STATE OF CONNECTICUT
DEPARTMENT OF ECONOMIC AND COMMUNITY DEVELOPMENT
INFRASTRUCTURE AND REAL ESTATE PROJECTS

ENVIRONMENTAL ASSESSMENT CHECKLIST
Project ID No: (issued by OPM)

Date: 11/19/2013 **Staff Contact:** Nelson Tereso
Municipality: Bethel **Project Name:** Francis J. Clarke Industrial Park Expansion
Funding Source: TBD **State Funds:** TBD
Type of State Agency Review **Stage 1** X **Stage 2** _____

This assessment is being conducted in conformance to the department's Environmental Classification Document to determine CEPA obligations

Project Description: The Town of Bethel is seeking state financial assistance for the expansion of the existing Francis J. Clarke Industrial Park by extending an existing roadway (Trowbridge Drive) southerly in order to add approximately 10 acres of town-owned land which could result in the creation of up to 5 additional lots. The additional lots would be located on land in an area designated as a Priority Funding Area and a Balanced Priority Funding Area on the 2013-2018 State of Connecticut Conservation and Development (C&D) Locational Guide Map. The proposed activities include roadway and utility extension and other associated project costs.

Note: environmental remediation is a positive environmental impact, but not a CEPA activity.

RCSA sec. 22a-1a-3 Determination of environmental significance (direct/indirect)

1) *Impact on air and water quality or on ambient noise levels*

a) *Air*— No negatives impacts are anticipated.

Water Quality—

Wastewater from the Bethel sewer system is conveyed to the Danbury treatment plant. Their intermunicipal agreement with the city of Danbury is for 2 million gallons per day (MGD) of flow. Bethel is currently using between 1.0 and 1.1 MGD of that flow. The final plans and specifications for proposed sewer line extensions must be approved by the Municipal Facilities section of the Water Planning & Standards Division pursuant to section 22a-416 of the CGS before construction is initiated.

The 1983 CEPA review indentified concerns about potential impacts on the pond southeast of the existing industrial park and on other downstream waters. Although not conclusive, imagery available via the CT Environmental Conditions Online Aerial Photo Viewer suggests that the parcels closest to the pond may be contributing to runoff that is affecting water quality. The DEEP strongly supports the use of low

impact development (LID) practices such as water quality swales and rain gardens for infiltration of stormwater on site. Stormwater discharges from construction sites where one or more acres are to be disturbed, regardless of project phasing, require a permit from the Permitting & Enforcement Division. The General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities (DEEP-WPED-GP-015) will cover these discharges.

b) *Noise*— No negatives impacts are anticipated.

2) *Impact on a public water supply system or serious effects on groundwater, flooding, erosion, or sedimentation*

a) *Water Supply*— No negatives impacts are anticipated.

b) *Groundwater*— No negatives impacts are anticipated.

c) *Flooding*— The proposed expansion areas are not within the 100-year flood zone on the community's Flood Insurance Rate Map.

3) *Disruption or alteration of an historic, archeological, cultural or recreational building, object, district, site or surroundings*— No negatives impacts are anticipated.

4) *Effect on natural land resources and formations, including coastal and inland wetlands, and the maintenance of in-stream flows*— Existing wetlands and watercourses at the site should be delineated by a certified soil scientist. Any subsequent development, including both buildings and access roadways, should avoid regulated areas to the maximum extent practicable. Unavoidable impacts should be mitigated and buffer areas established to further protect wetlands and watercourses. The local agency should be contacted regarding permit requirements. In order to protect wetlands and watercourses on and adjacent to the site, strict erosion and sediment controls should be employed during construction.

5) *Effect on natural communities and upon critical species of animal or plant and their habitats: interference with the movement of any resident or migratory fish or wildlife species*— There are records of a number of protected species in the project area. The DEEP Wildlife Division recommends that an invertebrate biologist familiar with the habitat requirements of the northern metalmark conduct surveys. The DEEP Wildlife Division recommends that a herpetologist familiar with the habitat requirements of the Jefferson salamander and eastern box turtle conduct surveys. The DEEP Wildlife Division recommends that botanical field surveys be conducted to identify the current distribution of state-listed species within the proposed project site.

6) *Use of pesticides, toxic or hazardous materials or any other substance in such quantities as to create extensive detrimental environmental impact*— No negatives impacts are anticipated.

7) *Substantial aesthetic or visual effects*— No negatives impacts are anticipated.

8) *Inconsistency with the written and/or mapped policies of the statewide Plan of Conservation and Development and such other plans and policies developed or coordinated by the Office of Policy and Management or other agency—*

The Locational Guide Map of the State of Connecticut Conservation and Development Policies Plan 2013-2018 (the Plan) indicates that the areas of industrial park expansion are within a Balanced Priority Funding Area and a Priority Funding Area. Since this proposal is seeking to receive state funding, the action must be consistent with the policies of the Plan. The Balanced Priority Funding Area is so categorized because of the conservation value associated with the public water supply watershed. Therefore, a proposal for developing within the Balanced Priority Funding Area must be consistent with the policies of Growth Management Principle #5, Protect and Ensure the Integrity of Environmental Assets Critical to Public Health and Safety. These policies include:

- Utilize an integrated watershed management approach to ensure that high quality existing and potential sources of public drinking water are maintained for human consumption.
- Minimize the impacts of development on drinking water sources by utilizing development forms and densities that limit impervious surface coverage to 10% of the overall area to be developed and which preserves the most amount of land in a natural or undisturbed state.

9) *Disruption or division of an established community or inconsistency with adopted municipal or regional plans*— No negatives impacts are anticipated.

10) Displacement or addition of substantial numbers of people— No negatives impacts are anticipated.

11) *Substantial increase in congestion (traffic, recreational, other)*— No negatives impacts are anticipated.

12) *A substantial increase in the type or rate of energy use as a direct or indirect result of the action*— No negatives impacts are anticipated.

13) *The creation of a hazard to human health or safety*— No negatives impacts are anticipated.

14) *Any other substantial impact on natural, cultural, recreational or scenic resources*— No negatives impacts are anticipated.

Conclusion:

Conclusion: The applicant shall address the following concerns as a requirement for utilization of state funding for the proposed project:

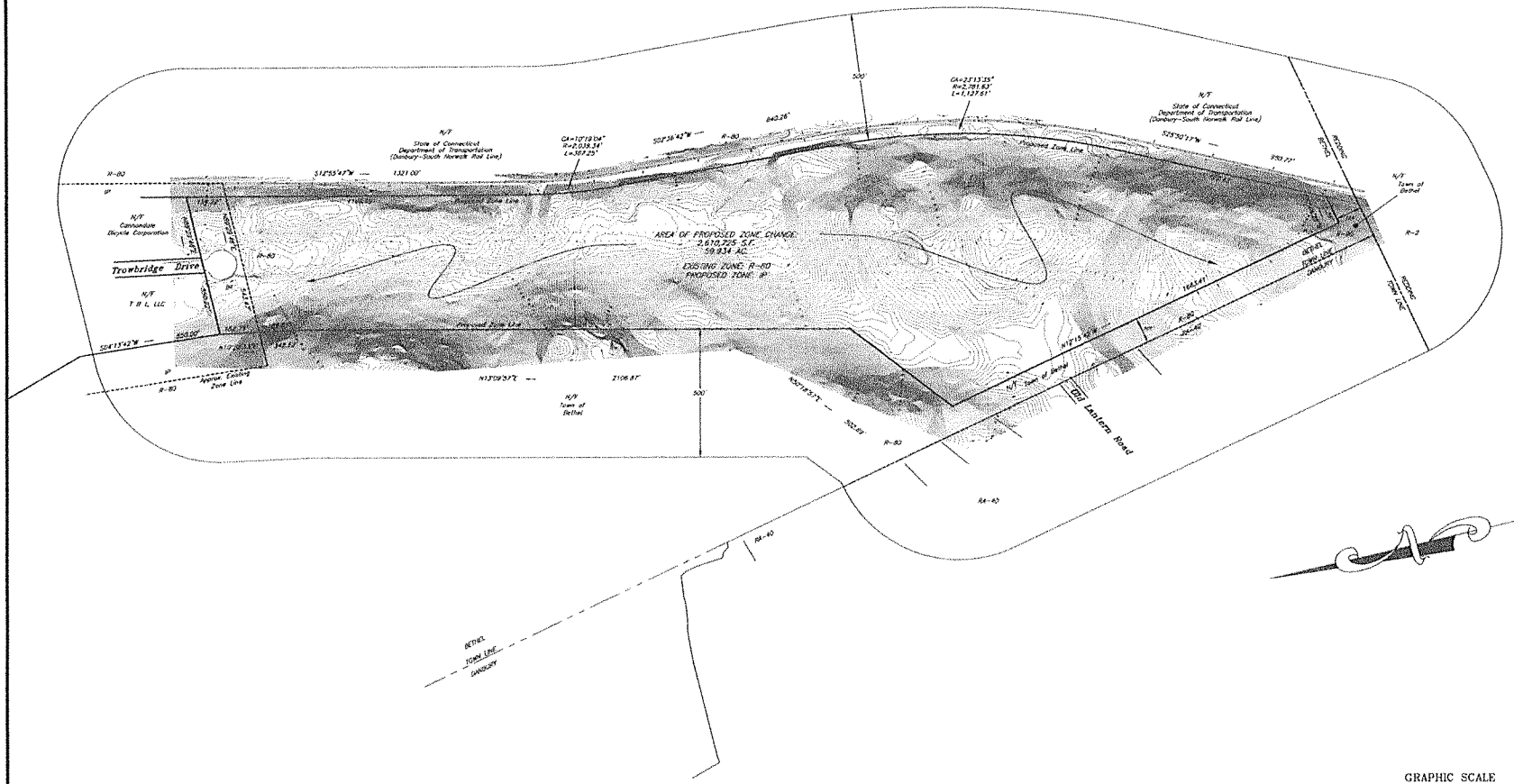
- Stormwater discharges from construction sites where one or more acres are to be disturbed require a permit pursuant to 40 CFR 122.26.
- A certified soil scientist shall perform a reconnaissance of the site in order to confirm that

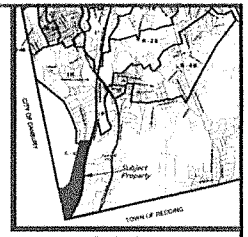
there are not any areas which would be regulated as wetlands or watercourses as defined by section 22a-38 (15) and (16) of the Connecticut General Statutes (CGS), respectively. If the reconnaissance identifies regulated areas, they should be delineated. Any development should avoid regulated areas to the maximum extent practicable.

- The following flora/fauna surveys shall be required and DEEP shall be consulted regarding implementation of mitigation measures:
    - A botanical field survey shall be conducted to identify the current distribution of state-listed species within the proposed project site.
    - An invertebrate biologist familiar with the habitat requirements of the northern metalmark conduct surveys shall perform a survey of the site.
    - A herpetologist familiar with the habitat requirements of the Jefferson salamander and eastern box turtle shall a survey of the site.

Recommendations:

The Department of Economic and Community Development does not recommend preparation of an Environmental Impact Evaluation to determine the extent of cumulative impacts associated with the proposed project.





Vicinity Map
Not To Scale

GRAPHIC SCALE

(IN FEET)
1 inch = 200 ft.

Notes:

1. This map represents a Boundary Survey based on a Resurvey and was prepared in accordance with Class A-2 Standards.
2. Refer to Vol. 634 Pg. 485 of the Danbury Land Records & Vol. 231 Pg. 87 of the Bethel Land Records.
3. Refer Map No.'s 176, 177, 576, 2166, 3530, 4018, 4076, 4411, 4536, 4885, 5042, 5158, 5306, 5665, 6330, 7840, 9697, 10755 & 10759 – Danbury Land Records.
4. Refer to Maps: File 6 Map 4, File 5 Map 156, File 9 Map 169, File 11 Map 20, File 12 Map 61, File 13 Map 93, File 18 Maps 172, 173 & 174, File 21 Map 98 & File 22 Map 36 – Bethel Land Records.
5. Refer to Right of Way and Track Map, The New York New Haven and Hartford R.R. Co., Operated by The New York New Haven and Hartford R.R. Co. From Danbury to South Norwalk, Station 211+20 to Station 264+00 & Station 264+00 to Station 316+80, Town of Bethel, State of Conn., Scale: 1"=100' Date: June 30, 1915, Sheets 5 & 6 of Twenty Five Sheets.
6. Field survey performed August 19, 2005.
7. Contours depicted hereon were taken from aerial topographical mapping prepared by Geomaps International and conform to Class T-3 Standards.

Proposed Zone Change Map

Prepared For

The Town of Bethel

Bethel, Connecticut

Scale:	1"=200'
Area:	59.934 Ac.
Zone:	R-80
Date:	Dec.4,2006

Revisions

1	Mar. 19, 2007
2	Dec. 3, 2007

I HEREBY DECLARE THAT TO MY KNOWLEDGE AND BELIEF, THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON. THIS SURVEY AND MAP HAS BEEN PREPARED IN ACCORDANCE WITH SECTIONS 20-300b-1 THRU 20-300b-20 OF THE REGULATIONS OF CONNECTICUT STATE AGENCIES - "MINIMUM STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ENDORSED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996.

NOT VALID WITHOUT A LIVE SIGNATURE AND EMBOSSED SEAL

NEW ENGLAND LAND SURVEYING, P.C.
ROBIN COMMONS - 118 COAL PIT HILL RD. - DANBURY, CT.
MATTHEW E. REYNOLDS, L.S. # 13286

Job No. 125
125-06p2c

Engineering, Planning,
Landscape Architecture
and Environmental Science

MILONE & MACBROOM

February 16, 2015

Ms. Janice Chrzescijanek
Director of Economic Development
Town of Bethel
1 School Street
Bethel, CT 06801

RE: Francis J. Clarke Business Park Expansion
Trowbridge Drive
Bethel, Connecticut
MMI #4494-03

Dear Ms. Chrzescijanek:

In accordance with our agreement, we have prepared a development feasibility analysis for the above-referenced parcel. The following is a summary of our findings:

EXISTING CONDITIONS

Land Use

The subject parcel borders the city of Danbury to the west, the town of Redding to the south, and is 250.17 acres in size. The parcel takes access from the end of Trowbridge Drive where there is an existing cul-de-sac.

The site is undeveloped and wooded. Surrounding land uses vary amongst adjacent parcels. To the east and northeast of the site is industrial park zoning along Trowbridge Drive, Francis Scott Circle, and Turnage Lane. Residential areas lie to the east of the site near Sympaug Pond and to the west along Firelite Drive, Frontier Lane, and New Light Drive. The neighboring parcel to the south in Redding is zoned as public open space.

Topography

Topography was obtained from state Lidar mapping and shows that the majority of the site is steeply sloped, with more than half of the area having slopes exceeding 25%. Elevations range from 400' to the east along Sympaug Pond to 838' at the central-west portion of the parcel closer to the town line of Danbury. The steepest portion of this site is along the east portion behind existing buildings along Trowbridge Drive. There is a general ridgeline running north to south, so about half of the site's runoff flows west toward the Danbury town line while the other half flows east toward Trowbridge Drive and Sympaug Pond. It appears as though the majority of the potential development area is currently sloped downward toward Sympaug Pond.

Soils/Wetlands

The soil information depicted on the steep slope analysis maps are from the USDA Soil Conservation Service. Soils upland of the potential development areas are generally poorly drained and are classified as Rock outcrop-Hollis complex. This results in a high runoff potential especially with the steep slopes in this area. The soils within and downgrade of the potential development area have a high to moderate infiltration rate, which will allow for a higher rate of water transmission. The approximate depth to ledge ranges throughout the site from 0'-6'. The wetlands located on site are located away from the potential development area and should be outside the limits of disturbance. Our soil scientist has identified the limits of the on-site wetlands, which are located approximately 100' south of the developed portion of the site.

Vegetation

The majority of the site is wooded with steep slopes. The potential development area will have to be cleared of vegetation.

Roadway Access

Road access is available through the cul-de-sac at the end of Trowbridge Drive. Sightlines at appropriate locations are adequate as the road is generally straight and flat.

UTILITIES

Storm Drainage

The new storm drainage system along the extended road is designed to flow into three stormwater management areas. All roadway drainage is shown to discharge downgradient of the developed area into Sympaug Pond. These stormwater management areas would be sized to detain the increase in runoff and provide the recommended CTDEEP water quality volume.

Sanitary Sewers

Sanitary sewers are within Trowbridge Drive, and an extension of this service is proposed in the new road. Given the relative elevation of the site and this sewer, about half of the site should be able to be served by gravity sewers while the rest will need a pump station and force main. From the end of the proposed cul-de-sac, approximately 400' of sewer will be served by a gravity sewer that connects into a pump station at a low point in the road. There would be roughly 900' of force main sewer running from the pump station to the high point in the road, then a gravity sewer will serve the remaining 450' to tie into the existing sewer. Town staff will need to be contacted to determine if any capacity problems exist in the area but, due to the small size of the potential development, capacity issues are not anticipated.

Water Supply

Within Trowbridge Drive, a water main can be extended to the proposed road. More information must be requested from the Bethel Water Department to confirm adequate flow and pressure is available to serve the anticipated site but, considering the adjacent use, it is assumed that sufficient capacity exists.

ZONING

Existing Zoning Classification

The permitted zone for this parcel is residential (R-80); however, the intent is for the site to extend the adjacent industrial park zoning of Trowbridge Drive. This industrial zone requires a minimum lot area of 80,000 square feet, minimum street frontage of 180', and a maximum building coverage of 30%. Building setbacks are as follows:

Front (from street lot line)	25'
Rear Yard	25'
Side Yard	20'

PRELIMINARY DEVELOPMENT PLAN

A conceptual layout has been developed using the industrial park zoning that as set forth in the Bethel zoning regulations. The plan is to continue the industrial park with approximately 1,700' of new roadway, with five lots fronting on the west side of the new roadway. In order to flatten the existing slope, Lots 3, 4, and 5 will feature a rock cut or wall ranging up to 25' behind each building. The estimated earthwork as well as roadway and utility installation costs for this concept is approximately $1,700,000, or $340,000 per lot. The existing steep slopes limit the potential for development of the parcel. An alternate concept was also developed where the last two lots were eliminated to reduce earthwork and infrastructure. This concept shows three lots with 650 feet of road. This estimated cost of this road would be approximately $600,000, or $200,000 per lot.

It should also be noted that there is a premium cost associated with grading the individual lots to create pad sites for development. We estimate the earthwork depending on the amount of rock, which could be in the range of $100,000 to $200,000 per lot.

If you have any questions, please feel free to call me.

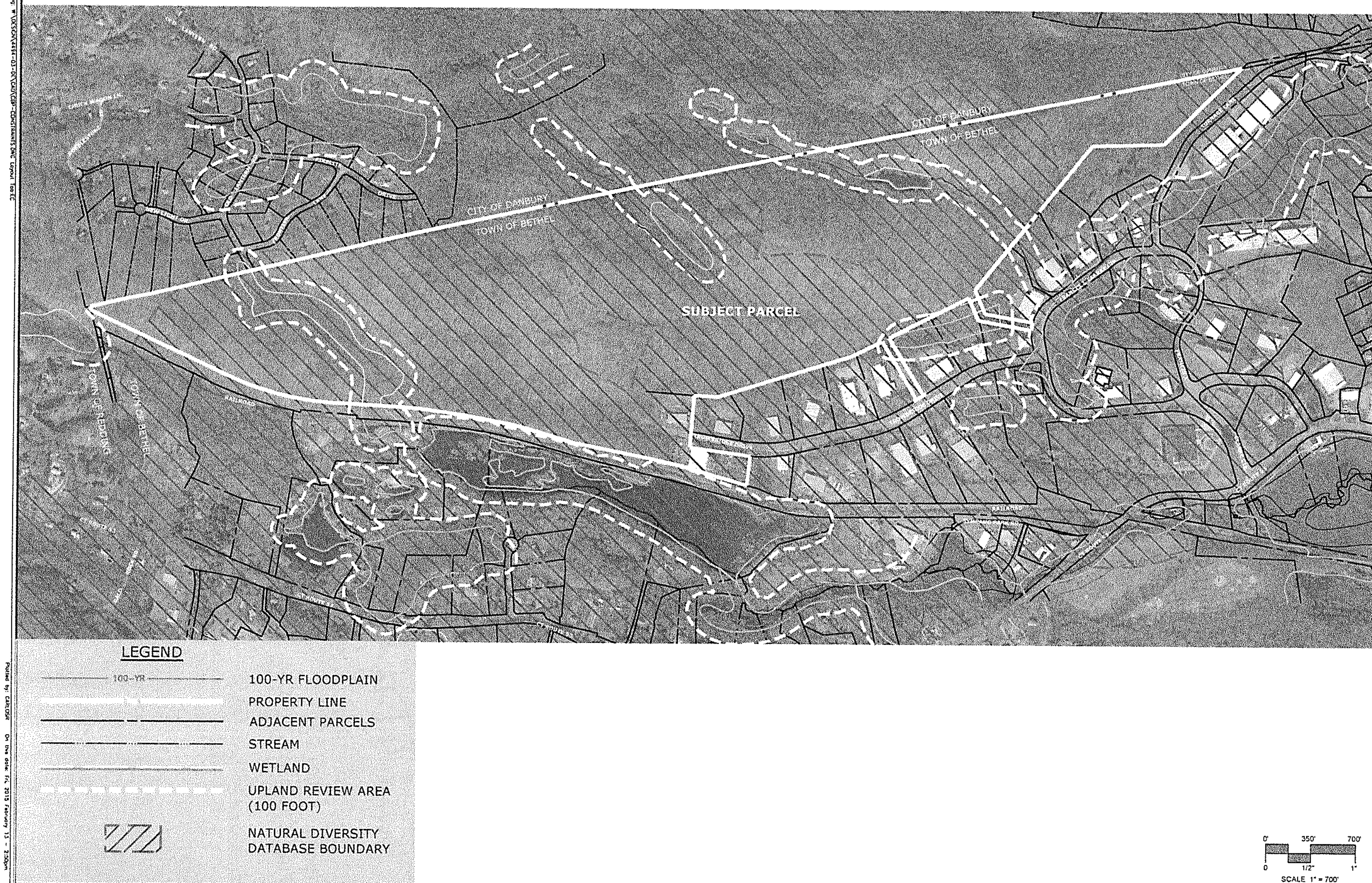
Very truly yours,

MILONE & MACBROOM, INC.

Thomas J. Daly, P.E.
Project Manager, Principal

Enclosure

4494-03-f1215-ltr



MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773 Fax (203) 272-9733
www.miloneandmacbroom.com

REVISIONS

EXISTING CONDITIONS MAP

FRANCIS J. CLARKE BUSINESS PARK EXPANSION

TROWBRIDGE DRIVE
BETHEL, CONNECTICUT

CJR	CJR	TD

1"=700'

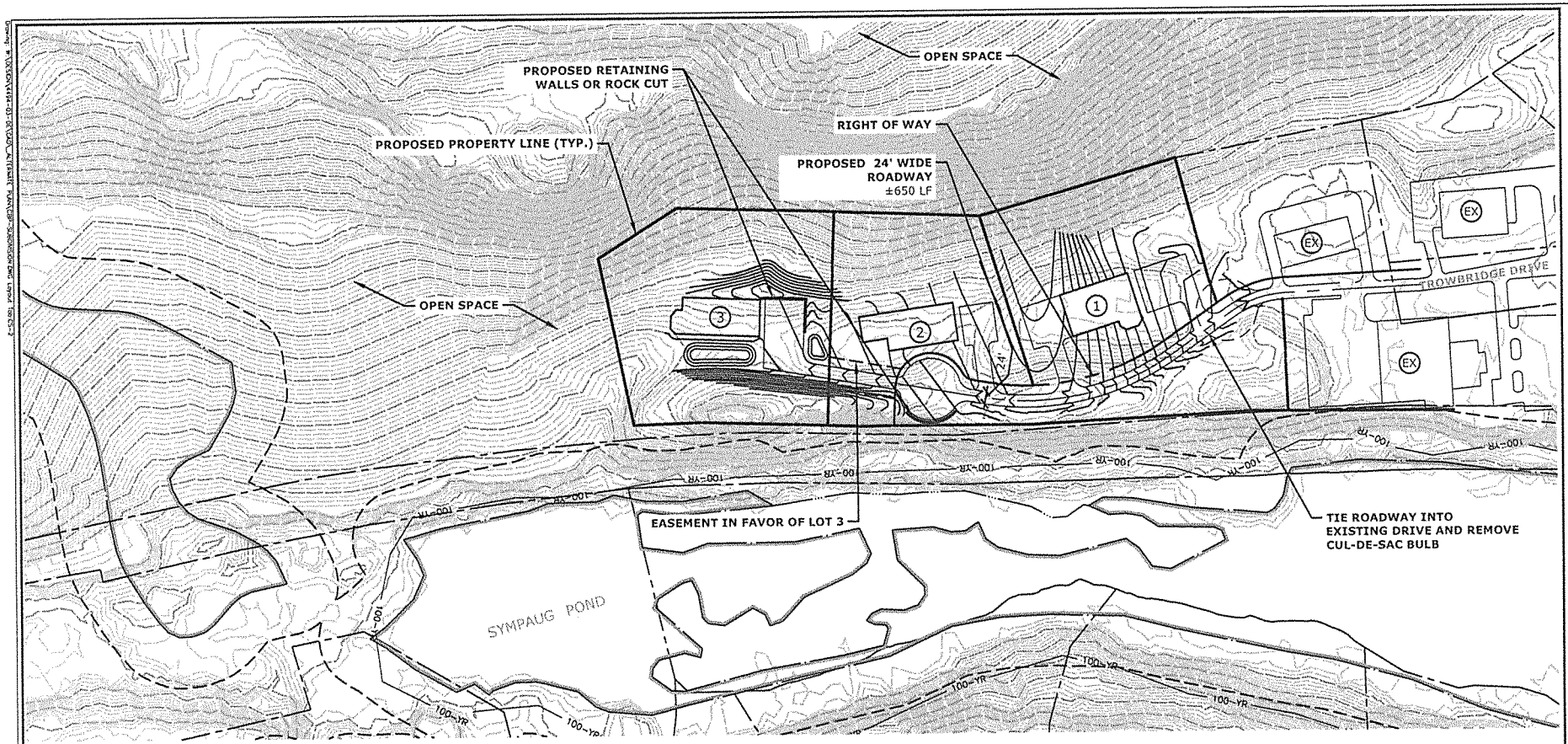
FEBRUARY 13, 2015

4494-03

EC

Drawing: W:\DESIGN\4494-03-01\CAD\CBP-CONSTRAINTS.DWG Layout Tab:EC

Plotted by: CARLOSR On the date: Fri, 2015 February 13 - 2:50pm



INDUSTRIAL PARK ZONING REQUIREMENTS

MINIMUM LOT AREA [SF]	80,000
MINIMUM LOT WIDTH [FT]	180
MINIMUM LOT FRONTAGE [FT]	180
FRONT SETBACK [FT]	25
SIDE SETBACK [FT]	20
REAR SETBACK [FT]	25
SETBACK FROM ADJACENT RESIDENTIAL ZONE [FT]	150
MAX. BUILDING COVERAGE [%]	30
MAX. BUILDING HEIGHT [FT]	35

LOT AREAS

	SF	AC
1	135,690	3.11
2	118,500	2.72
3	172,950	3.97

0' 100' 200'
0 1/2" 1"
SCALE 1" = 200'

MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773 Fax: (203) 272-9733
www.milone-macbroom.com

REVISIONS

CONCEPTUAL SUBDIVISION PLAN - ALTERNATE

FRANCIS J. CLARKE BUSINESS PARK EXPANSION

TROWBRIDGE DRIVE
BETHEL, CONNECTICUT

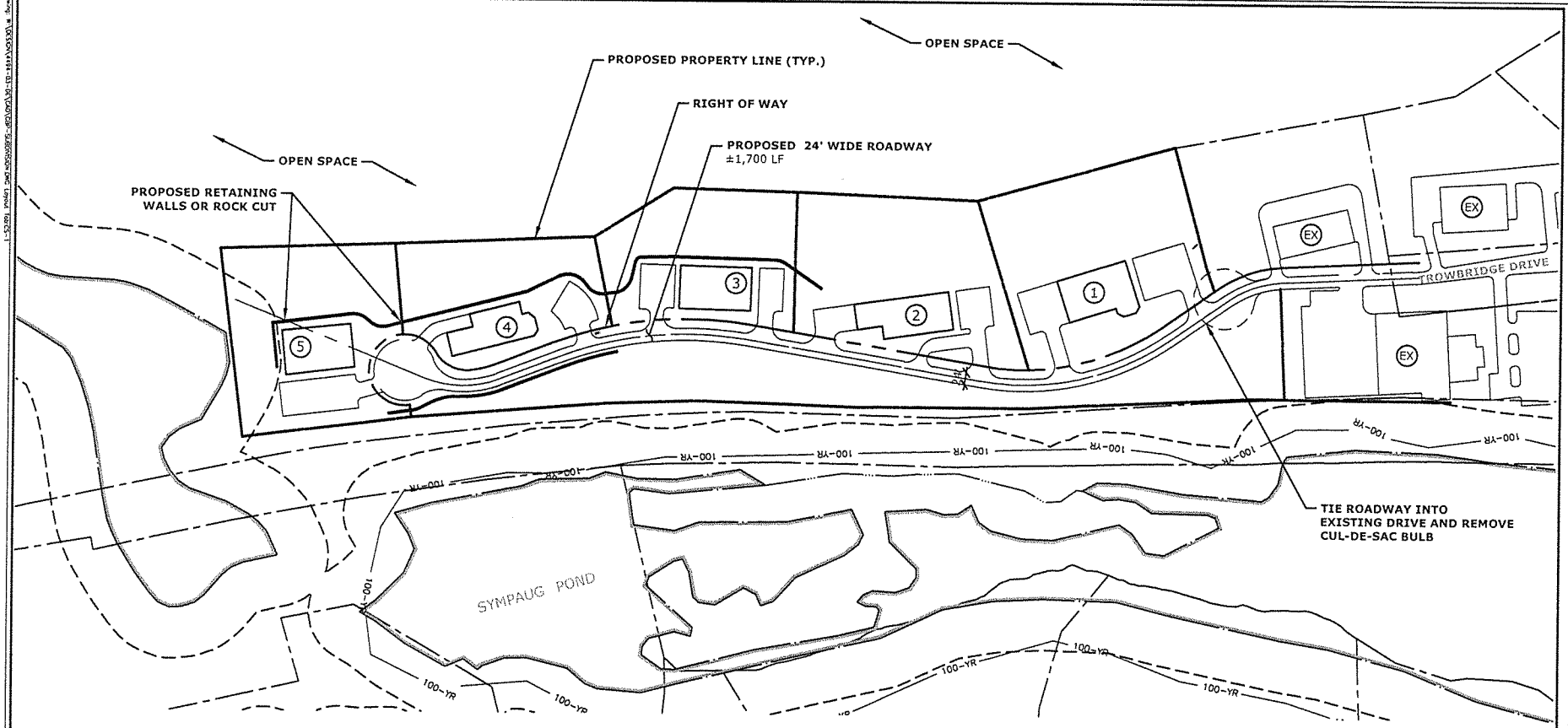
CJR	CJR	TD

1"=200'

FEBRUARY 13, 2015

4494-03

CS-2



INDUSTRIAL PARK ZONING REQUIREMENTS	
MINIMUM LOT AREA [SF]	80,000
MINIMUM LOT WIDTH [FT]	180
MINIMUM LOT FRONTAGE [FT]	180
FRONT SETBACK [FT]	25
SIDE SETBACK [FT]	20
REAR SETBACK [FT]	25
SETBACK FROM ADJACENT RESIDENTIAL ZONE [FT]	150
MAX. BUILDING COVERAGE [%]	30
MAX. BUILDING HEIGHT [FT]	35

	LOT AREAS	
	SF	AC
1	135,690	3.11
2	124,150	2.85
3	93,290	2.14
4	86,860	1.99
5	112,390	2.58

0' 100' 200'
0 1/2" 1"
SCALE 1" = 200'

MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773 Fax (203) 272-9733
www.miloneandmacbroom.com

REVISIONS

CONCEPTUAL SUBDIVISION PLAN

FRANCIS J. CLARKE BUSINESS PARK EXPANSION

TROWBRIDGE DRIVE
BETHEL, CONNECTICUT

CJR	CJR	TD
DESIGNED	DRAWN	CHECKED

1"=200'
SCALE
FEBRUARY 13, 2015
DATE
4494-03
PROJECT NO.

CS-1
SHEET NO.

Site Ecology Report

Francis J. Clarke Business Park Expansion
Trowbridge Drive
Bethel, CONNECTICUT

February 16, 2015
MMI #4494-03

Scope Item 1.0 Inland Wetlands Delineation

On August 8, 2014, the boundaries of inland wetlands and watercourses on the site were investigated by William A. Root, MS, a certified professional soil scientist, in accordance with the regulations of the Town of Bethel, Connecticut, and the State of Connecticut Inland Wetlands and Watercourses Act, CGS 22a-36 through 45. Regulated wetland areas consist of any of the soil types designated by the National Cooperative Soils Survey as poorly drained, very poorly drained, alluvial, or floodplain. Regulated watercourses consist of rivers; streams; brooks; waterways; lakes; ponds; marshes; swamps; bogs; and all other bodies of water, natural or artificial, vernal or intermittent, public or private, not regulated pursuant to CGS sections 22a-28 to 22a-35, inclusive (tidal wetlands).

1.1 Methodology

In general, transects were walked over the site looking for evidence of redoximorphic features in the soil (hydric soils), a predominance of wetland-adapted plants (hydrophytic vegetation), and evidence of high groundwater persisting into the growing season (wetland hydrology). Areas of flowing or standing water and incised channels were inspected for evidence of ordinary high water marks, a diagnostic feature of watercourses (perennial or intermittent).

Prior to the fieldwork, geospatial data was accessed via the Web Soil Survey to determine current United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) soil survey mapping for the project site (http://websoilsurvey.nrcs.usda.gov).

A copy of the web soil survey mapping is appended to this report. The USDA-NRCS maps the following soil units in the vicinity of the project area:

- Haven and Enfield soils (#32), well-drained, sandy soils
- Hinckley, gravelly sandy loam (#38), excessively drained
- Rock Outcrop, Hollis, Chatfield soils (#75, 76), well-drained to excessively drained soils
- Ridgebury, Leicester, Whitman soils (#3), poorly drained, wetland soils
- Open Water (W)

1.2 Field Survey

There are no wetland soils mapped by the USDA – NRCS near the end of Trowbridge Drive. At the end of the cul-de-sac, there is a narrow corridor of somewhat level land between the pond and railroad tracks and the steep rocky escarpment to the west. It extends southerly approximately 2,000 feet until it reaches a narrow wetland and watercourse trough that drains easterly to the pond. The upland soils here are glaciofluvial based and developed in stratified sand and gravel. There are several runoff rills from the steep rocky slopes that cross the site, but none of these meet criteria to be regulated as an intermittent watercourse. At the top of the escarpment, there are several depressions that remain saturated long enough to meet wetland/watercourse criteria. These are shown on the attached USDA-NRCS map and the attached GIS maps as well. However, these are located far from any portion of the site that may be accessed from Trowbridge Drive, except on foot as recreation trails.

Our conclusion is that expansion of the Francis J. Clarke Business Park southward from Trowbridge Drive is unlikely to encounter or impact any inland wetlands or watercourses.

Scope Item 2.0 Botanical Survey

The botanical survey for state-listed species was scheduled to coincide with the blooming season for the majority of species, which is May through July. However, state funding for the project was somewhat delayed and fieldwork did not commence until the very end of the blooming season. Therefore, this scope item was not fully addressed in 2014 and will be rescheduled to 2015 if approved by town staff.

Scope Item 3.0 Northern Metalmark Butterfly Survey

The butterfly survey was scheduled to coincide with the flight season for the species *Calephelis borealis,* which is June 15 through July 21. However, state funding for the project was somewhat delayed ,and fieldwork did not commence until the very end of the flight season. The host plant for the species is round-leaved ragwort, which blooms from April to June in this region. Therefore, searches for this species were also compromised by the late start. Therefore, this scope item was not fully addressed in 2014 and will be rescheduled to 2015 if approved by town staff.

Scope Item 4.0 Herpetologist Surveys

Despite the late approval of funding, MMI did conduct a vernal pool survey and did conduct surveys for Eastern box turtle at the site.

4.1 Vernal Pool Survey

MMI accomplished the following tasks to determine the presence of vernal pools and vernal pool obligate species at the site.

1) Reviewed published records for information regarding current and historical utilization of this site and surrounding sites in the watershed by vernal pool obligate species. *State Geological and Natural History Bulletin # 112* and other reference texts were reviewed for this purpose.
2) MMI reviewed published and available resource mapping including:
   - USDA – NRCS Soil Survey mapping
   - Current wetland mapping
   - USGS Quadrangle maps
   - Aerial photographs of the area
   - Site topography
   - Site hydrology
3) MMI conducted field studies (April 9, 2014) at the site including:
   - Physically locating and inspecting any bodies of standing water, pools, and ponds to determine their suitability to function as vernal pools.

- Surveying the site using the *visual encounter method*, this consists of walking over the landscape searching for amphibians. An *intensive cover search* was also conducted. This consists of inspecting likely habitat for amphibians and searching under decaying logs and rocks, which often shelter amphibians.
- Pools were carefully inspected by walking along the edges looking for adults and egg masses. Observed egg masses were counted and determined, if possible, to species. A *dip net survey* was conducted to sample for adult amphibians.

4) MMI located all verified vernal pools using a global positioning system (GPS), or other survey method, for subsequent inclusion on site maps.

4.1.1 Survey Results

Conversations with CT DEEP NDDB personnel alerted MMI that reports of Jefferson salamander complex (*Ambystoma jeffersonianum*) were in the Terre Haute Estate high up on the rocky plateau west of Trowbridge Drive. No indications of vernal pools or obligate species were encountered from the end of Trowbridge Drive southward for approximately 3,000 feet, somewhat beyond the intermittent watercourse and wetland trough that drains to the pond. The pond edge itself east of the railroad tracks was explored looking for adult amphibians, larvae, and egg masses, but none were observed. Exploration of the high ridge to the west (approximately 2,500 feet from Trowbridge Drive) was more fruitful. The rolling, rocky terrain with isolated depressions looked suitable for Jefferson salamander. Although no pools were encountered, wood frogs were heard calling faintly even farther upslope to the west indicating the likely presence of a vernal pool as shown on the attached aerial photographs.

Our conclusion is that expansion of the Francis J. Clarke Business Park southward from Trowbridge Drive is unlikely to encounter or impact Jefferson salamander populations or habitat.

4.2 Eastern Box Turtle (Terrapene c. Carolina) Survey

Box turtles inhabit old fields and deciduous forest habitat including power line cuts and logged areas. They are typically found near wetlands including minor streams and ponds. They often use sand and gravel-based soils (if available) for nesting and hibernation. They are active from April through October.

MMI surveyed the Trowbridge Drive site using the *visual encounter method*, which consists of walking over the landscape searching for turtles and an *intensive cover search*, inspecting likely habitat for

turtles under woody debris, leaf litter, and vegetation, which often shelter turtles. Survey dates were April 9, 2014 and August 8, 2014.

Although habitat for box turtles looked suitable (but not good), none were encountered. The level of development that borders the proposed expansion site including Trowbridge Drive and the railroad tracks may inhibit turtle movement. So too does the steep rocky slope to the west. The rocky highlands of the Terre Haute Estate are not good habitat for box turtles. In reviewing aerial photographs of the area, the open terrain to the east of the pond appears more suitable for box turtle. Standard protocols for box turtle protection are normally employed when initiating development of areas known or suspected of supporting box turtles. These protocols are normally issued as part of any CT DEEP permit.

Our conclusion is that expansion of the Francis J. Clarke Business Park southward from Trowbridge Drive is unlikely to encounter individual Eastern box turtles and will not impact their local population or habitat.

Very truly yours,

MILONE & MACBROOM, INC.

William A. Root, MS
Senior Project Specialist, Environmental

Attachments: CT DEEP Eco-Resource Maps

USDA-NRCS Soil Survey Map

GIS Maps

4494-03-f1215-rpt

CT DEEP Eco-Resource Maps

Francis J. Clarke Business Park Expansion

Trowbridge Drive
Bethel, Connecticut

February 12, 2015

MMI #4494-03

Inland Wetland Soils: There is a narrow wetland/watercourse trough south of Trowbridge Drive that drains easterly to the pond.

Natural Diversity Data Base: These are the reported occurrences on file with the CT DEEP.

They are Jefferson salamander and Eastern box turtle; neither is expected to be problematic for further development of the Francis J. Clarke Park site. Surveys for Northern Metalmark butterfly and state-listed plants are not yet complete.

USDA – NRCS Soil Survey Map

Francis J. Clarke Business Park Expansion

Trowbridge Drive
Bethel, Connecticut

February 12, 2015

MMI #4494-03

GIS MAP

Francis J. Clarke Business Park Expansion

Trowbridge Drive
Bethel, Connecticut

February 12, 2015

MMI #4494-03

Soil Map—State of Connecticut
(Trowbridge Dr, Bethel CT)

Map Scale: 1:8,790 if printed on A portrait (8.5" x 11") sheet.

N

0 100 200 400 600 Meters

0 400 800 1600 2400 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 13, Oct 28, 2014

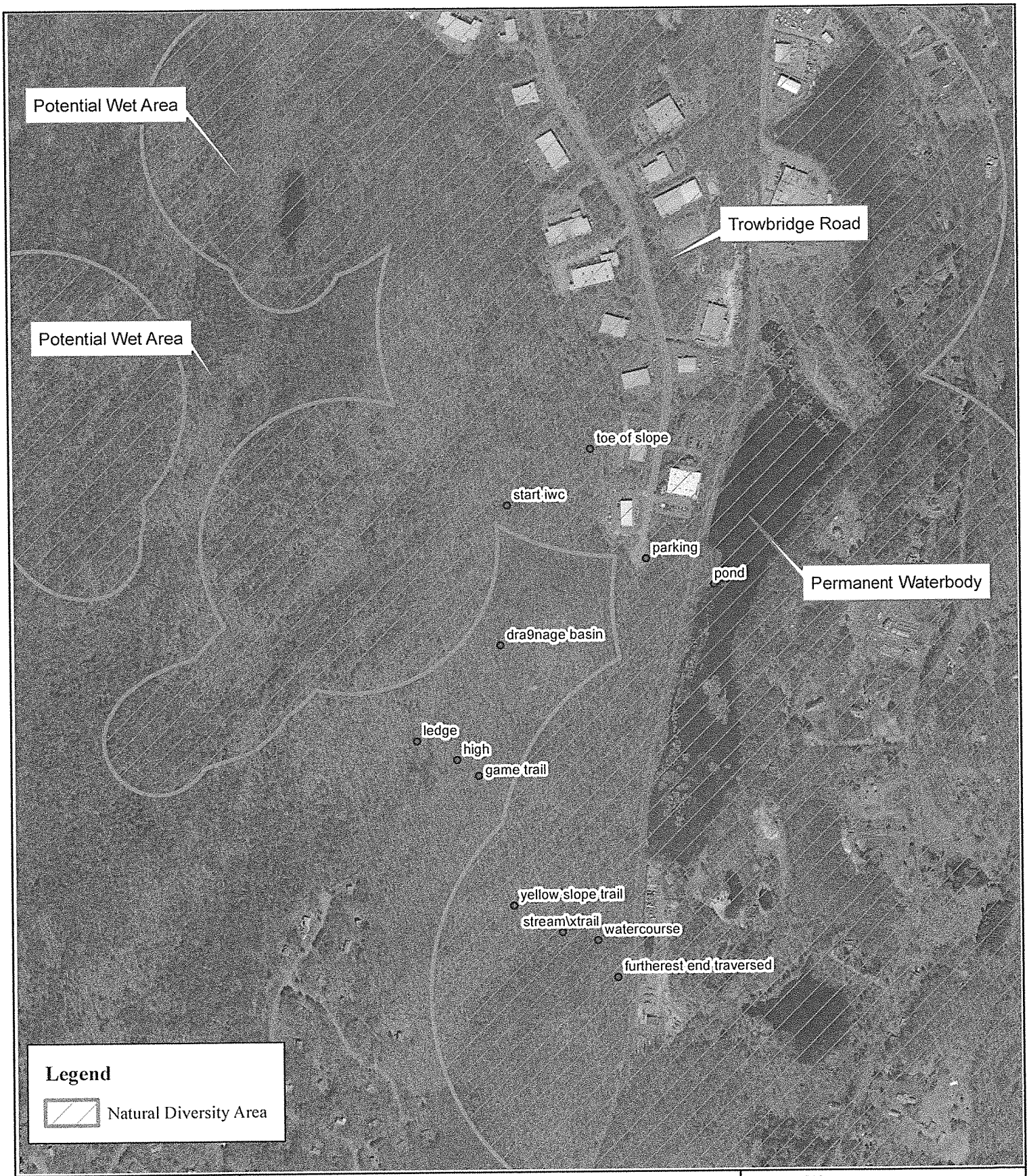
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 28, 2011—Oct 9, 2011

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

State of Connecticut (CT600)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	2.4	0.7%
12	Raypol silt loam	0.8	0.2%
18	Catden and Freetown soils	1.4	0.4%
32B	Haven and Enfield soils, 3 to 8 percent slopes	8.7	2.6%
38C	Hinckley gravelly sandy loam, 3 to 15 percent slopes	0.7	0.2%
38E	Hinckley gravelly sandy loam, 15 to 45 percent slopes	15.7	4.6%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	2.8	0.8%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	2.9	0.9%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	0.1	0.0%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	72.4	21.2%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	83.3	24.4%
76F	Rock outcrop-Hollis complex, 45 to 60 percent slopes	62.3	18.3%
94C	Farmington-Nellis complex, 3 to 15 percent slopes, very rocky	2.2	0.6%
94E	Farmington-Nellis complex, 15 to 35 percent slopes, very rocky	17.1	5.0%
302	Dumps	1.8	0.5%
305	Udorthents-Pits complex, gravelly	16.2	4.7%
306	Udorthents-Urban land complex	26.2	7.7%
W	Water	23.5	6.9%
Totals for Area of Interest		**340.7**	**100.0%**



SOURCE(S): CT DEEP NDDB Dec 2013	**Traverse Points**	LOCATION: **Bethel, CT**
N **Bethel** MXD: W:\Design\4494-03-DE\GIS\Maps\NDDBwithpoints.mxd	Map By: JDW MMI#: 4494-03 Original: 4/9/2014 Revision: 4/9/2014 Scale: 1 inch = 700 feet	MILONE & MACBROOM 99 Realty Drive Cheshire, CT 06410 (203) 271-1773 Fax: (203) 272-9733 www.miloneandmacbroom.com

Fiscal Assessment
For Extending Trowbridge Drive
Francis J. Clarke Business Park

Prepared for:

Town of Bethel

Prepared By:

Milone & MacBroom, Inc.
Cheshire, Connecticut

February 2015

TABLE OF CONTENTS

I. INTRODUCTION

The Town of Bethel is considering the feasibility of extending Trowbridge Drive, in its successful Francis J. Clarke Business Park, for the purpose of creating a new inventory of parcels for sale and generating economic benefits as the parcels are developed.

The purpose of this fiscal assessment is to ascertain how the expenditures necessary to extend the road including necessary utilities align with what can reasonably be expected in sales revenue from the lots. The area being considered for extension of the road has very difficult topography and preliminary engineering evaluation has developed two scenarios of three lots and five lots that are developable. This assessment will use the development costs of the two scenarios to determine break-even lot pricing.

To develop conclusions and recommendations, investigations and analyses were undertaken as to the area real estate market and the property tax yield from developed business parcels on Trowbridge Drive. An estimated parcel sales price was developed from current market activity and considering the general site characteristics of the potential development sites with respect to location, access, utility availability, terrain conditions and the general character of neighboring land use.

Specific market transaction data was obtained by reference to the Commercial Record and by reference to various web-based data service and/or the area Multiple Listing Service. Information about the competitive supply was developed through reference to broker listings and a review of sites and facilities posted on the Connecticut Economic Resource Center's (CERC) Sitefinder service.

II. DEFINITION OF MARKET TRADE AREA

Market Trade Area

A determination of market influence was made to assist in investigating the market pricing and comparables of the proposed Francis J. Clarke Business Park extension. A Market Area was identified to define the extent of the market area within which the potential business park sites are likely to compete. The Market Area has been defined to include the adjoining communities including:

- Bethel
- Danbury
- Newtown
- Redding
- Brookfield

III. AREA SUITABILITY ASSESSMENT

The Francis J. Clarke Business Park is an established business park that began development in the 1970's as a Town imitative and currently is about 85% occupied with over 70 businesses. The business park has a good reputation in the market place and is considered a strong location for business activity. Any new lots to be developed will benefit from this history and reputation.

IV. MARKET AREA COMPETITIVE SUPPLY

An overview survey of industrial land available for sale in the market area was conducted to inform the development of a market based sales price for the proposed parcels. Sources of information included CERC SiteFinder; commercial broker websites), and Loopnet.com. The following table describes the product currently being marketed in each town in the Market Area.

Industrial Land For Sale					
Address	**Town**	**Size (Acres)**	**Sale Price**	**Price/Acres**	**Use**
6A Francis Clarke Circle	Bethel	1.867	$325,000	$174,076.	Industrial/Mfg., Industrial Park
39 Stony Hill Road	Bethel	9	$975,000	$108,333.	Commericial/Other., Flex Zone
Bethel Total		**10.867**		**$119,628**	
533 Federal Road	Brookfield	2.1	$269,000	$128,095.	Commercial/Other, Flex Zone
984 Federal Road	Brookfield	1.77	$675,000	$381,355.	Commercial/Other, Flex Zone
Brookfield Total		**3.87**		**$243,928**	
3-7 Great Plain Road	Danbury	3.5	$599,000	$171,142.	Commercial/Other, Flex Zone
102 Mill Plain	Danbury	4.46	$3,500,000	$784,753.	Commercial/Other, Flex Zone
133 Padanaram Road	Danbury	1.01	$225,000	$222,772.	Retail/Commercial, Office
Danbury Total		**8.97**		**$482,051**	
10 Hawleyville Road	Newtown	102.71	$12,500,000	$121,701.	Commercial/Other land
24 Pecks Lane	Newtown	2.44	$339,000	$138,934.	Industrial
Newtown Total		**105.15**		**$122,102**	
241 Ethan Allen Highway	Redding	7.96	$2,280,000	$286,432	Office/Mfg.,Warehouse
Redding Total		**7.96**		**$286,432**	
GRAND TOTAL		**136.817**		**$158,511**	
GRAND TOTAL w/o DANBURY		**127.847**		**$135,810**	

As can be seen in the table, a wide range of price points exist for business property in the market area. In our view, pricing within the Clarke Business Park provides the strongest indicator of likely pricing level for the proposed parcels although some adjustment for market area price levels and quantities is warranted. Danbury parcels should be excluded from consideration as they are too dissimilar from the subject product. Bethel industrial land asking price currently averages $120,000/acre. The market area asking price without Danbury parcels averages $135,000/acre. For purposes of this assessment we will use $125,000/acre for the fiscal assessment. A comprehensive market and disposition study should be undertaken before final pricing decisions are made.

Buildings Available

In addition to the competitive supply of vacant land there is also available in the market area available vacant industrial and flex building space for sale including some in the Clarke Business Park. A listing of the industrial space inventory for sale can be found on the next page and completes the overview of for sale market inventory.

Industrial Buildings For Sale						
Address	**Town**	**Total Area (sq. ft.)**	**Available Area (sq. ft.)**	**Sale Price**	**Price/Sq.Ft.**	**Use**
6A Francis Clarke Circle	Bethel	0	0	$325,000	$0.00	Industrial/Mfg., Industrial Park
13 Trowbridge Drive	Bethel	9,750	9,750	$1,050,000	$107.69	Industrial/Mfg., Industrial Park
39 Stony Hill Road	Bethel	0	0	$975,000	$0.00	Commericial/Other., Flex Zone
Bethel Total		**9,750**	**9,750**			
91 Commerce Drive	Brookfield	24,000	24,000	$1,500,000	$62.50	Industrial / Warehouse
533 Federal Road	Brookfield	0	0	$269,000	$0.00	Commercial/Other, Flex Zone
984 Federal Road	Brookfield	0	0	$675,000	$0.00	Commercial/Other, Flex Zone
1120 Federal Road	Brookfield	20,000	12,000	$1,550,000	$77.50	Industrial/Mfg.
Brookfield Total		**44,000**	**36,000**			
3-7 Great Plain Road	Danbury	0	0	$599,000	$0.00	Commercial/Other, Flex Zone
45A Miry Brook	Danbury	36,735	36,735	$6,500,000	$176.94	Industrial
45B Miry Brook	Danbury	18,790	18,790	$2,500,000	$133.05	Industrial
88 Sugar Hollow Road	Danbury	29,500	29,500	$1,750,000	$59.32	Industrial
102 Mill Plain	Danbury	0	0	$3,500,000	$0.00	Commercial/Other, Flex Zone
133 Padanaram Road	Danbury	0	0	$225,000	$0.00	Retail/Commercial, Office
193 Long Ridge Road	Danbury	13,268	13,268	$895,000	$67.46	Industrial
Danbury Total		**98,293**	**98,293**			
10 Hawleyville Road	Newtown	0	0	$12,500,000	$0.00	Warehouse/Dist., Retail/Commercial
24 Pecks Lane	Newtown	0	0	$339,000	$0.00	Retail/Commercial, Warehouse/Dist.
174 Mount Pleasant Road	Newtown	20,000	0	$1,195,000	$59.75	Mixed Use, Industrial/Mfg.
191 S. Main Street	Newtown	21,184	21,184	$2,650,000	$125.09	Office
Newtown Total		**41,184**	**21,184**			
241 Ethan Allen Highway	Redding	55,000	55,000	$2,280,000	$41.45	Office/Mfg.,Warehouse
Redding Total		**55,000**	**55,000**			
GRAND TOTAL		**248,227**	**220,227**			

V. FISCAL ASSESSMENT

Engineering assessment of the area under consideration for extension of Trowbridge Drive has resulted in two scenarios for expansion of the business park. Topography in the area under consideration is a significant impediment to development of this area and requires greater than standard costs to create development.

Scenario A

This scenario creates five lots along 1000 feet of road extension. The road extension is estimated to cost $1,700,000. For purposes of this analysis it is assumed that road and infrastructure cost will be distributed equally to each of the parcels created or $340,000 per parcel.

There are additional costs associated with development of lots 2, 3, and 4 because of the topography and need for retaining walls and/or rock cuts. These premium costs will be borne by the developer but will have an influence on sales price, marketability and pace of absorption.

Lot Areas

1.	135,690 sf	3.11 ac
2.	124,150 sf	2.85 ac
3.	93,290 sf	2.14 ac
4.	86,860 sf	1.99 sf
5.	112,390 sf	2.58 sf

Scenario B

This scenario creates three lots along 750 feet of road extension. The road extension is estimated to cost $610,000. For purposes of this analysis it is assumed that road and infrastructure cost will be distributed equally to each of the parcels created or $203,333 per parcel.

Lot Areas

1.	135,690 sf	3.11 ac
2.	118,483 sf	2.72 ac
3.	172,933 sf	3.97 ac

Tax Yield

A prime objective in pursuing the development of these parcels is to generate a revenue stream from real and personal property taxes for the Town. Therefore, estimating the tax yield from this potential development is appropriate. As the Clarke Business Park has an established a track record of tax yield from the many business that occupy its sites. A review of properties closest to the proposed expansion area was conducted. The average tax yield per acre is $10,087 per acre and the calculation is illustrated on the following table.

TAX YIELD FROM SELECTED CLARKE BUSINESS PARK PARCELS

Address		Parcel Size *Ac.*	Total Assessed Value *$*	Tax Yield 32.11 Mill Rate	Tax Yield Per Acre
16 & 18	Trowbridge	4.96	$2,493,300.00	$80,059.86	$16,141.10
17	Trowbridge	2.18	$691,100.00	$22,191.22	$10,179.46
15	Trowbridge	2.62	$834,900.00	$26,808.64	$10,232.30
13	Trowbridge	3.96	$725,200.00	$23,286.17	$5,880.35
14A	Trowbridge	2.91	$600,300.00	$19,275.63	$6,623.93
12	Trowbridge	6.47	$1,105,500.00	$35,497.61	$5,486.49
11	Trowbridge	3.89	$1,111,500.00	$35,690.27	$9,174.88
10	Trowbridge	5.39	$1,606,100.00	$51,571.87	$9,568.07
9	Trowbridge	3.64	$2,039,400.00	$65,485.13	$17,990.42
7	Trowbridge	3.37	$1,487,100.00	$47,750.78	$14,169.37
8	Trowbridge	3.57	$801,100.00	$25,723.32	$7,205.41
TOTAL		**42.96**		**$433,340.51**	**$10,087.07**

Scenario A Assessment

5 parcels totaling 12.67 acres for sale x $125,000/acre = $1,583,750 revenue potential

Cost of infrastructure = $1,700,000

Misc. soft costs i.e. legal, survey, marketing, etc .lump sum = $ 70,000

Additional funds required **$186,250**

Years required to recoup project investment:

12.67 acres x $10,000/acre tax revenue = $126,700 or **1.5 years after full build-out.**

Scenario B Assessment

3 parcels totaling 9.8 acres for sale x $125,000/acre =$1,250,000 revenue potential

Cost of infrastructure =$ 610,000

Misc. soft costs i.e. legal, survey, marketing, etc .lump sum =$ 50,000

Surplus funds generated **$590,000**

This assessment is prepared at the order of magnitude level and ignores the time value of money. The reader is encouraged to undertake a detailed pro forma analysis of revenues and expenditures before final decisions are made to pursue the project.

4493-03-f1615-cht

GEOTECHNICAL ENGINEERING ASSESSMENT
CLARKE BUSINESS PARK EXPANSION
TROWBRIDGE DRIVE
BETHEL, CONNECTICUT

Prepared for:

Town of Bethel
1 School Street
Bethel, CT 06801

Prepared by:

GeoInsight®
Environmental Strategy & Engineering

GeoInsight, Inc.
186 Granite Street, 3rd Floor, Suite A
Manchester, New Hampshire 03101-2643
Tel: (603) 314-0820
Fax: (603) 314-0821

One Monarch Drive, Suite 201
Littleton, Massachusetts 01460-1440
Tel: (978) 679-1600
Fax: (978) 679-1601

200 Court Street, 2nd Floor
Middletown, Connecticut 06657-3341
Tel: (860) 894-1022
Fax: (860) 894-1023

info@geoinc.com
www.geoinsightinc.com

February 19, 2016

GeoInsight Project 7880-000

P:\7880-000_Business Park Expansion_Bethel CT_Geothechnical\Report\7880_2016-02-19_Clarke Business Park Geotechnical Report.docx

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE

FIGURES

APPENDIX

GEOTECHNICAL ENGINEERING ASSESSMENT
CLARKE BUSINESS PARK EXPANSION
TROWBRIDGE DRIVE
BETHEL, CONNECTICUT

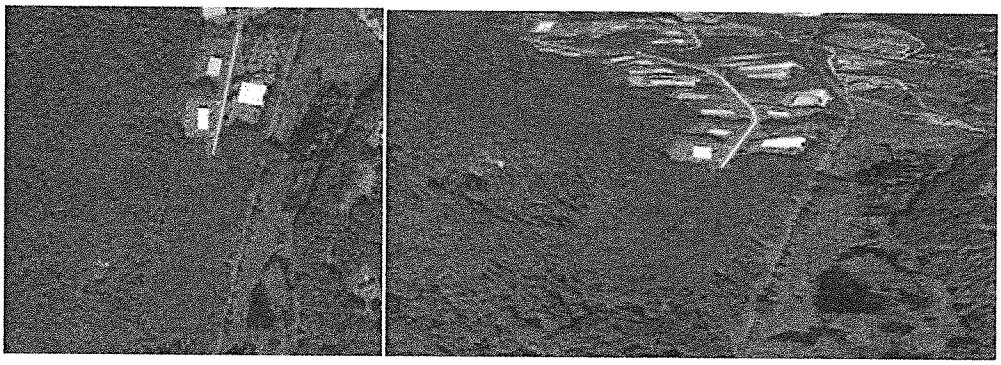
1.0 INTRODUCTION

GeoInsight, Inc. (GeoInsight) is pleased to present this report describing the results of a geotechnical engineering assessment prepared for the Town of Bethel, Connecticut (the Town) for the above-referenced project. Included herein is our assessment of subsurface conditions as they relate to foundation design and earthwork construction for the proposed project located south of Trowbridge Drive (dead end road) in Bethel, Connecticut (the "Site;" see Figure 1).

1.1 SITE DESCRIPTION

Our understanding of the proposed project is based upon review of a plan titled "Conceptual Subdivision Plan – Alternate, Sheet CS-2," dated February 13, 2015 and prepared by Milone & Macbroom of Cheshire, Connecticut. GeoInsight also engaged in discussions with the Town to better understand the proposed project.

The Site consists of an approximately 12-acre portion of land located south of Trowbridge Drive (dead end). The northern portion of Trowbridge Drive consists of an existing industrial park development. The project Site currently consists of undeveloped, wooded land. Vegetation at the Site generally includes a mixture of mature and immature growth. Ground surface regionally slopes upward from east to west, from Sympaug Pond (east of the Site, near elevation 375 feet) to a high point approximately 0.75 miles west of the Site (near elevation 740 feet). Within the Site boundary, the landform topography is generally concave. Ground surface is generally lower in the central portion of the Site (lower elevations typically ranging from approximately 414 feet to 425 feet). In the eastern portion of the Site, the ground surface rises to elevations ranging from approximately 466 to 438 feet before dropping steeply towards Sympaug Pond. In the western portion of the Site, ground surface rises to elevations ranging between approximately 464 feet and 504 feet (and continue to rise beyond the western Site boundary). The Conrail Railroad is located approximately 100 feet east of the Site and generally parallels the eastern edge of the Site.



Existing Site – Images from Google Earth

1.2 PROPOSED DEVELOPMENT

The proposed project consists of developing the Site with an expanded area of the existing business park. The new development is conceptually planned to include three new buildings, identified as Building 1 (northern-most building), Building 2, and Building 3 (southern-most building). The buildings are planned to be approximately 12,000 to 13,000 square feet in plan area, and we anticipate the buildings would be one to two stories with slab-on-grade construction. Proposed finished floor levels are planned to be approximately 446 feet, 436 feet, and 430 feet for Building 1 through Building 3, respectively.

In addition to the proposed buildings, Site development is planned to include an access driveway extending south through the Site from a continuation of Trowbridge Drive, and paved parking areas for each building. In order to achieve proposed Site grades, maximum cuts and fills of approximately 18 and 31 feet, respectively, are planned. The greatest cut depths are planned in the southwestern portion of the Site, while the majority of the central portion of the Site (where the previously mentioned "concave area" exists) is planned to include the greatest fill depths. The currently proposed grades with respect to the existing grades appear to result in the need for a relatively significant amount of fill. Stormwater management basins are planned in the south and north of the Site. A retaining wall with an exposed height of approximately 8 feet is planned in the southwestern portion of the Site. Soil slopes ranging from approximately 2 horizontal to 1 vertical (2H:1V) to 3H:1V are also planned in the southwestern and southeastern portions of the Site.

2.0 SUBSURFACE EXPLORATION PROGRAM

Subsurface explorations at the Site were conducted on January 21 through 25, 2016, and consisted of a total of 24 test pit excavations (identified as TP-1 through TP-24) and 3 geotechnical soil borings (identified as B-1 through B-3). The test pits were excavated by TD & Sons, Inc. of Bethel, Connecticut using a Samsung SE210-LC2 excavator. Test borings were drilled by New England Boring Contractors, Inc. of Glastonbury, Connecticut using a Diedrich D-50 all terrain vehicle-mounted drill rig and hollow-stem augers or flush-joint casing.

Test pit and test boring locations were selected based upon the Conceptual Subdivision Plan referenced herein. The test borings were located in the field using a handheld global positioning system (GPS) instrument and coordinates obtained from Google Earth, as well as reference to obvious Site features. Ground surface elevations recorded on the test boring logs are estimated based upon interpretation from the topographic contours depicted on the above-referenced Conceptual Subdivision Plan. The approximate locations of the subsurface explorations are shown on Figure 2.

Test pits were excavated to depths ranging from approximately 8 to 17 feet below ground surface (bgs). The test pit excavation depths were equal to or greater than the proposed cut depth at the specific test pit locations. One test pit (TP-4) terminated upon encountering excavator refusal on bedrock. The remaining 23 test pits terminated within the overburden soil layers without encountering refusal.

Test borings were advanced to depths ranging from approximately 15.2 to 20.2 feet bgs. Split-barrel sampling via the Standard Penetration Test (SPT, American Society for Testing and Materials [ASTM] International D-1586-11) was generally conducted at ground surface and at 5-foot intervals thereafter to the termination depth of the borings. The summation of the blows necessary to collect the SPT samples from 6 to 18 inches is called the Standard Penetration Number, which is used as an indicator of the soils' inherent *in situ* density.

Two 5-foot long rock cores were attempted from test boring B-1. The rock cores were drilled from depths of approximately 10 to 15 feet bgs (C-1) and 15 to 20 feet bgs (C-2). The rock cores were drilled using an NX-sized diamond-bit core barrel. Refer to Section 3.3 for an evaluation of the rock core collection.

A GeoInsight geologist conducted oversight of subsurface explorations, collected soil samples, measured apparent groundwater levels, and prepared test pit and test boring logs. Soil samples were placed in sealed containers and returned with the field logs to GeoInsight's office for further evaluation. Soil samples were classified in general accordance with visual and manual procedures (ASTM D-2488) and described using modified Burmister Soil Classification System descriptors. The final test pit and test boring logs are included as Appendix A. Stratification lines shown on the subsurface exploration logs represent approximate boundaries between soil types encountered. The actual transitions will likely be more gradual and may vary over short distances.

3.0 SUBSURFACE CONDITIONS

3.1 GENERAL

The soil profile and conditions outlined below highlight the major subsurface stratifications at the Site. The individual subsurface exploration logs should be consulted for detailed descriptions of the subsurface conditions encountered at each exploration location. When reviewing the test pit and test boring records and the subsurface profile, it should be understood that soil conditions might vary between and away from the exploration locations. The findings of this report are less likely to apply to areas not explored as a function of increased distance away from the specific subsurface exploration locations. Variations in subsurface conditions are possible laterally and with depth that are not identified on the logs or otherwise in this report. The subsurface conditions observed in the test pits and test borings are summarized in Table 1, attached.

3.2 OVERBURDEN SOILS

Subsurface conditions at the Site generally consisted of a surficial organic forest mat layer underlain by a relatively inorganic subsoil layer, a native granular terrace deposit, and a native glacial till deposit. A layer of fill was encountered at one test pit location. The individual soil layers encountered are described in detail in the following paragraphs.

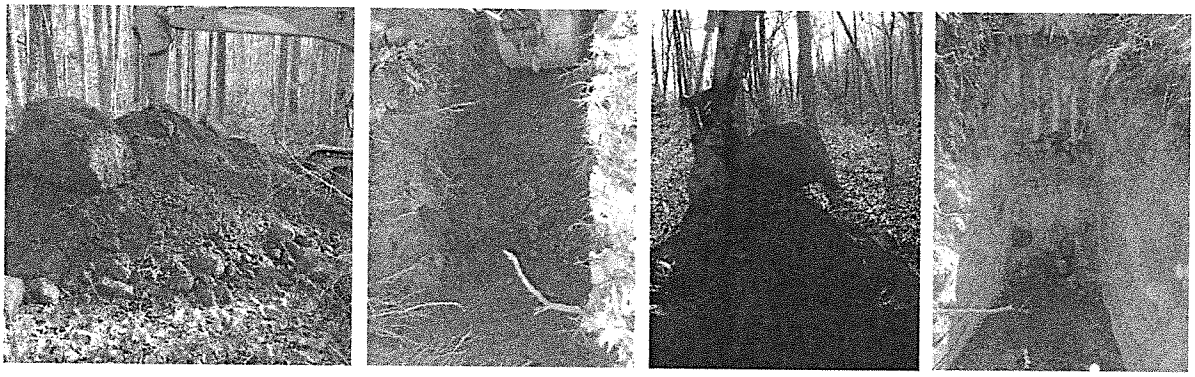
Forest Mat
A surficial forest mat layer was encountered in each of the test borings at ground surface. In general, the forest mat was observed to range in thickness from approximately 3 to 6 inches. The forest mat layer was generally described as dark brown, fine sand, with some organic and inorganic silt, and trace fine roots with leaf matter. The organic material is generally the result of decaying forest litter being incorporated into the underlying soil.

Existing Fill
A layer of existing fill was encountered at one subsurface exploration location (TP-22) directly below the forest mat layer (and above a buried subsoil layer). The existing fill was generally described as brown silt and fine sand with little gravel. The existing fill was likely placed during development of the existing Clarke Business Park and is not expected to be wide-spread throughout the Site.

Subsoil
A native subsoil layer was observed below the surficial forest mat at each of the subsurface exploration locations to depths ranging from approximately 1 to 3 feet bgs, and was typically observed to 2 feet bgs. A buried subsoil layer was encountered at TP-22 below the existing fill layer, and was observed to be approximately 2 feet thick. The subsoil layer was generally described as light brown, fine sand and silt with varying proportions of gravel. Roots were observed within the subsoil layer. The subsoil layer was generally observed to be inorganic; however, the percentage of roots present will determine whether the layer as a whole is regarded as organic or not.

Native Terrace Deposit
A native river terrace deposit was encountered at 11 of the 27 total subsurface explorations. The native terrace deposit was generally observed in the eastern portion of the Site. The terrace deposit was likely formed by the downcutting of moving water and resulting lateral erosion of the land alongside the moving water. The native terrace deposit was observed to

depths ranging from approximately 6 to 12 feet bgs. Eight of the explorations terminated within the terrace deposit and, therefore, the total depth of the deposit at these locations was not assessed. The deposit was generally described as brown to light brown, fine to coarse sand and gravel with some to trace silt and occasional cobbles.



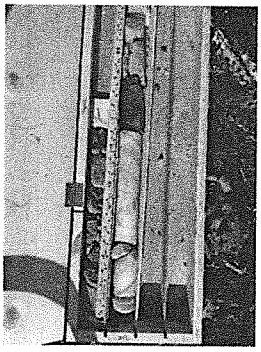
Portions of the terrace deposit were described as fine sand with some to trace gravel and varying proportions of silt. Where SPTs were performed within the terrace deposit (two samples at B-2), the relative density of the deposit was loose to medium dense.

Native Glacial Till Deposit

A native glacial till (ablation till) deposit was observed below the subsoil layer or terrace deposit at 19 of the 27 total subsurface exploration locations. The ablation till deposit was formed by the melt-out of sediment from the surface of a retreating glacier. The till deposit was observed to depths ranging from approximately 9 to 21.2 feet bgs. Seventeen of the explorations terminated within the glacial till deposit and, therefore, the total depth of the deposit at these locations was not assessed. The ablation till deposit was generally described as a heterogeneous mixture of sand, gravel, and silt with occasional to frequent cobbles and boulders. Where SPTs were performed within the till deposit, the relative density of the deposit was dense on average.

3.3 REFUSAL SURFACES

Refusal on apparent bedrock was encountered at two exploration locations (B-1 and TP-4), at depths of approximately 18.5 and 11.5 feet bgs, respectively, which corresponds to approximately elevation 428.5 feet. B-1 and TP-4 were located in the southwestern portion of the Site. At TP-4, the rock surface was identified based upon excavator refusal. At B-1, the rock surface was identified by collection of a rock core sample. Rock core samples were attempted at B-1 from depths of approximately 10 to 15 feet bgs (C-1) and 15 to 20 feet bgs (C-2). Based upon limited rock recovery from the core attempts between approximately 10 and 18.5 feet bgs, we presumed that cobbly/bouldery glacial till soil was present between these depths. From approximately 18.5 to 20 feet bgs, the rock core recovered from the test boring was generally described as white marble.



Based upon review of the 1985 Bedrock Geological Map of Connecticut, bedrock underlying the Site consists of white to gray dolomitic marble, which is generally consistent with the rock recovery from 18.5 to 20 feet bgs. A layer of weathered bedrock was observed at TP-4 that was approximately 1.5 feet thick.

It should be noted that the Site is characterized by numerous surface boulders that are generally situated along the west side of the Site (at the bottom of the steeper slop) and in certain areas along the east side of the Site. Some of the boulders were observed to be large and may indicate that large boulders are also present below ground.

3.4 GROUNDWATER

Groundwater was observed within the exploration depths at 2 of the 27 exploration locations (B-3 and TP-1). Groundwater was observed at depths of approximately 10 feet at each of B-3 and TP-1, which corresponds to approximately elevation 395 to 435 feet. Groundwater may have been present within the exploration depth at B-1; however, the drilling method employed introduces water into the borehole and, therefore, observation of groundwater depth after drilling was not possible.

Groundwater may be shallower or deeper during seasonal periods different from those at the time of the explorations, and generally will fluctuate due to season, temperature, precipitation, nearby underground utilities, and construction activity in the area. Water levels during and following construction may vary from the groundwater measurements reported herein. Given the local topographic characteristics, it is possible that significant rain events may influence groundwater levels at the Site (at least temporarily) because areas to the west drain groundwater and surface water toward the east.

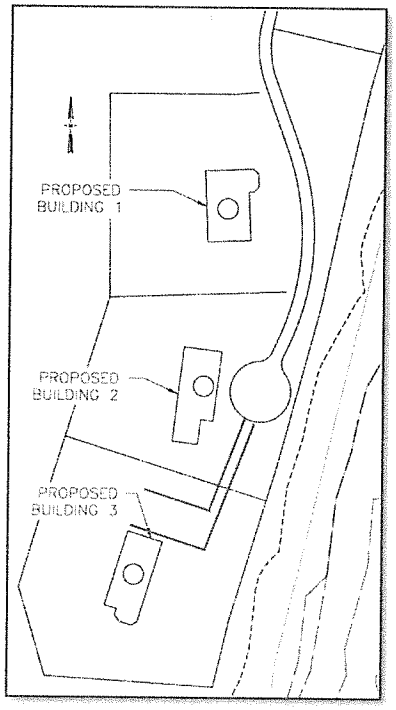
4.0 GEOTECHNICAL EVALUATION

Based upon review of the existing Site grades with respect to the proposed grades, a significant quantity of imported fill is expected to be necessary to achieve the conceptually-planned development grades. Cuts of up to approximately 18 feet are planned in the southern portion of the Site, while the central and northern portions of the Site will require up to 31 feet of fill. The cost of importing and placing the significant quantity of fill that will be required for the current conceptual Site development will likely be significant, and may warrant revising the currently-planned grades to better achieve a cut/fill balance.

Subsurface conditions at the Site are generally suitable for support of the proposed buildings on conventional shallow spread and continuous footings and slab-on-grade ground floor slabs. The expected foundation bearing strata for the three proposed buildings include the following, which is based upon the results of the subsurface explorations and our understanding of proposed finished floor elevations:

Building Identification	Bearing Strata
Building 1	Up to 28 feet of compacted structural fill over undisturbed native terrace deposit or glacial till soils
Building 2	Up to 7 feet of compacted structural fill over undisturbed native glacial till (southeast portion of the building) or directly on undisturbed native terrace deposit or glacial till soils (remaining portions of the building)
Building 3	Structural fill or crushed stone placed over the prepared bedrock surface (northwest portion of the building) or undisturbed glacial till soils (remaining portions of the building)

As is presented above, Building 1 and Building 2 will require placement of compacted structural fill to achieve bearing subgrades in some portions of the buildings, while the existing topography will be higher in other portions to allow for direct support of foundations on the native soils. At Building 3, bedrock is expected to be present below the slab elevation, but above the typical foundation bearing elevation in the northwest portion of the building. While significant rock removal is not expected to be necessary (based upon our current understanding of proposed elevations), the need for some removal of bedrock should be anticipated in order to prepare the rock surface for foundation support. The rock removal depth is expected to be up to approximately 4 to 5 feet, and is anticipated to be necessary over a relatively small portion of the building footprint (less than 25 percent; specifically, along the western exterior foundation line). Additionally, removal of up to a couple feet of bedrock may be necessary to construct the proposed retaining wall in the southern portion of the Site.



Based upon the presence of bedrock within the Building 3 foundation bearing depths, some (relatively limited) bedrock removal should be anticipated for construction of foundations. In general, where bedrock is present at or above the proposed foundation bearing depth, foundations could bear directly on the bedrock surface provided suitable soil to bedrock transition zones and/or structural control joints are included in the structural design of the foundations. However, based upon the relatively limited portion of the proposed building where bedrock is expected to be present within foundation bearing depths, we recommend over-excavating bedrock where necessary and constructing a soil cushion below foundations (rather than bearing directly on rock). Construction of a soil cushion will reduce the risk of differential settlement of adjacent footings or continuous footings that bear on dissimilar materials (i.e., soil and bedrock).

As relatively limited bedrock removal is anticipated for construction of the proposed Building 3 foundations and the retaining wall in the southern portion of the Site, we expect shallow bedrock removal can likely be completed using mechanical methods, such as a hydraulic hoe-ram. While we do not anticipate the need for systematic drilling and blasting, the selected earthwork contractor may determine that the quantity of rock removal warrants blasting in the southwest portion of the Site in order to most efficiently prepare the Site.

Soils encountered in the test pits and test borings are generally suitable for reuse as common fill in its current condition. Based upon visual classification, the majority of the native terrace deposit and ablation till soils may also be suitable for reuse a structural fill; however, the depositional variability in the materials may require stockpiling and blending materials intended for reuse as structural fill in order to create an overall well-blended material that meets structural fill specifications. Cobbles larger than 6 to 8 inches in diameter and boulders within the native soils may require segregation (or crushing) in order to be suitable for reuse as common fill or structural fill.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 FOUNDATION TYPE AND DESIGN CRITERIA

Building 1 and Building 2: We recommend supporting the proposed buildings on conventional shallow spread and continuous footing foundations bearing on: a) compacted structural fill placed over prepared native undisturbed terrace deposit or glacial till soils; or b) directly on undisturbed terrace deposit or glacial till soils. In general, inorganic subsoil is expected to be suitable to remain in place below building foundations.

The recommended maximum net allowable bearing pressure for the bearing conditions described above is 4,000 pounds per square foot (psf), provided footing subgrades are prepared as recommended herein. Total settlement is estimated to be nearly instantaneous as construction loads are added, and on the order of 0.5 inches or less, and differential settlement should be less than 0.25 inches between adjacent columns.

Building 3: We recommend supporting the proposed building on conventional shallow spread and continuous footing foundations bearing directly on undisturbed glacial till soils, or on a minimum 12-inch thick layer of compacted structural fill or crushed stone placed over bedrock. Where bedrock is present at or above the proposed foundation bearing depth, bedrock should be over-excavated to at least 12 inches below the foundation bearing elevation and be replaced with compacted structural fill or crushed stone to create a soil cushion. Construction of a soil cushion will reduce the risk of differential settlement of adjacent isolated footings or continuous footings that bear on dissimilar materials (i.e., soil and bedrock). Where bedrock over-excavation is required below foundations in order to construct soil cushions, the lateral extent of bedrock excavation below foundations should be equal to the depth of bedrock excavation from the foundation edges. If weathered bedrock is encountered at foundation bearing elevation, the weathered bedrock should be considered to behave like soil for the purposes of foundation design and construction.

The recommended maximum net allowable bearing pressure for the bearing conditions described above is 5,000 psf, provided footing subgrades are prepared as recommended herein. Total settlement is estimated to be nearly instantaneous as construction loads are added, and on the order of 0.3 inches or less, and differential settlement should be less than 0.15 inches between adjacent columns.

General: Where structural fill is needed to achieve the foundation bearing elevations, structural fill should extend to the lateral limits defined by the 1H:1V lines extending downward and outward from the bottom outside edges of foundations (referred to herein as the "bearing zone," refer to Section 6.2).

Lateral loads may be resisted by friction between the bottoms of footings and supporting subgrades, and by passive earth pressure against the sides of the foundation. A friction coefficient of 0.55 and an equivalent fluid unit weight of 200 pounds per cubic foot (pcf) against the sides of footings should be used for design of resisting walls. The recommended passive pressure equivalent fluid weight includes a factor of safety of 2.0. Passive pressure may be accounted for in conditions where the foundation moves horizontally in the direction of the soil, such as transient seismic or wind loading conditions.

In general, exterior footings should be protected from frost with at least 3.5 feet of earthen cover or other insulating material providing equivalent resistance against heat transfer. Interior footings not exposed to weather should be placed at least 2 feet below finished floor grade. The minimum width of footings should be 36 and 24 inches for individual column footings and continuous strip footings, respectively.

5.2 SLAB-ON-GRADE DESIGN CRITERIA

We recommend designing lowest floor slabs as soil-supported slabs-on-grade bearing directly on a minimum 12 inches of compacted structural fill or crushed stone placed above native terrace deposit or glacial till soils, or inorganic subsoil. A modulus of subgrade reaction of 350 pounds per cubic inch may be used for the slab design, assuming proper subgrade compaction.

New concrete slabs should be at least 4 inches thick, with an increased thickness used in higher traffic areas or where slab performance is more critical. The slab concrete should be underlain by a vapor barrier, reinforced at least with heavy gauge welded wire fabric, and include proper construction joints to control the occurrence of shrinkage cracks. We recommend slabs be specifically jointed around columns and walls to permit soil-supported slabs and shallow foundations to move differentially. Where the potential exists for localized heavy floor loads, it is advisable that anticipated loading conditions be addressed with the use of additional steel reinforcement within the slab; the use of haunched slab areas below zones of anticipated concentrated floor loads to distribute the weight; the addition of fibers into the concrete mix; and/or slab subgrade strengthening, such as the use of geosynthetics.

5.3 SEISMIC DESIGN CRITERIA AND LIQUEFACTION SUSCEPTIBILITY

The subsurface conditions at the Site were reviewed in accordance with the 2003 International Building Code. For calculation of the lateral seismic forces on the structure, the Site Soil Classification is "D". The maximum considered earthquake spectral response accelerations for short periods and 1-second periods are S_{MS} = 0.53 and S_{M1} = 0.22, respectively. The calculated design spectral response acceleration parameters for short periods and 1-second periods are S_{DS} = 0.36 and S_{D1} = 0.14, respectively. Based upon the subsurface explorations, the Site is not considered susceptible to liquefaction in the event of an earthquake.

5.4 LATERAL EARTH PRESSURES

The lateral earth pressure recommendations given in the following paragraphs are applicable to the design of rigid retaining walls fixed against rotation or subject to slight rotation, such as cantilever or gravity type concrete walls. The recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls.

In general, foundation walls, loading docks, and earth-retaining structures should be designed to resist lateral pressures generated by soil backfill materials and any temporary or permanent surcharge loads. At-rest conditions should be used for the design of loading dock walls, basement walls, and other walls that are not free to deflect or rotate. Walls that are free to deflect or rotate may be designed using active conditions. We assume that adequate drainage systems will be installed adjacent to below-grade structures (if planned), and thus hydrostatic forces have not been accounted for in the values provided herein. If

drainage systems are not included in the design, the lateral pressures provided herein should be modified accordingly.

The following parameters are based upon Rankine's Lateral Earth Pressure Theory and should be used to compute the lateral earth pressures for flexible and rigid walls constructed with level backfill, whichever apply:

	Active	At-Rest
Coefficient of Lateral Earth Pressure	0.33	0.50
Equivalent Fluid Unit Weight (pcf)	45	68

For sliding and overturning stability, the following design parameters are recommended for wall footings bearing directly on the native glacial till deposit, or on compacted structural fill or crushed stone placed above the native glacial till deposit or bedrock:

Unit weight of granular backfill:	135 pcf
Coefficient of sliding friction (μ)	0.55
Maximum foundation edge pressure	5,000 psf

The recommended minimum factors of safety against sliding and overturning are 1.5 and 2.0, respectively. Lateral pressures are cumulative for computing overall safety factors. In no case should the lateral pressure be less than 200 psf (as a surcharge) to account for compaction equipment during construction. Wall backfill should be adequately drained to minimize hydrostatic forces behind walls. Structural fill meeting quality control testing criteria is recommended for backfill. For active pressure conditions to be developed, the wall must rotate about its base with lateral top movements of approximately 0.002H to 0.004H.

Diagram 1 depicts the active and at-rest wall loading conditions described herein.

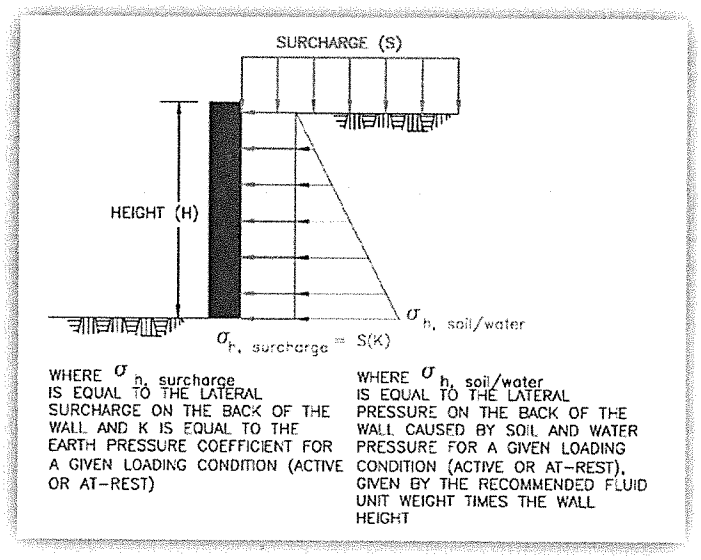


Diagram 1 – Lateral Earth Pressures for Earth Retaining Structures

5.5 FINISHED BUILDING ENVELOPE

The proposed buildings are not expected to include space below the exterior grade. If below-grade space is planned, the exterior face of those walls set below grade should be thoroughly waterproofed with a bituminous membrane applied to the prepared surface to minimize moisture from infiltrating the exterior concrete.

Based upon the proposed slab elevations for Building 1 and Building 2 and groundwater depth observations in subsurface explorations within or near those building footprints, foundation perimeter drains and floor slab underdrains are not expected to be necessary for Building 1 and Building 2.

Based upon the proposed slab elevation for Building 3, groundwater depth observations in subsurface explorations within or near Building 3, and the need for relatively significant cuts to achieve the foundation and slab elevations, we recommend foundation perimeter drains be installed along at least portions of the western and southern sides of the building where cutting will occur, to manage potential groundwater and infiltrating surface water. We also recommend observing subsurface conditions at Building 3 during construction for presence of seasonal high water indicators in order to determine whether floor slab underdrains are necessary. The need for floor slab underdrains should be based upon the elevation of the floor slab with respect to the seasonal high water level. In general, where seasonal high water elevation is within 2 feet of the underside of the lowest floor slab, floor slab underdrains should be installed to maintain groundwater levels at least 2 feet below the elevation of the underside of the slab. If slab underdrains are required at all, they would be limited to the approximately southwest quadrant of the building.

Perimeter drains at Building 3 should be installed adjacent to and along the outside perimeter of exterior footings. The perimeter drain system should be constructed using perforated pipe surrounded by clean stone and enveloped in filter fabric. The highest invert elevations of the perimeter drains should start at least 6 inches below the bottom of foundations, and should be sloped such that they collect water, then drain by gravity to approved receptors or discharge locations. If gravity discharge of the drain system is not possible, a sump and pump system will be required to facilitate water removal, and the sump should be connected to an auto-start generator system to continue water removal even during power outages.

Additionally, for all three of the new buildings, we recommend that an impervious or low permeability cover be placed at the exterior ground surface adjacent to each of the proposed buildings and that perimeter grades are designed to slope away from the buildings to reduce infiltration of surface runoff directly adjacent to the foundations.

5.6 DRIVEWAY AND PARKING LOT PAVEMENT DESIGN

Pavement design parameters (i.e., traffic loading, serviceability factors, etc.) were not provided for design of new pavement systems. Therefore, the pavement design recommendations provided herein are based upon assumptions made using our engineering judgment and experience with similar developments. It should be noted that these recommendations do not apply to the extension of Trowbridge Drive, which should meet all applicable local and state requirements.

Upon completion of proper subgrade preparation, the following minimum pavement sections are recommended for parking and driveway areas. Reference is made to materials described in the *State of Connecticut Department of Transportation (CT DOT) Standard Specifications for Roads, Bridges and Incidental Construction*.

Recommended Minimum Pavement Sections

Truck Entrance/Delivery Pathways	
Layer Description	Thickness
Bituminous Finish Course (CT DOT Section 4.06 & M.04, Class 2 or 3)	1½ inches
Bituminous Binder Course (CT DOT Section 4.06 & M.04, Class 1 or 2)	2½ inches
Crushed or Processed Gravel Base Course (CT DOT Section 3.02 & M.02.03/06, Grading C or Section 3.04 & M.05.01)	8 inches
Dense Graded Sand and Gravel Subbase (CT DOT Section 2.12 & M.02.02/06 Grading B)	6 inches

Standard Car Traffic Pathways	
Layer Description	Thickness
Bituminous Finish Course (CT DOT Section 4.06 & M.04, Class 2 or 3)	1½ inches
Bituminous Binder Course (CT DOT Section 4.06 & M.04, Class 1 or 2)	2 inches
Crushed or Processed Gravel Base Course (CT DOT Section 3.02 & M.02.03/06, Grading C or Section 3.04 & M.05.01)	8 inches
Dense Graded Sand and Gravel Subbase (CT DOT Section 2.12 & M.02.02/06 Grading B)	8 inches

The recommended pavement sections included herein are designed to support post-construction traffic only, and are not intended to support construction traffic conditions. It is our experience (and expectation) that if the binder course is installed over our recommended section and then the area is used as a haul road during construction (for example), the binder may require repair, shimming, or replacement prior to installation of the wearing course. Soil subgrade conditions are presumed to remain as encountered in the test pits, without deleterious effects (increased silt, mud, or moisture content), due to equipment traffic during construction. It will be important to evaluate subgrade conditions in the field during construction and re-compact, undercut, or stabilize if necessary to achieve suitable and stable subgrade conditions.

We recommend the pavement grading design consider provisions for preventing water (surface or irrigation) from entering the pavement section from landscaped areas in order to reduce the likelihood of accelerated pavement deterioration. This can be accomplished by creating positive grades that route runoff away from pavement and by sealing the interface between the asphalt edge and adjacent curbing.

In order to minimize the downward seepage of surface water into the base course, we recommend requiring the filling/sealing of all joints, as well as all pavement cracks that

might form in the early life of the pavement. This should be done as an on-going maintenance activity using a hot-applied, "rubberized" asphaltic sealant, or equivalent material. In particular, the need to apply a sealant should be assessed as part of normal on-going maintenance following normal shrinkage of the asphaltic concrete away from the curbs and other features.

5.7 PERMANENT SOIL SLOPES

Cut and fill slopes are planned as part of the proposed Site development. Soil cut slopes should be inclined no steeper than 2H:1V. Based on the estimated strength of on-site materials, new slopes may be constructed to a steepness of 2H:1V, provided that materials are compacted to at least 92 percent of their maximum dry density as determined by ASTM D-1557. Fill slopes designed at inclinations steeper than 2H:1V will require soil reinforcing (surficial or internal) and should be designed by a licensed geotechnical engineer.

Permanent slope surfaces should be stabilized and vegetated to protect against erosion. Permanent soil slopes with a steepness ranging between 3H:1V and 2H:1V should be protected with three-dimensional, non-degradable erosion control fabric, at a minimum.

5.8 EROSION AND SEDIMENT CONTROL

The nature and extent of the expected sitework necessary to construct the new development will require careful adherence to erosion and sediment control standards. Therefore, we recommend that an Erosion and Sedimentation Control Plan be prepared for the work, which GeoInsight can provide to the project team, if needed. Site soils will be moderately erodible if exposed to precipitation or if dried out and exposed to wind. As the extent of site disturbance planned is greater than one acre, a Connecticut Department of Energy & Environmental Protection Construction General Permit will be required for the construction (GeoInsight can prepare the permit if required).

6.0 CONSTRUCTION CONSIDERATIONS

6.1 GENERAL SITE PREPARATION

Initial Site preparation should commence with stripping of vegetation, topsoil, and subsoil with roots from proposed building and pavement areas. Stripping depths will likely vary across the Site and should be adjusted to remove vegetation and root systems (primarily within the subsoil layer based upon visual assessment). Inorganic soils removed during Site stripping operations should be stockpiled and evaluated for suitability for reuse as common fill or structural fill. Care should be exercised to separate organic materials from non-organic material to avoid mixing with fill planned for reuse.

Tree removal should be completed during initial Site preparation. Care should be taken to thoroughly remove root systems from the proposed buildings and pavement areas. Materials disturbed during removal of stumps should be undercut.

To the extent large boulders are present at the surface and below grade, they will require special management during general site preparation and excavation. Boulders may be considered for reuse in the construction of retaining walls.

6.2 SUBGRADE PREPARATION FOR NEW STRUCTURES

GeoInsight should be retained to provide construction oversight of foundation, floor slab, pavement and retaining wall subgrade preparation. Subgrades should be prepared and reviewed as follows.

Footing Subgrades:

Building 1 and Building 2: Footing subgrades will generally consist of undisturbed native terrace deposit or glacial till soils (i.e., native brown gravelly sand), or compacted structural fill placed above these materials. Inorganic subsoil, if present at or below foundation bearing elevations, may be suitable to remain in place below foundations provided the layer contains less than 5 percent organic material and is thoroughly proof-rolled and confirmed to be stable, as discussed below.

Following excavation to achieve design footing subgrades, the native gravelly sand subgrades should be proof-rolled with at least six passes (three each way in perpendicular directions) of a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor in trenches. During the proof-rolling process, the subgrade should be reviewed to identify soft or unstable areas. Unsuitable areas should be over-excavated to more competent material and be replaced with compacted structural fill, as needed. Following proof-rolling, compacted structural fill may be placed in the footing bearing zones to achieve design footing subgrade, if needed. Care must be taken to avoid disturbing the prepared subgrades by keeping construction traffic off the subgrade to the extent practical. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

Where structural fill is placed below foundations (either as fill or backfill), the lateral extent of the structural fill should be the footing bearing zone. The footing bearing zone is defined as the 1H:1V lines extending downward and outward from the bottom outside edge of foundations (refer to Diagram 2).

Building 3: Footing subgrades will generally consist of undisturbed native terrace deposit or glacial till soils (i.e., native brown gravelly sand), or a minimum 12-inch thick layer of compacted structural fill or crushed stone place over the prepared bedrock surface. Inorganic subsoil, if present at or below foundation bearing elevations, may be suitable to remain in place below foundations provided the layer contains less than 5 percent organic material and is thoroughly proof-rolled and confirmed to be stable, as discussed below.

Following excavation to achieve design footing subgrades, the native gravelly sand subgrades should be proof-rolled with at least six passes (three each way in perpendicular directions) of a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor in trenches. During the proof-rolling process, the subgrade should be reviewed to identify soft or unstable areas. Unsuitable areas should be over-excavated to more competent material and be replaced with compacted structural fill, as needed. Following proof-rolling, compacted structural fill may be placed in the footing bearing zones to achieve design footing subgrade, if needed. Care must be taken to avoid disturbing the prepared subgrades by keeping construction traffic off the subgrade to the extent practical. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

Bedrock is expected to be encountered within foundation bearing elevation in the southwest portion of the proposed Building 3 footprint. Where bedrock is encountered at or above footing bearing elevation, the bedrock should be over-excavated to at least 12 inches below footing bearing elevation for construction of a soil bearing cushion. The lateral extent of the bedrock excavation from the outside edge of the footing should be equal to the depth of the over-excavation below the bottom of the footing. Upon completion of bedrock over-excavation, a minimum 12-inch thick layer of compacted structural fill or crushed stone should be placed below foundations to achieve foundation bearing elevation.

Where structural fill is placed below foundations (either as fill or backfill), the lateral extent of the structural fill should be the footing bearing zone. The footing bearing zone is defined as the 1H:1V lines extending downward and outward from the bottom outside edge of foundations (refer to Diagram 2).

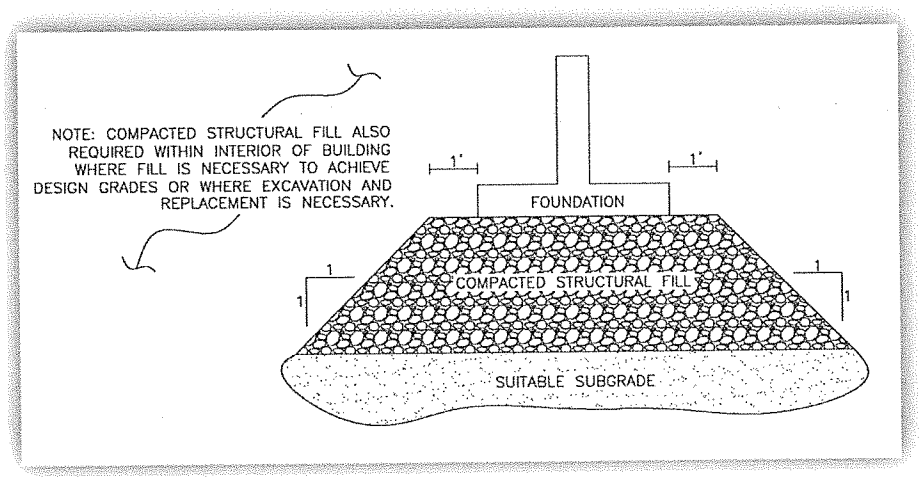


Diagram 2 – Minimum Foundation Bearing Zone

Pavement Areas: Pavement subgrades, generally expected to consist of undisturbed native terrace deposit or glacial till soils (i.e., native brown gravelly sand) or existing granular fill (in a localized area in the northern portion of the Site – refer to TP-22), should be proof-rolled with a minimum 10-ton vibratory roller, providing at least six passes (three each way in perpendicular directions). Unstable areas should be over-excavated to more competent material and replaced with compacted common fill or structural fill, as needed. Subsequent compacted common fill or structural fill may be placed, as necessary, to achieve design pavement subgrade.

Retaining Walls: Subsurface conditions at retaining wall bearing elevations are expected to generally consist of undisturbed native glacial till soils (i.e., native brown gravelly sand) or bedrock. Where bedrock is present within the planned retaining wall foundation elevation, the bedrock should be over-excavated a minimum 12 inches below the foundation bearing elevation and be replaced with compacted structural fill or crushed stone, as discussed under the Building 3 subgrade preparation section of this report.

Following excavation to achieve design retaining wall foundation subgrades, the native gravelly sand subgrades should be proof-rolled with at least six passes (three each way in perpendicular directions) of a minimum 10-ton vibratory roller in open areas, or a 1-ton vibratory roller or large plate compactor in trenches. During the proof-rolling process, the subgrade should be reviewed to identify soft or unstable areas. Unsuitable areas should be over-excavated to more competent material and be replaced with compacted structural fill, as needed. Following proof-rolling, compacted structural fill may be placed in the footing bearing zones to achieve design footing subgrade, if needed. Care must be taken to avoid disturbing the prepared subgrades by keeping construction traffic off the subgrade to the extent practical. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

6.3 DEWATERING

Based upon the groundwater levels observed in the test borings, significant construction dewatering is not anticipated for construction of the proposed foundations or relatively shallow subsurface utilities at the Site. Where significant cuts are planned in the southern portion of the Site, management of groundwater may be necessary until groundwater elevations equilibrate to the new grades.

In general, it should be practicable to accomplish construction dewatering, where required, through sumps and open pumping methods. The native overburden soils are anticipated to have relatively high to moderate permeability. The contractor should be required to maintain groundwater at least 2 feet below excavation subgrades in order to minimize bearing surface disturbance.

Surface water runoff should be directed away from excavations to reduce potential dewatering efforts and protect subgrades from becoming soft and unstable.

Temporary detention ponds, trenches, ditches, and other groundwater or stormwater control systems should be carefully planned and designed so as not to conflict with new areas to be excavated and/or backfilled.

6.4 FILL AND BACKFILL

Soil Reuse: Soil encountered in the test pits and test borings are generally suitable for reuse as common fill in its current condition. Based upon visual classification, the majority of the native terrace deposit and ablation till soils may be suitable for reuse a structural fill; however, the depositional variability in the materials may require stockpiling and blending materials intended for reuse as structural fill in order to create an overall well-blended material that meets structural fill specifications. Cobbles larger than 6 to 8 inches in diameter and boulders within the native soils may require crushing in order to be suitable for reuse as common fill or structural fill. Otherwise, cobbles and boulders that cannot be reused could require disposal at a suitable location on-site or transportation off-site.

In general, reuse of on-site excavate soils will be contingent on proper management of the soils, including the materials being properly stockpiled, dried, moisture conditioned, etc., in order to achieve adequate compaction during placement.

General: Soils approved for reuse should be segregated and stockpiled. Prior to reuse, grain-size distribution testing will be required for proposed fill soils in order to evaluate their suitability for reuse. The moisture-density relationship (Proctor Test) of soil confirmed for reuse as fill will be required to provide compaction criteria for use during fill placement. Working moisture content for moisture-sensitive soils typically ranges from about minus two to plus one percent (-2% to +1%) of the optimum moisture content as determined from a Proctor Test.

Only compacted structural fill or crushed stone should be used as fill below proposed building and retaining wall foundations, below floor slabs, and as backfill against foundations. Compacted structural fill and crushed stone below proposed foundations, floor slabs and retaining wall foundations should extend to the lateral limits defined by a 1H:1V line sloped down and away from the bottom outside edge of foundations or floor slabs to the top of suitable soil, as described in Section 6.2 (see Diagram 2). Crushed stone may be used in lieu of structural fill at the direction of the project geotechnical engineer or his/her representative where subgrades become saturated and over-excavation of saturated soils is not feasible. Crushed stone, if used, should be wrapped in a geotextile filter fabric, such as Mirafi 140N or equivalent, to reduce the potential for migration of fine-grained particles into the voids present within the stone. Walls should be backfilled evenly on both sides to the extent practical. Temporary bracing should be specified if unrestrained walls are permitted to be backfilled.

Bedding placed below utilities should be in accordance with the local utility or manufacturer requirements. In general, utilities may be supported by compacted structural fill, or other suitable pipe bedding materials. Fill placed as backfill for utilities below building floor slabs should consist of compacted structural fill or other suitable free-draining material approved by the project geotechnical engineer. Elsewhere, fill placed as backfill for utilities may consist of compacted common fill after the pipe is surrounded by proper bedding soil.

Common Fill: Excavated inorganic soil from the Site may be selectively reused as common fill provided it is free of deleterious materials and can be adequately compacted. Common fill should consist of soil free from frozen soil, debris, or other deleterious material. The maximum particle size is recommended to be 8 inches, and no more than 30 percent by weight should pass the No. 200 sieve. Common fill may be used to achieve finished grades outside building, bridge crossing and retaining wall foundation bearing zones. Common fill

may be placed below pavements to achieve the design pavement section subgrades, provided the common fill used for this purpose is consistent with the on-site granular subgrades, particularly with regard to the percentage of fine-grained particles. Common fill should be placed in loose lifts not exceeding 12 inches in thickness for self-propelled vibratory rollers and 8 inches for vibratory plate compactors, and compacted to at least 92 percent of the maximum dry density determined by ASTM D 1557, Method C.

Structural Fill: Structural fill should be free of organic, frozen, or other deleterious material and conform to the gradation requirements outlined below. Structural fill should be placed in loose lifts not exceeding 12 inches in thickness for self-propelled vibratory rollers and 8 inches for vibratory plate compactors. Structural fill placed within footing bearing zones and below floor slabs should be compacted to at least 95 percent of the maximum dry density determined by ASTM D 1557, Method C.

Structural fill should conform to the following gradation; upper and lower limit boundaries are shown on Diagram 3.

Structural Fill		
Sieve Size	**Percent Passing**	
	Minimum	**Maximum**
6 inches	100	--
1 inch	60	100
No. 4	35	85
No. 10	25	75
No. 20	15	60
No. 40	10	45
No. 100	5	25
No. 200	3	10
Note: Maximum 3-inch particle size within 12 inches of foundation or slab subgrade elevation.		

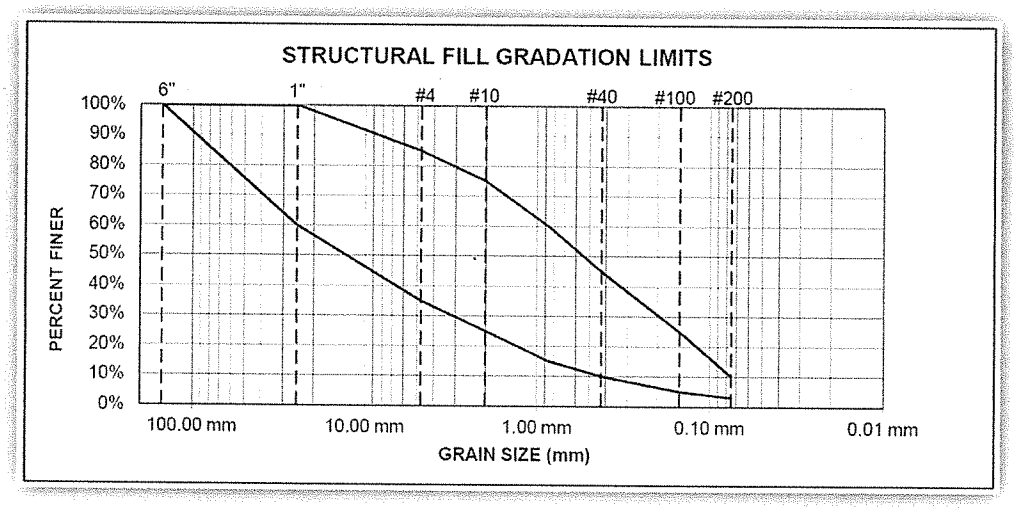


Diagram 3 – Structural Fill Gradation Upper and Lower Boundaries

6.5 EARTHWORK IN WET ENVIRONMENTS

Relatively isolated areas of the near-surface soils may contain a relatively high percentage of fine-grained particles (i.e., material passing the No. 200 sieve), based upon visual observations. In general, soil containing more than 10 percent fines will be sensitive to moisture, and compaction requirements will be difficult to achieve when the material is wet. The on-site soils may be selectively reused as common fill or structural fill, provided they meet the recommended gradation criteria, are relatively dry, and can be adequately compacted. The use of silty soil as fill is applicable during periods of construction when the climate and moisture are favorable for reusing silty soils. During wet environments, silty soils may be unsuitable for reuse. In addition, exposure of silty soil subgrades may require protection during rain events to avoid the need to over-excavate and remove saturated materials (which will likely require significant time to dry). Protection may be achieved by covering areas with waterproof tarps to shed and re-direct water, or by limiting final subgrade excavation until there is no threat of precipitation.

6.6 TEMPORARY EXCAVATIONS

Excavations should be cut to a stable slope or be temporarily braced, depending upon the excavation depths and the subsurface conditions encountered. Temporary construction slopes should be designed in compliance with applicable governing regulations including the Occupational Safety and Health Administration (OSHA). Based upon the soil samples recovered from the test borings, the near-surface soils should be considered OSHA Type C soils. Temporary excavations should be sloped at not steeper than 1.5H:1V for excavations to a maximum depth of 12 feet bgs.

Stockpiles should be placed at a distance away from the top of the excavation that is equal to at least the depth of the excavation. Surface drainage should be controlled to avoid flow of surface water into the excavations. Construction slopes should be reviewed for signs of mass movement, such as tension cracks near the crest or bulging at the toe. If potential stability problems are observed, work should cease, and the project geotechnical engineer should be contacted immediately. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the contractor.

6.7 BEDROCK EXCAVATION

Based upon the depths to bedrock observed during the subsurface exploration program and the expected cut depths required to achieve Site and building foundation grades, bedrock is expected to be encountered in the southwestern portion of the Site (Building 3 and the propose retaining wall). Due to the expected presence of rock in a relatively localized area of the Site and relatively limited total quantity of rock that will require removal, we anticipate that bedrock removal can be performed using mechanical methods (i.e., a hydraulic hoe-ram). The need for systematic drilling and blasting is not anticipated for the project; however, the selected earthwork contractor may determine that the quantity of rock removal warrants blasting in the southwest portion of the Site in order to most efficiently prepare the Site.

7.0 ADDITIONAL ENGINEERING SUPPORT

7.1 DESIGN REVIEW

We recommend that GeoInsight be retained to perform a general review of the foundation and earthwork plans and specifications prepared from the recommendations presented in this report in order to verify that our recommendations are properly interpreted and implemented. Our report has been written in a guideline recommendation format and is not necessarily appropriate for direct use as a specification without being reworded consistent with a specification-type format. This report should, however, be made a part of the project documents and available to prospective contractors for informational purposes.

7.2 CONSTRUCTION SERVICES

We recommend GeoInsight be retained to provide construction observation and soil testing services during the earthwork phases of construction. The purpose of our participation will be to verify our design assumptions in the field, particularly those regarding bearing surface identification, confirmation of proper subgrade preparation, removal and replacement of existing unsuitable materials, and potential reuse of on-site materials. Our understanding of Site subsurface conditions and construction objectives will allow engineering input in a timely manner if subsurface conditions are found to vary from those anticipated and a design change or a change in earthwork procedures is required. When construction oversight is provided by the geotechnical engineering firm that conducted the investigation, the resulting continuity of knowledge significantly benefits the efficiency of construction, promotes a higher quality of work, and best preserves investment in the project.

The evaluation of Site conditions that may be encountered during construction requires engineering judgment and interpretation. For this reason, if we are not retained during construction, we cannot assume responsibility for misinterpretation of our recommendations, or for unfavorable performance of structures such as foundations, floor slabs, pavements, or retaining walls as a result of work performed or judgments rendered by others without our express approval.

7.3 GENERAL CONSTRUCTION MONITORING AND TESTING GUIDELINES

Prior to initiating compaction operations, we recommend representative samples of the structural fill/backfill material to be used and acceptable exposed in-place soils be collected and tested to determine their compaction and classification characteristics. The maximum dry density, optimum moisture content, and gradation characteristics should be determined. These tests are needed for compaction quality control of the structural fill/backfill and existing soils, and to determine if the fill/backfill material is acceptable.

A representative number of in-place field density tests should then be performed in the compacted existing soils (to confirm proof-rolling efforts for foundation, slab, retaining wall and pavement subgrades) and then also in each lift of structural fill or backfill to confirm the required degree of compaction has been obtained. We recommend the following minimum density testing frequencies.

Recommended Field Density Test Frequencies	
Area	**Recommended Minimum Density Test Frequency**
Floor Slab Subgrade Soils	One test per 10,000 square feet (sf; minimum of two tests) in compacted existing soils to confirm successful proof-rolling efforts
Floor Slab Subgrade Soils	One test per 3,000 sf (minimum of two tests) in each lift of structural fill within the area of the planned buildings
Individual Column Footings	One test per 50 sf of bearing surface
Continuous (Strip) Footings	One test per 50 lineal feet of bearing surface
Pavement Subgrade Soils	One test per 10,000 sf of compacted existing soils and in each lift of structural fill
Retaining Wall Subgrade Soils	One test per 100 linear feet of wall of compacted existing soils and in each lift of structural fill

8.0 LIMITATIONS

GeoInsight provided the recommendations contained within this report based upon an evaluation of subsurface conditions observed and/or reported and their relation to proposed construction, as documented in the report text and attached materials. The evaluations described and recommendations made in this report pertain to the specific areas explored. GeoInsight believes the subsurface explorations and evaluations described herein were performed in a manner consistent with the services that would have been provided by other geotechnical professionals under similar circumstances. However, given the variable nature of native soil deposits and rock formations, we cannot represent that the subsurface conditions identified in the soil boring logs and described in this report are exact, nor can we guarantee that our interpolation between or extrapolation from subsurface exploration locations is completely representative of actual conditions.

Should additional information become available regarding the proposed Site development that is significantly different from that described in this report, or should subsurface conditions be found during construction that vary significantly from those observed during the subsurface exploration program and summarized in this report, GeoInsight should be given the opportunity to evaluate the data and modify its recommendations, if warranted.

This report has been prepared for specific application to the Site located south of Trowbridge Drive in Bethel, Connecticut. No other warranty, expressed, or implied, is made. In addition, this report was prepared exclusively for the Town of Bethel and the associated design team. The use of this report by other parties without written consent from GeoInsight is hereby prohibited.

TABLE

CLARKE BUSINESS PARK EXPANSION
TROWBRIDGE DRIVE
BETHEL, CONNECTICUT

TABLE 1 – SUMMARY OF SUBSURFACE CONDITIONS

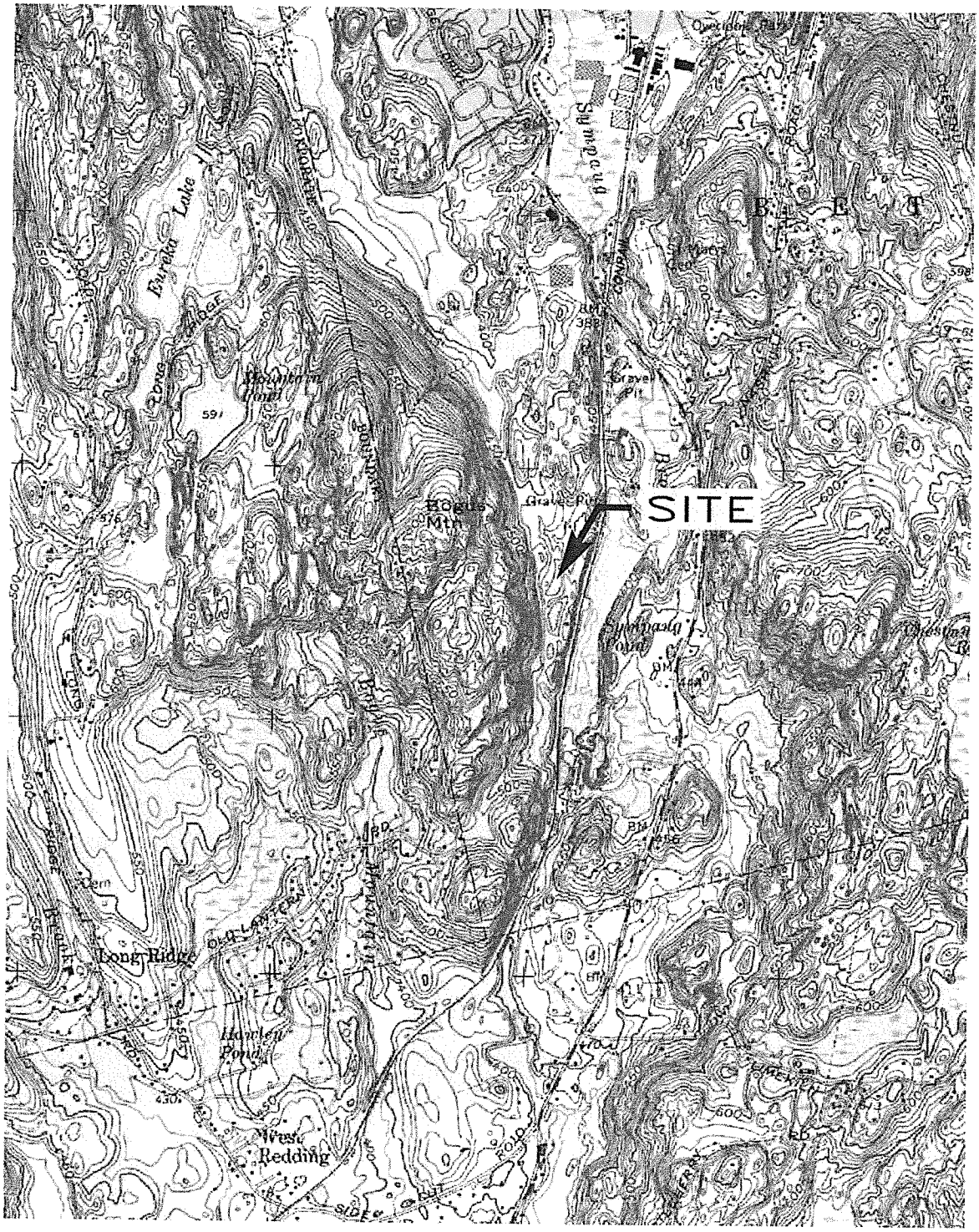
Subsurface Exploration Identification	Approximate Ground Surface Elevation (feet)	Approximate Depth to Refusal Surface (feet bgs)	Approximate Elevation of Refusal Surface (feet)	Approximate Soil Layer Thickness (feet)		
				Forest Mat/Subsoil	Native Terrace Deposit	Glacial Till
B-1	447	18.5	428.5	1	--	17.5[1]
B-2	430	NE	NE	1	6	13.2+
B-3	415	NE	NE	1.5[2]	--	13.7+
TP-1	445	NE	NE	2	--	15+
TP-2	435	NE	NE	2	5	5+
TP-3	438	NE	NE	2	4	8+
TP-4	440	11.5	428.5	2	--	8[3]
TP-5	439	NE	NE	2	10+	--
TP-6	429	NE	NE	2	8+	--
TP-7	435	NE	NE	2	10+	--
TP-8	437	NE	NE	2	8+	--
TP-9	435	NE	NE	2.5	--	10.5+
TP-10	427	NE	NE	2.5	--	7.5+
TP-11	439	NE	NE	2.5	8.5+	--
TP-12	428	NE	NE	2	--	8+
TP-13	441	NE	NE	2	6+	--
TP-14	444	NE	NE	3	7+	--
TP-15	431	NE	NE	2.5	--	7.5+
TP-16	417	NE	NE	2	--	8+
TP-17	441	NE	NE	3	6+	--
TP-18	423	NE	NE	2	--	7+
TP-19	417	NE	NE	1.5	--	8.5+
TP-20	438	NE	NE	2	--	8+
TP-21	427	NE	NE	3	--	7.5+
TP-22	420	NE	NE	2[4]	--	5+
TP-23	421	NE	NE	2.5	--	8.5+
TP-24	428	NE	NE	3	--	13+

Notes:

bgs = below ground surface; NE = not encountered.
+ indicates the test boring/test pit terminated within the notated soil layer; therefore, the total depth of the layer is not known.

1. A rock core was recovered from below the layer.
2. Layer consisted of road-base fill.
3. A 1.5-feet thick layer of weathered bedrock was present below the layer.
4. Layer was present below approximately 4 feet of fill.

FIGURES



SOURCE:

USGS BETHEL, CONNECTICUT
TOPOGRAPHIC QUADRANGLE DATED 1985.

CONTOUR INTERVAL: 10 FEET

0 2000 4000

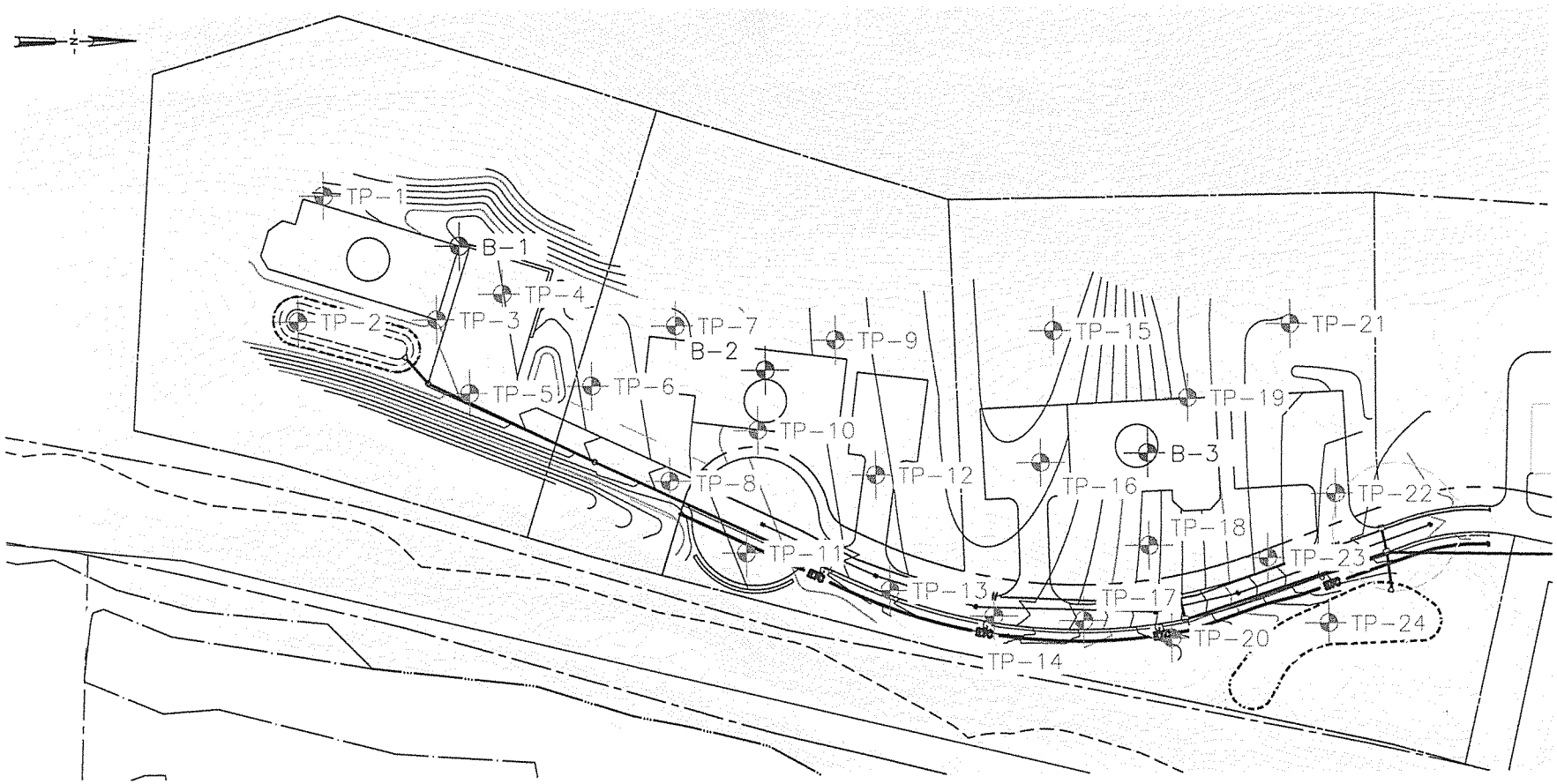
APPROX. SCALE IN FEET

CLIENT: TOWN OF BETHEL			
PROJECT: CLARKE BUSINESS PARK EXPANSION			
TITLE: SITE LOCUS			
DESIGNED: BTN	DRAWN: BTN	CHECKED: MCP	APPROVED: MCP
SCALE: 1" = 2000'	DATE: 2/12/16	FILE NO.: 7880LOCUS	PROJECT NO.: 7880

GeoInsight
Practical in Nature

FIGURE NO.: 1

PLOT DATE: 2-12-16
FILE: I:\7880\7880LOCUS.dwg



LEGEND

- B-1 — APPROXIMATE SOIL BORING LOCATION AND DESIGNATION
- TP-4 — APPROXIMATE TEST PIT LOCATION AND DESIGNATION

NOTES:

1. THIS FIGURE IS BASED UPON A PLAN TITLED "CONCEPTUAL SUBDIVISION PLAN – ALTERNATE, SHEET CS-2," DATED FEBRUARY 13, 2015 AND PREPARED BY MILONE & MACBROOM.

2. THIS FIGURE IS INTENDED TO DEPICT APPROXIMATE SUBSURFACE EXPLORATION LOCATIONS. OTHER USE OF THIS PLAN IS NOT INTENDED.

0 100 200
APPROX. SCALE IN FEET

CLIENT: TOWN OF BETHEL, CONNECTICUT				GeoInsight *Practical in Nature*
PROJECT: CLARKE BUSINESS PARK EXPANSION				
TITLE: SUBSURFACE EXPLORATION LOCATION PLAN				
DESIGNED: BTN	DRAWN: BTN	CHECKED: MCP	APPROVED: MCP	
SCALE: 1" = 100'	DATE: 2/12/16	FILE NO.: 7880D001	PROJECT NO.: 7880	FIGURE NO.: 2

PLOT DATE: 2-12-16
FILE: L:\7880\7880D001.dwg

APPENDIX A

TEST BORING AND TEST PIT LOGS

SOIL BORING LOG

GeoInsight
Environmental Strategy & Engineering

Client: Town of Bethel, CT	**Boring Identification:** B-1	
Project: Clarke Business Park Expansion		**Sheet:** 1 of 1
Location: Trowbridge Drive, Bethel, CT	**Checked By:** BTN	**Project Number:** 7880
Drilling Company: New England Boring Contractors, Inc.	**Boring Location:** See Plan	
Foreman: Orin	**Ground Surface Elevation:** 447 ft	**Datum:**
GeoInsight Engineer/Geologist: L. Jones	**Date Started:** 1/25/16	**Date Completed:** 1/25/16

DRILLING METHOD	SAMPLER	GROUNDWATER MEASUREMENTS			
		Date	Depth (ft)	Reference	Stabilization
Vehicle: ATV	**Type:** Split Spoon		See Note 1		
Model: Diedrich D-50	**Hammer (lb):** 140				
Method: 4" Flush Joint Casing	**Fall (in):** 30				

DEPTH (ft)	SAMPLE INFORMATION #	Pen/Rec (in)	Depth (ft)	Blows/6"	SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
0	S1	24/12	0-2	6	4" Forest mat	FOREST MAT		
1				5	S1: Loose, brown, fine to medium SAND, some Gravel and Silt, trace fine Roots.	SUBSOIL		
				5				
2				5		GLACIAL TILL		
3								
4								
5	S2	24/6	5-7	66	S2: Dense, brown, fine SAND, some Silt and Gravel.	*Silty Sand with Gravel*		
6				25				
				12				
7				12				
8								
9								
				Core Rate (min/ft)				
10	C1	60/12	10-15	3:00	C1: Gray, fine-grained GRANITE (likely cobbles and boulders in soil matrix).	POSSIBLE COBBLY GLACIAL TILL		
11				3:00	Note: Coring from approximately 10 to 15 feet returned relatively low recovery. Recovered rock was not consistent with the anticipated bedrock type based upon available geologic maps. Based upon recovery and core rates, it was assumed that recovery from 10 to 15 feet was likely cobbles/boulders within the Glacial Till deposit.			
12								
13				3:00				
14				2:00				
15				2:00				
	C2	60/27	15-20	3:00	C2: Likely cobbles and boulders in soil matrix in upper 3.5 feet.			
16								
17				3:00	Note: Coring from approximately 15 to 20 feet returned relatively low recovery. Based upon recovery and core rates, it was assumed that recovery from 15 to 18.5 feet was likely cobbles/boulders within the Glacial Till deposit.			
18				4:00				
				4:00	18.5 to 20 feet: Very hard, fresh, white, aphanitic MARBLE. Joints are horizontal to low-angle, very close to close, rough, stepped, and moderately open. Approximate RQD is 78% of recovered section.	BEDROCK		2
19				4:00				
20								
21								
22								
23								

GRANULAR SOILS		COHESIVE SOILS	
Blows/ft.	**Density**	**Blows/ft.**	**Consistency**
0-4	V. LOOSE	<2	V. SOFT
5-10	LOOSE	2-4	SOFT
11-30	M. DENSE	4-8	M. STIFF
31-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

NOTES

1. The drilling method introduces water into the borehole and therefore observation of the groundwater level immediately after drilling was not possible.

2. The RQD value indicated is not a truly representative value since the core recovery was not a full 60 inches.

SOIL BORING LOG

GeoInsight
Environmental Strategy & Engineering

Client: Town of Bethel, CT		**Boring Identification:** B-2	
Project: Clarke Business Park Expansion			**Sheet:** 1 of 1
Location: Trowbridge Drive, Bethel, CT		**Checked By:** BTN	**Project Number:** 7880
Drilling Company: New England Boring Contractors, Inc.	**Boring Location:** See Plan		
Foreman: Orin	**Ground Surface Elevation:** 430 ft		**Datum:**
GeoInsight Engineer/Geologist: L. Jones	**Date Started:** 1/25/16		**Date Completed:** 1/25/16

DRILLING METHOD	SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: ATV	**Type:** Split Spoon	**Date**	**Depth (ft)**	**Reference**	**Stabilization**
Model: Diedrich D-50	**Hammer (lb):** 140	01/25/2016	Not Encountered	Ground Surface	After Drilling
Method: 4 1/4" HSA	**Fall (in):** 30				

DEPTH (ft)	SAMPLE INFORMATION #	Pen/Rec (in)	Depth (ft)	Blows/6"	SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
0	S1	24/12	0-2	1	4" Forest mat	FOREST MAT		
1				2	S1: Loose, brown, fine to medium SAND, some Silt, trace fine Roots.	SUBSOIL		
				2				
2				4				
	S2	24/12	2-4	3	S2: Loose, light brown, fine SAND and SILT, some Gravel, moist.	*Silty Sand with Gravel* NATIVE TERRACE DEPOSIT		
3				3				
				6				
4				7				
5								
	S3	24/5	5-7	6	S3: Medium dense, light brown, fine SAND and SILT, some Gravel, moist.	*Silty Sand with Gravel*		
6				10				
				12				
7				11				
8						GLACIAL TILL		
9								
10								
	S4	24/2	10-12	35	S4: Dense, brown, medium SAND and GRAVEL, trace Silt.	*Gravelly Sand*		
11				34				
				12				
12				17				
13								
14								
15								
	S5	24/12	15-17	28	S5: Dense, medium to coarse SAND and GRAVEL, trace Silt.	*Gravelly Sand*		
16				26				
				20				
17				17				
18								
19								
20								
	S6	2/2	20-20.2	50/2"	S6: Similar to S5, except very dense.			
21					End of Boring - 20.2 feet. SPT refusal.			
22								
23								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	**Density**	**Blows/ft.**	**Consistency**	
0-4	V. LOOSE	<2	V. SOFT	
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG

GeoInsight
Environmental Strategy & Engineering

Client: Town of Bethel, CT	**Boring Identification:** B-3	
Project: Clarke Business Park Expansion		**Sheet:** 1 of 1
Location: Trowbridge Drive, Bethel, CT	**Checked By:** BTN	**Project Number:** 7880
Drilling Company: New England Boring Contractors, Inc.	**Boring Location:** See Plan	
Foreman: Orin	**Ground Surface Elevation:** 415 ft	**Datum:**
GeoInsight Engineer/Geologist: L. Jones	**Date Started:** 1/25/16	**Date Completed:** 1/25/16

DRILLING METHOD	SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: ATV	**Type:** Split Spoon	**Date**	**Depth (ft)**	**Reference**	**Stabilization**
Model: Diedrich D-50	**Hammer (lb):** 140	01/25/2016	10	Ground Surface	After Drilling
Method: 4 1/4" HSA	**Fall (in):** 30				

DEPTH (ft)	SAMPLE INFORMATION #	Pen/Rec (in)	Depth (ft)	Blows/6"	SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
0	S1	24/14	0-2	77	S1: Medium dense, gray/brown, fine to medium SAND and GRAVEL, some Silt, trace Wood fragments.	*Gravelly Sand with Silt* FILL		
1				17				
				9				
2				4				
						GLACIAL TILL		
3								
4								
5	S2	2/18	5-7	8	S2: Dense, light brown, fine SAND and SILT, some Gravel, moist.	*Silty Sand with Gravel*		
6				16				
				20				
7				23				
8								
9								
10	S3	24/22	10-12	5	S3: Medium dense, light brown, fine SAND and SILT, trace Gravel, wet.	*Silty Sand*		
11				6				
				8				
12				7				
13								
14								
15	S4	2/2	15-15.2	100/2"	S4: Very dense, gray, medium to coarse SAND and GRAVEL, trace Silt, wet.	*Gravelly Sand*		
16					End of Boring - 15.2 feet. SPT refusal.			
17								
18								
19								
20								
21								
22								
23								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	**Density**	**Blows/ft.**	**Consistency**	
0-4	V. LOOSE	<2	V. SOFT	
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.: Samsung SE210 LC-2
Capacity: 1/2 CY
Reach: 18 ft

GeoInsight Rc: Lloyd Jones
Contractor: TD & Sons, Inc.
Operator:

Test Pit No: TP-1
Sheet: 1 Of: 1
Project Number: 7880

Date: 21-Jan-16
Chkd. By: BTN

Weather: Sunny, Mid 20s
Ground Surface Elev 445 ft
Datum:

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.5'): Forest Mat.				
1	SUBSOIL	(0.5-2'): Brown, fine SAND and SILT, trace fine roots.				
2						
	GLACIAL TILL	(2-7'): Brown, fine SAND and SILT, some Gravel, occasional Cobbles and Boulders.				
3						
4						
5						
6						
7						
8		(7-17'): Gray/tan, fine SAND and SILT, little angular Gravel, occasional Boulders.				
9						
10						
11						
12						
13						
14						
15						
16						
17						
18		End of Test Pit - 17 feet. Refusal not encountered.				

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	10	ft BGS
Stabilization:	After Excavation	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	17
Width:	10	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-2
Sheet:	1 Of: 1
Project Number:	7880
Date:	21-Jan-16
Chkd. By:	BTN
Weather:	Sunny, Mid 20s
Ground Surface Elev	435 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, fine SAND and GRAVEL, some Silt, trace fine Roots.				
2						
3		(2-3'): Brown, medium to coarse SAND and GRAVEL, little Silt, occasional Cobbles.				
4	NATIVE TERRACE DEPOSIT	(3-7'): Brown, coarse SAND and GRAVEL, trace Silt.				
5						
6						
7						
8	GLACIAL TILL	(7-12'): Light gray, fine to medium SAND, little Gravel and Silt.				
9						
10						
11						
12						
13		End of Test Pit - 12 feet. Refusal not encountered.				
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	12
Width:	8	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-3
Sheet:	1 Of: 1
Project Number:	7880
Date:	21-Jan-16
Chkd. By:	BTN
Weather:	Sunny, Mid 20s
Ground Surface Elev	438 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, fine SAND and GRAVEL, some Silt, trace fine Roots.				
2						
	NATIVE TERRACE DEPOSIT	(2-6'): Brown, medium SAND and GRAVEL, trace Silt.				
3						
4						
5						
6						
	GLACIAL TILL	(6-14'): Tan, fine to coarse SAND, little gravel, trace Silt.				
7						
8						
9						
10						
11						
12						
13						
14						
		End of Test Pit - 14 feet. Refusal not encountered.				
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	11	Depth:	14
Width:	7	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-4
Sheet:	1 Of: 1
Project Number:	7880
Date:	21-Jan-16
Chkd. By:	BTN
Weather:	Sunny, 30s
Ground Surface Elev	440 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2.5'): Brown, fine SAND and GRAVEL, some Silt, trace fine Roots.				
2						
3	GLACIAL TILL	(2.5-4'): Brown, fine to medium SAND and GRAVEL, some Silt.				
4						
5		(4-7'): Brown, coarse to medium SAND and GRAVEL, some Silt.				
6						
7						
8		(7-10'): Gray/brown, fine to medium SAND and GRAVEL, trace Silt, occasional Cobbles .				
9						
10						
11	WEATHERED BEDROCK	(10-11.5'): Weathered bedrock.				
12		End of Test Pit - 11.5 feet. Refusal on Bedrock.				
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	11.5
Width:	7	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-5
Sheet:	1 Of: 1
Project Number:	7880
Date:	21-Jan-16
Chkd. By:	BTN
Weather:	Sunny, 30s
Ground Surface Elev	439 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, fine SAND and SILT, some Gravel, trace fine Roots.				
2						
3	NATIVE TERRACE DEPOSIT	(2-5'): Brown, coarse SAND and GRAVEL, some Silt, occasional Cobbles.				
4						
5						
6		(5-6.5'): Light brown, fine SAND and SILT.				
7		(6.5-12'): Gray, fine to medium SAND, trace Silt, occasional Cobbles and Boulders.				
8						
9						
10						
11						
12						
13		End of Test Pit - 12 feet. Refusal not encountered.				
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	11	Depth:	12
Width:	7	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-6
Sheet:	1 Of: 1
Project Number:	7880
Date:	21-Jan-16
Chkd. By:	BTN
Weather:	Sunny, 30s
Ground Surface Elev	429 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, fine SAND and SILT, some Gravel, trace fine Roots.				
2						
	NATIVE TERRACE DEPOSIT	(2-6'): Brown, fine to coarse SAND and GRAVEL, some Silt, occasional Cobbles.				
3						
4						
5						
6						
7		(6-10'): Gray, fine SAND, trace Gravel and Silt.				
8						
9						
10						
11		End of Test Pit - 10 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	10
Width:	6	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-7
Sheet:	1 Of: 1
Project Number:	7880
Date:	21-Jan-16
Chkd. By:	BTN
Weather:	Sunny, 30s
Ground Surface Elev	435 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, fine SAND and SILT, trace fine Roots.				
2						
3	NATIVE TERRACE DEPOSIT	(2-6'): Brown, fine to medium SAND and GRAVEL, little Silt.				
4						
5						
6						
7		(6-7'): Light brown/tan, fine SAND, little Gravel, trace Silt.				
8		(7-10'): Light brown, medium to coarse SAND and GRAVEL, trace Silt.				
9						
10						
11		(10-12'): Light brown/gray, fine SAND, some Gravel, trace Silt.				
12						
13		End of Test Pit - 12 feet. Refusal not encountered.				
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	12
Width:	8	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-8
Sheet:	1 Of: 1
Project Number:	7880
Date:	21-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	437 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, fine SAND and fine GRAVEL, little Silt, trace fine Roots.				
2						
3		(2-3'): Light brown, fine to medium SAND and GRAVEL, some Silt.				
4	NATIVE TERRACE DEPOSIT	(3-5'): Gray, coarse SAND and GRAVEL, trace Silt.				
5						
6		(5-10'): Light brown/gray, medium to coarse SAND and GRAVEL, trace Silt, occasional Cobbles.				
7						
8						
9						
10						
11		End of Test Pit - 10 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	10	Depth:	10
Width:	7	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-9
Sheet:	1 Of: 1
Project Number:	7880
Date:	22-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 10s
Ground Surface Elev	435 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2.5'): Brown, SILT and fine to medium SAND, little GRAVEL,				
		trace fine Roots.				
2						
3	GLACIAL TILL	(2.5-5.5'): Brown, SILT and fine to medium SAND, some Gravel,				
		occasional Cobbles.				
4						
5						
6		(5.5-8'): Brown, medium to coarse SAND and GRAVEL, some Silt.				
7						
8						
		(8-12'): Gray, fine to medium SAND and GRAVEL, trace Silt,				
9		frequent Cobbles.				
10						
11						
12						
		(12-13'): Light gray, fine SAND and GRAVEL, some fractured				
13		Rock fragments.				
		End of Test Pit - 13 feet. Refusal not encountered.				
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	13
Width:	7	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Rc	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-10
Sheet:	1 Of: 1
Project Number:	7880
Date:	22-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 10s
Ground Surface Elev	427 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2.5'): Brown, fine to medium SAND and SILT, little GRAVEL, trace fine Roots.				
2						
3	GLACIAL TILL	(2.5-6'): Brown, fine to medium SAND and GRAVEL, trace Silt, occasional Cobbles.				
4						
5						
6						
7		(6-10'): Brown, medium to coarse SAND and GRAVEL, little Silt.				
8						
9						
10						
11		End of Test Pit - 10 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	10	Depth:	10
Width:	5	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No: TP-11
Sheet: 1 Of: 1
Project Number: 7880
Date: 21-Jan-16
Chkd. By: BTN
Weather: Sunny Mid 20s
Ground Surface Elev 439 ft
Datum:

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2.5'): Brown, fine to medium SAND and SILT, little GRAVEL, trace fine Roots.				
2						
3	NATIVE TERRACE DEPOSIT	(2.5-4'): Brown, fine to medium SAND and GRAVEL, little Silt, occasional Cobbles.				
4						
5		(4-5'): Brown, coarse SAND and GRAVEL, trace Silt.				
6		(5-11'): Tan, fine SAND and GRAVEL, trace Silt.				
7						
8						
9						
10						
11						
12		End of Test Pit - 11 feet. Refusal not encountered.				
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	10	Depth:	11
Width:	7	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-12
Sheet:	1 Of: 1
Project Number:	7880
Date:	22-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 10s
Ground Surface Elev	428 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, SILT and fine SAND, little Gravel, trace fine Roots.				
2						
	GLACIAL TILL	(2-5'): Brown, fine SAND and Silt, some Gravel.				
3						
4						
5						
		(5-8'): Brown, medium to coarse SAND and GRAVEL, some Silt.				
6						
7						
8						
		(8-10'): Light brown/gray, fine to medium SAND and GRAVEL, occasional Cobbles.				
9						
10						
		End of Test Pit - 10 feet. Refusal not encountered.				
11						
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	10	Depth:	10
Width:	6	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.: Samsung SE210 LC-2 | GeoInsight Re: Lloyd Jones
Capacity: 1/2 CY | Contractor: TD & Sons, Inc.
Reach: 18 ft | Operator:

Test Pit No: TP-13
Sheet: 1 Of: 1
Project Number: 7880
Date: 25-Jan-16
Chkd. By: BTN
Weather: Sunny Mid 20s
Ground Surface Elev: 441 ft
Datum:

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Light brown, SILT and fine SAND, little Gravel, trace fine Roots.				
2						
3	NATIVE TERRACE DEPOSIT	(2-4'): Brown, fine to medium SAND and GRAVEL, little Silt, occasional Cobbles.				
4						
5		(4-5'): Brown, fine to coarse SAND and GRAVEL, trace Silt.				
6		(5-8'): Light brown, medium SAND and GRAVEL, trace Silt, occasional Cobbles.				
7						
8						
9		End of Test Pit - 8 feet. Refusal not encountered.				
10						
11						
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	8
Width:	7	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-14
Sheet:	1 Of: 1
Project Number:	7880
Date:	25-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	444 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-3'): Light brown, fine SAND and GRAVEL, little Silt, trace fine Roots.				
2						
3						
	NATIVE TERRACE DEPOSIT	(3-10'): Brown, medium to coarse SAND and GRAVEL, little Silt, frequent Cobbles.				
4						
5						
6						
7						
8						
9						
10						
		End of Test Pit - 10 feet. Refusal not encountered.				
11						
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	10	Depth:	10
Width:	5	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-15
Sheet:	1 Of: 1
Project Number:	7880
Date:	22-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	431 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2.5'): Brown, SILT and fine SAND, little Gravel, trace fine roots.				
2						
3	GLACIAL TILL	(2.5-4'): Brown, fine to medium SAND and GRAVEL, little Silt.				
4						
5		(4-10'): Brown, medium SAND and GRAVEL, little Silt, frequent Cobbles.				
6						
7						
8						
9						
10						
11		End of Test Pit - 10 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	10	Depth:	10
Width:	7	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-16
Sheet:	1 Of: 1
Project Number:	7880
Date:	22-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	417 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Brown, fine SAND and SILT, little Gravel, trace fine roots.				
2						
	GLACIAL TILL	(2-5'): Brown, fine to medium SAND, little Silt, trace Gravel.				
3						
4						
5						
6		(5-10'): Brown, medium to coarse SAND, some Gravel, trace Silt, occasional Cobbles.				
7						
8						
9						
10						
11		End of Test Pit - 10 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	8	Depth:	10
Width:	6	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-17
Sheet:	1 Of: 1
Project Number:	7880
Date:	25-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	441 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-3'): Brown, fine SAND and SILT, little Gravel, trace fine roots, occasional Cobbles.				
2						
3						
4	NATIVE TERRACE DEPOSIT	(3-5'): Brown, medium to coarse SAND, some Gravel, little Silt.				
5						
6		(5-8'): Light brown/gray, fine SAND, trace Silt.				
7						
8						
9		(8-9'): Brown, medium to coarse SAND and GRAVEL, trace Silt.				
10		End of Test Pit - 9 feet. Refusal not encountered.				
11						
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	9
Width:	5	Stability:	Poor

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-18
Sheet:	1 Of: 1
Project Number:	7880
Date:	22-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	423 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.4'): Forest Mat				
1	SUBSOIL	(0.4-2'): Brown, fine SAND and SILT, little Gravel, trace fine roots.				
2						
3	GLACIAL TILL	(2-5'): Brown, fine to medium SAND and GRAVEL, little Silt, occasional Cobbles.				
4						
5						
6		(5-9'): Tan, fine SAND, some Gravel, trace Silt.				
7						
8						
9						
10		End of Test Pit - 9 feet. Refusal not encountered.				
11						
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	10	Depth:	9
Width:	5	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.: Samsung SE210 LC-2 | GeoInsight Re: Lloyd Jones
Capacity: 1/2 CY | Contractor: TD & Sons, Inc.
Reach: 18 ft | Operator:

Test Pit No: TP-19
Sheet: 1 Of: 1
Project Number: 7880
Date: 22-Jan-16
Chkd. By: BTN
Weather: Sunny Mid 20s
Ground Surface Elev: 417 ft
Datum:

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-1.5'): Brown, SILT and fine SAND, some Gravel, trace fine roots.				
2	GLACIAL TILL	(1.5-4'): Brown, SILT, some fine to medium Sand, little Gravel.				
3						
4						
5		(4-7'): Brown, medium SAND and GRAVEL, trace Silt.				
6						
7						
8		(7-10'): Brown, coarse SAND and GRAVEL, trace Silt, frequent Cobbles.				
9						
10						
11		End of Test Pit - 10 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth: Not observed ft BGS
Stabilization: NA hours
Est. SHWT: Not Recorded ft BGS
Description:

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length: 10 Depth: 10
Width: 5 Stability: Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-20
Sheet:	1 Of: 1
Project Number:	7880
Date:	25-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	438 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2'): Brown, SILT and fine SAND, some Gravel, trace fine roots.				
2						
	GLACIAL TILL	(2-4'): Brown, fine to medium SAND, some Gravel and Silt.				
3						
4						
5		(4-10'): Brown, medium to coarse SAND and GRAVEL, little Silt, frequent Cobbles, with Boulders at 8 feet.				
6						
7						
8						
9						
10						
11		End of Test Pit - 10 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	11	Depth:	10
Width:	6	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No: TP-21
Sheet: 1 Of: 1
Project Number: 7880
Date: 22-Jan-16
Chkd. By: BTN
Weather: Sunny Mid 20s
Ground Surface Elev 427 ft
Datum:

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-3'): Brown, fine SAND, some Gravel, little Silt, trace fine roots.				
2						
3						
4	GLACIAL TILL	(3-10.5'): Brown, medium SAND and GRAVEL, some Silt, frequent Cobbles.				
5						
6						
7						
8						
9						
10						
11		End of Test Pit - 10.5 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	10.5
Width:	6	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No:	TP-22
Sheet:	1 Of: 1
Project Number:	7880
Date:	22-Jan-16
Chkd. By:	BTN
Weather:	Sunny Mid 20s
Ground Surface Elev	420 ft
Datum:	

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.4'): Forest Mat				
1	FILL	(0.4-4'): Brown, SILT and fine SAND, little Gravel.				
2						
3						
	SUBSOIL	(4-6'): Dark brown, fine SAND and GRAVEL, some Silt, trace fine roots.				
4						
5						
6						
	GLACIAL TILL	(6-11'): Light brown, fine SAND, some Silt, little Gravel.				
7						
8						
9						
10						
11						
		End of Test Pit - 11 feet. Refusal not encountered.				
12						
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	11
Width:	7	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Equip.:	Samsung SE210 LC-2	GeoInsight Re	Lloyd Jones
Capacity:	1/2 CY	Contractor:	TD & Sons, Inc.
Reach:	18 ft	Operator:	

Test Pit No: TP-23
Sheet: 1 Of: 1
Project Number: 7880
Date: 25-Jan-16
Chkd. By: BTN
Weather: Sunny Mid 20s
Ground Surface Elev 421 ft
Datum:

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.3'): Forest Mat				
1	SUBSOIL	(0.3-2.5'): Brown, fine SAND and SILT, some Gravel, trace fine Roots.				
2						
3	GLACIAL TILL	(2.5-6'): Brown, medium to coarse SAND and SILT, little Gravel.				
4						
5						
6						
7		(6-11'): Gray/brown, coarse SAND and GRAVEL, trace Silt, frequent Cobbles.				
8						
9						
10						
11						
12		End of Test Pit - 11 feet. Refusal not encountered.				
13						
14						
15						
16						
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	11	Depth:	11
Width:	5	Stability:	Moderate

FIELD TESTING PERFORMED

GeoInsight
Practical in Nature

TEST PIT LOG

Project: Clarke Business Park

Location: Bethel, Connecticut

Test Pit No: TP-24
Sheet: 1 Of: 1
Project Number: 7880
Date: 22-Jan-16
Chkd. By: BTN

Equip.: Samsung SE210 LC-2
Capacity: 1/2 CY
Reach: 18 ft

GeoInsight Re: Lloyd Jones
Contractor: TD & Sons, Inc.
Operator:

Weather: Sunny Mid 20s
Ground Surface Elev 428 ft
Datum:

DEPTH (ft)	STRATUM DESCRIPTION	SAMPLE DESCRIPTION	SAMPLE Sample I.D.	SAMPLE Depth (ft)	SAMPLE PID (PPM)	NOTE
	FOREST MAT	(0-0.4'): Forest Mat				
1	SUBSOIL	(0.4-3'): Brown, SILT, some fine to medium Sand and Gravel, trace fine Roots.				
2						
3						
	GLACIAL TILL	(3-9'): Brown, medium SAND and GRAVEL, little Silt, occasional Cobbles.				
4						
5						
6						
7						
8						
9						
		(9-16'): Light brown/gray, fine to coarse SAND and GRAVEL, trace Silt, frequent Cobbles.				
10						
11						
12						
13						
14						
15						
16						
		End of Test Pit - 16 feet. Refusal not encountered.				
17						
18						

NOTES:
1. "Cobble" refers to rock that is 3" to 12" in diameter.
2. "Boulder" refers to rock that is greater than 12" in diameter.
3. "Occasional" refers to estimated <25% observed (by weight).
4. "Frequent" refers to estimated 25-50% observed (by weight).

GROUND WATER OBSERVATIONS

Depth:	Not observed	ft BGS
Stabilization:	NA	hours
Est. SHWT:	Not Recorded	ft BGS
Description:		

TEST PIT SKETCH / ORIENTATION

TEST PIT DETAILS

Length:	12	Depth:	16
Width:	10	Stability:	Moderate

FIELD TESTING PERFORMED

Report on a botanical survey of the Trowbridge Drive terminus site, Frances Clarke Industrial Park Bethel, Connecticut

Prepared for Milone and MacBroom, Inc.
99 Realty Drive
Cheshire, Connecticut 06410

Christopher R. Mangels
Botanical & Ecological Consultant
New Fairfield, Connecticut 06812

Submitted 21 September 2016

Survey aims and methods

A botanical/ecological survey of southwestern-most portion of Francis J. Clarke Industrial Park (FJCIP), henceforth referred to as the Trowbridge Drive terminus (TDT) site, was conducted by the author at the behest of Milone and MacBroom (M&M) during the period of late June-July of 2016. The survey was prompted by plans currently under development by the Town of Bethel (TOB) to extend the road and expand the industrial park southward (William Root, M&M, personal communication of 2 June 2016). The basic objective of the survey was to investigate the possible presence of any rare/endangered plant species, and to evaluate populations of any such species identified within the survey area, as part of the environmental review process for the proposed road and building construction. More specifically, the survey was tasked with searching for several target species, a list of which was furnished by Connecticut Natural Diversity Database (CT-NDDB) based on existing data, and outlined in a communiqué by Laura Saucier of CT-DEEP (*NDDB 201303698,* dated 26 August 2013). This list included four vascular plant species (Goldie's fern, Bush's sedge and Tuckerman's sedge, State Special Concern status; Devil's-bit, State Endangered status) and three wildlife species (one insect, Northern metalmark, and two herptiles, Jefferson salamander and Eastern box turtle) known to occur within the immediate site vicinity. Responsibility for surveying for fauna was assumed by M&M, although some effort was made to note the insect's larval host and nectar source plant species. The site was visited on 22 June and again on 26 July 2016 for a total of approximately 7.5 hours field time. In addition to fine-scale reconnaissance, the survey entailed post-fieldwork compilation of notes, photographs and GPS data, along with some review of geospatial information and pertinent scientific literature.

Site description

TDT is located 1.7 miles to the southwest of Bethel town center, to the immediate west of Sympaug Pond (USGS Bethel Quadrangle). It extends from the southern end of Trowbridge Drive, a cul-de-sac, approximately 1,170 feet southwestward, and measures 400-500 feet in width. The site is sharply bounded along the eastern side by Metro-North railroad tracks, while its western limit roughly follows the 500-foot contour of the northeast-southwest oriented ridge system (no corner landmarks were evident). The actual area surveyed, which was guided by a site plan showing the location of proposed road provided by M&M (Fig. 1), covered approximately 13.5 acres, ranging in elevation from about 400 feet a.s.l. to 500 feet a.s.l. (in places possibly higher), with steep grades along both east and west margins. The site is nearly completely forested, and much of it is rocky, with a strong easterly aspect. It should be noted that site lies within the Southern Marble Valley Ecoregion (Dowhan and Craig, 1976), which contains many geologic and biological elements of restricted distribution within the state. Calcareous bedrock was observed during the survey, and clear calcareous influence was indicated by the presence of numerous plant and cryptogam species. Soil units indicated on recent soils maps include Haven and Enfield soils

(3-8% slopes), Hinckley gravelly sandy loam (15-45% slopes) and Rock outcrop-Hollis complex (45-60% slopes) (SoilWeb streaming interface, USDA-NCSS).

In terms of current land use, TDT contains no buildings, fencing, utility poles or other infrastructure. Despite the presence of some obscure remnant plaques and numbered trail markers, possibly related to past paint ball or other recreational activities, the site appears to be unused, in any official sense; no signs indicating Town ownership land were seen. However, there was abundant evidence of site disturbance, both chronic and recent: (1) a network of heavily used off-road vehicle (ORV) and/ or mountain bike tracks, some 15 feet or more wide, mainly through the central section (i.e. the most level and least rocky) of the site; (2) survey blazes and small (< 20 x 20 feet) clearings, in various places, apparently corresponding to test boring locations. Indications of trails or ORV tracks are visible on aerial imagery dating back to the 1990's, at which time the south end of Trowbridge Dr. was about 1,000 feet north of its present location. TDT is freely accessible by vehicles at this time via the cul-de-sac. A group of several ORV users was encountered onsite on the first survey date.

The landscape setting is primarily industrial/commercial use to the north and east, while an extensive (700+ acres) tract of unbroken forested land (designated "open space" on the M&M site plan), at least a portion of which is believed to be water-shed land belonging to TOB, abuts TDT to the south and west. Route 53, a local arterial roadway, lies a short distance to the east.

Findings

None of the plants among the CT-NDDB list of target species were found. Appropriate habitat conditions were noted for two of the species (Goldie's fern and Devil's-bit), but not for the others. Potential open field or edge habitat for Bush's sedge is limited to the margin of the cul-de-sac, which currently supports only weedy, highly disturbed vegetation. This species could be extant elsewhere in or around FJCIP, and might have been present at what is now TDT prior to 2004, in open land that preexisted the current configuration of Trowbridge Drive (visible on 1996 imagery). Tuckerman's sedge is an obligate wetland species, found in 2000 by myself in a drawdown swamp near the summit of Bogus Mountain, circa 0.5-mile upslope to the west. No appropriate habitat exists at TDT.

However, a small yet healthy population of another State Special Concern plant, *Ribes rotundifolium* (Wild currant or Appalachian gooseberry), was found in the course of the survey, near the western site limit. Although not referenced in the CT-NDDB letter, this species was documented in 2002 at a nearby (< 2 mile distant) site in Danbury, and is known historically from collections made in the town of Bethel. Regionally, *R. rotundifolium* has a restricted, mostly Appalachian montane distribution and reaches the northern limit of its range in western New England (FNA, 2009). In Connecticut, it is typically associated with rich talus

habitat. A rare plant reporting form has been completed for this population and will be sent to CT-NDDB upon submittal of this report.

No other State-listed species were observed onsite in the course of this survey. However, this is not a wholly unexpectable outcome, given the shortage of time available to organize and conduct this survey, and should not be interpreted as conclusive evidence of their absence. In my estimation, some potential remains for finding significant plant species, particularly ephemeral components of the ground layer flora that may have been missed in this survey during the earlier and later parts of the growing season. The same may also apply to State-listed species in certain faunal groups. This potential would be greater if unnatural impacts could be abated and the natural vegetation was allowed to recover. Levels of disturbance as profound as were observed in parts of the site, particularly when actively occurring at the time of fieldwork, are disruptive to the survey process insofar as (1) obscuring the physiognomy of vegetation and (2) raising uncertainty as to whether survey results represent accurate presence/ absence data, or may be due wholly or partly to effects of vegetation suppression.

Regarding overall biodiversity, in spite of previously noted disturbances, TDT supports a moderately high level of plant richness, with 228 species compiled within a brief time span (Appendix 1). While a substantial fraction (~20%) of this total comprises non-native species, such a percentage is typical for most sites in this region at present time. However, this subset does include a number of known highly invasive species (CIPC, 2014), though many of these are confined to a ruderal zone around the cul-de-sac. A fairly rich assemblage of lichens and bryophytes, including at least one regionally rare cyanolichen species, was also noted (Appendix 2). Due to the sensitivity of lichens to atmospheric pollution and desiccation, and their declining regional abundance in general (Hinds and Hinds, 2007), this may be viewed as a positive indication of environmental quality. Casual, mostly unrecorded observations of faunal groups such as birds and mammals included numerous typical forest species, while the number of species encountered in other groups, notably herptiles, seemed to be low. This may be more a reflection of the limitations of informal observation, e.g. inappropriate timing, than actual species richness.

With respect to vegetation/natural communities, TDT encompasses notable within-site variation, most of which is clearly attributable to slope position, soil moisture, bedrock type and disturbance history. A rudimentary classification would include three constituent types: (1) a steep, bouldery, rich and very moist talus forest; (2) a dry-mesic, moderately steep and rocky circumneutral oak/maple/hickory dominated forest; (3) a mesic, somewhat rich, level to gently sloping mixed hardwood forest (Fig. 6). The first, which occurs along the western side of the site, corresponds closely in structure and composition to the Sugar maple-White ash/Blue cohosh *(Acer saccharum-Fraxinus americanum/ Caulophyllum thalictroides*) community described by Metzler and Barrett (2006). The second, found along the eastern side, represents a Sugar maple-Chinkapin oak/Bristleleaf sedge (*Acer saccharum-Quercus muehlenbergii /Carex eburnea)*

community (Metzler and Barrett, 2006). Despite having a comparatively species-poor ground layer, the presence of Chinkapin oak, a species largely restricted to high-pH bedrock in New England (Haines, 2011), as a major canopy tree (along with other characteristic species) is diagnostic. The last type is transitional between the first two, with elements of each but much less distinctive in character, and exhibits far more ground layer disturbance than either. Along with a gradual southward downslope it has some moist to temporarily wet depressions; these have apparently been exaggerated and made more hydric over time through ORV traffic. For these reasons, and for sake of simplicity, the entire intervening area, including the cul-de-sac margins, was mapped as one unit. While a precise delineation of vegetation exceeded the scope of this survey, it is estimated that each of the three cover types occupies between 20% and 40% of the site.

In terms of quality indicators such floristic diversity and 'naturalness', the talus forest represents the most exemplary occurrence among the vegetation types. However, in terms of ecological significance, the Sugar maple/Chinkapin oak forest is in fact most noteworthy. Natural communities variously classified as "Calcareous uplands" and "Dry circumneutral forests" have long been recognized as a critical habitat, which denotes the rarest and most imperiled at the state level (Metzler and Wagner, 1998; CECO, 2011). More recent assessments include "Calcareous forests" among the eight forest sub-habitat types most important for wildlife in Connecticut (CDEEP, 2015a). The close association of Northern metalmark butterfly (State Endangered), one of the wildlife species sought at this site, with this community type is another basis for the critical habitat designation. Its larval host plant, Running groundsel (*Packera obovata*), was found in the eastern portion of the site, though not in abundance, and forest here is probably too shaded (i.e. close canopied) currently to support this insect. However, this does not preclude TDT as potential metalmark habitat, particularly if some form of species-specific habitat enhancement, as is practiced at most (if not all) extant Northern metalmark sites, were to be applied.

References (for report and appendices)

Connecticut Department of Energy and Environmental Protection. 2015a. *Connecticut Wildlife Action Plan*. Prepared by Terwilliger Consulting Inc. for Bureau of Natural Resources, CT-DEEP, Hartford.

Connecticut Department of Energy and Environmental Protection. 2015b. Connecticut's Endangered, Threatened, and Special Concern Species. Bureau of Natural Resources, Hartford.

Connecticut Environmental Conditions Online. 2011. Connecticut Critical Habitats. Available from: www.cteco.uconn.edu.

Connecticut Invasive Plants Council. 2014. Connecticut Invasive Plant List (updated November 2014). Available online at: http://cipwg.uconn.edu.

Dowhan, J.J and R.J. Craig. 1976. *Rare and Endangered Species of Connecticut and Their Habitats.* Report of Investigations No. 6, State Geological and Natural History Survey of Connecticut, Department of Environmental Protection, Hartford.

Flora of North America Editorial Committee, eds. 1993-2014. *Flora of North America North of Mexico*. Oxford University Press, New York and Oxford.

Haines, A. 2011. *Flora Novae Angliae: A Manual for Identification of Native and Naturalized Higher Vascular Plants of New England.* Yale University Press, New Haven.

Hinds, J.W. and P.L. Hinds. 2007. *Macrolichens of New England.* The New York Botanical Garden Press, Bronx, NY.

Lincoln, M.S.G. 2008. *Liverworts of New England.* The New York Botanical Garden Press, Bronx, NY.

McKnight, K.B., J.R. Rohrer, K. McKnight Ward, and W.J. Perdrizet. 2013. *Common Mosses of the Northeast and Appalachians.* Princeton University Press, Princeton, NJ.

Metzler, K.J. and J.P. Barrett. 2006. *The Vegetation of Connecticut: A Preliminary Classification.* Report of Investigations No. 12, State Geological and Natural History Survey of Connecticut, Department of Environmental Protection, Hartford.

Metzler, K.J. and D.L. Wagner. 1998. "Thirteen of Connecticut's Most Imperiled Ecosystems". Unpublished report prepared for Connecticut Department of Environmental Protection, Hartford.

Figure 1.

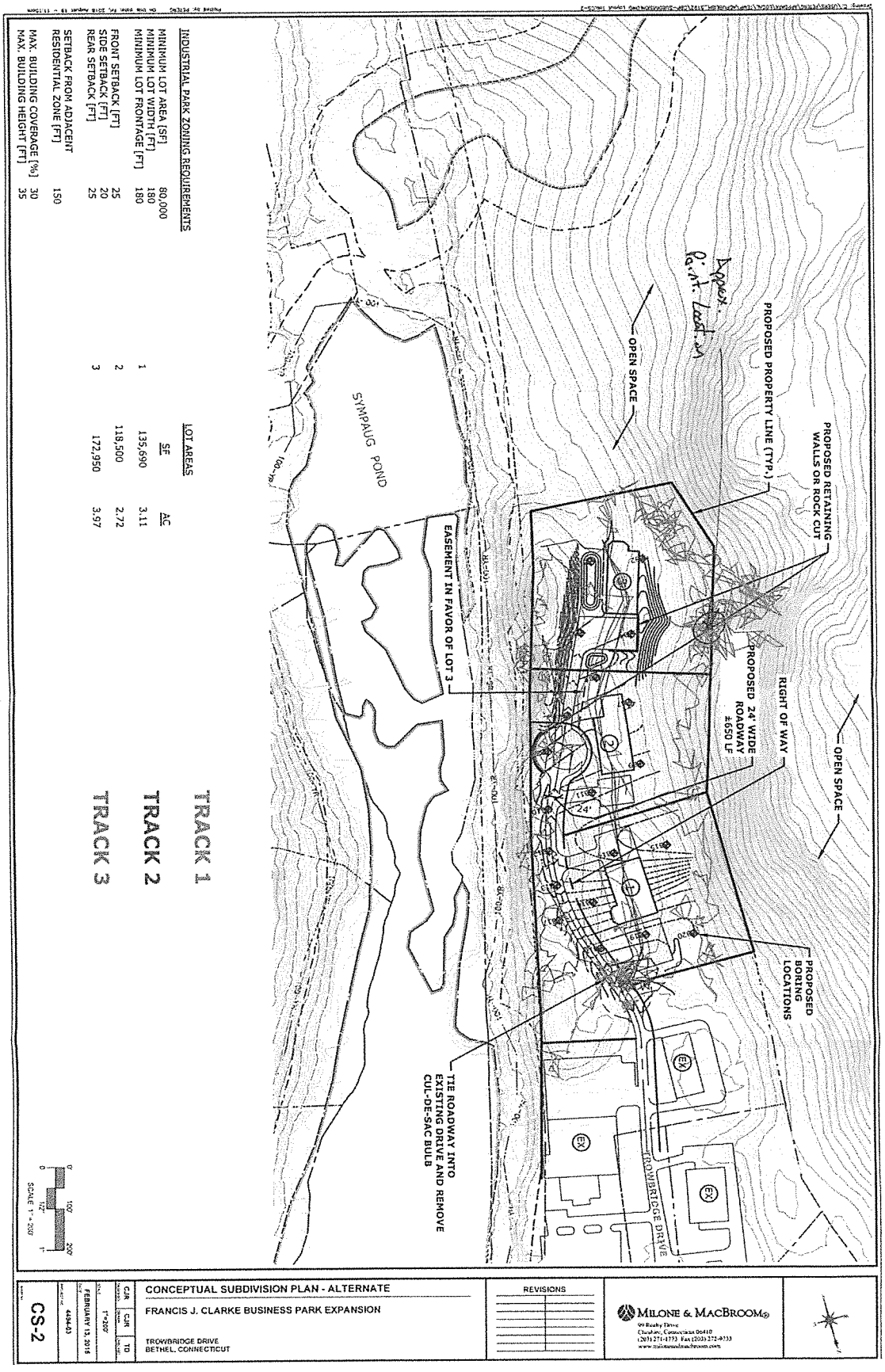

PROPOSED RETAINING WALLS OR ROCK CUT
PROPOSED PROPERTY LINE (TYP.)
OPEN SPACE
RIGHT OF WAY
PROPOSED 24' WIDE ROADWAY ±650 LF
OPEN SPACE
PROPOSED BORING LOCATIONS
SYMPAUG POND
EASEMENT IN FAVOR OF LOT 3
TIE ROADWAY INTO EXISTING DRIVE AND REMOVE CUL-DE-SAC BULB
TROWBRIDGE DRIVE
INDUSTRIAL PARK ZONING REQUIREMENTS
MINIMUM LOT AREA [SF] 80,000
MINIMUM LOT WIDTH [FT] 180
MINIMUM LOT FRONTAGE [FT] 180
FRONT SETBACK [FT] 25
SIDE SETBACK [FT] 20
REAR SETBACK [FT] 25
SETBACK FROM ADJACENT RESIDENTIAL ZONE [FT] 150
MAX. BUILDING COVERAGE [%] 30
MAX. BUILDING HEIGHT [FT] 35
LOT AREAS
SF AC
1 135,690 3.11
2 118,500 2.72
3 172,950 3.97
TRACK 1
TRACK 2
TRACK 3
SCALE 1" = 200'
CONCEPTUAL SUBDIVISION PLAN - ALTERNATE
FRANCIS J. CLARKE BUSINESS PARK EXPANSION
TROWBRIDGE DRIVE
BETHEL, CONNECTICUT
REVISIONS
MILONE & MACBROOM
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773 Fax (203) 272-9733
CS-2
4494-03
FEBRUARY 15, 2018
1" = 200'

Figure 2.

Figure 3.

Figure 4.

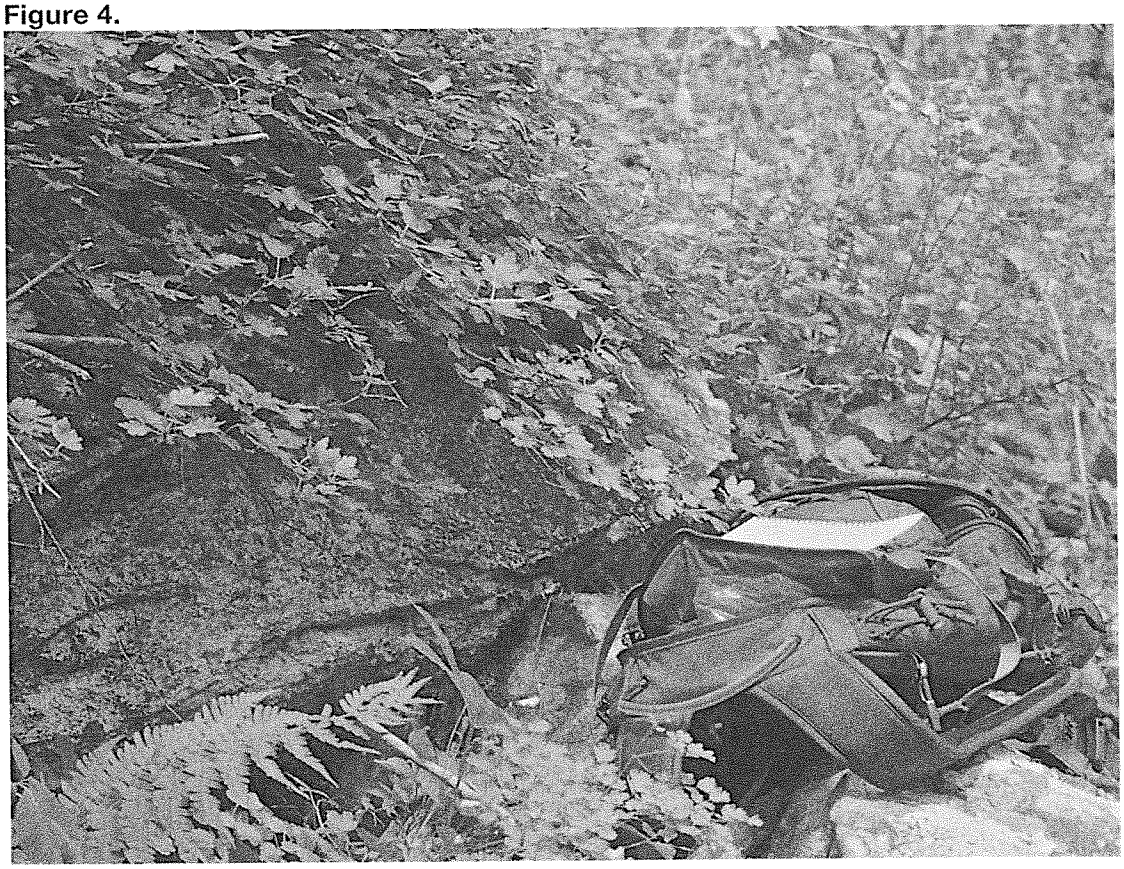


Figure 5.

List of Figures:


Trowbridge Drive terminus site, Bethel
Major vegetation/physiographic units, based on ground surveys (Mangels, June-July 2016). Imagery date 19 Apri 2016.
Legend
Approximate site limits
Circumneutral forest
Ribes rotundifolium
Talus section
Transitional/disturbed section
Sympaug Pond
Plantation Ct
53
Google earth
©2016 Google
1000 ft
N

Figure 6.

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Species name[1]	Common name[2]
Acalypha gracilens	Slender three-seeded-Mercury
Acer rubrum	Red maple
Acer saccharum	Sugar maple
Actaea pachypoda	White baneberry
Actaea rubra	Red baneberry
Adiantum pedatum	Northern maidenhair fern
Ailanthus altissima *	Tree-of-heaven
Alliaria petiolata *	Garlic mustard
Ambrosia artemisiifolia	Common ragweed
Amelanchier ?arborea	Downy shadbush
Amphicarpaea bracteata	American hog-peanut
Anthoxanthum nitens	Sweetgrass
Apocynum cannabinum	Hemp dogbane
Aquilegia canadensis	Red columbine
Aralia nudicaulis	Wild sarsaparilla
Arisaema triphyllum	Jack-in-the-pulpit
Artemisia vulgaris *	Mugwort
Asarum canadense	Canada wild ginger
Asplenium platyneuron	Ebony spleenwort
Athyrium angustum	Northern lady fern
Benthamidia florida	Flowering big-bracted-dogwood
Berberis thunbergii *	Japanese barberry
Betula alleghaniensis	Yellow birch
Betula lenta	Black birch
Betula populifolia	Grey birch
Bidens species	Beggar-ticks
Boehmeria cylindrica	False nettle
Botrychium virginianum	Rattlesnake fern
Brachyelytrum erectum	Southern long-awned wood grass

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Bromus inermis *	Smooth brome
Bromus ?pubescens	Hairy wood brome
Cardamine impatiens *	Narrow-leaved biter-cress
Carex albicans	White-tinged sedge
Carex albursina	White bear sedge
Carex appalachica	Appalachian sedge
Carex blanda	Eastern woodland sedge
Carex cephaloidea	Thin-leaved sedge
Carex cephalophora	Oval-headed sedge
Carex communis	Fibrous-rooted sedge
Carex debilis	White-edged sedge
Carex digitalis	Slender woodland sedge
Carex deweyana	Round-fruited short-scaled sedge
Carex gracillima	Graceful sedge
Carex hirtifolia	Pubescent sedge
Carex laxiflora	Broad loose-flowered sedge
Carex pensylvanica	Pennsylvania sedge
Carex platyphylla	Broad-leaved sedge
Carex rosea	Rosy sedge
Carex scoparia	Pointed broom sedge
Carex sparganioides	Bur-reed sedge
Carex sprengelii	Long-beaked sedge
Carex swanii	Swan's sedge
Carex virescens	Ribbed sedge
Carpinus caroliniana	Hornbeam
Carya cordiformis	Bitternut hickory
Carya ovata	Shagbark hickory
Carya tomentosa	Mockernut hickory
Catalpa species *	Catalpa
Caulophyllum thalictroides	Blue cohosh
Celastrus orbiculatus *	Oriental bittersweet
Chenopodium album *	White goosefoot

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Cichorium intybus *	Chicory
Chimaphila maculata	Spotted wintergreen
Circaea canadensis	Broad-leaved enchanter's-nightshade
Clinopodium vulgare	Wild basil
Commelina communis *	Asiatic dayflower
Corylus cornuta	Beaked hazelnut
Cynanchum species *	Swallowwort
Cystopteris species	Fragile fern
Dactylis glomerata *	Orchard grass
Danthonia compressa	Flattened oatgrass
Danthonia spicata	Poverty oatgrass
Dennstaedtia punctilobula	Hay-scented fern
Deparia acrostichoides	Silvery false spleenwort
Dianthus armeria *	Deptford pink
Dichanthelium species	Panicgrass
Dryopteris carthusiana	Spinulose wood fern
Dryopteris cristata	Evergreen wood fern
Dryopteris intermedia	Intermediate wood fern
Dryopteris marginalis	Marginal wood fern
Elaeagnus umbellata *	Autumn olive
Elymus hystrix	Eastern bottle-brush grass
Elytrigia repens *	Creeping wild-rye
Equisetum arvense	Field horsetail
Erechtites hieraciifolius	American burnweed
Erigeron pulchellus	Robin's plantain fleabane
Erigeron annuus	Fleabane
Euonymus alatus *	Winged burning bush
Eurybia divaricata	White wood aster
Euthamia graminifolia	Common grass-leaved goldenrod
Fagus grandifolia	American beech
Fallopia japonica *	Japanese knotweed
Festuca subverticillata	Nodding fescue

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Fragaria virginiana	Common strawberry
Fraxinus americana	White ash
Galium circaezans	Forest licorice bedstraw
Galium mollugo *	Whorled bedstraw
Galium triflorum	Fragrant bedstraw
Geranium maculatum	Spotted crane's-bill
Geum canadense	White avens
Glechoma hederacea *	Gill-over-the-ground
Gleditsia triacanthos *	Honey locust
Hamamelis virginiana	American witch-hazel
Helianthus decapetalus	Thin leaved-sunflower
Hemerocallis fulva *	Orange day-lily
Hepatica americana	Blunt-lobed hepatica
Heuchera americana	Common alum-root
Hieracium species	Hawkweed
Hylodesmum glutinosum	Pointed-leaved tick-trefoil
Impatiens capensis	Spotted jewelweed
Impatiens pallida	Pale jewelweed
Juncus tenuis	Path rush
Juniperus virginiana	Eastern red cedar
Kalmia latifolia	Mountain laurel
Lactuca species	Lettuce
Laportea canadensis	Canada wood-nettle
Leersia virginica	White cut grass
Lepidium virginicum	Poor-man's pepperweed
Leonurus cardiaca *	Motherwort
Lindera benzoin	Spicebush
Liriodendron tulipifera	Tulip-tree
Lonicera morrowii *	Fly honeysuckle
Luzula multiflora	Common wood-rush
Lysimachia ciliata	Fringed yellow-loosestrife
Maianthemum canadense	Canada-mayflower

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Maianthemum racemosum	Feathery false Solomon's-seal
Melilotus species *	Sweet-clover
Menispermum canadense	Canada moonseed
Microstegium vimineum *	Japanese stiltgrass
Mitchella repens	Partridge-berry
Monotropa uniflora	One-flowered Indian pipe
Morus alba *	White mulberry
Muhlenbergia schreberi	Nimblewill muhly
Muhlenbergia ?frondosa	Wire-stemmed muhly
Mollugo verticillata *	Green carpetweed
Myosoton aquaticum *	Giant chickweed
Oenothera biennis	Common evening-primrose
Onoclea sensibilis	Sensitive fern
Osmunda claytoniana	Interrupted fern
Osmunda regalis	Royal fern
Ostrya virginiana	Hop hornbeam
Oxalis species	Wood sorrel
Packera obovata	Running groundsel
Parthenocissus quinquefolia	Virginia creeper
Persicaria longiseta *	Oriental lady's-thumb smartweed
Persicaria maculosa *	Lady's-thumb smartweed
Persicaria sagittata	Arrow-leaved tearthumb
Persicaria virginiana	Jumpseed
Phegopteris connectilis	Long beech fern
Phytolacca americana	American pokeweed
Pilea pumila	Canada clearweed
Piptatherum racemosum	Black-seed mountain rice-grass
Plantago lanceolata *	English plantain
Plantago rugelii	Rugel's plantain
Poa annua *	Annual blue grass
Poa compressa *	Flat-stemmed blue grass
Polygonatum biflorum	King Solomon's-seal

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Polypodium ?virginianum	Rock polypody
Polystichum acrostichoides	Christmas fern
Populus deltoides	Cottonwood
Potentilla indica *	Indian-strawberry
Potentilla simplex	Common cinquefoil
Prunella vulgaris *	Common self-heal
Prunus serotina	Black cherry
Prunus virginiana	Choke cherry
Pyrola americana	American shinleaf
Quercus alba	White oak
Quercus coccinea	Scarlet oak
Quercus montana	Mountain chestnut oak
Quercus muehlenbergii	Chinkapin oak
Quercus rubra	Red oak
Quercus velutina	Black oak
Uvularia perfoliata	Perfoliate bellwort
Ranunculus abortivus	Kidney-leafed crowfoot
Ranunculus acris *	Tall buttercup
Ranunculus ?micranthus	Small-flowered buttercup
Ranunculus recurvatus	Hooked buttercup
Rhus typhina	Staghorn sumac
Ribes rotundifolium †	Appalachian gooseberry
Ribes ?rubrum	Garden red currant
Robinia pseudoacacia	Black locust
Rosa multiflora *	Multiflora rose
Rubus allegheniensis	Common blackberry
Rubus flagellaris	Northern dewberry
Rubus occidentalis	Black raspberry
Rubus odoratus	Flowering raspberry
Rubus phoenicolasius *	Wineberry
Rubus pubescens	Dwarf raspberry
Sambucus racemosa	Red elderberry

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Sanguinaria canadensis	Blood-root
Sassafras albidum	Sassafras
Securigera varia *	Purple crown-vetch
Silene latifolia *	White campion
Smilax herbacea	Carrion-flower
Solanum dulcamara *	Climbing nightshade
Solanum ptycanthum	Eastern black nightshade
Solidago caesia	Blue-stem goldenrod
Solidago flexicaulis	Zig-zag goldenrod
Solidago juncea	Early goldenrod
Solidago rugosa	Tall hairy goldenrod
Sphenopholis obtusata	Prairie wedgescale
Staphylea trifoliata	American bladdernut
Swida alternifolia	Alternate-leaved dogwood
Swida racemosa	Gray dogwood
Swida rugosa	Round-leaved dogwood
Symphyotrichum lanceolatum	Purple-stemmed American-aster
Symphyotrichum species	American-aster
Taraxacum officinale *	Common dandelion
Thalictrum dioicum	Early meadow-rue
Thalictrum thalictroides	Rue anemone
Thelypteris noveboracensis	New York fern
Tilia americana	American linden
Trifolium repens *	White clover
Trillium erectum	Red trillium
Toxicodendron radicans	Poison ivy
Tsuga canadensis	Eastern hemlock
Tussilago farfara *	Coltsfoot
Ulmus americana	American elm
Ulmus rubra	Slippery elm
Urtica dioica	Singing nettle
Verbascum thapsus *	Common mullein

Appendix 1. List of vascular plant species observed at F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut, 26 June and 24 July 2016

(Based on field notes, photos and specimens) © 2016 C.R. Mangels

Verbena urticifolia	White vervain
Veronica serpyllifolia *	Thyme-leaved speedwell
Viburnum acerifolium	Maple-leaved viburnum
Viburnum lentago	Nannyberry
Viburnum rafinesquianum	Downy arrowwood
Viola species	Violet
Vitis aestivalis	Summer grape

∑= 228 species

Type color denotes species primary location/associated habitat within the site: blue = talus slope forest; green = calcareous forest; red = disturbed edges or corridor; black = widely distributed across the site

(?) Denotes a tentative species or subspecies identification

(†) Denotes a species listed as Endangered, Threatened or Special Concern by State of Connecticut (CT-DEEP, 2015)

(*) Denotes species regarded as exotic or non-native in Connecticut or doubtfully native at this site, site based on county-level New England distribution maps (*GoBotany,* available at https://gobotany.newenglandwild.org). Nomenclature follows Flora North America (1993+) and/or Haines (2011); common names follow Haines (2011

Appendix 2. List of non-vascular plants and lichens observed during field surveys of 22 June and 26 July 2016, F. Clarke Park/Trowbridge Road terminus site, Town of Bethel, Connecticut (Source: Field notes, photos & collections, C.R. Mangels)

BRYOPHYTES

Liverworts

Conocephalum conicum	Snakeskin liverwort
Frullania eboracensis	Scalewort
Porella platyphylla	Wall scalewort

Mosses

Atrichum altecristatum	Wavy starburst moss
Bryum argenteum	Silver moss
Climacium americanum	Palm tree moss
Dicranum species	Broom moss
Fissidens osmundioides	Fern pocket moss
Hedwigia ciliata	Medusa moss
Leucobryum glaucum	Pincushion moss
Leskea species	Necklace chain moss
Orthotrichum species	Bristle moss
Polytrichum species	Haircap moss
Thuidium recognitum	Fern moss

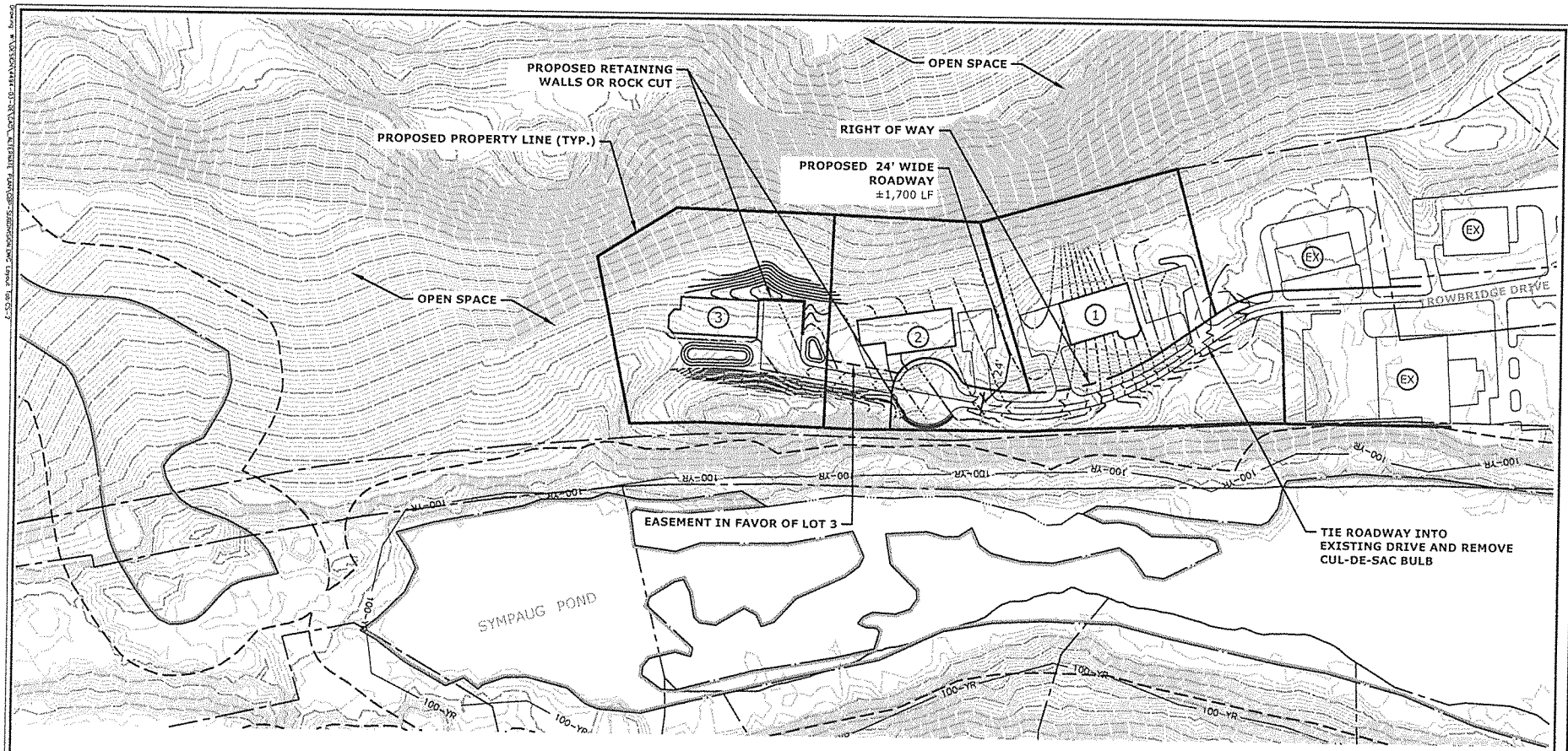
LICHENS

Candelaria concolor	Candleflame lichen
Cladonia species	Cup lichens
Cladonia squamosa	Dragon cladonia
Dermatocarpon miniatum	Common stippleback
Endocarpon pusillum	Scaly stippled lichen
Flavoparmelia baltimorensis	Rock greenshield

Flavoparmelia caperata	Common greenshield
Lecidea species	Frosted rim-lichen
Lepraria finkii	Dust lichen
Melanelia subaurifera	Abraded brown-shield
Myelochroa aurulenta	Powdery axil-bristle lichen
Parmelia squarrosa	Bottlebrush shield lichen
Parmelia sulcata	Hammered shield lichen
Parmotrema hypotropum	Southern powdered ruffle lichen
Phaeophyscia adiastola	Powder-tipped shadow lichen
Phaeophyscia rubropulchra	Orange-colored shadow lichen
Physcia millegrana	Mealy rosette lichen
Physcia stellaris	Star rosette lichen
Porpidia albocaerulescens	Smoky-eye boulder lichen
Punctelia rudecta	Rough speckled shield
Sarcogyne species	Grain-spored lichen
Scytinium dactylinum	Brown-buttoned jellyskin
Xanthoparmelia species	Rock-shield

Bryophyte nomenclature follows Bryophyte Flora of North America (2007); common names adopted from McKnight *et al.* (2013), Lincoln (2008) and Hinds and Hinds (2007).

Lichen nomenclature follows Hinds and Hinds (2007) and Brodo *et al.* (2001)



INDUSTRIAL PARK ZONING REQUIREMENTS

MINIMUM LOT AREA [SF]	80,000
MINIMUM LOT WIDTH [FT]	180
MINIMUM LOT FRONTAGE [FT]	180
FRONT SETBACK [FT]	25
SIDE SETBACK [FT]	20
REAR SETBACK [FT]	25
SETBACK FROM ADJACENT RESIDENTIAL ZONE [FT]	150
MAX. BUILDING COVERAGE [%]	30
MAX. BUILDING HEIGHT [FT]	35

LOT AREAS

	SF	AC
1	135,690	3.11
2	124,150	2.85
3	93,290	2.14
4	86,860	1.99
5	112,390	2.58

0' 100' 200'
0 1/2" 1"
SCALE 1" = 200'

MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773 Fax (203) 272-9733
www.miloneandmacbroom.com

REVISIONS

CONCEPTUAL SUBDIVISION PLAN - ALTERNATE

FRANCIS J. CLARKE BUSINESS PARK EXPANSION

TROWBRIDGE DRIVE
BETHEL, CONNECTICUT

CJR	CJR	TD
1"=200'		
JANUARY 30, 2015		
4494-03		

CS-2

CHRISTOPHER R. MANGELS

26 North Drive
New Fairfield, Connecticut 06812
203-746-6987
nyctflora@charter.net

Professional Experience

1985 to present — **Botanical and ecological Consultant**
Long Island, New York and New Fairfield, Connecticut

A diverse body of work centered on botanical inventory, rare species surveys and ecological site evaluation. Scope of assignments includes vegetation and plant community mapping; preparation of summary papers, project proposals, rare species assessment and other technical reports; literature, spatial imagery and herbarium research; review of impact statements, permit applications and supporting documents; wetlands delineation and analysis. Projects performed independently and in collaboration with other specialists for a wide range of clientele including federal, state, and local agencies, land trusts, civic groups and environmental engineering firms in New York and the southern New England region (full list available upon request).

2002 to present — **Photogrammetrist-Map technician**
Golden Aerial Surveys, Newtown and Waterbury, Connecticut

Produce high precision, large-scale plannimetric/topographic maps and digital terrain models from proprietary low altitude aerial photography, using computer workstations equipped with three-dimensional visualization hardware and specialized cartographic/ CAD software.

1991 — **Botanist**
The Nature Conservancy, Cold Spring Harbor, New York

Collected demographic and habitat data on Federal Threatened List species *Amaranthus pumilus* for preparation of draft summary status report for U.S. Fish and Wildlife Service. Monitored populations of State-listed species in state and county park systems throughout Long Island, which entailed updating and refining existing species data and maps.

1986 to 1987 — **Data Transcriber/Assistant Botanist**
The Nature Conservancy, Cold Spring Harbor, New York

Compiled and processed information on rare plant and animal species and significant natural communities throughout the Long Island and Lower Hudson regions for the New York Natural Heritage Program. Conducted field searches for historically known plant occurrences and documented exemplary habitats. Surveyed and evaluated conservation value of existing nature preserves and proposed acquisition lands; assisted in the preparation of site management plans.

Education

State University of New York at Stony Brook, Stony Brook, New York
Bachelor of Science, Biology, 1992

Collected and analyzed field data from experimental plots as a participant in two faculty research projects, Department of Ecology and Evolution, 1989-1990

Western Connecticut State University, Danbury, Connecticut
Seven graduate courses in ecology and computer science, 1994 to 1999

University of Connecticut, Storrs, Connecticut
Graduate courses in geographic information systems and conservation biology, Fall, 1997

Humboldt Field Research Institute, Steuben, Maine
Weeklong intensive courses in wetland identification/delineation (August 1997) and lichen identification (August 2015 and July 2016)

New York Botanical Garden, Bronx, New York
Nine courses in plant systematics and morphology, 1985 to 1990. Assisted NYBG scientist Joseph Beitel in instruction of a two-week field botany course at The Leelanau School, Glen Arbor, Michigan, July, 1987

Affiliations

New England Plant Conservation Program (NEPCoP)
Connecticut Task Force member, 1999 to present

Long Island Botanical Society
Founding member, Vice President, 1991-1993. Member of the Long Island Flora publication committee, 1989 to 2009

Brooklyn Botanic Garden
Contributor to New York Metropolitan Flora Project, 1993 to 1995

New York Flora Association
Torrey Botanical Society
New England Botanical Club
Botanical Society of America
American Bryological and Lichenological Society
Lower Hudson Partnership for Regional Invasive Species Management
Connecticut Botanical Society
Long Island Botanical Society
Connecticut Invasive Plant Working Group

Selected reports and publications

Mangels, C.R. 2015. Preliminary findings from a rare plant survey of Still River Preserve, Brookfield/New Milford, Connecticut. Report prepared for Weantinoge Heritage Land Trust, Kent, Connecticut.

Mangels, C.R. 2014. Survey, mapping and assessment of invasive plant species at the Underhill Preserve. Report prepared for Huntington-Oyster Bay Audubon Society, Huntington, New York in conjunction with Long Island Invasive Species Management Area (www.liisma.org).

Mangels, C.R. 2014. Report on a 2013 botanical survey of the Underhill Preserve, Jericho, New York. Report prepared for Huntington-Oyster Bay Audubon Society, Huntington, New York.

Mangels, C.R. 2013. Report on a rare plant rapid survey of Morse Beach/Sandy Point, West Haven. Connecticut. Report prepared for Audubon Connecticut, Southbury, Connecticut.

Mangels, C.R. 2013. Report on a 2012 botanical survey of the Carse Brook wetland corridor, Sharon, Connecticut. Report prepared for Audubon Sharon, Sharon, Connecticut.

Mangels. C.R. 2013. Report on a preliminary survey of the Watari parcel, North Spectacle Pond, Kent, Connecticut. Prepared for Weantinoge Heritage Land Trust, Kent, Connecticut.

Mangels, C.R. 2012. Brief report on a preliminary botanical inventory and habitat assessment of the Franc parcel, Bethel, Connecticut. Report submitted to Connecticut Environmental Review Team Program, Haddam, Connecticut.

Mangels, C.R. 2012. Preliminary biological inventory and habitat assessment of the Cooley Farm parcel, Cornwall, Connecticut. Report prepared for Cornwall Conservation Trust, West Cornwall, Connecticut.

Mangels, C.R. 2008. Interim report on a biological survey of the Slocum-Mostachetti Preserve, Town of Dover, New York. Report prepared for Oblong Land Conservancy, Pawling, New York.

Mangels, C.R. 2005. Report on a botanical survey of the Matchett-North Spectacle Pond site, Town of Kent, Connecticut, May-July 2005. Report prepared for Christopher Matchett (New York, NY) on behalf of Weantinoge Heritage Land Trust, Kent, Connecticut.

Mangels, C.R. 2003. Report on permit application review and preliminary botanical survey of the Yale Farm Property, Towns of Norfolk and North Canaan, Connecticut. Report prepared for Coalition For Sound Growth, Norfolk, Connecticut.

Mangels, C.R. 2002. Preliminary biological survey and ecological assessment of the North Taylor Avenue wetland site, City of Norwalk, Connecticut, October-December 2002. Report prepared for Lockwood, Kessler, & Bartlett, Inc., Consulting Engineers, Syosset, New York.

Mangels, C.R. 2002. A preliminary conservation plan for rare plant species and beach habitat at Southport Harbor-Sasco Hill Beach, Fairfield, Connecticut. Report prepared for Town of Fairfield Harbor Management Commission.

Mangels, C.R. 2001. Saugatuck Matrix Forest Survey: Significant species and vegetation inventory. Report prepared for The Nature Conservancy Lucius Pond Ordway Devil's Den Chapter, Weston, Connecticut.

Mangels, C. and Mickelson, J. 2000. Great Mountain Forest Conservation Evaluation: Vegetation and natural community rapid assessment. Report prepared for The Nature Conservancy Connecticut Field Office, Middletown, Connecticut.

Mangels, C.R. 1999. A NEPCoP Conservation Plan for *Corydalis flavula* (Pale corydalis) in New England. Draft report submitted to New England Plant Conservation Program, New England Wildflower Society, Framingham, Massachusetts.

Dirrigl, F. and C. Mangels. 1998. Survey of Hancock Brook Lake Dam and Hop Brook Lake Dam for rare and protected species and outstanding natural communities. Final report submitted to U.S. Army Corps of Engineers, Naugatuck River Basin, Connecticut, by Connecticut Natural Diversity Database, Department of Environmental Protection, Hartford, Connecticut.

Mangels, C.R. 1998. Report on a botanical survey of the "Sweet Hollow Forest Swamp" site, Town of Huntington, New York. Report submitted to the West Hills Civic Association, Huntington, New York.

Mangels, C.R. 1991. Seabeach amaranth in New York State. *New York Flora Association Newsletter* 2(2): 7-8.

Clemants, S. and C. Mangels. 1990. *Amaranthus pumilus:* 1990 New York State status survey. Report submitted to U.S. Fish and Wildlife Service, Newton Corner, Massachusetts.

O.J. Blanchard and C.R. Mangels. 1990. A preliminary biological inventory of the Long

Hill Vicinity. Report prepared for the Long Hill Civic Association, Stony Brook, New York.
O.J. Blanchard and C.R. Mangels. 1988. Botanical surveys of three sites on the Rockaway Peninsula. Report prepared for Cosper Environmental Services, Northport, New York.

References

Furnished upon request

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Wildlife Division • Sessions Woods WMA • Post Office Box 1550 • Burlington, CT 06013

May 15, 2017

Janice Chrzescijanek
Director of Economic Development
Town of Bethel, CJH Municipal Center
1 School Street, Bethel, CT 06801
chrzescijanekj@bethel-ct.gov

Re: Clarke Industrial Park Expansion, Trowbridge Drive in Bethel, Connecticut
NDDB Preliminary Review 201303698-additional comments

Dear Ms. Chrzescijanek:
Two reports pertaining to the above project were forwarded for review by the DEEP Natural Diversity Database (NDDB), one included faunal surveys dated July 2015, prepared by Milone & McBroom and the other was a botanical survey dated September 21, 2016, conducted by Mr. Chris Mangels.

Animals: Northern Metalmark Butterfly
The biological report submitted in July 2015 included a summary of survey work conducted for the Northern Metalmark butterfly. No map of the survey area was provided in that report, only noting that ten acres of the property were surveyed on July 13, 2015. No Northern metalmark butterflies were observed during the survey. This finding is not surprising given that the peak of this species flight period is typically a week earlier than noted in the report and this butterfly is not abundant, even in good habitat. The report concludes Northern metalmarks were not likely to utilize the site therefore expansion of Clarke Business Park southward from Trowbridge Drive is unlikely to encounter or impact the Northern metalmark butterfly. We do not agree with this statement given the botanical surveys conducted by Mr. Mangels indicate that host plant and natural community associated with this butterfly were documented on-site. This butterfly is strongly associated with dry circumneutral (calcareous) forest and there are records of the butterfly in close proximity thus conservation of this natural community will likely benefit this State Endangered butterfly.

We concur with Mr. Mangels *Implications and Recommendations* section of his report. We recommend that if plans for expansion of the industrial park southward moves forward, that development and fragmentation of dry circumneutral forest be minimized to the greatest extent possible. If it has not been already done, determining the full extent of this natural community in order to inform which areas of the site (and to what extent) may be developed without negative impacts, is recommended.

Northern Slimy Salamander
Mr. Mangels botanical report also notes talus forest being on-site. This habitat type is preferred habitat for slimy salamanders (*Plethodon glutinosus*), a State Threatened species. While this species was not identified in the original NDDB screening, new information provided to NDDB on potential habitat for this salamander in Fairfield County has indicated that the talus forest on-site has a significant likelihood of having slimy salamanders.

Slimy salamanders are found under rotting logs and forest leaf litter in moist, mature mixed hardwood forests with a dense canopy. In Connecticut, this species is found on steep, moist, rocky and talus slopes. It does not require pools of water for breeding. This species has been negatively impacted by invasive plant species.

If industrial park expansion is proposed to impact talus forest habitat, we recommend that a herpetologist familiar with the habitat requirements of this species conduct surveys between April and September to determine the extent of this species presence. A report summarizing the results of such surveys should include habitat descriptions, an amphibian species list and a statement/resume giving the herpetologist's qualifications. The

DEEP doesn't maintain a list of qualified herpetologists. A DEEP Wildlife Division permit may be required by the herpetologist to conduct survey work; you should ask if your herpetologist has one. The results of this investigation can be forwarded to the Wildlife Division and, after evaluation, recommendations for additional surveys, if any, will be made.

If this species is found, we typically recommend that trees not be cut in areas containing slimy salamanders and that contiguous areas of young second growth forest be preserved to serve as a buffer zone between development and habitat. As the buffer zone matures, it may provide additional habitat.

Jefferson Salamander Complex
We concur with the July 2015 Milone & McBroom report conclusion that expansion of industrial park southward from Trowbridge Drive is unlikely to encounter or impact Jefferson salamander populations.

Eastern Box Turtle
The eastern box turtle survey as described in the July 2015 report was lacking; it did not include a map of survey areas, included only 8 survey hours, and was conducted in July and August when there is potential for the turtles to be estivating (inactive due to hot temperatures) thus they are difficult to observe. We do not agree with the July 2015 Milone & McBroom report conclusion that expansion of industrial park southward from Trowbridge Drive is unlikely to encounter or impact box turtle populations or habitat given that their report states that habitat looked suitable for this species. Talus forest areas to the west are not ideal for box turtles but flatter areas to the east are likely suitable. Converting preferred forest habitat to development may negatively impact the eastern box turtle given its limited ability to travel long distances to find suitable habitat.

To minimize direct mortality to eastern box turtles, we recommend that harvesting/land clearing be done during the turtle's active season, which is 1 April through 1 November. Conducting land clearing while the turtle is active will allow the animal to move out of harm's way and minimize mortality to hibernating individuals. Additionally, the following recommendations will further minimize potential impacts:

- the logging crew be apprised of the species description and possible presence;
- the immediate area to be harvested each day should be searched for turtles prior to work starting;
- any turtles encountered during construction should be moved out of the way, just outside of the work area. This animal is protected by law and should never be taken off site;
- work conducted during the early morning and evening hours should occur with special care not to harm basking or foraging individuals.

For questions regarding State-listed animal species, please contact Laura Saucier (laura.saucier@ct.gov).

Plants
According to the botanical survey report prepared by Mr. Christopher Mangels and submitted to the Natural Diversity Data Base on September 21, 2016, the following State-listed plant species has been observed within one of the proposed lots for the Francis Clarke Industrial Park expansion (see attached):

- Wild currant (*Ribes rotundifolium*)
  Protection Status: State Special Concern
  Habitat: Rich, rocky woods, slopes, talus. Blooms Fl: Apr – early Jun ; fr: Jun – Sep.

To prevent impacts to this State-listed species, we recommend the following:

1. Prohibit clearing or other forms of disturbance within the extent of the Wild currant population.
2. Amend the property boundaries to transfer the full extent of the Wild currant population to the abutting open space parcel.

For questions regarding State-listed plant species, please contact Nelson DeBarros (nelson.debarros@ct.gov).

Natural Diversity Database information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Database should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Database as it becomes available.

Please be advised that this is a preliminary review and not a final determination. A more detailed review will be necessary to move forward with any environmental permit applications submitted to DEEP for the proposed project. This preliminary assessment letter cannot be used or submitted with your permit applications at DEEP. This letter is only valid for one year.

If you have any additional questions, please feel free to contact me at Laura.Saucier@ct.gov, please reference the NDDB number in the subject line of this letter in any future correspondence.

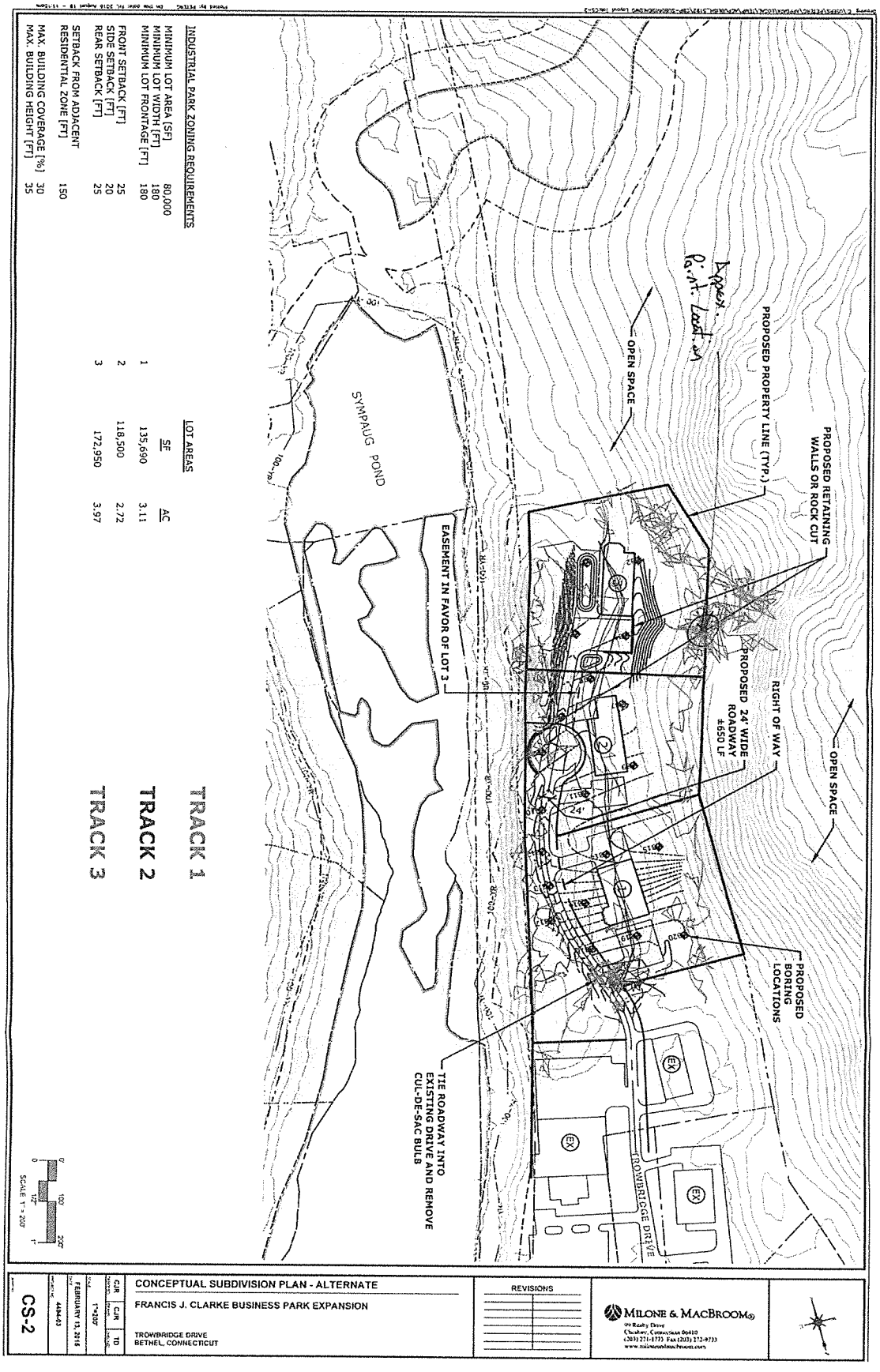
Sincerely,

Laura Saucier
Wildlife Biologist

enclosure

cc. N. DeBarros
L. Brunza
Nelson Tereso-DECD

Figure 1.


PROPOSED PROPERTY LINE (TYP.)
PROPOSED RETAINING WALLS OR ROCK CUT
OPEN SPACE
RIGHT OF WAY
PROPOSED 24' WIDE ROADWAY ±650 LF
PROPOSED BORING LOCATIONS
EASEMENT IN FAVOR OF LOT 3
SYMPAUG POND
TIE ROADWAY INTO EXISTING DRIVE AND REMOVE CUL-DE-SAC BULB
TROWBRIDGE DRIVE
TRACK 1
TRACK 2
TRACK 3
SCALE: 1" = 200'
INDUSTRIAL PARK ZONING REQUIREMENTS
MINIMUM LOT AREA [SF] 80,000
MINIMUM LOT WIDTH [FT] 180
MINIMUM LOT FRONTAGE [FT] 180
FRONT SETBACK [FT] 25
SIDE SETBACK [FT] 20
REAR SETBACK [FT] 25
SETBACK FROM ADJACENT RESIDENTIAL ZONE [FT] 150
MAX. BUILDING COVERAGE [%] 30
MAX. BUILDING HEIGHT [FT] 35
LOT AREAS
SF AC
1 135,690 3.11
2 118,500 2.72
3 172,950 3.97
CONCEPTUAL SUBDIVISION PLAN - ALTERNATE
FRANCIS J. CLARKE BUSINESS PARK EXPANSION
TROWBRIDGE DRIVE
BETHEL, CONNECTICUT
REVISIONS
MILONE & MACBROOM
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773 Fax (203) 272-9733
www.MilaneAndMacBroom.com
CS-2
FEBRUARY 13, 2018
1"=200'
4484-03

Engineering, Planning,
Landscape Architecture
and Environmental Science

MILONE & MACBROOM®

June 21, 2017

Ms. Laura Saucier, Wildlife Biologist
Wildlife Division
Session Woods WMA
P.O. Box 1550
Burlington, CT 06013

RE: Clarke Park Expansion
Trowbridge Drive
Bethel, Connecticut
MMI # 4494-03-1

Dear Ms. Saucier:

On behalf of our client, the Town of Bethel, Milone & MacBroom, Inc. (MMI) submits this response to your comment letter dated May 15, 2017, to Ms. Janice Chrzescijanek, Director of Economic Development. Thank you for your detailed, considered comments. Our collective opinions are presented below in the order used in your letter.

Northern Metalmark Butterfly

The map of the project site, CS-2, was recently forwarded to you via e-mail. You will note it is the same as Figure 1 in Mr. Mangels' Botanical Survey. This was the base map used for all the surveys although the herpetological and wetland surveys ranged farther. It shows the three proposed commercial lots at the end of Trowbridge Drive with anticipated grading to develop a pad for the three buildings.

We believe that our survey of July 15, 2015, was well within the flight period during this year for Northern metalmark; none were observed. The closed canopy forest excludes the preferred nectar plants for this species. Although the botanical survey located the host plant for metalmarks (eastern section of the site), other factors make its presence here unlikely. The exact boundary limits of the described "dry circumneutral forest" in the area were not delineated, but it is centered on the ridgetop and slope east of the development zone, closer to the railroad tracks and pond (Mangels' report). For the most part, or perhaps entirely, the forest will not be affected by the clearing and grading. This area could certainly serve as a mitigation site for metalmark propagation without negatively affecting the proposed development. The clearings around the commercial buildings would likely be stocked with suitable nectar plants. Therefore, we still believe that the proposed development of three commercial building lots will not negatively impact the Northern metalmark butterfly population.

Northern Slimy Salamander

This species was not within our scope of work for biological surveys, which was based upon the original National Diversity Data Base (NDDB) response. Further survey work, at additional cost to the town, would be necessary to determine the salamander's status here. The site does contain a forested talus slope. The talus is quite steep and expensive to develop. As the grading shows, almost none of the talus

will be impacted. The talus formation extends in greater distance in all directions within open space or otherwise undevelopable areas. The forest is not really a mixed hardwood forest, meaning that an evergreen component is included. It is a forest of mixed hardwoods. In our experience, this species is more likely to utilize a forest including Eastern hemlock for cooling, shading, moisture, woody debris, etc. We do not anticipate that slimy salamander will be found in this part of the site. As noted earlier, little or no talus will be directly impacted by the proposed development.

Jefferson Salamander

No additional comment is required.

Eastern Box Turtle

Many more survey hours for turtles were logged than the formal survey reported. The proposed development can incorporate all of the standard turtle protection measures normally suggested by the Connecticut Department of Energy & Environmental Protection (CT DEEP). Please note that relatively little of the site is being proposed for development. There is significant dumping and ATV disturbance in this section of the site as Mr. Mangels notes. Much of the site (and the better parts) will remain as open space.

Plants

Mr. Mangels notes in his report (September 21, 2016) that none of the state-listed NDDB plants were identified on the site or immediate surroundings. He notes that the proposed development zone is quite disturbed due to dumping and ATV traffic. The listed *Ribes* species Mr. Mangels located is far up the talus slope (west) in an undevelopable area; indeed, it may be over the proposed lot line. Part of the *Ribes* or a second specimen could be transplanted to the open space section of the site if CT DEEP thought this is advisable.

The "dry circumneutral forest" is centered on the slope and ridgetop east of the proposed development zone at the end of Trowbridge Drive ("Transitional/Disturbed Section") and the railroad tracks and pond. We continue to believe that the proposed development may proceed without endangering any state-listed plants or critical habitats.

If there are questions and/or comments, please contact me at 203-271-1773.

Very truly yours,

MILONE & MACBROOM, INC.

William A. Root, MS
Senior Project Specialist, Environmental

cc: Ms. Janice Chrzescijanek, Wildlife Biologist

4494-03-1-jn1917-ltr