APPENDIX B

Geology, Soils, and Seismicity

Soil Map—Cattaraugus County, New York
(TLC Health Network Tri-County Hospital)

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:2,990 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cattaraugus County, New York
Survey Area Data: Version 12, Dec 19, 2011

Date(s) aerial images were photographed: 6/17/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Cattaraugus County, New York (NY009)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
78B	Hornell silt loam, 3 to 8 percent slopes	14.4	32.5%
78C	Hornell silt loam, 8 to 15 percent slopes	4.9	11.1%
80A	Fremont silt loam, 0 to 3 percent slopes	18.8	42.4%
80B	Fremont silt loam, 3 to 8 percent slopes	6.3	14.1%
Totals for Area of Interest		**44.3**	**100.0%**

EMPIRE GEO SERVICES, INC.
A SUBSIDIARY OF SJB SERVICES, INC.

CORPORATE/ BUFFALO OFFICE
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

ALBANY OFFICE
PO Box 2199
Ballston Spa, NY 12020

5 Knabner Road
Mechanicville, NY 12118
Phone: (518) 899-7491
Fax: (518) 899-7496

CORTLAND OFFICE
60 Miller Street
Cortland, NY 13045
Phone: (607) 758-7182
Fax: (607) 758-7188

ROCHESTER OFFICE
535 Summit Point Drive
Henrietta, NY 14467
Phone: (585) 359-2730
Fax: (585) 359-9668

MEMBER
ACEC New York

August 29, 2011
Project No.: BE-11-097

Mr. Michael Corcimiglia
TLC Health Network
845 Routes 5 & 20
Irving, New York 14081

Re: Geotechnical Engineering Report for
Proposed New Tri-County Memorial Hospital Facility
Jolls Road and Stafford Road
Perrysburg, New York

Dear Mr. Corcimiglia:

Empire Geo-Services, Inc. (Empire) has prepared five (5) copies, along with a pdf format, electronic file copy, of the enclosed Geotechnical Engineering Report for the above referenced project. On behalf of TLC Health Network, we have distributed the report to the parties listed below.

Please contact me should you have any questions or wish to discuss this report. Thank you for considering Empire for this work and we look forward to working with you on this project, through its completion.

Sincerely,

EMPIRE GEO-SERVICES, INC.

John J. Danzer, P.E.
Senior Geotechnical Engineer

Geotechnical Engineering Report Distribution:

Mr. Michael Corcimiglia - TLC Health Network (2 Report Copies and pdf format, electronic file copy, via e-mail)

Mr. Brian Sitzman – Cannon Design (2 Report Copies and pdf format, electronic file copy, via e-mail)

Mr. Ronald Simmons – Simmons Recovery Consulting (1 Report Copy and pdf format, electronic file copy, via e-mail)

Ms. Valerie Sirianni – Cannon Design (pdf format, electronic file copy, via e-mail)

EMPIRE GEO SERVICES, INC.

A SUBSIDIARY OF SJB SERVICES, INC.

CORPORATE/ BUFFALO OFFICE
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

ALBANY OFFICE
PO Box 2199
Ballston Spa, NY 12020

5 Knabner Road
Mechanicville, NY 12118
Phone: (518) 899-7491
Fax: (518) 899-7496

CORTLAND OFFICE
60 Miller Street
Cortland, NY 13045
Phone: (607) 758-7182
Fax: (607) 758-7188

ROCHESTER OFFICE
535 Summit Point Drive
Henrietta, NY 14467
Phone: (585) 359-2730
Fax: (585) 359-9668

MEMBER

ACEC *New York*

Geotechnical Engineering Report for Proposed New Tri-County Memorial Hospital Facility Jolls Road and Stafford Road Perrysburg, New York

Prepared For:

TLC Health Network
845 Routes 5 & 20
Irving, New York 14081

Prepared By:

Empire Geo-Services, Inc.
5167 South Park Avenue
Hamburg, New York 14075

STATE OF NEW YORK
JOHN JOSEPH DANZER
No. 065989
LICENSED PROFESSIONAL ENGINEER

8/29/11

Project No.: BE-11-097
August 2011

TABLE OF CONTENTS

1.00 INTRODUCTION 1

1.10 GENERAL 1

1.20 PROJECT AND SITE DESCRIPTION 1

2.00 SUBSURFACE EXPLORATION 2

3.00 SUBSURFACE CONDITIONS 3

3.10 GENERAL 3

3.20 SURFACE MATERIAL 4

3.30 INDIGENOUS SOIL STRATUM 4

3.40 BEDROCK 4

3.50 GROUNDWATER CONDITIONS 5

4.00 GEOTECHNICAL CONSIDERATIONS AND RECOMMENDATIONS 6

4.10 GENERAL 6

4.20 FOUNDATION DESIGN 8

4.30 SLAB-ON-GRADE CONSTRUCTION 9

4.40 LATERAL EARTH PRESSURES AND EARTH RETAINING WALL DESIGN 10

4.50 FOUNDATION WALL DRAINAGE 11

4.60 SEISMIC DESIGN CONSIDERATION 12

4.70 ASPHALT PAVEMENT DESIGN 13

4.80 SITE PREPARATION AND CONSTRUCTION 15

4.80.1 EXCAVATION AND FOUNDATION CONSTRUCTION 15

4.80.2 SUBGRADE PREPARATION FOR SLAB-ON-GRADE 16

4.80.3 PAVEMENT CONSTRUCTION 17

5.00 CONCLUDING REMARKS 18

TABLE

TABLE 1 – SUMMARY OF SUBSURFACE CONDITIONS

FIGURES

FIGURE 1 – SITE LOCATION PLAN

FIGURE 2 – SUBSURFACE EXPLORATION PLAN

APPENDICES

APPENDIX A – SUBSURFACE EXPLORATION LOGS

APPENDIX B – FILL MATERIAL AND EARTHWORK RECOMMENDATIONS

APPENDIX C – INFORMATION REGARDING THIS GEOTECHNICAL ENGINEERING REPORT

1.00 INTRODUCTION

1.10 GENERAL

This report presents the results of a subsurface exploration program and geotechnical engineering evaluation completed by Empire Geo-Services, Inc. (Empire) for the proposed development of the new Tri-County Memorial Hospital facility at the southeast corner of Stafford Road and Jolls Road in the Town of Perrysburg, New York. The approximate location of the project site is shown on Figure 1.

TLC Health Network retained Empire to complete this work, which was done in accordance with our proposal dated July 11, 2011. SJB Services, Inc. (SJB), our affiliated drilling company, completed the subsurface exploration program, which consisted of eight (8) test borings drilled at the project site.

On this basis, Empire prepared this report, which summarizes the subsurface conditions encountered by the test borings and presents geotechnical recommendations for design and construction of the foundations and slab-on-grade floor construction for the proposed building, along with recommendations for associated pavement construction.

1.20 PROJECT AND SITE DESCRIPTION

Based on the information provided by Cannon Design, Inc. (Cannon), the proposed new Tri-County Memorial Hospital Facility building will be primarily a single-story, steel frame type structure, with a second-story mechanical penthouse within a portion of the building. The main entrance will consist of timber post and truss construction. The exterior cladding will consist of a combination of stone, wood and glass.

The building is planned to be supported on a shallow spread foundation system. Maximum foundation loads are expected to be around 1 kip per linear foot for continuous wall footings and around 40 kips for column footings, within the single story portion of the building. Maximum column loads in the second story mechanical penthouse area are expected to be around 270 kips or less.

No basement or depressed crawl space areas are planned, however, a portion of the building may be cut into the existing site slope, and therefore may require portions of the foundation walls to be earth retaining type walls. The ground floor is planned to be constructed as slab-on-grade.

The finished floor elevation (El.) for the new building is expected to be set at around El. 1028.5 feet. Existing site grades in the area of the building range between about El. 1022.6 feet and El.1035.7 feet, based on the ground surface elevations obtained at the test boring locations.

The project will also include construction of access drives and parking areas around the new building site. Traffic is expected to consist mainly of automobiles/light SUVs, ambulances and delivery trucks.

Figure 2 shows the planned site development and the approximate test boring locations.

The proposed new Tri-County Memorial Hospital facility is planned on a currently undeveloped parcel of land located at the southeast corner of Stafford Road and Jolls Road in the Town of Perrysburg, Cattaraugus County, New York. The site currently consists of an open cultivated farm field.

The overall site slopes down about 30 feet in elevation from southwest to northeast and east, with ground surface elevations ranging from about El 1040 feet in the southwest portion of the site to about El.1010 near the northeast corner of the site. Within the proposed building area net grade cuts of up to 7.2 feet and net grade fills of up to 5.9 feet are expected to establish the finished floor elevation.

2.00 SUBSURFACE EXPLORATION

The subsurface exploration program consisted of eight (8) test borings drilled by SJB between August 1st and 3rd, 2011. The borings are designated as B-1 through B-8 and their approximate locations are shown on Figure 2.

The proposed test boring locations were initially established on a site plan prepared by Cannon and then laid out in the field by SJB using tape measurements referenced to existing site features. Optical survey level techniques were utilized to determine the existing ground surface elevations at the test boring locations, using a spike benchmark set and established by others on the north side of an existing utility pole (NYSEG Pole #124S), which is located along the south side of Stafford Road, just south of the northwest corner of the site. The approximate location of the benchmark is shown on Figure 2 and it is reported to have an elevation of El. 1025.98 feet, as shown on a site survey map provided to Empire by Cannon.

The test borings were generally located within the area of the proposed building, and were each advanced through surficial topsoil, and overburden soil and then into

weathered Shale bedrock until auger refusal was encountered. Auger refusal was encountered at depths ranging between 7.7 feet and 17.9 feet, below the existing ground surface (bgs).

The test borings were made using a Central Mine Equipment (CME) model 85 truck mounted drill rig and were advanced in the overburden soil and weathered Shale using hollow stem auger and split spoon sampling methods. The split spoon sampling and SPT's were completed in general accordance with *ASTM D1586 – Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*.

Rock coring was performed in borings B-2, B-3, B-5 and B-7 after auger refusal was met. The rock coring was advanced 5.0 feet in these borings. The coring was completed in general accordance with *ASTM D 2113 – Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation*, using an NQ size double tube core barrel.

A geologist prepared the test boring logs based on visual observation of the recovered split spoon samples and rock core and review of the driller's field notes. The soil samples were described based on a visual estimation of the grain size distribution, along with characteristics such as color, relative density, consistency, moisture, etc. The rock core was also described, including characteristics such as color, rock type, hardness, weathering, bedding thickness, core recovery and rock quality designation (RQD). The test boring logs are presented in Appendix A, along with a summary sheet of general information and an explanation of terms and symbols used to prepare the logs.

3**.00 SUBSURFACE CONDITIONS**

3.10 GENERAL

The general stratigraphy encountered in the test borings consists of surface topsoil and a generally thin veneer (2 to 8 feet thick) of indigenous silt, clayey silt and sand soil, which overlies weathered Shale bedrock that becomes more competent with depth, as indicated by the subsequent auger refusal. Man placed fill soils were not apparent at the boring locations. The subsurface conditions encountered are described in more detail in the following sections and on the boring logs in Appendix A.

Table 1 presents a summary of the surface materials and their thickness, the depth and elevation of where weathered Shale was initially encountered, the depth and elevation of auger refusal (presumed more sound and competent bedrock) and the depth and elevation of suitable subgrades for placement of foundations (as discussed in Section 4.20).

3.20 SURFACE MATERIAL

A topsoil layer was encountered at the surface of each of the test boring locations. Based on the driller's interpretation, the topsoil layer thickness typically ranges between about 0.8 feet and 1.1 feet at the boring locations.

The topsoil thickness measurements noted by the driller are at widely spaced locations, and are based on the driller's interpretation. Therefore, these measurements should not be solely relied on for accurate construction quantity estimates. Accordingly, we recommend the Contractor, and/or others, make their own detailed observations and measurements, prior to bidding and construction, to determine the quantities, costs and efforts that will be required for topsoil material removal and associated replacement with appropriate suitable fill materials.

Man-placed fill soils were not apparent at the test boring locations. We note, however, the upper 1 to 2 feet of soils present on the site are generally loose or soft, and contain occasional inclusions of organics. Therefore, it appears the upper soils have been reworked and disturbed by past agricultural activities on the site.

3.30 INDIGENOUS SOIL STRATUM

Beneath the topsoil, a relatively thin stratum of indigenous orange-brown, olive-brown and brown silt, clayey silt and sand soil was encountered in most of the test borings, with the exception of test boring B-4. The indigenous soils are classified as ML and SM group soils using the Unified Soil Classification System (USCS).

Standard Penetration Test (SPT) "N" values obtained in the indigenous soils ranged from 5 to 35 indicating the relative density of the more granular or non-plastic silt and sand soils is typically loose to compact, while the consistency of the fine grained cohesive clayey silt soils is stiff to very stiff.

The indigenous soils grade to weathered Shale bedrock at depths generally ranging between 2 feet and 6 feet bgs at the boring locations. At test boring B-4 the indigenous soil stratum was absent, with the topsoil layer overlying weathered Shale at this location.

3.40 BEDROCK

Beneath the indigenous soils, and beneath the topsoil layer at boring location B-4, weathered Shale, which grades to more competent Shale bedrock with depth, was encountered in each of the borings. The weathered Shale bedrock is typically of a

friable and soil like matrix as it is first encountered and then grades to a more rock like matrix, with depth. The weathered Shale was initially encountered at depths ranging from about 1 foot bgs at boring B-4 to about 8 feet at boring B-7.

At each boring, it was possible to split spoon sample and auger into the weathered Shale, until auger refusal was subsequently encountered at depths ranging between about 7.7 feet bgs (boring B-8) and 17.9 feet bgs (boring B-1). Within this zone the SPT "N" values typically ranged from 16 to REF (Sample Spoon Refusal – 50 blows or more to advance the sample spoon with 6-inches or less of penetration).

The following table summarizes the depth and elevation where the weathered Shale was initially encountered and then the depth and elevation where auger refusal was met. The auger refusal suggests that a more sound and competent Shale bedrock was encountered.

Boring No.	Ground Surface El.	Depth/Elevation to Top of Weathered Shale Bedrock (feet)	Depth/Elevation of Auger Refusal (feet)
B-1	1029.1	6.0 / 1023.1	17.9 / 1011.2
B-2	1024.3	2.0 / 1022.3	8.5 / 1015.8
B-3	1031.5	6.0 / 1025.5	15.5 / 1016.0
B-4	1029.9	1.0 / 1028.9	9.9 / 1020.0
B-5	1022.6	2.0 / 1020.6	8.2 / 1014.4
B-6	1035.7	4.0 / 1031.7	14.6 / 1021.1
B-7	1034.2	8.0 / 1026.2	15.7 / 1018.5
B-8	1024.8	2.0 / 1022.8	7.7 / 1017.1

Following encountering auger refusal, bedrock coring was performed in borings B-2, B-3, B-5 and B-7. The recovered rock core is described as gray, soft to medium hard, slightly weathered to sound, laminated to thinly bedded Shale bedrock. Core recoveries ranged from 80% to 100% and the rock quality designation (RQD) values were 0% to 40% indicating the recovered bedrock core has a very poor to poor rock mass quality.

3.50 GROUNDWATER CONDITIONS

With the exception of test borings B-3 and B-7, freestanding water was not apparent within the test borings upon completion of the auger drilling and split spoon sampling operations. It is possible, however, that groundwater if present, did not have sufficient time to accumulate and stabilize within some of the

borings within the time period that had elapsed from the completion of the auger drilling and sampling operations and the time of the measurements.

Freestanding water was observed in test borings B-3 and B-7 at depths of 15.1 feet and 15.9 feet bgs, respectively, prior to rock coring. Following coring at boring locations B-3, B-5 and B-7, freestanding water was recorded at 2.7 feet, 6.1 feet and 5.7 feet, respectively. We note, however, water was added to the test holes to facilitate rock coring and therefore these water levels are not considered representative of stabilized groundwater conditions.

Based on the water encountered in borings B-3 and B-7, prior to rock coring, it appears that some localized zones of perched or trapped groundwater are present at various locations and depths within the shale bedrock. We note that groundwater conditions may fluctuate with changes in soil/bedrock conditions, along with changes in precipitation and seasonal conditions.

4.00 GEOTECHNICAL CONSIDERATIONS AND RECOMMENDATIONS

4.10 GENERAL

The following geotechnical considerations and recommendations are provided for planning and design of the proposed new Tri-County Memorial Hospital facility, based on the results of the subsurface exploration and our understanding of the proposed site development.

1. A conventional spread foundation system will be suitable to support the currently proposed building structure. In addition, the floor construction can proceed as slab-on-grade construction following proper subgrade preparation and site filling, as discussed further below.

2. Based on the sloping topography of the site and the proposed site development grading, it is anticipated that the spread foundations will bear on subgrades consisting of either the indigenous silt, clayey silt and sand soils, weathered Shale or on compacted Engineered Fill materials.

3. The subsurface conditions encountered in the test borings indicate that weathered Shale bedrock is generally present across the site within a depth of about 1 to 8 feet from the existing ground surface. Therefore, it is anticipated that excavation into the weathered Shale will be required to construct some of the foundations and underground utilities, as well as to establish some of the final site grades, particularly in the area of test

borings B-3, B-4, B-6 and B-7 and to the southwest portion of the site. Fills are anticipated in the area of test borings B-2, B-5 and B-8.

4. The ability to auger and split spoon sample in the weathered Shale bedrock suggests that this material can generally be loosened and excavated using conventional larger size excavators (backhoes) and bulldozers equipped with rock / ripper teeth.

   The test boring data, however, suggests the Shale bedrock becomes more competent with depth. Therefore, it is recommended that the Contractor also anticipate that the use of a pneumatic or hydraulic breaker, to loosen the bedrock prior to excavation, could potentially be necessary in some cases, where excavations proceed further into the Shale bedrock. The Contractor should consider excavating some test pits, prior to construction, to help determine the excavation effort and equipment that will be necessary.

5. The existing Shale bedrock and overlying indigenous soils, which are excavated as part of the site preparation, can be used as subgrade fill within the slab-on-grade and pavement areas, provided it is well graded from coarse to fine and is free of topsoil, deleterious conditions and particles greater than about 6-inches and can be properly compacted. This material, however, will not be suitable for use as Structural Fill or as the recommended Subbase Stone course material directly beneath floor slabs or asphalt pavement.

6. Spread foundations may be constructed over site subgrade fills consisting of suitable weathered Shale bedrock and indigenous soil material, provided that the subgrade fill is properly compacted and stable, and is free of rutting and surface deflections under the weight and operation of construction equipment and the rollers used for compaction and proof rolling. In areas where the foundations are constructed over site subgrade fills we recommend the final 2 feet of fill directly beneath the foundation consist of compacted Structural Fill material, as recommended below.

7. Site preparation and grading plans should address any planned future development areas of the site (i.e. for building additions and parking lot expansion) where filling is required to establish the currently proposed final site grades. Placement of un-suitable or non-engineered fill materials in these areas will not be suitable for future construction.

   Where filling is required in possible future development areas, the subgrades should be properly prepared (i.e. stripped, compacted and

proof-rolled) and suitable subgrade fill materials should be properly placed, compacted, and tested, as well as documented. Accordingly, fill containing topsoil, and un-suitable and/or un-compacted soils should not be placed in these areas.

8. Based on the sloping terrain towards the building from the southeast, we would recommend that a drainage swale be placed up slope on the south and west sides of the building to intercept potential surface water flow and divert it away from the building and parking areas. We would also recommend an exterior foundation drain be placed at the top of the wall footings, along the south and west foundation walls, to intercept any potential groundwater seepage, which could also flow towards the building area.

The following sections provide additional and more detailed recommendations for design and construction of the foundations, slab-on-grade floors and pavement for the new Tri-County Memorial Hospital facility.

4.20 FOUNDATION DESIGN

The building foundations should bear on suitable, in-situ indigenous soil or weathered Shale bearing grades following the removal of topsoil and/or any unsuitable indigenous soils or Shale, which may be present below the proposed footing grade. Foundations can also bear on Engineered Fill (i.e. compacted subgrade fill and Structural Fill), which is placed over suitable subgrades, following removal of the surface topsoil, and any loose, soft, wet, organic or otherwise deleterious existing underlying soil conditions.

Suitable in-situ subgrades should consist of indigenous firm to compact silt and sand soils or stiff to hard clayey silt soils or weathered Shale, which is free of vegetation, significant root matter, topsoil, organics, soft, loose, wet, soft or otherwise deleterious conditions. Suitable bearing subgrade conditions, for directly supporting foundations, were encountered at various depths and elevations in the test borings, as presented on Table 1. The foundations should bear at or below these grades or they should bear on compacted Engineered Fill, which is placed over suitable subgrades, which are prepared as described in Section 4.80.2.

Subsurface conditions may vary away from the exploration locations and therefore could require adjustments in the suitable subgrade elevation based on actual conditions encountered at the time of construction. Accordingly, close inspection of the foundation bearing subgrades, by qualified geotechnical personnel, is recommended at the time of construction.

In the case where foundations will bear over subgrade fills consisting of compacted indigenous soil and excavated weathered Shale material or imported Suitable Granular Fill, we recommend the final 2 feet of fill directly beneath the foundation consist of compacted Structural Fill material.

Where Structural Fill is placed beneath the foundations, it should be placed beyond the foundation limits a horizontal distance equal to at least 0.5 times the thickness of the Structural Fill layer beneath the foundation. Excavation or fill placement limits, therefore, will need to be planned and sized accordingly. Recommendations for Structural Fill material along with its placement and compaction are presented in Appendix B.

Foundations constructed on suitable in-situ bearing subgrades or on Engineered Fill, which is properly placed over the suitable subgrades can be sized based on a maximum net allowable bearing pressure of 3,000 pounds per square foot (psf).

Continuous wall footings should be at least 2.0 feet in width and column/individual footings should be at least 3.0 feet in width. Exterior foundations should be embedded a minimum of 4.0 feet below finished adjacent grades for frost protection. Interior foundations should be embedded a minimum of 2.5 feet below the finished floor elevation in order to develop adequate bearing capacity. All foundations, however, must bear on suitable bearing grades in accordance with the recommendations above.

It is estimated that spread foundations sized and properly constructed in accordance with our recommendations will undergo total settlement of less than ¾-inch.

4.30 SLAB-ON-GRADE CONSTRUCTION

The building floor slabs may be constructed as slab-on-grade over compacted subgrade fill placed to establish the finished floor grade or on in-situ indigenous soil or weathered Shale subgrades following removal of the topsoil and any unsuitable underlying materials (i.e. organics, soft, loose, wet soils, etc.) and preparation of the existing subgrades as discussed in Section 4.70.2.

A minimum of 6-inches of Subbase Stone is recommended beneath generally lightly loaded interior floor slabs (i.e. general hospital floor / office areas, etc.). A minimum of 10-inches of Subbase Stone is recommended beneath more heavily loaded floor slabs (i.e. material storage areas or slabs supporting equipment). Recommendations for Subbase Stone are presented in Appendix B.

To limit potential frost heaving of non-vehicle loaded exterior slabs (i.e. sidewalks, concrete pads, etc.) we recommend that the slab be constructed over at least 8 inches of Subbase Stone. A minimum of 12-inches of Subbase Stone should be placed in areas where exterior slabs would be subject to light vehicle loads. In both cases, subgrade and subbase drainage (i.e. underdrains) should be provided to help minimize the potential for frost action.

A suitable stabilization/separation geotextile, such as Mirafi 500X or suitable equivalent, should be placed over the existing indigenous soil subgrades prior to placement of the Subbase Stone layer. A geotextile would not be necessary where the Subbase Stone is placed over suitable compacted subgrade fill (i.e. Suitable Granular Fill).

Concrete slab-on-grade construction can be designed using a modulus of subgrade reaction of 150 pounds per cubic inch at the top of the Subbase Stone layer.

We note that the above subbase stone course thicknesses recommended are not designed for carrying construction vehicle loads. Therefore, it may be desirable for the Contractor to temporarily increase the Subbase thickness within the building pad and pavement areas to provide a suitable working surface to stage the construction, carry construction vehicle loads and protect the underlying subgrades. This will be particularly important if construction proceeds during seasonally wet periods. The additional subbase stone material could then be removed in preparation for the actual floor construction and re-used as foundation backfill, pavement area subbase or as otherwise determined appropriate.

Provided the finished floor grades will be established above the surrounding exterior grades, and suitable site drainage is provided as recommended in Section 4.10, the use of a moisture barrier does not appear warranted, unless otherwise recommended by the finished flooring manufacturer. It is recommended that the slab-on-grade be constructed such that it floats on the subbase and subgrades and is not structurally connected to, or resting directly on, perimeter walls or column footings in order to limit differential settlement effects.

4.40 LATERAL EARTH PRESSURES AND EARTH RETAINING WALL DESIGN

The design of earth retaining foundation walls or depressed pit structure walls should be based on lateral earth pressures caused by the load of backfill against the wall and the surcharge effects from any permanent or temporary loads. In addition foundation drains, as discussed in Section 4.50 below, should be incorporated in the design where the walls are designed for relieved hydrostatic pressures (i.e. drained conditions).

The design of earth retaining foundation walls or depressed pit structure walls (restrained walls), should be designed to resist "at rest" lateral earth pressures generated by the earth backfill and any temporary or permanent surcharge loads, based on the following soil parameters. Earth retaining walls, which are allowed to yield (i.e. cantilevered earth retaining walls), can be designed on the basis of "active" lateral earth pressures.

The lateral earth pressures can be computed using the following soil parameters where the wall backfill is a Structural Fill or Suitable Granular Fill, as described in Appendix B.

Recommended Soil Parameters for Earth Retaining Wall Design

- Coefficient of "At-Rest" Lateral Earth Pressure – 0.47
- Coefficient of "Active" Lateral Earth Pressure – 0.31
- Coefficient of "Passive" Lateral Earth Pressure – 3.25
- Angle of Internal Friction – 32 Degrees
- Moist Unit Weight of Soil (Drained Condition) – 125 pcf
- Submerged Unit Weight of Soil – 65 pcf
- Lateral Coefficient for Surcharge Loads – 0.50

Water should not be allowed to collect against the backfilled wall section unless the wall is designed for the additional hydrostatic pressure.

If any depressed pit type structures are designed for full hydrostatic pressures, the walls should be designed to resist the hydrostatic pressures as well as the lateral earth pressures acting the walls. In this case, the lateral earth pressure should be computed based on a submerged soil unit weight below the design groundwater level. In addition, the floor or bottom slab must be designed to resist potential hydrostatic uplift pressure acting on floor or pit bottom slab. For full hydrostatic pressure design, we recommend the groundwater be assumed to be at 2 feet below the finished surface adjacent to the pit structure. In this case, the pit structure should also be fully water proofed.

4.50 FOUNDATION WALL DRAINAGE

Where the earth retaining foundation walls and below grade pit structure walls are designed for relieved hydrostatic pressures (i.e. drained conditions), foundation drains (wall drains and underslab drains) should be provided to intercept potential perched groundwater and relieve potential hydrostatic pressures. The drainage

system must be properly designed, installed and maintained for long-term performance. The design should include such features as clean-outs to properly maintain the system in the drained condition. The foundation drainage system should drain to a sump and pump system or a suitable gravity drainage system, which does not have the potential to backup. The foundation drain pipes along the earth retaining foundation walls should be set at a minimum depth of 1.0 foot below the floor/bottom grade or lowest adjacent grade.

The foundation drainage system should include a drainage type geotextile (i.e. Mirafi 160N or suitable equivalent) installed around drainage stone surrounding a slotted under-drain pipe. The drainage stone should be sized in accordance with the pipe slotting or perforations. A crushed aggregate conforming to NYSDOT Standard Specifications Section 703-02, Size Designation No. 1 (½-inch washed gravel or stone) is generally acceptable for slotted under-drain pipe. The foundation drainage stone and surrounding drainage geotextile should extend above the drainpipe a minimum of 2 feet.

A pervious granular backfill or a suitable geosynthetic drainage composite (i.e. Grace Hydroduct, Miradrain 5000, Delta MS or suitable equivalent) should be placed against the foundation wall, above the drainage system, to allow infiltration to the drainage system.

Concrete Sand, which meets the minimum requirements of NYSDOT Standard Specifications Section 703-07 (100 percent passing 3/8 inch sieve to maximum of 3 percent passing a No. 200 sieve), is generally acceptable as pervious granular backfill. Structural Fill is also acceptable provided the Structural Fill is well graded to prevent infiltration of the adjacent soils and has a permeability of 1×10^{-3} cm/sec or greater when placed and compacted.

If a pervious granular backfill drainage media is used against the wall, it should be a nominal 2 feet in width and should extend up to the bottom of the Subbase Stone layer beneath adjacent slabs and pavements, and should extend up to about 1 to 2 feet below the finished grade in landscape areas, where it may be capped off with the foundation backfill material. The site grades surrounding the building structure should graded as such to provide positive surface water drainage away from the building.

4.60 SEISMIC DESIGN CONSIDERATIONS

Based on the subsurface conditions encountered in the test borings, the upper 100 feet of the project site can be classified as Seismic Site Class “C” in accordance with Table 1613.5.2 of the Building Code of New York State (December 2010). Therefore, seismic design may be based on this seismic site classification. The

soil conditions encountered are not considered to be susceptible to potential liquefaction in the case of a seismic event.

The spectral response accelerations in the project area were obtained by Empire using the United States Geological Survey (USGS) web site application (https://geohazards.usgs.gov/secure/designmaps/us/). The accelerations are based on the 2009 NEHRP Recommended Seismic Provisions, which makes use of the 2008 USGS seismic hazard data. The acceleration values obtained from this application were then adjusted, as recommended by the USGS, to obtain the 2% probability in 50 years mapping accelerations, as presented in the NYS Building Code.

Using the Zip Code 14129 for the Perrysburg, New York area, the calculated spectral response acceleration for Site Class "B" soils is 0.165g for the short period (0.2 second) response (S_S) and 0.046g for the one second response (S_1). For design purposes, these spectral response accelerations must be adjusted for the Seismic Site Class "C" soil profile determined for the project site.

Accordingly, the adjusted spectral response accelerations for Site Class "C" are as follows:

- Short Period Response (S_{MS}) - 0.198g
- 1 Second Period Response (S_{M1}) - 0.078g

The corresponding five percent damped design spectral response accelerations (S_{DS} and S_{D1}) are as follows:

- S_{DS} - 0.132g
- S_{D1} - 0.052g

4.70 ASPHALT PAVEMENT DESIGN

Pavement design recommendations are provided for a Commercial Duty Asphalt Concrete Pavement for the parking lot and driveway areas. The pavement section recommended is based on the assumption that the subgrades will be prepared as discussed in Section 4.80.2 below. A stabilization/separation geotextile is recommended beneath the subbase course of the pavement section in areas where it is constructed over compacted subgrade fill.

Commercial Duty Asphalt Concrete Pavement:

- 1.5 inches - Top Course
- 2.0 to 3.0 inches - Binder Course*
- 12 to 15 inches - Subbase Course*
- Geotextile

*It is recommended that the Binder Course thickness be increased to 3.0-inches and the Subbase Course thickness be increased to 15 inches in the entrance, access roads and drive aisle areas, which will be subject to more frequent and heavier loads, including emergency vehicles and delivery trucks. It may also be necessary to increase the subbase thickness in some areas to improve subgrade conditions and to promote drainage to underdrains, etc, as discussed below.

Materials for the above pavement structure components should consist of the following:

A. Asphalt Concrete Top Course - NYSDOT Standard Specifications, Item No. 403.198902 M - Hot Mix Asphalt, Type 7 Top Course.

B. Asphalt Concrete Binder Course - NYSDOT Standard Specifications, Item No. 403.138902 M - Hot Mix Asphalt, Type 3 Binder Course.

C. Subbase Course – Should comply with NYSDOT Standard Specifications, Item No. 304.14 - Type 4 Subbase, with the condition that if a gravel and sand product is used (vs. a crusher run quarry stone), the gravel should be a crushed gravel material.

D. Geotextile - Woven polypropylene stabilization/separation geotextile (i.e., Mirafi 500X or suitable equivalent).

Proper grading and drainage of the pavement structure is recommended to help limit potential frost action and improve pavement structure life and performance. Under-drains, connected to the site storm water drainage system, are recommended to drain the pavement subgrades and the subbase layer. Alternatively, the pavement subbase course can also be allowed to daylight/drain to an adjacent perimeter drainage swale. Drainage of the pavement subgrades and subbase course can be achieved by grading the subgrade to a slope of at least 2 percent to allow drainage to the underdrains or drainage swale.

4.80 SITE PREPARATION AND CONSTRUCTION

4.80.1 Excavation and Foundation Construction

It does not appear that a generalized permanent groundwater condition will be encountered in the relatively shallow excavations; however, some localized perched groundwater zones may be present within the Shale bedrock at various locations and depths, particularly during seasonally wet periods and following heavy precipitation events. Therefore, it should be anticipated that some dewatering of excavations, using conventional sump and pump methods, may be necessary during construction.

Excavation of the foundation bearing grades, should be performed using methods, which minimize disturbance to the bearing grades. All loose, disturbed soil and rock material should be removed from the foundation bearing grades.

Following excavation, the exposed bearing subgrades should be observed and evaluated by a representative of Empire, prior to placement of any overlying Engineered Fill and/or the foundation. Placement and compaction of subgrade fill and Structural Fill beneath foundations should also be observed and tested by a representative of Empire.

All subgrades for Engineered Fill placement and foundation construction should be protected from precipitation and surface water. No water should be allowed to accumulate on the subgrades.

Where foundations are constructed directly on indigenous soil bearing grades, placement of a nominal 2 to 3 inch thick, lean concrete (f'c > 500 psi) "mud mat", following observation of the bearing grade, should be considered to protect the bearing grade where the foundation cannot be constructed on the same day the excavation is made, particularly during periods of wet or inclement weather.

The subgrades should not be allowed to freeze, either prior to or after construction of foundations. If the bearing grades are not protected and degrade, they must be undercut/removed accordingly.

After completion of the foundation construction, the excavations should be backfilled as soon as possible and prior to construction of the superstructure. It is recommended that the foundation excavations, within slab-on-grade and pavement areas, be backfilled with Structural Fill or Suitable Granular Fill, as recommended in Appendix B.

4.80.2 Subgrade Preparation for Slab-on-Grade and Pavement Construction

Existing vegetation, topsoil, organic soils etc. and any deleterious wet, loose/soft or otherwise unsuitable materials within the proposed concrete slab-on-grade and asphalt pavement construction areas should be removed.

Following removal of the surface materials and excavation to the proposed subgrades, the exposed existing soil subgrades should be thoroughly compacted/densified and proof-rolled. The subgrade compaction and proof-rolling should be performed prior to any required fill placement, using a vibratory smooth drum roller weighing at least 7 tons. The roller should be operated in the vibratory mode for compacting the subgrades and in the static mode for proof rolling. The roller should complete at least four (4) passes over the exposed subgrades for the compaction/densification operation and at least two (2) passes for the proof rolling evaluation.

The subgrade compaction and proof-rolling should be done under the guidance of, and observed by, a representative of Empire. Any areas, which appear wet, loose, soft, unstable or otherwise unsuitable, should be undercut. Over excavation, which may be required as the result of the proof-rolling, should be performed based on evaluation of the conditions by Empire. Resulting over-excavations should be backfilled with controlled Structural Fill (Subbase Stone) as recommended in Appendix B. It is recommended that any utility trenches located within the proposed slab-on-grade and pavement areas also be backfilled with Structural Fill. Placement of Structural Fill should be observed and tested by a representative of Empire.
The subgrade fill placement necessary to raise the site grades may proceed following preparation and acceptance of the existing soil subgrades.

The majority of the site filling and grading necessary to establish the building pad and pavement areas should be performed in advance of the foundation and utility construction. The on-site soils can be used for constructing the fills for establishing the building pad and pavement areas and surrounding site grades, provided they can be properly placed and compacted in a controlled manner and to a stable well engineered condition, in accordance with our recommendations.
On-site soils used for filling within the building pad area and pavement areas must be free of all topsoil, organics, and any soft, wet or otherwise deleterious material, with no particles greater than about 6-inches

It should be expected that the use of the on-site soils for site filling will be more difficult to work with (i.e. dry for proper compaction), vs. an imported Suitable Granular Fill or Structural Fill material, particularly during seasonally inclement or wet weather. Efforts should be made to maintain the subgrades in a dry and

stable condition at all times, and limit construction traffic directly over these soils, particularly if they become wet.

Subgrade fill placed to establish the building pad and pavement areas, using the on-site soil and/or imported Suitable Granular Fill or Structural Fill material, should be compacted to a minimum of 95 percent of the maximum dry density as measured by the modified Proctor moisture-density relationship (ASTM D 1557). On-site soil material used for subgrade fill should have a moisture content within –3 % to +1 % of the optimum moisture content (determined by ASTM D 1557) when it is placed and compacted.

The subgrade fill should be placed to a stable condition and should not "pump", "rut" or show signs of movement or significant deflection (i.e. unstable conditions) as it is being constructed. Any unsuitable conditions should be undercut and removed. The fill subgrades should also be properly graded, drained and protected from moisture and frost. Placement of fill over wet, soft, snow covered or frozen subgrades is not acceptable.

Suitable Granular Fill or Structural Fill, as described in Appendix B, or other suitable imported soil materials, can also be used as subgrade fill to raise the existing site grades for building pad and pavement construction. Empire, however, should be consulted regarding the acceptability of any off-site materials, which do not meet the requirements recommended for Suitable Granular Fill or Structural Fill. It is recommended that any utility trenches located within the proposed slab-on-grade and pavement areas be backfilled with Structural Fill. Placement of all fill within the building pad and pavement areas, as well as possible future development areas, should be observed and tested on a "full-time" basis by a representative of Empire.

During construction the contractor should take precautions to limit construction traffic over the subgrades for slab on grade and pavement construction. Any subgrades, including existing soil subgrades or fill subgrades, which become damaged, rutted or unstable should be undercut and repaired as necessary prior to placement of the subbase courses.

4.80.3 Pavement Construction

The pavement construction can proceed on suitable subgrade soils following the proof-rolling and compaction evaluation. Installation of adjacent geotextile panels should have minimum overlap of 18 inches. Construction of the asphaltic concrete courses (i.e., binder and top) should be performed in accordance with NYSDOT Standard Specification Section 400. In addition, placement of asphalt

concrete courses should not be permitted on wet or snow covered surfaces or when the subgrade surface is less than 40° F.

5.00 CONCLUDING REMARKS

This report was prepared to assist in the planning, design and construction of the proposed the new Tri-County Memorial Hospital facility at Stafford Road and Jolls Road in the Town of Perrysburg, New York. The report has been prepared for the exclusive use of TLC Health Network; Cannon Design, Inc. and other members of the design team, for specific application to this site and this project only.

The recommendations were prepared based on Empire Geo-Services, Inc.'s understanding of the proposed project, as described herein, and through the application of generally accepted soils and foundation engineering practices. No warranties, expressed or implied are made by the conclusions, opinions, recommendations or services provided.

Empire Geo-Services, Inc. should be informed of any changes to the planned construction so that it may be determined if any changes to the recommendations presented in this report are necessary. Empire Geo-Services, Inc. should also be retained to review final plans and specifications and to monitor the foundation and site work construction to verify that the recommendations were properly interpreted and implemented.

If you have any questions or wish to discuss this information, please do not hesitate to contact our office at any time. Thank you for considering Empire Geo-Services, Inc. for this work.

Sincerely,

EMPIRE GEO-SERVICES, INC.

John J. Danzer, P.E.
Senior Geotechnical Engineer

TABLE

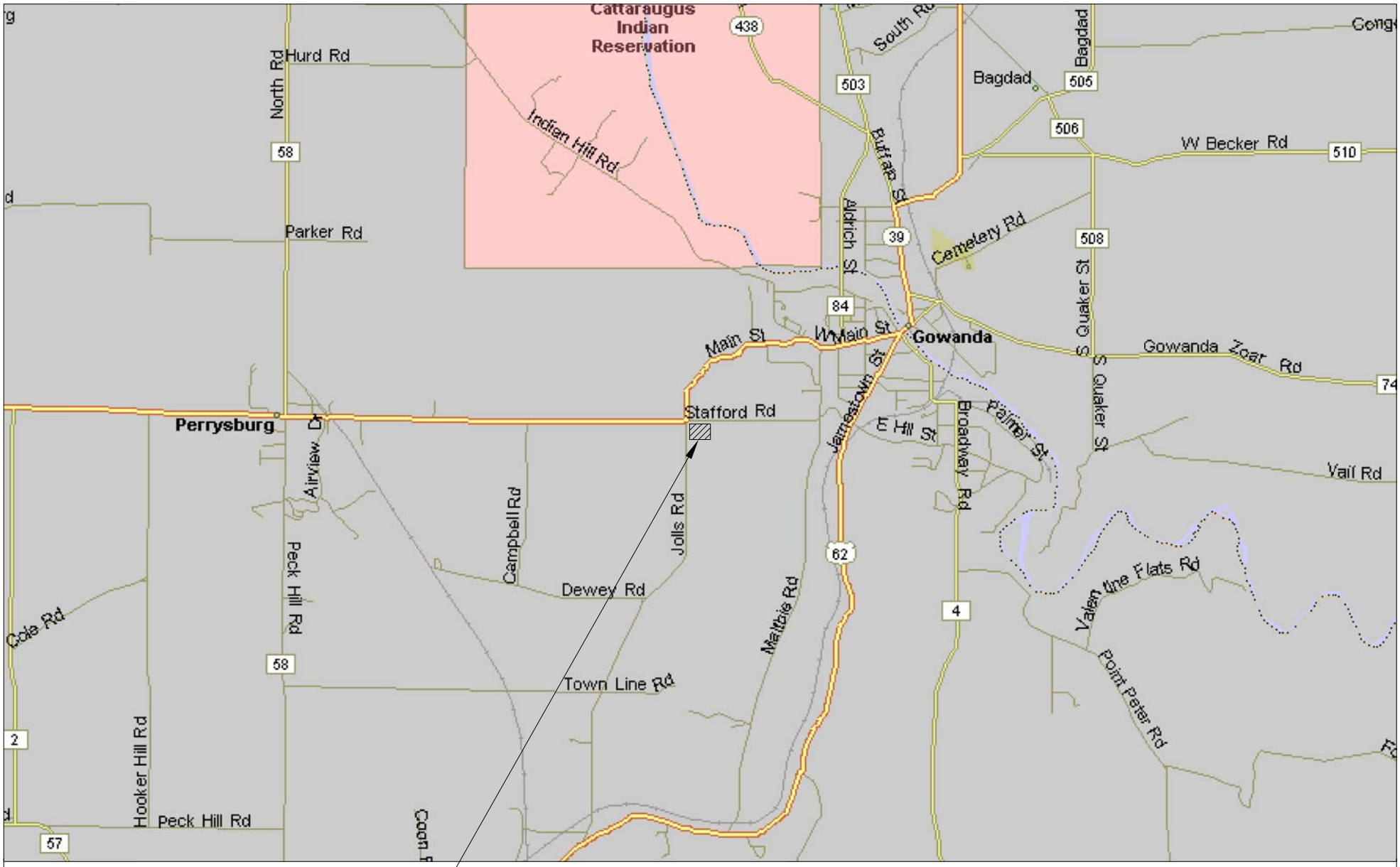
TABLE 1

SUMMARY OF SUBSURFACE CONDITIONS

TRI COUNTY MEMORIAL HOSPITAL
STAFFORD ROAD AND JOLLS ROAD
PERRYSBURG, NEW YORK

Boring Number	Ground Surface El.	Surface Material	Suitable Bearing Grade		Weathered Shale Bedrock		Competent Shale Bedrock	
			Depth	Elevation	Depth	Elevation	Depth	Elevation
B-1	1029.1	1.0' Topsoil	2.0	1027.1	6.0	1023.1	17.9	1011.2
B-2	1024.3	0.8' Topsoil	2.0	1022.3	2.0	1022.3	8.5	1015.8
B-3	1031.5	0.9' Topsoil	1.5	1030.0	6.0	1025.5	15.5	1016.0
B-4	1029.9	0.9' Topsoil	1.0	1028.9	1.0	1028.9	9.9	1020.0
B-5	1022.6	0.8' Topsoil	1.0	1021.6	2.0	1020.6	8.2	1014.4
B-6	1035.7	1.0' Topsoil	3.5	1032.2	4.0	1031.7	14.6	1021.1
B-7	1034.2	1.1' Topsoil	2.5	1031.7	8.0	1026.2	15.7	1018.5
B-8	1024.8	1.0' Topsoil	1.0	1023.8	2.0	1022.8	7.7	1017.1

FIGURES



APPROXIMATE SITE LOCATION

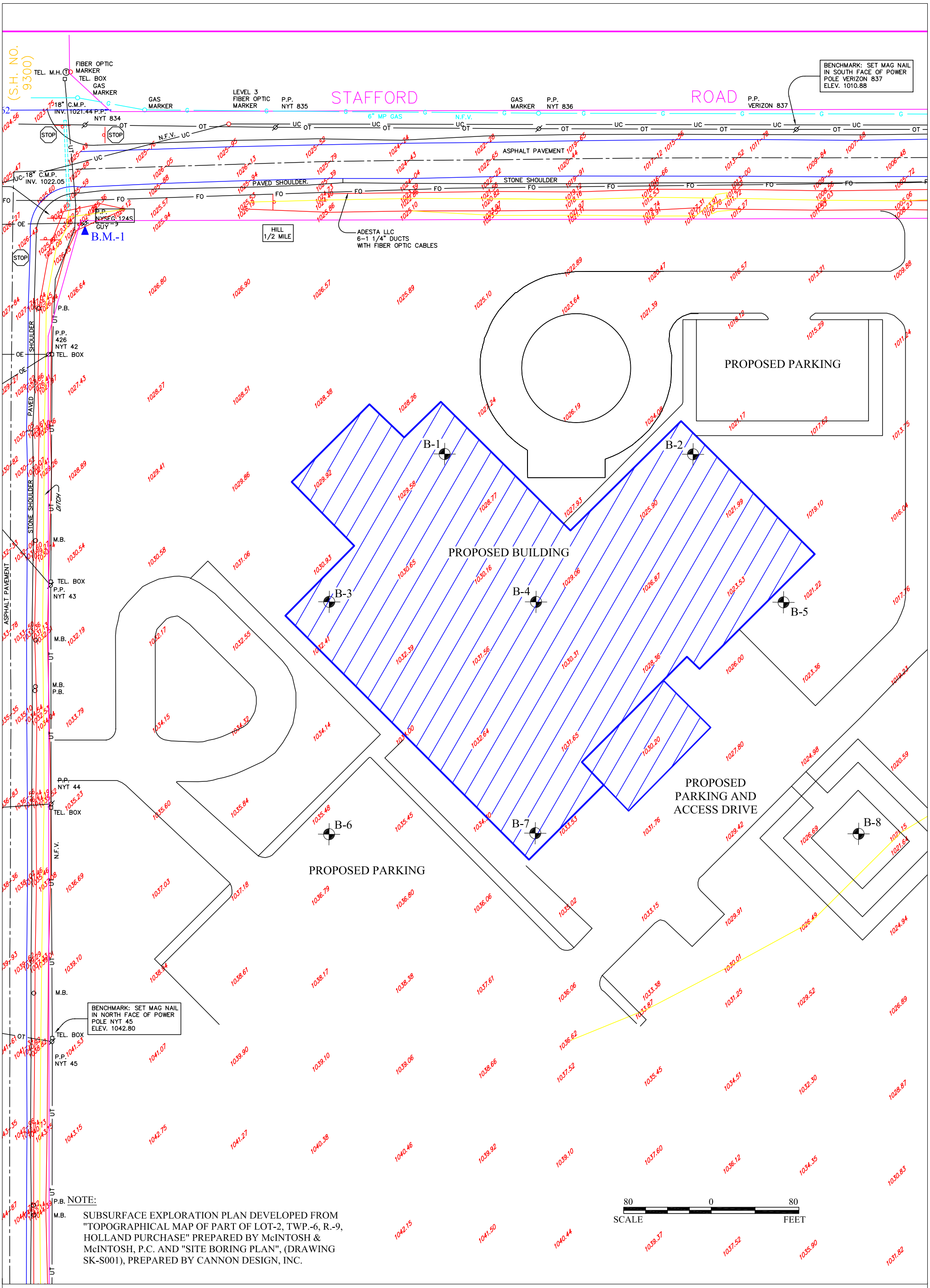
N

EMPIRE GEO SERVICES INC
a subsidiary of SJB Services, Inc.

PROPOSED NEW TRI-CITY MEMORIAL HOSPITAL
STAFFORD ROAD AND JOLLS ROAD
PERRYSBURG, NEW YORK

NOTE:
SITE LOCATION PLAN DEVELOPED
FROM MICROSOFT STREETS & TRIPS 2006

SITE LOCATION PLAN	DR BY: BFS	SCALE: NTS	PROJ NO.: BE-11-097
	CHKD BY: JJD	DATE: 08/29/11	FIGURE NO: 1



NOTE:

SUBSURFACE EXPLORATION PLAN DEVELOPED FROM "TOPOGRAPHICAL MAP OF PART OF LOT-2, TWP.-6, R.-9, HOLLAND PURCHASE" PREPARED BY McINTOSH & McINTOSH, P.C. AND "SITE BORING PLAN", (DRAWING SK-S001), PREPARED BY CANNON DESIGN, INC.

LEGEND:

B-1 INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING.

B.M.-1 APPROXIMATE BENCHMARK LOCATION, MAG NAIL IN NORTH FACE OF POWER POLE NYSEG 124S. REPORTED ELEVATION= 1025.98 FEET

EMPIRE GEO SERVICES INC
a subsidiary of SJB Services, Inc.

PROPOSED NEW TRI-CITY MEMORIAL HOSPITAL
STAFFORD ROAD AND JOLLS ROAD
PERRYSBURG, NEW YORK

SUBSURFACE EXPLORATION PLAN	DR BY: BFS	SCALE: AS SHOWN	PROJ NO.: BE-11-097
	CHKD BY: JJD	DATE: 08/29/11	FIGURE NO: 2

APPENDIX A

SUBSURFACE EXPLORATION LOGS

DATE

STARTED _____

FINISHED _____

SHEET ____ OF ____

SJB SERVICES, INC.
SUBSURFACE LOG

PROJ. No. _____

HOLE No. _____

SURF. ELEV. _____

G.W. DEPTH _____

PROJECT _____ LOCATION _____

DEPTH (ft)	SAMPLES	SAMPLE No.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	BLOWS ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
0		1	3	3	4	8	7	10	3" TOPSOIL	Groundwater at 10' upon completion, and 5' 24 hrs. after completion
								15	Brown SILT, some Sand, trace clay, ML (Moist-Loose)	
								50/.5		
5									Gray SHALE, medium hard, weathered, thin bedded, some fractures	Run#1, 2.5'-5.0' 95% Recovery 50% RQD

1 2 3 4 5 6 7 (numbered features explained on reverse) 8 9 10

TABLE I

- Split Spoon Sample
- Shelby Tube Sample
- Geoprobe Macro-Core
- Auger or Test Pit Sample
- Rock Core

TABLE II

Identification of soil type is made on basis of an estimate of particle sizes, and in the case of fine grained soils also on basis of plasticity.

Soil Type	Soil Particle Size	
Boulder	>12"	Coarse Grained (Granular)
Cobble	3" - 12"	
Gravel - Coarse	3" - 3/4"	
- Fine	3/4" - #4	
Sand - Coarse	#4 - #10	
- Medium	#10 - #40	
- Fine	#40 - #200	
Silt - Non Plastic (Granular)	<#200	Fine Grained
Clay - Plastic (Cohesive)		

TABLE III

The following terms are used in classifying soils consisting of mixtures of two or more soil types. The estimate is based on weight of total sample.

Term	Percent of Total Sample
"and"	35 - 50
"some"	20 - 35
"little"	10 - 20
"trace"	less than 10

(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter.)

TABLE IV

The relative compactness or consistency is described in accordance with the following terms:

Granular Soils		Cohesive Soils	
Term	Blows per Foot, N	Term	Blows per Foot, N
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Firm	10 - 30	Medium	4 - 8
Compact	30 - 50	Stiff	8 - 15
Very Compact	>50	Very Stiff	15 - 30
		Hard	>30

(Large particles in the soils will often significantly influence the blows per foot recorded during the penetration test)

TABLE V

Varved	Horizontal uniform layers or seams of soil(s).
Layer	Soil deposit more than 6" thick.
Seam	Soil deposit less than 6" thick.
Parting	Soil deposit less than 1/8" thick.
Laminated	Irregular, horizontal and angled seams and partings of soil(s).

TABLE VI

Rock Classification Term		Meaning
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	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.
	- Weathered	
	- Sound	

Rock Classification Term		Meaning	
Bedding	- Laminated	(<1")	Natural breaks in Rock Layers
	- Thin Bedded	(1" - 4")	
	- Bedded	(4" - 12")	
	- Thick Bedded	(12" - 36")	
	- Massive	(>36")	

(Fracturing refers to natural breaks in the rock oriented at some angle to the rock layers)

GENERAL INFORMATION & KEY TO SUBSURFACE LOGS

The Subsurface Logs attached to this report present the observations and mechanical data collected by the driller at the site, supplemented by classification of the material 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 Subsurface Logs together with the recovered samples provide a basis for evaluating the character of the subsurface conditions relative to the project. 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 or sampling procedures to more accurately evaluate the subsurface conditions. Any evaluation of the contents of this report and recovered samples must be performed by qualified professionals. The following information defines some of the procedures and terms used on the Subsurface Logs to describe the conditions encountered, consistent with the numbered identifiers shown on the Key opposite this page.

1. The figures in the Depth column define the scale of the Subsurface Log.

2. The Samples column shows, graphically, the depth range from which a sample was recovered. See Table I for descriptions of the symbols used to represent the various types of samples.

3. The Sample No. is used for identification on sample containers and/or Laboratory Test Reports.

4. Blows on Sampler - shows the results of the "Penetration Test", recording the number of blows required to drive a split spoon sampler into the soil. The number of blows required for each six inches is recorded. The first 6 inches of penetration is considered a seating drive. The number of blows required for the second and third 6 inches of penetration is termed the penetration resistance, N.

5. Blows on Casing - Shows the number of blows required to advance the casing a distance of 12 inches. The casing size, hammer weight, and length of drop are noted at the bottom of the Subsurface Log. If the casing is advanced by means other than driving, the method of advancement will be indicated in the Notes column or under the Method of Investigation at the bottom of the Subsurface Log. Alternatively, sample recovery may be shown in this column, or other data consistent with the column heading.

6. All recovered soil samples are reviewed in the laboratory by an engineering technician, geologist or geotechnical engineer, unless noted otherwise. Visual descriptions are made on the basis of a combination of the driller's field descriptions and noted observations together with the sample as received in the laboratory. The method of visual classification is based primarily on the Unified Soil Classification System (ASTM D 2487) with regard to the particle size and plasticity (See Table No. II), and the Unified Soil Classification System group symbols for the soil types are sometimes included with the soil classification. Additionally, the relative portion, by weight, of two or more soil types is described for granular soils in accordance with "Suggested Methods of Test for Identification of Soils" by D.M. Burmister, ASTM Special Technical Publication 479, June 1970. (See Table No. III). Description of the relative soil density or consistency is based upon the penetration records as defined in Table No. IV. The description of the soil moisture is based upon the relative wetness of the soil as recovered and is described as dry, moist, wet and saturated. Water introduced into the boring either naturally or during drilling may have affected the moisture condition of the recovered sample. Special terms are used as required to describe soil deposition in greater detail; several such terms are listed in Table V. When sampling gravelly soils with a standard two inch diameter split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders 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.

7. Rock description is based on review of the recovered rock core and the driller's notes. Frequently used rock classification terms are included in Table VI.

8. The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Solid stratification lines delineate apparent changes in soil type, based upon review of recovered soil samples and the driller's notes. Dashed lines convey a lesser degree of certainty with respect to either a change in soil type or where such change may occur.

9. Miscellaneous observations and procedures noted by the driller are shown in this column, including water level observations. It is important to realize the reliability of the water level observations depends upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that any drill water used to advance the boring may have influenced the observations. The ground water level will fluctuate seasonally, typically. 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 groundwater observation wells.

10. The length of core run is defined as the length of penetration of the core barrel. Core recovery is the length of core recovered divided by the core run. The RQD (Rock Quality Designation) is the total length of pieces of NX core exceeding 4 inches divided by the core run. The size core barrel used is also noted in the Method of Investigation at the bottom of the Subsurface Log.

DATE			
START	8/1/2011		
FINISH	8/1/2011		
SHEET	1	OF	1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-1
SURF. ELEV 1029.1' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL
PROJ. NO.: BE-11-097
LOCATION: STAFFORD ROAD AT JOLLS ROAD
PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	3			TOPSOIL	Driller notes approx. 1.0' Topsoil
		5	9		8	Orange-Brown and Grey Mottled Silt, little f-c Sand (moist, loose, ML)	
	2	14	12				
		14	14		26	Becomes Brown, contains some Fine Sand	
5	3	8	8			Brown f-c SAND and Silt, tr.gravel, tr.shale (moist, firm, SM)	
		9	10		17		
	4	9	11			Orange-Brown Mottled Weathered SHALE and Silt (moist)	
		9	14		20		
	5	28	34	50/0.1	REF		REF = Sample Spoon Refusal
10							
	6	39	50/0.3		REF	Becomes Olive-Brown and Grey	
15							
	7	50/0.3			REF	Grey SHALE Rock (moist)	
20						Boring Complete with Sample Spoon Refusal at 15.3' and Auger Refusal at 17.9'	No free standing water encountered at boring completion
25							
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. GORSKI

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	8/2/2011		
FINISH	8/2/2011		
SHEET	1	OF	1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-2
SURF. ELEV 1024.3' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL
PROJ. NO.: BE-11-097
LOCATION: STAFFORD ROAD AT JOLLS ROAD
PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	1			TOPSOIL	Driller notes approx. 0.8' Topsoil
		5	9		6	Orange-Brown Mottled Silt, little Fine Sand (moist, v.loose, ML)	
	2	9	10				
		11	10		21	Brown Weathered SHALE Rock and Silt (moist)	
5	3	8	11				
		13	13		24		
	4	19	32	50/0.1	REF	Becomes Mottled Orange-Brown	
						Becomes Olive-Brown	NQ '2' Size Rock Core
	5	50/0.1			REF		
10						Grey SHALE Rock, medium hard, slightly weathered to sound, laminated to thinly bedded.	RUN #1: 8.5' - 13.5' REC = Approx. 90% RQD = 0%
15						Boring Complete at 13.5'	No free standing water reading obtained at boring completion REF = Sample Spoon Refusal
20							
25							
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. GORSKI

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE START 8/1/2011 FINISH 8/1/2011 SHEET 1 OF 1	**SJB SERVICES, INC.** **SUBSURFACE LOG**	HOLE NO. B-3 SURF. ELEV 1031.5' +/- G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL LOCATION: STAFFORD ROAD AT JOLLS ROAD
PROJ. NO.: BE-11-097 PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	5	6			TOPSOIL	Driller notes approx. 0.9' Topsoil
		7	11		13	Orange-Brown Mottled Silt and f-c Sand, tr.shale (moist, firm, ML)	
	2	10	9				
		8	9		17	Olive-Brown Clayey SILT, tr.-little f-c Sand (moist, v.stiff, ML)	
5	3	7	9				
		10	12		19	Becomes Orange-Brown, contains tr.shale	
	4	29	45			Orange-Brown Highly Weathered SHALE Rock and Silt (moist)	
		38	52		83		REF = Sample Spoon Refusal
	5	57	50/0.1		REF	Grey Weathered SHALE Rock (moist)	
10							
	6	50/0.4			REF		
15							NQ '2' Size Rock Core
	7	50/0.4				Grey SHALE Rock, soft, to medium hard, laminated to thinly bedded, contains occasional Siltstone seams	RUN #1: 15.5' - 20.5' REC = Approx. 100% RQD = Approx. 40%
20							
25						Boring Complete at 20.5'	Free standing water recorded at 15.1' prior to coring. Free standing water recorded at 2.7' after coring.
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: S. GORSKI DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	8/3/2011	**SJB SERVICES, INC.**	HOLE NO. B-4
FINISH	8/3/2011	**SUBSURFACE LOG**	SURF. ELEV 1029.9' +/-
SHEET	1 OF 1		G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL LOCATION: STAFFORD ROAD AT JOLLS ROAD
PROJ. NO.: BE-11-097 PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	2			TOPSOIL	Driller notes approx. 0.9' Topsoil
		7	10		9	Brown Highly Weathered SHALE Rock and Silt (moist)	
	2	10	13			Becomes Orange-Brown and Grey	
		11	11		24		
5	3	8	8				
		8	10		16		
	4	10	11				
		11	12		22		
	5	10	17			Olive-Brown SHALE Rock (moist)	
10		33	50/0.3		50		
						Boring Complete with Sample Spoon Refusal at 9.8' and Auger Refusal at 9.9'	No free standing water encountered at boring completion
15							
20							
25							
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: S. GORSKI DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	8/2/2011		
FINISH	8/2/2011		
SHEET	1	OF	1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-5
SURF. ELEV 1022.6' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL
PROJ. NO.: BE-11-097
LOCATION: STAFFORD ROAD AT JOLLS ROAD
PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	3			TOPSOIL	Driller notes approx. 0.8' Topsoil
		15	12		18	Orange-Brown f-m SAND, some Silt, tr.gravel (moist, firm, SM)	
	2	9	8				
		13	14		21	Brown Weathered SHALE Rock and Silt (moist)	
5	3	8	9			Olive-Brown Highly Weathered SHALE Rock (moist)	
		17	32		26		
	4	39	47	50/0.2	REF	Becomes Brown-Grey	
							NQ '2' Size Rock Core
	5	50/0.0			REF		
10						Grey SHALE Rock, soft to medium hard, slightly weatehred to sound, laminated to thinly bedded, occasional Siltstone seams	RUN #1: 8.2' - 13.2' REC = Approx. 80% RQD = 0%
15						Boring Complete at 13.2'	No free standing water encountered prior to coring. Free standing water recorded at 6.1' after coring. REF = Sample Spoon Refusal
20							
25							
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. GORSKI

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	8/1/2011	**SJB SERVICES, INC.**	HOLE NO. B-6
FINISH	8/1/2011	**SUBSURFACE LOG**	SURF. ELEV 1035.7' +/-
SHEET	1 OF 1		G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL LOCATION: STAFFORD ROAD AT JOLLS ROAD
PROJ. NO.: BE-11-097 PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	1			TOPSOIL	Driller notes approx. 1.0' Topsoil
		4	5		5	Black SILT, little Fine Sand, tr.organics	
	2	5	4			(moist, v.loose, ML)	
		5	5		9	Becomes Orange-Brown	
5	3	9	9			Brown Highly Weathered SHALE Rock (moist)	
		10	11		19		
	4	10	9				
		8	12		17		
	5	17	26				REF = Sample Spoon Refusal
10		30	50/0.3		56	Becomes Orange-Brown and Grey	
	6	39	50/0.2		REF	Brown SHALE Rock (moist)	
15							
						Boring Complete with Sample Spoon Refusal at 10.7' and Auger Refusal at 14.6'	No free standing water encountered at boring completion
20							
25							
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW CLASSIFIED BY: Geologist

DRILLER: S. GORSKI DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	8/1/2011		
FINISH	8/2/2011		
SHEET	1	OF	1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-7
SURF. ELEV 1034.2' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL
PROJ. NO.: BE-11-097
LOCATION: STAFFORD ROAD AT JOLLS ROAD
PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	2			TOPSOIL	Driller notes approx. 1.1' Topsoil
		5	5		7	Brown-Black SILT, little Fine Sand, tr.gravel, tr.organics (moist, loose, ML)	
	2	3	5				
		7	6		12	Orange-Brown Mottled Clayey SILT and Weathered Shale (moist, stiff, ML)	
5	3	8	10				
		21	18		31	Contains tr.shale (hard)	
	4	17	15				
		20	17		35		REF = Sample Spoon Refusal
	5	25	32	50/0.1	REF	Grey Weathered SHALE Rock and Silt (moist)	
10							
	6	17	50/0.4		REF	Becomes Olive-Brown	
15						Becomes Grey	NQ '2' Size Rock Core
	7	50/0.1					
						Grey SHALE Rock, slightly weathered to sound, soft to medium hard, laminated to thinly bedded	RUN #1: 15.7' - 20.7' REC = Approx. 100% RQD = 0%
20							
						Boring Complete at 20.7'	No free standing water encountered at end of day on 8/1/11 - Augers at 15.9'
25							Free standing water recorded at 15.0' at 0800 on 8/2/11.
30							Free standing water recorded at 5.7' after coring.
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. GORSKI

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE			
START	8/2/2011		
FINISH	8/2/2011		
SHEET	1	OF	1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-8
SURF. ELEV 1024.8' +/-
G.W. DEPTH See Notes

PROJECT: PROPOSED TRI-COUNTY HOSPITAL
PROJ. NO.: BE-11-097
LOCATION: STAFFORD ROAD AT JOLLS ROAD
PERRYSBURG, NEW YORK

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	1			TOPSOIL	Driller notes approx. 1.0' Topsoil
		7	28		8	Orange-Brown SILT, little Fine Sand, tr.shale (moist, loose, ML)	
	2	13	15				
		40	47		55	Olive-Brown Weathered SHALE Rock (moist)	
5	3	18	31				
		42	37		73		REF = Sample Spoon Refusal
	4	45	50/0.4		REF		
10						Boring Complete with Sample Spoon Refusal at 6.9' and Auger Refusal at 7.7'	No free standing water encountered at boring completion
15							
20							
25							
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. GORSKI

DRILL RIG TYPE : CME-85

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

APPENDIX B
FILL MATERIAL AND
EARTHWORK RECOMMENDATIONS

APPENDIX B

FILL MATERIAL AND EARTHWORK RECOMMENDATIONS

I. Material Recommendations

A. Structural Fill

Structural Fill should consist of a crusher run stone or crushed gravel and sand, free of clay, organics and friable or deleterious particles. As a minimum, the crusher run stone or crushed gravel and sand should meet the requirements of New York State Department of Transportation, Standard Specifications, Item 304.14 – Type 4 Subbase, with the condition that if a gravel and sand product is used (vs. a crusher run stone), the gravel should be a crushed gravel material. Accordingly, the Structural Fill should have the following gradation requirements.

Sieve Size Distribution	Percent Finer by Weight
2 inch	100
¼ inch	25-60
No. 40	5-40
No. 200	0-10

B. Subbase Stone

The subbase stone course placed as the aggregate course beneath slab on grade and pavement construction should conform to the same material requirements as Structural Fill as stated above.

C. Suitable Granular Fill

Suitable, well graded from coarse to fine, soil material classified as GW, GP, GM, SW, SP and SM soils using the Unified Soil Classification System (ASTM D-2487) and having no more than 85 percent by weight material passing the No. 4 sieve, no more than 20 percent by weight material passing the No. 200 sieve and which is generally free of particles greater than 6 inches, will be acceptable as Suitable Granular Fill. It should also be free of topsoil, asphalt, concrete rubble, wood, debris, clay and other deleterious materials. Suitable Granular Fill can be used as foundation backfill and as subgrade fill to raise site grades beneath slab-on-grade and pavement construction.

Material meeting the requirements of New York State Department of Transportation, Standard Specifications, Item 203.07 – Select Granular Fill is acceptable for use as Suitable Granular Fill.

II. Placement and Compaction Requirements

Structural Fill placed beneath foundations should be compacted to dense stable matrix, where its total thickness over the indigenous soil subgrades is 1 foot or less, and to a minimum of 95 percent of the maximum dry density as measured by the modified Proctor test (ASTM D1557), where its total thickness will exceed 1 foot. All controlled fill placed beneath slab-on-grade and pavement construction and beneath utilities should be compacted to a minimum of 95 percent of the maximum dry density as measured by the modified Proctor test (ASTM D1557). Fill placed in non-loaded grass areas can be compacted to a minimum of 90 percent of the maximum dry density (ASTM D1557).

Placement of fill should not exceed a maximum loose lift thickness of 6 to 9 inches with the exception of subgrade undercuts and the subbase courses beneath slab on grade and pavement construction, which can be placed in a single or initial lift not exceeding 12 inches. The loose lift thickness should be reduced in conjunction with the compaction equipment used so that the required density is attained.

Fill should have a moisture content within two percent of the optimum moisture content prior to compaction. Subgrades should be properly drained and protected from moisture and frost. Placement of fill on frozen subgrades is not acceptable. It is recommended that all fill placement and compaction be monitored and tested by a representative of Empire Geo-Services, Inc.

III. Quality Assurance Testing

The following minimum laboratory and field quality assurance testing frequencies are recommended to confirm fill material quality and post placement and compaction conditions. These minimum frequencies are based on generally uniform material properties and placement conditions. Should material properties vary or conditions at the time of placement vary (i.e. moisture content, placement and compaction, procedures or equipment, etc.) Then additional testing is recommended. Additional testing, which may be necessary, should be determined by qualified geotechnical personnel, based on evaluation of the actual fill material and construction conditions.

A. Laboratory Testing of Material Properties

- Moisture content (ASTM D-2216) - 1 test per 4000 cubic yards or no less than 2 tests per each material type.

- Grain Size Analysis (ASTM D-422) - 1 test per 4000 cubic yards or no less than 2 tests per each material type.
- Liquid and Plastic Limits (ASTM D-4318) 1 test per 4000 cubic yards or no less than 2 tests per each material type. Liquid and Plastic Limit testing is necessary only if appropriate, based on material composition (i.e. clayey or silty soils).
- Modified Proctor Moisture Density Relationship (ASTM D-1557) 1 test per 4000 cubic yards or no less than 1 test per each material type. A maximum/minimum density relationship (ASTM D-4253 and ASTM D-4254) may be an appropriate substitute for ASTM D-1557 depending on material gradation.

B. Field In-Place Moisture/Density Testing (ASTM D-3017 and ASTM D-2922)

- Backfilling along trenches and foundation walls - 1 test per 50 lineal feet per lift.
- Backfilling Isolated Excavations (i.e. column foundations, manholes, etc.) 1 test per lift.
- Filling in open areas for slab-on-grade and pavement construction - 1 test per 2500 square feet per lift.

APPENDIX C
GEOTECHNICAL REPORT LIMITATIONS

GEOTECHNICAL REPORT LIMITATIONS

Empire Geo-Services, Inc. (Empire) has endeavored to meet the generally accepted standard of care for the services completed, and in doing so is obliged to advise the geotechnical report user of our report limitations. Empire believes that providing information about the report preparation and limitations is essential to help the user reduce geotechnical-related delays, cost over-runs, and other problems that can develop during the design and construction process. Empire would be pleased to answer any questions regarding the following limitations and use of our report to assist the user in assessing risks and planning for site development and construction.

PROJECT SPECIFIC FACTORS: The conclusions and recommendations provided in our geotechnical report were prepared based on project specific factors described in the report, such as size, loading, and intended use of structures; general configuration of structures, roadways, and parking lots; existing and proposed site grading; and any other pertinent project information. Changes to the project details may alter the factors considered in development of the report conclusions and recommendations. *Accordingly, Empire cannot accept responsibility for problems which may develop if we are not consulted regarding any changes to the project specific factors that were assumed during the report preparation.*

SUBSURFACE CONDITIONS: The site exploration investigated subsurface conditions only at discrete test locations. Empire has used judgement to infer subsurface conditions between the discrete test locations, and on this basis the conclusions and recommendations in our geotechnical report were developed. It should be understood that the overall subsurface conditions inferred by Empire may vary from those revealed during construction, and these variations may impact on the assumptions made in developing the report conclusions and recommendations. *For this reason, Empire should be retained during construction to confirm that conditions are as expected, and to refine our conclusions and recommendations in the event that conditions are encountered that were not disclosed during the site exploration program.*

USE OF GEOTECHNICAL REPORT: Unless indicated otherwise, our geotechnical report has been prepared for the use of our client for specific application to the site and project conditions described in the report. *Without consulting with Empire, our geotechnical report should not be applied by any party to other sites or for any uses other than those originally intended.*

CHANGES IN SITE CONDITIONS: Surface and subsurface conditions are subject to change at a project site subsequent to preparation of the geotechnical report. Changes may include, but are not limited to, floods, earthquakes, groundwater fluctuations, and construction activities at the site and/or adjoining properties. *Empire should be informed of any such changes to determine if additional investigative and/or evaluation work is warranted.*

MISINTERPRETATION OF REPORT: The conclusions and recommendations contained in our geotechnical report are subject to misinterpretation. *To limit this possibility, Empire should review project plans and specifications relative to geotechnical issues to confirm that the recommendations contained in our report have been properly interpreted and applied.*

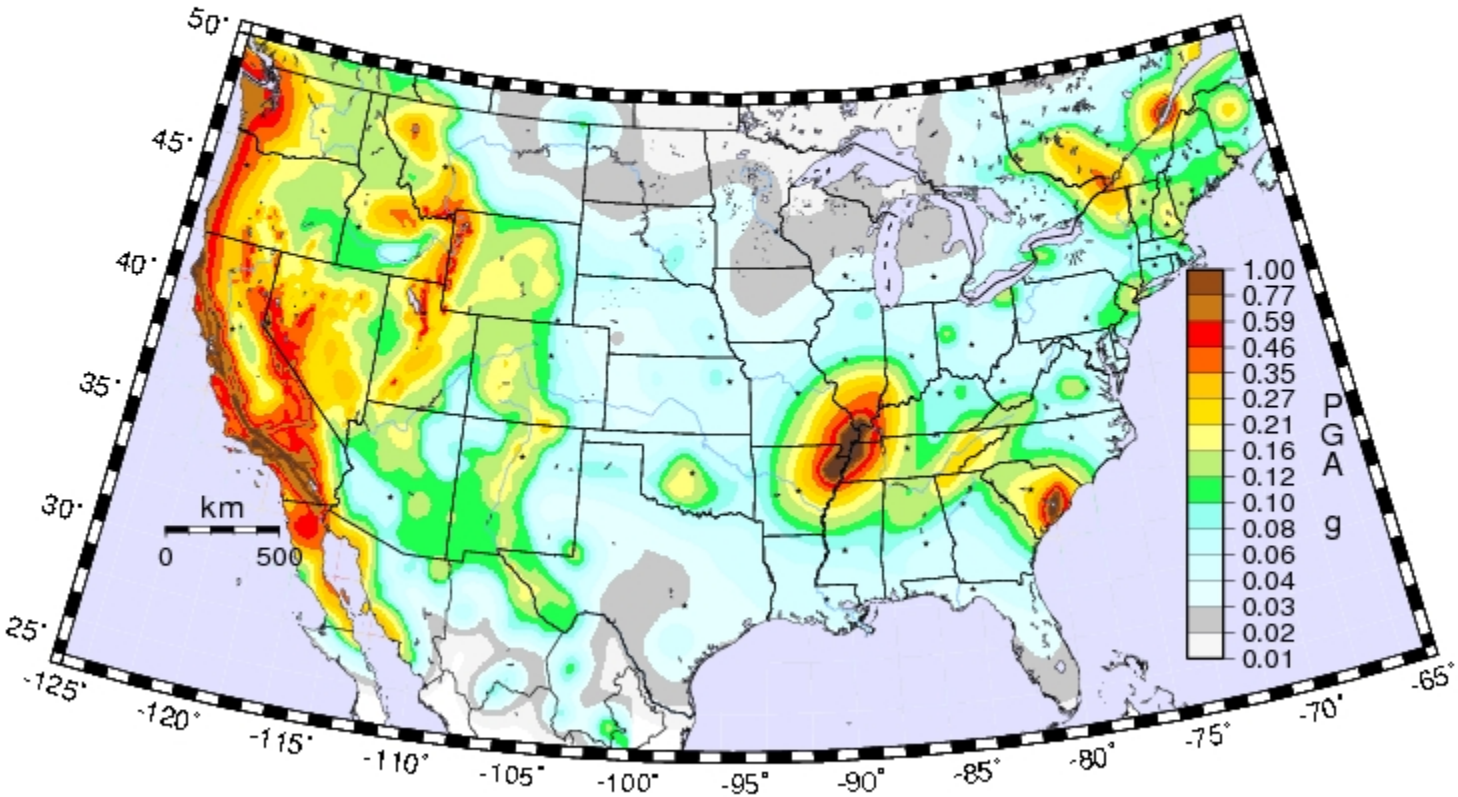
Subsurface exploration logs and other report data are also subject to misinterpretation by others if they are separated from the geotechnical report. This often occurs when copies of logs are given to contractors during the bid preparation process. *To minimize the potential for misinterpretation, the subsurface logs should not be separated from our geotechnical report and the use of excerpted or incomplete portions of the report should be avoided.*

OTHER LIMITATIONS: Geotechnical engineering is less exact than other design disciplines, as it is based partly on judgement and opinion. For this reason, our geotechnical report may include clauses that identify the limits of Empire's responsibility, or that may describe other limitations specific to a project. These clauses are intended to help all parties recognize their responsibilities and to assist them in assessing risks and decision making. Empire would be pleased to discuss these clauses and to answer any questions that may arise.

Appendix B

Phase I Environmental Site Assessment – available upon request

Appendix B

Phase I Environmental Site Assessment – available upon request

PGA with 2% in 50 year PE. BC rock. 2008 USGS