBSERVATIONS: Water seepage at: 26.5', 29.5' Water level at completion: 34.3' (prior to coring) 9.8' (includes drilling water) | % Aggregate | Sand | M. Sand | % F. Sand | % Silt | % Clay | Natu.<br>P | NDARE<br>ral Mois<br>L I<br>Blows | ture Co           | ontent, 1 | LL   |
| 0 —<br>0.6 _<br>    | 625.8                  | 3<br>5<br>7   | 18            | 1           |     | 4.0   | Topsoil - 7" Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; contains few rock fragments; damp.           |             |      |         |           |        |        |            | Q                                 |                   |           |      |
| 5 <del></del>       |                        | 5<br>6<br>7   | 14            | 2           |     | -   |  |             |      |         |           |        |        |            | Q                                 |                   |           |      |
| -                   |                        | 8<br>10<br>9  | 15_           | 3           |     |   | ·  |             |      |         |           |        |        |            | \<br>}                            | <b> </b><br> <br> |           |      |
| -<br>10 <del></del> |                        | 6<br>8<br>6   | 16            | 4           |     | 4.0   | -<br>-   |             |      | !       |           |        |        |            | ď                                 |                   |           |      |
| -                   |                        | 9<br>10<br>16 | 18            | 5           |     | 4.5+  | @ 11.0'-12.5', brown and gray.   |             |      |         |           |        |        |            |                                   |                   |           |      |
| -<br>15 —           |                        | 6<br>7<br>12  | 18            | 6           |     | 4.0   |  | 23          | 13   | -       | 9         | 33     | 22     |            | •!                                | <i>  /</i>        | -         |      |
| -<br>-<br>:         |                        | 4<br>9<br>11  | 18            | 7           |     | 4.5   |  |             |      |         |           |        |        |            | •                                 | \<br>}            |           |      |
| 20 —                | 607.9                  | 5<br>9        | 18_           | 8           |     | 4.5   | Hard brown CLAY (A-7-6), trace fine sand; damp.  |             |      |         |           |        |        |            | φ                                 |                   |           |      |
| -                   | 602.9                  | 5<br>5        | 16            | 9           |     | 2.5   | Very stiff brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; contains rust stains; damp.                         |             |      |         |           |        |        |            | ]/<br>                            |                   |           |      |
| 25.5<br>25.5<br>-   |                        | 3             | 18            | 10          | ST1 | 0.5   | Medium stiff to stiff gray CLAY (A-7-6), trace fine sand; contains rock fragments; moist.  | 0           | 0    | -       | 1         | 25     | 74     | γ<br>φ     |                                   |                   |           |      |
| -                   |                        | WOH<br>2<br>4 | 18            | 11          |     | 1.5   |  |             |      |         |           |        |        | Q          |                                   |                   |           |      |
| 30                  |                        | 5 4 5         | 18            | 12          |     | 1.25  |  |             |      |         |           |        |        | ¥<br>د     |                                   |                   |           |      |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, COLLMBUS, OHIO 43229 \* (614)888-0040

| Client                                    | : Trans | Syste | ms,          | Inc.          |             |     |     | Project: SCI-823-0.00   | Job No. (                          | 0121-3070.03                                     |
|---|---------|-------|--------------|---------------|-------------|-----|-----|---|------------------------------------|--|
| LOG                                       | OF: E   | Borin | ıg C         | -117          |             | _   |     | rox. Sta. 183+57.1, 192.0 ft. RT of SR 823 CL Date Drilled: 07/02/07  |                                    |  |
| Dept<br>(ft)                              | (ft)    | y.    | Blows per 6" | Recovery (in) | Samp<br>No. |     |     | 0.01 (hadiidaa dallihaa iintaa)   199   | atural Moisture<br>PL <del> </del> | ENETRATION (N) e Content, % -   LL foot -  30 40 |
| 35  |         | 5     | 4 7          | 15            | 13          |     | 2.5 | Very stiff gray SILT AND CLAY (A-6a), little gravel, trace fine sand; contains rock fragments; moist.   |                                    |  |
| 40  |         | C     | Core<br>60"  | Rec<br>60*    | RQD<br>73%  | R-1 |     | Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, massive, moderately to highly fractured. |                                    |  |
| 42.                                       | 3 - 303 |       |              |               |             |     |     | Bottom of Boring - 42.5'  |                                    |  |
| FILE: 0121-3070-03 [ 11/12/2007 9:37 PM ] |         |       |              |               |             |     |     |   |                                    |  |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO. BUS, OHIO 43229 \* (614)888-0040

| Client: T                      | ranSv                | stems       | . Inc.     |             | •      |  | Project: SCI-823-0.00  | Job No. 0121-3070.03  |
|--------------------------------|----------------------|-------------|------------|-------------|--------|--|--|---|
| LOG O                          |                      |             |            |             | L      | ocation: Apt                                 | rox. Sta. 239+61.2, 433.1 ft. LT of SR 823 CL Date Drilled: 07/03/07   | 1   |
|                                |                      |             |            | Samp<br>No. | ole    |  | NATER GRADATION GRADATION  |   |
| Depth                          | Elev.                | per 6"      | rery (in)  |             | / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load | Water level at completion: 0.7' (includes drilling water)  | STANDARD PENETRATION (N) Natural Moisture Content, % -  PL   LL |
| (ft)                           | <i>(ft)</i><br>652.6 | Blows       | Recovery   | Drive       | Press, | Strength<br>(psi)                            | % Aggregat % C. Sand % F. Sand % Sitt % Clay   | Blows per foot - ()<br>10 20 30 40                              |
| —1.0—                          | 651 6                |             |            |             |        |  | Sand and Gravel - 12" (drilled in creekbed)  |   |
|                                | 651.6<br>650.6       | 30<br>50/3  | 7          | 1           |        |  | Severely weathered brown SANDSTONE, argillaceous, rust-  |   |
| 5 <del></del>                  |                      | Core<br>60" | Rec<br>58" | RQD<br>95%  | R-1    | ·  | Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, massive, moderately fractured.  @ 5.3', pyritic, increased very fine grain content. |   |
| 7.0                            | 645.6                |             |            |             |        |  | Bottom of Boring - 7.0'  |   |
|                                |                      |             |            |             |        |  |  |   |
| 10 —                           |                      |             |            |             |        |  |  |   |
| _                              |                      |             |            |             |        |  |  |   |
| _                              |                      |             |            |             |        |  |  |   |
|                                |                      |             |            |             |        |  |  |   |
| 15                             | ]                    |             |            |             |        |  |  |   |
| -                              |                      |             |            |             |        |  |  |   |
| -                              | 1                    |             |            |             |        | ļ  |  |   |
| -<br>20                        | ]                    |             |            |             |        |  |  |   |
| -                              | -                    |             |            |             |        |  |  |   |
| _                              |                      |             |            |             |        | -  |  |   |
| _                              |                      | :           |            |             |        |  |  |   |
| 25 <del></del><br>25<br>-<br>- | 1                    |             |            |             |        |  |  |   |
| _                              | ]                    |             |            |             |        |  |  |   |
| _                              |                      |             |            |             |        |  |  |   |
| 20                             |                      |             |            |             |        |  |  |   |

FILE: 0121-3070-03 | 11/12/2007 9:37 PM J

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C

MBUS, OHIO 43229 \* (614)888-0040

| Client:                                 | ranSy:         | stems       | Inc.     |             |         | · · · · · · · · · · · · · · · · · · ·                | Project: SCI-823-0.00   |             |            |         |        |        |        |       | Job No. 0121-3                    | 070.03                 |
|---|----------------|-------------|----------|-------------|---------|--|---|-------------|------------|---------|--------|--------|--------|-------|-----------------------------------|------------------------|
| LOG C                                   |                |             |          |             | _       |  | prox. Sta. 238+19.5, 467.4 ft. RT of SR 823 CL Date Drilled:  | 7/03        | _          | _       |        |        |        |       |                                   |                        |
| Depth                                   | Elev.          | er 6"       | ry (in)  | Samp<br>No. |         | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER OBSERVATIONS: Water seepage at: None Water level at completion: 4.0' (includes drilling water)                        | egate       |            |         | Puic   |        |        | Natur | NDARD PENETR<br>al Moisture Conte | nt, % - 🔸              |
| (ft)                                    | (ft)<br>638.6  | Blows per   | Recovery | Drive       | Press / | Strength<br>(psi)                                    | DESCRIPTION   | % Aggregate | %<br>C. S. | % M. S. | % F. S | % Silt | % Clay |       | Blows per foot -                  | → LL<br>○<br><u>40</u> |
| -0.3                                    | 638.3          | 6<br>8<br>8 | 18       | 1           |         |  | Topsoil - 4"  Medium dense brown GRAVEL WITH SAND AND SILT (A-2-contains rock fragments; damp.                              | 1);         |            |         |        |        |        |       | φ                                 |                        |
| 5                                       | 632 6          | 7<br>7<br>9 | 16       | 2 ·         |         |  |   |             |            |         |        |        |        |       | 67,7                              |                        |
| 7.3                                     | 632.6<br>631.3 | 21          |          | 3           |         |  | Hard brown SILT (A-4b), some fine to coarse sand, trace gravel; damp.   | :           |            |         |        |        |        |       |                                   | 50+(                   |
| 10 —                                    |                | Core<br>60" | Rec 60"  | RQD<br>57%  | R-1     |  | Hard brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, massive, highly fractured.  @ 10.7', gray. |             |            |         |        |        |        |       |                                   |                        |
| 12.3                                    | 626.3          |             |          |             |         |  | Bottom of Boring - 12.3'  |             |            |         |        |        |        |       |                                   |                        |
| 15 - 25 - 25 - 25 - 25 - 25 - 25 - 25 - |                |             |          |             |         |  |   |             |            |         |        |        |        |       |                                   |                        |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO.

| BUS. | оню    | 43229 | * | (614  | )888-0040  |
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| uco, | O. 110 | 70220 |   | (0,17 | ,000 00 10 |

| Client:         | ranSy               | stems       | , Inc.      |            |  |   | Project: SCI-823-0.00  |      |           |             |        |       |        |                  | Job N      | o. 01        | <u>21-3</u> | <u> 1070</u> | .03 .       |
|-----------------|---------------------|-------------|-------------|------------|--|---|--|------|-----------|-------------|--------|-------|--------|------------------|------------|--------------|-------------|--------------|-------------|
| LOG O           | F: Bo               | ring        | R-24        |            | ] _  | ocation: Sta  | . 66+18.9, 77.5 ft. LT of SR 823 CL Date Drilled: 05   | /17/ |           |             |        |       |        |                  |            |              |             |              | <del></del> |
| Depth           | per 6"              | ery (in)    | Samp<br>No. | Core       | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER OBSERVATIONS: Water seepage at: Not Reported Water level at completion: 17.0' (prior to coring) 14.0' (includes drilling water) |  |      | % M. Sand | Sand        |        | Λίε   | Natu   | NDAR<br>ral Mois |            |              |             | - •          |             |
| (ft)            | (ft)<br>569.8       | Blows per   | Recovery    | Drive      | Press /  | Strength<br>(psi)   | 14.0' (includes drilling water)  DESCRIPTION   |      |           |             | % F. S | % Sil | % Clay | 1                | Blows<br>0 | per fo<br>20 | ot -<br>30  | <u> </u>     | <u>40</u>   |
| 0.3             | <del>-</del> 569.5- | 2 1         | 12_         | 1          |  | 2.5   | Topsoil - 4" POSSIBLE FILL: Stiff to very stiff dark brown SILT (A-4b), little clay, trace fine to coarse sand; moist.   |      | -         |             |        |       |        | ρ                |            |              |             |              |             |
| 5—              |                     | 2·<br>1     | 15          | 2          |  | 1.75  |  | 0    | 1         | <del></del> | 4      | 82    | 13     | Ò                |            |              |             | •            |             |
| <del>6</del> .0 | <del>-56</del> 3.8  | 1 2         | 18          | 3          |  | 0.75  | Medium stiff to stiff brown SILT AND CLAY (A-6a), trace to little fine to coarse sand, trace gravel; moist.  |      |           |             |        |       |        | \<br><b>\</b>    |            |              |             |              |             |
| -<br>10         |                     | 2 2         | 18          | 4          |  | 1.5   | -  | 0    | 0         | -           | 4      | 63    | 33     | Q                |            | •            | 1           |              |             |
| -               |                     | 5 6         | 18          | 5          |  | 3.0   | @ 11.0'-12.5', very stiff.   |      |           |             |        |       |        |                  | þ          |              |             |              |             |
| —13.5—<br>15 —  | 556.3               | 3 6         | 14          | 6          |  |   | Medium dense brown SANDY SILT (A-4a), little gravel, trace clay; rust stained; damp.   |      |           |             |        |       |        |                  | )<br>      |              |             |              |             |
| _               | 553.1-              | 1 (         | 17          | 7          |  | 1.5   | Stiff gray SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; rust stained; moist.  |      |           |             |        |       |        |                  |            |              |             |              |             |
| r-              | 551.3-<br>-548.8-   | 1           | 16          | 8          |  |   | Severely weathered gray SANDSTONE, argillaceous.   |      |           |             |        |       |        |                  |            |              |             |              | 83-         |
| 25 —            |                     | Core<br>66" | Rec<br>65"  | RQD<br>56% | R-1  | *487  | Medium hard gray SANDSTONE; very fine to fine grained, highly weathered, argillaceous, thinly to medium bedded, moderately to highly fractured, contains few argillaceous laminations.  @ 24.2'-26.5', thickly bedded. |      |           |             |        |       |        |                  |            |              |             |              |             |
| 26.5            | 543.3               |             |             |            |  |   | Bottom of Boring - 26.5'   |      |           |             |        |       |        |                  |            |              |             |              |             |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. MBUS, OHIO 43229 \* (614)888-0040

|  | TranSy             |              |               |             |              |   | Project: SCI-823-0.00   |             |           |           |           |        |        |           | Job N                                 | o. <b>0</b> 1                                    | 21-3  | 3070.          | 03          |
|--|--------------------|--------------|---------------|-------------|--------------|---|---|-------------|-----------|-----------|-----------|--------|--------|-----------|---------------------------------------|--|-------|----------------|-------------|
| LOG  | F: Bo              | ring         | R-25          |             | _            |   | . 66+16.7, 28.5 ft. LT of SR 823 CL Date Drilled: 05  | /18/        |           |           |           |        |        |           |                                       |  |       |                |             |
| 1  |                    |              |               | Samp<br>No. |              | Hand  | WATER OBSERVATIONS: Water access at: 16.0'  | $\vdash$    | GF        | RAD.      | ATIO      | DN     |        |           |                                       |  |       |                |             |
| Depth<br>(ft)                                | Elev.<br>(ft)      | Blows per 6" | Recovery (in) | Drive       | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | Water seepage at: 16.0'  Water level at completion: 18.0' (prior to coring) 2.0' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | 6 M. Sand | % F. Sand | % Sitt | % Clay | Natu<br>F | ANDARI<br>Iral Mois<br>PL I—<br>Blows | per fo   | Conte | nnt, %<br>—⊢ L | - •         |
| 0.2=   | 578.7<br>578.5     | _            | 1 02          | 9           | <u>a</u>     |   | \Topsoil - 2"   | -           | 8         | 8         | 8         | 8      | - 2    |           | <u>10</u>                             | 20<br>   | 30    | <del>4</del>   | <i>io</i>   |
| -  |                    | 3 4          | 14            | 1           |              | 2.75  | Very stiff brown SILT AND CLAY (A-6a), trace to little fine to coarse sand, trace gravel; damp to moist.  |             |           |           |           |        | i      | ρ         |                                       |  |       |                |             |
| 5 <del>-</del>                               | -573.2-            | 3 4          | 16            | 2           |              | 2.75  |   | 0-          | 3         | -         | 3         | 69     | 25     | О         |                                       | -  |       | <del>-</del>   |             |
| 3.0  | 373.2              | 2 2          | _18           | 3           |              | <0.25   | Stiff to very stiff brown and gray SILT (A-4b), some clay, trace fine to coarse sand; moist.  @ 6.0'-7.5', very soft.   |             |           |           |           |        |        | φ         |                                       |  |       |                |             |
| 10 —   | -                  | 1 1 2        | 18            | 4           |              | 1.0   | <del>.</del>  |             | ,         |           |           |        |        | ļ<br>Q    |                                       |  |       |                |             |
|  | 1<br>-<br>-<br>-   | 1 3          | 18            | 5           |              | 1.75  | ·<br>_  | 0           | 1         | -         | 2         | 74     | 23     | Ç         | )                                     |  | -     |                |             |
| 15 —   |                    | WOH<br>1     | 18            | 6           |              | 4.5   |   |             |           |           |           |        |        | \d        |                                       |  |       |                |             |
|  |                    | 5 4 6        | 18            | 7           |              | 2.5   |   |             |           |           |           |        |        | - \       | \<br>\                                |  |       |                |             |
| 20 -   | 560.2              | 8            | 17            | 8           |              |   | Medium dense brown SANDY SILT (A-4a), trace clay, trace gravel; moist.  |             |           |           |           |        |        |           | \\\\                                  | <del>                                     </del> |       | ,              |             |
| 21.0   | 557.7              | 38<br>50/4   | 10            | 9           |              |   | Severely weathered gray SANDSTONE, argillaceous.  |             |           |           |           |        |        |           |                                       |  |       | 7              | 50+(        |
| 23.5-0170-021-0170-0170-0170-0170-0170-0170- | 555.2              | Core<br>70"  | Rec<br>64"    | RQD<br>83%  | R-1          | *122  | Medium hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, medium bedded, moderately to highly fractured with clay infilling. |             |           |           | ,         |        |        |           |                                       |  |       |                |             |
| 29.3   | 549.4 <sup>-</sup> |              | <u> </u>      |             | _            |   | Bottom of Boring - 29.3'  | 4           |           |           |           |        |        |           |                                       |  |       |                |             |
| 30   |                    | 1            | <del></del>   | Щ           | 1            | 1   | BOUGH DEBORNO - 29 3  | -           | _         | 1         | 4         | 1      |        |           | + • • •                               |  |       | <u></u>        | <del></del> |

| 4 |       |     |       |   |               |  |
|---|-------|-----|-------|---|---------------|--|
| C | MBUS, | ОНЮ | 43229 | • | (614)888-0040 |  |

| Client:       | TranSy              | stems.         | , Inc.        | -           |     |                             | Project: SCI-823-0.00  |             |          |         |           |      |        | Job No. 0  | 121-3070.03  |
|---------------|---------------------|----------------|---------------|-------------|-----|-----------------------------|--|-------------|----------|---------|-----------|------|--------|--|--------------|
| LOG           | )F: Bo              | ring           | R-26          |             | _   |                             | . 66+91.6, 42.4 ft. RT of SR 823 CL Date Drilled: 05   | /18/        |          |         | 4 710     |      |        |  |              |
| Depth<br>(ft) | Elev.<br>(ft)       | Blows per 6"   | Recovery (in) | Samp<br>No. |     | Hand Penetro- meter (tsf) / | WATER OBSERVATIONS: Water seepage at: 6.0' Water level at completion: None (prior to coring) 3.5' (includes drilling water)  DESCRIPTION   | % Aggregate | C. Sand  | M. Sand | % F. Sand | Silt | 6 Clay | STANDARD PEI<br>Natural Moisture<br>PL \<br>Blows per fi | Content, % - |
| 3=            | 577.1<br>576.8      |                | 8             | 1           | 0   |                             | `Topsoil - 3"  | 10%         | %        | 8       | 9/        | %    |        | 10 20  | 30 40        |
| -             | 370.0               | 1 2 2          | 7             | 1           |     |                             | Loose to medium dense brown SANDY SILT (A-4a), little clay, trace to little gravel; damp to moist.   | 10          | 22       |         | 11        | 46   | 11     | Q. •   | Non-Plastic  |
| 5-            | -                   | 2<br>11<br>6   | 10            | 2           |     |                             |  |             |          |         |           |      |        |  |              |
| 8.0           | 569.1               | WOH<br>1<br>6  | 13            | 3           |     |                             | ONT (A A)  |             | <u> </u> |         |           |      |        | a(   |              |
| 10 —          |                     | 6 9 9          | 16            | 4           |     | 3.25                        | Very stiff gray and brown SILT (A-4b), some clay, little fine to coarse sand; damp to moist.   | 0           | 1        | -       | 14        | 63   | 22     | )<br> <br>   |              |
|               | -                   | 3 4 7          | 15            | 5           |     | 3.5                         | @ 11.0', contains sandstone fragments.   | ,           |          |         |           | . !  |        |  |              |
| 15 —          | 563. <del>6</del>   | 12<br>24<br>16 | 18            | 6           |     |                             | Severely weathered gray SANDSTONE, argillaceous, micaceous.  |             |          |         |           | ,    |        |  |              |
| 47.0          | 500.4               | 50/5           | 4             | 7           |     |                             | •  |             |          |         |           |      |        |  | 50+          |
| Ma 65:200 —   | -560.1 <del>-</del> | Core<br>60"    | Rec<br>58"    | RQD<br>77%  | R-1 |                             | Medium hard to hard gray SANDSTONE; very fine grained, highly to moderately weathered, argillaceous, micaceous, thinly bedded to medium bedded, moderately fractured.  @ 17.5'-17.9', clay filled fractures. |             |          |         |           |      |        |  |              |
| 22.0-         | 555.1               |                |               |             |     |                             | Bottom of Boring - 22.0'   | 1           |          |         |           |      |        |  |              |
| 25 —          |                     |                |               |             |     |                             |  |             | ļ        |         |           |      |        |  |              |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. BUS, OHIO 43229 \* (614)888-0040

| Client: T         |                        |                  |            | -           |            |                                      | Project: SCI-823-0.00   |             |          |           |           |        |        | Job No        | . 012 | 1-307 | 0.03 |
|-------------------|------------------------|------------------|------------|-------------|------------|--------------------------------------|---|-------------|----------|-----------|-----------|--------|--------|---------------|-------|-------|------|
| LOG O             | F: Bo                  | ring             | R-27       |             | _          | ocation: Sta                         | a. 74+12.9, 22.6 ft. RT of SR 823 CL Date Drilled: 04   | /11         | _        |           | A T46     | 241    |        | <br>          |       |       |      |
|                   |                        | 9                | (in)       | Samp<br>No. |            | Hand<br>Penetro-<br>meter<br>(tsf) / | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 6.6' (includes drilling water)   | ate         |          |           | ATIO      | N<br>  |        | ANDARE        |       |       |      |
| Depth<br>(ft)     | Elev.<br>(ft)<br>609.8 | Blows per        | Recovery   | Drive       | Press / Co | * Point-Load<br>Strength<br>(psi)    |   | % Aggregate | % C. San | % M. Sand | % F. Sand | % Sitt | % Clay | ral Mois<br>L |       |       | LL   |
|                   |                        | 25<br>48<br>50/3 | 15         | 1           |            | •                                    | No Topsoil Severely weathered brown SANDSTONE, argillaceous.  | :           |          |           |           |        |        |               |       |       |      |
| -                 | CO4.0                  | 15<br>50/4       | 10         | 2 .         |            |                                      |   |             |          |           |           |        |        |               |       |       | 50-  |
| 10 —              | 604.8-<br>598.4-       | Core<br>84"      | Rec<br>84" | RQD<br>88%  | R-1        | *106                                 | Soft to medium hard brownish gray SANDSTONE interbedded with SILTSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle iron stained fractures.  @ 7.0'-7.2', broken zone.  |             |          |           |           |        |        |               |       |       |      |
| 15 —              |                        | Core<br>120°     | Rec 120"   | RQD<br>92%  | R-2        | *434                                 | Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle iron stained fractures.  @ 11.4'-17.4', contains few to moderate argillaceous. laminations. @ 12.6'-12.9', iron stained broken zone.  @ 17.4'-22.0', slightly fractured. |             |          |           |           |        |        |               |       |       |      |
| 20 <del></del>    | 587.8                  |                  |            | ·           |            |                                      |   |             |          |           | -         | :      |        |               |       |       |      |
|                   | -                      |                  |            |             |            |                                      | Bottom of Boring - 22.0'  |             |          |           | 1         |        |        |               |       |       |      |
| 25 <del></del>    |                        |                  |            |             |            |                                      |   |             |          |           |           |        |        |               |       |       |      |
| -<br>-<br>-<br>30 | 1                      |                  |            |             |            |                                      |   |             |          |           |           |        |        |               |       |       |      |

| Client:                | TranSy                 | stems,       | Inc.          |             |     |   | Project: SCI-823-0.00   |             |    |           |    |        |     | Jol            | No.    | 012 | 1-30   | 70.0                                | )3 |
|------------------------|------------------------|--------------|---------------|-------------|-----|---|---|-------------|----|-----------|----|--------|-----|----------------|--------|-----|--------|-------------------------------------|----|
| LOG C                  | F: Bo                  | ring         | R-88          |             | Ĺ   | ocation: Sta  | 1. 166+92.7, 51.3 ft. LT of SR 823 CL Date Drilled: 11  | /2/0        |    |           |    |        |     |                |        |     |        |                                     |    |
| Depth<br>(ft)          | Elev.<br>(ft)<br>699.7 | Blows per 6" | Recovery (in) | Sami<br>No  |     | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 5.6' (includes drilling water)  DESCRIPTION  | % Aggregate | ığ | % M. Sand | ρι | % Clay | Nat | ural N<br>PL + | loistu |     | ontent | TION<br>t, % -<br>→ LL<br>○<br>— 40 | •  |
| 0.3                    | 699.4                  |              |               |             |     |   | Topsoil - 3"  | -           |    | ł         |    |        |     |                |        |     |        |                                     | 5  |
|                        |                        | 50/2         | 2             | 1           |     |   | Severely weathered brown SANDSTONE, argillaceous.   |             |    |           |    |        |     |                |        |     |        |                                     |    |
| 5—2.0<br>5—            | 697.7-                 | Core<br>120" | Rec<br>57*    | RQD<br>0%   | R-1 |   | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, thinly bedded to thickly bedded, broken, contains large filled fractures.  |             |    |           |    |        |     |                |        |     |        |                                     |    |
| —13.7—<br>15 —<br>20 — |                        | Core 120"    | Rec<br>120"   | RQD<br>78%  | R-2 | *578  | Medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typically low angle fractures, contains few argillaceous laminations. |             |    |           |    |        |     |                |        |     |        |                                     |    |
| _                      | -<br>-<br>-<br>-674.7- | Core<br>36"  | Rec<br>36"    | RQE<br>100% | R-3 | *667  | Bottom of Boring - 25.0'  |             |    |           |    |        |     |                |        |     |        |                                     |    |
| 25.0                   |                        |              |               |             |     |   |   |             |    |           |    |        |     |                |        |     |        |                                     |    |

| Client: T  | ranSy                          | stems,         | Inc.          |             | _            |        | Project: SCI-823-0.00   |         |         |      |        | Job No. 0121-3070.03   |
|--|--------------------------------|----------------|---------------|-------------|--------------|--------|---|---------|---------|------|--------|--|
| LOG O  | F: Bo                          | ring l         | ₹-90          |             | _            |        | 168+20.2, 110.2 ft. LT of SR 823 CL Date Drilled: 10/28/04  WATER GRA   | 245     | ) A T   | to   | 1      | 10/29/04   |
| Depth  | Elev.<br>(ft)                  | Blows per 6"   | Recovery (in) | Samp<br>No. | Press / Core |        | Water seepage at: None Water level at completion: None (prior to coring) 7.7' (includes drilling water)   | M. Sand | F. Sand | IIS. | % Clay | STANDARD PENETRATION (N)  Natural Moisture Content, % -  PL  LL  Blows per foot -  10 20 30 40 |
| 0.5<br>0.5                                       | 764.1<br>-763.6-               | 5              | 1             | 1           |              | 4.5+   | Topsoil - 6" Hard brown SANDY SILT (A-4a), trace clay; contains   |         |         |      |        |  |
| -  |                                | 6<br>12        |               | '           |              | 4.5+   | sandstone fragments; damp.  |         |         |      |        |  |
| 5 —<br>5.5                                       | -760.1 <del>-</del><br>-758.6- | 16<br>26<br>40 | 18            | 2           |              |        | Severely weathered SANDSTONE.   |         |         |      |        | <b>○66</b> →   |
| 10 —   | 7 30.0                         | Core<br>90"    | Rec<br>90"    | RQD<br>69%  | R-1          |        | Soft gray and brown SILTSTONE; highly weathered, argillaceous, highly fractured, with typical low angle fractures.  |         |         |      |        |  |
| 15 — 17.5— 20 — 20 — 20 — 20 — 20 — 20 — 20 — 20 | 746.6                          | Core<br>120"   | Rec 120"      | RQD<br>91%  | R-7          | 2 *549 | Medium hard to hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thickly bedded to massive, moderately to highly fractured with typical low angle clay filled fractures. |         |         |      |        |  |
| FILE: 0121-3070-03 ( 1                           | 739.5                          | Core<br>120"   | Rec<br>120*   | RQC<br>100% | R-           | 3 *595 | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thickly bedded to massive, slightly fractured.   |         | ,       |      |        |  |

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|                          | TranSy        |              |               |                     | _   |   | Project: SCI-823-0.00  |             |   |   |           |    |        |      | _                       | No.             | 0121              | -3070  | .03  |
|--------------------------|---------------|--------------|---------------|---------------------|-----|---|--|-------------|---|---|-----------|----|--------|------|-------------------------|-----------------|-------------------|--------|------|
| LOG                      | F: Bo         | ring         | R-90          |                     |     |   | . 168+20.2, 110.2 ft. LT of SR 823 CL Date Drilled:  | 10/28       |   |   |           | to | 1      | 0/29 | /04                     |                 |                   |        |      |
| Depth<br>(ft)            | Elev.<br>(ft) | Blows per 6" | Recovery (in) | Sami<br>No<br>Drive |     | Hand<br>Penetro-<br>meter<br>(Isf) /<br>* Point-Load<br>Strength<br>(psi) | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 7.7' (includes drilling water)  DESCRIPTION | 6 Aggregate |   |   | % F. Sand |    | 6 Clay | Na   | tural N<br>PL 1-<br>Blo | Noistu<br>ws pe | re Cor<br>er foot | TRATIO | LL • |
| 30 —<br>-<br>-           | 734.1         | 9            | <b>u</b> .    | 9                   | F   |   | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded.            | - 6         | 8 | 6 | 6         | 6  | 6      |      | 10                      | 20              |                   | 30     | 40   |
| -                        |               | Core<br>24*  | Rec<br>24"    | RQD<br>100%         | R-4 | *622  |  |             |   |   |           |    |        |      |                         |                 |                   |        |      |
| 40 — 45 — 555 — 555 — 60 | 729.1-        |              |               |                     |     |   | Bottom of Boring - 35.0'   |             |   |   |           |    |        |      |                         |                 |                   |        |      |

FILE: 0121-3070-03 [ 11/12/2007 12:49 PM

BUS, OHIO 43229 \* (614)888-0040

Client: TranSystems, Inc. Job No. 0121-3070.03 Project: SCI-823-0.00 LOG OF: Boring R-91 Location: Sta. 168+47.7, on CL SR 823 11/1/04 Date Drilled: 11/1/04 to GRADATION WATER Sample Hand **OBSERVATIONS:** No. Water seepage at: None Penetro-(in Water level at completion: None (prior to coring) meter STANDARD PENETRATION (N) % Aggregate 2.6 (includes drilling water) (tsf) / Sand Sand Sand Natural Moisture Content, % Recovery Point-Load Depth Elev. % M . % F. S. % Silt % Clay Strength Drive U Blows per foot -DESCRIPTION (psi) % -728.<del>6</del>-Topsoil - 4" Severely weathered SANDSTONE. **-726.9**-2.0-Hard to very hard brown and gray SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured with typically low angle clay filled fractures. ROD R-1 Core Rec \*1023 70% @ 2.0'-2.4',2.6'-2.8',3.0'-3.4', 8.7'-9.0', broken zones. 120" 120" 10 @ 6.5'-6.6',7.3'-7.4', high angle fractures. Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly 15 bedded. @ 12.0'-12.1',13.5'-13.9', high angle rust stained fractures. Core Rec RQD R-2 \*583 120" 92% 120" 20 Core Rec RQD 100% R-3 \*617 36" @ 24.0'-24.3', argillaceous zone. -25.0-<del>-703.9</del> Bottom of Boring - 25.0'

| Client:   | TranSy                          | stems       | Inc.        |             |         |                           | Project: SCI-823-0.00  |             |        |      |        |        |        |       | Job N | lo. 012 | 21- <u>3</u> 07 | 0.03    | $\Box$ |
|---|---------------------------------|-------------|-------------|-------------|---------|---------------------------|--|-------------|--------|------|--------|--------|--------|-------|-------|---------|-----------------|---------|--------|
| LOG   | OF: Bo                          | ring        | R-92        |             | Įι      | ocation: Sta              | . 168+46.5, 79.3 ft. RT of SR 823 CL Date Drilled: 1   | 1/2/0       |        |      |        | to     | 1      | 1/2/0 | 4     |         |                 |         | 4      |
|   |                                 | -           | l,          | Samp<br>No. |         | Hand<br>Penetro-<br>meter | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring)   |             |        | RAD  | ATIO   | ON.    | -      | S.T.  | ANDAE | O DEN   | ETRATI          | ION (NI |        |
| Depth   | Elev.                           | per 6"      | ary (in)    |             | Core    | (tsf) /<br>* Point-Load   | 9.8' (includes drilling water)   | regate      | Sand   | Sand | Sand   |        |        | Nati  |       |         | ontent,         |         | •      |
| (ft)  | (ft)<br>697.2                   | Blows ,     | Recovery    | Drive       | Press / | Strength<br>(psi)         | DESCRIPTION  | % Aggregate | % C. S | Σį   | %F. Sa | % Silt | % Clay |       |       | per foo |                 |         |        |
| 0.4   | 696.8                           |             |             |             |         |                           | Topsoil - 5"/2.5' soil removed before drilling   | ]           |        |      |        |        |        |       |       |         | <b>F</b>        |         |        |
| •   | 1                               | 27<br>.50/1 | 7           | 1           |         |                           | Severely weathered brown SANDSTONE, argillaceous.  | 1           |        |      |        |        |        |       |       |         |                 |         | 5      |
| 5-  | 695.2                           | Core 120"   | Rec<br>120" | RQD<br>96%  | R1      | *311                      | Medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical low angle clay filled fractures.                                     |             |        |      |        |        |        |       |       |         |                 |         |        |
| 8.1—<br>10 —  | 689.1-                          |             |             |             |         |                           | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  |             |        |      |        |        |        |       |       |         |                 |         |        |
| 11/12/2001 12:49 PM ) = 20 -  | -<br>-<br>-<br>-<br>-<br>-<br>- | Core 120"   | Rec<br>120" | RQD<br>100% | R2      | *519                      | <ul> <li>@ 11.2', low angle rust stained fracture.</li> <li>@ 20.0'-20.1', 20.9'-21.0', arenaceous zones.</li> <li>@ 24.0', 24.7', 25.3', low angle fractures.</li> <li>@ 24.0'-25.3', contains moderate to few argillaceous laminations.</li> </ul> |             |        |      |        |        |        |       |       |         |                 |         |        |
| 20.00 - 255 - 30.00 - | 667.2                           | Core<br>96" | Rec<br>96*  | RQD<br>100% | R3      | *96                       | Bottom of Boring - 30.0'   |             |        |      |        |        |        |       |       |         |                 |         |        |

| MBUS, OHIO 43229 | * | (614) | )888-0 | 040 |
|------------------|---|-------|--------|-----|

| Client:  | FranSy | stems        | , Inc.        |            |     |   | Project: SCI-823-0.00  |           | _    |         |      |   |        |       | Job No.                               | 012    | 1-3070   | 0.03        |
|--|--------|--------------|---------------|------------|-----|---|--|-----------|------|---------|------|---|--------|-------|---------------------------------------|--------|----------|-------------|
| LOG O  | F: Bo  | ring         | R-99          |            | _   | ocation: Sta                                      | . 177+03.6, 0.9 ft. RT of SR 823 CL Date Drilled: 10   | 27        | _    |         |      |   |        | ····. |                                       |        |          |             |
| Depth<br>(ft)  | Elev.  | Blows per 6" | Recovery (in) | Samj<br>No |     | Hand Penetro- meter (tsf) / * Point-Load Strength |  | Aggregate | Sand | N. Sand | Sand |   | % Clay | Natu  | ANDARD<br>Iral Moist<br>PL<br>Blows p | ure Co | ntent, % | 6 - •<br>LL |
| 0-   | 667.8  | 810          | Rec           | Drive      | Pre | (psi)   | DESCRIPTION  | 1%        | %    | % K     | %    | % | %      |       | 10 2                                  |        | 30       | 40          |
| 0.4<br><br>-   | 664.8  | 4<br>6<br>9  |               | 1          |     |   | Topsoil - 5"  Medium dense brown SANDY SILT (A-4a), trace clay; contains sandstone fragments; damp to moist.  Very dense brown GRAVEL (A-1-a), trace to little silt; damp.   |           |      |         |      |   |        |       | ď                                     |        | <i></i>  |             |
| -  | -      | 50/3         | 0             | 2          |     | <u> </u>  |  |           |      |         |      |   |        |       |                                       |        |          | 50∓         |
| 5.0<br><br>9.1<br>10   | 658.7  | Core<br>96"  | Rec<br>96"    | RQD<br>63% | R-1 | *238  | Soft brown SHALE; highly weathered to decomposed, moderately fractured with typical low angle clay filled fractures; contains moderate arenaceous laminations.  @ 6.4'-6.6',7.4'-7.8', broken zones.  Medium hard brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typically low angle clay filled fractures.  @ 9.9'-10.4', argillaceous laminations. |           |      |         |      |   |        |       |                                       |        |          |             |
| 15 —   | -      | Core<br>84"  | Rec<br>84"    | RQD<br>73% | R-2 | 2 *410  | <ul><li>@ 10.6'-11.3', high angle fractures.</li><li>@ 18.3'-18.6', high angle rust stained fracture.</li><li>@ 16.0'-16.1',18.9'-19.3', broken zones.</li></ul>   |           |      |         |      |   |        |       |                                       |        |          |             |
| 20.00 (11/12/2004) 1 20.00 (20 | 647.8  |              |               |            |     |   | Bottom of Boring - 20.0'   |           |      |         |      |   |        |       |                                       |        |          |             |

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| Client:        | TranSy         | stems         | Inc.          |             |              |  | Project: SCI-823-0.00  |             |         |         |           |        |        |                | . Job No                    | . 012   | 1-307     | 0.03        |
|----------------|----------------|---------------|---------------|-------------|--------------|--|--|-------------|---------|---------|-----------|--------|--------|----------------|-----------------------------|---------|-----------|-------------|
| LOG            | F: Bo          | ring          | R-99A         | "           | _            |  | . 175+32.2, 24.4 ft. RT of SR 823 CL Date Drilled: 10  | /28/        |         |         |           |        |        |                |                             |         |           | <u> </u>    |
| 1              |                | ;             | İ             | Samp<br>No. |              | Hand   | WATER OBSERVATIONS: Water seepage at: 2.5'   | Н           | GI      | RAD.    | ATIC      | N<br>T | -      |                |                             |         |           |             |
| Depth<br>(ft)  | Elev.          | Blows per 6"  | Recovery (in) |             | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength | Water level at completion: 7.4' (includes drilling water)  | % Aggregate | S. Sand | A. Sand | % F. Sand | Silt   | Clay   | Nati           | ANDARD<br>ural Mois<br>PL I | ture Co | ontent, S | % - •<br>LL |
|                | 628.4          | Blov          | Rec           | Drive       | Pre          | (psi)  | DESCRIPTION  | 1%          | ა<br>%  | % M.    | %         | %      | %      | , <i>,</i> , , | 10 2                        | 20      | 30        | 40          |
| 0.3            | 628.1-         | 1 1           | 18            | 1           |              | 1.0  | Topsoil - 4" Stiff dark brown SANDY SILT (A-4a), little clay, little gravel; moist.  | 14          | 13      | _       | 23        | 36     | 14     | Q              | •                           |         |           |             |
| 5-             | _              | 2<br>5<br>7   | 18            | 2           |              | 2.5  | @ 3.5', very stiff, contains sandstone fragments, damp.  |             |         | .       |           |        |        |                | Ò                           |         |           |             |
|                | -              | 3<br>6<br>10  | 18            | 3           |              | 3.0  |  |             |         |         |           |        |        |                | i Ò                         |         |           |             |
| 10             | 1              | 9<br>10<br>19 | 18            | 4           |              | 4.0  | @ 8.5', hard.  |             |         |         |           |        |        |                |                             |         | þ         |             |
|                | -<br>-<br><br> | 9<br>15<br>17 | 18            | 5           |              | 4.5+   |  |             |         |         |           |        |        |                |                             |         | \<br> Ò   |             |
| 15 -           |                | 4<br>9<br>12  | 18            | 6           |              | 4.5+   |  |             |         |         |           |        |        |                |                             | d<br>d  |           |             |
| PM )           |                | 5<br>10<br>13 | 18            | 7           |              | 3.5  |  |             |         |         |           |        |        |                |                             | Ò       |           |             |
| 20 -           | <u> </u>       | 6<br>11<br>13 | 18            | 8           |              | 4.5+ .   |  |             |         |         |           |        |        |                |                             | Ò       |           |             |
| 23.0-          | 605.4          | 1             | 18            | 9           |              | 4.5+   |  |             |         |         |           |        |        |                |                             |         |           |             |
| _              | 603.4          | 25<br>50/3    | 7             | 10          |              |  | Severely weathered SANDSTONE, argillaceous, micaceous.   |             |         |         |           |        | !<br>! |                |                             |         |           | 50+         |
| 25.0-<br>26.5- | _              |               |               |             |              |  | Medium hard to hard gray and brown SANDSTONE; very fine the fine grained, moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  @ 26.0'-26.4', high angle clay filled fracture.  Hard gray SANDSTONE; very fine to fine grained, moderately the fine grained. |             |         |         |           |        |        |                |                             |         |           |             |
| 30             |                | Core<br>120"  |               | RQD<br>53%  | R-           | 1  | highly weathered, argillaceous, micaceous.   |             |         |         |           |        |        |                |                             |         |           |             |

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|  | TranSy<br>OF: Bo       |              |               | Sample<br>No. |   | a. 175+32.2, 2<br>WATER<br>OBSERVATIO | Project: SCI<br>24.4 ft. RT of                              | SR 823 CL                                     |                 | Date Drille    | ed: 10/ |             |                        | DATIC     | אפ     |     | Job No. C   | - |
|--|------------------------|--------------|---------------|---------------|---|---------------------------------------|---|---|-----------------|----------------|---------|-------------|------------------------|-----------|--------|-----|---|---|
| Depth<br>(ft)  | Elev.<br>(ft)<br>598.4 | Blows per 6" | Recovery (in) |               | Penetro-<br>meter<br>(tsf) /<br>• Point-Load<br>Strength<br>(psi) | ,                                     | Water level at co   | epage at: 2.5'<br>mpletion: 7.4'<br>DESCRIPTI | (includes drill | ing water)     |         | % Aggregate | % C. Sand<br>% M. Sand | % F. Sand | % Sitt | Nat | FANDARD PE<br>lural Moisture<br>PL IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII | • |
| 30 —   |                        |              |               | ·             | *492  | highly wea                            | SANDSTONE<br>thered, argilla<br>oderately to h<br>ractures. | ceous, mic                                    | aceous, thi     | nly to thickly | · [     |             |                        |           |        |     |   |   |
| 35.0   | -593.4-<br>-<br>-      |              |               |               |   |                                       | Botto   | om of Boring                                  | g - 35.0'       | •              |         |             |                        |           |        |     |   |   |
| 40 —   | -<br>-<br>-            | Ē            |               |               |   |                                       |   |   |                 | ·              |         |             |                        |           | -      |     |   |   |
| 45 —   | -<br>-<br>-            |              |               |               |   |                                       |   |   |                 |                |         |             |                        |           |        |     |   |   |
| 20 – 20 – 20 – 20 – 20 – 20 – 20 – 20 –                                    |                        |              |               |               |   |                                       |   |   |                 |                |         |             | -                      |           | ·      |     |   |   |
| 1/11   10-020-1210   11/11   50-020   55   55   56   56   56   56   56   5 | -<br>-<br>-<br>-       |              |               |               |   |                                       |   |   |                 |                |         | - :         |                        |           |        |     |   |   |
| FILE: 012  | -                      |              |               |               |   |                                       |   |   |                 |                |         |             |                        |           |        |     |   |   |

FILE: 0121-3070-03 [ 11/12/2007 12:49 PM ]

| 00.           | TracC          | ·loss s              | las             |            |     |          | Project: SCI-823-0.00   |             |     |      |         |        |          | Job No. 0121-3070.03  |
|---------------|----------------|----------------------|-----------------|------------|-----|----------|---|-------------|-----|------|---------|--------|----------|---|
| Client:       |                |                      |                 |            | 7   | than Ci- |   | 0/27        | 104 |      |         | to     | 1        | 0/28/04   |
| LOGO          | )r: B0         | ring i               | <del>-100</del> | Samp       | _   |          | 176+77.5, 310.0 ft. RT of SR 823 CL Date Drilled: 1   | 1           |     |      | ATIO    |        | $\dashv$ |   |
| Depth<br>(ft) | Elev.<br>(ft)  | Blows per 6"         | Recovery (in)   | No.        |     |          | OBSERVATIONS: Water seepage at: 13.5'-20.0' Water level at completion: 4.2' (includes drilling water)  DESCRIPTION  | % Aggregate |     | Sand | F. Sand | % Silt | % Clay   | STANDARD PENETRATION (N)  Natural Moisture Content, % -  PL   LL  Blows per foot -  10 20 30 40 |
| 0.2=          | 601.4<br>601.2 |                      | -               | †          |     | -        | \Topsoil - 2"   | 1           |     |      | П       |        | 一        |   |
| -             |                | 2<br>3<br>8          | 18              | 1          |     |          | Medium dense to dense dark brown SANDY SILT (A-4a), some gravel, little clay; contains sandstone fragments; damp to moist   |             |     |      |         |        |          | ρ IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII  |
| 5 —           |                | 5<br>5<br>6          | 18_             | 2          |     |          |   |             |     |      |         |        |          |   |
| -             | -              | 8<br>14<br>20        | 18              | 3          |     |          |   |             |     |      |         |        |          |   |
| 10 —          | _              | 8<br>11<br>11        | 18              | 4          |     |          |   |             |     |      |         |        |          | q   |
| -             | 1              | 9<br>13              | 18              | 5          |     |          |   |             |     |      |         |        |          | þ   |
| 15 —          | 1              | 3<br>6<br>6          | 18              | 6          |     |          |   | !           |     |      |         |        |          | ø   |
| -<br>E        |                | 2 2                  | 18              | 7          |     |          | @ 16.0', gray and brown.  |             |     |      |         |        | .        |   |
| 20 —<br>—20.5 | 580.9          | 1                    | 18              | 8          |     | ,        | Severely weathered SANDSTONE.   |             |     |      |         |        |          |   |
| ,             | _              | 12<br>17             | 12              | 9          |     |          | Corolog Waldington Orithograms.   |             |     |      |         | . '    |          |   |
| 25 —          | 578.9          | 50/3<br>Core<br>120" | Rec 118"        | RQD<br>98% | R-1 | *483     | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, slightly fractured.  @ 22.9',23.4',23.7', low angle fractures. |             |     |      |         |        |          | 50+   |
| 30            |                | 120                  | 110             | 30 70      |     |          |   |             |     |      |         |        |          |   |

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|                    | Client:            | ranSy         | stems     | , Inc.   |             |              |                                     |                              | Pro      | oject: SC | CI-823- | 0.00                        |           | ·                               |        |             |           |           |        |        |        |                  | lo. 01       | 21-3               | 3070. | 03    |
|--------------------|--------------------|---------------|-----------|----------|-------------|--------------|-------------------------------------|------------------------------|----------|-----------|---------|-----------------------------|-----------|---------------------------------|--------|-------------|-----------|-----------|--------|--------|--------|------------------|--------------|--------------------|-------|-------|
| Ĺ                  | LOG C              | F: Bo         | ring      | R-100    |             | _            | ocation: Sta                        |                              | 5, 310.0 | oft. RT   | of SR   | 823 CL                      |           | Date Drill                      | ed: 10 | 27/         |           |           | to     |        | 10/28/ | <u>)4</u>        |              |                    |       |       |
|                    |                    |               | .9        | (in)     | Samp<br>No. | <del>.</del> | Hand<br>Penetro-<br>meter           | WATER<br>OBSERVAT            |          |           |         | at: 13.5'-2<br>on: 4.2' (ir |           | illing water)                   |        | 9           |           |           | TION   |        | STA    | ANDAR            | D PÉN        | VETR               | ATIO! | v (N) |
| ۱                  | Depth<br>(ft)      | Elev.<br>(ft) |           | 1        |             | s / Core     | (tsf) /<br>* Point-Load<br>Strength |                              |          |           |         |                             |           |                                 |        | % Aggregate | % C. Sand | Sand      | 2 2    | ) fe   | 1      | iral Moi<br>PL I |              |                    | LI    |       |
| l                  | 30                 | 571.4         | Blows per | Recovery | Drive       | Press        | (psi)                               | ,                            |          |           |         | RIPTIO                      |           |                                 |        | % Ag        | %<br>C    | % 9<br>∑. | S Silt | ,<br>% |        | Blows<br>10      | per fo<br>20 | oot -<br><u>30</u> |       | 10    |
| :                  | -                  | 500.0         |           |          |             |              |                                     | Medium<br>grained,<br>bedded | slightly | y weath   | ered, a | rgillaced                   | ous, mica | y fine to fine<br>aceous, thinl | у      |             |           |           |        |        |        |                  |              |                    |       |       |
|                    | <del></del> 32.5   | 568.9         |           |          |             |              |                                     |                              |          |           |         | Boring                      |           |                                 |        |             |           | -         | 1      |        |        |                  |              |                    |       |       |
|                    | 35 <del></del>     |               |           |          |             |              |                                     |                              |          |           |         |                             |           |                                 |        |             |           |           |        |        |        |                  |              |                    |       |       |
|                    | -<br>40 —          |               |           |          |             |              | ·                                   |                              |          |           |         | -                           |           | · .                             |        |             |           |           |        |        |        |                  |              |                    |       |       |
|                    | -<br>-<br>-        | -             |           |          |             |              |                                     |                              |          |           |         |                             |           |                                 |        |             |           |           |        |        |        |                  |              |                    |       |       |
|                    | 45 <del></del><br> | -<br>-<br>-   |           |          |             |              |                                     |                              |          |           |         |                             |           |                                 |        |             |           |           |        |        |        |                  |              |                    |       |       |
| /2007 12:49 PM     | 50 —               |               |           |          |             |              |                                     |                              |          |           |         |                             |           |                                 |        |             |           |           |        |        |        |                  |              |                    |       |       |
| (11/12)            | -                  |               |           | ļ.       |             |              |                                     |                              |          |           |         |                             |           |                                 |        |             |           |           |        |        |        |                  |              |                    |       |       |
| FILE: 0121-3070-03 | 55 —               |               |           |          |             |              |                                     |                              |          |           |         |                             |           |                                 |        |             |           |           |        |        |        |                  |              |                    |       |       |
| FILE:              | -                  | <br> -<br> -  |           |          |             |              |                                     |                              |          |           |         |                             |           |                                 |        |             |           |           |        |        |        |                  |              |                    |       |       |

| Client:                                  | ranSv                  | steme            | Inc           |            |              |   | Project: SCI-823-0.00  |             | _         |           |           |              |        | Job N                  | o. 0121-3070.03 .   |
|--|------------------------|------------------|---------------|------------|--------------|---|--|-------------|-----------|-----------|-----------|--------------|--------|------------------------|---|
| LOG O                                    |                        |                  |               |            | ٦,           | ocation: Sta  | . 180+90.9, 23.6 ft. LT of SR 823 CL Date Drilled: 10  | /27         | /04       |           |           |              |        |                        |   |
| 1000                                     | . 50                   | 11.9             |               | Samp       | _            |   | WATER  |             |           |           | ATIO      | ON           |        |                        |   |
| Depth<br>(ft)                            | Elev.<br>(ft)<br>695.6 | Blows per 6"     | Recovery (in) | Drive      | Press / Core | Hand Penetro- meter (isf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 7.3' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt       | % Clay | Natural Mois<br>PL ├── | D PENETRATION (N) sture Content, % -   LL per foot -   20 30 40 |
| 0.2=                                     | 695.4                  |                  |               |            |              |   | Topsoil - 2"   | Γ           |           |           |           |              |        |                        |   |
| -  |                        | <sup>2</sup> 3 4 | 18            | 1          |              |   | Loose brown SANDY SILT (A-4a), trace clay; contains sandstone fragments; damp.   |             | ŀ         |           | <br>      |              |        | Q,                     |   |
| 3.0                                      | 692.6                  | 9 13             | 40            | 2          |              |   | Severely weathered brown SANDSTONE.  |             |           |           | <br> <br> |              |        | <i>,</i>               | <del> </del>  |
| 5 —                                      |                        | 21<br>7          | 18            |            |              | :   | - · ·  | ļ           |           | ŀ         |           |              |        |                        |   |
| -  |                        | 8<br>10          | 18_           | 3          |              | }   |  |             |           |           |           |              | !      |                        | *   |
| 10 —                                     |                        | 50/4             | 4             | 4          |              |   | -  |             |           |           |           |              |        |                        | 50+   |
| -  |                        | 9<br>11<br>16    | 18            | 5          |              |   |  |             |           |           |           |              |        |                        |   |
| 15 —                                     |                        | 27<br>37<br>48   | 18            | 6          |              |   | @ 13.5'-17.5', argillaceous.   |             |           |           |           | <br> <br>  . |        |                        | ⊜85.→   |
|  |                        | 27<br>9<br>22    | 18            | 7          |              |   |  |             |           |           |           |              |        |                        | 0+(+)-  |
| 12:49 PM                                 |                        | 50/2             | 2             | 8          |              |   |  |             |           |           |           |              |        |                        | 50+   |
| 25.00-20.0-20.0-20.0-20.0-20.0-20.0-20.0 | 675.6                  | Core 120"        | Rec 120"      | RQD<br>33% | R-           | *499  | Medium hard to hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly to thickly bedded, highly fractured, with typical high angle rust stained fractures.  @ 20.7'-21.5', 22.8'-23.9', 24.1'-25.2', high angle rust stained fractures.  @ 25.3'-26.4', high angle fractures. | 1           |           |           |           |              |        |                        |   |
| 30.0                                     | 665.6                  |                  |               |            |              |   | Bottom of Boring - 30.0'   |             |           |           |           |              |        |                        |   |

| Client             | Tra | anSys        | tems             | Inc.          |            |        |  | Project: SCI-823-0.00   |           |        |         |         |       |        | Job No. 0121-3070.03  |
|--------------------|-----|--------------|------------------|---------------|------------|--------|--|---|-----------|--------|---------|---------|-------|--------|---|
| LOG                | OF: | : Boı        | ing              | R-102         |            | L      | ocation: Sta   | . 181+02.4, 182.6 ft. RT of SR 823 CL Date Drilled: 10  | 1271      | 04     |         |         |       |        |   |
|                    |     |              |                  |               | Samı<br>No |        | Hand   | WATER OBSERVATIONS: Water access at 0.5 2 0   |           | GF     | ₹AD,    | ATIC    | ON    |        |   |
| Depti<br>(ft)      |     | Elev.        | s per 6"         | Recovery (in) |            | / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength | Water level at completion: 8.0' (includes drilling water)   | Aggregate | Sand   | M. Sand | Sand    | <br>  | УE     | STANDARD PENETRATION (N)  Natural Moisture Content, % -   PL   LL |
| -0.2               | 6   | 12.8<br>12.6 | Blows            | Reco          | Drive      | Press  | (psi)  | DESCRIPTION   | % Ag      | %<br>C | % M     | %<br>F. | % Sil | % Clay | Blows per foot - () 10 20 30 40                                   |
| 0.2                |     | L            |                  |               |            |        |  | Topsoil - 2"  |           |        |         |         | İ     | ļ      |   |
|                    | -   |              | 2<br>2<br>3      | 18            | 1          |        |  | Loose to medium dense brown SANDY SILT (A-4a), little gravel, trace clay; contains sandstone fragments; damp.   |           |        |         |         |       |        | Ω   |
| 5                  | _   |              | 4<br>5<br>8      | 18            | 2          |        |  |   |           |        |         |         |       |        |   |
|                    |     | ļ            | 13<br>16<br>13   | 18            | 3          |        |  |   |           |        |         |         |       |        |   |
| 8.0                |     | 504.8        | 3<br>5<br>4      | 18            | 4          |        | 1.25   | Stiff gray and brown SILT AND CLAY (A-6a), trace fine to coarse sand; damp to moist.  @ 9.0', torvane = 0.7 tsf |           |        |         |         |       |        |   |
|                    |     | t t          | w <sub>o</sub> H | 18            | 5          | P-1    | 1.0  | Medium stiff to stiff gray SILT (A-4b), trace fine sand, some clay; moist to wet.  @ 11.0', torvane = 0.2 tsf   | 0         | 0      |         | 5       | 70    | 25     | ∫<br>5  |
| 15                 | +   | L            | WOH<br>2<br>2    | 18            | 6          |        |  | Loose gray and brown SILT (A-4b), some fine to coarse sand, trace gravel; contains sandstone fragments; moist.  |           |        |         |         |       |        | ί<br>Ö  |
| ~ K                |     |              | WOH<br>2<br>3    | 18            | 7          |        |  |   | 5         | 6      |         | 21      | 56    | 12     | 2 Ndn-Plastic •   |
| 20<br>5 — 20.5     |     | 592.3        | <sup>4</sup> 2 3 | 18            | 8          |        |  |   |           |        |         |         |       |        | d.  |
| 1/12/200           | 1   |              | 10<br>9<br>9     | 18            | 9          |        |  | Medium dense gray and light brown FINE SAND (A-3), little silt; contains sandstone fragments; damp.             | ].        |        |         |         |       |        |   |
| _                  | 4   | 589.8        | 4<br>8<br>8      | 18            | 10         |        |  | Medium dense gray SANDY SILT (A-4a), trace clay; contains sandstone fragments; damp to moist.                   |           |        |         |         |       |        |   |
| FILE: 0121-3070-03 | -   |              | 3<br>5<br>— 6    | 18            | 11         |        |  |   |           |        |         |         |       |        |   |
| 30                 | -   |              | 8<br>8<br>11     |               | 12         |        |  |   |           |        |         |         |       |        |   |

| Client: T           | ranSv                  | stems         | Inc           |             |              |  | Project: SCI-823-0.00  | ж-о <sub>с</sub> | 740       |           |           |      |        |      | Job N   | o. 0121  | -3070.0              | 3            |
|---------------------|------------------------|---------------|---------------|-------------|--------------|--|--|------------------|-----------|-----------|-----------|------|--------|------|---------|----------|----------------------|--------------|
| LOG O               |                        |               |               |             | L            | ocation: Sta                                 | . 181+02.4, 182.6 ft. RT of SR 823 CL Date Drilled: 10   | 0/27             | /04       |           |           | _    |        |      |         |          |                      | <del>`</del> |
|                     |                        |               |               | Samp<br>No. | le           |  | WATER OBSERVATIONS: Water seepage at: 8.5'-35.0' Water level at completion: 8.0' (includes drilling water)                     | _                | G         |           | ATIO      | N    | П      | et/  | MOAE    | D DENE   | TRATION (            | /A/)         |
| Depth<br>(ft)       | Elev.<br>(ft)<br>582.8 | Blows per 6"  | Recovery (in) | Drive       | Press / Core | (tsf) /<br>* Point-Load<br>Strength<br>(psi) | DESCRIPTION  | % Aggregate      | % C. Sand | % M. Sand | % F. Sand | ₩S % | % Clay | Natu | ral Moi |          | ntent, % -<br>——∣ LL | •            |
| 30 —                | 552.5                  |               |               |             |              |  | Medium dense gray SANDY SILT (A-4a), trace clay; contains sandstone fragments; damp to moist.                                  |                  |           |           |           |      |        |      |         | <b>T</b> |                      |              |
| 35 —                | -576.8-                | 6<br>10<br>13 | 18_           | 13          |              |  | - ·  |                  |           |           |           |      |        |      |         | 6.       |                      |              |
| -<br>-              |                        | 50/3          | _3            | 14          |              |  | Severely weathered gray SANDSTONE.   | i                |           |           |           |      |        |      |         |          | <i>/</i>             | 50+          |
| 40 —<br>-           | 573.8-                 |               |               |             |              |  | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, pyritic, thickly bedded, slightly fractured. |                  |           |           |           |      |        |      |         |          |                      |              |
| -<br>-<br>45 —      |                        | Core<br>120"  | Rec<br>120"   | RQD<br>100% | R-1          | *678   |  |                  |           |           |           |      |        |      |         |          |                      |              |
| 49.0                | 563.8                  |               |               |             |              |  |  |                  |           |           |           |      |        |      |         |          |                      |              |
| 50 <del></del><br>- |                        |               |               |             |              |  | Bottom of Boring - 49.0'   |                  |           |           |           |      |        |      |         |          |                      |              |
| 55 <del></del>      |                        |               |               | ·           |              |  |  |                  |           |           |           |      |        |      |         |          |                      |              |
| -<br>-<br>60        | -<br>-                 |               |               |             |              |  |  |                  |           |           |           |      |        |      |         |          |                      |              |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. MBUS, OHIO 43229 \* (614)888-0040

| Client:        | TranSy           | stems         | , Inc.      |                        |         |  | Project: SCI-823-0.00  |             |      |     |      |        |        |          | Job N         | o. 012         | -3070.03     |
|----------------|------------------|---------------|-------------|------------------------|---------|--|--|-------------|------|-----|------|--------|--------|----------|---------------|----------------|--------------|
| LOG            | DF: Bo           | ring          | R-103       |                        | _       | ocation: Sta                                       | . 185+41.0, 317.0 ft. LT of SR 823 CL Date Drilled: 10   | /26/        |      |     |      | to     | 1      | 10/27/0  | 14            |                |              |
| Depth          | Elev.            | per 6"        | nry (in)    | Sam <sub>j</sub><br>No |         | Hand<br>Penetro-<br>meter<br>(tsf) /<br>Point-Load | WATER OBSERVATIONS: Water seepage at: 2.5', 11.0'-21.0' Water level at completion: 6.1' (includes drilling water)  | egate       | Sand | Bnd | Sand |        |        | Natur    | al Mois       | sture Co       |              |
| (ft)           | (ft)<br>633,3    | Blows         | Recovery    | Drive                  | Press / | Strength<br>(psi)                                  | DESCRIPTION  | % Aggregate | ان   | Z.  | u:   | % Siii | % Clay |          |               | per foot<br>20 | - C<br>30 40 |
| 0.3            | 633.0            |               |             |                        |         |  | `\Topsoil - 4"   |             |      | 1   |      |        |        |          |               |                | 1:::::       |
|                | -<br>-           | 5<br>6<br>6   | 18          | 1                      |         | 2.5  | Very stiff brown SILT (A-4b), some clay, trace fine to coarse sand, trace gravel; contains sandstone fragments; damp to moist.   |             |      |     |      |        |        |          | Ο             |                |              |
| 5—             | -                | 3<br>5<br>8   | 13          | 2 ·                    |         | 3.0  |  |             |      |     |      |        |        |          | 1<br>0        |                |              |
|                | -                | 10<br>11<br>7 | 18          | 3                      |         | 2.25   |  | 1           | 2    | 1   | 7    | 65     | 25     |          | \             |                |              |
| 10 —<br>—10.5— | 622.8            | 4 6           | 18          | 4                      |         | 3.5  | -  |             |      |     |      |        |        | ς        | <i>y</i><br>3 |                |              |
|                | 022.0            | 2<br>3<br>——4 | 18          | 5                      |         |  | Very loose to loose brown and gray SILT (A-4b), some fine to coarse sand, little clay, trace gravel; contains sandstone fragments; damp.   | 1           | 13   | 1   | 12   | 58     | 16     | <i>γ</i> | •             |                | Non-Plasti   |
| 15 —           | -                | 3<br>4<br>4   | 18          | 6                      |         |  |  |             |      |     |      |        |        | þ        |               |                |              |
| - X            | -<br>-           | 1 1 2         | 18          | 7                      |         | ,  |  |             |      |     |      |        |        | ď        |               |                |              |
| 20 —           |                  | 2 3           | 18          | 8                      |         |  | @ 18.5', moist.  |             |      |     |      |        |        | )<br>    |               | -              |              |
| 21.0-<br>21.5- | 612.3-<br>611.8- | 50            | 6           | _9_                    |         |  | Severely weathered grayish brown SANDSTONE.  | 1           |      |     |      |        |        |          |               |                | 507          |
| ŠI .           | 610.4            |               | Rec<br>120* | RQD<br>88%             | R-1     | *274   | Medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly to thickly bedded, highly fractured, with typical low angle rust stained fractures.  Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly to thickly bedded, moderately fractured, with typical low angle clay filled fractures. |             |      |     |      |        |        |          |               |                |              |

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Job No. 0121-3070.03 Project: SCI-823-0.00 Client: TranSystems, Inc. LOG OF: Boring R-103 Date Drilled: 10/26/04 10/27/04 Location: Sta. 185+41.0, 317.0 ft. LT of SR 823 CL GRADATION WATER Sample Hand OBSERVATIONS: Water seepage at: 2.5', 11.0'-21.0' No. Penetro-Water level at completion: 6.1' (includes drilling water) STANDARD PENETRATION (N) (ii) meter % Aggregate % M. Sand % F. Sand % Silt % Clay (tsf) / Natural Moisture Content, % % C. Sand Blows per Recovery Point-Load Depth Elev. Strength (ft) Blows per foot -**DESCRIPTION** (psi) 603.3 Hard gray SANDSTONE; very fine to fine grained. -31.5-601.8 Bottom of Boring - 31.5' 35 40

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO. BUS, OHIO 43229 \* (614)888-0040

| Γ                  | Client: T           | ranSv               | tems   | , Inc.   |             |         |  | Project: SCI-823-0.00   |         |         |      |      |        |          |          | Job          | <i>No</i> . 0                | 121-3        | 070.03                     | 3                                     |
|--------------------|---------------------|---------------------|--|----------|-------------|---------|--|---|---------|---------|------|------|--------|----------|----------|--------------|------------------------------|--------------|----------------------------|---------------------------------------|
| _                  | OG O                |                     |  |          |             | L       |  | . 184+80.6, 37.3 ft. RT of SR 823 CL Date Drilled: 10   | /26/    |         |      |      |        |          |          |              |                              |              |                            |                                       |
| ٦                  |                     | •                   |  |          | Samp<br>No. |         |  | WATER OBSERVATIONS: Water seepage at: 5.0', 16.0', 30.0'  | Щ       | GI      | RAD. | ATIO | ON.    | 긤        |          |              |                              |              |                            |                                       |
|                    | Depth               | Elev.               | рег 6"   | ery (in) | 100.        | Core    | Penetro-<br>meter<br>(tsf) /<br>* Point-Load | Water seepage at: 5.0', 16.0'-30.0'  Water level at completion: 4.8' (includes drilling water)                            | pregate | Sand    | Sand | Sand |        | % Clay   | Na       | tural M      |                              | Conte        | ATION (<br>nt, % -<br>→ LL | •                                     |
|                    | (ft)                | (ft)<br>627.5       | Blows  | Recovery | Drive       | Press / | Strength<br>(psi)                            | DESCRIPTION   | % Agg   | %<br>C) | % M. | % F. | % Silt | % Cla    |          |              |                              | foot -<br>30 |                            | <u>,</u>                              |
| F                  | -0.3                | 627.2               |  |          | ]           |         |  | Topsoil - 3"  | ļ       |         |      |      | 1      |          |          | 1            |                              |              |                            |                                       |
|                    | _                   |                     | <sup>2</sup> <sub>3</sub>                        | 18_      | 1           |         | 4:0  | Very stiff to hard brown and gray SILT AND CLAY (A-6a), little to some gravel, little fine to coarse sand; damp to moist. |         |         |      |      |        |          |          | $\Omega$     |                              |              |                            |                                       |
|                    | -<br>5              |                     | 2<br>3<br>4                                      | 18       | 2           |         | 3.5  |   |         |         |      |      |        |          |          | <i>!</i>   5 |                              |              |                            |                                       |
|                    | -                   |                     | 2 5  | 40       | 3           |         | 3.0  |   |         |         | :    |      |        |          | <i>,</i> |              |                              |              |                            |                                       |
|                    | _                   |                     | 11   |          |             |         |  |   |         |         | :    |      |        |          |          |              | $\left\langle \cdot \right $ |              |                            |                                       |
| Ì                  | 10                  |                     | 11<br>12<br>13                                   | 18       | 4           |         | 3.25   |   |         |         |      |      |        | <u> </u> |          |              |                              | Ö            |                            |                                       |
| ١                  | -                   |                     | 9 8  | 18       | 5           |         | 4.0  |   |         |         | -    |      |        |          |          |              | ø                            |              |                            |                                       |
|                    | -<br>15 <del></del> |                     | 3 4  | 18       | 6           |         | 3.5  |   | 20      | 5       | -    | 11   | 44     | 20       | Ċ        | <b>₹</b>     | •                            |              | 4                          |                                       |
|                    | <del>-</del>        |                     | 4 6 8  | 18       | 7           |         | · .<br>2.5                                   |   |         |         |      |      |        |          |          | \            |                              |              |                            |                                       |
| 12:49 PM           | _                   | <del>-6</del> 09.5- | 3 3  | 18       | 8           | P1      | <0.25  | Very soft gray CLAY (A-7-6), trace to little fine to coarse sand; contains sandstone fragments; moist to wet.             | 0       | 2       | -    | 9    | 31     | 58       |          | <i>\</i>     | -                            |              |                            |                                       |
| <u>-</u>           | 20.5<br>-20.5<br>-  | 607.0               |  | <u> </u> |             |         |  | Loose to medium dense gray SANDY SILT (A-4a); contains  | ┨       |         |      | .    |        |          |          | $\mathbb{H}$ |                              |              |                            |                                       |
| 11/12/20           | _                   |                     | 5<br>6   | 18       | 9           |         |  | sandstone fragments; dry to damp.   | -       |         |      |      |        |          |          | þ            |                              |              |                            | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| 70-03 [            | 25 —                |                     | 2 4  | 18       | 10          |         |  |   |         |         |      |      |        |          |          | <u>//</u>    |                              |              |                            |                                       |
| FILE: 0121-3070-03 |                     |                     | 3 4  | 40       | 11          |         |  |   |         |         |      | ·    |        |          |          |              |                              |              |                            |                                       |
| ILE:               | _                   |                     | <del>                                     </del> | 18       | f           |         |  |   |         |         |      |      |        |          |          | 9            |                              |              |                            |                                       |
|                    | -<br>30             |                     | 3 4 7  | 18       | 12          |         |  |   |         |         |      |      |        |          |          |              |                              |              |                            |                                       |

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| Client:       | TranSy                 | stems              | Inc.          |             |   | <del> </del>  | Project: SCI-823-0.00  |             |     |      |           |     |        |              | Job No.                  | 0121-3 | 070.03                           |
|---------------|------------------------|--------------------|---------------|-------------|---|---|--|-------------|-----|------|-----------|-----|--------|--------------|--------------------------|--------|----------------------------------|
| LOG (         |                        |                    |               |             | L | ocation: Sta  | . 184+80.6, 37.3 ft. RT of SR 823 CL Date Drilled: 1   | 0/26        | /04 |      |           |     |        |              |                          |        |                                  |
| Depth<br>(ft) | Elev.<br>(ft)<br>597.5 | Blows per 6"       | Recovery (in) | Samp<br>No. |   | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | WATER OBSERVATIONS: Water seepage at: 5.0', 16.0'-30.0' Water level at completion: 4.8' (includes drilling water)  DESCRIPTION   | % Aggregate |     | Sand | % F. Sand | Sit | % Clay | Natura<br>PL | l Moistu<br><br>Blows pe |        | ATION (N)<br>at, % - ●<br>LL<br> |
| -<br>-<br>-   | 593.5                  | 50<br>Core<br>120" | Rec 120"      | RQD 79%     |   | *572  | Severely weathered gray SANDSTONE, very fine to fine grained, argillaceous.  Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly to thickly bedded, slightly to moderately fractured.  @ 41.5'-43.0', argillaceous zone. |             |     |      |           |     |        |              | <del></del>              |        | 50+                              |
| 44.0          | 583.5                  |                    |               |             |   |   | Bottom of Boring - 44.0'   |             |     |      |           |     |        |              |                          |        |                                  |

FILE: 0121-3070-03 ( 11/12/2007 12:49 PM )

BUS, OHIO 43229 \* (614)888-0040

| Client <sup>.</sup> | TranSy                                  | stems        | Inc        |             |        |  | Project: SCI-823-0.00  | 00 00       |              |      |        |        |        |     | lob | Vo. 012             | 21-30  | 70.03               | $\neg$        |
|---------------------|---|--------------|------------|-------------|--------|--|--|-------------|--------------|------|--------|--------|--------|-----|-----|---------------------|--------|---------------------|---------------|
|                     | DF: Bo                                  |              |            |             | ٦,     | ocation: Sta   | . 185+04.3, 215.9 ft. RT of SR 823 CL Date Drilled: 1  | 0/27        | // <u>04</u> |      |        |        |        |     | 300 | 10. 0 12            |        | 10.00               | $\dashv$      |
|                     |   |              |            | Samp        |        | ,  | WATER  | <u> </u>    |              |      | ATIO   | ON     |        |     |     |                     | _      |                     | $\overline{}$ |
| Depth               | Elev.                                   | per 6"       | ery (in)   | No.         | / Core | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | OBSERVATIONS: Water seepage at: None Water level at completion: 6.7' (includes drilling water)   | % Aggregate |              |      |        |        |        | Nat |     | RD PENi<br>isture C |        | TION (N)<br>, % - • | -             |
| (ft)                | (ft)<br>684.5                           | Blows        | Recovery   | Drive       | Press, | Strength<br>(psi)                                    | DESCRIPTION  | % Agg       | %<br>C.      | % M. | % F. S | % Silt | % Clay |     | _   | s per foo           | ot - ( | )<br>40             |               |
| 0.3                 | 684.2                                   | 5<br>9<br>12 | 18         | 1           |        |  | Topsoil - 3"  Medium dense brown SILT (A-4b), some fine to coarse sand, little clay, trace gravel; contains sandstone fragments and roots damp to moist.                                 | 9           | 16           | -    | 10     | 54     | 11     |     | •   | <b>Ο</b> -          |        | Non-Plas            | stic          |
| 3.5                 | 681.0-                                  | i :          | 0          | 2           |        |  | Severely weathered SANDSTONE.  | 1.          |              |      |        |        |        |     |     |                     |        | 50                  | )Ŧ(           |
| 5.0                 | + 679.5<br>-<br>-<br>-<br>-             | Core         | Rec        | BOD         | -      |  | Medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly to thickly bedded, highly fractured, with typical low angle fractures |             |              |      |        |        |        |     |     |                     |        |                     |               |
| 10 —                | -<br>-<br>-<br>-<br><del>-</del> 671.7- | 96"          | 96"        | RQD<br>40%  | R-1    | *428   | @ 9.0'-10.8',12.5'-12.8', rust stained high angle fractures.   |             |              |      |        |        |        |     |     |                     |        |                     |               |
| 15                  | - 071.7                                 |              |            |             |        |  | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly to thickly bedded, slightly fractured to unfractured.                                |             |              |      |        |        |        |     |     |                     |        |                     |               |
| 1 24 64             | -                                       | Core<br>84"  | Rec<br>84" | RQD<br>100% | R-2    | *441   |  |             |              | !    |        |        |        |     |     |                     |        |                     |               |
| 20.0—               | 664.5                                   |              |            |             |        |  | Potton of Position 2000  | 4           |              |      |        |        |        |     |     |                     |        |                     |               |
| 25 —                | -                                       |              |            |             |        |  | Bottom of Boring - 20.0'   |             |              |      |        |        |        |     |     |                     |        |                     |               |

FILE: 0121-3070-03 [ 11/12/2007 12:49 PM ]

| Client:     | ΓranSy        | stems               | , Inc.     |                        |           |  | Project: SCI-823-0.00  |           |          |         |      |        |           |       | Job            | No.         | 012      | 1-307  | 0.03      |
|-------------|---------------|---------------------|------------|------------------------|-----------|--|--|-----------|----------|---------|------|--------|-----------|-------|----------------|-------------|----------|--------|-----------|
| LOG C       | F: Bo         | ring                | R-106      |                        | _         | ocation: Sta                                 | 1. 188+85.1, 50.5 ft. RT of SR 823 CL Date Drilled: 10   | /26       |          |         |      |        |           |       |                | _           |          |        |           |
|             |               |                     |            | Sam <sub>i</sub><br>No |           | Hand<br>Penetro-                             | WATER OBSERVATIONS: Water seepage at: None   |           | GI       | RAD.    | ATIO | NC     | 1         |       |                |             |          |        |           |
| Depth       | Elev.         | s per 6"            | very (in)  |                        | s/Core    | meter<br>(tsf) /<br>* Point-Load<br>Strength | Water level at completion: None (prior to coring) 9.9' (includes drilling water)   | Aggregate | Sand     | M. Sand | Sand | 1,1    | Clay      | Nat   | ural M<br>PL ⊢ | oistu       | гө Со    | ntent, | LL        |
| (ft)        | (ft)<br>647.4 | Blows               | Recovery   | Drive                  | Press / ( | (psi)  | DESCRIPTION  | % Ag      | %<br>'C' | % W.    | % F. | % Sitt | ζ<br>%    | : : : | Biov<br>10     | vs p∈<br>20 | r foo    | 30     | )<br>     |
| -0.3        | 647.1-        | 4                   | <u> </u>   |                        |           |  | <u>Topsoil - 3"</u> Medium dense brown SANDY SILT (A-4a), little clay, trace   | $\{ \  $  |          |         | ·    |        |           |       |                |             |          |        |           |
| -           |               | <sup>7</sup> 4      | 18         | 1                      |           |  | gravel; contains sandstone fragments; damp to moist.   |           |          |         | i    |        |           |       | þ              |             |          |        |           |
| 5           |               | 4<br>6<br>9         | 18_        | 2                      |           |  |  |           |          |         |      |        | :         |       | ځ              | 5           |          |        |           |
| 5.5         | 641.9         | 4<br>6<br>7         | 18         | 3                      |           | 0.25   | Soft to stiff mottled brown and gray SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; contains sandstone fragments; damp to moist.  | 9         | 4        |         | 8    | 55     | 24        |       | å              | İ           |          |        |           |
| 10—         | 4             | 12<br>16<br>17      | 18         | 4                      |           | 2.0  |  | 0         | 4        | -       | 9    | 64     | 23        |       |                | •           | <u> </u> | ,<br>a |           |
| —10.5—<br>- | 636.9         | 12<br>22<br>29      | 18         | 5                      |           | 4.0  | Hard brown SANDY SILT (A-4a), trace clay; contains sandstone fragments; damp to moist.   |           |          |         |      |        |           |       |                |             |          |        | )<br>()51 |
| 15.0        | 632.4         | 12<br>15<br>19      | 18         | 6                      |           | 4.5+   |  |           |          |         |      | i      | <br> <br> |       |                |             |          |        |           |
| - 15.0      | 032.4         | 12                  |            | 7                      |           |  | Severely weathered brown SANDSTONE, argillaceous.  |           |          |         |      |        |           |       |                |             |          |        |           |
| 20 —        | 630.4         | 50/3<br>Core<br>72" |            | RQD<br>22%             | R-1       | *609   | Soft gray and brown SANDSTONE; very fine to fine grained, decomposed to highly weathered, argillaceous, thinly to thickly bedded, highly fractured to broken, with typical low angle fractures.    |           |          |         |      |        |           |       |                |             |          |        | 50        |
| 21.2        | 626.2         |                     |            |                        |           |  | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, pyritic, thickly bedded, moderately to highly fractured.  @ 23.0', slightly fractured. |           |          |         |      |        |           |       |                |             |          |        |           |
| 25 —        |               | Core<br>84"         | Rec<br>84" | RQD<br>100%            | R-2       | *615   |  |           |          |         |      |        |           |       |                |             |          |        |           |
| 30.0        | 617.4         |                     |            |                        |           |  | Bottom of Boring - 30.0'   |           |          |         |      |        |           |       |                |             |          |        |           |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO BUS, OHIO 43229 \* (614)888-0040

|                 | ranSy:                 |                |               | _                | _   |   | Project: SCI-823-0.00   | <u></u>     | 10.1 |      |      |     |        |           | Job No.   | 0121-30   | 70.03          |
|-----------------|------------------------|----------------|---------------|------------------|-----|---|---|-------------|------|------|------|-----|--------|-----------|---|-----------|----------------|
| LOG O           | F: Bo                  | ring           | K-106         | <b>A</b><br>Samp | _   | ocation: Sta  | i. 191+91.1, 71.3 ft. RT of SR 823 CL Date Drilled: 10  | /26<br>I    |      |      | ATIO | λΛ. | 1      |           |   |           | <del></del>    |
| Depth<br>(ft)   | Elev.<br>(ft)<br>665.8 | Blows per 6"   | Recovery (in) | Drive X          |     | Hand Penetro- meter (Isf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None Water level at completion: 13.4' (includes drilling water)  DESCRIPTION  | % Aggregate | Sand | Sand | Sand |     | % Clay | Natu<br>P | ANDARD P<br>Iral Moistur<br>PL I———<br>Blows pei<br>10 20 | e Content | 1, % -<br>⊣ LL |
| -0.3            | 665.5                  |                |               |                  |     |   | Topsoil - 4"  |             |      |      |      |     | П      |           |   |           |                |
| -               | ,                      | 3<br>4<br>5    | 18            | 1                |     | •   | Medium dense brown SANDY SILT (A-4a), little gravel, trace clay; contains sandstone fragments; damp.  | ]<br> -<br> |      |      | }    |     |        | Ç         | <u> </u>  |           |                |
| 5 —             |                        | 9<br>12<br>17  | 18            | 2 ·              |     |   |   |             |      |      |      |     |        |           |   | Ò         |                |
| _               |                        | 16<br>22<br>29 | 18            | 3                |     |   |   | :           |      |      |      |     |        |           |   |           | )<br>/<br>O    |
| -8.0<br>-<br>10 | 657.8                  | Core<br>60"    | Rec<br>32"    | RQD<br>0%        | R-1 |   | Very soft to soft brown SANDSTONE; very fine to fine grained, decomposed, argillaceous, broken; contains gravel and other residual soil like materials.  @ 9.1'-11.7', no recovery.   |             |      |      |      |     |        |           |   |           |                |
| -13.0<br><br>15 | 652.8                  |                |               |                  |     |   | Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly to thickly bedded, slightly to moderately fractured, with typical low angle fractures.  @ 13.0'-13.8', brown highly weathered. |             |      |      |      |     |        |           |   |           |                |
| 20 —            |                        | Core<br>120"   | Rec<br>120"   | RQD<br>84%       | R-2 | *480  |   |             |      |      |      |     |        |           |   |           |                |
| 25              |                        | Core<br>84*    | Rec<br>84*    | RQD<br>100%      | R-3 | *503  |   | -           |      |      |      |     |        |           |   |           |                |
| 30.0            | 635.8                  | !              |               |                  |     |   | Bottom of Boring - 30.0'  |             |      |      |      |     |        |           |   |           |                |

| - 48 |       |            |   |               |
|------|-------|------------|---|---------------|
| C    | MBUS. | OHIO 43229 | • | (614)888-0040 |

| Client:        | ranç <sub>ı</sub>      | lome           | lnc           |            |              |   | Project: SCI-823-0.00  |             |           |           | _         |        |        |            | lah si                             | o. 0121      | 1-3070   | 0.03          |
|----------------|------------------------|----------------|---------------|------------|--------------|---|--|-------------|-----------|-----------|-----------|--------|--------|------------|------------------------------------|--------------|----------|---------------|
| LOG O          |                        |                |               |            | 7.           | acation: Sta  | 1. 194+85.7, 32.6 ft. RT of SR 823 CL Date Drilled: 10   | 1/26        | 101       |           |           | _      |        |            | JOD IVO                            | <i>.</i> 012 | 1-3070   | 7.03          |
|                |                        | my             | 107           | Sam        | ole          |   | WATER  | 120         |           | RAD,      | ATIO      | N      | 口      | · <u> </u> |                                    |              | -        | <del> ·</del> |
| Depth<br>(ft)  | Elev.<br>(ft)<br>685.7 | Blows per 6"   | Recovery (in) | Drive      | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: None  Water level at completion: None (prior to coring) 11.1' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay | Natu       | ANDARE<br>Iral Mois<br>PL<br>Blows | ture Cor     | ntent, % | . •           |
| —0.ჭ—          | 685.4                  |                |               |            |              |   | Topsoil - 3"/1.1' soil removed before drilling   | Ť           |           |           | *         |        | Ť      |            | Ť                                  | Ĭ            |          | Ĭ             |
| -              |                        | 3<br>3<br>6    | 18            | 1          |              | 0.25  | Soft brown SILT AND CLAY (A-6a), some fine to coarse sand, trace to little gravel; contains sandstone fragments; damp to moist.  | 4           | 5         |           | 16        | 46     | 29     | Ç          | )<br>}                             |              |          |               |
| 5 —            |                        | 6<br>8<br>12   | 18            | 2          |              | 1.0   |  |             |           |           |           |        |        |            |                                    |              |          |               |
| -              |                        | 11<br>15<br>18 | 18            | 3          |              | 3.5   | @ 6.0', very stiff to hard.  |             |           |           |           |        |        |            |                                    |              | Ö        |               |
| -<br>10 —      |                        | 10<br>11<br>13 | 18            | 4          |              | 2.5   | -  |             |           |           |           |        |        |            |                                    | \<br>  \d    | <b>4</b> |               |
| -12 0-         | -672.7-                | 10<br>12<br>14 | 18            | 5          |              | 4.5+  |  |             | <br>      |           |           |        |        |            |                                    | l<br>Ö       |          |               |
| -              |                        | 19<br>50/2     | 8             | 6          |              |   | Severely weathered brown and gray SANDSTONE.   |             |           |           |           |        |        |            |                                    |              | <i>†</i> | 50+           |
|                | 670.7-                 | Core<br>96"    | Rec<br>96"    | RQD<br>76% | R-1          | *477  | Medium hard to hard gray SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly laminated to thickly bedded, slightly to highly fractured, with typically low angle fractures; contains few argillaceous laminations. |             |           |           |           |        |        |            |                                    |              |          |               |
| 25 —<br>-<br>- |                        | Core<br>84"    | Rec<br>84*    | RQD<br>80% | R-2          | *127  | @ 20.6'-22.5', broken with clay filled fractures.  @ 22.5'-26.7', moderate to abundant argillaceous laminations, fissile.  |             |           |           | -         |        |        |            |                                    |              |          |               |
| 30.0_          | 655.7                  |                |               |            |              |   | Bottom of Boring - 30.0'   |             |           |           |           |        |        |            |                                    |              |          |               |

FILE: 0121-3070-03 [ 11/12/2007 12:49 PM ]

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| Client        | TranSy        | stems         | Inc           | -          |        | _   | Project: SCI-823-0.00  |             | _      |      |      |    |      |              | lob No. 012          | 1-3070 03     |
|---------------|---------------|---------------|---------------|------------|--------|---|--|-------------|--------|------|------|----|------|--------------|----------------------|---------------|
|               | F: Bo         |               |               |            | 7,     | ocation: Sta                                      | 1. 208+61.9, 255.4 ft. LT of SR 823 CL Date Drilled: 10  | 7/20        | /04    |      |      |    |      |              |                      | . 55. 5.55    |
|               |               | 9             |               | Sam        |        | •   | WATER  | 1           |        |      | ATI  | ON | - 1  |              |                      | <del></del> _ |
| Depth<br>(ft) | Elev.<br>(ft) | Blows per 6"  | Recovery (in) | No         | Core   | Hand Penetro- meter (tsf) / * Point-Load Strength | OBSERVATIONS: Water seepage at: 1.0'-2.5' Water level at completion: 3.6' (includes drilling water)  | % Aggregate | Sand   | Sand | Sand |    | Clay | Natura<br>PL | I Moisture Co        | LL            |
| 0-            | 678.2         | B/ov          | Rec           | Drive      | Press. | (psi)   | DESCRIPTION  | %<br>A      | %<br>C | % ₹  | % F. | 8  | %    | 10           | Blows per fool<br>20 | - ()<br>30 40 |
| -0.3          | 677.9         |               |               |            |        |   | ``Topsoil - 4"   |             |        |      |      |    |      |              |                      |               |
|               |               | 2<br>4<br>4   | 18            | 1          |        | 3.0   | Very stiff to hard brown, gray, and orange SANDY SILT (A-4a), trace gravel, trace clay; contains sandstone fragments; damp.  |             |        |      |      |    |      |              |                      |               |
| 5 <b>—</b>    |               | 8<br>9<br>17  | 18            | 2 ·        |        | 4.25  |  |             |        |      |      |    |      |              |                      |               |
| -             |               | 9<br>12<br>16 | 18            | 3          |        | 3.5   |  |             |        |      |      |    |      |              | ١ ا                  |               |
| 10-           |               | 7<br>13<br>21 | 18            | 4          |        | 4.0   | •  |             |        |      |      |    |      |              |                      |               |
| -10.5<br>-    | 667.7         | 9<br>15<br>18 |               | 5          |        | 4.5+  | Hard gray SILT AND CLAY (A-6a), trace fine to coarse sand; contains sandstone fragments; damp.   |             |        |      |      |    |      |              |                      |               |
| -             | 665.2         |               |               | 6          |        |   | Severely weathered gray SANDSTONE  |             |        |      |      |    |      |              |                      |               |
| -15.0         | 663.2         | Core<br>63"   | Rec<br>63"    | RQD<br>70% | R-1    | *33   | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly to thickly bedded, moderately fractured, with typical low angle clay filled fractures, turbidity bedded, few argillaceous laminations. |             |        |      |      |    |      |              |                      |               |
| -33-          |               |               |               |            |        |   |  |             |        |      |      |    |      |              |                      |               |
| 20.3          | 658.0         |               |               |            |        |   | Bottom of Boring - 20.3'   |             |        |      |      |    |      |              |                      |               |

| ſ                  | Client: T              | ranSys          | stems,          | Inc.        |             | _            |                         | Project: SCI-823-0.00   |             |         |         |        |        |        |          |                               | 012      | 1 <u>-3070.0</u> | 3       |
|--------------------|------------------------|-----------------|-----------------|-------------|-------------|--------------|-------------------------|---|-------------|---------|---------|--------|--------|--------|----------|-------------------------------|----------|------------------|---------|
| _                  | LOG O                  |                 |                 |             |             | I            |                         | . 209+68.7, 41.2 ft. LT of SR 823 CL Date Drilled: 10   | /19/        | _       |         |        | to     | 1      | 0/20/0   | 14                            |          |                  |         |
|                    |                        |                 |                 |             | Samp<br>No. |              |                         | WATER OBSERVATIONS: Water seepage at: 1.0'-5.0', 8.5'-12.0'   |             | GF      | RAD.    | ATIC   | NC     |        |          |                               |          |                  |         |
|                    |                        |                 | 6"              | (in)        |             | 9.           | meter                   | Water level at completion: 8.2' (includes drilling water)   | 916         | _       | ,       |        |        |        |          |                               |          | TRATION          | (N)     |
|                    | Depth                  | Elev.           |                 | эгу         |             | , Co         | (tsf) /<br>* Point-Load |   | rege        | Sano    | M. Sand | Sand   |        | _      |          | ral Moisi<br>L ⊢——            | ure Co   | ntent, % -<br>LL |         |
|                    | (ft)                   | (ft)            | Blows per       | Recovery    | Drive       | Press / Core | Strength<br>(psi)       | DESCRIPTION   | % Aggregate | %<br>C) | % M.    | % F. S | % Sitt | % Clay |          | Blows p                       |          | - O              | ,       |
| I ⊦                | _o.3 <del></del>       | 675.3<br>-675.0 | 00              | _ 4         | 7           | 4            |                         | ∖Topsoil - 3"   | -           | -       |         |        | Ť      |        |          | <u>֓֞֞</u> ֡֓֞֞֜֞֞֜֞֞֞֜֞֡֓֞֡֓ |          | Tilli            |         |
|                    | -                      |                 | 1<br>1<br>3     | 18          | 1           |              |                         | Loose brown SANDY SILT (A-4a), little clay, trace gravel; contains sandstone fragments; damp.                                   |             |         |         |        |        |        | O        |                               |          |                  |         |
| H                  | -                      | <u>'</u>        |                 |             |             |              |                         | •   |             |         |         |        | ļ      |        | 7        |                               |          |                  |         |
|                    | 5                      |                 | 4 4             | 18          | 2           |              |                         |   | 7           | 21      |         | 29     | 30     | 13     | Ö        | •                             |          | Non⊦             | Plastic |
|                    | 5.5                    | -669.8          | 8               |             |             |              |                         | Hard brown and gray SANDY SILT (A-4a), little clay, little gravel   | 1           |         |         |        |        |        |          | N.                            |          |                  |         |
|                    | _                      |                 | <sup>15</sup> 6 | 18          | 3.          |              | 4.5+                    | contains sandstone fragments; damp.   |             |         |         |        |        |        |          |                               | R        |                  |         |
|                    | _                      | ]               | 4               |             |             |              |                         |   |             |         |         |        |        |        |          |                               | N        |                  |         |
|                    | 10                     |                 | 916             | 18          | 4           |              | 4.5+                    | <u>.</u>  |             |         |         |        |        |        |          |                               | Q        |                  |         |
| li                 | _                      |                 | 8               |             | Ц           |              |                         |   | 1           |         |         |        | :      |        |          |                               |          |                  |         |
|                    | -                      | ·               | 14<br>25        | 18          | 5           |              | 4.5+                    |   |             |         |         |        |        |        |          |                               |          | X                | }       |
|                    | <del></del> 13.0       | 662.3           | 4               |             |             |              | · .                     | Severely weathered gray SANDSTONE, very fine grained,   | 1           |         |         |        |        |        |          |                               |          |                  |         |
|                    | 15 —                   |                 | 8<br>12         | 18          | 6           |              |                         | argillaceous.   |             |         |         |        |        |        |          |                               | 541      |                  |         |
| ł                  | 15 <del></del><br>15.5 | 659.8           | 50/5            | 5           | 7           |              |                         | Medium hard gray and brown SANDSTONE; very fine to fine   | 1           |         |         |        |        |        |          |                               |          |                  | 50+(    |
| H                  | _                      | -               |                 |             | 200         |              |                         | grained, highly weathered, argillaceous, thinly to thickly bedded,  | 1           |         |         |        |        | 1.     |          |                               |          |                  |         |
| PM .               | _                      |                 | Core<br>54"     | Rec<br>47"  | RQD<br>59%  | R-1          | 1 *370                  | moderately fractured, with typical low angle clay filled fractures.   |             |         |         | ŀ      |        |        |          |                               |          |                  |         |
| 12:49              |                        | 1               |                 | i           | i           |              |                         | @ 15.8'-16.1', few argillaceous laminations.  | ] .         |         |         |        |        |        |          |                               |          |                  |         |
| . 70               | <del></del> 20.0       | 655.3           |                 |             |             | 1            |                         | Hard gray SANDSTONE; very fine to fine grained, slightly to   |             |         |         |        |        |        |          |                               |          |                  |         |
| 12/20              | _                      |                 |                 |             |             |              |                         | moderately weathered, argillaceous, micaceous, thinly to thickly bedded, slightly fractured, with typical low angle clay filled |             |         |         |        |        |        |          |                               |          |                  |         |
| 11                 |                        | -               |                 |             |             |              |                         | fractures; contains few argillaceous laminations.   |             |         |         |        |        |        |          |                               |          |                  |         |
| 03                 | _                      | -               |                 | 1_          |             |              |                         |   |             |         |         | -      |        |        |          |                               |          |                  |         |
| FILE: 0121-3070-03 | 25 —                   | 1               | Core<br>120"    | Rec<br>120" | 75%         | R-:          | 2 *516                  |   |             |         |         |        |        |        |          |                               |          |                  |         |
| 5121-              | -                      | 1               |                 |             | 1           |              |                         |   |             |         |         |        |        |        |          |                               |          |                  |         |
| TE: (              | _                      |                 |                 |             |             |              |                         |   |             |         |         |        |        |        |          |                               |          |                  |         |
| £1                 | -                      | _               |                 |             |             |              |                         |   |             |         |         |        |        |        |          |                               |          |                  |         |
|                    | 30.0_                  | 645.3           |                 |             |             |              | <u> </u>                | Bottom of Boring - 30.0'  |             |         | Ш       |        |        |        | <u> </u> |                               | <u> </u> | : [ ] [ ] [      |         |

| Client:                         | FranSv                 | stems         | Inc           |            |                | -   | Project: SCI-823-0.00   |             |           |           |           |        |        |             | Job No. 0121-3070.03                        | 3 .                                     |
|---------------------------------|------------------------|---------------|---------------|------------|----------------|---|---|-------------|-----------|-----------|-----------|--------|--------|-------------|---|---|
| LOG C                           |                        |               |               |            | T <sub>L</sub> | ocation: Sta  | . 209+68.8, 304.6 ft. RT of SR 823 CL Date Drilled: 10  | /19/        | 04        |           |           |        |        |             |   |   |
|                                 |                        |               | [             | Samp       | ole            | Hand  | WATER   |             | GI        | RAD.      | ATIC      | N      | $\Box$ |             |   |   |
| Depth<br>(ft)                   | Elev.<br>(ft)<br>659.3 | Blows per 6"  | Recovery (in) | Drive      | Press / Core   | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: 1.0'-2.5' Water level at completion: 2.9' (includes drilling water)  DESCRIPTION  | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Sitt | % Clay | Natur<br>PL | NDARD PENETRATION (I al Moisture Content, % | ×)                                      |
| 0.3                             | 659.0                  |               |               | İ          |                |   | Topsoil - 4"  |             |           |           |           |        |        |             |   |   |
| -<br>-                          |                        | 1<br>1<br>4   | 18            | 1          |                |   | Loose to medium dense dark brown SANDY SILT (A-4a), trace clay, trace gravel; contains sandstone fragments; damp.   |             |           |           |           |        |        | δ           |   |   |
| 5-                              | <u> </u>               | 5<br>13<br>15 | 18            | 2          |                |   | ·   |             |           |           |           |        |        |             |   |   |
| 5.5                             | <del>  6</del> 53.8-   | 9<br>13<br>20 | ·             | . 3        |                |   | Severely weathered brown SANDSTONE, fine to medium grained, argillaceous.   |             |           |           |           |        |        |             | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\      | 1 |
| -                               | 1                      | 26<br>50/2    | 6             | 4          |                | -   |   | ]           |           |           |           |        |        |             |   | 50+(                                    |
| 10 —                            | 650.3                  | Core<br>18"   | Rec<br>18"    | RQD<br>61% | R-1            | *289  | Medium hard to hard brown and gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous,  |             |           |           |           |        |        |             |   | 30.7                                    |
| 15 —                            | 647.2-                 | Core<br>120"  | Rec<br>120"   | RQD<br>96% | R-2            | *609  | micaceous, thinly to thickly bedded, highly fractured.  @ 9.5'-9.8', high angle rust stained fracture.  @ 10.0',11.9',12.0', low angle rust stained fractures.  Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, micaceous, pyritic, thinly to thickly bedded, moderately fractured. |             |           |           |           |        |        |             |   |   |
| FILE: 0121-3076-03   11/12/2007 |                        | Core<br>120** | Rec<br>120"   | RQD<br>98% | R-:            | 3 *676  | @ 15.6',15.8',30.2', low angle clay filled fractures.   |             |           |           |           |        |        |             |   |   |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, Co. BUS, OHIO 43229 \* (614)888-0040

| Client: T      |               |           |          |                   | _            |  |                  |           |         | CI-823               |        |   |          |        |             |             |         |        |          |        |             | Job N                         | o. <b>012</b>      | 1-307               | 0.03           |
|----------------|---------------|-----------|----------|-------------------|--------------|--|------------------|-----------|---------|----------------------|--------|---|----------|--------|-------------|-------------|---------|--------|----------|--------|-------------|-------------------------------|--------------------|---------------------|----------------|
| LOG O          | F: Bo         | ring      | R-117    |                   |              | ocation: Sta   |                  | 8, 304.   | 6 ft. R | of SR                | 823 CL | · |          | Date I | Orilled: 10 | )/19,       |         |        | <u> </u> |        | Γ           |                               |                    | -                   |                |
| Depth          | Elev.         | эөг 6"    | ry (in)  | Samp<br>No.       |              | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER<br>OBSERVA |           |         | seepage<br>t complet |        |   | drilling | water) |             | egate       |         |        | TION     |        | ST/<br>Natu | ral Moi:                      | D PENE<br>sture Co | ntent, <sup>s</sup> | % -            |
| (ft)<br>30     | (ft)<br>629.3 | Blows per | Recovery | Drive             | Press / Core | Strength<br>(psi)                                    |                  |           |         |                      | CRIPTI |   |          |        |             | % Aggregate | % C. S. | % M. S | % T %    | % Clay | F           | L <del> </del><br>Blows<br>10 | per foo<br>20      |                     | LL<br>)<br>.40 |
| —30.5—<br>—    | 628.8         |           |          |                   |              |  | √ <u>@</u> 30.0' | -30.5', · |         | ns few a<br>ottom o  |        |   |          | ons.   | ···         |             |         |        |          |        |             |                               |                    |                     |                |
| 35 —           |               |           |          | <b>,</b><br>, , , |              | •  |                  |           |         |                      |        |   |          |        |             |             |         |        |          |        |             |                               |                    |                     |                |
| -<br>-         |               |           |          |                   |              |  | ·                |           |         |                      |        |   |          |        |             |             |         |        |          |        |             |                               |                    |                     |                |
| 40 <del></del> |               | :         |          |                   |              |  |                  | •         |         |                      | -      |   |          |        |             |             |         |        |          |        |             |                               |                    |                     |                |
|                |               |           |          | :                 |              |  |                  |           |         |                      |        |   |          |        |             |             |         |        |          |        |             |                               |                    |                     |                |
| 45 —           |               |           | ,        |                   | !            |  |                  | •         |         | ٠.                   |        |   |          |        | •           |             |         |        |          | :      |             |                               |                    |                     |                |
| _              | ]<br>].<br>-  |           |          |                   | •            |  |                  | • .       |         |                      |        |   |          |        |             |             |         |        |          |        |             |                               |                    | 7                   |                |
| 50 —<br>-<br>- |               |           |          |                   |              |  |                  | •         |         |                      |        |   |          |        |             |             |         | •      |          |        |             |                               |                    |                     |                |
| 55             |               |           |          |                   |              |  |                  |           |         | -                    |        |   |          |        |             |             |         |        |          | ,      |             |                               |                    |                     |                |
| <u>-</u><br>-  |               |           |          |                   |              |  |                  |           |         |                      |        |   |          |        |             |             |         |        |          |        |             |                               |                    |                     |                |

| Client:       | TranSy               | stems            | , Inc.     |             |              |                          | Project: SCI-823-0.00  |             |         |        |      |       |      |     | Job No.              | 0121 | -3070         | .03     |
|---------------|----------------------|------------------|------------|-------------|--------------|--------------------------|--|-------------|---------|--------|------|-------|------|-----|----------------------|------|---------------|---------|
|               | F: Bo                |                  |            | _           | _            |                          | . 230+51.4, 286.0 ft. LT of SR 823 CL Date Drilled: 10   | /13         |         |        |      |       |      |     |                      |      |               |         |
|               |                      |                  |            | Samp<br>No. |              | Hand<br>Penetro-         | WATER OBSERVATIONS: Water seepage at: None   | -           | G       | RAD    | ATIO | NC    |      |     |                      |      |               |         |
|               |                      | .6.              | (in)       |             | ore          | meter<br>(tsf) /         | Water level at completion: None (prior to coring) 3.4' (includes drilling water)   | gate        | ٩       | ٩      | ٔ م  |       |      | STA | NDARD i<br>al Moistu |      |               |         |
| Depth<br>(ft) | Elev.<br>(ft)        | ws per           | Recovery   | 6,          | Press / Care | * Point-Load<br>Strength |  | % Aggregate | C. Sand | A. Sar | San  | #IS % | Slay | PL  | . ⊢<br>Blows pe      |      | <del></del> ! |         |
|               | 684.0<br>683.8       | Blows            | Rec        | Drive       | Pre          | (psi)                    | DESCRIPTION  | %           | %       | %      | %    | %     | %    | 10  |                      |      | 30            | 40      |
| -             | - 000.0              | 5                |            | 1           |              | 4.5+                     | \Topsoil - 2" Hard brown SANDY SILT (A-4a), trace clay; contains   | 1           |         |        |      |       |      |     |                      |      |               |         |
|               |                      | 20<br>20         | 14         | ,           |              | 4.5*                     | sandstone fragments; dry to damp.  |             |         |        |      |       |      |     |                      |      |               | <u></u> |
| -             |                      | 10<br>14<br>15   | 15         | 2           |              | 4.0                      |  |             |         |        |      |       |      |     |                      |      | /             |         |
| 5.0           | 679.0                | 11<br>22<br>50/5 |            | 3           |              |                          | Severely weathered brown SANDSTONE.  |             |         |        |      |       |      |     |                      |      | <u> </u>      | 50+     |
| -0.5          | <del>  6</del> 77.5- | Core<br>42"      | Rec<br>42" | RQD<br>40%  | R-1          | *349                     | Medium hard to hard gray SANDSTONE interbedded with SHALE; very fine to fine grained, highly weathered, micaceous, thinly laminated to thinly bedded, highly fractured, with typical |             |         |        |      |       |      |     |                      |      |               |         |
| 10 —          | _                    |                  |            |             |              |                          | low angle clay filled fractures.   |             |         |        |      |       |      |     |                      |      |               |         |
| -15.0-        | 669.0                | Core             | Rec        | RQD<br>74%  | P.2          | *339                     |  |             |         |        |      |       |      |     |                      |      |               |         |
| - HM -        | 1 303.0              | 120"             | 120*       | 74%         |              |                          | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, pyritic, micaceous, thinly bedded to thickly bedded, moderately to highly fractured.             |             |         | )<br>I |      |       |      |     |                      |      |               |         |
| 20.0          | 664.0                | -                |            |             |              | ,                        | Bottom of Boring - 20.0'   | +           |         |        |      |       |      |     |                      |      |               |         |
| 7002/21/11    |                      |                  |            |             |              |                          |  |             |         |        |      | ,     |      |     |                      |      |               |         |
| -             | -                    |                  |            |             |              |                          |  |             |         |        |      |       |      |     |                      |      |               |         |
| 25 —          |                      |                  |            |             |              |                          |  |             |         |        |      |       |      |     |                      |      |               |         |
| 25 — 25 —     | 1                    |                  |            |             |              |                          |  |             |         |        |      |       |      |     |                      |      |               |         |
| FILE:         |                      |                  |            |             |              |                          |  |             |         |        |      |       |      |     |                      |      |               |         |
| 30            | 1                    |                  |            |             |              |                          | · · · · · · · · · · · · · · · · · · ·  |             |         |        |      |       |      |     |                      |      |               |         |

| Client: | ranSy                | stems         | Inc.        |             |       |                         | Project: SCI-823-0.00   |           |        |         |      |        |        |   | Job No. 0121-                   | 3070.03        |
|---------|----------------------|---------------|-------------|-------------|-------|-------------------------|---|-----------|--------|---------|------|--------|--------|---|---------------------------------|----------------|
| LOG C   | F: Bo                | ring l        | R-127       |             | _     | ocation: Sta            | . 230+97.3, 92.5 ft. LT of SR 823 CL Date Drilled: 10   | /13       | _      |         |      |        |        |   |                                 |                |
|         |                      |               |             | Samp<br>No. |       | Hand<br>Penetro-        | WATER OBSERVATIONS: Water seepage at: None  | -         | G      | RAD     | ATK  | NC     |        |   |                                 |                |
|         |                      | .9            | (in)        |             | ا ق   | meter                   | Water level at completion: Not Reported   | ate       | _      |         |      |        |        |   | ANDARD PENETI                   |                |
| Depth   | Elev.                | per           | /ery        |             | Š/    | (tsf) /<br>* Point-Load |   | grege     | Sand   | M. Sand | Sand |        | . Ye   |   | ural Moisture Cont<br>PL 1————— | ent, % - ■<br> |
| (ft)    | (ft)<br>725.1        | Blows         | Recovery    | Drive       | Press | Strength<br>(psi)       | DESCRIPTION   | % Aggrega | %<br>C | %<br>M  | % F. | % Sitt | % Clay | i | Blows per foot -<br>10 20 30    | 40             |
| —o.3—   | <del>-</del> 724.8   | _             |             |             |       | ,                       | Topsoil - 4"/3.0' soil removed before drilling  | 1         |        |         |      |        |        |   |                                 |                |
| -       |                      | 5<br>10<br>6  | 16          | 1           |       |                         | Medium dense brown SANDY SILT (A-4a), trace clay; contains sandstone fragments; dry to damp.  |           |        |         |      | :      |        |   | φ                               |                |
| _       |                      | 5 7           | 13          | 2           |       |                         | į.  |           |        |         |      |        |        |   |                                 |                |
| 5—      | 740.4                | 9             | 13_         |             |       |                         |   |           |        |         |      |        |        |   |                                 |                |
| 6.0     | 719.1                | 10<br>7<br>33 | 15          | 3           |       |                         | Severely weathered brownish gray SANDSTONE.   |           |        |         |      |        |        |   |                                 | \ \d           |
| _       | •                    | 25<br>50/2    |             | <b>■</b> 4  |       |                         |   |           |        |         |      |        |        |   |                                 |                |
|         | -715.1-              | 50/2          | 7           | 4           |       |                         |   |           |        | İ       |      |        |        |   |                                 | 50+            |
| -       | 712.0-               |               |             |             |       |                         | Medium hard to hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle rust stained fractures. |           |        |         |      |        | ļ      |   |                                 |                |
| 15.1    | 712.0                | Core<br>120"  | Rec<br>114" | RQD<br>70%  | R-1   | *467                    | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical low angle clay filled  |           |        |         |      |        |        |   |                                 |                |
| · _     | -<br>-               |               |             |             |       |                         | fractures. @ 12.0'-12.5', broken zone. @ 13.4',13.9',14.3',14.5', 15.4',15.6',16.0',17.0'-17.3', argillaceous zones.  |           |        |         |      |        |        |   |                                 |                |
|         | <b> </b>             |               |             |             |       |                         | @ 15.4',15.5',15.9',17.0', 17.2',17.3',17.7', low angle fractures.  |           |        |         |      |        |        |   |                                 |                |
| 20.0-   | <del> -</del> 705.1- |               | ,           |             |       |                         | Bottom of Boring - 20.0'  |           |        |         |      |        |        |   |                                 |                |
| -       | <u> </u>             |               |             |             |       |                         |   |           |        |         |      |        |        |   |                                 |                |
| -       |                      |               |             |             |       | -                       |   |           |        |         |      |        |        |   |                                 |                |
| 25 —    | -                    | Ì             |             |             |       |                         |   | ĺ         |        |         | 1    |        |        |   |                                 |                |
| 25 —    |                      |               |             |             |       |                         |   |           |        |         |      |        |        |   |                                 |                |
| -       | -                    |               |             |             |       |                         |   |           |        |         |      |        |        |   |                                 |                |
| 30      | 1                    |               |             |             |       |                         |   |           |        |         |      | L.     |        |   |                                 |                |

| Client:       | TranSy                        | stems        | Inc.          |             |          | _  | Project: SCI-823-0.00  | -              | _      |         |         |        |      | Job N              | lo. 0121       | -3070.0            | 03 .   |
|---------------|-------------------------------|--------------|---------------|-------------|----------|--|--|----------------|--------|---------|---------|--------|------|--------------------|----------------|--------------------|--|
|               | F: Bo                         |              |               |             | 1        | ocation: Sta   | . 230+74.1, 130.6 ft. RT of SR 823 CL Date Drilled: 10   | )/14           | /04    |         |         |        |      |                    |                |                    |  |
|               |                               | _            |               | Samp<br>No. | ole      | Hand   | WATER OBSERVATIONS: Water seepage at: None   | <u> </u>       | G.     | RAD     | ATI     | ON     |      |                    |                |                    |  |
| Depth<br>(ft) | Elev.<br>(ft)                 | s per 6"     | Recovery (in) |             | s / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength | Water level at completion: Not Reported  | % Aggregate    | Sand   | M. Sand | Sand    | 11     | Clay | tural Moi<br>PL ├─ | D PENET        | itent, % -<br>⊢ LL | •  |
|               | 799.8                         | Blows        | Reco          | Drive       | Press    | (psi)  | DESCRIPTION  | %<br>A         | %<br>C | %       | %<br>T. | % Silt | %    | <br>Blows<br>10    | per foot<br>20 | - ()<br>80 40      | <u>)                                      </u> |
| -0.2          | -799. <del>6</del> -          | 4<br>8<br>15 | 11            | 1           |          | ļ  | Topsoil - 2" Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand; damp.   |                | ŀ      |         |         |        |      |                    | O              |                    |  |
| 3.0           | 796.8                         | 50           | 5             | 2           |          | •  | Severely weathered brown and gray CLAYSTONE, arenaceous  | -              |        |         |         |        |      |                    |                | <u>†</u>           | 50+(   |
| 5.0           | -794.8-<br>-                  |              |               |             |          |  | Soft to medium hard brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, micaceous, thinly bedded to thickly bedded, broken to highly fractured.  | <br> <br> <br> |        |         |         |        |      |                    |                |                    |  |
| 10 —          | -                             | Core<br>120" | Rec<br>120"   | RQD<br>18%  | R-1      | *276   | @ 10.8'-11.2', high angle clay filled fracture.  | :              |        |         |         |        |      |                    |                |                    |  |
| 15 —          | 785.7-                        | Core         | Rec           | RQD         |          | 2288   | Medium hard gray SANDSTONE; very fine to fine grained, decomposed to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typically low angle clay filled fractures, contains moderate argillaceous laminations.  @ 15.6'-17.4', 18.0'-19.6', abundant argillaceous laminations. @ 17.2'-17.4', broken zone. |                |        |         |         |        |      |                    |                |                    |  |
| 20.0          | <del> </del> 779.8-<br>-<br>- | 120*         | 120*          | RQD<br>63%  | R-2      | 2 288  | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured.  |                |        |         |         |        |      |                    |                |                    |  |
|               | 774.8                         |              |               |             |          |  | @ 19.8'-20.0', broken.<br>@ 20.8',23.7',24.9', low angle fractures.  |                |        |         |         |        |      |                    |                |                    |  |
| -25.0-        |                               |              |               |             |          |  | Bottom of Boring - 25.0'   |                |        |         |         |        |      |                    |                |                    |  |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, 0 MBUS, OHIO 43229 \* (614)888-0040

|                 |                   |                                 | stems        |             |                        | _       |                                  | Project: SCI-823-0.00   |         |        |           |       |        |        |             | Job        | No. 0   | 121-         | 3070                                    | .03          |
|-----------------|-------------------|---------------------------------|--------------|-------------|------------------------|---------|----------------------------------|---|---------|--------|-----------|-------|--------|--------|-------------|------------|---------|--------------|---|--------------|
| LO              | G OF              | : Во                            | ring         | R-129       |                        |         | Location: Sta                    | . 236+03.9, 104.6 ft. RT of SR 823 CL Date Drilled: 10  | /13     | _      |           | A 714 | 241    |        |             |            |         |              |   |              |
|                 |                   |                                 |              | ŋ           | Sam <sub>l</sub><br>No |         | Hand<br>Penetro-                 | WATER OBSERVATIONS: Water seepage at: None Water level at completion: 10.0' (includes drilling water)   |         |        | RAD.      |       |        |        | 67          | 'ANDAI     | DU DE   | NETE         | ΣΔΤΙΩ                                   | N (N)        |
| Dep             |                   | Elev.                           | per 6"       | ery (in)    |                        | / Core  | meter<br>(tsf) /<br>* Point-Load | Yyater lever at completion. Toto (mondes drilling water)  | gregate | Sand   | % M. Sand | Sand  |        | γε     | Nat         | ural Mo    | oisture |              |   | - •          |
| (ft             |                   | <i>(ft)</i><br>656.0<br>655.8   | Blows per    | Recovery    | Drive                  | Press / | Strength<br>(psi)                |   | % Ag    | ن<br>% | % W       | % F.  | % Sill | % Clay | <del></del> | Blow<br>10 | s per : | foot -<br>30 |   | 40           |
| 0.:             | 2                 | 655.8                           |              |             | IJ                     | l       |                                  | Topsoil - 2"/3" soil removed before drilling  | 1       |        | 1         |       |        |        |             |            |         |              |   |              |
|                 | 7                 | ,                               | 4<br>6<br>10 | 15          | 1                      |         | 4.5+                             | Hard brown SANDY SILT (A-4a), little clay, trace gravel; damp.  |         | <br>   | ,         |       |        |        |             |            |         |              |   |              |
| <del></del> 3.0 | <b>○</b>          | <del>6</del> 53.0-              | 29<br>25     |             | 2                      |         | 4.5+                             | Severely weathered brown SANDSTONE.   |         |        |           |       |        |        |             |            |         |              |   |              |
| !               | 5 -               |                                 | - 23         |             |                        |         |                                  |   |         |        |           |       |        |        |             |            |         |              |   | <b>○54</b> - |
| <u></u> 7 :     | $\longrightarrow$ | <del>6</del> 49.0-              | 45<br>50/5   | 10_         | 3                      |         |                                  |   |         |        |           |       |        |        |             |            |         |              |   | 50+          |
|                 | -                 | 043.0                           | Core<br>54"  | Rec<br>54"  | RQD<br>57%             | R-1     | 1 *200                           | Medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle clay filled fractures.  |         |        |           |       |        |        |             |            |         |              |   |              |
|                 | 0 —               | <del>-6</del> 44. <del>8-</del> |              |             |                        |         |                                  | @ 10.7'-11.1', high angle rust stained fracture.  |         |        |           |       |        |        |             |            |         |              |   |              |
|                 | 5—                |                                 |              |             |                        |         |                                  | Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately to highly fractured, with typical low angle clay filled fractures; contains few argillaceous laminations. |         |        |           |       |        |        |             |            |         |              | 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |              |
|                 |                   |                                 | Core<br>120" | Rec<br>119" | RQD<br>87%             | R-2     | 597                              |   |         |        |           |       |        |        |             |            |         |              |   |              |
|                 |                   |                                 |              | ·           |                        |         |                                  | . @ 11.6', low angle rust stained fracture.   |         |        |           |       |        |        |             |            |         |              |   |              |
| 2               | ٥-                |                                 |              | ,           |                        |         |                                  |   |         |        |           |       |        | ŀ      |             |            |         |              |   |              |
| 21              | .5                | <del>-6</del> 34.5-             |              |             |                        |         |                                  | Bottom of Boring - 21.5'  | ļ.      |        |           |       |        |        |             |            |         |              |   |              |
|                 | -                 |                                 |              |             |                        |         |                                  |   |         |        |           |       |        |        |             |            |         |              |   |              |
| 2               | 5—                |                                 |              |             |                        |         |                                  |   |         |        |           | -     |        |        |             |            |         |              |   |              |
|                 |                   |                                 |              |             |                        |         |                                  | ·   |         |        |           |       |        |        |             |            |         |              |   |              |
| 3               |                   |                                 |              | <u> </u>    |                        |         | 1                                |   |         |        |           |       |        |        |             |            |         |              |   |              |

MBUS, OHIO 43229 \* (614)888-0040

| Client: 1 | ranSy                        | stems          | Inc.       |             |         |                         | Project: SCI-823-0.00  |             |           |          |           |        |          |    | Job No              | . 0121           | -3070             | 03 .            |
|-----------|------------------------------|----------------|------------|-------------|---------|-------------------------|--|-------------|-----------|----------|-----------|--------|----------|----|---------------------|------------------|-------------------|-----------------|
| LOG O     |                              |                |            | -           | $I_{L}$ | ocation: Sta            | . 235+85.6, 7.1 ft. RT of SR 823 CL Date Drilled: 10   | /14         | /04       |          |           |        |          |    |                     |                  |                   |                 |
|           |                              |                |            | Samp<br>No. |         | Hand                    | WATER OBSERVATIONS: Water seepage at: None   | L           | G         | RAE<br>T | ATI       | ON     | $\vdash$ |    | _                   |                  |                   |                 |
|           |                              | .9             | (in)       |             | 6       | renetro-<br>meter       | Water level at completion: 4.4' (includes drilling water)  | ۰           |           | '        | ļ         |        |          | ST | ANDARI              | PENET            | RATION            | I (N)           |
| Depth     | Elev.                        | per            |            |             | / Core  | (tsf) /<br>* Point-Load |  | rega        | Sand      | Sand     | Sand      |        |          |    | urai Mois<br>PL I—— |                  | tent, %<br>——⊢ Li |                 |
| (ft)      | (ft)<br>671.8                | Blows          | Recovery   | Drive       | Press.  | Strength<br>(psi)       | DESCRIPTION  | % Aggregate | %<br>C. S | % M.     | % F. Sand | % Sitt | % Clay   |    |                     | per foot<br>20 3 |                   | 0               |
| —o.;3—    | 671.5                        |                |            |             |         |                         | ∖Topsoil 4"  |             |           |          |           |        |          |    |                     |                  |                   |                 |
| -         |                              | 25<br>29<br>35 | 18         | 1           |         |                         | Severely weathered brown SILTSTONE.  |             | -         |          |           |        |          |    |                     |                  |                   | O <sup>64</sup> |
|           |                              | 30<br>50/4     | 10         | 2           |         | ·                       |  |             |           |          |           |        |          |    |                     |                  |                   |                 |
| 5.0       | 666.8                        | 50/4           | 10         |             |         |                         |  | 1           |           |          |           |        |          |    |                     |                  |                   | 50+(            |
|           |                              |                |            |             |         |                         | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle rust stained fractures.  |             |           |          |           |        |          |    |                     |                  |                   |                 |
|           |                              | Core<br>96"    | Rec<br>96" | RQD<br>49%  | R-1     | *328                    | -  |             |           |          |           |        |          |    |                     |                  |                   |                 |
| 10 —      | į                            |                |            |             |         |                         |  |             |           |          |           |        |          |    |                     |                  |                   |                 |
| -         |                              |                |            |             |         | ·                       |  |             |           |          |           |        |          |    |                     |                  |                   |                 |
| 15 —      | <del>-6</del> 58.6-          | Core<br>84"    | Rec<br>84" | RQD<br>96%  | R-2     | *463                    | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical low angle clay filled fractures. @ 13.6'-15.7', contains few to moderate argillaceous laminations. |             |           |          |           |        |          |    |                     |                  |                   |                 |
|           | -054.0                       |                |            |             |         |                         |  |             |           |          |           |        |          |    |                     |                  |                   |                 |
| 20.0—     | _ <b>6</b> .1.6 <del>0</del> |                |            |             |         |                         | Bottom of Boring - 20.0'   | 1           |           |          |           |        |          |    |                     |                  |                   |                 |
| 25 —      |                              |                |            |             |         |                         |  |             |           |          |           | ,      |          |    |                     |                  |                   |                 |
| _ 30      |                              |                |            |             |         |                         |  |             |           |          |           |        |          |    |                     |                  |                   |                 |

FILE: 0121-3070-03 ( 11/12/2007 12:49 FM )

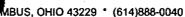
DLZ OHIO INC. \* 6121 HUNTLEY ROAD, 0 1805, OHIO 43229 \* (614)888-0040

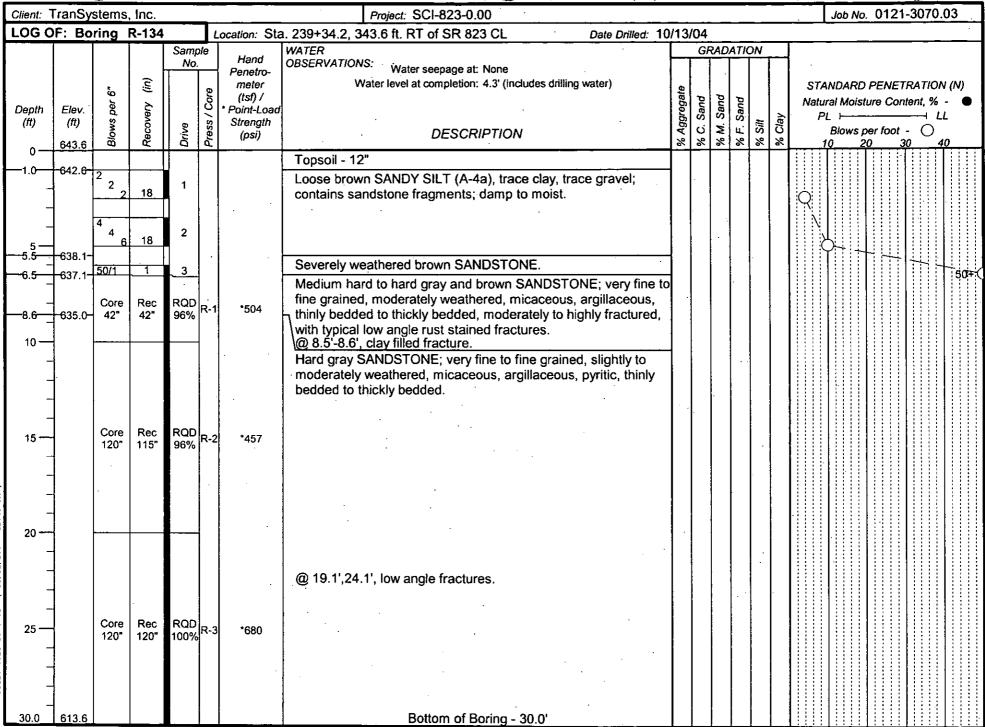
| LOG OF: Boring R-131 Sample Coefficient St. 235-49.3, 230.1 ft. RT of SR 823 CL Date Drilled: 10/14/04    Coefficient Coeffici | lient: T            |                     |             |            |            | _    |                              | Project: SCI-823-0.00  |             |  |     |    |        |           | Job No                       | . 0121-    | 3070.03                    |
|--|---------------------|---------------------|-------------|------------|------------|------|------------------------------|--|-------------|--|-----|----|--------|-----------|------------------------------|------------|----------------------------|
| Depth   Elex   Second   Plan   | OG O                | F: Bo               | ring        | R-131      | _          | _    | ocation: Sta                 |  | )/14<br>T   |  | ATI | ON |        |           |                              |            |                            |
| Topsail - 3"/9" soil removed before drilling Very stiff brown SANDY SILT (A-4a), trace gravel; damp.  Severely weathered brown SANDSTONE.  Soft to medium hard brown SANDSTONE, very fine to fine grained, highly weathered to decomposed, argillaceous, thinly bedded to thickly bedded.  Core 8cc 76" 80" R-1 234  6 6.5"-7.7', infilled fracture.  6 6.5"-7.7', infilled fracture.  6 6.0"-6.5",8.5"-9.1", broken decomposed zones.  6 14.4"-14.6", high angle rust stained fracture.  Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  20 19.8"-20.0", high angle rust stained fracture.  |                     | (ft)                |             |            | No         | Core | Penetro-<br>meter<br>(tsf) / | OBSERVATIONS: Water seepage at: None Water level at completion: 8.1' (includes drilling water)   | % Aggregate |  |     |    | % Clay | Nati<br>F | ural Mois<br>PL I<br>Blows I | ture Conte | ent,% -<br>  LL            |
| Severely weathered brown SANDSTONE.  Soft to medium hard brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, thinly bedded to thickly bedded.  Core Rec 90° 76° 67% R-1  (@ 6.5'-7.7', infilled fracture.  (@ 6.0'-6.5',8.5'-9.1', broken decomposed zones.  (@ 14.4'-14.6', high angle rust stained fracture.  Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  (@ 19.8'-20.0', high angle rust stained fracture.  | -                   | <del>-</del> 716.4- | 11          | 18         | 1          |      | 3.5                          |  |             |  |     |    |        |           |                              | Q          |                            |
| Soft to medium hard brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, thinly bedded.  Core 90° 76° 8RCD 76° 8R.1 '234  @ 6.5'-7.7', infilled fracture.  @ 6.0'-6.5',8.5'-9.1', broken decomposed zones.  @ 14.4'-14.6', high angle rust stained fracture.  Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  @ 19.8'-20.0', high angle rust stained fracture.  | 5—                  |                     |             | 16         | 2 -        |      |                              |  |             |  |     |    |        |           |                              |            | <i>/ / / / / / / / / /</i> |
| Core 84" Rec 84" R2D 73% R-2 *320 Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  @ 19.8'-20.0', high angle rust stained fracture.   | -<br>-<br>-         | 711.2               |             | Rec<br>76* | RQD<br>67% | R-1  | *234                         | grained, highly weathered to decomposed, argillaceous, thinly bedded to thickly bedded.  -  @ 6.5'-7.7', infilled fracture.                  |             |  |     |    |        |           |                              |            |                            |
| 20.0 Bottom of Boring - 20.0'  | 16.5<br>-<br>-<br>- |                     | Core<br>84" | Rec<br>84* | RQD<br>73% | R-2  | *320                         | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded. |             |  |     |    |        |           |                              |            |                            |
| 25—  | 20.0                | -096.7              |             |            |            |      |                              | Bottom of Boring - 20.0'   | 7           |  |     |    |        |           |                              |            |                            |
|  | 25                  |                     |             |            |            |      |                              |  |             |  |     | -  |        |           |                              |            |                            |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. MBUS, OHIO 43229 \* (614)888-0040

|     |                  | ranSy              |                |          |             | _               |                                  | Project: SCI-823-0.00   |             |         |           |        |       |       |     | Job    | No. C        | 121- | 3070                | .03 |
|-----|------------------|--------------------|----------------|----------|-------------|-----------------|----------------------------------|---|-------------|---------|-----------|--------|-------|-------|-----|--------|--------------|------|---------------------|-----|
| L   | og o             | F: Bo              | ring           | R-132    |             | _               | Location: Sta                    | . 239+86.4, 314.0 ft. LT of SR 823 CL Date Drilled: 10  | /13/        |         |           |        |       | 1     |     |        | -            |      |                     |     |
|     |                  |                    |                | ,        | Samp<br>No. |                 | Hand<br>Penetro-                 | WATER OBSERVATIONS: Water seepage at: None Water level at completion: 5.3' (includes drilling water)                |             | GF      | RAD.      | ATIO   | ON    |       |     |        |              |      | <b>.</b> . <b>.</b> |     |
| , c | Depth            | Elev.              | per 6"         | ery (in) |             | / Core          | meter<br>(tsf) /<br>* Point-Load |   | regate      | C. Sand | Sand      | and    |       |       | Nat | ural M | RD PE        | Cont |                     | •   |
|     | (ft)             | (ft)<br>653.8      | Blows          | Recovery | Drive       | Press /         | Strength<br>(psi)                | DESCRIPTION   | % Aggregate | % C. S  | % M. Sand | % F. S | nis % | % Cla |     |        | ws per<br>20 |      |                     | 40  |
| Н   | 0.2              | 653.6              |                |          |             |                 |                                  | Topsoil - 2"  |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | -                |                    | 3<br>4<br>4    | 18       | 1           |                 |                                  | Loose to medium dense brown SANDY SILT (A-4a), trace clay; (possible decomposed sandstone); dry to damp.            |             |         |           |        |       |       |     |        |              |      |                     |     |
| l   | _                |                    | 10<br>13<br>19 | 18       | 2           |                 | ·                                |   |             |         |           |        |       |       |     |        | <del> </del> | , l  |                     |     |
| L   | -5.5             | 648.3 <del>-</del> | 19             | 10       | ₫           | ١,              |                                  |   |             |         |           |        |       |       |     |        |              |      | $\cap$              |     |
|     | _                |                    |                |          |             | 1               |                                  | Medium hard to hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, |             |         |           |        |       |       |     |        |              |      |                     |     |
| l   | _                |                    | Core           | Rec      | RQD<br>56%  | P <sub>-1</sub> | *424                             | argillaceous, thinly bedded to thickly bedded, highly fractured,  |             |         |           |        |       | '     |     |        |              |      |                     |     |
| ┞   | -8. <del>5</del> | 645.3              | 54"            | 54*      | 56%         |                 | 424                              | with typical low angle clay filled fractures.   |             |         |           |        |       |       |     |        |              |      |                     |     |
| l   |                  |                    |                |          |             |                 |                                  | Hard gray SANDSTONE; very fine to fine grained, slightly  |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | 10               | 1                  |                |          |             |                 |                                  | weathered, micaceous, pyritic, thinly bedded to thickly bedded, slightly fractured to unfractured.                  |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | 7                | }                  |                |          | 1           |                 |                                  | ongring master, ou to driff doubted.  |             |         |           |        |       |       |     |        |              |      |                     |     |
|     |                  | ]                  |                |          |             |                 |                                  |   |             |         | ļ.        |        |       |       |     |        |              |      |                     |     |
|     |                  |                    |                |          |             |                 |                                  |   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | 15               | ]                  | Core           | Rec      | RQD         |                 | °654                             |   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | 15 —-            |                    | 120"           | 120"     | 98%         | )               | 4 004                            |   |             |         |           |        | .     |       |     |        |              |      |                     |     |
|     |                  | ]                  |                |          |             |                 |                                  |   | 1           | 1       |           |        |       |       |     |        |              |      |                     |     |
|     | _                |                    |                |          |             | .               |                                  |   |             | ľ       |           |        |       |       |     |        |              |      |                     |     |
|     | _                | 1                  |                |          |             |                 |                                  | @ 18.7',18.9', low angle clay filled fractures.   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | 20 —             | -                  |                | <u> </u> | <b></b>     | $\downarrow$    | ,                                | W 10.1, 10.3, 10W angle clay filled fractures.  |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | _                | -                  |                |          |             |                 |                                  |   |             |         |           | 1      |       |       |     |        |              |      |                     |     |
|     | _                | -                  |                |          |             |                 |                                  |   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | -                | -                  |                |          |             |                 | ,                                | ,   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | _                |                    |                |          |             |                 |                                  |   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | 25 —             | 1                  | Core<br>120"   | 120"     | RQD<br>100% | ′¦R∹            | 3 <b>*</b> 645                   | ·   | 1           |         |           |        |       |       |     |        |              |      |                     |     |
|     | _                | 1                  |                |          |             |                 |                                  |   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | _                |                    |                |          |             |                 |                                  |   |             |         |           |        |       |       |     |        |              |      |                     |     |
|     | -                |                    |                |          |             |                 |                                  |   |             |         |           | 1      |       |       |     |        |              |      |                     |     |
| ĺ   | 30.0             | 623.8              |                |          |             |                 |                                  | Bottom of Boring - 30.0'  |             |         | İ         |        |       |       |     |        |              |      |                     |     |

| Client: | ranSv         | stems        | Inc.          |             |              |                         | Project: SCI-823-0.00  |      |          |          |                    |        |          | Job No. (                              | 0121-3070.03   |
|---------|---------------|--------------|---------------|-------------|--------------|-------------------------|--|------|----------|----------|--------------------|--------|----------|--|----------------|
| LOG O   |               |              |               |             | L            | ocation: Sta            | 239+96.6, 1.5 ft. RT of SR 823 CL Date Drilled:  | 10/1 | 2/0      | 4        |                    |        |          |  |                |
|         |               | -            |               | Samp<br>No. | -            |                         | WATER OBSERVATIONS: Water seepage at: 2.5'   |      | -        | GRA.     | DATI               | ON     |          |  |                |
|         | Elev.         | Blows per 6" | Recovery (in) | 1 1         |              | meter                   | Water level at completion: 5.9' (includes drilling water)  | ۽ ا  | <u>.</u> |          | M. Sand<br>F. Sand |        | .        |  | ENETRATION (N) |
| Depth   |               |              |               |             | Press / Core | (tsf) /<br>* Point-Load |  |      | 66       | Sand     |                    |        | <u> </u> | Natural Moisture Content, % - ■ PL  LL |                |
| (ft)    | (ft)<br>648.4 |              |               |             |              | Strength<br>(psi)       | DESCRIPTION  |      |          | د<br>د % | % F.               | % Silt | % Clay   | Blows per foot - () 10 20 30 40        |                |
| 0.2     | 648.2         |              |               |             |              |                         | Topsoil - 2"   | _    |          |          |                    |        |          |  |                |
| -       |               | 2<br>5<br>6  | 18_           | 1           |              | 4.5+                    | Medium dense brown SANDY SILT (A-4a), trace clay; contain sandstone fragments; damp to moist.  | าร   |          |          |                    |        |          | a                                      |                |
|         |               | 7            |               |             |              |                         |  |      |          |          |                    |        |          |  |                |
| 5—      | ]             | 11<br>15     | 18            | 2           |              | 4.5+                    |  |      |          |          |                    |        |          |  | <i>X</i>       |
| 5.5     | 642.9         | 50/4         | 4             | 3           |              |                         | Severely weathered brown and gray SANDSTONE.   | _].  |          |          |                    |        |          |  | 50+            |
| 1       | 641.4         |              | _             | 200         |              |                         | Medium hard to hard gray and brown SANDSTONE; very fine  | to   |          |          |                    | ŀ      |          |  |                |
| -       | 640.1         | Core<br>36"  | Rec<br>33"    | RQD<br>69%  | R-1          | *360                    | fine grained, highly weathered, micaceous, argillaceous, thinly bedded to thickly bedded, highly fractured, with typical low any rust stained fractures. |      |          |          |                    |        |          |  |                |
| 10 —    | -             |              |               |             |              |                         | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, pyritic, thickly bedded, slightly fractured to unfractured. |      |          |          |                    |        |          |  |                |
| _       |               |              |               |             |              |                         |  |      | -        |          |                    |        |          |  |                |
| 15 —    |               | Core<br>120" | Rec<br>120"   | RQD<br>92%  | R-2          | *580                    |  | .    |          |          |                    |        |          |  |                |
| -       |               |              |               |             |              |                         | @ 14.5', low angle clay filled fracture.   |      |          |          |                    |        |          |  |                |
|         |               |              | ,             | •           |              |                         |  |      | .        |          |                    |        |          |  |                |
| 20 —    |               |              |               |             |              |                         |  | ı    |          |          |                    |        |          |  |                |
| 20 —    | ]             |              |               |             |              |                         |  |      | ĺ        |          | ٠   .              |        |          |  |                |
| -       | 4             |              |               |             |              |                         |  |      | .        |          |                    |        |          |  |                |
| -       | -             |              |               |             |              |                         |  |      |          |          |                    | •      |          |  |                |
| 200     | ] .           | Core         | Rec           | RQD         |              | *630                    |  | ·    |          |          |                    |        | .        |  |                |
| 25 —    |               | Core<br>120" | Rec<br>120"   | RQD<br>100% | rk-S         | *630                    |  |      |          |          |                    |        |          |  |                |
| 25 —    | -             |              |               |             |              |                         |  |      |          |          |                    |        |          |  |                |
|         | -             |              |               |             |              |                         |  |      | ĺ        |          |                    |        |          |  |                |
| 30.0    | 618.4         |              |               |             |              |                         | Bottom of Boring - 30.0'   |      |          |          |                    |        |          |  |                |





DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C BUS, OHIO 43229 \* (614)888-0040

|                | <u> </u>       | 10.000       | I             |             |          |   | Project: SCI-823-0.00   | •           |     | _    |      |     |        |             | Job No.                             | 0121-3  | 3070.03 |
|----------------|----------------|--------------|---------------|-------------|----------|---|---|-------------|-----|------|------|-----|--------|-------------|-------------------------------------|---------|---------|
| Client:        |                |              |               |             | ٦.       |   |   | 0/13        | Una |      |      | -   |        |             | 000 110.                            |         |         |
| LOG C          | F: Bo          | ring         | K-135         |             | _        | ocation: Sta  | . 243+71.4, 216.6 ft. LT of SR 823 CL Date Drilled: 1 WATER   | T           |     |      | ATIO | ON. | 1      |             |                                     |         |         |
| Depth<br>(ft)  | Elev.<br>(ft)  | Blows per 6" | Recovery (in) | Samp<br>No. |          | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None Water level at completion: 5.5' (includes drilling water)  DESCRIPTION   | % Aggregate |     | Sand | Sand | ţ   | % Clay | Natui<br>Pi | al Moistur<br>.    ———<br>Blows per | e Conte | → LL    |
| - 03-          | 713.8<br>713.5 | B            | œ             | 0           | ď        | <u> </u>  | Tongell 48/4 21 cell removed before drilling  | ╬           | -   | 100  | 1°   | 6/  | 0,     |             | <u>0 20</u>                         | 30      | 40      |
| 0.3<br><br>3.0 | ] !            | 5<br>7<br>8  | 18            | 1           |          |   | Topsoil - 4"/1.2' soil removed before drilling  Medium dense brown SANDY SILT (A-4a), trace gravel; contains sandstone fragments; damp.   |             |     |      |      |     |        |             | ٥-,                                 |         |         |
| 5.5            |                | 27<br>50/2   | 8             | 2           |          |   | Severely weathered brown SANDSTONE.   | _           |     |      |      |     |        |             | -                                   |         | 50+     |
|                | -708.3-        | Core<br>90"  | Rec<br>90"    | RQD<br>63%  | R-1      | ·<br>*178   | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, micaceous, argillaceous, thinly laminated to thinly bedded, highly fractured, with typical low angle clay filled fractures; contains few to moderate argillaceou laminations, poorly cemented. |             |     |      |      |     |        |             |                                     |         |         |
| -14.7 <u>-</u> | 699.1          | Core<br>84"  | Rec<br>84"    | RQD<br>86%  | R-2      | *32   | Medium hard to hard brown SANDSTONE, very fine to fine grained, highly weathered, micaceous, argillaceous, thickly bedded, moderately fractured; contains few argillaceous laminations.   |             |     |      |      |     |        |             |                                     |         |         |
| 20.0-          | 693.8          |              |               |             | $\vdash$ |   | Bottom of Boring - 20.0'  | $\dashv$    |     |      |      |     |        |             |                                     |         |         |
| 25 —           |                |              |               |             |          |   |   |             |     |      |      |     |        |             |                                     |         |         |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, COMBUS, OHIO 43229 \* (614)888-0040

| Client:            | TranSy            | stems        | Inc.       |             |          |                         | Project: SCI-823-0.00   |           |        |           |      |             |        |      | Job I            | vo. 01         | 21-3       | 070.0         | 03       |
|--------------------|-------------------|--------------|------------|-------------|----------|-------------------------|---|-----------|--------|-----------|------|-------------|--------|------|------------------|----------------|------------|---------------|----------|
|                    | F: Bo             |              |            |             | L        | ocation: Sta            | . 243+98.7, 76.5 ft. LT of SR 823 CL Date Drilled: 10   | /12/      |        |           | _    |             |        | _    |                  |                |            | _             | •        |
|                    |                   |              |            | Samp<br>No. |          | Hand<br>Penetro-        | WATER OBSERVATIONS: Water seepage at: None  |           | GI     | RAD       | ATIO | <u>  NO</u> |        |      |                  |                |            |               |          |
| 1                  |                   | .9           | (in)       |             | 9        | meter                   | Water level at completion: 3.5' (includes drilling water)   | ste       | 75     | , I       | _    |             |        |      | ANDAF            |                |            |               | (N)      |
| Depth              | Elev.             |              | ery        |             | / Core   | (tsf) /<br>* Point-Load |   | Aggregate | Sanc   | Sand      | Sand |             | 7      |      | ural Mo<br>PL ├─ | isture (       | Jontei     | 11, %<br>→ Ll | - •<br>L |
| (ft)               | (ft)<br>682.6     | Blows per    | Кесоиегу   | Drive       | Press    | Strength<br>(psi)       | DESCRIPTION   | % Ago     | %<br>C | % M. Sand | % F. | % Sitt      | % Clay | ·    |                  | s per fo<br>20 | ot -<br>30 | 0             | 0        |
| —₀.ŝ=              | 682.3             |              |            |             |          |                         | Topsoil - 3"  |           |        |           |      |             |        |      |                  |                |            |               |          |
|                    | 1                 | 3<br>7<br>18 | 15         | 1           |          |                         | Medium dense brown SANDY SILT (A-4a), little to some gravel, trace clay; contains sandstone fragments; damp.                    |           |        |           |      |             |        |      |                  | ļç             | )<br> <br> |               |          |
|                    | 1                 | 9            | 45         | 2           |          | ·<br>1                  |   |           |        |           |      |             | }      |      |                  |                |            |               |          |
| 5.0-               | 677. <del>6</del> | 1 12         | 15         |             | 1        |                         | Medium hard brown SANDSTONE; very fine to fine grained,   |           | l      |           |      | -           |        |      |                  |                |            |               |          |
| 6.3                | 676.3             | ┨            |            |             |          |                         | highly weathered, argillaceous, thinly bedded to thickly bedded,  |           |        |           |      |             |        |      |                  |                |            |               |          |
|                    |                   | Core<br>60"  | Rec<br>59" | RQD<br>58%  | R-1      | *182                    | \moderately fractured, with typical low angle clay filled fractures.  Hard brown and gray SANDSTONE; very fine to fine grained, | ۱.        |        |           |      |             |        |      |                  |                |            |               |          |
|                    | 1                 |              |            |             |          |                         | moderately weathered, argillaceous, thinly bedded to thickly  |           |        |           |      |             |        |      |                  |                |            |               |          |
| 10                 | 4                 |              | ļ          | <b>.</b>    |          |                         | bedded, moderately fractured, with typical low angle fractures; contains few argillaceous laminations, turbidity bedded.        |           |        |           |      |             |        |      |                  |                |            |               |          |
|                    | -{                |              |            |             |          |                         | contains few arginaceous familiations, tarbiaty beddes.   |           |        |           | .    |             |        |      |                  |                |            |               |          |
|                    | -                 |              |            |             |          |                         | @ 10.3'-13.3', moderate to abundant argillaceous laminations,   |           |        |           |      |             |        |      |                  |                |            |               |          |
|                    | _                 |              |            | I           |          |                         | poorly cemented.  |           |        | ľ         | Ì    |             |        |      |                  |                |            |               |          |
|                    |                   | Core         | Rec        | RQD         | <br>     |                         | <u>.</u>  |           |        |           |      |             |        |      |                  |                |            |               |          |
| 15 —               | 1                 | 120"         | 115"       | 55%         | R-2      | 442                     |   |           |        |           |      | •           |        |      |                  |                |            |               |          |
|                    | ]                 |              |            |             |          | ļ.                      |   |           |        |           |      |             |        |      |                  |                |            |               |          |
| ×                  | _                 |              |            |             | -        |                         |   |           |        |           |      |             |        |      |                  |                |            |               |          |
| 20 0               | 4                 |              |            | •           |          |                         |   |           |        |           |      |             |        |      |                  |                |            |               |          |
| 20.0               | 662.6             | -            | -          | <b>I</b>    | $\vdash$ |                         | Bottom of Boring - 20.0'  | -         |        |           |      |             |        |      |                  |                |            |               |          |
| 12/2007            | -                 |              |            |             |          |                         | DOMOIN OF BOINING - 20.0  |           |        |           |      | .           |        |      |                  |                |            |               |          |
| 1/12               | -                 |              |            |             |          |                         |   |           |        |           |      |             |        |      |                  |                |            |               |          |
|                    | 1                 |              |            |             |          |                         |   |           |        |           | 1    |             |        |      |                  |                |            |               |          |
| 0-03               | ]                 |              |            |             |          |                         |   |           |        |           |      |             |        |      |                  |                |            |               |          |
| 25 -               |                   |              |            | .           |          |                         | ·   |           |        |           |      |             |        |      |                  |                |            |               |          |
| FILE: 0121-3070-03 |                   |              |            |             |          |                         |   |           |        |           |      |             |        |      |                  |                |            |               |          |
| TIPE               | _                 |              |            |             |          |                         | ·   |           |        |           |      |             |        |      |                  |                |            |               |          |
| 1                  | _                 | 1            |            |             |          |                         |   |           |        |           | 1    |             |        |      |                  |                |            |               |          |
| 30                 |                   | 1            | 1          | ∐           |          | 1                       | l   | 1         |        |           |      | 1_          | L      | 1111 | 1   1            | :   : :        |            |               | 1: 1     |

| Client:                | TranSy              | stems/         | , Inc.     | Project: SCI-823-0.00 |        |                                |  |             |      |         |        |          |        |      | Job No.                         | 0121-     | 3070.03                          |
|------------------------|---------------------|----------------|------------|-----------------------|--------|--------------------------------|--|-------------|------|---------|--------|----------|--------|------|---------------------------------|-----------|----------------------------------|
| LOG                    | OF: Bo              | ring           | R-137      |                       | _      | ocation: Sta                   | a. 243+94.3, 103.9 ft. RT of SR 823 CL Date Drilled: 10  | /13         |      |         |        |          |        |      |                                 |           |                                  |
|                        |                     |                | , n        | Samp<br>No.           |        | Hand<br>Penetro-               | WATER OBSERVATIONS: Water seepage at: None Water level at completion: 3.7' (includes drilling water)   | -           | Gi   | RAD     | ATK    | NC<br>NC |        |      |                                 |           | 21701440                         |
| Depth                  | 1                   | per 6"         | rery (in)  |                       | / Core | meter<br>(tsf) /<br>Point-Load |  | % Aggregate | Sand | Sand    | Sand   |          | _      | Nati | ANDARD .<br>ural Moistu<br>PL + |           | RATION (N)<br>ent, % - ●<br>— LL |
| (ft)                   | (ft)<br>759.3       | Blows          | Recovery   | Drive                 | Press  | Strength<br>(psi)              | DESCRIPTION  | % Agg       | \%   | %<br>Z. | % F. S | % Sitt   | % Clay |      | Blows po                        | er foot - | _                                |
| -0.3                   | 759.0<br>-<br>-     | 11<br>15<br>19 | 18         | 1                     |        | 4.5+                           | Topsoil - 3"/12" soil removed before drilling Hard brown SILT AND CLAY (A-6a); little fine to coarse sand, trace gravel; damp.   | !           |      |         |        |          |        |      |                                 |           | 6                                |
| 5.0-                   | -<br>754.3          | 19<br>27<br>46 | 18         | 2 -                   |        | 4.5+                           |  |             |      |         |        |          |        |      |                                 |           |                                  |
| 0.0                    | _                   | 21 30          |            | 3                     |        |                                | Severely weathered brown SANDSTONE, argillaceous.  |             |      |         |        |          |        |      |                                 |           |                                  |
| 7.5-<br>9.0-           | 751.8<br>-<br>750.3 | 50/4           | 16         |                       |        |                                | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous,   |             |      |         |        |          |        |      |                                 |           | 50+                              |
| 10 -                   | <u>-</u>            | Core<br>66"    | Rec<br>66" | RQD<br>68%            | R-1    | *83                            | thinly bedded to thickly bedded, moderately fractured, with typical low angle fractures.  Medium hard to hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to thickly bedded, highly fractured, |             |      |         |        |          |        |      |                                 |           |                                  |
| 15 -                   | -                   | Core           | Rec        | RQD                   | R-2    | *442                           | with typical low angle clay filled fractures.  @ 9.9'-10.1',11.5'-11.6',12.4' -12.6', high angle clay filled fractures.  @ 16.1'-16.2', high angle rust stained fracture.  |             |      |         |        |          |        |      |                                 |           |                                  |
| —16.8-<br>E            | 742.5               |                | 84"        | 90%                   |        | 772                            | Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, pyritic, thinly bedded to thickly bedded, moderately fractured, with typical low angle clay filled fractures.   | ļ<br>,      |      |         |        |          |        |      |                                 |           |                                  |
| 11/12/2007             | -                   |                |            | ,                     |        |                                | Bottom of Boring - 20.0'   |             |      |         |        |          |        |      |                                 |           |                                  |
| FILE: 0121-3070-03 [ ] | <u></u>             |                |            |                       |        |                                |  |             |      |         |        |          |        |      |                                 |           |                                  |
| FILE: 0                | -<br>-              |                |            |                       |        |                                |  |             |      |         |        |          |        |      |                                 |           |                                  |

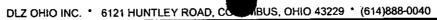
|                        | •                                |                  |               |             |     |   | OLZ OHIO INC. * 6121 HUNTLEY ROAD, COBUS, OHIO 43229 * (614)88   | 8-00        | 40 |         |           |      |        |           |                 |        |                 |                | <del></del> - |
|------------------------|----------------------------------|------------------|---------------|-------------|-----|---|--|-------------|----|---------|-----------|------|--------|-----------|-----------------|--------|-----------------|----------------|---------------|
| Client: T              | ranSys                           | stems,           | Inc.          |             |     |   | Project: SCI-823-0.00  |             |    |         |           |      |        |           | Job I           | Vo. 0  | 121-30          | 070.0          | 3             |
| LOG O                  | F: Bo                            | ring f           | ₹-138         | •           |     | ocation: Sta  | 1. 247+87.7, 10.4 ft. RT of SR 823 CL Date Drilled: 10   | /13         |    |         |           |      |        |           |                 |        |                 |                |               |
| Depth<br>(ft)          | Elev.<br>(ft)                    | Blows per 6"     | Recovery (in) | Samp<br>No. |     | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | WATER OBSERVATIONS: Water seepage at: None Water level at completion: 6.8' (includes drilling water)  DESCRIPTION  | % Aggregate |    | M. Sand | % F. Sand | Silt | 6 Clay | Natu<br>F | iral Mo<br>PL ⊢ | isture | NETRA<br>Conten | t, % -<br>⊣ LL |               |
| 0                      | 741.6                            | 10               |               | 1           | a.  | 4.0   | No Topsoil<br>Medium dense brown SANDY SILT (A-4a), trace gravel; damp.  | *           |    |         |           |      |        |           |                 |        |                 |                | 5             |
| —2.0<br>—              | <del>-</del> 739. <del>6  </del> | 50/4             | 16            |             |     |   | Severely weathered brown SANDSTONE, argillaceous.  |             |    |         |           |      |        |           |                 |        |                 |                | Y             |
| 5 —                    |                                  | 35<br>37<br>50/3 | 15            | 2           |     |   |  |             |    |         |           |      |        |           |                 |        |                 |                | 50+           |
| -5.5                   | -736.1<br>-729.2-                | Core<br>90"      | Rec<br>84"    | RQD<br>61%  | R-1 | *412  | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, thickly bedded, highly fractured, with typical high angle rust stained fractures.  @ 5.8'-6.3', lost recovery.  @ 7.0'-7.2', high angle clay filled fracture.  Hard gray SANDSTONE; very fine to fine grained, slightly |             |    |         |           |      |        |           |                 |        |                 |                |               |
| -<br>15<br>-<br>-<br>- |                                  | Core<br>84"      | Rec<br>84"    | RQD<br>100% | R-2 | *530  | weathered, micaceous, argillaceous, pyritic, thickly bedded, moderately to slightly fractured.  @ 13.9',14.5', low angle fractures.  |             |    |         |           |      |        |           |                 |        |                 |                |               |
| <del></del> 20.0       | <del>-721.6-</del>               |                  |               |             |     |   | Bottom of Boring - 20.0'   | 7           |    |         |           |      |        |           |                 |        |                 |                |               |
| 25 —<br>               |                                  |                  |               |             |     |   |  |             |    |         |           |      |        |           |                 |        |                 |                |               |
| 30                     |                                  | <u> </u>         |               |             |     |   |  |             |    |         |           |      | ,      |           |                 |        |                 |                |               |

FILE: 0121-3070-03 ( 11/12/2007 12:49 PM )

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| Client:                | FranSy:                      | stems         | , Inc.      | •           |        |  | Project: SCI-823-0.00   |             |             |    |      |   |        |                 | Job No                      | 012     | 1-307    | 0.03 |
|------------------------|------------------------------|---------------|-------------|-------------|--------|--|---|-------------|-------------|----|------|---|--------|-----------------|-----------------------------|---------|----------|------|
| LOG O                  | F: Bo                        | ring          | R-139       |             | _      |  | . 251+91.9, 143.0 ft. LT of SR 823 CL Date Drilled: 1   | )/12        |             |    |      |   |        |                 |                             |         |          |      |
| Depth                  | Elev.                        | per 6"        | ary (in)    | Samp<br>No. |        | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER OBSERVATIONS: Water seepage at: None Water level at completion: 2.5' (includes drilling water)  | % Aggregate |             |    | Sand |   | ٧      | Natu            | NDARD<br>ral Moisi<br>L ⊢—— |         | ntent, 9 |      |
| (ft)                   | (ft)<br>825.6                | Blows         | Recovery    | Drive       | Press, | Strength<br>(psi)                                    | DESCRIPTION   | % Agg       | ر<br>ا<br>ا | 12 | u    |   | % Clay | ·<br>-: : : : : | Blows p                     | er foot |          |      |
| 0.2                    | 825.4                        |               |             |             |        |  | Topsoil - 2"  | ┨           |             |    |      |   |        |                 |                             |         |          |      |
|                        | 823.1-                       | 6<br>12<br>12 | 12          | . 1         |        |  | Medium dense brown SANDY SILT (A-4a), trace clay; dry.  |             |             |    |      |   |        |                 |                             | 0.      |          |      |
|                        |                              | 50/4          | 4           | 2           |        |  | Severely weathered gray SANDSTONE, very fine grained.   |             |             |    |      | ! |        |                 |                             |         | 7        | 50+  |
| 5.0<br>-<br>-<br>-     | 820.6                        | Core<br>60"   | Rec<br>60"  | RQD<br>52%  | R-1    | *280   | Medium hard gray and brown SANDSTONE; fine grained, high weathered, argillaceous, micaceous, thinly bedded to massive, highly to moderately fractured, with typical low angle clay filled fractures, contains moderate argillaceous laminations.  | У           |             |    |      |   |        |                 |                             |         |          |      |
| 10 —                   |                              | Core          | Rec         | RQD         | R-2    |  | @ 10.6'-11.2', iron stone inclusion.  @ 12.1'-13.5', 15.7'-16.9', 18.0'-20.6', contains abundant argillaceous laminations, broken.  |             |             |    |      |   |        |                 |                             |         |          |      |
| 20 —                   | -                            | 120"          | 117"        | . 53%       |        |  |   |             |             |    |      |   |        |                 |                             |         |          |      |
| 1/11 ) = 23.6 = 25 = - | 803.9-<br>-802.0-<br>-798.2- | Core<br>120*  | Rec<br>118* | RQ0<br>55%  | R-3    | *350   | Medium hard to soft SHALE, decomposed to highly weathered arenaceous, thinly laminated to thinly bedded, moderately fractured.  Medium hard gray SANDSTONE, fine grained, highly weathered, argillaceous, micaceous, laminated to thickly bedded, moderately fractured, contains moderate argillaceous laminations. |             |             |    |      |   |        |                 |                             |         |          |      |
| 27.4                   |                              |               |             |             |        |  | Medium hard to hard brown SANDSTONE; very fine to fine grained, slightly to mod. weathered, argillaceous, micaceous, thinly bedded to massive, broken to moderately fractured.  |             |             |    |      | • |        |                 |                             |         |          |      |

| Client:                        | FranSv | stems.       | Inc.          |            |              |   | Project: SCI-823-0.00   |             |           |           |           |        |        |             | Job No          | . 0121   | -3070.03 |   |
|--------------------------------|--------|--------------|---------------|------------|--------------|---|---|-------------|-----------|-----------|-----------|--------|--------|-------------|-----------------|----------|----------|---|
|                                | F: Bo  |              |               |            | l            | ocation: Sta  | 1. 251+91.9, 143.0 ft. LT of SR 823 CL Date Drilled: 10   | /12         |           |           | _         |        |        |             |                 |          |          |   |
|                                |        |              |               | Samp       |              | Hand  | WATER   | L-,         | GI        | RAD       | ATI       | ON     | _      |             |                 |          |          |   |
| Depth<br>(ft)                  | Elev.  | Blows per 6" | Recovery (in) | Drive      | Press / Care | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: None Water level at completion: 2.5' (includes drilling water)  DESCRIPTION   | % Aggregate | & C. Sand | 6 M. Sand | 6 F. Sand | 6 Sitt | % Clay | ST.<br>Nati | ıral Mois<br>PL | ture Con | - ()     | • |
| 30<br><br><br>35<br><br><br>40 | 795.6  | Core<br>120" | Rec<br>120"   | RQD<br>91% |              |   | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, thinly bedded to massive.  @ 34.3'-35.0', abundant argillaceous laminations.  @ 35.2', decomposed clay seam.  @ 35.7'-36.9', contains abundant argillaceous laminations, decomposed to highly weathered.  @ 37.1'-40.0', moderate argillaceous laminations.  @ 41.4',42.7', low angle rust stained fractures. | %           | %         | %         | %         | %      | %      |             | 10 2            | 0 3      | 0 40     |   |
| 45 — 50.0                      | 775.6  | Core<br>120" | Rec<br>119"   | RQD<br>90% | R-5          | *406  | @ 40.4', 40.5', 43.0', 44.2', 48.0', clay filled low angle fractures.  Bottom of Boring - 50.0'   |             |           |           |           |        |        |             |                 |          |          |   |
| FILE: 0121-3070-03   11/12/200 |        |              |               |            |              |   |   |             |           |           |           |        |        |             |                 |          |          |   |



| Client             | TranSys                                    | tome           | Inc           |            | -            |   | Project: SCI-823-0.00  |             |           |     |           |    | •      |    | Job N   | o. 012   | 1-3070   | .03             |
|--------------------|--|----------------|---------------|------------|--------------|---|--|-------------|-----------|-----|-----------|----|--------|----|---|----------|----------|-----------------|
|                    | OF: Bo                                     |                |               |            | 7            | ocation: Sta  | . 251+91.3, 92.5 ft. RT of SR 823 CL Date Drilled: 1   | 0/12        | /04       |     |           |    |        |    |   |          |          |                 |
|                    |  | g ·            |               | Samp       | _            |   | WATER  |             | G.        | RAD | ATIO      | NC |        |    |   |          |          |                 |
| Depth<br>(ft)      | Elev.<br>(ft)                              | Blows per 6"   | Recovery (in) | Drive ov   | Press / Core | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 8.3' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | Σį  | % F. Sand | S  | % Clay | Na | FANDARı<br>lural Moi:<br>PL ⊢—<br>Blows<br>10 | sture Co | ntent, % | - •             |
| 0-                 | 805.7                                      |                |               | -          |              |   | Topsoil - 7"/1.8' soil removed before drilling   |             |           |     |           |    |        |    |   |          |          |                 |
| 0.0                | - 000.7                                    | 12<br>29<br>36 | 18            | 1          |              | 4.0   | Hard brown and gray SILT AND CLAY (A-6a); damp.  |             |           |     |           |    |        |    |   |          |          | ⊖ <sup>65</sup> |
| 3.0-               | <del> </del> 803.3                         | 50/1           | 1             | 2          |              |   | Severely weathered brown SANDSTONE, argillaceous.  | ]           |           |     |           |    |        |    |   |          |          | 50+             |
| —4.0<br>5 –        | 802.3                                      | Core 108"      | Rec<br>108"   | RQD<br>67% | R-1          | *332  | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, micaceous, argillaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle rust stained fractures.  @ 6.9'-7.6', high angle clay filled fracture. | 0           |           |     |           |    |        |    |   |          |          | 30,             |
| 9.6                | - <del> -</del> 796.7-<br>-<br>-<br>-<br>- |                |               |            |              |   | Soft to medium hard gray SANDSTONE; very fine to fine grained, highly to moderately weathered, micaceous, argillaceous, thinly bedded to thickly bedded, broken to highly fractured, with typical low angle clay filled fractures.  @ 7.0'-7.7', clay filled high angle fracture.  |             |           | ,   |           |    |        |    |   |          |          |                 |
| 15-                | -<br>-<br>-                                |                |               |            |              |   | @ 9.0', gray. @ 13.4'-19.6', contains abundant to moderate argillaceous laminations, decomposed to highly weathered.   |             |           |     |           |    |        |    |   |          |          |                 |
| : 49 РМ ]          | -  | Core<br>120"   | Rec<br>120"   | RQD<br>71% | R-2          | *278  |  |             |           |     |           |    |        |    |   |          |          |                 |
| 2119.9=            | 786.4-                                     |                |               |            |              |   | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, thinly bedded to thickly bedded.  |             |           |     |           |    |        |    |   |          |          |                 |
| 25 -               | <u>-</u>                                   |                |               |            | ,            |   | @ 23.0'-23.9' contains moderate argillaceous laminations, broken @ 24.2'-25.4', high angle fracture.   |             |           |     |           |    |        |    |   |          |          |                 |
| E11E: 0121-3070-03 |  | Core<br>120"   | Rec<br>120"   | RQE<br>84% | R-S          | 3 *516  |  |             |           | i   |           |    |        |    |   |          |          |                 |

| BUS, | OHIO | 43229 | ٠ | (614 | )888-0040 |  |
|------|------|-------|---|------|-----------|--|

| Client: T     | ranSvs                 | stems.       | Inc.          |             |     |   | Project: SCI-823-0.00  | Job No. 0121-3070.03                                     |
|---------------|------------------------|--------------|---------------|-------------|-----|---|--|--|
| LOG O         |                        |              |               |             | L   | ocation: Sta  | 251+91.3, 92.5 ft. RT of SR 823 CL Date Drilled: 10/12/04  |  |
| Depth<br>(ft) | Elev.<br>(ft)<br>776.3 | Blows per 6" | Recovery (in) | Samp<br>No. |     | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | 8.3' (includes drilling water)   | TANDARD PENETRATION (N) tural Moisture Content, % - ● PL |
| 30 —          |                        |              |               |             |     |   | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, thinly bedded to thickly bedded, highly to moderately weathered.  @ 32.9'-33.4', moderate argillaceous lamination zones.  @ 32.7',34.0',36.7', low angle clay filled fractures. |  |
| 40.0          | <b>-</b> 766.3-        | Core<br>84"  | Rec<br>84"    | 95%         | R-4 | *405  |  |  |
| 45 —          |                        |              |               |             |     |   | Bottom of Boring - 40.0'   |  |
| 50 —          |                        |              |               |             |     |   |  |  |

FILE: 0121-3070-03 [ 11/12/2007 12:49 PM ]

| Client:       | ranSv                  | stems.        | Inc.          |             |     |  | Project: SCI-823-0.00  |             |           |         |           |      |        | Job No. 0121-3070.03   |
|---------------|------------------------|---------------|---------------|-------------|-----|--|--|-------------|-----------|---------|-----------|------|--------|--|
| LOG O         |                        |               |               |             |     | ocation: Sta   | . 255+69.2, 122.9 ft. LT of SR 823 CL Date Drilled: 10   | /11         | /04       |         |           |      |        |  |
| Depth<br>(ft) | Elev.<br>(ft)<br>823.4 | Blows per 6"  | Recovery (in) | Samp<br>No. |     | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 4.7' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | M. Sand | % F. Sand | Sitt | % Clay | STANDARD PENETRATION (N)  Natural Moisture Content, % -  PL  LL  Blows per foot -  10 20 30 40 |
| 0             | 020.4                  | 8<br>11<br>11 | 4             | 1           |     | 1.5  | No topsoil  Medium stiff brown SANDY SILT (A-4a), trace clay; contains sandstone fragments; damp.  |             |           |         |           |      |        | Q'   |
| 5—            |                        | 5<br>10<br>35 | 18            | 2 ·         |     | 1.0  |  |             |           |         |           |      |        | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\   |
|               | -817.9-                | Core<br>90"   | Rec<br>83"    | RQD<br>42%  | R-1 | ·<br>*450  | Soft to medium brown SANDSTONE; very fine to fine grained, decomposed highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, broken to highly fractured, with typica high angle clay filled fractures.  @ 5.7',6.1',6.3', low angle clay filled fractures.            |             |           |         |           |      |        |  |
| 15            |                        | Core          | Rec<br>120"   | RQD<br>51%  | R-2 | *397   | @ 13.0', gray. @ 13.0'-13.4', 14.5'-20.2', 22.0'-23.4', contains abundant to moderate argillaceous laminations, broken.  |             |           |         |           |      |        |  |
| 20            |                        | ·             |               |             |     |  |  |             |           | :       |           | :    |        |  |
| 24.9          | 798.5-<br>             | Core<br>120"  | Rec<br>120"   | RQD<br>86%  | R-3 | 3 <b>*</b> 455                                       | Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical low angle clay filled fractures.  @ 24.9', 27.5', 27.7', 28.7', 31.4', 31.6' 36.2', low angle fractures. |             |           |         |           |      |        |  |

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Job No. 0121-3070.03 Project: SCI-823-0.00 Client: TranSystems, Inc. Date Drilled: 10/11/04 Location: Sta. 255+69.2, 122.9 ft. LT of SR 823 CL LOG OF: Boring R-141 GRADATION WATER Sample OBSERVATIONS: Water seepage at: None Hand No. Penetro-Water level at completion: None (prior to coring) STANDARD PENETRATION (N) ĵ. meter Social 4.7' (includes drilling water) Sand Sand (tsf) / Natural Moisture Content, % -Recovery Point-Load Depth Elev. % Clay 18 Press/ % M. % F. Strength (ft) . C Blows per foot -Drive DESCRIPTION (psi) 8 793.4 30 Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical low angle clay filled fractures. @ 33.0'-33.5', moderate to few argillaceous laminations, broken. 35 @ 35.9'-36.5', contains moderate argillaceous laminations, broken. @ 36.7',45.3',49.1',49.8',53.7', low angle fractures. Core Rec RQD \*389 120" 120" 96% RQD 100% R-5 Rec Core \*507 120" 120" 50 Rec RQD Core R-6 \*559 100% -768.4· Bottom of Boring - 55.0

| BUS. | оню   | 43229 | <b>±</b> ′ | (614 | )888-0040 |
|------|-------|-------|------------|------|-----------|
| ,    | 01110 | 70440 |            | (0.7 | ,000 00-0 |

| Client:        | TranSy:             | stems                     | , Inc.          | -               |              |   | Project: SCI-823-0.00   |           |    |             |      |      |      | Job No. 0121-3070.03  |
|----------------|---------------------|---------------------------|-----------------|-----------------|--------------|---|---|-----------|----|-------------|------|------|------|---|
| LOG C          | F: Bo               | ring                      | R-143           |                 | _            | ocation: Sta  | . 256+05.6, 189.8 ft. RT of SR 823 CL Date Drilled: 10  | /11       |    |             |      | to   |      | 0/12/04   |
|                |                     |                           |                 | Samı<br>No.     |              | Hand  | WATER OBSERVATIONS: Water accepted at Name  |           | GI | R <i>AD</i> | ATIC | NC   |      |   |
| Depth<br>(ft)  | Elev.<br>(ft)       | Blows per 6"              | Recovery (in)   | Drive           | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | Water seepage at: None  Water level at completion: None (prior to coring) 6.2' (includes drilling water)  DESCRIPTION                   | Aggregate | C  | M. Sand     | u:   | Silt | Clay | STANDARD PENETRATION (N)  Natural Moisture Content, % -  PL  LL  Blows per foot - |
| <u></u>        | 872.1<br>871.7      | 89                        | DŽ.             | a               | ď            | <u> </u>  |   | %         | %  | %           | 1%   | %    | %    | 10 20 30 40   |
| -0.4           | 0/1./               | 2<br>4<br>6               | 18              | 1               |              | 4.5+  | Topsoil - 5" Hard brown SANDY SILT (A-4a), trace clay; damp.  |           |    |             |      |      |      | Q   |
| 5—             |                     | 7<br>10<br>12             | 18              | 2 ·             |              | 4.5+  |   |           |    |             |      |      |      | Ò   |
| -              | -                   | 6<br>14<br>18             | 18_             | 3               |              | 4.0   |   |           |    |             |      |      |      | Ì,<br>Q   |
|                | <del>-</del> 864.1- | 11<br>17<br>33            | 18              | 4               |              |   | Medium dense to dense brown and gray COARSE AND FINE SAND (A-3a), trace to little clay; dry to damp. (POSSIBLE DECOMPOSED SANDSTONE)    |           |    |             |      |      |      |   |
| -              |                     | 15<br>42<br>50/3          | 11              | 5               |              |   |   |           |    |             |      |      |      | 50+(  |
| 15 <del></del> |                     | 15<br>45<br>50/3          | 12              | 6               |              |   |   |           |    |             |      |      |      | 50+(  |
| -              |                     | 10<br>_50/3               | 6               | 7               |              |   |   |           |    |             |      |      |      | 50+(  |
| 65:21<br>      | 852.6               | 40<br>50/2<br>Core<br>12" | 6<br>Rec<br>12" | 8<br>RQD<br>33% | R-1          | *357  | Medium hard brown SANDSTONE; fine grained, moderately to highly weathered, thinly bedded to thickly bedded, highly                      |           |    |             |      |      |      | 50+(  |
| 13 ( 11/12/20  | -<br>-              | !                         | ,               |                 |              |   | fractured, with typical low angle clay filled fractures.  @ 22.7'-23.9', SDI = 95.5%. @ 20.1'-21.0', 21.4'-21.8' argillaceous interbeds |           |    |             |      |      |      |   |
| 25 —           | -                   | Core<br>120"              | Rec<br>120*     | RQD<br>30%      | R-2          | *200  |   |           |    |             |      |      |      |   |
| 20.3           | 843.8<br>843.2      |                           |                 | ,               |              |   | Soft brown SHALE, decomposed. Soft to medium hard gray to black SHALE.  |           |    |             |      |      |      |   |

| Client:   | rang                   | tome         | Inc           |             | _            |   | Project: SCI-823-0.00   | -           | Ť         |           |           |        |        |           | Job No            | 0121                                  | 3070.0   | 3 |
|---|------------------------|--------------|---------------|-------------|--------------|---|---|-------------|-----------|-----------|-----------|--------|--------|-----------|-------------------|---------------------------------------|----------|---|
| LOG O   |                        |              |               |             | ٦,           | ocation: Sta  | a. 256+05.6, 189.8 ft. RT of SR 823 CL Date Drilled: 10   | /11         | /04       |           |           | to     | - 4    | 10/12/    |                   |                                       | <u> </u> |   |
| 1000  | 7 . BO                 | ing          | V-143         | Sam         | ole          | Hand  | WATER   |             |           |           | ATIO      |        |        |           |                   |                                       |          |   |
| Depth<br>(ft)   | Elev.<br>(ft)<br>842.1 | Blows per 6" | Recovery (in) | Drive       | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 6.2' (includes drilling water)  DESCRIPTION  | % Aggregate | % C. Sand | % M. Sand | % F. Sand | W Sitt | % Clay | Natu<br>F | ral Moist<br>L —— | PENETI<br>ure Cont<br>per foot<br>0 3 | ent, % - | • |
| 30 —  |                        | Core 120"    | Rec<br>120"   | RQD<br>86%  | R-3          | *118  | Soft to medium hard gray to black SHALE; highly weathered to decomposed, highly to moderately fractured, thinly laminated, carbonaceous. typical low angle fractures, black and gray angle fractures, contains few argillaceous layers. |             |           |           |           |        |        |           |                   |                                       |          |   |
| 40 <del></del><br>  |                        |              |               |             |              |   | @ 39.7'-40.5', coal blossom.<br>@ 38.4'-39.2', SDI = 19.4%.   |             |           |           |           |        |        |           |                   |                                       |          |   |
| 45 — 48.4 — 48.4 — 50 —   | 823.7-                 | Core<br>120" | Rec<br>120*   | RQ0<br>63%  | R-4          | <b>*22</b>  | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, thinly bedded to thickly bedded, moderately fractured.   | -           |           |           |           |        |        |           |                   |                                       |          |   |
| FILE: 0121-3070-03 ( 11/12/2007 C C C C C C C C C C C C C C C C C C |                        | Core<br>120" | Rec<br>120"   | RQI<br>1009 | )<br>R-      | 5 *509  | @ 49.5'-49.8', broken zone. @ 52.1',54.5',57.6', low angle clay filled fractures.   |             |           |           |           |        |        |           |                   |                                       |          |   |

|              | Client: ]       | FranSy:            | stems        | , Inc.       |             |              |                                  | Project: SCI-823-0.00  |             | -      |      |         |       |        |       |             | lo. 012 | 21- <u>3070</u>                | .03 |
|--------------|-----------------|--------------------|--------------|--------------|-------------|--------------|----------------------------------|--|-------------|--------|------|---------|-------|--------|-------|-------------|---------|--------------------------------|-----|
|              |                 | F: Bo              |              |              |             | _            |                                  | 1. 256+05.6, 189.8 ft. RT of SR 823 CL Date Drilled: 10  | )/11        |        |      |         | to    | 1      | 0/12/ | 04          |         |                                |     |
|              |                 |                    |              |              | Samp<br>No. |              | Hand<br>Penetro-                 | WATER OBSERVATIONS: Water seepage at: None   |             | G      | RAD  | ATIO    | NC    |        |       |             |         |                                |     |
|              | Depth           | Elev.              | per 6"       | ery (in)     |             | Press / Core | meter<br>(tsf) /<br>* Point-Load | Water level at completion: None (prior to coring) 6.2' (includes drilling water)   | % Aggregate | Sand   | Sand | Sand    | Sit   | . Ye   | Natu  |             |         | ETRATIO<br>ontent, %<br>———⊢ L | - • |
|              | (ft)<br>60 —    | (ft)<br>812.1      | Blows per    | Recovery     | Drive       | Press        | Strength<br>(psi)                | DESCRIPTION  | % Ag        | %<br>C | % M. | %<br>T. | % Sit | % Clay |       | Blows<br>10 | per foo | t - ()                         | 40  |
|              |                 |                    |              |              |             |              | •                                | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, micaceous, argillaceous, thinly bedded to thickly bedded, contains few argillaceous laminations. |             |        |      |         |       |        |       |             |         |                                |     |
| ١            | -<br>65 —       |                    | 0            |              | DOD         |              |                                  | @ 63.1', 64.1', 65.0', low angle fractures   |             |        |      |         |       |        |       |             |         |                                |     |
|              | -<br>-          |                    | Core<br>120" | Rec<br>120"  | RQD<br>92%  | R-6          | *485                             |  |             |        |      |         |       |        |       |             |         |                                |     |
|              | _               |                    |              |              |             |              | . •                              |  |             |        |      |         |       |        |       |             |         |                                |     |
|              | 70              |                    |              |              |             |              | ,                                | -  |             |        |      |         |       |        |       |             |         |                                |     |
|              | -               |                    |              |              |             |              |                                  | @ 71.9'-72.1', qu = 10,888 psi.<br>@ 72.6', low angle clay filled fracture.  |             |        |      |         |       |        |       |             |         |                                |     |
|              | 75—             |                    | Core<br>120" | Rec<br>120". | RQD<br>100% | R-7          | *250                             |  |             |        |      |         |       | -      |       |             |         |                                |     |
| - M          | -               |                    |              | ,            |             |              |                                  |  |             |        |      |         |       |        |       |             |         |                                |     |
| 12:49        | 80 <del></del>  | -                  |              |              |             |              |                                  |  |             |        |      |         |       |        |       |             |         |                                |     |
| 1/12/2007    | -               | -                  | !            |              |             |              | -                                |  | 1           |        |      |         |       |        |       |             |         |                                |     |
| -03 ( 1;     | -               | 1                  |              |              |             |              |                                  | @ 82.2'-82.3', moderate argillaceous zone.   |             |        |      |         |       |        |       |             |         |                                |     |
| 0121-3070-03 | 85 <del>-</del> | -                  | Core<br>120" | Rec<br>120"  | RQD<br>88%  | R-8          | *562                             |  |             |        |      |         |       |        |       |             |         |                                |     |
| FILE: 0      | -               | <del> </del><br> - |              |              |             |              |                                  |  |             |        |      |         |       |        |       |             |         |                                |     |
| Į            | 90              |                    |              |              |             |              |                                  |  |             |        |      |         |       |        |       |             |         |                                |     |

| Client:  | FranSy:       | stems.       | , Inc.    |             |           |  | Project: SCI-823-0.00  |         |         |      |           |      |      |            |             | . 012         | 1-3070       | .03       |
|--|---------------|--------------|-----------|-------------|-----------|--|--|---------|---------|------|-----------|------|------|------------|-------------|---------------|--------------|-----------|
| LOG  | F: Bo         | ring         | R-143     |             | L         | ocation: Sta   | a. 256+05.6, 189.8 ft. RT of SR 823 CL Date Drilled:   | 10/11   |         |      |           | to   |      | 0/12       | 04          |               |              |           |
| Depth  | Elev.         | s per 6"     | very (in) | Samp<br>No. | Sare      | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 6.2' (includes drilling water)  | gregate |         |      | % F. Sand |      | эу   | ST<br>Nati | ural Mois   | ture Co       | TRATIO       | - •       |
| (ft)   | (ft)<br>782.1 | Blows per    | Recovery  | Drive       | Press / ( | Strength<br>(psi)                                    | DESCRIPTION  | % Ag    | %<br>C) | % M. | %<br>F.   | % Si | % C! |            | Blows<br>10 | per foo<br>20 | t - ()<br>30 | <u>40</u> |
| 90 —<br>-<br>-<br>-<br>95 —<br>-<br>-<br>-<br>100.0— | 772.1-        | Core<br>114" | Rec 114"  | RQD<br>100% |           | *449   | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, thinly bedded to thickly bedded.  @ 95.4', low angle fracture.  Bottom of Boring - 100.0' | 6       | 6       |      |           | 6    | 5    |            |             |               |              |           |
| 110 - 110 - 11/15/2001 13:46 H                       |               |              |           |             |           |  |  |         |         |      |           |      |      |            |             |               |              |           |

| Client:                   | TranS         | /stems         | , Inc.     |                        | _        |                         | Project: SCI-823-0.00  |             |        |      |        |        |        | Job No. 0121-3070.03                    |
|---------------------------|---------------|----------------|------------|------------------------|----------|-------------------------|--|-------------|--------|------|--------|--------|--------|---|
| LOG                       | OF: Bo        | ring           | R-148      |                        | _        |                         | . 270+53.0, 112.3 ft. LT of SR 823 CL Date Drilled: 10   | /06/        |        |      |        | to     |        | 10/07/04                                |
|                           |               |                |            | Sam <sub>i</sub><br>No |          |                         | WATER OBSERVATIONS: Water seepage at: None   | $\vdash$    | GI     | RAD  | ATIO   | ON_    | Γ      | -                                       |
|                           |               | ٠,             | (in)       |                        | , b      | meter                   | Water level at completion: None (prior to coring) 7.7' (includes drilling water)   | ₽.          |        | _    |        |        |        | STANDARD PENETRATION (N)                |
| Depth                     | Elev.         | per (          | <u>``</u>  |                        | Core     | (tsf) /<br>* Point-Load | · · · · · · · · · · · · · · · · · · ·  | rega        | Sand   | Sand | Sand   |        |        | Natural Moisture Content, % - ■ PL ⊢ LL |
| (ft)                      | (ft)<br>849.0 | Blows per 6"   | Recovery   | Drive                  | Press,   | Strength<br>(psi)       | DESCRIPTION  | % Aggregate | %<br>C | % M. | % F. S | % Silt | % Clay | Blows per foot - 0                      |
| —0.3 <del></del>          | 848.7         |                |            | 1                      | <u> </u> | -                       | ∖Topsóil - 3"  |             |        | Ħ    |        |        | T      |   |
|                           | -<br>-<br>-   | 4 4 7          | 18         | 1                      |          | 4.0                     | Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; contains sandstone fragments; dry to damp.   |             |        |      |        |        |        |   |
|                           | 1             | 4 8            | 10         | 2 .                    |          | 4.5+                    |  |             |        |      |        |        |        |   |
| 5 -                       | -             | 12             |            |                        |          |                         |  |             |        |      |        |        |        |   |
| -8.0-                     | 841.0         | 11<br>17<br>20 | 18         | 3                      |          | 4.5+                    |  |             |        |      |        |        |        | ĺγ                                      |
| 10 -                      |               | 6<br>13<br>21  | 18         | 4                      |          | 4.5+                    | Hard brown and gray CLAY (A-7-6), trace fine to coarse sand, trace gravel; damp.   |             |        |      |        |        |        |   |
|                           |               | 8<br>11<br>12  | 18         | 5                      |          | 4.5+                    | @ 11.0'-15.0', contains coal fragments.  |             |        |      |        |        |        | d                                       |
|                           | -<br>-<br>-   | 5<br>10<br>14  | 18         | 6                      |          | 4.5+                    |  |             |        |      |        |        |        |   |
| 15 —                      | 1             |                |            |                        |          |                         |  | -           |        |      | }.     |        |        |   |
|                           |               | 7<br>9<br>18   | 18         | 7                      |          | 4.5+                    |  |             |        |      |        |        |        |   |
| Σ.                        | 1             | 6              | <u>'</u>   |                        |          |                         | •  |             |        |      |        |        |        | 1                                       |
| 20 –                      |               | 11 13          | 18         | 8                      |          | 4.5+                    |  |             |        |      | ,      |        |        |   |
| 1/13/200                  |               | 7<br>18<br>27  | .18        | 9                      |          | 4.5+                    |  |             |        |      |        |        |        | <u> </u>                                |
|                           | 824.5         |                |            |                        |          |                         |  |             |        |      |        |        |        |   |
| 25 – 24.5– 25 – 25 – 30.0 | 024.3         | Core<br>66"    | Rec<br>66* | RQD<br>88%             | R-1      | *489                    | Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical low angle clay filled fractures.  @ 26.4'-26.9', argillaceous, broken zone. @ 24.8', 27.5', 27.7', 28.8', low angle fractures. |             |        |      |        |        |        |   |

| Client:                          | ransve                 | tems         | Inc           | <u></u> .  |              |   | Project: SCI-823-0.00   |             | -         |           |           | _      |        |              | Job No.                      | 0121    | -3070. | 03  |
|----------------------------------|------------------------|--------------|---------------|------------|--------------|---|---|-------------|-----------|-----------|-----------|--------|--------|--------------|------------------------------|---------|--------|-----|
| LOG O                            |                        |              |               |            | 77           | ocation: Sta  | 1. 270+53.0, 112.3 ft. LT of SR 823 CL Date Drilled: 10   | /06         | /04       |           |           | to     | 1      | 0/07/04      |                              |         |        |     |
| 1000                             |                        | iiig         | 140           | Samı       | _            |   | WATER   |             |           |           | ATIC      | N      |        |              |                              |         | -      |     |
| Depth<br>(ft)                    | Elev.<br>(ft)<br>819.0 | Blows per 6" | Recovery (in) | Drive      | Press / Core | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 7.7' (includes drilling water)  DESCRIPTION  | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Sitt | % Clay | Natura<br>PL | nl Moistu<br>⊢——<br>Blows pe | ire Con | L      | - • |
| 35.0                             | -819.0-                | Core<br>120° | Rec 120*      | RQD<br>88% |              | *699  | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, thinly bedded to massive, moderately fractured, with typical low angle clay filled fractures.  @ 30.6', low angle clay filled fracture.  @ 35.6'-36.0', broken zone.  @ 35.6'-37.1', gray SHALE highly weathered.  @ 32.5', 33.0', 35.3', 37.2', 39.7', low angle fractures.  @ 40.4', 41.0', 42.5', 43.4', 45.5', low angle fractures. |             |           | -         |           |        |        |              |                              |         |        |     |
| 45 —                             |                        | Core<br>120" | Rec<br>120"   | RQD<br>92% | R-3          | *506  | @ 41.0'-44.4', contains few argillaceous laminations. @ 46.0', slightly fractured. @ 56.5', 56.6', 56.8', low angle fractures.  |             |           |           |           |        |        |              |                              |         |        |     |
| 65 55 61711-3070-013 (11713/2007 |                        | Core<br>120" | Rec<br>120"   | RQE<br>97% | R-4          | *709  |   |             |           |           |           |        |        |              |                              |         |        |     |

| Client:  | TranSy                 | <u>/stems</u> | , Inc.        |            | _            |   |  | Project:   | SCI-823-     | 0.00      |                                  | •                |             |           |           |           |          |       | Job I                | vo. 012                                | 21-307  | 70.03 | ┙ |
|--|------------------------|---------------|---------------|------------|--------------|---|--|------------|--------------|-----------|----------------------------------|------------------|-------------|-----------|-----------|-----------|----------|-------|----------------------|--|---------|-------|---|
| _  | OF: Bo                 |               |               |            | L            | ocation: Sta  | ı. 270+53.0, 1                         | 12.3 ft. L | T of SR 8    | 23 CL     |                                  | Date Drilled:    | 10/06       |           |           |           | 0        | 10/07 | /04                  |  |         |       | _ |
|  |                        |               |               | Samp       |              | Hand  | WATER<br>OBSERVATION                   | 16.        |              |           |                                  |                  |             | G         | RAD       | ATIO.     | <u>V</u> | 4     |                      |  |         |       |   |
| Depth<br>(ft)  | Elev.<br>(ft)<br>789.0 | Blows per 6"  | Recovery (in) | Drive No.  | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | v                                      | YTAL       |              | n: None ( | prior to corin<br>cludes drillin | g)<br>g water) . | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Sitt   | Na    | tural Mo<br>PL     — | RD PENI<br>isture C<br>s per fox<br>20 | ontent, | LL    | • |
| 60 -   | - 709.0<br>            | Core<br>60"   |               | RQD<br>90% |              | <b>*</b> 518  | Medium ha<br>grained, sli<br>micaceous | ghtly to n | noderately   | weathe    | red, argilla                     | aceous,          |             |           |           |           |          |       |                      |  |         |       |   |
| 65.0   | 784.0                  | <u> </u>      |               |            | _            |   |  | -          | <del> </del> | D:        | 05.0                             | •                |             | .         | -         |           |          |       |                      |  |         |       |   |
| 25. 70070-03   11/13/2007 3:33 PM ] 7. 70070-03   1 | -                      |               |               |            |              |   |  |            | Bottom of    | Boring -  | 65.0'                            |                  |             |           |           |           |          |       |                      |  |         |       |   |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO. BUS, OHIO 43229 \* (614)888-0040

| Client: 1                | TranSy                      | stems                        | , Inc.        |             |     |   | Project: SCI-823-0.00  |             |           | _ |        |             | Job No                        | 0121-                                    | 3070.            | 03_      |
|--------------------------|-----------------------------|------------------------------|---------------|-------------|-----|---|--|-------------|-----------|---|--------|-------------|-------------------------------|--|------------------|----------|
| LOG O                    | F: Bo                       | ring                         | R-149         |             | _   | ocation: Sta  | . 270+86.6, 45.0 ft. RT of SR 823 CL Date Drilled: 10/   | 07/         | <br>      |   |        |             |                               |  | <u> </u>         | <u> </u> |
| Depth<br>(ft)            | Elev.<br>(ft)<br>809.5      | Blows per 6"                 | Recovery (in) | Samp<br>No. |     | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 7.5' (includes drilling water)  DESCRIPTION   | % Aggregate | % W. Sand |   | % Clay | ST/<br>Natu | ral Moist<br>L I——<br>Blows p | PENETI<br>ure Cont<br>uer foot -<br>0 30 | ent, %<br>—   Li | - •<br>L |
| —0.2 <del></del>         | 809.3                       | 7<br>9<br>11                 | 18            | 1           |     | 4.5+  | Topsoil - 2" Hard brown and gray SILT AND CLAY (A-6a), trace fine to coarse sand; contains sandstone fragments; damp.  |             |           |   |        |             |                               | <i></i>                                  | /                |          |
| 5 —<br>5 —               | 1                           | 21<br>25<br>27<br>35<br>50/2 | 18            | 3           | ,   | . 4.5+  | Severely weathered brown and gray SANDSTONE, argillaceous.   |             |           |   |        |             |                               |  | 7                | 50+      |
| 7.5<br><br>10            | 802.0                       | Core<br>66"                  | Rec<br>66"    | RQD<br>73%  | R-1 | *68   | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle clay filled fractures, contains decomposed argillaceous zones.  @ 7.8'-8.3',9.1'-9.3',10.9'-11.0 ', high angle rust stained |             |           |   |        |             |                               |  |                  | 30       |
| -<br>15<br>-<br><br>18.2 | -<br>-<br>-<br>-<br>-791.3- | Core<br>84"                  | Rec<br>84"    | RQD<br>83%  | R-2 | *514  | fractures.  @ 16.9'-17.1', high angle clay filled fracture.  |             |           |   |        |             |                               |  |                  |          |
| 20.0                     | 789.5                       |                              |               |             |     |   | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, micaceous, argillaceous, thinly bedded to thickly bedded.  Bottom of Boring - 20.0'  |             |           |   |        |             |                               |  |                  |          |
| 25<br>-<br>-<br>-        | -<br>-<br>-<br>-<br>-<br>-  |                              |               |             |     |   |  |             |           |   |        |             |                               |  |                  |          |

| Client:   | FranSy:              | stems.         | Inc.         |              |              |                                     | Project: SCI-823-0.00   | Job No. 0121-3070.03             |
|---|----------------------|----------------|--------------|--------------|--------------|-------------------------------------|---|----------------------------------|
| LOG   | F: Bo                | ring           | R-158        |              | ٠.,          |                                     | 291+67.6, 16.2 ft. RT of SR 823 CL Date Drilled: 9/27/04  |                                  |
|   |                      |                | (in)         | Sampl<br>No. | е            | Hand<br>Penetro-<br>meter           | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring)  | STANDARD PENETRATION (N)         |
| Depth<br>(ft)   | Elev.                | ws per 6"      | Recovery (ii | 9            | Press / Care | (tsf) /<br>* Point-Load<br>Strength | 6.4' (includes drilling water) .   times   pues   pues   No   | atural Moisture Content, % -  PL |
| ^   | 704.9                | Blows          | Rec          | Drive        | e e          | (psi)                               |   | 10 20 30 40                      |
| -0.3  | -704. <del>6</del> - | 7<br>10<br>11  | 18_          | 1            |              | 4.5+                                | Topsoil - 4"/1.1' soil removed before drilling  Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, little gravel; contains sandstone fragments; dry to damp.  | Q                                |
| 5-  |                      | 8<br>10<br>11  | 18           | 2            |              | 4.5+                                |   |                                  |
| 5.5-  | 699.4                | 15<br>20<br>31 | 18           | 3            |              |                                     | Severely weathered brown SANDSTONE, argillaceous.   | )<br>(js1 <b>&gt;</b>            |
|   | 694.9                | 45<br>50/3     | 9            | 4            |              |                                     |   | 50+:0                            |
| -10.0<br>-<br>-<br>-<br>-<br>15 —   | 094.9                | Core<br>120"   | Rec<br>120"  | RQD<br>61%   | ₹-1          | *153                                | Medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typically low angle rust stained fractures.  @ 10.0'-10.5',11.2'-11.7',12.5'- 12.7', broken zones.  @ 12.2'-12.3',14.0'-14.3',17.6'- 17.7', high angle rust stained |                                  |
| 12:49 PM ]  |                      |                |              |              | •            |                                     | fractures   |                                  |
| 25 — 20.07/21/11   100-000/21/21/11   25 — 25 — 25 — 25 — 25 — 25 — 25 — 25 | 684.9                |                |              |              |              |                                     | Bottom of Boring - 20.0'  |                                  |

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| Client: 1        | ranSv                  | tems            | Inc           |            |     |   | Project: SCI-823-0.00   |              | _         |           |           |        |            |      | Job No             | . 0121   | -3070.03                            | $\neg$ |
|------------------|------------------------|-----------------|---------------|------------|-----|---|---|--------------|-----------|-----------|-----------|--------|------------|------|--------------------|----------|-------------------------------------|--------|
| LOGO             |                        |                 |               |            | ٦,  | ocation: Sta  | . 292+37.8, 273.7 ft. LT of SR 823 CL Date Drilled: 8/  | 31/0         | )4 .      |           |           |        |            |      |                    |          |                                     | _      |
| 2000             |                        | 9               |               | Samp       | _   |   | WATER   |              |           | RAD       | ATIC      | ÓΝ     |            |      |                    |          | -                                   |        |
| Depth<br>(ft)    | Elev.<br>(ft)<br>576.4 | Blows per 6"    | Recovery (in) | Drive 0X   |     | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: 6.0' Water level at completion: None (prior to coring) 5.2' (includes drilling water)  DESCRIPTION  | % Aggragate  | % C. Sand | % M. Sand | % F. Sand | % Sitt | % Clay     | Natu | ral Moist<br>L ⊢—— |          | RATION (N) tent, % - ( LL - () 0 40 | •      |
| 0.3              | 576.1~                 |                 |               |            | 1   |   | Topsoil - 3"  | ł            |           |           |           |        |            |      |                    |          |                                     |        |
| -                | ļ                      | 3<br>3<br>4     | 18_           | 1          |     |   | Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little to some silty clay; contains sandstone fragments; damp.  |              |           | \<br>!    |           |        |            | Q    |                    |          |                                     |        |
| 5                |                        | 4<br>7<br>7     | 18            | 2          |     |   |   | <u>.</u>     |           |           | į         |        |            |      | Ò                  |          |                                     |        |
| _<br>_<br>_      |                        | 4<br>9<br>8     | 18            | 3          |     |   |   |              |           |           | :         |        |            |      | þ                  |          |                                     |        |
| 10 <del></del>   | 565.9                  | 3<br>4<br>6     | 18            | 4          | ļ   |   | <u>-</u>  | 60           | 7         | -         | 10        | 2      | <br> 3<br> | (    | )<br>}             |          | Non-Pla                             | stic   |
| -                |                        | 7<br>6<br>3     | 18            | 5          |     |   | Loose brown SILT (A-4b); contains sandstone fragments; damp.  |              |           | _         |           |        |            | Ç    | \$                 |          |                                     |        |
| 15 —             | 563.4                  | 6<br>8          | 18            | 6          |     |   | Medium dense brown SANDY SILT (A-4a); contains sandstone fragments; damp.   |              |           |           |           |        |            |      | 70                 |          |                                     |        |
| 15.5<br><br>17.5 | 560.9<br>558.9         | 3<br>13<br>50/5 | 13            | 7          |     |   | Severely weathered brownish gray SANDSTONE.   |              |           |           |           |        |            |      |                    | <i>†</i> | 5                                   | ν÷0    |
| 19.0             | -557.4-<br>-553.9-     | Core<br>60"     | Rec<br>60"    | RQD<br>13% | R-1 | *794  | Medium hard to hard brown and gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle iron stained fractures.  Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, micaceous, argillaceous, thinly bedded | )<br> <br> - |           |           |           |        |            |      |                    |          |                                     |        |
| 25 —             | 333.5                  |                 |               |            |     |   | to thickly bedded. @ 21.9', low angle clay filled fracture.  Bottom of Boring - 22.5'   |              |           |           |           |        |            |      |                    |          |                                     |        |
| 30               |                        |                 |               |            |     |   |   |              |           |           |           |        |            |      |                    |          |                                     |        |

| Client:              | TranSy        | stems        | , Inc.  |             |             |                         | Project: SCI-823-0.00  |              |        |           |      |        |          |       | Job i             | Vo. 01     | 21-3       | 070.03            | $\Box$ |
|----------------------|---------------|--------------|---|-------------|-------------|-------------------------|--|--------------|--------|-----------|------|--------|----------|-------|-------------------|------------|------------|-------------------|--------|
| LOG                  |               |              | _   |             | L           | ocation: Sta            | 295+71.6, 121.5 ft. LT of SR 823 CL Date Drilled: 8/   | 30/0         |        |           |      | to     | 8        | /31/0 | )4                |            |            |                   | 4      |
|                      |               |              |   | Samp<br>No. | le          |                         | WATER OBSERVATIONS: Water seepage at: 10.0'  | -            | GI     | RAD.      | ATIC | אכ<br> | =        |       |                   |            |            |                   | ı      |
|                      |               |              | (in)  |             | 9           | meter                   | Water level at completion: None (prior to coring) 5.3' (includes drilling water)   | <u>a</u>     | _      | _         |      |        |          |       |                   |            |            | ATION (N)         |        |
| Depth                | Elev.         | per 6"       | ery   |             | CO          | (tsf) /<br>* Point-Load | o.o (modulos arming visios)  | greg         | Sand   | San       | Sand | _      | <u>~</u> |       | urai Mo<br>PL  ├─ | isture (   |            | nt, % - ■<br>→ LL | '      |
| (ft)                 | (ft)<br>570.8 | Blows        | Recovery                                      | Drive       | Press / Cor | Strength<br>(psi)       | DESCRIPTION  | % Aggregate  | %<br>C | % M. Sand | % F. | % Sitt | % Clay   |       | Biow<br>10        | s per fo   | ot -<br>30 | O <sub>40</sub>   |        |
| -0.2                 | 570.6         |              |   |             |             |                         | \Topsoil - 2"  |              |        |           |      |        |          |       |                   |            |            |                   |        |
|                      |               | 4<br>7<br>12 | 18  | 1           |             |                         | Medium dense to dense brown SANDY SILT (A-4a), little clay, little gravel; contains sandstone fragments; dry to damp.  |              |        |           |      |        |          |       |                   | Q.         |            |                   |        |
|                      | 1             | 5<br>17      | 10  | 2           |             |                         |  |              |        |           |      |        |          |       |                   |            |            |                   |        |
| 5 —                  | 1             | 20           |   |             |             |                         |  |              |        |           |      |        |          |       |                   |            |            | $ \mathcal{Y} $   |        |
|                      |               | 10<br>11     | 18  | 3           |             |                         | · .  | 11           | 21     | -         | 26   | 30     | 12       |       | •                 |            |            | Ndn-Plas          | tic    |
|                      | -             |              |   |             | :           |                         |  | İ            |        |           |      |        |          |       |                   |            |            |                   |        |
|                      | -             | 10           | 18  | 4           |             |                         | •  |              |        |           |      |        |          |       |                   | $\lambda'$ |            |                   |        |
| 10 —                 | ]             | <u> </u>     | 4   |             |             |                         |  |              |        |           |      |        |          |       |                   | ДΗ         |            |                   |        |
|                      |               | 7 7          | 18  | 5           |             |                         |  |              |        |           |      |        |          |       | Ø                 |            |            |                   |        |
| 13.0                 | 557.8         | 3 5          | 18  | 6           |             |                         | Loose gray GRAVEL WITH SAND (A-1-b), little silt; moist.   | 54           | 12     |           | 13   | 2      | <br>     |       | <b>_</b>          |            |            | Non-Plas          | stic   |
| 15 —                 |               |              | <u>'                                     </u> |             |             |                         |  |              |        |           |      |        |          |       | Υ                 |            |            |                   |        |
|                      | -             | 5 5          | 18  | 7           |             |                         |  |              |        |           |      |        |          |       | \<br>\            |            |            |                   |        |
| 18.0-                | 552.8         | -            | · _   | ·           |             | · .                     | Medium dense gray SILT AND CLAY (A-6a), little fine to coarse  | <del>,</del> |        |           |      | 1      |          |       |                   |            |            |                   |        |
| <sup>5</sup><br>20 – |               | 5 7          | 16  | 8           |             |                         | sand; dry to damp.   |              |        |           |      |        |          |       |                   | Ъ          |            |                   |        |
| 20.5                 | 550.3         | Core 114"    | Rec 114"                                      | RQD<br>96%  | R-          | *113                    | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, slightly fractured.  @ 20.6',20.9',24.8',27.8', low angle clay filled fractures. |              |        |           |      |        |          |       |                   |            |            |                   |        |
| 25 25 30.0           | 540.8         |              | 114"  | 95%         |             |                         | Bottom of Boring - 30.0'   |              |        |           |      |        |          |       |                   |            |            |                   |        |

| Client:   | <b>FranSy</b>          | stems          | , Inc.        |             |              |   | Project: SCI-823-0.00   |             |           |           |           |    |        |      | Job No    | . 0121   | -3070.03  |
|---|------------------------|----------------|---------------|-------------|--------------|---|---|-------------|-----------|-----------|-----------|----|--------|------|-----------|----------|-----------|
| LOG C   | F: Bo                  | ring           | R-161         |             | I            | ocation: Sta  | . 295+68.4, 122.1 ft. RT of SR 823 CL Date Drilled: 9/2   | 24/0        |           |           |           |    |        |      |           |          | · · · ·   |
|   |                        |                |               | Samp<br>No. |              | Hand<br>Penetro-                                      | WATER OBSERVATIONS: Water seepage at: None  |             | GI        | RAD.      | ATI       | ON |        |      |           |          |           |
| Depth<br>(ft)   | Elev.<br>(ft)<br>687.7 | Blows per 6"   | Recovery (in) | Drive       | Press / Core | meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | Water level at completion: None (prior to coring) 3.5' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | % M. Sand | % F. Sand | Š  | % Clay | Nati | ural Mois | ture Con | <i>LL</i> |
| 0.3 <del></del>   | -687.4-                |                |               | 1           |              |   | Topsoil - 4"/1.5' soil removed before drilling  |             |           |           | Γ         |    |        |      |           |          |           |
| -   |                        | 6<br>6<br>7    | 18            | 1           |              |   | Hard brown and gray SILT AND CLAY (A-6a), some gravel; contains sandstone fragments; damp.  |             | -         | <u> </u>  |           |    |        |      | la,       |          |           |
| -<br>-<br>5-  |                        | 9<br>10<br>21  | 18            | 2           |              |   |   |             |           |           |           |    |        |      |           |          |           |
| 5.5   | 682.2                  | 12<br>27<br>35 | -             | 3           |              |   | Severely weathered brown SANDSTONE, argillaceous.   |             |           |           |           |    |        |      |           |          |           |
| -   |                        | 50/4           | 4             | 4           |              |   | ·   | -           |           |           |           |    |        |      |           |          | 50+       |
| -   | 677.7-                 | Core 120"      | Rec<br>120"   | RQD<br>68%  | R-1          |   | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typically low angle clay filled fractures.  @ 11.4'-11.9',13.4'-13.6',14.5', high angle clay filled fractures.  Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded. |             |           |           |           |    |        |      |           |          |           |
| -20.0   | -<br>-<br>- 667.7-     |                |               |             | -            |   | @ 18.1',18.9', low angle clay filled fractures.   |             |           |           |           |    |        |      |           |          |           |
| 700-0121-3010-03 ( 11/12/2001 ) = 25 — 30 — 30 — 30 — 30 — 30 — 30 — 30 — 3 |                        |                |               |             |              |   | Bottom of Boring - 20.0'  |             |           |           |           |    |        |      |           |          |           |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 \* (614)888-0040

|                          | ranSy                  |                  |               |             | _   |   | Project: SCI-823-0.00   |             |      |           |       |    |        |           | Job No. 012                           | <u>1-3070.03</u> |
|--------------------------|------------------------|------------------|---------------|-------------|-----|---|---|-------------|------|-----------|-------|----|--------|-----------|---------------------------------------|------------------|
| LOG O                    | F: Bo                  | ring             | R-163         |             |     | ocation: Sta  | . 299+65.8, 177.9 ft. LT of SR 823 CL Date Drilled: 8/  | 27/0        |      |           | . = . |    | -1     |           |                                       |                  |
| Depth<br>(ft)            | Elev.<br>(ft)<br>564.7 | Blows per 6"     | Recovery (in) | Samp<br>No. |     | Hand Penetro- meter (Isf) / * Point-Load Strength (psi) | WATER OBSERVATIONS: Water seepage at: 7.5' Water level at completion: None (prior to coring) 6.8' (includes drilling water)  DESCRIPTION  | % Aggregate | Sand | % M. Sand | Sand  |    | % Clay | Natu<br>F | ANDARD PENE<br>ral Moisture Co<br>L \ | ontent, % -      |
| -0.3<br><br>-            | -564.4-                | 4<br>3<br>3      | 18            | 1           |     | ,   | Topsoil - 4"  Loose to medium dense brown and gray SANDY SILT (A-4a), little gravel, trace clay; contains sandstone fragments; dry to damp.   |             |      |           |       |    |        | Q         |                                       |                  |
| 5 <del></del>            |                        | 3<br>6<br>5      | 18            | 2 ·         |     |   |   |             |      |           |       |    |        |           | )<br>Q                                |                  |
| <del>-</del> -           |                        | 7<br>12<br>10    | 18            | 3           |     |   | @ 6.0', damp to moist.  |             |      |           |       |    |        |           |                                       |                  |
| 10 —                     |                        | 8 6              | 18            | 4           |     |   | •   | 12          | 19   |           | 26    | 34 | 9      |           | Ô                                     | Non-PI           |
| -<br>-                   | <u> </u>               | 9<br>8<br>3<br>5 | 18            | 5<br>6      |     |   |   |             |      |           |       |    |        |           | )<br> <br>                            |                  |
| 15 —<br>-<br>-           |                        | 4<br>7<br>6      | 18            | 7           |     |   |   |             |      |           |       |    |        |           | )<br>}.                               |                  |
| -18.5<br>20<br>20.5      | 546.2<br>544.2         | 9<br>15<br>50    | 16            | 8           |     |   | Severely weathered gray SANDSTONE, argillaceous.  | -           | !    |           |       |    |        |           |                                       |                  |
| -<br>-<br>25 —<br>-<br>- |                        | Core<br>120"     | Rec<br>120*   | RQD<br>84%  | R-1 | *640  | Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, medium bedded to thickly bedded, moderately fractured.  @ 20.6'-21.1',21.7'-21.8', high angle clay filled fractures.  @ 23.5',23.7', low angle clay filled fractures. |             |      |           |       |    |        |           |                                       |                  |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO. BUS, OHIO 43229 \* (614)888-0040

| Client:                    | TranSy | stems        | , Inc.   |                   |        | - L               | LZ OHIO | J 1140.       | _                |               | CI-823   |            |                          | , OHIO 4322     |             |             |        |       |      |        |          |       | Job No | . 012            | 1-307        | 0.03         |
|----------------------------|--------|--------------|----------|-------------------|--------|-------------------|---------|---------------|------------------|---------------|----------|------------|--------------------------|-----------------|-------------|-------------|--------|-------|------|--------|----------|-------|--------|------------------|--------------|--------------|
|                            | OF: Bo |              |          |                   | L      | ocation: Sta      |         |               | 77.9             | ft. LT        | of SR    | 823 CL     |                          | Date            | Drilled: 8/ | 27/0        |        |       |      |        | •        |       |        |                  |              |              |
|                            |        |              |          | Sam               |        | Hand              | WATER   | ?<br>!!/AT/O/ |                  |               |          |            |                          |                 | •           | Н           | GI     | RAD.  | ATIC | N<br>T | $\dashv$ |       |        |                  |              | •            |
|                            |        |              | _        | No                |        | Penetro-          | OBSER   |               |                  |               |          | at: 7.5'   | - ( <del>-</del>         | ensine)         |             |             |        |       |      | -      |          | CTA   | NOADI  | DENI             | STOATI       | ON (N)       |
|                            |        |              | (in)     |                   | ē      | meter<br>(tsf) /  |         | •             | water i          | evel at       | complet  | 18.6 ; not | e (prior to<br>(includes | drilling water) | )           | ate         | פַר    | امِ ا | ٩    | ]      |          |       |        |                  | ontent, S    |              |
| Depth                      | Elev.  | per          | φ.       |                   | / Core | * Point-Load      |         |               |                  |               |          |            |                          |                 |             | greg        | Sand   | Sand  | Sand | _      | <u>چ</u> | Pl    |        |                  | <del></del>  | LL           |
| (ft)                       | (ft)   | Blows per 6" | Recovery | Drive             | Press  | Strength<br>(psi) |         |               |                  |               | DES      | CRIPTI     | ON                       |                 | •           | % Aggregate | %<br>C | % M.  | % F. | % Sitt | % Clay   |       |        | per foc<br>20    | ot - C<br>30 | 10           |
| 30                         | 534.7  | ì            | 8        | Ď                 | Pr     | (,,,,             |         | 241.00        |                  | fi-           | _        |            |                          |                 |             | %           | 9      | -     | -    | ᡨ      | <u>*</u> | mń    | o      |                  |              | 1            |
| 30.5                       | 534.2  |              |          |                   |        | <del></del>       | (@30    | J.T-30        | 1.5°, <u>v</u> e | ery iin<br>Bo | e, fissi | f Borine   | g - 30.5'                |                 |             | 1           |        | İ     |      | }      |          |       |        |                  |              |              |
|                            | _      |              |          |                   |        |                   |         |               |                  |               |          |            | 9 00.0                   |                 | •           | ] !         |        |       |      |        | }        |       |        |                  |              |              |
|                            | _      |              |          |                   | }      |                   |         |               |                  |               |          |            |                          |                 |             |             |        |       |      | İ      |          |       |        |                  |              |              |
| 1                          | - -    |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             |             | 1      | ١     |      | ļ      |          |       |        |                  |              |              |
| 35 -                       | 4      |              | ì        |                   |        |                   |         |               |                  |               |          |            |                          |                 |             |             | Į      |       |      |        | 1        |       |        |                  |              |              |
| 1                          | 4      |              |          | h                 | '      | ·                 |         |               |                  |               |          |            |                          |                 | -           | 1           |        |       |      | Ì      |          |       |        |                  |              |              |
|                            | 4      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             |             |        |       | . '  |        |          |       |        |                  |              |              |
| ŀ                          | 4      |              |          |                   | .      |                   |         |               |                  |               |          |            |                          |                 |             | '           |        |       |      |        |          |       |        |                  |              |              |
|                            | 4      | •            |          | ]]                |        |                   |         |               |                  |               |          |            |                          |                 |             |             | ł      |       | '    |        |          |       |        |                  |              |              |
| 40 -                       | 4      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             |             |        |       | İ    |        |          |       |        |                  |              |              |
| İ                          | 4      |              |          |                   |        |                   |         |               | -                |               |          |            |                          |                 | •           |             |        |       |      |        |          |       |        |                  |              |              |
| 1                          | _      |              |          |                   |        |                   |         |               |                  |               |          |            |                          | •               |             | 1           |        | 1     |      |        |          |       |        |                  |              |              |
|                            | _      |              |          |                   |        |                   | ļ       |               |                  |               |          |            |                          |                 |             | ],          |        | ŀ     |      |        |          |       |        |                  |              |              |
|                            | 4      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             |             |        |       |      |        |          |       |        |                  |              |              |
| 45 -                       |        |              |          |                   |        |                   | Ì       |               |                  |               |          |            |                          |                 |             |             |        |       |      |        |          |       |        |                  |              |              |
|                            | 4      |              |          |                   |        |                   |         |               |                  |               |          | •          |                          |                 |             |             |        |       |      |        |          |       |        |                  |              |              |
|                            | _      |              |          | H                 |        |                   |         |               |                  |               |          |            |                          |                 |             |             |        |       | İ    |        | ÌÌ       |       |        |                  |              |              |
| -<br>E                     | _      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             | -           |        |       |      |        |          |       |        |                  |              |              |
| 10: 40<br>10: 40<br>10: 40 | _      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             |             |        |       |      |        |          |       |        |                  |              |              |
| 50 -                       | _      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             | .           |        |       |      |        |          |       |        |                  |              |              |
|                            | _      |              | 1        |                   |        | ĺ                 |         |               |                  |               |          |            |                          |                 |             |             |        |       |      |        |          |       |        |                  |              |              |
| 12/2007                    |        |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             |             | Ì      |       |      |        |          |       |        |                  |              |              |
| ì                          |        |              | 1        |                   | ı      |                   |         |               |                  |               |          |            |                          |                 |             | 1           |        |       |      |        |          |       |        |                  |              |              |
| e e                        | 4      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 |             | 1           |        |       |      |        |          |       |        |                  |              |              |
| و<br>55 -                  |        |              |          |                   |        |                   |         | •             |                  |               |          |            |                          |                 | •           | -           |        |       |      |        | 1        |       |        |                  |              |              |
| 1-30                       |        |              | 1        | $\prod_{i=1}^{n}$ |        |                   |         |               |                  |               |          |            |                          |                 |             |             |        |       |      |        |          |       |        |                  |              |              |
| FILE: 0121-3070-03         | 1      |              |          |                   |        |                   |         |               |                  |               |          |            |                          |                 | •           |             |        |       |      |        |          |       |        |                  |              |              |
| 11.5:                      |        |              |          |                   |        |                   | '       |               |                  |               |          |            |                          |                 |             |             |        | -     | 1    |        |          |       |        |                  |              |              |
| E                          |        |              |          |                   |        |                   |         |               |                  |               |          |            |                          | •               |             |             |        |       |      |        |          |       |        |                  |              |              |
| 60                         |        | 1            | 1        |                   |        | ļ                 | l       |               |                  |               |          |            |                          |                 |             | _1_         |        |       | -    | L.     | 1        | [:::: | [:::   | <u>: [ ] : [</u> | <u>:: ::</u> | <u>:: ::</u> |

| Client:       | TranSy           | stems         | , Inc.        |            |              |   | Project: SCI-823-0.00  |             | _       |           |      |      |        | Job No. 0121-3070.03  |
|---------------|------------------|---------------|---------------|------------|--------------|---|--|-------------|---------|-----------|------|------|--------|---|
|               | F: Bo            |               |               |            | I            | ocation: Sta  | . 300+08.2, 146.8 ft. RT of SR 823 CL Date Drilled: 8  | 30/0        | )4      |           |      |      |        |   |
|               |                  |               |               | Samp       | ole          |   | WATER  |             | G       | RAD       | ATI  | ON   |        |   |
| Depth<br>(ft) | Elev.<br>(ft)    | Blows per 6"  | Recovery (in) | Drive So.  | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: 8.5' Water level at completion: None (prior to coring) 12.5' (includes drilling water)  DESCRIPTION  | % Aggregate | G. Sand | 6 M. Sand | l ui | l is | % Clay | STANDARD PENETRATION (N)  Natural Moisture Content, % -  PL  LL  Blows per foot - |
| o —           | 561.3            | 80            | Œ             | Q.         | ď.           | ., ,  | Topsoil-12"  | %           | 2/2     | %         | 8    | -8   | 92     | 10 20 30 40   |
| 1.0           | 560.3            | 8<br>9<br>3   | 18            | 1          |              |   | Medium dense brown SANDY SILT (A-4a), little gravel, trace to little clay; contains sandstone fragments; dry to damp.  |             |         |           | į    |      |        | ġ.  |
| 5—            |                  | 6<br>12<br>10 | 18            | 2          |              |   |  |             |         |           |      |      |        | , C   |
| -             | -                | 6<br>6<br>5   | 18            | 3          |              |   |  |             |         |           |      |      |        | RÍ III  |
| 10<br>10.5    | 550.8            | 6<br>8<br>10  | 18            | 4          |              | ,   | Medium stiff to stiff gray SILTY CLAY (A-6b), contains   |             |         |           |      |      |        |   |
| 13.0          | 548.3            | 3<br>2<br>5   | 18            | 5          |              | 1.0   | sandstone fragments; moist.  |             |         |           |      |      |        | q (   |
| 15 —          | -                | 3<br>2<br>7   | 18            | 6          |              |   | Loose to medium dense brown and gray SANDY SILT (A-4a), trace clay, trace gravel; damp.  | 3           | 15      | i         | 28   | 45   | 9      | ● Non-Plastic   |
| -<br>-        | -                | 6             | 12            | 7          |              |   |  |             |         |           |      |      |        | <b>♦</b>  |
| à .           | 542.3-<br>541.3- | '27           | 16            | 8          |              |   | Severely weathered brown and gray SANDSTONE,  \argillaceous.  Soft to medium hard brown SANDSTONE; very fine to fine   |             |         |           |      |      |        | 7.70  |
| 25.0          | 540.0-           | Core<br>120"  | Rec<br>120"   | RQD<br>84% | R-1          | *657  | grained, highly weathered to decomposed, argillaceous, thinly bedded to thickly bedded, highly fractured to broken, with typical low angle clay filled fractures.  Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly to moderately fractured; contains few argillaceous laminations.  @ 22.2',26.8',29.8', low angle clay filled fractures.  Bottom of Boring - 30.0' | al<br>_     |         |           |      |      |        |   |

| Client:                                 | Transia        | stems            | Inc           |  |              |   | Project: SCI-823-0.00  |             |           |   |           |        |           |      | Job N    | o. 012  | 21-307           | 0.03        |
|---|----------------|------------------|---------------|--|--------------|---|--|-------------|-----------|---|-----------|--------|-----------|------|----------|---------|------------------|-------------|
| LOG O                                   |                |                  |               |  | 7,           | ocation: Sta  | . 299+84.7, 435.6 ft. RT of SR 823 CL  | 23/0        | )4        |   |           | to     | 9/        | 24/0 | 4        |         |                  |             |
| 2000                                    |                | iiig             | 1             | Samı   | _            |   | WATER  | L           |           |   | ATIC      | N      | $\exists$ |      |          |         |                  |             |
| Depth<br>(ft)                           | Elev.<br>(ft)  | Blows per 6"     | Recovery (in) | Drive  | Press / Core | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None  Water level at completion: None (prior to coring)  4.8' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | Σ | % F. Sand | % Sitt | % Clay    | Natu | ral Moi: | sture C | ETRATI           | % - •<br>LL |
| —₀.ĝ=                                   | 654.8<br>654.5 | -                |               | <del>                                     </del> |              |   | Topsoil - 4"/2.5' soil removed before drilling   |             |           |   |           |        |           |      |          |         |                  |             |
| _                                       | -              | 5<br>7<br>9      | 18            | 1  |              |   | Medium dense brown SANDY SILT (A-4a), little gravel; contain sandstone fragments; damp.  | S           |           |   |           |        |           |      | Ο        |         |                  |             |
| -3.0<br>-<br>5                          | 651.8          | 13<br>15<br>15   | 18            | 2  |              |   | Severely weathered grayish brown SANDSTONE, argillaceous.  |             |           |   |           |        |           |      |          |         | \<br>\<br>\<br>\ |             |
| -                                       | -              | 15<br>16<br>50/4 | 16            | 3.   | '            |   |  |             |           |   |           |        |           |      |          |         |                  | )<br>)      |
| 10                                      |                | 7<br>9           | 18            | 4  |              |   | -  |             |           |   | <br> <br> |        |           |      |          | )#. [   | _                | +           |
|   | 1              | 5010             | <u> </u>      | _ ا  |              |   |  | _           |           |   | -         |        |           |      |          |         | †   † -          | -           |
|   | -              | Core<br>104"     | Rec<br>104"   | RQE<br>93%                                       | R-1          | ·   | Medium hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle clay filled fractures.  @ 15.7'-15.8',16.1'-16.3', broken zones. |             |           |   |           |        |           |      |          |         |                  | 507         |
| 16.6                                    | 638.2          |                  |               |  | -            |   | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded.  |             |           |   |           |        |           |      |          |         |                  |             |
| 20.0                                    | 634.8          | }                | 1             |  |              |   | Bottom of Boring - 20.0'   | 1           |           |   |           |        | ŀ         |      |          |         |                  |             |
| 25 - 25 - 25 - 25 - 25 - 25 - 25 - 25 - |                |                  |               |  |              |   |  |             |           |   |           |        |           |      |          |         |                  |             |

| 4   |                 |   |               |  |
|-----|-----------------|---|---------------|--|
| ÇĞ. | BUS, OHIO 43229 | • | (614)888-0040 |  |

| Client:            | ranSy:                     | stems,       | Inc.          |             |          |   | Project: SCI-823-0.00  |             |           |       |        |     | Jot            | No.                                   | 0121              | -3070    | ).03 |
|--------------------|----------------------------|--------------|---------------|-------------|----------|---|--|-------------|-----------|-------|--------|-----|----------------|---------------------------------------|-------------------|----------|------|
| LOG C              | F: Bo                      | ring         | R-166         |             | _        |   | . 302+85.4, 47.1 ft. LT of SR 823 CL Date Drilled: 9/2   | 23/0        | <br>745   | A 711 | <br>T  |     |                |                                       |                   |          |      |
| Depth<br>(ft)      | Elev.                      | Blows per 6" | Recovery (in) | Samp<br>No. |          | Hand Penetro- meter (Isf) / * Point-Load Strength (psi) | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 6.6' (includes drilling water)  DESCRIPTION   | % Aggregate | % M. Sand |       | % Clay | Nat | ural N<br>PL + | loistu                                | re Coi<br>er foot | ntent, % | LL   |
| 0.4                | 604.1                      | 3 3 4        | 18            | 1           | 1        | 3.5   | Topsoil - 5"/1.1' soil removed before drilling  Very stiff to hard brown SILT AND CLAY (A-6a), little to some gravel; contains sandstone fragments; damp.  |             |           |       |        | Ç   | <b>)</b>       |                                       |                   |          |      |
| 5-                 | 508 1-                     | 5<br>5<br>6  | 18            | 2           |          | 4.0   |  |             |           |       |        |     | \<br>Ь.        | , , , , , , , , , , , , , , , , , , , |                   | T,       |      |
| 7.0                | 598.1-<br>597.1-           | 10<br>50/4   | 10            | 3           |          |   | Severely weathered brown SANDSTONE, argillaceous.  | -           |           |       |        |     |                |                                       |                   |          | 50+( |
| 10 —               | 597.1                      | Core<br>72"  | Rec<br>72"    | RQD<br>85%  | R-1      | *326  | Medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thickly bedded, moderately to highly fractured.  @ 7.7'-7.8',8.0'-8.1',9.5'-9.7', high angle clay filled fractures.  Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, thinly bedded to thickly bedded, slightly fractured to unfractured.  @ 8.2',8.9',9.8', low angle rust stained fractures. |             |           |       |        |     |                |                                       |                   |          |      |
| 15 —               | -<br>-<br>-<br>-<br>-<br>- | Core 120"    | Rec<br>120"   | RQD<br>100% | R-2      | *413  |  |             |           |       |        |     |                |                                       |                   |          |      |
| (11/12/2007        | -                          |              |               |             |          |   |  |             |           |       |        |     |                |                                       |                   |          |      |
| E11E: 0151-300-0-0 | 574.1                      | Core<br>84"  | Rec<br>84"    | RQE<br>100% | )<br>R-≎ | 3 *798  | Bottom of Boring - 30.0'   |             |           |       |        |     |                |                                       |                   |          |      |

| C | MBUS. | OHIO 43229 | • | (614)888-0040 |
|---|-------|------------|---|---------------|

| Client: 1                   | FranSy              | stems         | , Inc.        |             |     |  | Project: SCI-823-0.00   |           |   |      |         |      |          |         | Job No. 012                        | 1-3070.03         |
|-----------------------------|---------------------|---------------|---------------|-------------|-----|--|---|-----------|---|------|---------|------|----------|---------|------------------------------------|-------------------|
| LOG O                       | F: Bo               | ring          | R-167         |             | _   | ocation: Sta   | . 302+63.9, 232.4 ft. RT of SR 823 CL Date Drilled: 8/3   | 26/0      |   |      |         | to   |          | 3/27/04 | ļ                                  |                   |
| Depth<br>(ft)               | Elev.<br>(ft)       | ws per 6"     | Recovery (in) | Samp<br>No. |     | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength | WATER OBSERVATIONS: Water seepage at: 6.0' Water level at completion: None (prior to coring) 5.7' (includes drilling water)  DESCRIPTION  | Aggregate |   | Sand | F. Sand | Sitt | Clay     | Natui   | NDARD PENE<br>ral Moisture Co<br>L | ontent, % -       |
| 0                           | 558.4               | Blo           | Rei           | Drive       | Pre | (psi)  | · · · · · · · · · · · · · · · · · · ·   | %         | % | %    | %       | %    | %        | 1       | 0 20                               | 30 40             |
| 0.3<br>                     | -558.1 <del>-</del> | 8<br>8<br>11  | 18            | 1           |     | 3.5  | Topsoil - 3"  Very stiff brown SANDY SILT (A-4a), trace clay, trace gravel; contains sandstone fragments; damp.   |           |   |      |         |      |          |         | Q                                  |                   |
| 5 —<br>-5.5                 | 662.0               | 8<br>12<br>11 | 18            | 2           |     | 2.0  |   |           |   |      |         |      |          |         |                                    |                   |
|                             | 552.9               | 3<br>5<br>5   | 18            | 3           |     | 2.0  | Stiff to very stiff brown and gray SILT (A-4b), some clay, trace fine to coarse sand; damp.   | 0         | 1 |      | 9       | 71   | 20       |         |                                    |                   |
| 8.0<br><br>10               | 550.4               | 9<br>12<br>12 | 18            | 4           |     |  | Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4) dry to damp.   |           |   | !    |         |      |          |         | ) \                                |                   |
| <br><br>13 0                |                     | 6<br>10<br>14 | 18            | 5           |     |  |   |           |   |      |         |      |          |         |                                    |                   |
| 15.0<br>-<br>15.—<br>-15.5— |                     | 1 1 6         | 18            | 6           |     | 3.5  | Very stiff gray SILT (A-4b), little fine to coarse sand, little clay, trace gravel; contains sandstone fragments, damp.   | 9         | 7 | -    | 9       | 61   | 14       | α       | •н                                 |                   |
| -15.5<br><br>               | 542.9               | 2<br>8<br>10  | 18            | 7           |     |  | Medium dense brown SANDY SILT (A-4a), little gravel, trace clay; contains sandstone fragments; damp.  |           |   |      |         |      |          |         | Ò                                  |                   |
| 20 —<br>-20.5—              | 537.9               | 5<br>6<br>9   | 18            | 8           |     |  |   |           |   |      |         |      |          |         | <i>j</i><br>6                      |                   |
| -                           | 535.8-              |               |               |             |     |  | Medium hard gray to brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical high angle clay filled fractures, contains few argillaceous laminations. |           |   |      |         |      | <u>.</u> |         |                                    |                   |
| 25 <del></del><br>          |                     | Core<br>114"  | Rec<br>114*   | RQD<br>72%  | R-1 | *95  | Hard gray SANDSTONE; very fine to fine grained, moderately to slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured.  @ 22.0',22.5', low angle clay filled fractures.  |           | į |      |         |      |          |         |                                    |                   |
| _                           |                     |               |               |             |     |  | @ 24.9',25.8',26.3', low angle fractures.   |           |   |      |         |      |          |         |                                    |                   |
| 30.0                        | 528.4               |               |               |             |     | _  | Bottom of Boring - 30.0'  |           |   |      |         |      |          |         |                                    | :   : : : :   : : |

| Client:            | Tran            | nSyst        | ems,        | Inc.        |              |        | _                       | Project: SCI-823-0.00   |             |         |         |      |        |        | Jo              | No. 0           | 21-3        | 070.0           | <b>)</b> 3 |
|--------------------|-----------------|--------------|-------------|-------------|--------------|--------|-------------------------|---|-------------|---------|---------|------|--------|--------|-----------------|-----------------|-------------|-----------------|------------|
|                    |                 |              |             | R-168       |              | L      | ocation: Sta            | . 302+66.0, 615.4 ft. RT of SR 823 CL Date Drilled: 8/  | 26/0        |         |         |      |        |        |                 |                 |             |                 |            |
|                    |                 |              |             |             | Samp<br>No.  |        | Hand                    | WATER OBSERVATIONS: Water seepage at: 8.5'  | $\vdash$    | Gi      | RAD     | ATK  | אכ     |        |                 |                 |             |                 |            |
|                    |                 |              | 6.          | (in)        |              | 9      | Penetro-<br>meter       | Water level at completion: None (prior to coring)   | te          |         |         |      |        |        |                 | ARD PEI         |             |                 | (N)        |
| Depth              | Ele             | ev.          |             | er.         |              | / Core | (tsf) /<br>* Point-Load | 5.5' (includes drilling water)  | rega        | Sand    | M. Sand | Sand |        | ۸.     | Natural I<br>PL | Aoisture (      |             | it, % -<br>→ LL | - • !<br>L |
| (ft)               |                 | ft)<br>3.4   | Blows per   | Recovery    | Drive        | Press  | Strength<br>(psi)       | DESCRIPTION   | % Aggregate | %<br>C) | % M.    | % F. | % Sitt | % Clay | Blo<br>10       | ws per fo<br>20 | oot -<br>30 | 0               | 0          |
| —ი.ჭ <del>-</del>  |                 | 3.1-         |             |             |              |        |                         | ∖Topsoil - 3"   |             |         |         |      |        |        |                 |                 |             |                 |            |
|                    | -               | 3            | 6           | 18          | 1            |        |                         | Loose to medium dense brown GRAVEL WITH SAND (A-1-b); contains sandstone fragments; dry.                            |             |         |         |      |        |        | Ö               |                 |             |                 |            |
|                    |                 | 3            | 3           |             | 2            |        |                         | •   |             |         |         |      |        |        |                 |                 |             |                 |            |
| 5-                 |                 | 17.9         | 4 2         | 18          | <sup>2</sup> |        |                         |   |             |         |         |      |        |        |                 |                 |             |                 |            |
|                    | ]               | 5            | 5           |             | 3            | -      | 3.0                     | Very stiff brown SANDY SILT (A-4a), little gravel; damp.  | ŀ           |         |         |      | ,      |        |                 |                 |             |                 |            |
|                    | 4               |              | 7           | 18          |              |        | ,                       |   |             |         |         |      |        |        |                 |                 |             |                 |            |
| 10-                |                 | 2            | 4 4         | 18          | 4            |        | 2.5                     |   |             |         |         |      |        |        |                 |                 |             |                 |            |
|                    | 4               | 4            | ٠           |             |              |        | 20                      | @ 11.0', sandstone fragments, moist.  |             |         |         |      |        |        |                 |                 |             |                 |            |
|                    | <del> </del> 54 | 10 4-        | 5<br>8      | 18          | 5            |        | 2.0                     |   |             |         |         |      |        |        |                 | )               |             |                 |            |
| 10.0               | -               | 3            | 3 4         | 18          | 6            |        | 4.0                     | Very stiff to hard gray SILT (A-4b), little fine sand, trace gravel; contains sandstone fragments; damp.            |             |         |         |      |        |        | <u> </u>        |                 |             |                 |            |
| 15                 | ┪ .             |              | 5           | 10          |              |        |                         |   |             |         |         |      |        | 1      |                 |                 |             |                 |            |
| į                  | 4               | [3           | 3<br>4<br>6 | 18          | 7            |        | 3.5                     |   |             |         |         |      |        |        |                 |                 |             |                 |            |
| Æ                  | -               | 4            | 1           |             |              |        |                         |   |             |         |         |      |        |        |                 | <b>,</b> ,      |             |                 |            |
| £ 20               | ┨               |              | 12<br>18    | 18          | 8            |        | 4.0 .                   | •   |             |         |         |      |        |        |                 |                 | 9           |                 |            |
| 20.5               | -53             | 32.9<br>31.9 | 50/4        | 2           | 9            |        |                         | Severely weathered gray SANDSTONE.  |             |         |         |      |        |        |                 |                 |             |                 | 50+(       |
| 11/12              |                 | ,,,,         |             | ,           |              |        |                         | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, fossiliferous, micaceous, thickly |             |         |         |      | }      |        |                 |                 |             |                 |            |
| - 60               |                 |              |             |             |              |        |                         | bedded, slightly to highly fractured, contains few argillaceous laminations.  |             |         |         |      |        |        |                 |                 |             |                 |            |
| 25                 |                 |              | Core        | Rec         | ROD          |        |                         | ianniauons.   |             |         |         | .    |        |        |                 |                 |             |                 |            |
| FILE: 0121-3070-03 | _               |              | 108"        | Rec<br>108" | RQD<br>97%   | R-1    | *612                    | @ 21.5',21.9',22.8', low angle fractures.   |             |         |         |      | }      |        |                 |                 |             |                 |            |
| FILE:              | -               |              |             |             |              |        |                         |   |             |         |         |      |        |        |                 |                 |             |                 |            |
| 30                 |                 |              |             |             |              |        |                         |   |             |         |         |      |        |        |                 |                 |             |                 |            |

| Client:                                | FranSys       | tems         | Inc.          |             |    |  | DEZ ONIO INI      | Proj            | ect: S | CI-823- |            |           |                          | (014)000     |      |           |     |      |        |           | Job I  | <i>lo.</i> 01        | 21-30                                       | 70.0           | 3 |
|--|---------------|--------------|---------------|-------------|----|--|-------------------|-----------------|--------|---------|------------|-----------|--------------------------|--------------|------|-----------|-----|------|--------|-----------|--------|----------------------|---|----------------|---|
| LOG C                                  | F: Bo         | ing          | R-168         |             |    | ocation: Sta   |                   | ), <u>615.4</u> | ft. RT | of SR   | 823 CL     |           | Date D                   | rilled: 8/20 | 6/04 | GRA       | DAT | 1001 |        | · -       |        |                      |   |                |   |
| Depth<br>(ft)                          | Elev.<br>(ft) | Blows per 6" | Recovery (in) | Samp<br>No. |    | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER<br>OBSERVAT |                 |        |         | on: None ( | cludes di | oring)<br>rilling water) |              |      | % C. Sand |     |      | % Clay | Natu<br>F | ral Mo | istur <del>e</del> ( | VETRA<br>Content<br>Content<br>Coot -<br>30 | t, % -<br>⊣ LL | • |
| 30 —<br>30.5 —<br>35 —<br>40 —<br>50 — | 523.4         | 8            | CC.           | 0           | O. |  |                   |                 | Во     | ttom of | Boring -   | 30.5'     |                          |              | 6    |           |     |      |        |           |        |                      |   |                |   |

|                                | C C: :                 | <u> </u>           | la :          | -                   |     |  | EZ OHIO INC. 6121 HONTLET ROAD, CC 1805, OHIO 43229 (014)   |             |    |           | _   |     |        | -   | loh             | Mo ∩1     | 21-307 | 0.03        |
|--------------------------------|------------------------|--------------------|---------------|---------------------|-----|--|---|-------------|----|-----------|-----|-----|--------|-----|-----------------|-----------|--------|-------------|
| Client:                        |                        |                    |               |                     | ٦.  |  | Project: SCI-823-0.00  . 306+41.8, 398.7 ft. RT of SR 823 CL  Date Drilled: 9   | 122/        | 24 |           |     |     |        |     | 300             | NO. 01    | 21-001 | 0.00        |
| LOG                            | F: Bo                  | ring               | K-1/1         |                     | _   |  | . 306+41.8, 398.7 ft. RT of SR 823 CL Date Drilled: 9   | 1/2/2/N     |    | RAD       | ΔŤΙ | NC. | Ī      |     |                 |           |        |             |
| Depth<br>(ft)                  | Elev.<br>(ft)<br>646.1 | Blows per 6"       | Recovery (in) | Samj<br>No<br>Prive |     | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 4.5' (includes drilling water)  DESCRIPTION  | % Aggregate |    | % M. Sand |     |     | % Clay | Nat | ural Mo<br>PL ⊢ | oisture ( |        | % - •<br>LL |
| 0.3                            | 645.8                  |                    |               |                     |     |  | Topsoil - 3"  | _           | 1  |           | ļ   |     | 1      |     |                 |           |        |             |
| -                              |                        | 25<br>50/3<br>50/1 | 9             | . 2                 |     |  | Severely weathered brown SANDSTONE.   |             |    | ļ         |     |     |        |     |                 |           |        | 50+         |
| -5.0<br>-<br>-<br>-<br>-<br>10 | 641.1-                 | Core 96"           | Rec<br>96"    | RQD<br>57%          | R-1 | *202   | Medium hard to hard brown and gray SANDSTONE; very fine fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical high angle rust stained fractures. | to          |    | -         |     |     |        |     |                 |           |        |             |
| 15 —                           | 628.1-<br>626.1-       | Core<br>84"        | Rec<br>84*    | RQE<br>88%          | R-2 |  | @ 15.2', low angle rust stained fracture.  Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, slightly fractured.  |             | -  |           |     |     |        |     |                 |           |        |             |
| 25. 0121-3070-03 11/12/2007    |                        |                    |               |                     |     |  | Bottom of Boring - 20.0'  |             |    |           |     |     |        |     |                 |           |        |             |

| Cli                | ent: T             | ranSys                          | tems           | Inc.       | -          |         |  | Project: SCI-823-0.00  |           |         |           |         |        |        |       | Job No.                    | 0121-           | 3070.0         | 03    |
|--------------------|--------------------|---------------------------------|----------------|------------|------------|---------|--|--|-----------|---------|-----------|---------|--------|--------|-------|----------------------------|-----------------|----------------|-------|
| _                  |                    | F: Bo                           |                |            |            | L       | ocation: Sta                                 | . 306+32.2, 647.2 ft. RT of SR 823 CL Date Drilled: 9/   | 15/0      | )4      |           |         |        |        |       |                            |                 |                |       |
|                    |                    |                                 |                |            | Samp       | _       | Hand   | WATER  |           | GF      | RAD.      | ATIO    | NC     |        |       |                            |                 |                |       |
|                    | 45                 | - Flavi                         | per 6"         | y (in)     | No.        | Core    | Penetro-<br>meter<br>(tsf) /<br>* Point-Load | OBSERVATIONS: Water seepage at: None Water level at completion: None   | Aggregate | and     | and       | Sand    |        |        | Natur | NDARD i<br>al Moistu       |                 | nt, %          |       |
|                    | epth<br>(ft)       | Elev.<br>(ft)<br>569.3          | Blows p        | Recovery   | Drive      | Press / | Strength<br>(psi)                            | DESCRIPTION  | % Aggr    | % C. S. | % M. Sand | % F. S. | % Silt | % Clay |       | . I———<br>Blows pe<br>0 20 | er foot -<br>30 |                | o<br> |
|                    | ).3<br>            | -569.0                          | 5<br>5<br>7    | 18_        | 1          |         | 2.25   | Topsoil - 4"  Very stiff brown SANDY SILT (A-4a), some gravel, little clay; damp.  | 26        | 11      | -         | 7       | 40     | 16     |       | •                          |                 |                |       |
|                    | 5                  |                                 | 12<br>14<br>13 | 18         | 2          |         | 3.0  |  |           |         |           |         |        |        |       |                            | , O,            |                |       |
|                    | 5.5                | <del>-</del> 563.8 <del>-</del> | 30<br>50/5     | 10         | 3          |         |  | Severely weathered brown and gray SANDSTONE,   |           |         |           |         |        | ľ      |       |                            |                 | ;;;;;<br>;;;;; |       |
|                    | 7.0                | <del>-</del> 562.3              | Core           | Rec        | RQD        | R-1     |  | argillaceous.  Soft to medium hard brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical high angle rust stained fractures. |           |         |           |         |        |        |       |                            |                 |                | 50+1  |
|                    | 3.0                | -556.3-                         | 72"            | 72"        | 14%        |         |  | Hard gray SANDSTONE; very fine to fine grained, moderately to  |           |         |           |         |        |        |       |                            |                 |                |       |
|                    | 15 —               |                                 | Core<br>84"    | Rec<br>84" | RQD<br>90% | R-2     | *612   | highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, contains few argillaceous laminations.   |           |         |           |         |        |        |       |                            |                 |                |       |
| 12:49 PM 1         | -<br>-<br>0.0      | <del>-5</del> 49.3-             |                |            |            |         |  | @ 13.1',14.0',18.7', low angle rust stained fractures.   |           |         |           |         |        |        |       |                            |                 |                |       |
| 11/12/2007         | -<br>-<br>-        |                                 |                |            |            |         |  | Bottom of Boring - 20.0'   |           | ,       |           |         |        |        |       |                            |                 |                |       |
| FILE: 0121-3070-03 | 25 <del></del><br> |                                 |                |            |            |         |  |  |           |         |           | :       |        |        |       |                            |                 |                |       |
| L                  | 30<br>             |                                 |                |            |            |         |  |  |           |         |           |         |        |        |       |                            |                 |                |       |

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| Clie               | nt: T    | ranSy                           | stems                 | , Inc.     |             |        |                  | Project: SCI-823-0.00  |           |         |        |      |           |        | <br>Job I   | Vo. 012         | 21-307(                               | 0.03_      |
|--------------------|----------|---------------------------------|-----------------------|------------|-------------|--------|------------------|--|-----------|---------|--------|------|-----------|--------|-------------|-----------------|---------------------------------------|------------|
| LO                 | G O      | F: Bo                           | ring                  | R-177      | •           | ] L    | ocation: Sta     | . 310+79.1, 269.6 ft. RT of SR 823 CL Date Drilled: 8  | 31/0      |         |        |      |           |        | <br>        |                 |                                       |            |
|                    |          |                                 |                       |            | Samp<br>No. |        | Hand<br>Penetro- | WATER OBSERVATIONS: Water seepage at: 5.0'   |           | Gi      | RAD    | ATIO | <u>NO</u> |        |             |                 |                                       |            |
|                    |          |                                 | .9                    | (in)       |             | £9     | meter<br>(tsf) / | Water level at completion: None (prior to coring) 5.6' (includes drilling water)   | ate       | ,       | ۵      | _    |           |        |             |                 | ETRATIC                               |            |
| Dep                |          | Elev.                           | s per                 | very       |             | / Core | * Point-Load     | · · · · · · · · · · · · · · · · · · ·  | Aggregate | San     | Sand   | Sanc | _         | ay     | PL -        |                 |                                       | LL         |
| (fi                | <u> </u> | <i>(ft)</i><br>58 <u>1</u> .1   | Blows                 | Recovery   | Drive       | Press  | (psi)            | DESCRIPTION  | % Ag      | %<br>C) | % M. S | % F. | %         | % Clay | Blows<br>10 | s per foo<br>20 | ot - ()<br>30                         | 40         |
| 0.                 | 3—       | 580.8                           |                       |            |             |        |                  | Topsoil - 4"   | 1         |         |        |      |           |        |             |                 |                                       |            |
|                    | -        |                                 | 9<br>9<br>10          | 18         | 1           |        |                  | Medium dense brown SANDY SILT (A-4a), little gravel; damp.   |           |         |        |      |           |        |             |                 |                                       |            |
|                    |          |                                 | 9                     |            |             |        |                  |  | 1.        |         |        |      |           |        |             |                 |                                       |            |
|                    | 5 —      |                                 | 9 9                   | 18         | 2           |        |                  |  |           |         |        |      |           |        |             | ٦               |                                       |            |
|                    | -        |                                 | 8 12                  |            | 3           |        |                  |  |           | İ       |        |      |           |        |             | Nii             |                                       |            |
| 1                  |          |                                 | <sup>0</sup> 12<br>11 | 18         | 3           | Į ,    |                  |  |           |         |        |      |           |        |             | þ               |                                       |            |
| <del></del> 8.     | 5-       | <del>-5</del> 72. <del>6-</del> | 3 4                   | 40         | 4           |        | ·                | Loose to medium dense brown and gray SILT (A-4b), trace fine   |           |         |        |      |           |        |             |                 |                                       |            |
| 1                  | 0—       |                                 | 4                     | 18         |             |        |                  | to coarse sand, trace gravel; damp to moist.  @ 11.0'-12.5', some fine to coarse sand.                                   |           |         |        |      |           |        | } ;         |                 |                                       |            |
|                    | -        |                                 | 9<br>16<br>19         | 18         | 5           |        |                  |  | 2         | 11      | -      | 23   | 51        | 13     | •           | )               | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | on-Plastic |
|                    | -        |                                 | l .                   |            |             |        |                  |  |           |         | ŀ      |      |           |        |             |                 |                                       | <u> </u>   |
|                    | .0<br>5  | -567.1-                         | 50/0                  | 0          | 6           |        |                  | Medium hard gray and brown SANDSTONE; very fine to fine  | 1         |         |        |      |           |        |             |                 |                                       | 50+        |
| '                  |          |                                 |                       |            |             |        |                  | grained, slightly to highly weathered, argillaceous, micaceous, thinly laminated to thickly bedded, moderately to highly | ĺ         |         |        |      |           |        |             |                 |                                       |            |
| _                  |          |                                 | Core<br>72"           | Rec<br>72" | RQD<br>54%  | R-1    | *244             | fractured.   |           |         |        |      |           | Ì      |             |                 |                                       |            |
| 12:49 PM           | -        | ·                               |                       |            |             |        |                  | @ 13.3'-13.4',18.2'-18.5',19.5'- 19.6', broken with typical low angle clay filled fractures.                             |           |         |        |      |           |        |             |                 |                                       |            |
|                    | .0       | <del>-</del> 561.1-             |                       | ,          |             |        |                  | Bottom of Boring - 20.0'   | 1         |         | :      | .    |           |        |             |                 |                                       |            |
| /12/20             | _        |                                 |                       |            |             |        |                  |  |           |         |        |      |           | ŀ      |             |                 |                                       |            |
| 11                 | -        |                                 |                       |            |             |        | •                |  | '         |         |        |      |           |        |             |                 |                                       |            |
| 0-03               | _        |                                 |                       |            |             |        |                  |  |           |         |        | .    |           | .      |             |                 |                                       |            |
| 7 21-307           | ر<br>ا   |                                 |                       |            |             |        |                  |  |           |         |        |      |           |        |             |                 |                                       |            |
| FILE: 0121-3070-03 | 4        |                                 |                       |            |             |        |                  |  |           |         |        |      |           |        |             |                 |                                       |            |
| FIL                |          |                                 | 1                     |            | .           |        |                  | ·  |           |         |        |      |           |        |             |                 |                                       |            |
|                    | <u></u>  |                                 |                       |            |             |        |                  |  |           |         |        |      |           |        |             |                 |                                       |            |

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|                                |                  |              | -                |            |              |   | ILZ OHIO INC. 6121 HUNTLEY ROAD, COL 305, OHIO 43229 (614)80   |             | <del></del> - |           | _         |    | _      | <u> </u> | Job No.                                      | 0121-            | 3070.          | 03   |
|--------------------------------|------------------|--------------|------------------|------------|--------------|---|--|-------------|---------------|-----------|-----------|----|--------|----------|--|------------------|----------------|------|
| Client:                        |                  |              |                  |            | 7.           | C1-   | Project: SCI-823-0.00 . 310+11.3, 568.7 ft. RT of SR 823 CL Date Drilled: 8/3  | 31/0        | )4            |           |           | to | ç      | 9/1/04   |  |                  |                |      |
| LOG                            | )F: Bo           | ring i       | <del>(-1/8</del> | Samp       | _            | ocation: Sta  | WATER  |             |               | RAD       | ATIC      |    |        |          |  |                  |                |      |
| Depth<br>(ft)                  | Elev.<br>(ft)    | Blows per 6" | Recovery (in)    | Drive No:  | Press / Care | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: 2.5' Water tevel at completion: None (prior to coring) 4.0' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand     | % M. Sand | % F. Sand | Ŝ  | % Clay | Natura   | IDARD I<br>al Moistu<br><br>Blows pe<br>) 20 | re Conte<br>     | ent, %<br>  Li | - •  |
| —0.2̂=                         | 566.2<br>566.0   |              | *                | -          |              |   | \Topsoil - 2"  |             |               | T         |           |    |        |          |  | ! ! ! ! <b>!</b> |                |      |
|                                | -                | 2 1 9        | 18               | 1          |              | -   | Loose to medium dense brown SANDY SILT (A-4a), little gravel, trace clay, damp to moist.   |             |               |           |           |    | -      | Ç        |  |                  |                |      |
| 3.0                            | 563.2            | 24<br>50/6   | 10_              | 2          |              |   | Severely weathered brown SANDSTONE.  |             |               |           | ŀ         |    |        |          |  | <i>†</i>         | #              | 50+( |
| 7.1<br>10                      | 561.2            | Core<br>120" | Rec<br>120*      | RQD<br>85% | R-1          |   | Medium hard to hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, medium to thickly bedded, broken, with typical low angle rust stained fractures.  Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly laminated to thickly bedded, slightly fractured.  @ 13.4', low angle clay filled fracture. |             |               |           |           |    |        |          |  |                  |                |      |
| 2:49 PM ]                      | -<br>-<br>-<br>- | Core<br>60"  | Rec<br>60*       | RQE<br>87% | R-2          | *656  |  |             |               | ,         |           |    |        |          |  |                  |                |      |
| 20.0                           | 546.2            |              | 1                | 1          | 十            |   | Bottom of Boring - 20.0'   |             |               |           |           |    |        |          |  |                  |                |      |
| FILE: 0121-3070-03   11/12/200 |                  |              |                  |            |              |   |  |             |               |           |           |    |        |          |  |                  |                |      |
| 30                             | 7                |              |                  |            |              | _   |  |             |               |           |           | _  |        |          |  |                  |                |      |

| BUS. | OHIO 43229 | • | (614 | 1888-0040 |
|------|------------|---|------|-----------|
|      |            |   |      |           |

| Client:  | TranSy:             | stems         | . Inc.        |            | _            |   | Project: SCI-823-0.00   |             |               |                 |           |        |        |     | Job No.    | 0121                 | 3070.03    |
|--|---------------------|---------------|---------------|------------|--------------|---|---|-------------|---------------|-----------------|-----------|--------|--------|-----|------------|----------------------|------------|
|  | OG OF: Boring R-182 |               |               |            |              |   |   | 28/0        | 28/04 to 9/29 |                 |           |        |        |     | 4          |                      |            |
|  |                     |               |               | Samp       | le           | Hand  | WATER   | F           | G             | RAD.            | ATIC      | NC     | $\Box$ |     |            |                      |            |
| Depth<br>(ft)  | Elev.<br>(ft)       | Blows per 6"  | Recovery (in) | Drive 08   | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | Water seepage at: None Water level at completion: None (prior to coring) 4.6' (includes drilling water)  DESCRIPTION  | % Aggregate | % C. Sand     | Σ               | % F. Sand | % Silt | % Clay | Nat | ural Moist | ur <del>e</del> Cont | LL         |
| 0 —  | 683.8               | - 40          | œ             | 0          | ď            |   | Topsoil - 12"   | ╬           | 1             | <del>  °`</del> | 9,        | ó      | -      | 111 |            |                      |            |
| 1.0  | 682.8               | 2 4 7         | 12            | 1          |              |   | Medium dense to dense brown and gray GRAVEL WITH SAND AND SILT (A-2-4), little clay; contains sandstone fragments; damp.  | 5           |               |                 |           |        |        |     | ο, (       |                      |            |
| 5—   | -                   | 8<br>16<br>19 | 18            | 2          |              |   | · ·   | 63          | 2             |                 | 6         | 19     | 10     |     | •          | /                    | Non-Plasti |
| -8.0-  | 675.8               | 3<br>9<br>18  | 18            | 3          |              | :   | Constituted by CANDCTONE coeilleague  | _           | :             |                 |           |        |        |     |            | Q                    |            |
| 10 —   |                     | 4<br>9<br>15  | 18            | 4          |              |   | Severely weathered brown SANDSTONE, argillaceous.   |             |               |                 |           |        |        |     |            | ,<br>Ø               |            |
| -  | -<br>-              | 4<br>5<br>9   | 18            | 5          |              |   |   |             |               |                 |           |        |        |     | ď          | <i>+</i>             |            |
| 14.0<br>15   | 669.8               | 28<br>50/4    | 6             | 6          |              |   | Soft to medium hard brown and gray SANDSTONE; very fine t fine grained, highly weathered, argillaceous, moderately fractured, contains moderate argillaceous laminations. | 5           |               |                 |           |        |        |     |            |                      | 507        |
| 12:49 PM ]   | -<br>-              | Core<br>60"   | Rec<br>55*    | RQD<br>28% | R-1          |   |   |             |               |                 |           |        |        |     |            |                      |            |
| 20.0   | -663.8<br>-         | -             |               |            |              | -   | Bottom of Boring - 20.0'  |             |               | -               |           |        |        |     |            |                      |            |
| 25 – 255 – 300 – 3 |                     |               |               |            |              |   |   |             |               |                 |           |        |        |     |            |                      |            |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, CO BUS, OHIO 43229 \* (614)888-0040

| Client:                       | TranSy                               | stems         | Inc.          |             |              |   | Project: SCI-823-0.00   |             |         |         |         |        |      |       | Job No                           | . 012  | 1-307     | 0.03   | ↲ |
|-------------------------------|--------------------------------------|---------------|---------------|-------------|--------------|---|---|-------------|---------|---------|---------|--------|------|-------|----------------------------------|--------|-----------|--|---|
| LOG                           | F: Bo                                | ring          | R-184         |             | I            | ocation: Sta  | . 319+26.4, 357.1 ft. RT of SR 823 CL Date Drilled: 9/3   | 29/0        |         |         |         |        |      | _     |                                  |        |           |  | 4 |
|                               |                                      |               |               | Samp<br>No. |              | Hand<br>Penetro-                                      | WATER OBSERVATIONS: Water seepage at: None  |             | Gi      | RAD     | ATIO    | NC     |      |       |                                  |        |           |  | ı |
| Depth<br>(ft)                 | Elev.                                | Blows per 6"  | Recovery (in) | Drive       | Press / Core | meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | Water level at completion: None (prior to coring) 19.3' (includes drilling water)   | % Aggregate | C. Sand | M. Sand | F. Sand | % Sitt | Clay | Natur | NDARD<br>al Moisi<br><br>Blows p | ure Co | ontent,   | LL   |   |
| l 0-                          | 736.4                                | og<br>B       | Re            | ă           | ď            | (psi)   |   | %           | %       | %       | %       | %      | %    | 1     | 0 2                              | 0      | <i>30</i> | <u>40                                     </u> | ┨ |
| —1.0—<br>-                    | 735.4                                | 4<br>8<br>12  | 18            | 1           |              |   | Topsoil - 12"  Medium dense to dense brown SANDY SILT (A-4a); contains sandstone fragments; damp.   |             |         |         | i       |        |      |       |                                  |        |           |  |   |
| 5 <del></del> 5.5             | -                                    | 13<br>31<br>6 | 18            | 2           |              |   |   |             | :       |         |         |        |      |       |                                  |        | 17        | ٦  |   |
| 5.5                           | <del>  </del> 730.9-                 | 26            | 7             | 3           | Ì .          |   | Severely weathered brown SANDSTONE.   |             |         |         |         |        |      |       |                                  |        |           | 50   |   |
| 7.0                           | 729.4                                | Core<br>36"   | Rec<br>36*    | RQD<br>53%  | R-1          | *250  | Medium hard to hard brown SANDSTONE; very fine to fine grained, highly weathered, moderately fractured. @ 7.0'-7.5', broken zone. @ 7.9'-8.3',8.4'-8.8', 9.6'-9.7',9.8'-9.9', high angle fractures.   |             |         |         |         |        |      |       |                                  |        |           | 504  |   |
| 15 -                          | 718.0                                | Core<br>120"  | Rec<br>120"   | RQD<br>76%  | R-2          | *339  | @ 12.5'-13.1', high angle fracture.  @ 17.1', low angle clay filled fracture. @ 17.2',18.3', low angle rust stained fractures.  Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly | _           |         |         |         |        |      |       |                                  |        |           |  |   |
| 7002/21/11   11/15/2001<br>25 | -<br>-<br>-<br>-<br>-<br>-<br>-<br>- | Core 120*     | Rec<br>120"   | RQE<br>98%  | R-:          | 3 *373  | bedded, slightly to moderately fractured; contains few argillaceous laminations.  |             |         |         |         |        |      |       |                                  |        |           |  |   |

| Client: T                 |                  |              |             |              | _       | - <u> </u>   | Project: SCI-823-0.00  |             | 20.1 |     |              |     |        |             | Job             | No. (   | 0121  | -3070              | ).03         |
|---------------------------|------------------|--------------|-------------|--------------|---------|--|--|-------------|------|-----|--------------|-----|--------|-------------|-----------------|---------|-------|--------------------|--------------|
| LOG O                     | F: Bo            | ring         | R-184       |              | -       | ocation: Sta   | . 319+26.4, 357.1 ft. RT of SR 823 CL Date Drilled: 9  | 7/29/       |      | RAL | 1 <u>4</u> T | ON. |        |             |                 |         |       |                    |              |
| Depth                     | Elev.            | s per 6"     | very (in)   | Sampl<br>No. | Core    | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 19.3' (includes drilling water)   | % Aggregate |      |     |              |     | % Clay | ST/<br>Nati | ural Mi<br>PL ⊢ | oisture | e Cor | rRATIC<br>ntent, % | 6 - <b>(</b> |
| (ft)                      | (ft)<br>706.4    | Blows per    | Recovery    | Drive        | Press / | (psi)  | DESCRIPTION  | %<br>A      | 8    | 8 8 | %<br>n.      | 8,8 | %      | <del></del> | <i>Blow</i>     | vs per  |       | - O                | 40           |
| 30                        |                  |              |             |              |         |  | Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, slightly to moderately fractured; contains few argillaceous laminations. |             |      |     |              |     |        |             |                 |         |       |                    |              |
| 35 —<br>-                 |                  | Core<br>120" | Rec<br>120" | RQD<br>100%  | R-4     | *395   |  |             |      |     |              |     |        |             |                 |         |       |                    |              |
| -<br>-<br>40 —            |                  |              |             |              |         |  | -  |             | 1    |     | }            |     |        |             |                 |         |       |                    |              |
| -<br>-                    |                  | Core<br>60"  | Rec<br>60"  | RQD<br>100%  | R-5     | *376   | @ 41.2'-41.4', high angle fracture with weathering.  |             |      |     |              |     |        |             |                 |         |       |                    |              |
| —45.0—<br>-               | 691.4            |              |             |              |         | ,  | Bottom of Boring - 45.0'   | 7           |      |     |              |     |        |             |                 |         |       |                    |              |
| · -                       | -                |              | ,           | -            |         |  |  |             |      |     |              | ļ   |        |             |                 |         |       |                    |              |
| 50 <del>-</del><br>-<br>- | -<br>-<br>-<br>- |              |             |              |         |  |  |             | . i  |     |              |     |        |             |                 |         |       |                    |              |
| 55 <del></del>            | -                |              |             |              |         |  |  |             |      |     |              |     |        |             |                 |         |       |                    |              |
| 55 —<br>-<br>-<br>-       | _                |              |             |              |         |  |  |             |      |     |              |     |        |             |                 |         |       |                    |              |

| Client:                         | ranS\*        | tems        | Inc        |             |              |                   | Project: SCI-823-0.00   |             |           |      |           |        |        |        | Job      | No. (   | 121         | -3070            | 0.03 |
|---------------------------------|---------------|-------------|------------|-------------|--------------|-------------------|---|-------------|-----------|------|-----------|--------|--------|--------|----------|---------|-------------|------------------|------|
|                                 | F: Bo         |             |            |             | 7 /          | ocation: Sta      | 322+09.9, 269.8 ft. RT of SR 823 CL Date Drilled: 9/  | 2/04        |           |      |           |        |        |        |          |         |             |                  |      |
| Depth                           | Elev.         | 6"          | (in)       | Samp<br>No. | le           |                   | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None  | regate      | Sand      | RAD  |           |        |        | Natu   |          | oisture |             | RATIC<br>tent, % |      |
| (ft)                            | (ft)<br>617.8 | Blows per   | Recovery   | Drive       | Press / Care | Strength<br>(psi) | DESCRIPTION   | % Aggregate | %<br>C. S | % M. | % F. Sand | % Silt | % Clay |        |          |         | foot        | - Ò              |      |
| -0.3                            | 617.5         | 1 2 2       | 9          | 1           |              | 0.75              | Topsoil - 4"  Medium stiff brown SILT AND CLAY (A-6a), little to some fine to coarse sand, little silt; damp.                       |             |           |      |           |        |        | Q      |          |         |             |                  |      |
| 3.0<br>-<br>5                   | 614.8         | 5<br>1<br>5 | 11         | 2           |              |                   | Loose brown SANDY SILT (A-4a), trace gravel, trace clay; damp.  |             |           | !    |           |        | :      | \<br>О | <i>t</i> |         |             |                  |      |
| 7.5                             | 610.3         | 2<br>50/5   | 3          | 3           |              |                   | @ 6.0', very dense, moist.  |             |           |      |           |        |        |        |          |         | <del></del> | <i></i>          | 507  |
| 10 —                            | 1             | Core<br>48" | Rec<br>48" | RQD<br>98%  | R-1          | _                 | Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, moderately bedded to thickly bedded. |             |           |      |           |        |        |        |          |         |             |                  |      |
| 15 —                            |               | Core        | Rec        | ROD         |              |                   |   |             |           | -    |           |        |        |        |          |         |             |                  |      |
| - 20 0-                         | -             | 102"        | 102"       | 96%         | R-2          | 2                 |   | !           |           |      |           |        |        |        |          |         |             |                  |      |
| 20.0                            | 597.8         |             | †          |             |              |                   | Bottom of Boring - 20.0'  | 7           |           |      |           |        | ŀ      |        |          |         |             |                  |      |
| FILE: 0121-3070-63   11/12/2007 |               |             |            |             |              |                   |   |             |           |      |           |        |        |        |          |         |             |                  |      |

DLZ OHIO INC. \* 6121 HUNTLEY ROAD, C. MBUS, OHIO 43229 \* (614)888-0040

|                      | TranSy              |               |             |            |              |                                     | Project: SCI-823-0.00  |             |         |         |      |     |      |                  | Job N               | o. 012        | 1-3070   | 0.03   |
|----------------------|---------------------|---------------|-------------|------------|--------------|-------------------------------------|--|-------------|---------|---------|------|-----|------|------------------|---------------------|---------------|----------|--------|
| LOG                  | DF: Bo              | ring          | R-186       | _          | _            | ocation: Sta                        | . 324+37.9, 54.6 ft. RT of SR 823 CL Date Drilled: 8/  | 31/0        |         |         |      |     |      |                  |                     |               |          |        |
|                      |                     |               | (in)        | Sam<br>No  | <u> </u>     | Hand<br>Penetro-<br>meter           | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring)   |             | G       | RAL     | DATI | ON  |      | .57              | TANDAR.             | N PENE        | TRATIC   | ON (N) |
| Depth<br>(ft)        | Elev.<br>(ft)       | Blows per 6"  | Recovery (  | 9/         | Press / Core | (tsf) /<br>* Point-Load<br>Strength | 10.0' (includes drilling water)  | % Aggregate | C. Sand | A. Sand | Sand | Sit | Clay | Nai              | tural Moi:<br>PL ⊢— | sture Co      | ntent, % | 6 - •  |
| . 2 —                | 717.6               | Blo           | Re          | Drive      | ag.          | (psi)                               | DESCRIPTION  | 1 %         | %       | %       | % F. | %   | %    | <del>, , ,</del> | 10                  | per foo<br>20 | 30       | 40     |
| -0.3-<br>2.5-        | 717.3               | 5<br>11<br>36 | 11          | 1          |              | ·                                   | Topsoil - 3"/2.5' soil removed before drilling  Hard light brown SILT AND CLAY (A-6a); contains sandstone fragments; dry.  Severely weathered brown SANDSTONE.   |             |         |         |      |     |      |                  |                     |               |          | Q      |
| 5.0-                 | -712. <del>6-</del> | 50/5          | 4           | 2          |              | <u> </u>                            |  |             |         |         |      |     |      |                  |                     |               |          | 50+(   |
| -                    | -                   | Core<br>60"   | Rec<br>60"  | RQD<br>52% | R-1          | *390                                | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly to moderately fractured, with typically low angle fractures. |             |         |         |      |     |      |                  |                     |               |          |        |
|                      |                     | Core          | Rec         | BOD        |              |                                     | @ 10.0'-10.5', 12.0'-12.4', 12.9'-13.3', abundant argillaceous laminations.  |             |         |         |      |     |      |                  |                     |               |          |        |
| 15 —<br>—16.5 —<br>— | 701.1—              | 120*          | 118"        | RQD<br>61% | R-2          | *337                                | Soft to medium hard gray SANDSTONE interbedded with SILTSTONE, very fine grain to fine grain, highly weathered, micaeous, thinly bedded to very thinly bedded, broken.   |             |         |         |      |     |      |                  |                     |               |          |        |
| 25 —                 |                     | Core<br>120"  | Rec<br>120" | RQD<br>29% | R-3          | *400                                | <ul> <li>@ 19.0'-19.3', broken zone.</li> <li>@ 26.0'-26.3', 26.9'-27.1', argillaceous interbeds.</li> <li>@ 22.2'-23.7', qu = 7,168 psi, SDI = 97.0%.</li> </ul>  |             |         |         |      |     |      |                  |                     |               |          |        |

FILE: 0121-3070-03 ( 11/13/2007 8:42 PM

| Client:   | FranSy:                | stems        | , Inc.        |             |              |   | Project: SCI-823-0.00   |             |           |           |           |        |        |             | Job No.                                     | 0121                | 3070.0       | )3 |
|---|------------------------|--------------|---------------|-------------|--------------|---|---|-------------|-----------|-----------|-----------|--------|--------|-------------|---|---------------------|--------------|----|
| LOG C   | F: Bo                  | ring         | R-186         |             | _            | ocation: Sta  | . 324+37.9, 54.6 ft. RT of SR 823 CL Date Drilled: 8/3  | 31/0        |           |           |           |        |        |             |   |                     |              |    |
|   |                        |              |               | Samp<br>No. |              | Hand  | WATER<br>ORSERVATIONS:  | ļ.,         | GI        | RAD       | ATI       | ON_    |        |             |   |                     |              |    |
| Depth<br>(ft)   | Elev.<br>(ft)<br>687.6 | Blows per 6" | Recovery (in) | Drive       | Press / Care | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 10.0' (includes drilling water)  DESCRIPTION   | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay | Natui<br>Pi | NDARD I<br>ral Moistu<br>L I———<br>Blows po | ire Coni<br>er foot | ent, % -<br> | •  |
| 35 —  | 677.6                  | Core<br>120" | Rec<br>117*   | RQD<br>36%  | R-4          | *478  | Soft to medium hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, highly fractured, with typical low angle fractures.  (a) 31.4'-31.6',32.5'-39.1', abundant argillaceous laminations.  (b) 33.6',33.9', low angle clay filled fractures.  (c) 39.0'-39.4', fine to medium grained, poorly cemented. |             |           |           |           |        |        |             |   |                     |              |    |
| 45 — 45 — 5002-031 ( 11/15/2002 ) 45 — 60 — 60 — 60 — 60 — 60 — 60 — 60 — 6 |                        |              |               |             |              |   | Bottom of Boring - 40.0'  |             |           |           |           |        |        |             |   |                     |              |    |



| MBUS, OHIO 43229 * (614)888 |
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| Client:                    | TranSy               | stems,           | Inc.        |             |         |                             | Project: SCI-823-0.00   |             |        |      |          |    |        |      | Job N | o. 012            | 21- <u>30</u> | 70.0                 | 3            |
|----------------------------|----------------------|------------------|-------------|-------------|---------|-----------------------------|---|-------------|--------|------|----------|----|--------|------|-------|-------------------|---------------|----------------------|--------------|
| LOG                        | F: Bo                | ring (           | ₹-192       |             | _       |                             | . 328+77.3, 131.7 ft. RT of SR 823 CL Date Drilled: 9   | 2/04        | _      | 045  | A 71     | ~  |        |      |       |                   |               |                      |              |
| Depth                      | Elev.                | per 6"           | 'ery (in)   | Samp<br>No. | Core    | Hand Penetro- meter (tsf) / | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring)  | % Aggregate |        | Sand | Sand     |    | ye     | Natu |       | D PENI<br>sture C |               |                      | •            |
| (ft)                       | (ft)<br>694.9        | Blows            | Recovery    | Drive       | Press / | Strength<br>(psi)           | DESCRIPTION   | % Ag        | %<br>% |      | lu:      | 13 | % Clay |      | Blows | per foo<br>20     | ot - 1<br>30  | ○<br><del>- 40</del> | )<br>; ; ; ; |
| -0.2                       | 694.7                | 3<br>13<br>12    | 11          | 1           |         |                             | Topsoil - 2"/1.5' soil removed before drilling  Medium dense brown SILT (A-4b), trace fine to coarse sand; damp.  | -           |        | ŀ    |          |    |        |      |       | 0                 |               |                      |              |
| 3.0                        | <del>  6</del> 91.9- | 19<br>30<br>50/5 | 14          | 2           |         |                             | Severely weathered brown SANDSTONE, argillaceous.   |             |        |      |          |    |        |      |       |                   |               | /                    | 50+          |
| -5.0                       | 689.9                | Core<br>60"      | Rec<br>42"  | RQD<br>0%   | R-1     |                             | Soft to medium hard brown SANDSTONE; very fine to fine grained, highly weathered to decomposed, argillaceous, thinly bedded to thickly bedded, broken with typical low angle rust stained fractures; contains moderate to abundant argillaceous laminations.  @ 11.5'-12.3', contains few argillaceous laminations.   |             |        |      |          |    |        |      |       |                   |               |                      |              |
| —12.3—                     | 682.6                | Core<br>120"     | Rec<br>120" | RQD<br>43%  | R-2     |                             | Soft to medium hard gray SANDSTONE interbedded with SHALE, very fine to fine grained, decomposed to highly weathered, highly fractured.   |             |        |      |          |    |        |      |       |                   |               |                      |              |
| 2007 12:48 M               | 677.2                |                  | •           |             |         |                             | Medium hard brown and gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, medium bedded to thickly bedded.  @ 19.4'-21.3', few to moderate argillaceous laminations.  @ 20.4'-20.8', broken with typical low angle rust stained   |             |        |      | <b>)</b> |    |        |      |       |                   |               |                      |              |
| 71LE: 0121-3070-03   11/17 | - 0/3.1              | Core<br>120"     | Rec 120"    | RQD<br>30%  | R-3     | 3                           | fractures. @ 21.3'-21.8', fine to medium grained, calcareous, poorly cemented.  Medium hard to hard gray and brown SANDSTONE; very fine fine grained, moderately to highly weathered, broken, argillaceous, micaceous, thinly bedded to massive; contains fe argillaceous laminations. @ 25.2'-25.3',28.4'-28.8', high angle fractures.  Bottom of Boring - 30.0' |             |        | <br> |          |    |        |      |       |                   |               |                      |              |

|                    | Client: 1        | ranSy          | stems,            | Inc.        |             |              |                         | Project: SCI-823-0.00  |             |         |           |        | _        |        |     | Job              | No. 0          | 121-3        | <u>3070.</u>    | 03   |
|--------------------|------------------|----------------|-------------------|-------------|-------------|--------------|-------------------------|--|-------------|---------|-----------|--------|----------|--------|-----|------------------|----------------|--------------|-----------------|------|
|                    | LOG O            | F: Bo          | ring l            | R-193       |             | _            |                         | . 329+27.5, 337.2 ft. RT of SR 823 CL Date Drilled: 9/3  | 2/04        |         | 345       | 4      | <u> </u> |        |     |                  |                |              |                 |      |
| I                  |                  |                |                   |             | Samp<br>No. |              | Hand                    | WATER OBSERVATIONS: Water seepage at: None   |             | GI      | ₹AD.      | AIR    | ON .     | П      |     |                  |                |              |                 |      |
| ı                  | i                |                | <b>.</b>          | (in)        |             |              | Penetro-<br>meter       | Water level at completion: None (prior to coring)  | ıte         |         |           |        |          |        |     |                  | RD PE          |              |                 |      |
| ł                  | Depth            | Elev.          | )er 6"            |             |             | Š            | (tsf) /<br>* Point-Load |  | rega        | Sand    | Sano      | Sand   |          |        |     | tural M<br>PL ⊢  | oisture        | Conte        | ent, %<br>—⊣ Li |      |
|                    | (ft)             | (ft)           | Blows per         | Кесочегу    | Drive       | Press / Core | Strength<br>(psi)       | DESCRIPTION  | % Aggregate | ν<br>Ω  | % M. Sand | % F. S | % Silt   | % Clay |     |                  | vs per t<br>20 | foot -<br>30 | 0               | 10   |
| L                  | o.ĝ=             | 642.0<br>641.7 | 8                 | Α.          | 0           | <u> </u>     |                         | ∖Topsoil - 3"  | 9,          | <u></u> | <u> </u>  | -      |          |        |     | ΪΪΙΙ             |                | ΠĬ           |                 |      |
| ı                  | -                |                | 2 _               |             |             |              | <u> </u>                | Medium dense brown SANDY SILT (A-4a); damp.  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| l                  | _                | 1              | <sup>2</sup> 5 24 | 12          | '           |              |                         |  |             |         | 1         |        |          |        |     |                  |                | φ            | 111             |      |
| t                  | <del>-3.0</del>  | 639.0          | 50/4              | 4           | 2           |              | ;                       | Severely weathered gray SANDSTONE, argillaceous.   |             |         |           |        |          |        |     |                  |                |              |                 | 50+( |
| L                  | <br>5.0          | 637.0-         |                   |             | <u> </u>    | '            |                         |  | ł           |         |           |        |          |        |     |                  |                |              |                 |      |
| ı                  | _                |                |                   |             |             | '            |                         | Medium hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, thinly |             |         |           |        |          |        |     |                  |                |              |                 |      |
|                    | _                |                | Core              | Rec         | RQD         | R-1          |                         | bedded to massive, broken to highly fractured, contains  | ١.          |         |           |        |          |        |     |                  |                |              |                 |      |
| ł                  | -                |                | 60"               | 60"         | 62%         |              |                         | moderate argillaceous laminations.   |             |         |           |        |          |        |     |                  |                |              |                 |      |
| 1                  | -                | 1 .            |                   |             | 1           |              |                         | @ 5.0'-7.6', highly fractured, with typically low angle clay filled  |             | Į       |           |        |          |        |     |                  |                |              |                 |      |
| ı                  | 10 —             |                |                   |             | 1           |              |                         | fractures.   |             |         |           |        |          |        |     |                  |                |              |                 |      |
| ١                  | _                |                |                   |             | •           |              |                         |  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| ı                  | -                | 4              |                   |             |             |              | į .                     | ·  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| ı                  | -                | -              |                   |             |             |              |                         |  |             |         |           |        |          |        |     |                  |                |              |                 |      |
|                    | 15 —             | ┨              | Core<br>120"      | Rec<br>120" | RQD<br>88%  | R-2          | 2                       |  | 1           |         |           |        |          |        |     |                  |                |              |                 |      |
|                    | _                | 1              |                   |             | l           |              |                         |  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| _                  | _                |                |                   |             |             |              |                         | @ 17.0',17.1',19.7', low angle clay filled fractures.  | ĺ           |         |           |        |          |        |     |                  |                |              |                 |      |
| 49 PM              | _                |                |                   | 1           |             |              |                         | •  |             | 1       |           |        |          |        |     |                  |                |              |                 |      |
| 12:49              | <del></del> 20.0 | 622.0          | 1                 | ļ           | <u> </u>    | $\vdash$     |                         | Bottom of Boring - 20.0'   | ┨           |         |           |        |          |        |     |                  |                |              |                 |      |
| /2003              | -                | 1              |                   |             |             |              |                         | Bottom of Boring - 20.0  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| 1/12/              | -                | 1              |                   |             |             |              |                         |  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| _                  | -                | 1              |                   |             |             |              |                         |  |             |         |           |        |          | 1      |     |                  |                |              |                 |      |
| 0-03               | 25               |                |                   |             |             |              |                         |  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| 1-307              | 25 —             | 1              |                   |             |             |              |                         | · ·  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| 012                | -                | 4              |                   |             |             |              |                         |  |             | 1       |           | -      |          |        |     |                  |                |              |                 |      |
| FILE: 0121-3070-03 | -                | -              |                   |             |             |              |                         |  |             |         |           |        |          |        |     |                  |                |              |                 |      |
|                    | -                | -              |                   |             |             |              |                         |  |             |         |           |        |          |        |     |                  |                |              |                 |      |
| l                  | 30               | 1              | 1                 |             | 11          |              |                         | l  |             |         | 1         | _      |          |        | لنا | <u>: : [ ; ;</u> | <u> </u>       |              | <u> </u>        |      |

| Client              | r: Tr    | ranSy                           | stems,              | Inc.            | •               |              |  | Project: SCI-823-0.00   |             |         |         |      |        |          |      | Job No. 012                   | 21-3070.03                |
|---------------------|----------|---------------------------------|---------------------|-----------------|-----------------|--------------|--|---|-------------|---------|---------|------|--------|----------|------|-------------------------------|---------------------------|
| _                   |          |                                 | ring l              |                 |                 | L            | ocation: Sta                                 | . 345+21.9, 234.9 ft. LT of SR 823 CL Date Drilled: 9/  | 7/04        |         |         |      |        |          |      |                               |                           |
|                     |          |                                 |                     |                 | Samp            | le           | Hand   | WATER OBSERVATIONS: Water seepens at: None  | $\vdash$    | G.      | RAD     | ATI  | ON_    |          |      |                               |                           |
| Dept                | 'n       | Elev.                           | per 6"              | ery (in)        | No.             | / Core       | Penetro-<br>meter<br>(tsf) /<br>* Point-Load | Water seepage at: None Water level at completion: 5.5' (after coring)   | % Aggregate | Sand    | M. Sand | Sand |        | <u> </u> | Natu | ANDARD PEN<br>Iral Moisture C | ETRATION (N) Content, % - |
| (ft)                |          | (ft)<br>579.8                   | Blows per           | Recovery        | Drive           | Press / Core | Strength<br>(psi)                            | DESCRIPTION   | % Ago       | %<br>'C | % M     | % F. | % Sitt | % Clay   |      | Blows per foo                 |                           |
|                     | -        |                                 | 13<br>9<br>8        | 18              | 1               |              | 4.0  | No Topsoil Hard brown SANDY SILT (A-4a); contains sandstone fragments; damp.  |             |         |         |      |        |          |      | Q                             |                           |
| 5.5                 |          |                                 | 19<br>18<br>18      | 18              | 2.              |              | 4.5+   |   |             |         |         |      |        |          |      |                               |                           |
|                     |          |                                 | 15<br>29<br>31      | 18              | 3               |              | 4.5+   | Hard gray SILT AND CLAY (A-6a); damp.   |             |         |         |      |        |          |      |                               | Ç60-                      |
| 10                  | 1        | <del>-</del> 571.7 <del>-</del> | 50/1<br>Core<br>59" | 1<br>Rec<br>59" | 4<br>RQD<br>93% | R-1          | 4.5+   | Medium hard gray and brown SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately to highly fractured, with typical low angle clay filled fractures; contains few argillaceous laminations.  @ 8.6'-11.4', fissile. |             | ;       |         |      |        |          |      |                               | <b>5</b> 0+               |
| 15                  |          |                                 | Core                | Rec             | RQD<br>100%     | R-2          |  |   |             |         |         |      |        |          |      |                               |                           |
| 11/12/2007 12:49 Pt | <u> </u> |                                 | 120*                | 120"            | 100%            |              |  |   |             |         |         |      |        |          |      |                               |                           |
| -                   |          | <del>-5</del> 54. <del>8</del>  | Core<br>24"         | Rec<br>24"      | RQD<br>100%     | R-3          | ·  |   |             |         |         |      |        | . ·      |      |                               |                           |
| 25.                 | <u> </u> | 554.0                           |                     |                 |                 |              |  | Bottom of Boring - 25.0'  |             |         |         |      |        |          |      |                               |                           |
| 525. 221.3070-03    | -        |                                 |                     |                 |                 |              |  |   |             |         |         |      |        |          |      |                               |                           |

| Client:                    | TranSy                 | stems,      | Inc.       |             |         |  | Project: SCI-823-0.00  |             |        |        |           |        |        |             | Job     | No. O             | 21-3   | 070.0   | )3 .       |
|----------------------------|------------------------|-------------|------------|-------------|---------|--|--|-------------|--------|--------|-----------|--------|--------|-------------|---------|-------------------|--------|---------|------------|
| LOG                        | )F: Bo                 | ring l      | R-205      |             |         |  | . 345+24.0, 332.6 ft. RT of SR 823 CL Date Drilled: 9/2  | 2/04        | _      |        |           | to     | 9      | /7/04       | 1       |                   |        |         |            |
| Depth                      | Elev.                  | per 6"      | ry (in)    | Samp<br>No. |         | Hand<br>Penetro-<br>meter<br>(tsf) /<br>* Point-Load | WATER OBSERVATIONS: Water seepage at: None Water level at completion: 2.2' (after coring)  | egate       | •      |        | pue       |        |        | Nat         | ural Me | RD PEi<br>pisture | Conter | nt, % - |            |
| (ft)<br>0.2=               | (ft)<br>558.2<br>558.0 | Blows       | Recovery   | Drive       | Press / | Strength<br>(psi)                                    | DESCRIPTION  | % Aggregate | % C. S | % M. S | % F. Sand | % Silt | % Clay | <del></del> |         | rs per fo         |        |         | )<br>! ! ! |
| -0.2                       | - 556.0                | 50/4        | 3          | 1           |         |  | Topsoil - 2" Severely weathered brown SANDSTONE.   |             |        |        |           |        |        |             |         |                   |        |         |            |
| 4.5                        | 553.7-                 | 50/1        |            | 2           |         | ·<br>  | @ 3.5', gray.  |             |        |        |           |        |        |             |         |                   |        |         | 50+        |
| 5 —                        |                        | Core<br>90" | Rec<br>90* | RQD<br>72%  | R-1     |  | Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to thickly bedded, moderately fractured, with typical high angle clay filled fractures.  @ 6.9'-7.0', 8.1'-8.2', 9.9'- 10.0', 10.4'-10.5', 10.8'-11.0', clay filled fractures. |             | ·      |        |           |        |        |             |         |                   |        |         |            |
| 10 —                       |                        |             |            |             |         |  | @ 13.1'-13.2', 14.1'-14.2', clay filled fractures.   |             |        |        |           |        |        |             |         |                   |        |         |            |
| 15 —                       | -<br>-<br>-            | Core<br>84" | Rec<br>84" | RQD<br>68%  | R-2     |  | @ 18.5'-21.6', very fine grained, friable.   |             |        |        |           |        |        |             |         |                   |        |         |            |
| MR 61:31 7005/31/11 ) 50-0 |                        | Core<br>72" | Rec<br>72" | RQD<br>94%  | R-3     | 3  | @ 20.2',21.4',21.6', low angle clay filled fractures.  |             |        |        |           |        |        |             |         |                   |        |         |            |
|                            |                        |             |            |             |         |  | Bottom of Boring - 25.0'   |             |        |        |           |        |        |             |         |                   |        |         |            |

|                              | TranSy                   | _              | _            |                        | _        |                                     | Project: SCI-823-0.00   |           |      |      |      |        |        |      | Job No.              | 012          | 1-3070             | 0.03  |
|------------------------------|--------------------------|----------------|--------------|------------------------|----------|-------------------------------------|---|-----------|------|------|------|--------|--------|------|----------------------|--------------|--------------------|-------|
| LOG                          | OF: Bo                   | ring           | R-215        |                        |          | ocation: Sta                        | . 286+03.1, 117.5 ft. LT of SR 823 CL Date Drilled: 1/  | 11/0      |      |      | 4.7  |        |        |      |                      |              |                    |       |
|                              |                          |                | (in)         | Sam <sub>i</sub><br>No |          | Hand<br>Penetro-<br>meter           | WATER OBSERVATIONS: Water seepage at: 9.0' Water level at completion: None (prior to coring)  |           | G    | RAD  | ATI  | NO<br> |        | ST.  | ANDARD               | PENE         | TRATIO             | N (N) |
| Depth<br>(ft)                | Elev.                    | 's per 6"      | Recovery (i  |                        | s / Core | (tsf) /<br>* Point-Load<br>Strength | 20.7' (includes drilling water)   | Aggregate | Sand | Sand | Sand | Sitt   | Clay   | Natu | ıral Moist<br>PL +—— | ure Co       | ntent, %<br>—— ⊢ l | - •   |
| '                            | 787.9                    | Blows          | Reco         | Drive                  | Press/   | (psi)                               | DESCRIPTION   | % A       | %    | % M. | % F  | s %    | %<br>C | ,    | Blows p              | er foot<br>0 | - ()<br>30         | 40    |
| 0.8                          | 787.1-                   |                |              |                        |          | . !                                 | Topsoil - 9"  | 1         |      |      |      |        |        |      |                      |              |                    |       |
|                              |                          | 20<br>13<br>17 | 12           | 1                      |          |                                     | Severely weathered brown SANDSTONE, argillaceous.   |           |      |      |      |        |        |      |                      |              |                    |       |
|                              |                          | 50/5           | 5            | 2                      |          |                                     |   |           |      |      |      |        |        |      |                      |              |                    | 50+   |
| 5.0                          | 782.9-<br><br>           |                |              |                        |          |                                     | Medium hard to hard grayish brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, massive, moderately to highly fractured.  @ 5.0'-6.2', high angle, filled fracture.   |           |      |      |      |        |        |      |                      |              |                    |       |
| 10 —                         | <del>-</del>  <br>-<br>- | Core<br>103"   | Rec<br>103"  | RQD<br>77%             | R-1      | *658                                | @ 11.3'-11.6', high angle fracture.   |           |      |      |      | ,      |        |      |                      |              |                    |       |
| 15 —                         | -<br>-<br>-<br>-         |                |              |                        |          |                                     | <ul> <li>① 13.2'-13.4', 14.2'-14.5', 16.1'-16.3', high angle iron stained fractures.</li> <li>② 13.6'-14.0', broken zone.</li> </ul>  |           |      |      |      |        |        |      |                      |              |                    |       |
| <del></del> 17. <del>5</del> | 770.4                    |                |              |                        |          |                                     |   |           |      |      |      |        |        |      |                      |              |                    |       |
| 2/2007 12:49 PM              |                          | Core<br>120"   | 'Rec<br>120" | RQD<br>63%             | R-2      | *278                                | Soft to medium hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thinly laminated to thinly bedded, moderately fractured, contains moderate to abundant argillaceous laminations.  @ 17.7'-18.1', high angle, iron stained fracture. |           |      |      |      |        |        |      |                      |              |                    |       |
| 1/11                         |                          |                |              |                        |          |                                     | @ 22.1'-22.9', vertical fracture, iron stained.   |           |      |      |      |        |        |      |                      |              |                    |       |
| 25 <b>–</b>                  |                          |                |              |                        |          |                                     |   |           |      |      |      |        |        |      |                      |              |                    |       |
| 25 —                         | 760.8-                   | Core<br>120"   | Rec<br>120"  | RQD<br>88%             | R-3      | *928                                | Medium hard to hard brown and gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, massive, slightly fractured.  |           |      |      |      | -      |        |      |                      |              |                    |       |

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|                                | TranSy                 |              |               |             | _            |   | Project: SCI-823-0.00   |             |           |           |           |         |        |    | Job No                                      | . 0121-   | 3070.          | 03  |
|--------------------------------|------------------------|--------------|---------------|-------------|--------------|---|---|-------------|-----------|-----------|-----------|---------|--------|----|---|-----------|----------------|-----|
| LOG C                          | F: Bo                  | ring         | R-215         |             |              | ocation: Sta  | a. 286+03.1, 117.5 ft. LT of SR 823 CL Date Drilled: 1/   | 11/0        |           |           |           |         |        |    |   |           |                | ·   |
|                                |                        |              |               | Samp<br>No. |              | Hand  | WATER OBSERVATIONS: Water seepage at: 9.0'  | $\vdash$    | GF        | RAD<br>I  | AT/       | ON<br>I | Н      |    |   |           |                |     |
| Depth<br>(ft)                  | Elev.<br>(ft)<br>757.9 | Blows per 6" | Recovery (in) | Drive       | Press / Core | Penetro-<br>meter<br>(tsf) /<br>* Point-Load<br>Strength<br>(psi) | Water level at completion: None (prior to coring)  20.7' (includes drilling water)  | % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Sitt  | % Clay | Na | TANDARE<br>tural Mois<br>PL Home<br>Blows ( | ture Cont | ent, %<br>—→ L | - • |
| 30 —                           | 757.9                  | Core 120"    | Rec 120"      | RQD 100%    | R-4          | *1636   | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, massive, unfractured to slightly fractured, iron stained.  ② 27.1'-31.0', iron stained.  Bottom of Boring - 45.0' | %           | %         | %         | %         | %       | %      |    |   | 20 30     | ) 4            | O   |
| 55 —<br>-<br>-<br>-<br>-<br>60 |                        |              |               |             |              |   |   |             |           |           |           |         |        |    |   |           |                |     |

FILE: 0121-3070-03 [ 11/12/2007 12:49 PM

| Client:                                 | TranSy        | stems        | , Inc.      |             |          |                                  | Project: SCI-823-0.00   |           |        |        |          |        |         |   | Jo               | b No.       | 0121   | -3070.03                                |
|---|---------------|--------------|-------------|-------------|----------|----------------------------------|---|-----------|--------|--------|----------|--------|---------|---|------------------|-------------|--------|---|
|   | F: Bo         |              |             | 7           | l        | ocation: Sta                     | . 291+72.6, 439.2 ft. LT of SR 823 CL Date Drilled: 1   | 2/14      |        | _      |          |        |         |   |                  |             |        |   |
|   |               |              |             | Samp<br>No. |          | Hand<br>Penetro-                 | WATER OBSERVATIONS: Water seepage at: 11.0'-17.5'   | -         | Gi     | RAD    | ATK      | NC     |         |   |                  |             |        |   |
| Depth                                   | Elev.         | per 6"       | ry (in)     |             | Core     | meter<br>(tsf) /<br>* Point-Load | Water level at completion: 17.5' (prior to coring) 0.0' (includes drilling water)   | Aggregate | Sand   | Sand . | Sand     |        |         |   | tural l          | Moistu      |        | RATION (N)                              |
| (ft)                                    | (ft)<br>579.6 | Blows        | Recovery    | Drive       | Press /  | Strength<br>(psi)                | DESCRIPTION   | % Agg     | % C. S | Σį     | u:       | % Silt | % Clay  |   | PL 1<br>Bk<br>10 |             | r foot | - LL<br>- O<br>10 40                    |
| 0.1                                     | 579.5         |              |             |             |          |                                  | Topsoil - 1"  | 4         |        |        |          |        |         |   |                  |             |        |   |
|   |               | 5<br>5<br>6  | 5           | 1           |          |                                  | Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4 trace to little clay; contains sandstone fragments; damp.   | ),        |        |        |          |        |         |   | Q                |             |        |   |
|   | -<br>-        | 3 8 11       | 9           | 2.          |          |                                  |   |           |        |        |          |        |         |   |                  |             |        |   |
| 5                                       | †<br>         | 6            | J           |             |          |                                  |   | 22        | 21     | _      | 14       | 22     | ٥       |   |                  |             | ١      | Non-Plasti                              |
| 8.0                                     | 571.6         | 11           | 10          | 3           |          |                                  | Loose to medium dense grayish brown SANDY SILT (A-4a),  | _         | 31     | -      | -        | 23     | ,       |   |                  | ,           | Ó      | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |
| 10 —                                    |               | 2<br>4<br>6  | 11          | 4           |          |                                  | trace to little clay, trace to little gravel, damp to moist.  | 9         | 16     | -      | 19       | 45     | 11      |   | 0                | •           |        |   |
|   | -             | 5 5 4        | 13          | 5           |          |                                  |   | 16        | 32     | -      | 13       | 31     | 8       |   | •                |             |        | Non-Plasti                              |
| —13.0—                                  | 566.6         | 4 6          |             | 6           |          |                                  | Medium dense grayish brown GRAVEL WITH SAND AND SIL (A-2-4), trace clay; contains sandstone fragments; damp.  | Ī         |        |        |          |        |         |   | N                |             |        |   |
| 15 —                                    |               | 8            | 9           |             |          |                                  | (A-2-4), trace day, contains salidstone fragments, damp.  |           |        |        |          |        |         |   |                  | $\supset  $ |        |   |
| 18.0-                                   | -561.6-       | 3<br>7<br>8  | 14          | 7           |          |                                  |   |           |        |        |          |        |         |   |                  | Ö-          |        |   |
| 219.0-                                  | 560.6         |              | 2           | . 8         |          |                                  | <ul> <li>Severely weathered brownish gray SANDSTONE, argillaceous</li> </ul>  |           |        |        |          |        |         |   |                  |             |        | in the second                           |
| 20 —                                    | 000.0         |              |             |             |          |                                  | Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, moderately to highly fractured. | į         |        |        | <i>.</i> |        |         |   |                  |             |        |   |
| 11/12/                                  | _             |              |             |             |          |                                  | @ 19.0'-19.2', 21.8'-21.9', 22.0'-22.1', broken.<br>@ 19.2'-20.3', core loss.   |           |        |        |          |        |         | 4 1 1<br>1 1 1<br>2 1 1<br>4 1 4<br>1 1 1<br>1 1 1<br>1 1 1 |                  |             |        |   |
| g<br>25 —                               | 1             | Core<br>120" | Rec<br>106" | RQD<br>83%  | R-1      | *586                             |   |           |        |        |          |        |         |   |                  |             |        |   |
| 25 — 25 — 25 — 25 — 25 — 25 — 25 — 25 — | _             |              |             |             |          |                                  |   |           |        |        |          |        |         |   |                  |             |        |   |
|   | -<br>550.6    |              |             |             | <u> </u> |                                  | Dollars of Davis and Co. Cl.  |           |        |        |          |        |         |   |                  |             |        |   |
| 30                                      | <u> </u>      | 1            | <u> </u>    | Ц           |          |                                  | Bottom of Boring - 29.0'  |           |        | ⊥_     | <u> </u> | 1      | $\perp$ |   |                  | <u>:</u> :: |        |   |

| Client:                         | TranSy         | stems         | , Inc.     |                        |              |   | Project: SCI-823-0.00  |             | 0 10       |          |           |    |        |        | Job N              | o. 012   | 1-307 | 0.03          |
|---------------------------------|----------------|---------------|------------|------------------------|--------------|---|--|-------------|------------|----------|-----------|----|--------|--------|--------------------|----------|-------|---------------|
| LOG                             | F: Bo          | ring          | R-216      |                        |              | ocation: Sta                                  | . 295+62.8, 372.4 ft. LT of SR 823 CL Date Drilled:  | 12/19       |            |          |           | to |        | 12/20/ | )5                 |          |       | -             |
|                                 |                |               |            | Sam <sub>i</sub><br>No |              | Hand<br>Penetro-                              | WATER OBSERVATIONS: Water seepage at: None   | -           | T          | GRA.     | DAT       | ON |        |        |                    |          |       |               |
| Depth                           | Elev.          | er 6"         | cy (in)    |                        | Core         | meter<br>(tsf) /<br>* Point-Load              | Water level at completion: 3.7' (includes drilling water)  | gate        | 200        | 2 2      | 9         |    |        |        | ANDARI<br>ral Mois |          |       |               |
| (ft)                            | (ft)           | Blows per     | Recovery   | Drive                  | Press / Core | Strength<br>(psi)                             | DESCRIPTION  | % Andreaste | manusary y | % M Sand | % F. Sand | 18 | % Clay | l      |                    | per foot |       | LL<br>)<br>40 |
| 0.2 <del></del>                 | 597.7<br>597.5 |               |            |                        |              |   | Topsoil - 2"/1.6' soil removed before drilling   | <u> </u>    |            | Ť        | Ť         | Ť  | Ť      |        | Ĭ                  | Ĭ        | Ĭ     | T)            |
| -                               | 1              | 4<br>31<br>22 | 12         | 1                      |              |   | Severely weathered brown SANDSTONE.  |             |            |          |           |    |        |        |                    |          |       | 5             |
| -                               |                | 50/3          | 2          | 2                      |              |   |  |             |            | .        |           |    |        |        |                    |          |       | 50+           |
| 5 —                             |                | 50/5          | 3          | 3                      |              |   |  |             |            |          |           |    |        |        |                    |          |       |               |
| 8.0                             | 589.7          |               |            |                        |              |   |  | ].          |            |          |           |    |        |        |                    |          |       | 50+           |
| 10 —                            |                | Core<br>60"   | Rec<br>60" | RQD<br>100%            | R-1          | *1665   | Very hard gray SANDSTONE; fine grained, moderately weathered, argillaceous, micaceous, massive, moderately to highly fractured, burrows.  @ 8.3'-8.7', iron stained.  @ 8.3', 8.5', 8.8', 9.4', low angle fractures. |             |            |          |           |    |        |        |                    |          |       |               |
| 15 —                            |                | Core<br>84"   | Rec<br>84" | RQD<br>100%            | R-2          | *992  | @ 18.4'-18.9', calcareous.   |             |            |          | -         |    |        |        |                    |          |       |               |
| 20.0—                           | 577.7-         |               |            |                        |              | , <u>,                                   </u> | Pottom of Poring 20.0'   | 4.          |            |          |           |    |        |        |                    |          |       |               |
| FILE: 0121-3070-03 [ 11/12/2007 |                |               |            |                        |              |   | Bottom of Boring - 20.0'   |             |            |          |           |    |        |        |                    |          |       |               |

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| Client                            | Trar      | Sys       | tems,            | Inc.          |                          |   |   | Project: SCI-823-0.00  |             |         |    |         |    |        |           | Job i            | Vo. 0              | 121-         | 3070 | .03  |
|-----------------------------------|-----------|-----------|------------------|---------------|--------------------------|---|---|--|-------------|---------|----|---------|----|--------|-----------|------------------|--------------------|--------------|------|------|
| LOG                               | OF:       | Bori      | ing l            | R-216         |                          | _ | Location: Sta   | a. 302+46.9, 253.1 ft. LT of SR 823 CL Date Drilled: 12  | /20,        |         |    | A Ti    | ON |        |           |                  | _                  |              |      |      |
| Depti<br>(ft)                     | 678       | t)<br>3.7 | Blows per 6"     | Recovery (in) | Samp<br>No.              |   | Hand Penetro- meter (tsf) / * Point-Load Strength (psi) | WATER OBSERVATIONS: Water seepage at: None Water level at completion: None  DESCRIPTION  | % Aggregate | C. Sand | Σį | F. Sand |    | % Clay | Nati<br>F | iral Mo<br>PL ⊢- | istur <del>o</del> | Conte        |      | -    |
| 0.2                               | 678       | 3.5       | 1<br>5<br>6      | 13            | 1                        |   | -<br>-  | \Topsoil - 2" Stiff brown SANDY SILT (A-4a), trace to little clay, contains rock fragments; damp   | 35          | 17      | _  | 7       | 33 | 8      |           | •                | 1                  |              |      |      |
|                                   | -         | - 1       | 15<br>45<br>50/1 | 17            | 2 -                      |   | 4.5+  | @ 3.5'-5.0', hard.   |             |         |    |         |    |        |           |                  |                    | <del> </del> | 7    | 50+  |
| 10                                | -         |           | Core<br>120"     | Rec<br>117"   | RQD<br>59%<br>RQD<br>77% |   |   | Hard brown SANDSTONE; very fine to fine grained, highly weathered, argillaceous, laminated to thinly bedded, highly fractured.  @ 8.2'-8.4', broken zone. @ 8.8'-9.1', high angle fracture. @ 9.1'-12.9', contains argillaceous clast.  @ 11.0'-12.1', gray.  @ 13.0'-13.6', high angle fracture. @ 13.6'-13.7', low angle fracture.  @ 16.1',16.2',16.4',18.3', 19.1', low angle fractures. |             |         |    |         |    |        |           |                  |                    |              |      | 30,7 |
| ش<br>20.0                         | -<br>- 65 | 8.7       |                  |               |                          |   |   | @ 18.3'-18.8', high angle, iron stained fracture.  |             |         |    |         |    |        |           |                  |                    |              |      |      |
| 25.002/21/11   10-0206-1210 :3714 | -         | J.,       |                  |               |                          |   |   | Bottom of Boring - 20.0'   |             |         |    |         |    |        |           |                  |                    |              |      |      |
| 30                                |           |           |                  |               |                          |   |   |  |             |         |    |         |    |        |           |                  |                    |              |      |      |

| Clie            | nt: T                   | ranSy                           | stems        | , Inc.      |             |              |                          | Project: SCI-823-0.00   |             |         |        |          |           |        |   | Job No   | o. <b>012</b> 1  | -3070    | .03  |
|-----------------|-------------------------|---------------------------------|--------------|-------------|-------------|--------------|--------------------------|---|-------------|---------|--------|----------|-----------|--------|---|----------|------------------|----------|------|
| LO              | GΟ                      | F: Bo                           | ring         | R-217       |             | _            | ocation: Sta             | . 311+92.6, 5.1 ft. LT of SR 823 CL Date Drilled: 1   | 2/22        |         |        |          |           |        |   |          |                  |          | •    |
|                 |                         |                                 |              |             | Samp<br>No. |              | Hand<br>Penetro-         | WATER OBSERVATIONS: Water seepage at: 11.0'-11.5'   |             | Gi      | RAD    | ATI      | <u>ON</u> |        | - |          |                  |          |      |
|                 |                         |                                 | <b>.</b>     | (in)        |             | e<br>g       | meter<br>(tsf) /         | Water level at completion: 13.1' (prior to coring) 7.5' (inside hollowstem augers)  | ate         | _       | -      | <u>,</u> | Ì         |        |   |          | PENET            |          |      |
| Dep<br>(fi      |                         | Elev.<br>(ft)                   | Blows per 6" | Кесочегу    |             | Press / Core | * Point-Load<br>Strength |   | % Aggregate | C. Sand | . Sand | Sand     | <br>      | Clay   |   | ι        |                  | <u> </u> |      |
| ı "             | <u></u>                 | 590.8                           |              | Кесс        | Drive       | Pres         | (psi)                    | DESCRIPTION   | %<br>A      | %       | % M.   | 7 %<br>F | % Sitt    | %<br>C |   | Blows    | per foot<br>20 3 |          | 40   |
| <b>├</b> 0.     | 3 -                     | <del>-</del> 590.5 <del>-</del> | _            |             |             |              |                          | Topsoil - 3"/1.1' soil removed before drilling  | -           |         |        |          |           |        |   |          |                  |          |      |
|                 |                         |                                 | 12<br>15     | 7           | 1           |              |                          | Medium dense brown SANDY SILT (A-4a), trace to little clay, contains sandstone fragments; dry.  |             |         |        |          |           |        |   |          | م                |          |      |
| <b>—3</b> .     | 5—                      | <del>-5</del> 87.3 <del>-</del> | 10 7         | 10          | 2           |              | 4.5+                     | Hard brown SILT AND CLAY (A-6a), little fine to coarse sand; contains sandstone fragments; dry to damp.   |             |         | •      |          |           |        |   | Ø        | <i>/</i>         |          |      |
| <del>6</del> .  | <del>-</del>            | <del>-</del> 584.8-             | 3<br>4<br>5  | 13          | .3          |              | 2.5                      | Very stiff to hard brown SILT (A-4b), little clay, trace gravel, some fine to coarse sand; contains sandstone fragments; mois to wet.   | 2           | 5       |        | 22       | 53        | 18     | C | <u> </u> | 1                |          |      |
| 10              | o —                     |                                 | 8<br>8<br>12 | 13          | 4           |              | 4.5+                     | @ 8.5'-10.0', dry   |             |         |        |          |           |        |   |          |                  |          |      |
| -11             |                         | <del>-</del> 579.3-             | 8            | 10          | 5Δ          |              | 2.5                      | @ 11.0', contains rock fragments.   |             |         |        |          |           |        |   |          |                  |          |      |
|                 |                         | 070.0                           | 50/4_        | 10          | 5A<br>5B    |              | 2.0                      | Severely weathered gray SANDSTONE.  |             |         |        |          |           |        |   |          |                  |          | 50+( |
| <u> </u>        | .⊶                      | <del>-5</del> 76.8-             | 50/4         | 4           | 6           | _            |                          |   |             |         |        |          |           |        |   |          |                  |          | 50+( |
|                 | 5 <del></del><br>-<br>- |                                 | -<br>-       |             |             |              |                          | Medium hard to hard gray SANDSTONE; very fine to fine grained, unweathered, argillaceous, calcareous, massive, slightly to moderately fractured.  @ 14.6', 15.6, 15.8', 15.9', low angle fractures.  @ 15.1-15.4', lost recovery, fracture or void suspected. |             |         |        |          |           |        |   |          |                  |          |      |
| 2, 2002/21      | -<br>0 <del></del>      |                                 | Core<br>120" | Rec<br>116" | RQD<br>92%  | R1           | *2071<br>·               | @ 18.2'-18.9', limestone seam.  |             |         |        |          |           |        |   |          |                  |          |      |
| );;<br>;;       | _                       |                                 |              |             |             |              |                          |   |             |         |        |          |           |        |   |          |                  |          |      |
| 24<br>2         |                         | <del>-5</del> 66.8-             |              | -           |             | $\vdash$     | -                        | Bottom of Boring - 24.0'  | 1           |         |        |          |           |        |   |          |                  |          |      |
| 2 21-30         | ~                       |                                 | :            |             |             |              |                          |   |             |         |        |          |           |        |   |          |                  |          |      |
| 21124<br>HT1124 | -<br>-                  |                                 |              |             |             |              |                          |   |             |         |        |          |           |        |   |          |                  |          |      |

| Client: T        | ransır                 | tome           | Inc              |            |        |   | Project: SCI-823-0.00  | Job No. 0121-3070.03                                      |
|------------------|------------------------|----------------|------------------|------------|--------|---|--|---|
| LOG O            |                        |                |                  | <u> </u>   | ٦,     | ocation: Sta  | 321+48.0, 1.1 ft. RT of SR 823 CL Date Drilled: 12/27/05   | 000710, 0121 001010                                       |
| 2000             | 1. 50                  | ing i          | \- <u>Z 10</u> , | Samp       | _      |   | WATER GRADATION GRADATION  |   |
| Depth<br>(ft)    | Elev.<br>(ft)<br>672.3 | Blows per 6"   | Recovery (in)    | Drive 02   |        | Hand Penetro- meter (Isf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring)   | STANDARD PENETRATION (N) Natural Moisture Content, % - PL |
| _<br>_           | -672.1-<br>-669.3-     | 3<br>6<br>18   | 17               | 1          |        | 4.5+  | Topsoil - 2" Hard brown SANDY SILT (A-4a), little to some clay; contains sandstone fragments; dry to damp.   | Ģ   |
| 5—               |                        | 6<br>9<br>14   | 17               | 2 ·        |        | 4.5+  | Hard brown SILT AND CLAY (A-6a), some fine to coarse sand; contains sandstone fragments; dry to damp.  | o Hill  |
| -<br>-<br>-      |                        | 10<br>12<br>16 | 18               | 3          |        | 4.5+  |  | ) \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\                    |
| 10               |                        | 47<br>30<br>24 | 18               | 4          | !<br>! | 4.5+  |  | )<br>   |
| —11.0—<br>—12.0— | 661.3~<br>660.3        |                | _18              | 5          |        | 3.0   | Very stiff brown SANDY SILT (A-4a), some clay; contains 2 4 - 29 42 23 sandstone fragments; moist.   | i <b>⊕</b>  |
| 15 —             |                        | Core<br>120"   | Rec<br>119"      | RQD<br>79% | R1     | *406  | Medium hard to hard brown and gray SANDSTONE; fine grained, highly to moderately weathered, argillaceous, micaceous, massive, highly to slightly fractured. @ 12.0'-14.2', 14.9'-15.0', 15.3'-15.5', 15.7'-16.0', 16.7'-17.4', 18.9'-19.2', iron staining.  @ 18.5'-19.2', broken. |   |
| -                | 650.3                  |                |                  | ·          |        | ļ   |  |   |
| -                | -                      |                |                  |            |        |   | Bottom of Boring - 22.0'   |   |
| 25 —<br>-<br>-   |                        |                |                  |            |        |   |  |   |
| -<br>30          |                        |                |                  |            |        |   |  |   |

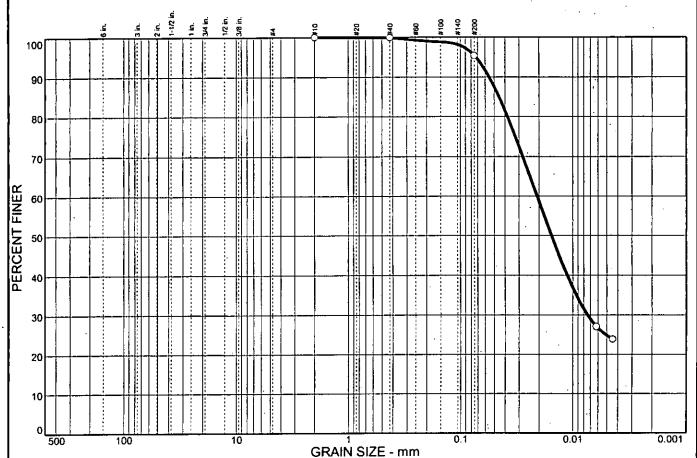
| Client: T        |                        |                 |               | <u> </u>         | <b>7</b> . |   | Project: SCI-823-0.00  | 1/24        | IOE       |           |     |    |        |      | Job N           | io. 012    | 1-3070.                                | 03         |
|------------------|------------------------|-----------------|---------------|------------------|------------|---|--|-------------|-----------|-----------|-----|----|--------|------|-----------------|------------|--|------------|
| _OG O            | r: B0                  | ring            | <b>₹-</b> 218 | <b>4</b><br>Samj |            |   | . 318+74.1, 247.4 ft. LT of SR 823 CL Date Drilled: 12 WATER   | JZ1.        |           | RAD       | ATI | ON |        |      |                 |            |  |            |
| Depth<br>(ft)    | Elev.<br>(ft)<br>677.0 | Blows per 6"    | Recovery (in) | Drive            |            | Hand Penetro- meter (Isf) / * Point-Load Strength (psi) | OBSERVATIONS: Water seepage at: None Water level at completion: None (prior to coring) 8.1' (inside hollowstem augers)  DESCRIPTION  | % Aggregate | % C. Sand | % M. Sand | u   | જિ | % Clay | Natu | ral Moi<br>L ⊢— | sture Co   | ETRATION<br>ontent, %<br>t - O<br>30 4 | -          |
| -0.2 <del></del> | -676.8                 |                 |               |                  |            |   | Topsoil - 2"   |             |           |           | Ì   |    |        |      |                 |            |  |            |
| -                |                        | 5<br>7<br>8     | 13            | 1                |            | 4.5+  | Hard brown CLAY (A-7-6), trace fine to coarse sand, trace gravel, some silt; moist.  | 1           | 1         | -         | 6   | 28 | 64     |      | a               | •          |  |            |
| -3.5<br>-<br>5 — | <del>6</del> 73.5      | .10<br>19<br>14 | 18            | 2                |            | 4.5+  | Hard brown SANDY SILT (A-4a), little clay; contains sandstone fragments; damp.   | 7           | 15        | <br> -    | 33  | 29 | 16     |      | <b>-</b>        | <b>/</b> / | Q                                      |            |
| -                |                        | 11<br>19<br>19  | 18            | _3               |            |   |  |             |           |           |     |    |        |      |                 |            | \<br>\<br>\                            | 4          |
| 10 -             |                        | 15<br>22<br>50  | 18            | 4                |            | 4.5+  |  |             |           |           |     |    |        |      |                 |            |  | $\Diamond$ |
| 12.5             | <del>-6</del> 64.5-    | 12<br>16<br>49  | 18            | 5                |            | 4.0   |  |             |           |           |     |    |        |      |                 |            | ,                                      |            |
| 15 —             |                        | Core<br>120"    | Rec<br>120"   | RQD<br>76%       | R1         | *1317   | Medium hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, massive, highly to slightly, fractured.  @ 12.5'-14.4', highly weathered, broken to highly fractured.  @ 14.4', 16.5', 17.1', decomposed low angle fractures.  @ 15.8'-16.1', contains argillaceous laminations. |             |           |           |     |    |        |      |                 |            |  |            |
| 20 —             |                        |                 |               |                  |            | ,   |  | -           |           |           |     |    |        |      |                 |            |  |            |
| 22.5             | <del>-6</del> 54.5-    |                 |               |                  |            |   | Bottom of Boring - 22 5'   |             |           |           |     |    |        |      |                 |            |  |            |
| 25 —<br>-        |                        |                 |               |                  |            |   | Sollow of Borning - 22.0   |             |           |           |     |    |        |      |                 |            |  |            |
| <br>-<br>30      |                        |                 |               |                  |            |   |  |             |           |           |     |    |        |      |                 |            |  |            |



## APPENDIX B

Laboratory Shear Strength Testing

## PARTICLE SIZE DISTRIBUTION TEST REPORT



|           | % GR | AVEL | İ    | % SANI | )    | % FINES |      |
|-----------|------|------|------|--------|------|---------|------|
| % COBBLES | CRS. | FINE | CRS. | MEDIUM | FINE | SILT    | CLAY |
| 0.0       | 0.0  | 0.0  | 0.0  | 0.1    | 4.6  | 70.5    | 24.8 |

| SIEVE              | PERCENT               | SPEC.*  | PASS?  |
|--------------------|-----------------------|---------|--------|
| SIZE               | FINER                 | PERCENT | (X=NO) |
| #10<br>#40<br>#200 | 100.0<br>99.9<br>95.3 |         |        |
|                    |                       |         | •      |
|                    |                       |         |        |
|                    |                       |         |        |
|                    |                       |         |        |

|  | Soil Description   | 1   |
|--|--|---|
| Lean clay  |  |   |
|  |  |   |
| PL= 19   | Atterberg Limits LL= 29  | <u>5</u><br>P <b>I</b> = 10                   |
| D <sub>85</sub> = 0.0454<br>D <sub>30</sub> = 0.0074<br>C <sub>U</sub> = | Coefficients D <sub>60</sub> = 0.0208 D <sub>15</sub> = C <sub>c</sub> = | D <sub>50</sub> = 0.0155<br>D <sub>10</sub> = |
| USCS= CL   | Classification<br>AASH   | TO= A-4(9)                                    |
|  | Remarks  |   |
| Moisture Conten  |  |   |
| Specific Gravity   | = 2.66   |   |

(no specification provided)

Sample No.: P-1

Source of Sample: R-102

Date: 11/29/05

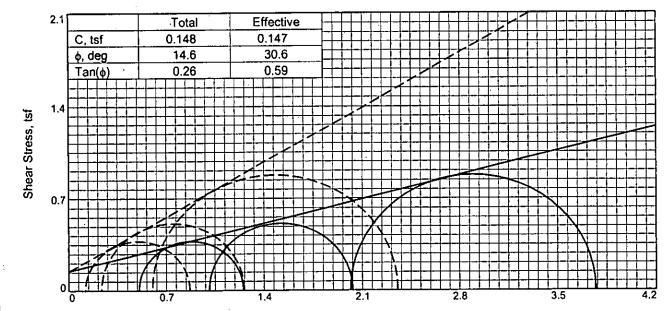
Location: Elev./Depth: 11



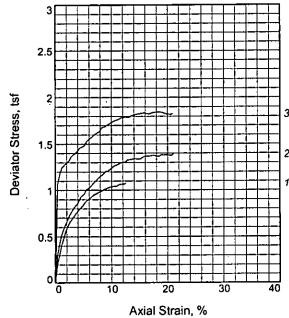
Client: TranSystems, Inc. Project: SCI-823-0.00

Project No: 0121-3070.03

**Figure** 



Total Normal Stress, tsf ————
Effective Normal Stress, tsf ———



| Туре | of | Test: |  |
|------|----|-------|--|

CU with Pore Pressures

Sample Type: 3" Press Tube

Description: Lean clay

LL= 29

**PL**= 19

PI= 10

**Assumed Specific Gravity= 2.66** 

Remarks:

|     | Sai                   | mple No.            | 1      | 2      | 3      |   |
|-----|-----------------------|---------------------|--------|--------|--------|---|
|     |                       | Water Content,      | 27.9   | 27.9   | 27.9   |   |
|     |                       | Dry Density, pcf    | 96.0   | 97.1   | 95.0   |   |
|     | Initial               | Saturation,         | 101.5  | 104.4  | 99.2   |   |
|     | ij                    | Void Ratio          | 0.7305 | 0.7103 | 0.7471 | • |
|     |                       | Diameter, in.       | 2.77   | 2.80   | 2.81   |   |
| 3   |                       | Height, in.         | 5.49   | 5.56   | 5.19   |   |
|     |                       | Water Content,      | 29.6   | 25.4   | 24.0   |   |
| _ ' |                       | Dry Density, pcf    | 92.9   | 99.2   | 101.4  |   |
| 2   | At Test               | Saturation,         | 100.0  | 100.0  | 100.0  |   |
|     | <b> </b> <del> </del> | Void Ratio          | 0.7872 | 0.6748 | 0.6383 |   |
| 1   | 1                     | Diameter, in.       | 2.82   | 2.79   | 2.75   |   |
|     |                       | Height, in.         | 5.45   | 5.47   | 5.07   |   |
|     | Str                   | ain rate, in./min.  | 0.06   | 0.06   | 0.06   |   |
|     | Ba                    | ck Pressure, tsf    | 4.03   | 4.03   | 4.03   |   |
|     | Се                    | ll Pressure, tsf    | 4.54   | 5.04   | 6.05   |   |
|     | Fai                   | I. Stress, tsf      | . 0.75 | 1.02   | 1.75   |   |
|     | 1                     | Total Pore Pr., tsf | 4.42   | 4.80   | 5.45   |   |
|     | Ult                   | . Stress, tsf       | 0.75   | 1.02   | 1.75   |   |
|     | 1                     | Total Pore Pr., tsf | 4.42   | 4.80   | 5.45   |   |
|     | $\overline{\sigma}_1$ | Failure, tsf        | 0.87   | 1.26   | 2.35   |   |
|     | $\overline{\sigma}_3$ | Failure, tsf        | 0.12   | 0.24   | 0.60   |   |

Client: TranSystems, Inc.

**Project:** SCI-823-0.00

Source of Sample: R-102

Depth: 11

Sample Number: P-1

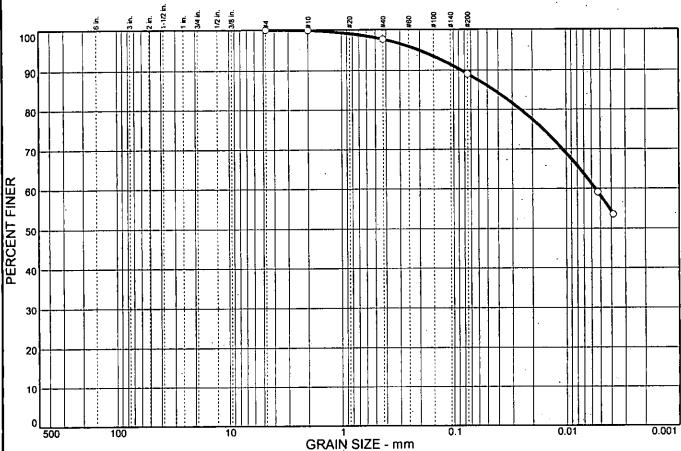
Proj. No.: 0121-3070.03

Date: 11/29/05



Figure \_\_\_\_\_





| <del></del> | % GR | AVEL | 1    | % SAND | <u> </u> | % FINE | <u> </u> |
|-------------|------|------|------|--------|----------|--------|----------|
| % COBBLES   | CRS. | FINE | CRS. | MEDIUM | FINE.    | SILT   | CLAY     |
| 0.0         | 0.0  | 0.0  | 0.1  | 2.3    | 8.5      | 30.9   | 58.2     |

| SIEVE<br>SIZE            | PERCENT<br>FINER              | SPEC.*<br>PERCENT | PASS?<br>(X=NO) |
|--------------------------|-------------------------------|-------------------|-----------------|
| #4<br>#10<br>#40<br>#200 | 100.0<br>99.9<br>97.6<br>89.1 |                   |                 |
|                          |                               |                   |                 |
| •                        |                               |                   |                 |
|                          |                               |                   |                 |

| Lean clay Delete  | Soil Description Sample S1 - CIU   |  |  |  |  |
|---|--|--|--|--|--|
| PL= 22  | Atterberg Limits LL= 48  | PI= 26                                 |  |  |  |
| D <sub>85</sub> = 0.0439<br>D <sub>30</sub> =<br>C <sub>u</sub> = | Coefficients D <sub>60</sub> = 0.0056 D <sub>15</sub> = C <sub>c</sub> = | D <sub>50</sub> =<br>D <sub>10</sub> = |  |  |  |
| USCS= CL  | Classification<br>AASHT  | O= A-7-6(25                            |  |  |  |
| Remarks Moisture Content= 26.9% Specific Gravity= 2.71            |  |  |  |  |  |

(no specification provided)

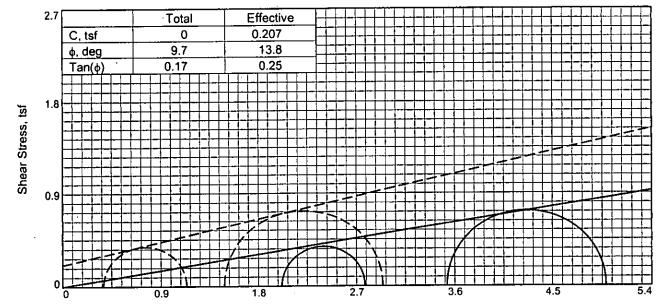
Sample No.: P1 Location: Source of Sample: R-104

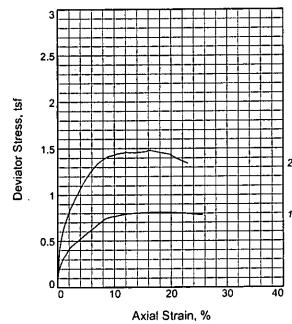
**Date:** 10/7/05 **Elev./Depth:** 18.0

Client: TranSystems, Inc. Project: SCI-823-0.00

Project No: 0121-3070.03

Figure





|   | Sample No.   |  | 1  | 2  |  |
|---|--|--|--|--|--|
|   | Initial  | Water Content, Dry Density, pcf Saturation, Void Ratio Diameter, in. Height, in. | 26.9<br>98.0<br>100.2<br>0.7271<br>2.82<br>5.21      | 26.9<br>98.0<br>100.4<br>0.7259<br>2.80<br>5.12              |  |
| 2 | At Test  | Water Content, Dry Density, pcf Saturation, Void Ratio Diameter, in. Height, in. | 28.2<br>95.9<br>100.0<br>0.7648<br>2.85<br>5.21      | 26.5<br>98.5<br>100.0<br>0.7183<br>2.79<br>5.12              |  |
|   | Strain rate, in./min. Back Pressure, tsf Cell Pressure, tsf Fail. Stress, tsf Total Pore Pr., tsf Ult. Stress, tsf Total Pore Pr., tsf |  | 0.01<br>4.03<br>6.05<br>0.76<br>5.67<br>0.78<br>5.68 | 0.01<br>4.03<br>7.56<br>1.46<br>6.07<br>1.47<br>6.04<br>2.94 |  |
|   | o  σ  σ  σ  σ  σ  σ  σ  σ  σ  σ  σ  σ  σ   |  | 0.37   | 1.49   |  |

Type of Test:

CU with Pore Pressures
Sample Type: Press Tube

Description: Lean clay Delete Sample S1 - CIU

LL= 48

**PL=** 22

PI= 26

Specific Gravity= 2.71

Remarks:

**Project:** SCI-823-0.00

Client: TranSystems, Inc.

Source of Sample: R-104

**Depth:** 18.0

Sample Number: P1

Proj. No.: 0121-3070.03

Date: 10/7/05



Figure \_\_\_\_

· .

## APPENDIX C

Slope Stability Analyses



SUBJECT

TransSystems / ODOT Dist 9

SCI - 823 - 0.00

Mainline Embankment Stability - Phase 3

Stability Analysis - Summary

JOB NUMBER SHEET NO.

CHECKED BY

0121-3070.03

COMP. BY

DATE 3/28/2007

JTH DAA

Evaluate the slope stability for all cross-section.

A total of 1

Phase 3

0+00 to 352+00

|           |        |           | Maximum |            | Cohesive  |        |                  |                   |         |                    |
|-----------|--------|-----------|---------|------------|-----------|--------|------------------|-------------------|---------|--------------------|
| Fill Se   | ction  | X-section | Fill    | Foundation | Soil      |        |                  |                   |         |                    |
| Local     | tion   | Analyzed  | Height  | Thickness  | Thickness |        | Factor of Safety |                   |         |                    |
| Beginning | Ending | (Station) | (feet)  | (feet)     | (feet)    | Slope  | Undrained        | Drained           | Seismic | Comments           |
| 63+00     | 75+00  | 66+00     | 49.0    | 21.0       | 21.0      | 2.0:1  | 1.95             | 1.80              | 1.67    |                    |
| 105+00    | 114+34 | 105+00    | 104.0   |            |           | 2.5:1  | Ana              | Analysis Included |         |                    |
| 116+09    | 122+42 | 116+00    | 70.0    |            |           | 2.5:1  | in Highland Bend |                   |         |                    |
| 123+09    | 131+54 | 123+50    | 74.0    |            |           | 2.5:1  | Report           |                   |         |                    |
| 166+50    | 168+50 |           | 39.7    | <2.0       | <2.0      | 2.0:1  | OK by inspection |                   |         |                    |
| 173+50    | 188+00 | 175+40    | 86.0    | 36.0       | 7.0       | 2.5:1  | 1.30             | 1.64              | 1.50    |                    |
| 188+00    | 197+50 |           | 39.0    | 13.0       | 13.0      | 2.0:1  | OK by inspection |                   |         |                    |
| 207+00    | 212+50 | 209+50    | 90.1    | 13.0       | 0.0       | 2.0:1  | 1.79             | 1.59              | 1.47    |                    |
| 227+00    | 257+75 | 240+00    | 195.6   | 5.5        | 5.5       | 2.0:1_ | 1.41             | 1.56              | 1.45    | * - infinite slope |
| 268+25    | 273+25 | 271+50    | 49.0    | 24.5       | 24.5      | 2.0:1  | 2.16             | 1.40*             | 1.30*   | solution           |
| 289+00    | 306+50 | 298+25    | 219.4   | 20.5       | 7.5       | 2.0:1  | 1.29             | 1.54              | 1.43    |                    |
| 308+50    | 315+50 | 312+00    | 158.9   | 13.0       | 0.0       | 2.0:1  | 1.31             | 1.57              | 1.46    |                    |
| 315+50    | 324+00 | 319+75    | 94.8    | 13.0       | 13.0      | 2.0:1  | 1.75             | 1.59              | 1.47    |                    |
| 328+00    | 330+00 |           | 36.5    | 5.0        | 5.0       | 2.0:1  | OK by inspection |                   |         |                    |
| 343+00    | 348+00 |           | 91.1    | 8.0        | 8.0       | 2.0:1  | OK by inspection |                   |         |                    |

Use UTEXAS3 stope stability program by S.G. Wright, Ver 1.204, 10/22/1993.

Analyze for undrained, drained and seismic loading condition.

Use a pseudo-static seismic coefficient of 0.03.

Conservatively, use a ground water table of 5 feet below the ground surface.

The borrow source for the embankments has not been identified.

Use the following shear strength parameters for compacted fill for embankments under 40 feet in height.

2,000

degrees

300 psf 28

Use the following shear strength parameters for compacted fill for embankments over 40 feet in height.

c =

ø =

osf

c' =

0 psf

ø =

35

degrees

ø' =

35 degrees

degrees

|                      |             |               |         | ·       |                    |          |          |
|----------------------|-------------|---------------|---------|---------|--------------------|----------|----------|
|                      |             |               | Undr    | ained   | Dra                |          |          |
| Material             | Consistency | Soil Type     | C (psf) | Φ (deg) | C' (psf)           | φ' (deg) | γ (pcf)  |
| Material 1           | Compacted   | Emb. Fill     | 2000    | 0       | 300                | 28       | 120      |
| Material 2           |             | Silt and Clay | 2000    | 0       | 0                  | 30       | 120      |
| Material 3           |             | Silt          | 1000    | 0       | 0                  | 29       | 120      |
| Material 4           |             | Bedrock       | 5000    | 45      | 5000               | 45       | 145      |
| El 578.7<br>El 573.6 |             |               | Mo      |         |                    | nt Heigh | nt=32.0′ |
|                      | El 557.7'   |               |         |         |                    |          |          |
|                      |             | Undrained FS  | S=1.95  |         | FS=1.80<br>FS=1.67 |          |          |

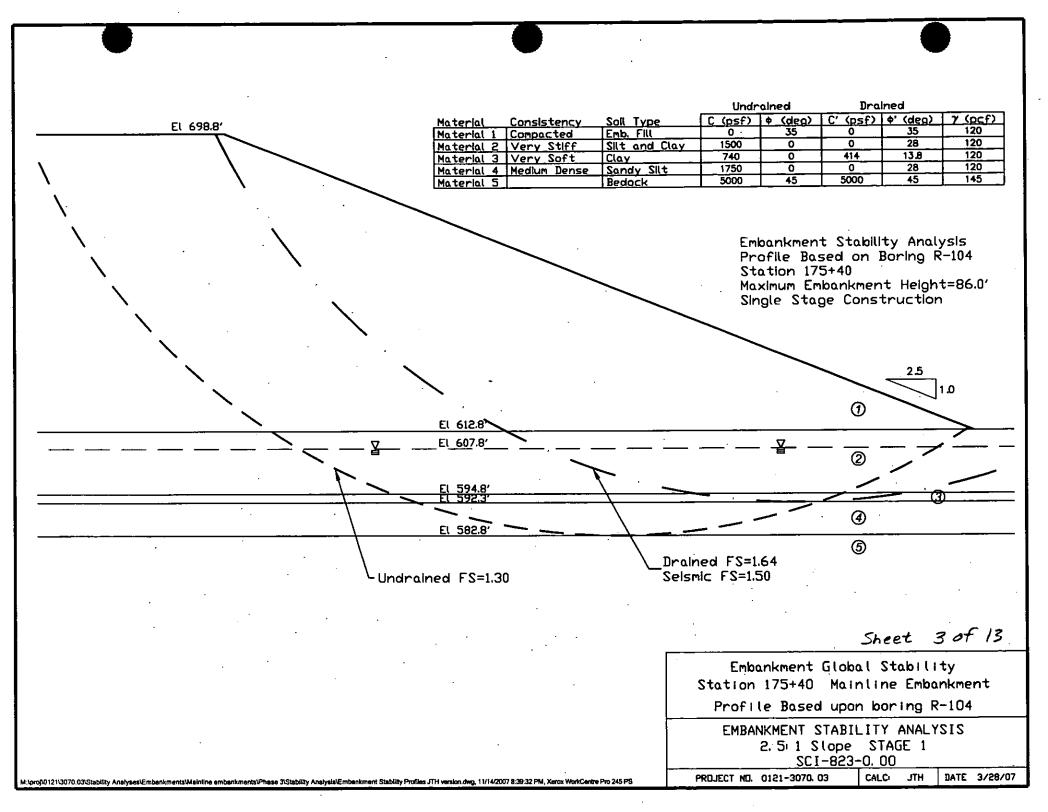
Sheet 2 of 13

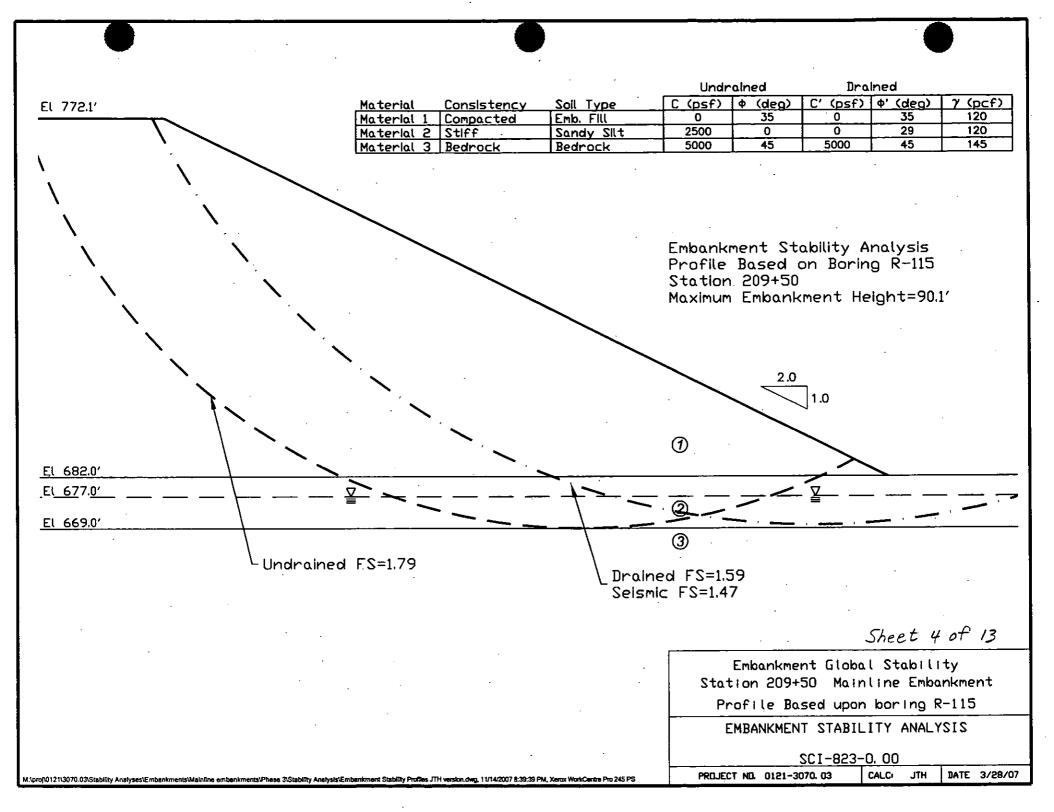
Embankment Global Stability
Station 66+00 Mainline Embankment
Profile Based upon boring R-25
EMBANKMENT STABILITY ANALYSIS

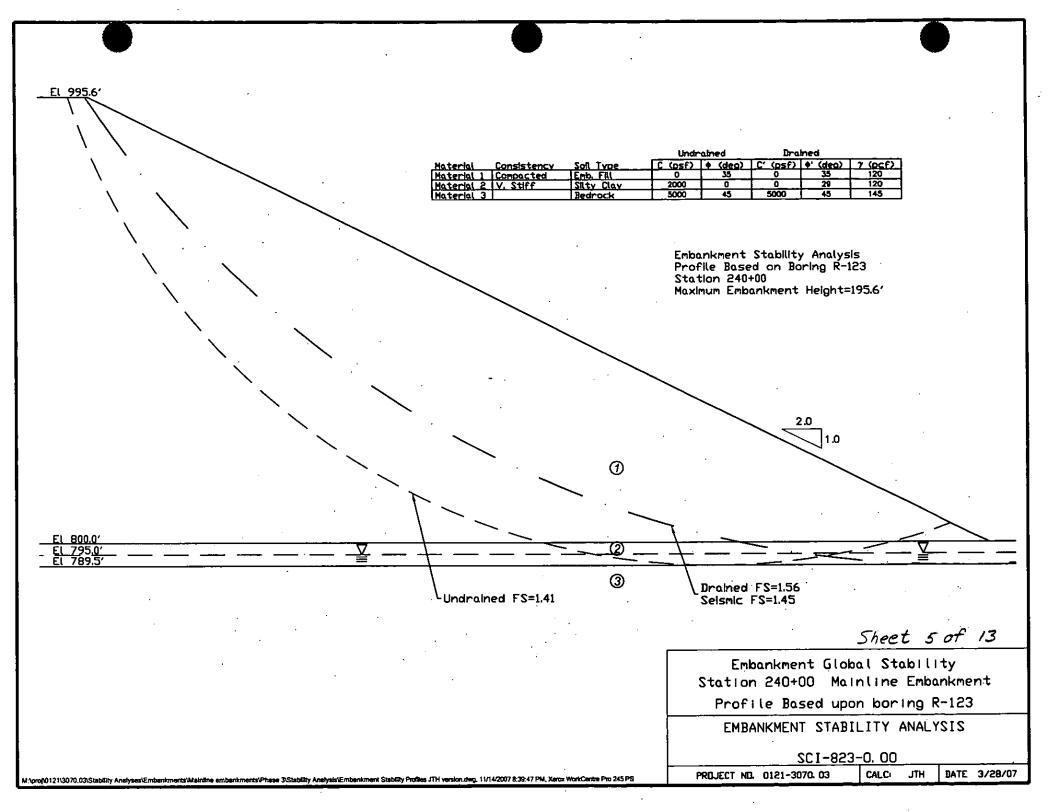
SCI-823-0.00

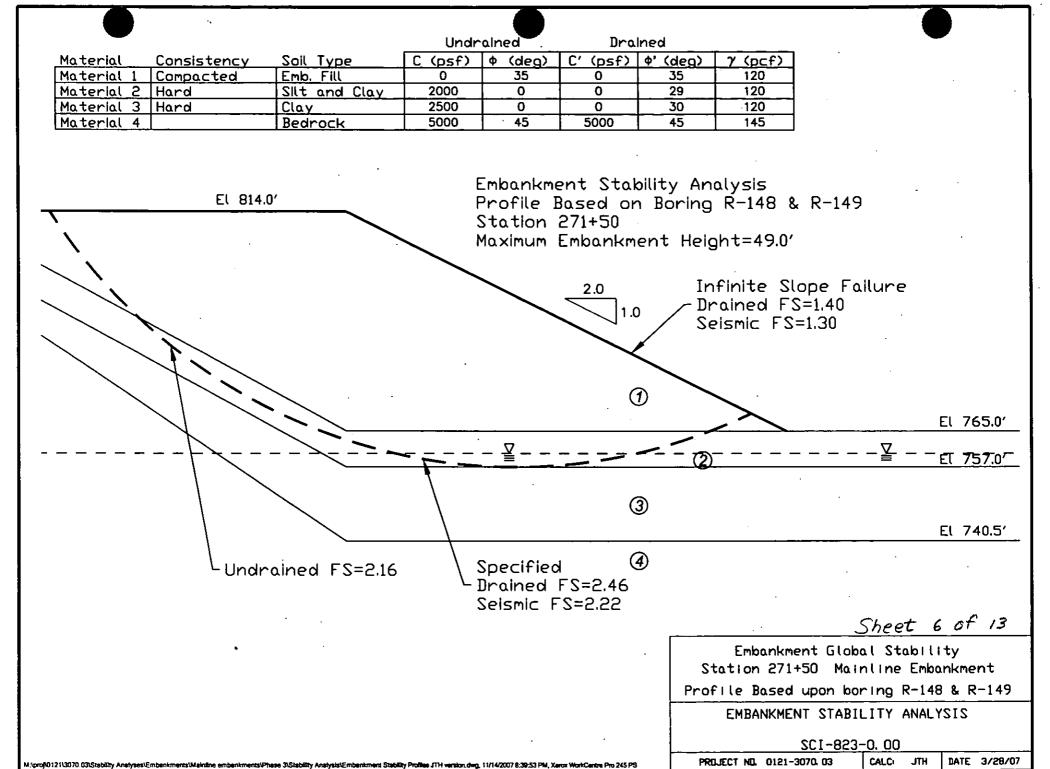
PROJECT NO. 0121-3070. 03 CALC: JTH DATE 3/28/07

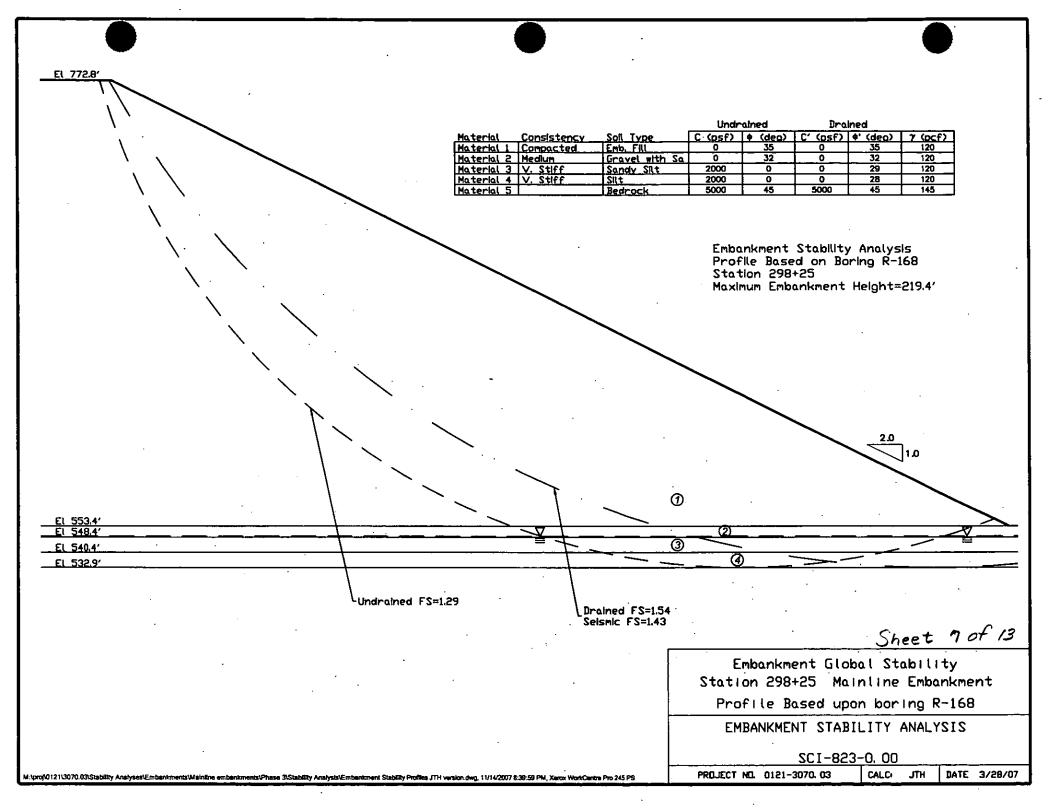
M:\profi0121\3070.03\Stability Analyses\Embankments\Meinline embankments\Phase 3\Stability Analysis\Embankment Stability Profice JTH version.dwg, 11/14/2007 8:39:24 PM, Xerox WorkCentre Pro 245 PS

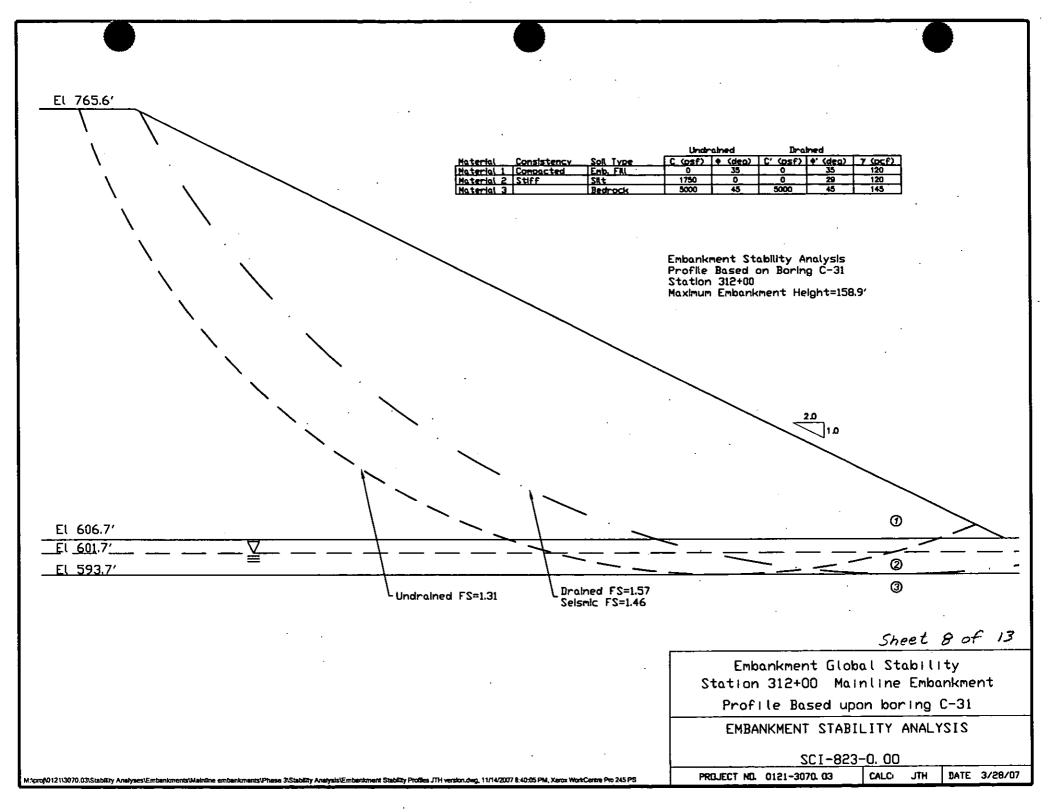


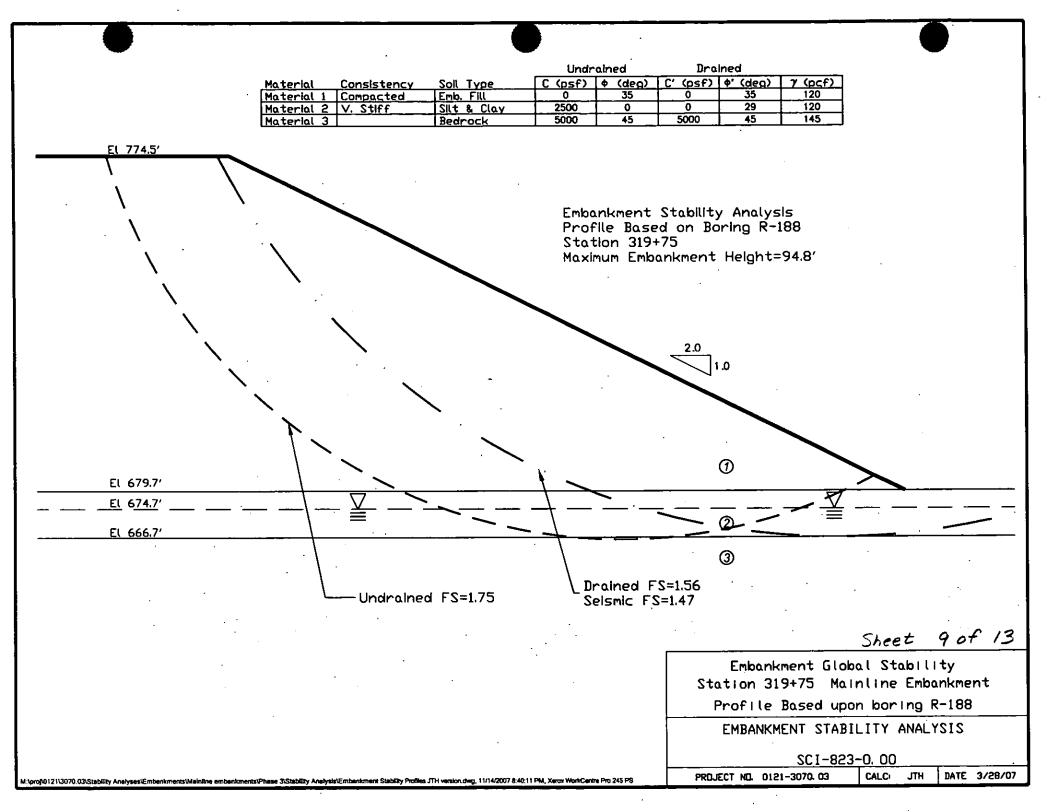














| CLIENT     | TRAIS 45/2175 DOOT DIST 9 |   |
|------------|---------------------------|---|
| PROJECT_SC | <u> </u>                  | _ |

SUBJECT MAIN LINE EMBRACH FUT

STABILITY ANALYSIS

PROJECT NO. 0/2 / - 3070.03

SHEET NO. 0F /3

COMP. BY DATE 3/28/07

CHECKED BY DAA DATE 11/12/07

6774 166150 TO 168+50 (SOUTH HO ; LOW POAD)

BORINGS R-89, R-89A, R-88 + R-93 ARE CLOSEST TO MUSIMUM SECTION.

R-89, R-89A MID R-93 DID NOT ADVANCE TO TOP OF ROCK. THEREFORE, ACTUAL SUESURFACE CONDITIONS ARE UNKNOWN. THESE BORINGS ENCOUNTERBD FILL OVER SIXT AND CHY + SANDY SIXT. THE BORING TERMINATED IN OVERBURDEN.

R-88 ENCOUNTERED TOP OF PECK AT 2.0 FT 595.

EMBNORMENT HOSTOUT = 39.7 F

BASED ON PROVIOUS ANATYSIS, USE A 2:1 SLOPE.



CLIENT / DEO? UST 9 PROJECT NO. 0/2/-3070.03 PROJECT <u>SC1-Q23-0.00</u>

SHEET NO.

COMP. BY \_\_\_

STABILATY ANALYSIS

DATE/1/12/07

STA 186+50 to 197+50

BOXINGS R-106, R-106A, R-107

R-107 HAS CRITICAL FOUNDATION CONDITION 13 FT SULTAND CLASS N= 9TO 33

MAXIMUM HOSGIFF = 39 FT

SIMILAR FOUNDATION CONDITIONS TO STATION 319+75, WHERE ZII SLOPES ARE OK.

USE 24:1V SLOPES



PLANNERS - SURVEYORS

| CLIENT        | T8ANS45722 | n/0001 51579 | PROJECT NO. | 0/2/-3 | 070.03       |    |
|---------------|------------|--------------|-------------|--------|--------------|----|
| PROJECT_      | 501-826    | -0,00        | SHEET NO    | 12     | of /3        | ,  |
| s<br>SUBJECT_ | MIMINAINE  | EMBANKMONT   | COMP. BY    | HH-    | DATE 3/28/   | 67 |
| _             | 470000     |              | CHECKED BY  | TAA    | DITE 1/12 10 | 7  |

STA 328+00 TO 330+00

BORINGS C-34, C-35 AND R-192 ARE IN SECTION.

BELDON IS SUMMON, TYPICATLY 3 TO 5 FEET
EMBANKMENT HODGET = 37 F4

BASED ON SHALLOW DEDRECK DEDTH AND EMBALLMENT METGLIT OF 37 F+ USE A 2:1 SLOPE.



CLIENT TRANS 4575M O DOT DIST 9 PROJECT NO. 021-3070.03

PROJECT 501-823-0.00 SHEET NO. 13 OF 13

SUBJECT MOTONELINE EMBANKINE TO COMP. BY\_

COMP. BY \_\_\_\_\_\_\_\_ DATE 3/28/0

STABILITY ANALYSIS

CHECKED BY / DATE 11/12/07

STA 343+50 to 348+00

BORINGS R-203 + R-205 ARE IN SECTION.

BEDFOCK IS SHALLOW COMPARED TO EMBANKMENT HEDGHT.

BASED ON PROVIOUS ANALYSIS USE A ZIL SLOPE.



## APPENDIX D

**Settlement Calculations** 



CLIENT TransSystems / ODOT Dist 9
PROJECT SCI - 823 - 0.00
SUBJECT Mainline Embankment
Settlement - Summary

Evaluate the quantity of settlement for the fill cross-sections.

|           |                          |           | Maximum |            | Cohesive  |                                  | Total            |  |
|-----------|--------------------------|-----------|---------|------------|-----------|----------------------------------|------------------|--|
| Fill Se   | ection                   | X-section | Fill    | Foundation | Soil      | Immediate                        | · Primary        |  |
| Loca      | ation                    | Analyzed  | Height  | Thickness- | Thickness | Settlement                       | Settlement       |  |
| Beginning | Ending                   | (Station) | (feet)  | (feet)     | (feet)    | (inch)                           | (inch)           |  |
| 63+00     | 75+00                    | 66+00     | 32.0    | 21.0       | 21.0      | 0                                | 5.1              |  |
| 105+00    | 5+00 114+34 105+00 104.0 |           |         |            |           | Analyzed In Highland Bend Report |                  |  |
| 116+23    | 122+42                   | 116+00    | 70.0    |            |           |                                  | land Bend Report |  |
| 123+09    | 131+50                   | 123+50    | 74.0    |            |           | Analyzed In High                 | land Bend Report |  |
| 166+50    | 168+50                   |           | 39.7    | <2.0       | <2.0      | negligible                       | negligible       |  |
| 173+50    | 188+00                   | 175+40    | 86.0    | 30.0       | 20.5      | 2.4                              | 16.7             |  |
| 188+00    | 197+50                   | 189+00    | 39.0    | 13.0       | 13.0      | 0.0                              | 4.4              |  |
| 207+00    | 212+50                   | 209+50    | 90.1    | 13.0       | . 0.0     | negligible                       | negligible       |  |
| 227+00    | 257+75                   | 240+00    | 195.6   | 5.5        | 5.5       | 3.4                              | 3.4              |  |
| 268+25    | 273+25                   | 271+50    | 49.0    | 24.5       | 24.5      | 0.0                              | 10.0             |  |
| 289+00    | 306+50                   | 298+25    | 219.4   | 20.5       | 7.5       | 2.3                              | 12.1             |  |
| 308+50    | 315+50                   | 312+00    | 158.9   | 13.0       | 0.0       | 0.0                              | 5.7              |  |
| 315+50    | 324+00                   | 319+75    | 94.8    | 13.0       | 13.0      | 0.0                              | 13.4             |  |
| 328+00    | 330+00                   |           | 36.5    | 5.0        | 5.0       | negligible                       | negligible       |  |
| 343+00    | 348+00                   |           | 91.1    | 8.0        | 8.0       | negligible                       | negligible       |  |



**PROJECT** SUBJECT

TransSystems / ODOT Dist 9

SCI - 823 - 0.00

Mainline Embankment Settlement - Soil Properties

JOB NUMBER SHEET NO.

COMP, BY

**CHECKED BY** 

No consolidation test data available. No known equations or

Practice, Terzaghi and Peck, 1967)

correlation for overconsolidated soils. Use these equations for normally consolidated soils. (Soil Mechanics in Engineering

0121-3070.03

OF 18 **JTH** DATE

3/28/07 DAA DATE 11/12/07

Cross-section geomerty and soil properties.

$$e_0 = \frac{Gs \times wc}{100}$$

Assume  $G_s = 2.70$  for clayey soils.

Therefore,

$$e_0 = \frac{2.70 \text{ x wc}}{100}$$

 $C_c = 0.009 (LL-10)$ 

C' (Hough Coef.) is from the chart on page 14 of 18.

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 66+00     | 32     | 21.0       |  |  |

| Soil Layer | Thickness | Soil Type   | wc   | LL | PI | e <sub>o</sub> | Cc    | C <sub>r</sub> | N | C' |
|------------|-----------|-------------|------|----|----|----------------|-------|----------------|---|----|
| 1          | 5.5       | Silt & Clay | 25.0 | 33 | 13 | 0.675          | 0.207 | 0.021          |   |    |
| 2          | 15.5.     | Silt        | 26.0 | 29 | 8  | 0.702          | 0.171 | 0.017          |   |    |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 105+00    | 104    |            |  |  |

| Soil Layer Thickness | Soil Type | wc | LL           | PI            | e <sub>n</sub> | C <sub>c</sub> | C <sub>r</sub> | N        | C' |
|----------------------|-----------|----|--------------|---------------|----------------|----------------|----------------|----------|----|
| Son Layer Thickness  | , ,       |    | moleted as i | part of the I | Highland Bo    | end report.    | · ·            | <u> </u> |    |

|           | Fill   | Foundation |
|-----------|--------|------------|
| X-section | Height | Thickness  |
|           | (feet) | (feet)     |
| 116+00    | 70     |            |

| Soil Layer Thickness | Soil Type | WC          | LL           | PI            | e <sub>o</sub> | C <sub>c</sub> | C <sub>r</sub> | N        | C, |
|----------------------|-----------|-------------|--------------|---------------|----------------|----------------|----------------|----------|----|
|                      | /         | Analysis co | mpleted as p | oart of the I | lighland Be    | end report.    | -              | <u> </u> |    |



TransSystems / ODOT Dist 9 0121-3070.03 JOB NUMBER CLIENT PROJECT SCI - 823 - 0.00 SHEET NO. 3/28/07 SUBJECT Mainline Embankment COMP. BY JTH DAT<sub>{</sub> DAA DATE 11/12/07 Settlement - Soil Properties CHECKED BY

| X-section | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
|           | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 123+50    | 74     |            |  |  |

| Soil Layer Thickness | Soil Type | WC          | LL           | PI            | e <sub>o</sub> | Cc         | Cr | Ν | C' |
|----------------------|-----------|-------------|--------------|---------------|----------------|------------|----|---|----|
|                      |           | unalycic co | malatad as r | part of the I | Highland Re    | and report |    |   |    |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
| 1         | (feet) | (feet)     |  |  |
| 166+50    | 39.7   | <2.0       |  |  |

| Soil Layer | Thickness | Soil Type  | WC | LL | PI  | e <sub>o</sub> | C <sub>c</sub> | Cr   | N | C, |
|------------|-----------|------------|----|----|-----|----------------|----------------|------|---|----|
| 1          | <2.0      | Sandy Silt |    |    | neg | ligible prim   | ary settlen    | nent |   |    |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 175+40    | 86     | 30.0       |  |  |

| Soil Layer | Thickness | Soil Type   | WC     | LL     | Pl     | e <sub>o</sub> | $C_c$  | C <sub>r</sub> | N  | C  |
|------------|-----------|-------------|--------|--------|--------|----------------|--------|----------------|----|----|
| 1          | 18.0      | Silt & Clay | 21.0   | 33.0   | 12.0   | 0.567          | 0.207  | 0.021          |    |    |
| 2          | 2.5       | Clay        | 27.0   | 48.0   | 27.0   | 0.729          | 0.342  | 0.034          |    |    |
| 3          | 9.5       | Sandy Silt  | No Lab | No Lab | No Lab | No Lab         | No Lab | No Lab         | 12 | 40 |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 189+00    | 39.0   | 13.0       |  |  |

| Soil Layer | Thickness | Soil Type   | WC   | LL   | PI   | e <sub>o</sub> | C <sub>c</sub> | C,    | N | C' |
|------------|-----------|-------------|------|------|------|----------------|----------------|-------|---|----|
| 1          | 13.0      | Silt & Clay | 19.0 | 28.0 | 17.5 | 0.513          | 0.162          | 0.016 |   |    |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 209+50    | 90.1   | 13.0       |  |  |

| Soil Layer Thickness Soil Type | wc                            | LL | Ē | e <sub>o</sub> | င | C <sub>r</sub> | N | C' |  |  |  |
|--------------------------------|-------------------------------|----|---|----------------|---|----------------|---|----|--|--|--|
|                                | negligible primary settlement |    |   |                |   |                |   |    |  |  |  |



CLIENT PROJECT SUBJECT

TransSystems / ODOT Dist 9 SCI - 823 - 0.00

Settlement - Soil Properties

JOB NUMBER Mainline Embankment

SHEET NO. COMP. BY-CHECKED BY

0121-3070.03 18 OF 3/28/07 JTH DATE 11/12/07 DAA DATE

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 240+00    | 195.6  | 5.5        |  |  |

| Soil Layer | Thickness | Soil Type  | WC | LL | PI | e <sub>o</sub> | C <sub>c</sub> | C <sub>r</sub> | N | Ċ  |
|------------|-----------|------------|----|----|----|----------------|----------------|----------------|---|----|
| 1          | 5.5       | Sandy Silt |    |    |    |                |                |                | 8 | 36 |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 271+50    | 49     | 24.5       |  |  |

|     |   |      |             |      |   |       |       |       | <br> |
|-----|---|------|-------------|------|---|-------|-------|-------|------|
| ſ   | 1 | 8.0  | Silt & Clay | <br> | • | 0.513 | 0.162 | 0.016 | <br> |
| . [ | 2 | 16.5 | Clay        | <br> |   | 0.729 | 0.342 | 0.034 | <br> |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 298+25    | 219.4  | 20.5       |  |  |

| Soil Layer | Thickness | Soil Type  | WC  | LL | . Pl | e <sub>o</sub> | C <sub>c</sub> | , C <sub>r</sub> | N  | ,C' |
|------------|-----------|------------|-----|----|------|----------------|----------------|------------------|----|-----|
| 1          | 5.5       | Grvl w/ Sa |     | '  |      |                |                |                  | 10 | 55  |
| 2          | 7.5       | Sandy Silt | *** |    |      |                |                |                  | 12 | 40  |
| 3          | 7.5       | Silt       |     |    |      | 0.513          | 0.177          | 0.018            |    |     |

| Fill   | Foundation       |  |  |
|--------|------------------|--|--|
| Height | Thickness        |  |  |
| (feet) | (feet)           |  |  |
| 158.9  | 13.0             |  |  |
|        | Height<br>(feet) |  |  |

| Soil Layer |      | Soil Type  | WC | LL | PI | e <sub>o</sub> | Cc | C <sub>r</sub> | N  | C' |
|------------|------|------------|----|----|----|----------------|----|----------------|----|----|
| 1          | 13.0 | Sandy Silt | 16 |    |    |                |    |                | 12 | 40 |

|           | Fill   | Foundation |  |  |
|-----------|--------|------------|--|--|
| X-section | Height | Thickness  |  |  |
|           | (feet) | (feet)     |  |  |
| 319+75    | 94.8   | 13.0       |  |  |

| Soil Layer | Thickness | Soil Type  | WC   | LL   | Pl   | e <sub>o</sub> | $C_c$ | C <sub>r</sub> | N | C'  |
|------------|-----------|------------|------|------|------|----------------|-------|----------------|---|-----|
| 1          | 13.0      | Silty Clay | 18.0 | 33.0 | 15.0 | 0.486          | 0.207 | 0.021          |   | *** |



TransSystems / ODOT Dist 9 JOB NUMBER 0121-3070.03 18 SCI - 823 - 0.00 SHEET NO. OF DATE 3/28/07 SUBJECT Mainline Embankment COMP. BY JTH DATE 11/12/07 DAA Settlement - Soil Properties **CHECKED BY** 

| X-section | Fill   | Foundation |  |  |  |  |
|-----------|--------|------------|--|--|--|--|
|           | Height | Thickness  |  |  |  |  |
|           | (feet) | (feet)     |  |  |  |  |
| 328+00    | 36.5   | 5.0        |  |  |  |  |

|                      |           |    |    |              |                |    |                |   | ·  |
|----------------------|-----------|----|----|--------------|----------------|----|----------------|---|----|
| Soil Layer Thickness | Soil Type | wc | LL | PI           | e <sub>o</sub> | Cc | C <sub>r</sub> | N | C' |
|                      |           |    |    | orimary sett | lement         |    |                |   |    |

|           | Fill   | Foundation |
|-----------|--------|------------|
| X-section | Height | Thickness  |
|           | (feet) | (feet)     |
| 343+00    | 91.1   | 8.0        |

| Soil Layer Thickness | Soil Type | wc | LL           | PI           | e <sub>o</sub> _ | Cc | Cr | N | C' |
|----------------------|-----------|----|--------------|--------------|------------------|----|----|---|----|
|                      |           |    | negligible p | orimary sett | lement           |    |    |   |    |



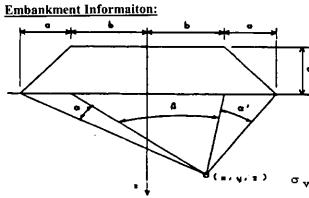
Client TranSystem / ODOT Dist. 9 Project SCI-823-0.00 Item Mainline Embankment - Settlement

Station 66+00

JOB NUMBER SHEET NO. . COMP. BY **CHECKED BY** 

0121-3070.03 OF JTH 03/28/07 DATE 11/12/07 DAA DATE

### SETTLEMENT ANALYSIS - EMBANKMENT



D=5.0 ft Groundwater Table: ft H =32 Embankment Height:

120 3,840 psf Fill Unit Weight:  $\gamma_{\rm emb} =$ pcf

Width of Slope:

45 Top half-width of Emb: b =

Distance from CL: 0

0 Output Range: z =

\*See Data output Attached

$$\sigma_{\gamma}(z) := \left(\frac{q}{\pi a}\right) \left(a \left(\alpha(z) + \beta(z) + \alpha'(z)\right) + b \left(\alpha(z) + \alpha'(z)\right) + x \left(\alpha(z) - \alpha'(z)\right)\right)$$

$$\beta(z) := atan \left[ \frac{(b-x)}{z} \right] + atan \left[ \frac{(b+x)}{z} \right]$$

$$\alpha^t(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right] \qquad \alpha(z) := atan \left[ \frac{(a+b+x)}{z} \right] - atan \left[ \frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis". Table C-1

|     |          |         |               |                         |                       |                       |           |                       | Cohesionles | S    |           |                |
|-----|----------|---------|---------------|-------------------------|-----------------------|-----------------------|-----------|-----------------------|-------------|------|-----------|----------------|
|     | Soil Pro | operite | Settlement is | calculated at mid-      | point of layer        |                       |           |                       | Soils       | Co   | hesive So | oils           |
|     | Bot. of  |         | Soil Type     | γ <sub>soil</sub> (pcf) | σ' <sub>c</sub> (psf) | σ' <sub>o</sub> (psf) | Δσz (psf) | σ' <sub>f</sub> (psf) | C'          | Cr   | Cc        | e <sub>o</sub> |
| سار | 5.5      | ft      | Silt & Clay   | 120                     | 1,650                 | 330                   | 3,840     | 4,170                 | 0.0         | 0.02 | 0.21      | 0.675          |
|     | 21.0     | ft      | Silt          | 120                     | 6,450                 | 1,075                 | 3,829     | 4,904                 | 0.0         | 0.02 | 0.17      | 0.702          |
| 3   | 0.0      | -       |               | 0                       | 0                     |                       |           |                       |             |      |           | <u> </u>       |
| 4   | 0.0      |         |               | 0                       | 0                     |                       |           | ·                     |             |      |           |                |
| 5   | 0.0      |         |               | 0                       | 0                     |                       |           |                       |             | •    |           |                |
| 6   | 0.0      |         |               | 0                       | 0                     |                       |           |                       |             |      |           |                |
| 7   | 0.0      |         |               | 0                       | 0                     |                       |           |                       | · • · ·     |      |           |                |
| 8   | 0.0      |         |               | 0                       | 0                     |                       |           |                       |             |      |           |                |
| 9   | 0.0      |         |               | 0                       | 0                     |                       |           |                       |             |      |           |                |
| 10  | 0.0      |         |               | 0                       | 0                     |                       |           |                       |             |      |           |                |

|     |          |      | •                |
|-----|----------|------|------------------|
| No. | Settleme | ent: | Total Settlement |
| j   | 0.322    | ft   |                  |
| 2   | 0.102    | ft   | 0.424 ft         |
| 3   |          | ·    | <del></del> -    |
| 4   |          |      |                  |
| 5   |          |      | 5.1 in           |
| 6   |          |      |                  |

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ( $\sigma'_0 < \sigma'_c$ ) Eqn:11.24

$$\left(\delta_{c}\right)_{ult} = \sum \frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_c < \sigma_f$ ) Eqn:11.25

$$\left(\delta_{c}\right)_{uh} = \Sigma \left[\frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{c}}{\sigma'_{0}}\right) + \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{c}}\right)\right]$$

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_c$ ) Eqn: 11.23

$$\left(\delta_{c}\right)_{uh} = \sum \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

$$\left(\delta_{c}\right)_{ut} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$



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Mainline Embankment - Settlement Station 175+40

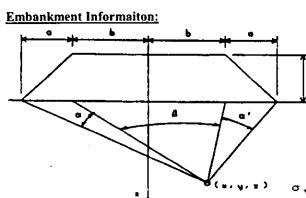
JOB NUMBER

SHEET NO.

COMP. BY **CHECKED BY**  0121-3070.03

JTH DAA DATE

## SETTLEMENT ANALYSIS - EMBANKMENT



Groundwater Table: D=

5.0 ft

Embankment Height: H =86 ft

Fill Unit Weight: 120  $\gamma_{\rm emb} =$ pcf q = 10,320 psf

Width of Slope: 215

Top half-width of Emb:

Distance from CL:

0 Output Range:

\*See Data output Attached

$$\sigma_{\mathbf{v}}(z) := \left(\frac{q}{\pi a}\right) \left(a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z))\right)$$

$$\beta(z) := atan \left[ \frac{(b-x)}{z} \right] + atan \left[ \frac{(b+x)}{z} \right]$$

$$\alpha^{t}(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) := \operatorname{atan} \left[ \frac{(a+b-x)}{z} \right] - \operatorname{atan} \left[ \frac{(b-x)}{z} \right] \qquad \alpha(z) := \operatorname{atan} \left[ \frac{(a+b+x)}{z} \right] - \operatorname{atan} \left[ \frac{(b+x)}{z} \right]$$

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Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis". Table C-1

| ~ .   | •     |        |
|-------|-------|--------|
| ( Ahe | 2010  | nless  |
| CULIC | 25 IU | 111622 |
|       |       |        |

|    | Soil Pro  | perite | es: Settlement is | calculated at mid-      |                     | Soils               | Co                      | hesive Sc                    | 0.675<br>0.567<br>0.000 |                |                |                |
|----|-----------|--------|-------------------|-------------------------|---------------------|---------------------|-------------------------|------------------------------|-------------------------|----------------|----------------|----------------|
| -  | Bot. of I |        | Soil Type         | γ <sub>soil</sub> (pcf) | $\sigma'_{c}$ (psf) | $\sigma'_{o}$ (psf) | $\Delta \sigma$ z (psf) | $\sigma'_{\mathrm{f}}$ (psf) | C'                      | C <sub>r</sub> | C <sub>c</sub> | e <sub>o</sub> |
| 1- | 18.0      | ft     | Silt & Clay       | 120                     | 4,150               | 830                 | 10,317                  | 11,147                       | 0.0                     | 0.02           | 0.21           | 0.675          |
| •  | 20.5      | ft     | Clay              | 120                     | 7,105               | 1,421               | 10,289                  | 11,710                       | 0.0                     | 0.02           | 0.17           | 0.567          |
| 3  | 30.0      | ft     | Sandy Silt        | 120                     | 8,830               | 1,766               | 10,254                  | 12,021                       | 40.0                    | 0.00           | 0.00           | 0.000          |
| 4  | 0.0       |        |                   | 0                       | 0                   |                     |                         |                              |                         |                |                |                |
| 5  | 0.0       |        |                   | 0                       | 0                   |                     | ·                       |                              |                         | . <u></u>      |                |                |
| 6  | 0.0       |        |                   | 0                       | 0                   |                     |                         |                              |                         |                |                |                |
| 7  | 0.0       |        |                   | 0                       | 0                   |                     |                         | ·                            |                         |                |                |                |
| 8  | 0.0       |        |                   | 0                       | 0                   |                     |                         |                              |                         |                |                |                |
| 9  | 0.0       |        |                   | 0                       | 0                   |                     |                         |                              |                         |                |                |                |
| 10 | 0.0       |        |                   | 0                       | 0                   |                     |                         |                              |                         |                |                |                |

Total Settlement

1.112 0.078 ft

No. Settlement:

1.388

3 0.198

ft

16.7 in

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_s < \sigma_f$ ) Eqn:11.25  $\left(\delta_{c}\right)_{uh} = \sum \left[\frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{c}}{\sigma'_{0}}\right) + \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{c}}\right)\right]$ 

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_s$ ) Eqn: 11.23

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999 Overconsolidated Soils - Case I ( $\sigma'_0 < \sigma'_c$ ) Eqn:11.24

$$(\delta_c)_{nh} = \sum \frac{C_c}{1 + e_0} H \log \left( \frac{\sigma'_f}{\sigma'_0} \right)$$

 $(\delta_c)_{uh} = \sum \frac{C_r}{1 + e_0} H \log \left( \frac{\sigma'_f}{\sigma'_0} \right)$ 

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

$$(\delta_c)_{uh} = \sum \frac{1}{C'} H \log \left( \frac{\sigma'_f}{\sigma'_0} \right)$$

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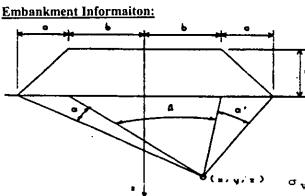
Mainline Embankment - Settlement Station 189+00

SHEET NO. COMP. BY CHECKED BY

JOB NUMBER

0121-3070.03 OF JTH 03/28/07 DATE DAA DATE

### **SETTLEMENT ANALYSIS - EMBANKMENT**



D=5.0 Groundwater Table: ft Embankment Height: H =39

Fill Unit Weight: 120 4,680 psf  $\gamma_{\rm emb} =$ pcf

Width of Slope:

45 Top half-width of Emb: b =

Distance from CL: 0

Output Range: z =to

\*See Data output Attached

$$\sigma_{\psi}(z) := \left(\frac{q}{\pi}\right) \left( e \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z)) \right)$$

$$\beta(z) := atan \left[ \frac{(b-x)}{z} \right] + atan \left[ \frac{(b+x)}{z} \right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) \coloneqq \text{atan} \left[ \frac{(a+b-x)}{z} \right] - \text{atan} \left[ \frac{(b-x)}{z} \right] \qquad \alpha(z) \coloneqq \text{atan} \left[ \frac{(a+b+x)}{z} \right] - \text{atan} \left[ \frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

#### Cohesionless

|    | Soil Pro | perite | es: Settlement is | calculated at mid- | point of layer |                     |                         |                       | Soils    | Co   | hesive So      | oils   |
|----|----------|--------|-------------------|--------------------|----------------|---------------------|-------------------------|-----------------------|----------|------|----------------|--|
|    | Bot. of  |        | Soil Type         |                    |                | $\sigma'_{o}$ (psf) | $\Delta \sigma z$ (psf) | σ' <sub>f</sub> (psf) | C'       | Cr   | C <sub>c</sub> | e <sub>o</sub>                               |
| 1. | 13.0     | ft     | Silt & Clay       | 120                | 3,430          | 686                 | 4,679                   | 5,365                 | 0.0      | 0.02 | 0.16           | 0.513  |
|    | 0.0      |        |                   | 0                  | 0              |                     |                         |                       | <u></u>  | ,    |                |  |
| 3  | 0.0      |        |                   | 0                  | 0              |                     |                         |                       |          |      |                | <u>.                                    </u> |
| 4  | 0.0      |        |                   | 0                  | 0              |                     |                         |                       |          |      |                |  |
| 5  | 0.0      |        |                   | 0                  | 0              |                     |                         | ·<br>                 |          |      | -,             |  |
| 6  | 0.0      |        |                   | 0                  | 0              |                     |                         |                       |          |      |                | <u> </u>                                     |
| 7  | 0.0      |        |                   | 0                  | 0              |                     |                         |                       | <u> </u> |      |                |  |
| 8  | 0.0      |        |                   | 0                  | 0              |                     |                         |                       |          | ,    |                |  |
| 9  | 0.0      |        |                   | 0                  | 0              |                     |                         |                       |          |      |                |  |
| 10 | 0.0      |        |                   | 0                  | 0              |                     |                         |                       |          |      |                |  |

No. Settlement: **Total Settlement** 

ft

l 0.366 0.3662 4.4 in Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I (
$$\sigma'_0 < \sigma'_c$$
) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1 + e_0} H \log \left( \frac{\sigma'_f}{\sigma'_o} \right)$$

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_c < \sigma_t$ ) Eqn:11.25

$$\left(\delta_{c}\right)_{ult} = \Sigma \left[\frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{c}}{\sigma'_{0}}\right) + \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{c}}\right)\right]$$

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_c$ ) Eqn: 11.23

$$\left(\delta_c\right)_{uh} = \sum \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0}\right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

$$(\delta_c)_{ut} = \sum \frac{1}{C'} H \log \left( \frac{\sigma'_f}{\sigma'_0} \right)$$



Client TranSystem / ODOT Dist. 9

Station 240+00

Project SCI-823-0.00 Mainline Embankment - Settlement

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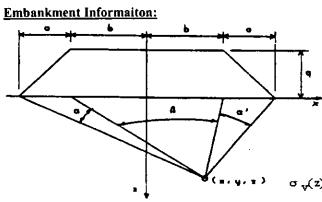
JOB NUMBER SHEET NO.

0121-3070.03 OF JTH DATE DAA DATE

q = 23,472 psf

ft

#### **SETTLEMENT ANALYSIS - EMBANKMENT**



Groundwater Table: 5.0

Embankment Height: 195.6 Fill Unit Weight: 120 pcf

 $\gamma_{\rm emb} =$ 

Width of Slope: 391.2

Top half-width of Emb: b = 45

Distance from CL:

Output Range: to

\*See Data output Attached

$$\sigma_{\sqrt{z}}(z) := \left(\frac{q}{\pi \cdot a}\right) \left(a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z))\right)$$

ft

$$\beta(z) := atan \left[ \frac{(b-x)}{z} \right] + atan \left[ \frac{(b+x)}{z} \right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right] \qquad \alpha(z) := atan \left[ \frac{(a+b+x)}{z} \right] - atan \left[ \frac{(b+x)}{z} \right]$$

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Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

|       |          |        |                   |                           |                       |                       | •         |                       | Conesionies | iS             |                |                |
|-------|----------|--------|-------------------|---------------------------|-----------------------|-----------------------|-----------|-----------------------|-------------|----------------|----------------|----------------|
| 5     | Soil Pro | perite | es: Settlement is | Soils                     | Cohesive Soils        |                       |           |                       |             |                |                |                |
| No. I | 3ot. of  | Laye   | Soil Type         | $\gamma_{\rm soil}$ (pcf) | σ' <sub>c</sub> (psf) | σ' <sub>o</sub> (psf) | Δσz (psf) | σ' <sub>f</sub> (psf) | C'          | C <sub>r</sub> | C <sub>c</sub> | e <sub>o</sub> |
| ط     | 5.5      | ft     | Sandy Silt        | 120                       | 3,070                 | 330                   | 23,472    | 23,802                | 36.0        | 0.00           | 0.00           | 0.000          |
|       | 0.0      |        |                   | 0                         | 0                     |                       |           |                       |             |                |                | ,              |
| 3     | 0.0      |        |                   | 0                         | 0                     |                       |           |                       |             |                |                |                |
| 4     | 0.0      |        |                   | Ö                         | 0                     |                       |           |                       |             |                |                |                |
| 5     | 0.0      |        |                   | 0                         | 0                     |                       |           |                       |             |                |                |                |
| 6     | 0.0      |        |                   | 0                         | 0                     |                       |           |                       |             |                |                |                |
| 7     | 0.0      |        |                   | 0                         | 0                     |                       |           |                       |             |                |                |                |
| 8     | 0.0      | ٠      |                   | 0 .                       | 0                     |                       |           |                       |             |                |                |                |
| 9     | 0.0      |        |                   | 0                         | 0                     | •                     |           |                       |             |                |                |                |
| 10    | 0.0      |        |                   | 0                         | 0                     |                       |           |                       |             |                |                |                |

No. Settlement: **Total Settlement** 

0.284 1 ft 2

0.284ft

3.4 in Reference: Geotechnical Engineering Principles and Practices: Coduto, 1999

Overconsolidated Soils - Case I ( $\sigma'_0 < \sigma'_c$ ) Eqn:11.24

$$\left(\delta_{c}\right)_{uh} = \sum \frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_c < \sigma_t$ ) Eqn:11.25

$$\left(\delta_{c}\right)_{ult} = \sum \left[\frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{c}}{\sigma'_{0}}\right) + \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{c}}\right)\right]$$

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_c$ ) Eqn: 11.23

$$\left(\delta_{c}\right)_{uh} = \sum \frac{C_{c}}{1 + e_{o}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{o}}\right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

$$\left(\delta_{c}\right)_{ut} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$



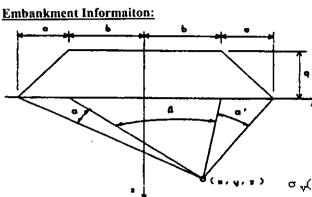
Client TranSystem / ODOT Dist. 9 Project SCI-823-0.00 Mainline Embankment - Settlement

Station 271+50

JOB NUMBER SHEET NO. COMP, BY CHECKED BY

0121-3070.03 OF 03/28/07 JTH DATE DATE 11/12/07 DAA

### **SETTLEMENT ANALYSIS - EMBANKMENT**



Groundwater Table: D= 5.0 Embankment Height: H= 49

Fill Unit Weight:  $\gamma_{\rm emb} =$ 120 pcf 5.880 psf

Width of Slope: 98

Top half-width of Emb: b =

Distance from CL: 0

Output Range: 7 ==

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999 Overconsolidated Soils - Case I ( $\sigma'_0 < \sigma'_c$ ) Eqn:11.24

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_c < \sigma_f$ ) Eqn:11.25

 $\left(\delta_{c}\right)_{nh} = \sum \left[\frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{c}}{\sigma'_{0}}\right) + \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{c}}\right)\right]$ 

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_c$ ) Eqn: 11.23

\*See Data output Attached

$$\sigma_{\gamma}(z) := \left(\frac{q}{\pi a}\right) \left(a\left(\alpha(z) + \beta(z) + \alpha'(z)\right) + b\left(\alpha(z) + \alpha'(z)\right) + x\left(\alpha(z) - \alpha'(z)\right)\right)$$

$$\beta(z) := atan \left[ \frac{(b-x)}{z} \right] + atan \left[ \frac{(b+x)}{z} \right]$$

$$\alpha'(z) := \operatorname{atan} \left[ \frac{(a+b-x)}{z} \right] - \operatorname{atan} \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) \coloneqq \operatorname{atan} \left[ \frac{(a+b-x)}{z} \right] - \operatorname{atan} \left[ \frac{(b-x)}{z} \right] \qquad \alpha(z) \coloneqq \operatorname{atan} \left[ \frac{(a+b+x)}{z} \right] - \operatorname{atan} \left[ \frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

|       |                |        |                   |                         |                        |   |                         |  | Cohesionles                           | SS  |                                 |                |  |
|-------|----------------|--------|-------------------|-------------------------|------------------------|---|-------------------------|--|---------------------------------------|---|---------------------------------|----------------|--|
| :     | Soil <u>Pr</u> | operit | es: Settlement is | calculated at mid-      | point of layer         |   |                         |  | Soils                                 | Co  | Cohesive Soils                  |                |  |
| No.   | Bot. of        | Laye   | Soil Type         | 7 <sub>soil</sub> (pcf) | σ' <sub>c'</sub> (psf) | σ' <sub>o</sub> (psf)                         | $\Delta \sigma z$ (psf) | $\sigma'_{\mathbf{f}}$ (psf)                       | C'                                    | C <sub>r</sub>                              | $C_c$                           | e <sub>o</sub> |  |
| _<br> | 8.0            | ft     | Silt & Clay       | 120                     | 2,400                  | 480   | 5,880                   | 6,360  | 0.0                                   | 0.02  | 0.16                            | 0.513          |  |
|       | 24.5           | ft     | Clay              | 120                     | 6,240                  | 1,248   | 5,858                   | 7,106  | 0.0                                   | 0.03  | 0.34                            | 0.729          |  |
| 3     | 0.0            |        |                   | 0                       | 0                      |   |                         |  | · · · · · · · · · · · · · · · · · · · |   |                                 | , <u> </u>     |  |
| 4     | 0.0            |        |                   | 0                       | 0                      |   |                         | · · · <del>- · - · - · - · - · - · - · - · -</del> |                                       | · <del> · · · · · · · · · · · · · · ·</del> | · · · · · · · · · · · · · · · · |                |  |
| 5     | 0.0            |        |                   | 0                       | 0                      |   |                         | ,  |                                       |   |                                 |                |  |
| 6     | 0.0            |        |                   | 0                       | 0                      | <u>, , , , , , , , , , , , , , , , , , , </u> |                         |  |                                       | ·   |                                 |                |  |
| 7     | 0.0            |        |                   | 0                       | 0                      |   |                         |  |                                       |   |                                 |                |  |
| 8     | 0.0            |        |                   | 0                       | 0                      |   |                         |  |                                       |   |                                 |                |  |
| 9     | 0.0            |        |                   | 0                       | 0                      |   |                         |  | ·                                     |   |                                 |                |  |
| 10    | 0.0            |        |                   | . 0                     | 0                      |   |                         |  |                                       |   |                                 |                |  |

No. Settlement: **Total Settlement** 

0.422 0.411 ft

0.833

3 4 5

6

10.0 in

 $(\delta_c)_{uh} = \sum \frac{C_c}{1 + e_o} H \log \left( \frac{\sigma'_f}{\sigma'_o} \right)$ 

 $(\delta_c)_{ut} = \sum \frac{C_r}{1 + e_0} H \log \left( \frac{\sigma'_f}{\sigma'_o} \right)$ 

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

 $(\delta_c)_{ut} = \sum \frac{1}{C!} H \log \left( \frac{\sigma'_f}{\sigma'_c} \right)$ 



Mainline Embankment - Settlement Station 298+25

JOB NUMBER SHEET NO. COMP. BY

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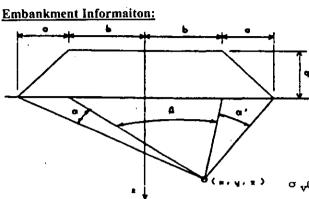
ft

ft

pcf

0121-3070.03 JTH DATE DAA DATE

#### **SETTLEMENT ANALYSIS - EMBANKMENT**



5.0 Groundwater Table: 219.4 Embankment Height:

Fill Unit Weight:

q = 26,328 psf

438.8 Width of Slope:

Top half-width of Emb: b =

Distance from CL:

Output Range:

\*See Data output Attached

$$\sigma_{q}(z) := \left(\frac{q}{\pi a}\right) \left(a \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + b \cdot (\alpha(z) + \alpha'(z)) + x \cdot (\alpha(z) - \alpha'(z))\right)$$

120

$$\beta(z) \coloneqq \text{atan} \left[ \frac{(b-x)}{z} \right] + \text{atan} \left[ \frac{(b+x)}{z} \right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right] \qquad \alpha(z) := atan \left[ \frac{(a+b+x)}{z} \right] - atan \left[ \frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis". Table C-1

|    |          |        | ·               |                           |                     |                       | •                                |                       | Cohesionles | s              |                |         |
|----|----------|--------|-----------------|---------------------------|---------------------|-----------------------|----------------------------------|-----------------------|-------------|----------------|----------------|---------|
| S  | oil Pra  | perite | Settlement is o | alculated at mid-         | point of layer      |                       |                                  |                       | Soils       | Co             | hesive So      | oils    |
| _  | ot. of I |        | Soil Type       | $\gamma_{\rm soil}$ (pcf) | $\sigma'_{c}$ (psf) | σ' <sub>0</sub> (psf) | $\Delta \sigma \mathbf{z}$ (psf) | σ' <sub>f</sub> (psf) | C'          | C <sub>r</sub> | C <sub>c</sub> | $e_{o}$ |
| _  | 5.5      | ft     | Grvl w/ Sand    | 120                       | 1,650               | 330                   | 26,328                           | 26,658                | 55.0        | 0.00           | 0.00           | 0.000   |
|    | 13.0     | ft     | Sandy Silt      | 120                       | 4,225               | 845                   | 26,323                           | 27,168                | 40.0        | 0.00           | 0.00           | 0.000   |
| 3  | 20.5     | ft     | Silt            | 120                       | 8,250               | 1,277                 | 26,302                           | 27,578                | 0.0         | 0.02           | 0.18           | 0.513   |
| 4  | 0.0      |        |                 | 0                         | 0                   |                       |                                  |                       |             |                |                | ·       |
| 5  | 0.0      |        |                 | 0                         | 0                   | ,                     |                                  |                       |             |                |                |         |
| 6  | 0.0      |        |                 | 0                         | 0                   |                       |                                  |                       |             |                |                |         |
| 7  | 0.0      |        |                 | 0                         | 0                   |                       |                                  |                       |             |                |                |         |
| 8  | 0.0      | •      |                 | 0 .                       | 0                   |                       |                                  |                       |             |                |                |         |
| 9  | 0.0      |        |                 | 0                         | 0                   |                       |                                  |                       |             |                |                |         |
| 10 | 0.0      |        |                 | 0                         | 0                   |                       |                                  |                       |             |                |                |         |

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ( $\sigma'_0 < \sigma'_c$ ) Eqn:11.24

$$\left(\delta_{c}\right)_{utt} = \sum \frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_c < \sigma_f$ ) Eqn:11.25

$$(\delta_c)_{nh} = \sum \left[ \frac{C_r}{1 + e_0} H \log \left( \frac{\sigma'_c}{\sigma'_0} \right) + \frac{C_c}{1 + e_0} H \log \left( \frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_s$ ) Eqn: 11.23

$$(\delta_c)_{uh} = \sum \frac{C_c}{1+e_0} H \log \left(\frac{\sigma'_f}{\sigma'_0}\right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

$$\left(\delta_{c}\right)_{uh} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

No. Settlement: 0.191 0.283 0.532

**Total Settlement** 

ft 1.006

12.1 in



Mainline Embankment - Settlement Station 312+00

JOB NUMBER

SHEET NO. .

COMP. BY CHECKED BY 0121-3070.03

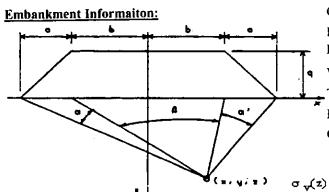
12 OF 18

**JTH** DATE DAA DATE

19,068 psf

3828/07

### SETTLEMENT ANALYSIS - EMBANKMENT



Groundwater Table:

5.0

158.9 Embankment Height:

120 Fill Unit Weight: Width of Slope: 317.8

45 Top half-width of Emb: b =

Distance from CL: 0

Output Range:

\*See Data output Attached

$$\sigma_{\mathbf{v}}(z) := \left(\frac{q}{\pi a}\right) \left(a\left(\alpha(z) + \beta(z) + \alpha'(z)\right) + b\left(\alpha(z) + \alpha'(z)\right) + x\left(\alpha(z) - \alpha'(z)\right)\right)$$

$$\beta(z) := \operatorname{atan}\left[\frac{(b-x)}{z}\right] + \operatorname{atan}\left[\frac{(b+x)}{z}\right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) \coloneqq \text{atan} \left[ \frac{(a+b-x)}{z} \right] - \text{atan} \left[ \frac{(b-x)}{z} \right] \qquad \alpha(z) \coloneqq \text{atan} \left[ \frac{(a+b+x)}{z} \right] - \text{atan} \left[ \frac{(b+x)}{z} \right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

|    |           |        |                  | •                  |                         | •                                     |                 | ,                     | Cohesionle  | SS   |           |                |
|----|-----------|--------|------------------|--------------------|-------------------------|---------------------------------------|-----------------|-----------------------|-------------|------|-----------|----------------|
| 5  | Soil Proj | perite | s: Settlement is | calculated at mid- | point of layer          | •                                     |                 |                       | Soils       | Co   | hesive So | oils           |
| _  | Bot. of L |        | Soil Type        |                    | $\sigma'_{\rm c}$ (psf) | $\sigma$ ' <sub>o</sub> (psf)         | Δσz (psf)       | σ' <sub>f</sub> (psf) | C'          | Cr   | $C_{c}$   | e <sub>o</sub> |
| _  | 13.0      | fì     | A-4a/A-4b        | 120                | 3,430                   | 686                                   | 19,066          | 19,753                | 40.0        | 0.00 | 0.00      | 0.000          |
|    | 0.0       |        |                  | 0                  | 0                       |                                       |                 |                       | <del></del> | ·    |           |                |
| 3  | 0.0       |        |                  | 0                  | 0                       |                                       |                 |                       |             |      |           |                |
| 4  | 0.0       |        |                  | 0                  | 0                       | · · · · · · · · · · · · · · · · · · · |                 |                       | _           |      |           |                |
| 5  | 0.0       |        |                  | 0                  | 0                       |                                       | - · . <u></u> - |                       |             |      |           |                |
| 6  | 0.0       |        |                  | 0                  | 0                       |                                       |                 |                       |             |      |           | <del> </del>   |
| 7  | 0.0       |        |                  | 0                  | 0                       |                                       |                 |                       |             |      |           |                |
| 8  | 0.0       |        |                  | 0                  | 0                       |                                       |                 | <u></u> .             |             |      |           |                |
| 9  | 0.0       |        |                  | 0                  | 0                       |                                       |                 | ·                     |             |      |           |                |
| 10 | 0.0       |        |                  | 0                  | 0                       |                                       |                 |                       |             |      |           |                |

No. Settlement:

**Total Settlement** 

0.474 2

0.474ft

5.7

in

3

10

 $(\delta_c)_{ull} = \sum \frac{C_r}{1 + e_0} H \log \left( \frac{\sigma'_f}{\sigma'_o} \right)$ 

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_c < \sigma_t$ ) Eqn:11.25

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999 Overconsolidated Soils - Case I ( $\sigma'_0 < \sigma'_c$ ) Eqn:11.24

$$\left(\delta_{c}\right)_{nh} = \Sigma \left[\frac{C_{r}}{1 + e_{0}} H \log \left(\frac{\sigma'_{c}}{\sigma'_{0}}\right) + \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{c}}\right)\right]$$

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_c$ ) Eqn: 11.23

$$\left(\delta_{c}\right)_{utt} = \sum \frac{C_{c}}{1+e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

$$(\delta_c)_{utr} = \sum \frac{1}{C'} H \log \left( \frac{\sigma'_f}{\sigma'_0} \right)$$



Mainline Embankment - Settlement

**JOB NUMBER** 

SHEET NO. COMP. BY

**JTH** DATE DAA

**CHECKED BY** Station 319+75

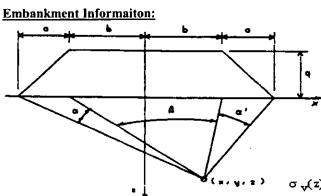
ft

pcf

DATE

0121-3070.03

## **SETTLEMENT ANALYSIS - EMBANKMENT**



Groundwater Table:

D=5.0

Embankment Height: H =94.8 ft

Fill Unit Weight: 120 q = 11,376 psf

Width of Slope:

189.6

Top half-width of Emb: b =

Distance from CL:

Output Range:

13

\*See Data output Attached

$$\sigma_{\mathbf{v}}(z) := \left(\frac{\mathbf{q}}{\pi}\right) \left(\mathbf{a} \cdot (\alpha(z) + \beta(z) + \alpha'(z)) + \mathbf{b} \cdot (\alpha(z) + \alpha'(z)) + \mathbf{x} \cdot (\alpha(z) - \alpha'(z))\right)$$

$$\beta(z) := atan \left[ \frac{(b-x)}{z} \right] + atan \left[ \frac{(b+x)}{z} \right]$$

$$\alpha'(z) := atan \left[ \frac{(a+b-x)}{z} \right] - atan \left[ \frac{(b-x)}{z} \right]$$

$$\alpha'(z) \coloneqq \operatorname{atan}\left[\frac{(a+b-x)}{z}\right] - \operatorname{atan}\left[\frac{(b-x)}{z}\right] \qquad \alpha(z) \coloneqq \operatorname{atan}\left[\frac{(a+b+x)}{z}\right] - \operatorname{atan}\left[\frac{(b+x)}{z}\right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

| ( '~ | 100101 | OCC. |
|------|--------|------|
| V.O  | hesion | 1033 |
|      |        |      |

| 5  | oil Pro | perite | es: Settlement i | s calculated at mid-    | point of layer      |                     |                         |                         | Soils          | Co             | hesive.So      | oils           |
|----|---------|--------|------------------|-------------------------|---------------------|---------------------|-------------------------|-------------------------|----------------|----------------|----------------|----------------|
| -  | ot. of  |        | Soil Type        | γ <sub>soil</sub> (pcf) | $\sigma'_{c}$ (psf) | $\sigma'_{o}$ (psf) | $\Delta \sigma$ z (psf) | $\sigma'_{\rm f}$ (psf) | C'             | C <sub>r</sub> | C <sub>c</sub> | e <sub>o</sub> |
| 1  | 13.0    | ft     | Silt             | 120                     | 3,430               | 686                 | 11,374                  | 12,061                  | 0.0            | 0.02           | 0.21           | 0.486          |
|    | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 3  | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 4  | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 5  | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 6  | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 7  | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 8  | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 9  | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
| 10 | 0.0     |        |                  | 0                       | 0                   |                     |                         |                         |                |                |                |                |
|    |         |        | •                |                         | R                   | eference: Geo       | technical Engine        | ering Principles        | and Practices; | Coduto, 19     | 99             |                |

**Total Settlement** 

No. Settlement: 1 1.117 ft 2 3

ft 1.117

13.4 in Overconsolidated Soils - Case I ( $\sigma'_{0} < \sigma'_{c}$ ) Eqn:11.24

$$\left(\delta_{c}\right)_{ult} = \sum \frac{C_{r}}{1+e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

Overconsolidated Soils - Case II ( $\sigma'_0 < \sigma'_c < \sigma_f$ ) Eqn:11.25

$$(\delta_c)_{nlt} = \sum \left[ \frac{C_r}{1 + e_0} H \log \left( \frac{\sigma'_c}{\sigma'_0} \right) + \frac{C_c}{1 + e_0} H \log \left( \frac{\sigma'_f}{\sigma'_c} \right) \right]$$

Normally Consolidated Soils ( $\sigma'_0 = \sigma'_c$ ) Eqn: 11.23

$$\left(\delta_{c}\right)_{uh} = \sum \frac{C_{c}}{1 + e_{0}} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$

Reference: FHWA NHI-00-045

Cohesionless Soils ( $\sigma'_0 = \sigma'_c$ )

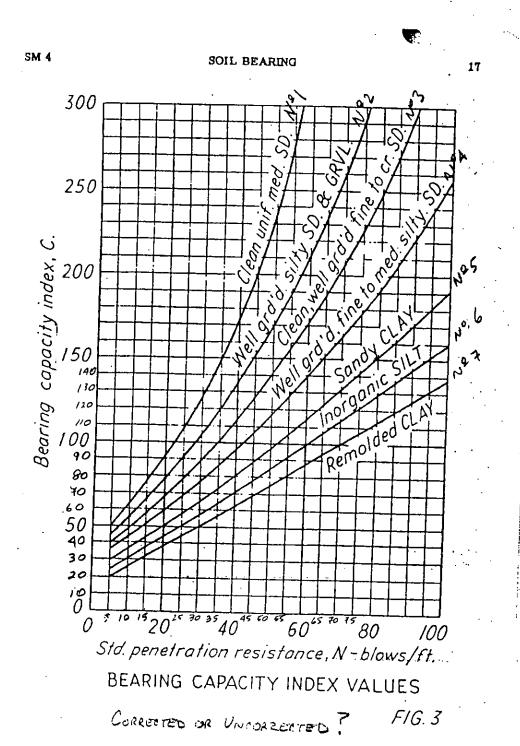
$$\left(\delta_{c}\right)_{ut} = \sum \frac{1}{C'} H \log \left(\frac{\sigma'_{f}}{\sigma'_{0}}\right)$$





| CLIENT TransSystems / ODOT Dist 9 | JOB NUMBER | 01  | 21-3070.03    |
|-----------------------------------|------------|-----|---------------|
| PROJECT SCI - 823 - 0, 00         | SHEET NO.  | 14  | OF 18         |
| SUBJECT Mainline Embankment       | COMP. BY   | JTH | DATE 3/28/07  |
| Settlement - Quantity             | CHECKED BY | DAA | DATE 11/12/07 |

COMPRESSIBILITY AS THE BASIS FOR SUL BEARING WILLE, B.K. HOUGH, AUG 1959.





| CLIENT  | TransSystems / ODOT Dist 9 | JOE |
|---------|----------------------------|-----|
| PROJECT | SCI - 823 - 0.00           | SHE |
| SUBJECT | Mainline Embankment        | CO  |
|         | Settlement - Time Rate     | CHE |

| JOB NUMBER | 01  | 21-3070 | .03      |
|------------|-----|---------|----------|
| SHEET NO.  | 15  | OF      | 18       |
| COMP. BY   | JTH | DATE    | 3/28/07  |
| CHECKED BY | DAA | DATE    | 11/12/07 |

Evaluate the time rate of settlement for cross-section with greater than 6 inches of consolidation settlement.

. The following cross-sections have greater than 6 inches of consolidation settlement.

66+00

175+40

240+00

271+50

298+50

312+00

319+75

Assume single drainage

No consolidation testing available. Assume a C<sub>v</sub> of 1 ft²/day.

C<sub>v</sub> assumed based on references on pages 3 & 4.

Determine time to reach 90 percent consolidation, therefore  $T_v = 0.57$ .

$$t_{90} = \frac{T_v \times H^2}{C_v}$$

$$t_{90} = \frac{0.85 \times H^2}{1.0}$$

For X-section 66+00, H = 21.0 ft.

$$t_{90} = \frac{0.85 \times 21.0^2}{1.0}$$

$$t_{90} = 375 \text{ days}$$
 or 12.5 months

For X-section 175+40, H = 30.0 ft.

$$t_{90} = \frac{0.85 \times 30.0^2}{1.0}$$



| CLIENT  | TransSystems / ODOT Dist 9 |  |
|---------|----------------------------|--|
| PROJECT | SCI - 823 - 6.81           |  |
| SUBJECT | Mainline Embankment        |  |
| -       | Settlement - Time Rate     |  |

 JOB NUMBER
 0121-3070.03

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 ILO OF IB

 COMP. BY
 JTH DATE 3/28/07

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 DATE

For X-section 240+00, H = 5.5 ft.

$$t_{90} = \frac{0.85 \times 5.5^2}{1.0}$$

 $t_{90} = 26 \text{ days}$ 

or

0.9 months

For X-section 271+50, H = 24.5 ft.

$$t_{90} = \frac{0.85 \times 24.5^2}{1.0}$$

t<sub>90</sub> = 510 days

ог

17 months

For X-section 298+25, H = 20.5 ft.

$$t_{90} = \frac{0.85 \times 20.5^2}{1.0}$$

t<sub>90 =</sub> 357 days

or

11.9 months

For X-section 312+00; H = 13.0 ft.

$$t_{90} = \frac{0.85 \times 13.0^2}{1.0}$$

t<sub>90</sub> = 144 days

OΓ

4.8 months

For X-section 319+75, H = 13.0 ft.

$$t_{90} = \frac{0.85 \times 13.0^2}{1.0}$$

 $t_{90} = 144 \text{ days}$ 

0

4.8 months



|   | CLIENT   | TransSystems / ODOT Dist 9 | JOB NUMBER | 01  | 21-307 | 0.03        |
|---|----------|----------------------------|------------|-----|--------|-------------|
| , | PROJECT  | SCI - 823 - 0,00           | SHEET NO.  | 17  | OF     | 18          |
| • | SUBJECT  | Mainline Embankment        | COMP. BY   | JTH | DATE   | 2/14/07     |
|   | <u>-</u> | Settlement - Time Rate     | CHECKED BY | DAA | DATE   | 11/12/07    |
|   |          |                            |            |     |        | <del></del> |

TABLE 9-8
TYPICAL VALUES OF COEFFICIENT OF VERTICAL CONSOLIDATION, c,
(Compiled by Carter and Bentley, 1991)

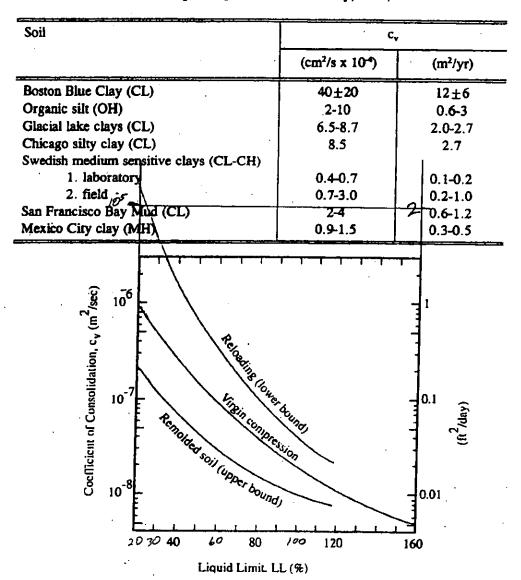


Figure 9-5: Approximate Correlations Between c, and LL. (NAVFAC, DM-7.1, 1982)

9 - 10

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| CLIENT  | TransSystems / ODOT Dist 9 | JOB NUMBER | 012 | 1-3070.03     |
|---------|----------------------------|------------|-----|---------------|
| PROJECT | SCI - 823 - C.CO           | SHEET NO.  | 18. | OF 18         |
| SUBJECT | Mainline Embankment        | COMP. BY   | JTH | DATE 2/14/07  |
|         | Settlement - Time Rate     | CHECKED BY | DAA | DATE 11/12/07 |

TABLE 9.-- APPROXIMATE CORRELATION BETWEEN C AND LIQUID LIMIT (After Terzaghi and Peck, 1967)

| Liquid Limit (%) | Ran            | ge o | of C | , (ft | ²/yr)            |
|------------------|----------------|------|------|-------|------------------|
| 30               | A4104<br>+ 055 | 20   | to   | 360   | F-1/day<br>0.986 |
| 40               | 0.033          | 12   | to   | 230   | 0.630            |
| 50               | 0. 022         | 8    | to.  | 150   | 0.411            |
| 60               | 0.014          | 5    | to   | 90    | 0.247            |
| 70               |                | . 3  | to   | 58    |                  |
| 80               |                | 2    | to   | 36    |                  |
| 90               |                | 1    | to   | 23    |                  |
|                  | -              |      |      |       |                  |

TYPICALL LL = 30

USE CV = 1.0 Fr2/DAY (CONSERVATIVE)



# APPENDIX E

Geotechnical Design Checklist

C-R-S: SCI-823-0.00 Stage 1 PID: 77366 Reviewer: D. Adams Date: 11-16-07 Settlement Y N X 1 If soil conditions and project requirements warrant, have settlement issues been addressed? If not applicable (X), go to Question 14 <u>Y</u> N X 2 Have consolidation properties of the foundation soils been determined? Check methods used: empirical correlations with moisture content and Atterberg values □ other Y N X 3 Have calculations been performed to estimate the total expected embankment settlement and the time of consolidation? Check method used: ■ EMBANK or equivalent software Spreadsheet used. Y N X 4 If differing foundation soil and/or loading conditions occur throughout the embankment area, have sufficient analyses been completed to evaluate consolidation at locations representative of the most critical conditions? Y N X 5 Have the total settlement and the time of consolidation analyses indicated acceptable values at all locations for the scope of the embankment work? Y N X 6 If total settlement or time of consolidation is unacceptable, have the stations and lateral extent of the problem areas been defined? **Y** N X 7 Has a method been chosen as a solution to the settlement issues? Check methods used: ■ waiting periods with monitoring drainage blanket and wick drains □ surcharge (preloading) removal and replacement of weak soil ☐ lowering proposed grade / change alignment lightweight fill

|   |   |          |    | □ other L  | ist Other items:   |
|---|---|----------|----|--|--|
| Y | N | ×        | 8  | Based on accepted design practice applicable, adhering to published goesign recommendations from FHI calculations been performed to every effectiveness of the chosen solutions.   | guidelines and WA, have aluate the                           |
| Y | N | ×        | 9  | Has an economic analysis been per<br>evaluate the cost benefits of the re-<br>solution compared to others?   |  |
| Y | N | <u>X</u> | 10 | Have all necessary notes, specificate details for the chosen solution bee  |  |
| Y | N | X        | 11 | Have the need, locations, type, pla<br>reading schedule for settlement pla<br>determined?  |  |
| Y | N | <u>X</u> | 12 | Have the effects of the predicted s<br>the chosen solution been determin<br>accounted for on the construction s  | ed and   |
| Y | N | <u>x</u> | 13 | Has the effect of any foundation so<br>(including differential settlement) b<br>with regard to adjacent structures (<br>buildings, culverts, utilities) which<br>undergo settlement and be subject<br>induced by the consolidation of the<br>soil? | een evaluated<br>(e.g., bridges,<br>will also<br>to stresses |

Notes:

| Stability |   |   |          |    |  |   |
|-----------|---|---|----------|----|--|---|
| Y         |   | N | X        | 14 | If soil conditions and project requirements warrant, have stability issues been addressed?   |   |
|           |   |   |          |    | If not applicable (X), go to Question 27   |   |
| Y         |   | N | ×        | 15 | Has the total (short term) and effective (long term) shear strength of the foundation soils been determined?   |   |
|           |   |   |          |    | Check method used:   |   |
|           |   |   |          |    |  |   |
|           |   |   |          |    | ☑ estimation from SPT or field tests   |   |
| Y         |   | N | X        | 16 | Have the OGE's recommended values of shear strength for proposed embankment fill material (total: c = 2000 psf, phi = 0; effective: c = 300 psf, phi = 28) been used in the stability analyses?                | 16. Alternate shear strength values assumed due to anticipated rock fill. |
| Y         |   | N | X        | 17 | Have calculations been performed to determine the F.S. for stability?  |   |
|           |   |   |          |    | Check method used:   |   |
|           |   |   |          |    | STABL, XSTABL, or equivalent software  |   |
|           |   |   |          |    | ☐ hand calculations  |   |
|           |   |   |          | 18 | Have the following F.S. been met or exceeded, as determined by the calculations, for the given stability conditions:   |   |
| Y         |   | N | X        |    | a 1.30 for short term condition  |   |
| Y         |   | N | Χ        |    | b 1.30 for long term condition   |   |
| Y         | ١ | N | <u>X</u> |    | c 1.10 for rapid drawdown, flood condition   |   |
| Y         | - | N | <u>X</u> |    | d 1.50 for embankment supporting bridge abutments (not on deep foundations)  |   |
| Y         |   | N | X        | 19 | When differing soil or loading conditions occur throughout the embankment area, have sufficient analyses been completed to evaluate the stability at locations representative of the most critical conditions? |   |
| Y         | _ | N | ×        | 20 | If the F.S. was not met or exceeded, have the stations and lateral extent of the problem areas been defined?   |   |
| Y         | ı | N | X        | 21 | Has a method been chosen as a solution to the stability issues?  |   |
|           |   |   |          |    | Check the method(s) used:  |   |
|           |   |   |          |    |  | ·   |
|           |   |   |          |    | □ counterberm  |   |

|          |          |          |    | ☐ lightweight embankment   |  |
|----------|----------|----------|----|--|--|
|          |          |          |    | reinforced soil stope  |  |
|          |          |          |    | ☐ soil nailing   |  |
|          |          |          |    | ☐ drainage blanket and wick drains   |  |
|          |          |          |    | ☐ removal of soft soil, adding shear key   |  |
|          |          |          |    | ☐ reduced grade / change alignment   |  |
|          |          |          |    | stage construction   |  |
|          |          |          |    | ☐ controlled rate of fill placement  |  |
|          |          |          |    | ☐ drilled shaft slope stabilization  |  |
|          |          |          |    | □ other List Other items:  |  |
| <u>Y</u> | N        | ×        | 22 | Based on accepted design practices, and where applicable, adhering to published guidelines and design recommendations from FHWA, have calculations been performed to evaluate the effectiveness of the chosen solution(s)? |  |
| Y        | <u>N</u> | X        | 23 | Has an economic analysis been performed to evaluate the cost benefits of the recommended solution compared to others?  |  |
| Υ        | N        | <u>X</u> | 24 | Have all necessary notes, specifications, and details for the chosen solution been determined?   | 24, 25 – Generally not addressed in Stage I submittal. |
| Y        | N        | X        | 25 | Have the need, location, type, plan notes, and reading schedule for piezometers and inclinometers been determined?   |  |
| Υ        | N        | <u>X</u> | 26 | If piezometers will be used, has the critical pressure value been determined and the appropriate information included in the plans?  |  |
| Y        | N        | <u>X</u> | 27 | Have the effects of the stability solution been determined and accounted for on the construction schedule?   |  |
| <u>Y</u> | N        | ×        | 28 | Has the effect of the stability solution been evaluated with regard to structures (e.g., bridges, buildings, culverts, utilities) which may be subject to unusual stresses or require special construction considerations? |  |

Notes:

| Sid | Sidehill Fills |          |    |   |  |  |  |
|-----|----------------|----------|----|---|--|--|--|
| Y   | N              | X        | 29 | If soil conditions and project requirements warrant, have sidehill fill issues been addressed?  | ·  |  |  |
|     |                |          |    | If not applicable (X), go to Question 34  |  |  |  |
| Y   | N              | ×        | 30 | In accordance with <u>Geotechnical Bulletin 2:</u> <u>Special Benching and Sidehill Embankment Fills</u> ( <u>GB 2</u> ), have sidehill fills been evaluated to determine if special benching or shear keys are needed? |  |  |  |
|     |                |          | 31 | In accordance with GB 2, if special benching or shear keys are required, has  | 31a, 31b – Generally not addressed in Stage I submittal.                       |  |  |
| Y   | N              | <u>X</u> |    | a Plan Note G110 from L&D3 been included in<br>the General Notes?   |  |  |  |
| Y   | N              | X        |    | b quantities for both excavation and<br>embankment been calculated for the benched<br>areas and added to the plan General<br>Quantities?  |  |  |  |
| Y   | N              | X        |    | c the special benching or shear keys been indicated on the appropriate cross sections?  | 31c. This information has been provided to the prime consultant (TranSystems). |  |  |
| Υ   | N              | <u>X</u> | 32 | Have water bearing zones been identified and their impact addressed?  |  |  |  |
| Y   | N              | X        | 33 | Have subsurface drainage controls been adequately addressed?  |  |  |  |

Notes:

| Sp | ecia | al       | ·  |   |
|----|------|----------|----|---|
| Y  | N    | X        | 34 | Have all of the environmental factors, including wetlands, stream mitigation, and landfills, been considered and incorporated prior to design and analysis of embankment settlement and stability, including EPA or other government agencies' involvement, mitigation, or special design or construction considerations? |
|    |      |          | 35 | If an embankment is to be placed through standing water or over weak, wet soils (with or without a fabric separator), the fill should be placed by the method of end dumping to a given height above the standing water or until compaction is achievable over the soft soil. If end dumping is to be specified,          |
| Y  | N    | <u>X</u> |    | a has the material type for the fill to be end dumped been specified?   |
| Y  | N    | X        |    | b has the need for a fabric separator or filter layer been determined?  |
| Y  | N    | <u>X</u> |    | c has the height of fill to be end dumped been determined?  |
| Υ  | N    | <u>X</u> |    | d have all notes and specifications for end dumping been developed?   |

Notes: