# Appendix D:
# Subsurface Exploration and Laboratory Test Report, Harbor Point Redevelopment CM#2 Project, City of Utica, New York, CME, December 2014

# Geotechnical Evaluation
# and
# Interpretive Report

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## Harbor Point Redevelopment CM#2 Project
## City of Utica, New York

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**Prepared For:**


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**CME Report No.: 26959B-02-1214**
**December 2014**


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# Table of Contents
# Report No. 26959B-02-1214



**Attachment Listing:**

Subsurface Exploration and Laboratory Test Report
CME Report No. 26959B-01-1214 (21 pages of 21 pages)

CME Associates, Inc.

# Geotechnical Evaluation
# and
# Interpretive Report
# Harbor Point Redevelopment CM#2 Project
# City of Utica, New York

## 1.0 INTRODUCTION

Elan Planning Design & Landscape Architecture, PLLC (Elan or Client) is providing project management and other lead consultant services, to the City of Utica and the Utica Harbor Point Local Development Corporation in support of the remediation and redevelopment of the Utica Harbor Area in the City of Utica, Oneida County, New York. As part of the Draft GEIS Preparation, Elan engaged CME Associates, Inc. (CME) for planning-level geotechnical engineering investigation and testing.

CME conducted a field program of subsurface exploration-test borings and collected disturbed and undisturbed samples. Laboratory testing of selected samples was also accomplished. CME presents the data collected and the results of the field and lab program in the attached report titled "*Subsurface Exploration and Laboratory Test Report – CME Report No.: 26959B-01-1214.*" That report presents the geotechnical field and lab program results and includes the Test Borings Logs, Boring Location Sketch, and Laboratory Test Summary.

In addition to the field and lab program, CME collected subsurface information and data available through the NYS Department of Environmental Conservation, the USDA Soil Survey, Web Soil Survey, and National Grid – Utica Harbor Point Manufactured Gas Plant Operable Unit 3 Cleanup Project records and websites.

This report presents the results of CME's evaluation of the above noted data and includes addressing the following items (as taken from the Elan/CME Agreement):

- A generalized characterization of the deposits and their affect and limitations with respect to the planned development's building and infrastructure improvements.
- Identify or outline the potential design or construction problems which may warrant further study.
- Present one or more potential satisfactory solutions for the major foundation design and construction problems identified.
- Present preliminary criteria for planning of the project foundations.
- Present general recommendations which may aid in the selection of an optimum arrangement for facilities on the site vis-à-vis the limitations of the subsurface conditions identified in the field program.
- Recommend additional exploration and testing which may be warranted to further reduce the risks and uncertainties always present in work involving subsurface conditions.
- Recommend a Seismic Site Classification using the SPT results and the requirements of the 2010 Building Code of New York State.

This report is not intended to address any of the myriad hazardous materials problems or conditions associated with the site's inactive hazardous waste disposal and NYS Superfund Programs.

## 2.0 ORIGIN OF DEPOSITS

The Harbor Point site is located over a narrow buried valley trending east-west. The valley was created by prehistoric glacier which gouged out the soft shale bedrock leaving a mantel of dense glacial till soil in its wake.

A very large prehistoric lake then formed and sand, silt and clay materials, which flowed into the lake from surrounding rivers and streams, settled to the lakebed in the calm lake waters.

Eventually the lake was drained and the Mohawk River formed and flowed through the area causing erosion of the valley sides, carrying and depositing silts, sands and gravels. As the river flow subsided, its path meandered across the surface creating oxbows, deltas, floodplains, swamps and marshes.

The Utica Marsh and floodplains west of Harbor Point are characteristic of how Harbor Point once looked, prior to man's development.

## 3.0 SURFACE AND SUBSURFACE CONDITIONS

### 3.1 Surface Conditions

The Harbor Point Project Area lies east and south of an oxbow of the Mohawk River and is bounded on the south by the active railroad and on the east by North Genesee Street. This roughly square land mass is split into two triangular-shaped peninsulas by the man-made harbor and harbor neck constructed between 1913 and 1918.

The entire Project Area was once low-land marsh and swamp subject to frequent flooding prior to construction of the Erie Canal System and Utica Harbor. Dredged materials and imported fill were deposited over the then-natural grades in order to make dry, useable land to support the emerging industrialization of the Utica Harbor.

The subsequent 160 years of industrialization resulted in environmental pollution and what we know today as hazardous waste materials (HazMat). Remediation and cleanup activities over the past 30 years have resulted in a site that exhibits landfill and dredge areas interspersed among NYS Canal Corporation and other urban mixed-use type properties and areas. Consequently, the upper 2 feet to about 20 feet of the project area has been disturbed and hundreds of test borings and subsurface explorations have been advanced, some to depths of over 130 feet below present grade.

### 3.2 Subsurface Profile

The site's subsurface profile is not uniform or consistent horizontally or vertically.

The conditions for the upper 20 feet of the site are extremely random and varied. In some areas, such as the area known as Dredge Spoils Area 1 (DSA 1) on the NYS Canal Corporation Property, environmental remediation has produced two large man-made ponds due to contaminated soil removal. In another area, known as the NMPC Harbor Point Site, an above-grade landfill exists.

The CME Borings revealed an overall profile of surfacing, underlain by Random Miscellaneous Fill, underlain by glacial lakebed sediments, underlain by dense Glacial Till which is known to overlie Shale Bedrock. CME's Boring B-3 identified the following subsurface profile, presented in order of encounter from existing grade elevation 404.5:

**Surfacings**: The site exhibits a variety of surfacings including but not limited to, water, cinders, asphalt, gravel, concrete, barren land, grass, scrub, brush, trees, roads, hard stands, and parking lots. Grade elevation varies from about elevation 400 to about elevation 419.

**Random Miscellaneous Fill**: Existing Random Miscellaneous Fill (ERM Fill) varies from about 2 feet (4' at B-3) to up to about 20 feet in thickness. ERM Fill may consist of earth, inert materials, HazMat, wood, building rubble, coal, slag, roots, decomposed organic matter, and putrescible waste, among other things.

**Clay**: CME Boring B-3 penetrated an upper glacial lakebed (lacustrine) deposit below 4 feet. From 4 to 10 feet, the boring encountered Clay (USCS[1] Class "CL") with minor Sand and Silt components. This layer is known to be discontinuous across the Harbor Point Site. Consistency varied from very soft (N=1) to medium stiff (N=5) based on SPT[2].

**Organic Silty Clay**: Organic Silty Clay was found between 10 to 20 feet in B-3, but is commonly encountered directly below ERM Fill and typically contains Peat (Pt) lenses or layers intermixed with roots, plant litter and organic detritus. Plasticity ranges from moderate (OL) to high (OH). Consistency ranged from very soft (e.g. can insert thumb fully using moderate effort) to soft. These soils may exhibit a putrid odor, in addition to a doughy or spongy consistency. In place water content, expressed as a percentage of dry weight, varies from about 30% to over 100%.

**Lower Glacial Lakebed Deposits**: Below a depth of about 20 feet and to a depth of 98 feet, CME Boring B-3 encountered low plasticity Silts (ML) and Clays (CL) with variable Sand and Gravel content or mixtures thereof. SPT N-values range from 0 (very soft) to 49 (hard).

**Glacial Till**: Till is a heterogeneous, unsorted mixture of Gravel, Sand, Silt and Clay which was overridden by glacier and compressed into a dense mass lying on Bedrock. Till was encountered at about 98 feet depth but is known to vary across the Harbor Point site from about 50 feet to over 130 feet deep.

**Shale Bedrock**: Although not verified in this program, the site is likely underlain by black, soft, thinly-bedded, easily eroded Utica Shale Bedrock.

## 3.3 Groundwater

The site exhibits both perched and static water tables. A perched water table may occur where surface and groundwater is suspended within more pervious soils (such as sand) overlying a less pervious, unsaturated soil (such as clay). The DSA 1 ponds are an example of perched waterbodies. Perched groundwater was present on-grade during CME's December 2014 field work. The static water table is generally reflective of the normal stage water level of Utica Harbor, around Elevation 400, more or less.

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[1] USCS – Unified Soil Classification System, ASTM D2487.
[2] SPT – Standard Penetration Test resulting N-value, ASTM D1586.

# 4.0 CHARACTERIZATION OF DEPOSITS

While this report and engineer does not address any of the myriad environmental contamination and HazMat issues with respect to this current redevelopment project, it is important for the reader to understand that the existing HazMat conditions cannot be considered separately and/or distinctly from the structural and geotechnical characteristics of the site's subsurface materials.

For example, soils excavated from a trench for a new underground pipeline may be satisfactory geotechnically for re-use as backfill of the pipe trench, but fail the re-use criteria given in NYSDEC STARS 1.

## 4.1 Generalized Characterization

This section characterizes the soil deposits in terms of their importance, effect and limitations on the proposed redevelopment as depicted in Concept Phase Master Plan.

**Existing Random Miscellaneous Fill**: The ERM Fill is highly variable in composition, extent and depth. It has no presumptive bearing capacity. ERM Fill should not be planned for re-use in any cut-and-cover excavations. Plan on using clean, granular Imported Fill or Controlled Low Strength Material for all backfilling. It is recommended that an area on-site be designated for permanent placement of excavated soils. The Fill disposal area should be graded to drain and covered with 18 inches of sand and gravel followed by a final cover of 6 inches of Topsoil, and then planted for a sustainable green area.

**Upper Lacustrine Clay**: This is a discontinuous layer across the site. Where present above the static water table, this clay is generally medium stiff and exhibits a low bearing capacity. This layer exhibits poor trafficability and, due to significant silt content, surfaces subject to foot or machine traffic will quickly degrade into a sea of mud. These soils are highly frost susceptible, and do not dry out readily. This material may be suitable for lining of wet ponds and wet stormwater management facilities as the clay exhibits low permeability and nil infiltration rate. This is not a competent bearing stratum.

**Organic Silty Clay**: Typically encountered below the static water table near elevation 400 or directly below ERM Fill, the Organic Silty Clay with Peat is severely limiting with respect to uniform competent soil bearing. This highly compressible soil is typically ½ part water to ½ part solid matter. It has no bearing capacity and will compress and consolidate excessively for long periods of time after even nominal loadings are applied over it. Because of variable Organic Content, water content, depth of encounter, and overall thickness; predicted settlements of structures, pavements and fills placed above must be ballpark numbers estimated from undisturbed soil samples subject to consolidation testing. Verification of settlement and time rate of settlement is prudent for each project during construction of the proposed improvements.

**Lower Glacial Lakebed Deposits**: These low plasticity Silts and Clays with interbedded layers or lenses of Sand and Gravel generally vary in relative density, thickness and strength, and exhibit low strength. Friction piles can typically derive significant axial load capacity when embedded into these materials. These soils are generally encountered below Elevation 380.

**Glacial Till and Shale Bedrock**: Till and bedrock depth varies significantly across this site. These represent competent end-bearing for deep foundation systems such as piles or drilled shafts.

**Water Table**: The site exhibits shallow perched and static water table conditions. Excavations made below the water table will require advance planning for dewatering, sheeted cofferdams of cutoff walls, and special provisions for discharge of water which is likely contaminated with various HazMat substances.

# 5.0 ENGINEERING EVALUATION

## 5.1 Geotechnical Summary

The Harbor Point Site occupies a position within a floodplain over a deep buried valley where the Mohawk River meandered back and forth cutting and filling the pre-existing soft glacial lakebed soils. These natural events created a complex stratigraphic profile. Add to that 200 years of industrial and commercial activity including environmental remediation and cleanup activities, and the result is a site where prudence dictates there are no rules on thumb and where few, if any, presumptions should be made with respect to what is buried there and its effect on the planned improvements.

CME recommends that as individual projects develop, each new phase, structure and associated infrastructure be planned in concert with a geotechnical investigation and engineering evaluation tailored to the specific project or phase. A broad brush approach is not applicable to the Harbor Point Site.

## 5.2 Planning Foundations

Conventional shallow foundations consisting of footings and mats should not be planned for new buildings and structures. Conventional foundation systems should be considered only in combination with a prerequisite form of ground improvement or preload (temporary surcharge) of the site.

Deep foundation and structural grade-level slab systems which utilize driven piles represent an economical and time efficient solution to the majority of the structures planned for this site. Friction piles may provide up to about 25 tons and end-bearing piles on Till or Bedrock over 25 tons axial capacity each.

Where one or more feet of new fill is to be placed on site near or in travelled ways, a temporary preload/surcharge may be appropriate to reduce abrupt elevation changes from pile-supported structures to on-grade pavements, aprons and walkways. Otherwise, it is prudent to design special details at all thresholds to minimize trip-and-fall risks.

Foundations subject to frost action should be provided with 4'-6" of cover measured from final exterior grade to bottom of foundation element.

## 5.3 General Recommendations

In light of the subsurface conditions and limiting conditions thereof, CME recommends the following be considered in the planning and design process.

A. Locate and designate a permanent soil spoil area.

B. Plan on deep foundation and structural grade-level slab systems combined with temporary surcharge/preloading procedures.
C. Minimize footprints – go vertical.
D. Consider on-grade parking underneath structures to eliminate the structural grade-level floor and associated piles need to support floor.
E. Minimize Fills above existing grade.
F. Plan on long periods of rest and settlement monitoring for areas which will require fills in excess of a couple of feet.
G. Consider using premium cost Lightweight Aggregate Products (e.g. Solite, Norlite, expanded shale and pumice products) for structural backfills to mitigate post-construction settlements.
H. Install roadway embankments, stormwater facilities, sanitary sewer and water utilities infrastructure early.
I. Consider centrally located sanitary sewer pump station(s) with short gravity sewer services to buildings, or individual building sanitary pump station and force main to public system.
J. Install fill and grade to crown all priority sites early, monitor for settlement then market sites as pad ready.
K. Locate stormwater collection and management ponds in areas where existing grade is already low, such as DSA 1.

## 5.4 Other Considerations

CME does not recommend additional exploration or testing at this time. A full compilation, organization and geotechnical evaluation of all the subsurface exploration associated with the environmental contamination and HazMat remediation at the Utica Harbor may be beneficial prior to starting any specific site work activities. During this limited program, CME became aware of over 300 explorations conducted over the past 30 years.

CME is required to share its subsurface information with NYS Canal Corporation and NYS Department of Environmental Conservation. The Subsurface Exploration and Laboratory Test Report, will be shared with the responsible persons at these agencies.

## 5.5 Seismic Site Classification

CME calculated Seismic Site Class using the Site Class Definitions given in the 2010 BCNYS Table 1613.5.2 and the CME Boring B-3 plus the laboratory index test results presented in the attached report, CME Report No.: 26959B-01-1214. A Site Class "D" representative of "stiff soil profile" resulted from this analysis. This CME Boring did not sample soils vulnerable to potential failure or collapse under seismic loadings such as liquefiable soils, quick or highly sensitive clays, and collapsible weakly cemented soils.

However, it is important to note that soils vulnerable to potential failure or collapse do exist at the Harbor Point Site in Utica, New York, and a more comprehensive exploration and laboratory testing program may show that individual parcels on site are representative of a "soft soil profile", Site Class "E".

CME recommends that a Seismic Site Class "E" be utilized for planning purposes.

## 6.0 CLOSING COMMENTS AND LIMITATIONS

This report has been prepared based on a limited planning level investigation and is not intended or represented to be satisfactory for design of any structures or future improvements. Each future project must have a geotechnical investigation and engineering evaluation tailored to the specifics of the project and of sufficient scope to meet the requirements of the Building Code prevailing at the time of the project. Also, CME's review of over two dozen explorations logs conducted on the Harbor Point site lead us to the conclusion that the site subsurface conditions are complex and varied. Thus, specific project sites within the proposed redevelopment may exhibit conditions which are less favorable or more favorable than those disclosed here. CME's scope for this report does not include recommendations for filling the DSA 1 area ponds or for any improvements/remediation of the existing concrete bulkhead structure.

CME endeavored to conduct the services identified herein in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession currently practicing in the same locality and under similar conditions as this project.

CME is pleased to have been selected to provide these services and looks forward to continuing as the Utica Harbor Point Redevelopment unfolds.

Please feel free to contact the undersigned engineer with any questions or if you wish to discuss any aspect of this report and its application to the planning process.

STATE OF NEW YORK
MARCUS ALAN ROTUNDO
No. 059582
LICENSED PROFESSIONAL ENGINEER

12/23/2014

Marcus A. Rotundo, P.E.
Sr. Geotechnical Engineer

Reviewed By: Anas N. Anasthas, P.E.
Geotechnical Engineer

MAR/jll

**Attachment Listing:**
Subsurface Exploration and Laboratory Test Report
CME Report No. 26959B-01-1214 (21 pages of 21 pages)

# Subsurface Exploration and Laboratory Test Report

# Harbor Point Redevelopment CM#2 Project
# City of Utica, New York

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**CME Report No.: 26959B-01-1214**
**December 2014**

# Table of Contents
# Report No. 26959B-01-1214



**Attachment Listing:**

CME Associates, Inc.

# Subsurface Exploration
# and
# Laboratory Test Report
# Harbor Point Redevelopment CM#2 Project
# City of Utica, New York

## 1.0 INTRODUCTION

CME Associates, Inc. (CME) was retained by Elan Planning, Design & Landscape Architecture (Elan-Client) to provide subsurface exploration and laboratory testing services for the referenced project. CME advanced two (2) Subsurface Exploration Test Borings at locations selected by CME for the Harbor Point Redevelopment CM#2 Project in Utica, New York. It was originally intended to advance two more borings at the site, however, due to soil disturbance restrictions and because of the availability of existing subsurface information (through NYSDEC) CME eliminated Borings labeled B-1 and B-2 from this program.

## 2.0 METHODS

The exploration locations were laid out in the field by CME in advance of the scheduled field work. Elevation at grade at each exploration location was determined by CME utilizing standard survey equipment, and referencing an on-site benchmark (top of Bulkhead at location shown on the Boring Location Sketch). This benchmark is designated Elevation 404. The approximate as-drilled locations are shown on the Boring Location Plan, labeled, BLP-1, attached. A Locus Map showing a portion of Utica East Quadrangle, labeled PLM-1, is also attached.

Boring B-3 was advanced using a Diedrich D120, truck-mounted, rotary exploration drill rig, equipped with 4-inch casing to advance the boring using mud-rotary methods. Soil Sampling and Standard Penetration Testing (SPT) were conducted using a 140-pound auto hammer dropping through a distance of 30 inches to drive a 2-inch O.D. split barrel sampler. This test method is described in ASTM Standard Practice D1586.

Boring B-3A was advanced using 4-¼" I.D. hollow stem augers for the purpose of collecting Undisturbed Soil Samples to be preserved for later use. Undisturbed soil sampling was conducted using 3" thin-walled Shelby tubes in accordance with ASTM D1537.

Upon completion, borehole B-3 was backfilled with cement-grout to grade, and B-3A was backfilled with auger cuttings to approximate surrounding grade.

The boring samples were logged and visually classified in the field by the CME drill crew and a portion of each soil sample was placed and sealed in a glass jar. The soil classifications were later reviewed by the CME Geotechnical Engineer. The visual soil classifications were made using the modified Burmister Classification System, as described in the attached document entitled *"General Information & Key to Test Boring Logs"*.

As part of the sampling program, CME followed equipment decontamination protocols consistent with industry standards for environmental investigations, including use of a three-bucket Alconox® wash and rinse cycle for all split spoon samplers. Hot water pressure-wash decontamination of augers and drill tools was also performed prior to drilling.

## 3.0 LABORATORY ANALYSES

CME's engineer selected samples and laboratory index testing was performed in CME's AMRL[1] Accredited East Syracuse Laboratory. Lab testing included gradation analysis, natural moisture content, void ratio, Atterberg limits testing, and organic content. A Laboratory Test Summary is attached.

## 4.0 SUBSURFACE SUMMARY AND GROUNDWATER

Boring B-3 encountered Miscellaneous Fill to 2 feet depth underlain by Clay to 10 feet, underlain by Clay with Peat and Organic Silt to 20 feet depth.

Below 20 feet to a depth of 98 feet, the boring penetrated glacial lakebed deposits consisting of interlayered or units of fine sand, silt and clay with occasional gravel.

At 98 feet, the boring encountered a dense mixture of silt, sand and gravel indicative of Glacial Till. Based on sample moisture content, the groundwater table was encountered at 8 feet below grade corresponding to Elevation 396.5 on 12/18/2014. The water surface in the harbor that day was Elevation 399.71. Please refer to the attached Boring Logs for additional information.

## 5.0 REPRESENTATIONS

CME has the information in this section to those using our reports, so they may acquire a better understanding of geotechnical engineering professional practice and the limitations associated with its application to this and other projects.

/for

Melissa McConnell
Project Manager, Subsurface Exploration Division

**Attachment Listing:**

Project Locus Map, PLM-1 (1 of 1)
Boring Location Plan, BLP-1 (1 of 1)
Site Photographs (2 of 2)
Subsurface Exploration-Test Boring Logs, labeled B-3 and B-3A (6 of 6)
Laboratory Test Summary Report (3 of 3)
*General Information & Key to Test Boring Logs* (4 of 4)

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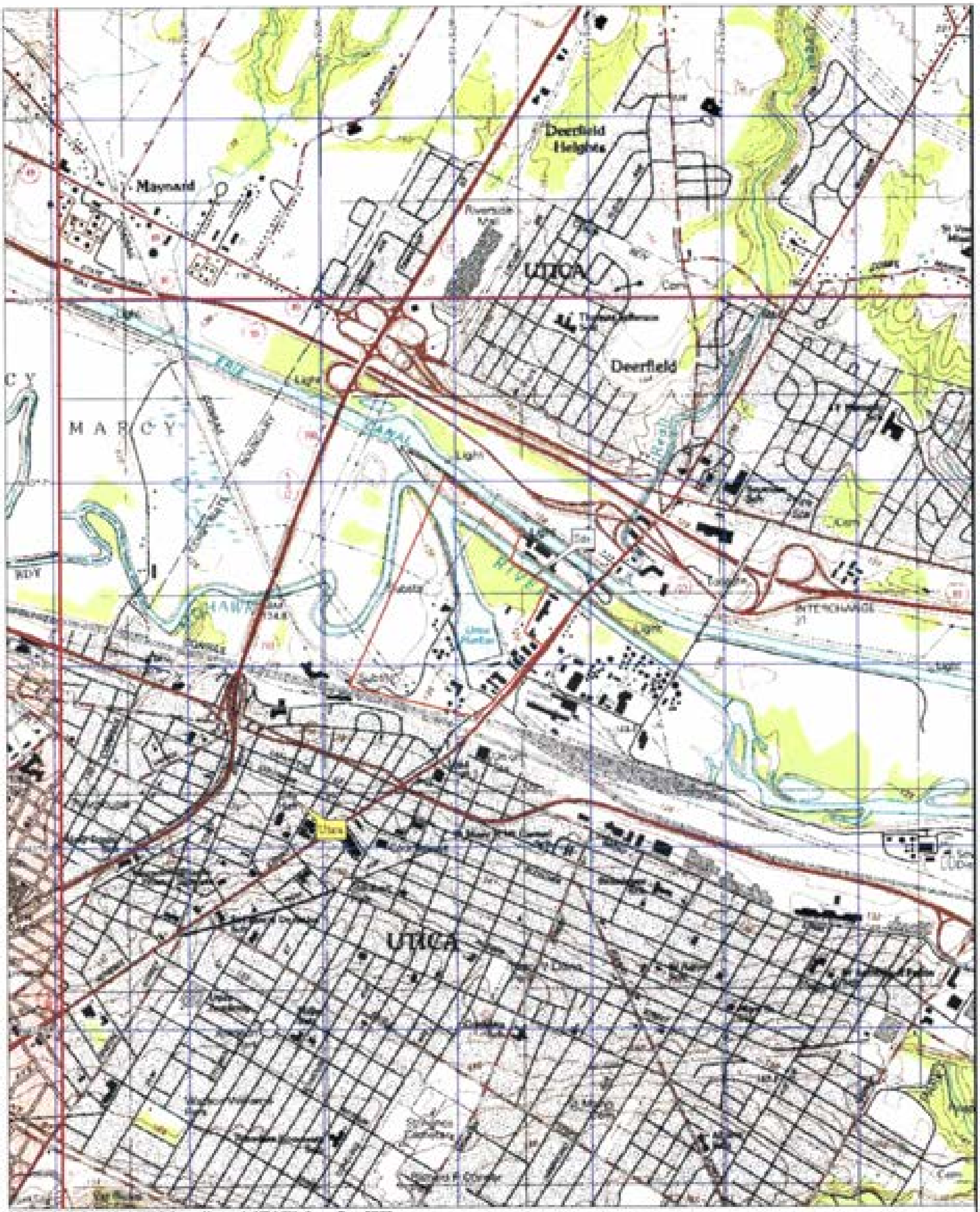
[1] **AMRL** – American Association of State Highway& Transportation Officials (AASHTO) Materials Reference Laboratory, a Federal Agency having jurisdiction to assess laboratory competency according to the Standards of the United States of America. CME East Syracuse accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net




3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

750 ft Scale 1 : 25,000 Detail: 13-0 Datum: WGS84

CME Associates, Inc.

Original Map provided by 3-D TopoQuads

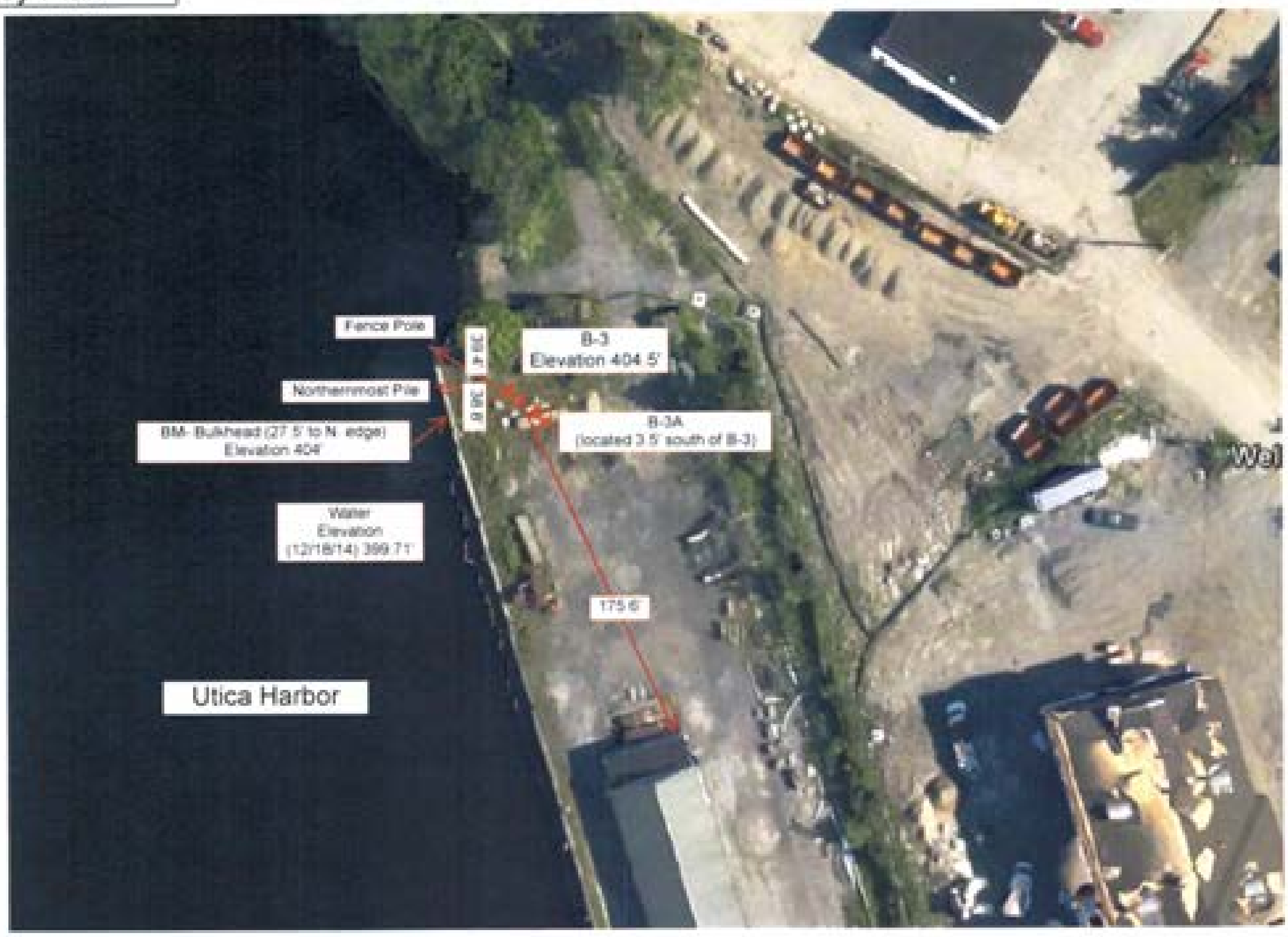
**Project Locus Map, PLM-1**
**Harbor Point Redevelopment Project**
**Utica, New York**
**CME REPORT NO.: 26959B-01-1214**

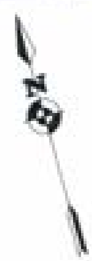
Sketch Notes:
Portion of Utica East Quadrangle

NOT TO SCALE

Date 12/19/14
Revised

**PLM-1**


CME Associates, Inc.

Original Map provided by Google Earth and marked to reflect field locations by CME

**Boring Location Plan, BLP-1**
**Harbor Point Redevelopment Project**
**Utica, New York**
**CME REPORT NO.: 26959B-01-1214**

Sketch Notes

B-# - Indicates Approximate Soil Boring Location

NOT TO SCALE

Date 12/19/14
Revised

**BLP-1**

Photo 1- Site of CME Boring B-3 in upper left of photo at north edge of NYS Canal Corporation storage area and just (north of) beyond concrete bulkhead on 12/15/2014.

Photo 2- Benchmark used- Top of Concrete Bulkhead at Utica Harbor Elevation, 404.0, on 12/15/2014.

# SUBSURFACE EXPLORATION – TEST BORING LOG

**Project:** Harbor Point Redevelopment, Utica, New York
**Client:** Elan Planning, Design & Landscape Architecture, PLLC
**Location of Boring:** See Boring Location Sketch
**Report No.:** 26959B-01-1214
**Date Started:** 12/11/14 **Finished:** 12/15/14
**Elevation of Surface of Boring:** 404.5'

## METHODS OF INVESTIGATION

**Casing:** 4" flush joint
**Casing Hammer:**
**Other:** spun-in mud-rotary
**Soil Sampler:** 2" OD Split Barrel
**Sampler Hammer: Wt.** 140 lbs.
**Make & Model of Drill Rig:** Diedrich D-120 Truck-Mounted
**Driller:** Dave Lyons
**Driller:** A. DePaolo
**Inspector:** M. McConnell
**Rod Size:** AWJ
**Fall:** 30 in.

## GROUND WATER OBSERVATIONS

| Date | Time | Depth | Casing At |
|---|---|---|---|
| See Remarks. | | | |

## LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

| Depth Scale (Feet) | Casing Blows/ Foot | Sample I.D. | Depth of Sample (Feet) From | Depth of Sample (Feet) To | Sample Type/ Recovery (Inches) | Blows On Sampler Per 6 inches | Depth Of Change (feet) | Classification of Material | SPT "N" or RQD |
|---|---|---|---|---|---|---|---|---|---|
| 0 | XXX | 1 | 0.0 | 2.0 | SS/10 | 3-6-6-4 | | Black cmf SAND and cmf GRAVEL, with SILT/ORGANICS (moist, medium compact) ~ Fill ~ | 12 |
| | | 2 | 2.0 | 4.0 | SS/0 | 3-3-3-3 | 4 | No Recovery | 6 |
| 5 | | 3 | 4.0 | 6.0 | SS/6 | 3-2-3-2 | | Brown CLAY, little cmf SAND, trace SILT (moist, medium stiff) | 5 |
| | | 4 | 6.0 | 8.0 | SS/14 | 2-3-2-3 | | Similar Soil (moist, medium stiff) -CL- | 5 |
| | | 5 | 8.0 | 10.0 | SS/16 | WH-WH-1-2 | 10 | Brown CLAY, little SILT, little cmf SAND (moist, very soft) | 1 |
| 10 | | 6 | 10.0 | 12.0 | SS/18 | WH-2-2-2 | | Dark Brown CLAY and ORGANIC SILT with PEAT, little mf SAND (saturated, soft) | 4 |
| | | 7 | 12.0 | 14.0 | SS/16 | WH-1-2-2 | | Similar (saturated, soft) | 3 |
| | | 8 | 14.0 | 16.0 | SS/18 | WH-WH-W-WH | | Similar (saturated, very soft) | WH |
| 15 | | | | | | | | -OL- | |
| | | 9 | 16.0 | 18.0 | SS/19 | WH-WH-W-WH | | Similar (saturated, very soft) | WH |
| | | 10 | 18.0 | 20.0 | SS/7 | WH-WH-W-WH | 20 | Similar (saturated, very soft) | WH |
| 20 | | 11 | 20.0 | 22.0 | SS/4 | WH-WH-W-WH | | Dark Brown to Black SILT, trace mf SAND, trace CLAY, trace course GRAVEL (saturated, very soft) | WH |
| | | 12 | 22.0 | 24.0 | SS/4 | 1-2-2-2 | | Dark Brown SILT, little mf SAND, little CLAY, trace course GRAVEL (saturated, soft) | 4 |
| | | 13 | 24.0 | 26.0 | SS/24 | 2-3-4-3 | | Dark Brown SILT, some mf SAND, trace CLAY, trace ORGANICS (saturated, medium stiff) | 7 |
| 25 | | | | | | | | Continued on page 2 -ML- | |

*SS – Split Spoon, U – Undisturbed Tube, C – Core, WH – Weight of Hammer & Rods

**Remarks:** This boring was advanced using mud-rotary method, Revert Quick Mud and tricone bit. Boring was backfilled with cement grout upon completion.

| LOG OF BORING SAMPLES | | | | | | | CLASSIFICATION OF MATERIAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth Scale (Feet) | Casing Blows/ Foot | Sample I.D. | Depth of Sample (Feet) From | Depth of Sample (Feet) To | Sample Type/ Recovery (Inches) | Blows On Sampler Per 6 inches | Depth Of Change (feet) | c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 % | SPT "N" or RQD |
| 25 | | | | | | | | Continued from page 1 | |
| | | 14 | 26.0 | 28.0 | SS/24 | 3-4-7-7 | | Dark Brown SILT, little fine SAND, trace Fibrous ORGANICS (moist, stiff) | 11 |
| | | 15 | 28.0 | 30.0 | SS/24 | 3-3-5-7 | | Similar (moist, medium stiff) | 8 |
| 30 | | | | | | | | -ML- | |
| | | 16 | 33.0 | 25.0 | SS/12 | 10-8-7-7 | | Greyish-Brown SILT (saturated, stiff) | 15 |
| 35 | | | | | | | | | |
| | | 17 | 38.0 | 40.0 | SS/20 | 4-4-4-3 | | Brown SILT, little cmf SAND, trace CLAY, trace ORGANICS, trace fine GRAVEL (saturated, medium stiff) | 8 |
| 40 | | | | | | | | | |
| | | 18 | 43.0 | 45.0 | SS/20 | WH-3-4-5 | | Brown/Grey Mottled CLAY, little SILT, trace fine SAND, trace medium GRAVEL (saturated, medium stiff) | 7 |
| 45 | | | | | | | | -CL- | |
| | | 19 | 48.0 | 50.0 | SS/24 | WH-WH-3-6 | | Brown Similar (saturated, soft) | 3 |
| 50 | | | | | | | | Continued on page 3 | |

*SS – Split Spoon, U – Undisturbed Tube, C – Core, WH – Weight of Hammer & Rods

**Remarks:** This boring was advanced using mud-rotary method, Revert Quick Mud and tricone bit. Boring was backfilled with cement grout upon completion.

| LOG OF BORING SAMPLES | | | | | | | CLASSIFICATION OF MATERIAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth Scale (Feet) | Casing Blows/ Foot | Sample I.D. | Depth of Sample (Feet) | | Sample Type/ Recovery (Inches) | Blows On Sampler Per 6 inches | Depth Of Change (feet) | c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 % | SPT "N" or RQD |
| | | | From | To | | | | | |
| 50 | | | | | | | | Continued from page 2 | |
| | | 20 | 53.0 | 55.0 | SS/24 | WH-WH-2-5 | | Brown CLAY, little SILT, trace fine SAND (saturated, soft) | 2 |
| 55 | | | | | | | | -CL- | |
| | | 21 | 58.5 | 60.0 | SS/18 | 10-11-12 | | Brown CLAY, little SILT, trace mf SAND (saturated, very stiff) | 23 |
| 60 | | | | | | | | | |
| | | 22 | 63.0 | 65.0 | SS/21 | 19-21-16-16 | | Brown SILT and mf SAND (saturated, hard) | 37 |
| 65 | | | | | | | | -ML- | |
| | | 23 | 68.0 | 70.0 | SS/16 | 5-7-10-10 | | Brown SILT and mf SAND, trace CLAY (saturated, very stiff) | 17 |
| 70 | | | | | | | | | |
| | | 24 | 73.0 | 75.0 | SS/8 | 7-5-6-7 | | Brown SILT and mf SAND (saturated, medium stiff) | 11 |
| 75 | | | | | | | | Continued on page 4 | |

*SS – Split Spoon, U – Undisturbed Tube, C – Core, WH – Weight of Hammer & Rods

**Remarks:** This boring was advanced using mud-rotary method, Revert Quick Mud and tricone bit. Boring was backfilled with cement grout upon completion.

| LOG OF BORING SAMPLES | | | | | | | CLASSIFICATION OF MATERIAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth Scale (Feet) | Casing Blows/ Foot | Sample I.D. | Depth of Sample (Feet) From | To | Sample Type/ Recovery (Inches) | Blows On Sampler Per 6 inches | Depth Of Change (feet) | c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 % | SPT "N" or RQD |
| 75 | | | | | | | | Continued from page 3 | |
| | | 25 | 78.0 | 80.0 | SS/24 | WH-WH-WH-7 | | Brown Marbled CLAY, little SILT (saturated, soft) | WH |
| 80 | | | | | | | | | |
| | | 26 | 83.0 | 85.0 | SS/24 | 6-5-3-5 | | Grey SILT, some fine SAND (saturated, medium stiff) | 8 |
| 85 | | | | | | | | -ML-CL- | |
| | | 27 | 88.0 | 90.0 | SS/158 | 8-4-1-11 | | Grey SILT and CLAY (saturated, medium stiff) | 5 |
| 90 | | | | | | | | | |
| | | 28 | 93.0 | 95.0 | SS/12 | 19-22-27-19 | | Grey SILT (saturated, hard) | 49 |
| 95 | | | | | | | | | |
| | | | | | | | 98 | | |
| | | 29 | 98.0 | 100.0 | SS/14 | 12-10-6-8 | | Brown cmf SAND, some SILT, little cmf GRAVEL (saturated, medium compact) | 16 |
| | | | | | | | | ~ Glacial Till ~ | |
| 100 | | | | | | | | Continued on page 5 | |

*SS – Split Spoon, U – Undisturbed Tube, C – Core, WH – Weight of Hammer & Rods

**Remarks:** This boring was advanced using mud-rotary method, Revert Quick Mud and tricone bit. Boring was backfilled with cement grout upon completion.

| LOG OF BORING SAMPLES | | | | | | | CLASSIFICATION OF MATERIAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth Scale (Feet) | Casing Blows/ Foot | Sample I.D. | Depth of Sample (Feet) | | Sample Type/ Recovery (Inches) | Blows On Sampler Per 6 inches | Depth Of Change (feet) | c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 % | SPT "N" or RQD |
| | | | From | To | | | | | |
| 100 | | | | | | | | Continued from page 4 | |
| | | | | | | | | ~ Glacial Till ~ | |
| | | 30 | 103.0 | 105.0 | SS/13 | 51-29-21-28 | | Brown cmf GRAVEL, some cmf SAND, some SILT (saturated, compact) | 50 |
| 105 | | | | | | | | Bottom of Boring @ 105' | |
| 110 | | | | | | | | | |
| 115 | | | | | | | | | |
| 120 | | | | | | | | | |
| 125 | | | | | | | | | |

*SS – Split Spoon, U – Undisturbed Tube, C – Core, WH – Weight of Hammer & Rods

**Remarks:** This boring was advanced using mud-rotary method, Revert Quick Mud and tricone bit. Boring was backfilled with cement grout upon completion.

# SUBSURFACE EXPLORATION – TEST BORING LOG

**Project:** Harbor Point Redevelopment, Utica, New York
**Report No.:** 26959B-01-1214
**Client:** Elan Planning, Design & Landscape Architecture, PLLC
**Date Started:** 12/11/14 **Finished:** 12/15/14
**Location of Boring:** See Boring Location Sketch
**Elevation of Surface of Boring:** 404.5'

## METHODS OF INVESTIGATION

**Casing:** 4-1/4" ID H. Stem Auger
**Driller:** Dave Lyons
**Casing Hammer:**
**Driller:** A. DePaolo
**Other:**
**Inspector:** M. McConnell
**Soil Sampler:** 2" OD Split Barrel
**Rod Size:** AWJ
**Sampler Hammer: Wt.** 140 lbs.
**Fall:** 30 in.
**Make & Model of Drill Rig:** Diedrich D-120 Truck-Mounted

## GROUND WATER OBSERVATIONS

| Date | Time | Depth | Casing At |
|---|---|---|---|
| 12/11/14 | While drilling | None Noted | |
| 12/11/14 | Before casing removed | None Noted | |
| 12/11/14 | After casing removed | None Noted | out |
| 12/15/14 | After casing removed | Cave @ 6.0 | out |

## LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

| Depth Scale (Feet) | Casing Blows/ Foot | Sample I.D. | Depth of Sample (Feet) From | To | Sample Type/ Recovery (Inches) | Blows On Sampler Per 6 inches | Depth Of Change (feet) | Classification of Material | SPT "N" or RQD |
|---|---|---|---|---|---|---|---|---|---|
| 0 | XXX | | | | | | | Augered to 2.0' | |
| | | 1a | 2.0 | 3.0 | SS/18 | 4-4-4-4 | 3 | Dark Brown cmf SAND, some SILT, trace COAL, trace BRICK, trace CLAY (moist, loose) ~ Fill ~ | 8 |
| | | 1b | 3.0 | 4.0 | | | | Brown mf SAND, little SILT (moist, loose) | |
| | | 2 | 4.0 | 6.0 | U/0 | PUSH | | No Recovery | |
| 5 | | 3 | 4.0 | 6.0 | SS/6 | 1-WH-WH-WH | | Dark Grey cmf SAND and SILT, little CLAY (saturated, loose) | WH |
| | | 4 | 6.0 | 8.0 | U/24 | PUSH | | | |
| | | 5 | 8.0 | 10.0 | SS/5 | 1-1-1-2 | 10 | Dark Grey cmf SAND and SILT, trace CLAY (moist, loose) | 2 |
| 10 | | 6 | 10.0 | 12.0 | SS/2 | WH-WH-1-2 | | Dark Brown/Grey CLAY, little SILT, trace mf SAND, trace PEAT/ORGANICS (moist, soft) | 1 |
| | | 7 | 12.0 | 14.0 | U/19 | PUSH | | | |
| 15 | | 8 | 14.0 | 16.0 | SS/24 | WH-WH-WH-2 | | Dark Brown CLAY and Organic SILT with PEAT (saturated, very soft) | WH |
| | | 9 | 16.0 | 18.0 | U/24 | PUSH | | | |
| | | 10 | 18.0 | 20.0 | SS/24 | WH-WH-WH-WH | | Dark Brown Similar (saturated, very soft) | WH |
| 20 | | | | | | | | Bottom of Boring @ 20.0' | |
| 25 | | | | | | | | | |

*SS – Split Spoon, U – Undisturbed Tube, C – Core, WH – Weight of Hammer & Rods

**Remarks:** Petroleum Odor noted throughout boring.

CME Associates, Inc.

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East Syracuse, New York 13057
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(315) 701-0526 (Fax)

www.cmeassociates.com

# LABORATORY TEST SUMMARY
## Harbor Point Redevelopment CM#2, Utica, New York
## Elan Planning, Design & Landscaping Architecture, PLLC
## CME Report No.: 26959L-01-1214
## December 22, 2014


CME Representatives obtained soil samples from Test Borings advanced as part of the Subsurface Exploration Program conducted for the subject project. Selected samples were delivered to CME's East Syracuse facility, an AASTHO AMRL[1] accredited laboratory for various laboratory testing. The results are presented below:

Sample ID Notations: B - Test Boring, S - Sample

### I. Natural Moisture Content ASTM D2216

| Sample ID | Natural Moisture Content (%) |
|---|---|
| B-3, S-2 | 30.5 |
| B-3, S-3 | 40.5 |
| B-3, S-4 | 50.9 |
| B-3, S-5 | 40.1 |
| B-3, S-6 | 61.4 |
| B-3, S-7 | 81.4 |
| B-3, S-8 | 121.4 |
| B-3, S-9 | 59.9 |
| B-3, S-10 | 103.9 |
| B-3, S-11 | 35.1 |
| B-3, S-12 | 31.8 |
| B-3, S-13 | 39.4 |
| B-3, S-14 | 26.4 |
| B-3, S-15 | 31.4 |
| B-3, S-16 | 19.5 |
| B-3, S-17 | 21.5 |

[1] **AMRL** – American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the standards of the United States. **CME** East Syracuse accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

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**Natural Moisture Content (Continued)**

| Sample ID | Natural Moisture Content (%) |
|---|---|
| B-3, S-18 | 27.5 |
| B-3, S-19 | 40.5 |
| B-3, S-20 | 31.1 |
| B-3, S-21 | 24.8 |
| B-3, S-22 | 23.1 |
| B-3, S-23 | 22.2 |
| B-3, S-24 | 22.2 |
| B-3, S-25 | 32.2 |
| B-3, S-26 | 28.4 |
| B-3, S-27 | 25.8 |
| B-3, S-28 | 24.2 |
| B-3, S-29 | 11.2 |
| B-3, S-30 | 7.9 |

## II. Organic Content ASTM D2974

| Sample ID | Organic Content (%) |
|---|---|
| B-3, S-7 | 8.2 |

## III. Atterberg Limits Testing ASTM D4318

| Sample ID | Liquid Limit | Plastic Limit | Plasticity Index | Natural Moisture (%) |
|---|---|---|---|---|
| B-3, S-3 | 42 | 23 | 19 | 40.5 |
| B-3, S-5 | 47 | 28 | 19 | 40.1 |
| B-3, S-8 | Non-Plastic | | | 121.4 |
| B-3, S-11 | Non-Plastic | | | 35.1 |
| B-3, S-18 | 29 | 18 | 11 | 27.5 |
| B-3, S-20 | 27 | 18 | 9 | 31.1 |
| B-3, S-26 | Non-Plastic | | | 28.4 |

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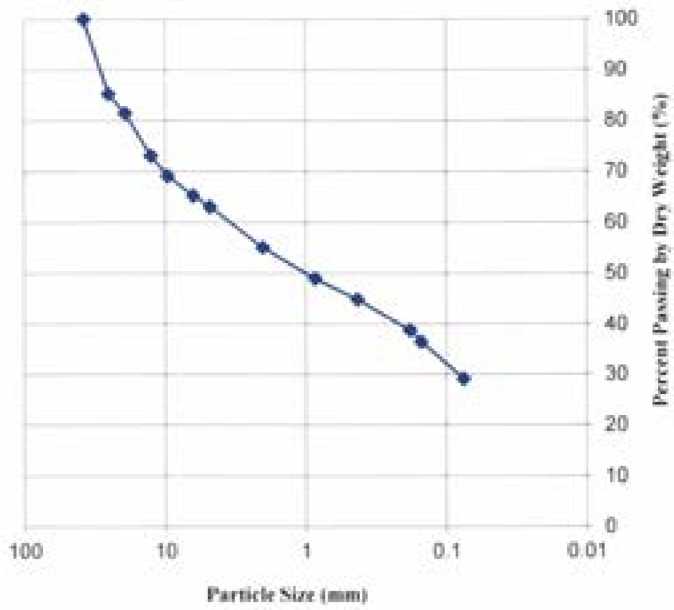
## IV. Mechanical Analysis ASTM D422

**Sample ID:** B-3, S-30

**Burmister Classification:** Brown cmf GRAVEL, some cmf SAND, some SILT

| Sieve Designation | Particle Size (mm) | Percent Passing |
|---|---|---|
| 1 1/2" | 37.5 | 100 |
| 1" | 25.0 | 85 |
| 3/4" | 19.0 | 81 |
| 1/2" | 12.5 | 73 |
| 3/8" | 9.50 | 69 |
| 1/4" | 6.25 | 65 |
| No. 4 | 4.75 | 63 |
| No. 10 | 2.00 | 55 |
| No. 20 | 0.850 | 49 |
| No. 40 | 0.425 | 45 |
| No. 80 | 0.180 | 39 |
| No. 100 | 0.150 | 36 |
| No. 200 | 0.075 | 29 |




## V. Void Ratio

| Sample ID | Void Ratio |
|---|---|
| B-3, S-3 | 0.41 |
| B-3, S-4 | 0.86 |
| B-3, S-6 | 0.83 |
| B-3, S-9 | 0.80 |
| B-3, S-19 | 0.90 |

If you have any questions regarding this report please contact our office.

Niel Zuern
Branch Manager

# GENERAL INFORMATION & KEY TO TEST BORING LOGS

The **Subsurface Exploration - Test Boring Logs produced by CME Associates, Inc.** present the observations and mechanical data collected by the driller while at the site, supplemented, at times, by classification of the materials removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Exploration Logs together with the recovered samples will provide a basis for evaluating the character of the subsurface conditions relative to the proposed construction. The evaluation must consider all the recorded details and their significance relative to each other. Often, analyses of standard boring data indicate the need for additional testing and sampling procedures to more accurately evaluate the subsurface conditions. Any evaluations of the contents of CME's report and the recovered samples must be performed by Licensed Professionals having experience in Soil Mechanics and Foundation Engineering. The information presented in this Key defines some of the procedures and terms used on the CME Exploration Logs to describe the conditions encountered. Refer to the Log on page 3 for key number.

| Key No. | Description |
|---|---|
| 1. | The figures in the **DEPTH SCALE** column define the vertical scale of the Boring Log. |
| 2. | **CASING BLOWS/FOOT** - shows the number of blows required to advance the casing a distance of 12 inches. The casing size, the hammer weight and the length of drop are noted under the **Methods of Investigation**. If the casing is advanced by means other than driving, the method of advancement will be indicated under **Methods of Investigation** at the top of the Log. If Hollow Stem Augers or Coring is used, it will be so noted in this column. |
| 3. | The **SAMPLE I.D.** is used for identification on the sample containers and in the Laboratory Test Report or Summary. |
| 4. | The **DEPTH OF SAMPLE** column gives the exact depth range from which a sample was recovered. |
| 5. | The **SAMPLE TYPE/RECOVERY** column is used to signify the various type of sample attempt. "SS" is Split Spoon, "P" is piston tube, "U" is Undisturbed tube. For soil samples, the recovered length of the sample is also indicated, in inches. If a rock core sample is taken, the core bit size designation is given here. |
| 6. | **BLOWS ON SAMPLER** - shows the results of the "Standard Penetration Test (SPT) ASTM D1586", recording the number of blows required to drive a split spoon sampler into the soil beneath the casing. The number of blows required for each six inches of penetration is recorded. The total number of blows required for the 6 inch to 18 inch interval is summarized in the **SPT "N"** column and represents the "Standard Penetration Number". The outside diameter of the sampler, the hammer weight and the length of drop are noted in the **Methods of Investigation** portion of the log. A "WH" or "WR" in this column indicates that the sample spoon advanced the 6 inch interval under **W**eight of **H**ammer or **W**eight of **R**ods, respectively. |
| 7. | The **DEPTH OF CHANGE** column designates the depth (in feet) that the driller noted a compactness or stratum change. In soft materials or soil strata exhibiting a consistent relative density, it is difficult for the driller to determine the exact change from one stratum to the next. In addition, a grading or gradual change may exist. In such cases the depth noted is approximate or estimated only and may be represented by a dashed line. |
| 8. | **CLASSIFICATION OF MATERIAL - Soil materials** encountered and sampled are described by the driller on the original log. Notes of driller observations are also placed in this column. Recovered samples may also be visually classified by a Soil Technician upon receipt in the Laboratory. Visual sample classification is by Burmister System and strata may be classified additionally by the Unified System. The Burmister System is a type of visual-manual textural classification estimated by the Driller or Technician on the basis of weight-fraction of the recovered soil. See Table 1 **"Classification of Materials"**. The description of the relative soil compactness or consistency is based upon the standard penetration number as defined in Table 2. The description of the soil moisture condition is described as dry, moist, wet, or saturated. Water used to advance the boring may have affected the in-situ moisture content of the sample. Special terms are used as required to describe materials in greater detail, such terms are listed in ASTM D653. When sampling gravelly soils with a standard two-inch O.D. Split Spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders, cobbles, and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller. |

8. **CLASSIFICATION OF MATERIAL** (continued)
The Description of **Rock** is based upon the recovered rock core. Terms frequently used in the description are included in Table 3. The length of core run is defined as length of penetration between retreivals of the corebarrel from the bore hole, expressed in inches. The core recovery expresses the length of core recovered from the core barrel per core run, in percent. The size core barrel used is noted in **Column 5**. The more commonly used sizes of core barrels are denoted "AX" and "NX". An "NX" core, being larger in diameter than "AX" core, often produces better recovery, and is frequently utilized where accurate information regarding the geologic conditions and engineering properties is needed. A better estimate of in-situ rock quality is provided by a *modified core recovery ratio* known as the **"Rock Quality Designation" (RQD)**. This ratio is determined by considering only pieces of core that are at least 4 inches long and are hard and sound. Breaks obviously caused by drilling are ignored. The diameter of the core should preferably be not less than 2 inches (NX). The percentage ratio between the total length of such core recovered and the length of core drilled on a given run is the RQD. Table 4 gives the rock quality description as related to the **RQD**.

9. The **SPT "N"** or **RQD** is given in this column as applicable to the specific sample taken. In Very Compact coarse grained soils the N-value may be indicated as 50+, and in Hard fine-grained soils the N-value may be indicated as 30+. This typically means that the blow count was achieved prior to driving the sampler the entire 6 inch interval or the sampler refused further penetration. For "NX" rock cores, the RQD is reported here, expressed in percent.

10. **GROUND WATER OBSERVATIONS** and timing noted by the driller are shown in this section. It is important to realize that the reliability of the water level observations depend upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that drill water used to advance the borings may have influenced the observations. Ground water levels typically fluctuate seasonally so those noted on the log are only representative of that exhibited during the period of time noted on the log. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or ground water observation well installations.

***TABLE 1 - VISUAL CLASSIFICATION OF MATERIALS (BURMISTER)***

| **GROUP** | **TEXTURAL CLASSIFICATION SIZES** |
|---|---|
| BOULDERS | larger than 12" diameter |
| COBBLES | 12" diameter to 3" sieve |
| GRAVEL | 3" - coarse - 1" - medium - 1/2" - fine - #4 sieve |
| SAND | #4 - coarse - #10 - medium - #40 - fine - #200 sieve |
| SILT | #200 sieve (0.074mm) to 0.005mm size (see below *) |
| CLAY | 0.005mm size to 0.001mm size (see below *) |

| **ABBREVIATIONS** | **PERCENT OF TOTAL SAMPLE BY WEIGHT** | |
|---|---|---|
| f - fine | and | 35 to 50% |
| m - medium | some | 20 to 35% |
| c - coarse | little | 10 to 20% |
| | trace | 0 to 10% |

***PLASTICITY DESCRIPTIONS**

| **TERM** | **PLASTICITY INDEX** | **DRY STRENGTH** | **FIELD TEST** |
|---|---|---|---|
| Non-plastic | 0 - 3 | Very low | falls apart easily |
| Slightly plastic | 4 - 15 | Slight | easily crushed by fingers |
| Plastic | 15 - 30 | Medium | difficult to crush |
| Highly plastic | 31 or more | High | impossible to crush with fingers |

| *TABLE 2 - DESCRIPTION OF SOIL COMPACTNESS OR CONSISTENCY based on SPT "N"** | | |
|---|---|---|
| **Primary Soil Type** | **Descriptive Term of Compactness** | **Range of Standard Penetration Resistance (N)** |
| **COARSE GRAINED SOILS** | Very loose | less than 4 blows per foot |
| (More than half of Material is larger than No. 200 sieve size.) | Loose | 4 to 10 |
| | Medium compact | 10 to 30 |
| | Compact | 30 to 50 |
| | Very compact | Greater than 50 |
| **FINE GRAINED SOILS** | **Descriptive Term of Consistency** | **Range of Standard Penetration Resistance (N)** |
| (More than half of material is smaller than No. 200 sieve size.) | Very soft | less than 2 blows per foot |
| | Soft | 2 to 4 |
| | Medium stiff | 4 to 8 |
| | Stiff | 8 to 15 |
| | Very stiff | 15 to 30 |
| | Hard | Greater than 30 |

*The number of blows of 140 pound weight falling 30 inches to drive 2 inch O.D., 1-3/8 inch I.D. sampler 12 inches is defined as the Standard Penetration Resistance designated "N".

| *TABLE 3 - ROCK CLASSIFICATION TERMS* | | |
|---|---|---|
| **Rock Classification Terms** | | **Field Test or Meaning of Term** |
| **Hardness** | Soft | Scratched by fingernail |
| | Medium Hard | Scratched easily by penknife |
| | Hard | Scratched with difficulty by penknife |
| | Very Hard | Cannot be scratched by penknife |
| **Weathering** | Very Weathered<br>Weathered<br>Sound | Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc. |
| **Bedding**<br><br>(Natural Breaks in Rock Layers) | Laminated<br>Thinly bedded<br>Bedded<br>Thickly bedded<br>Massive | less than 1inch<br>1inch to 4 inches<br>4 inches to 12 inches<br>12 inches to 36 inches<br>greater than 36 inches |

| *TABLE 4* Relation of Rock Quality Designation (RQD) and in-situ Rock Quality | |
|---|---|
| **RQD (%)** | **Rock Quality Term Used** |
| 90 to 100 | Excellent |
| 75 to 90 | Good |
| 50 to 75 | Fair |
| 25 to 50 | Poor |
| 0 to 25 | Very Poor |

**BORING NO.:** B-1 Page 1 of 1

## SUBSURFACE EXPLORATION - TEST BORING LOG

| | |
|---|---|
| **Project:** | **Report No.:** |
| **Client:** | **Date Started:** **Finished:** |
| **Location of Boring:** | **Elevation of Surface of Boring:** |

**METHODS OF INVESTIGATION**

**Casing:** 3-1/4" I.D. Hollow Stem Auger **Hammer:**

**Other:**

**Soil Sampler:** 2" O.D. Split Barrel **Rod Size:**

**Sampler Hammer: Wt.** 140 lbs. **Fall:** 30 in.

**Make & Model of Drill Rig:**

**GROUND WATER OBSERVATIONS**

| Date | Time | Depth | Casing At |
|---|---|---|---|
| | While drilling | | |
| | Before casing removed | | |
| | After casing removed | | |
| | | | |

**LOG OF BORING SAMPLES** / **CLASSIFICATION OF MATERIAL**

| Depth Scale (Feet) | Casing Blows/ Foot | Sample I.D. | Depth of Sample (Feet) From | To | Sample Type/ Recovery (inches) | Blows on Sampler Per 6 inches | Depth of Change (feet) | f - fine<br>m - medium<br>c - coarse<br>**and** - 35 to 50%<br>**some** - 20 to 35%<br>**little** - 10 to 20%<br>**trace** - 0 to 10% | STP "N" or RQD |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 9 |

Denotes Key Number (see page 1)