FRESHWATER WETLAND SERVICES

June 15, 2020

Attn: John Manners
The Casle Corporation
200 Fisher Drive
Avon, CT 06001

Re: Glastonbury Gateway V - Western Boulevard, Glastonbury, CT
Wetland Existing Conditions and Project Impact Report

Mr. John Manners,

FWS is pleased to submit this report detailing the existing wetland conditions as well as he evaluation of the proposed site improvements as they relate to potential wetland impacts at the property known as 280 Western Boulevard in Glastonbury, CT. Site development improvements are depicted on the plan set entitled "Glastonbury Gateway V", 280 Western Boulevard, Glastonbury, CT, plan-set L sheets dated 6.11.20, and S sheets dated 6.12.20, herein referred to the project plans. The proposed project includes the construction of two medical office buildings (Buildings J & K) and associated improvements.

EXISTING CONDITIONS

FWS inspected the property in September of 2019 to review the existing conditions as it relates to the location of wetland resource areas on the property. Immediately adjacent wetland boundaries were delineated in accordance with local and state regulations and marked with sequentially numbered pink flagging.

The topography of the property provides for a high point in the westerly portion of the property which gently slopes to the east and south. The property is forested and abuts the utility Right-of-Way (ROW) and commercial buildings to the south, medical office buildings to the east and north. A wetland system is also located across Western Boulevard to the northwest.

SOILS

The soils mapped by the Natural Resources Conservation Service (NRCS) on the site include the Ellington, Ninigret, Manchester, and Hartford soils series. The following are descriptions of each soil type as presented by NRCS.

The Ellington series consists of very deep, moderately well drained soils formed in loamy over sandy and gravelly glacial outwash. They are nearly level to strongly sloping soils on glaciofluvial landforms, typically in slight depressions and broad drainageways. Slope ranges from 0 to 15 percent. Permeability is moderate or moderately rapid in the surface layer and subsoil, and rapid or very rapid in the substratum. The taxonomic class is coarse-loamy over sandy or sandy-skeletal, mixed, subactive, mesic Aquic Dystrudepts.

The Hartford series consists of very deep, somewhat excessively drained soils formed in sandy glacial outwash. They are nearly level to strongly sloping soils on plains and terraces. Slope ranges from 0 to 8 percent. Saturated hydraulic conductivity is high in the surface layer and subsoil and high or very high in the substratum. The taxonomic class is sandy, mixed, mesic Typic Dystrudepts.

The Ninigret series consists of very deep, moderately well drained soils formed in loamy over sandy and gravelly glacial outwash. They are nearly level to strongly sloping soils on glaciofluvial landforms, typically in slight depressions and broad drainage ways. Slope ranges from 0 through 15 percent. Saturated hydraulic conductivity is moderately high or high in the solum and high or very high in the substratum. The taxonomic class is coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Aquic Dystrudepts.

The Manchester series consists of very deep, excessively drained soils formed in sandy and gravelly glacial outwash and stratified drift. They are nearly level to steep soils on outwash plains, terraces, kames, deltas and eskers. Slope ranges from 0 to 45 percent. Saturated hydraulic conductivity is high or very high in the surface layer and subsoil, and very high in the substratum. The taxomomic class is sandy-skeletal, mixed, mesic Typic Udorthents

Defined by the NRCS soil survey and observed in the field, the soils range from a silty to a coarse sandy soil. The upland soils were noted to be very bright in color, whereas a mucky mineral horizon underlain by a gleyed sub-soil was noted in the regulated wetland areas. Please note that all series are designated as moderately drained or better and do not qualify as jurisdictional wetland soils.

The soils abruptly change with topography from a very bright friable soil, to a soil with a mucky mineral topsoil immediately above gleyed soils. A transition zone was observed that was defined by a soil with more dominant redoximorphic features in the sub soil and reduced thickness of the mucky mineral horizon. There was also a clear transition in vegetation from the upland to the wetland area.

The wetland soils observed on-site and within the utility Right of Way (ROW) more closely resemble the Raypol series which is described by NRCS as very deep, poorly drained soils formed in loamy over sandy and gravelly outwash. They are nearly level to gently sloping soils in shallow drainageways and low-lying positions on terraces and plains. Slope ranges from 0 to 5 percent. The soils have a water table at or near the surface much of the year. Permeability of the Raypol soils is moderate in the surface layer and subsoil and rapid or very rapid in the substratum. The taxonomic class is coarse-loamy over sandy or sandy-skeletal, mixed, active, acid, mesic Aeric Endoaquepts.

Regulated Wetlands

Regulated wetland observed on the property were limited to those identified in the southeast corner of the property in accordance with local and state standards. The wetlands are located at the base of a forested slope, primarily within the utility ROW. The wetland boundary was marked with sequentially numbered pink flags WA100 through WA110 (WA106 through WA109 are located on the property), where the majority of the boundary was identified in the ROW. The wetland boundaries as defined on the project plan are, to the best of my knowledge true and accurate. The wetland is defined as a palustrine mixed emergent and scrub-shrub wetland. It was noted at that time that the vegetation management within the ROW had/has been occurring within and immediately adjacent to the wetland. It was also noted that stormwater discharge from existing developments provides hydrology jointly with groundwater contributions.

An off-property wetland area was noted to the northwest of the project site, across Western Boulevard. This wetland boundary was delineated by others previously for a purpose unrelated the proposed project; and has been shown on the project plans to define the limits of the 100-foot Upland Review Area (URA) that just extends into the proposed work area. Ocular observations of this wetland area reflected it to be configured as shown on the project plans.

Wetland Impacts and Mitigation

The project is designed to have no direct impacts to the wetland resource areas. A retaining wall is proposed adjacent to the wetland, which can be constructed from the upland side that prevents any direct wetland impacts. This wetland system overall appears to be routinely impacted for the utility system vegetation maintenance. Please see sheet L-12.3 of the project plans which includes pictures of the ROW wetland area. Impacts due to its routine vegetative maintenance in addition to its proximity to multiple commercial development sites reduces the functions and values that this wetland area n provides. Considering only a small portion of this wetland is located on the project site, it was determined that improvements to this small wetland area would only provide minimal, if any benefits.

Therefore, it was determined that creating a subsurface gravel wetland (SGW) stormwater treatment system would provide the greatest benefits to the project site as well as downstream wetland areas. Details regarding this design are provided on the project plans, within the Clark Engineering Stormwater Report, and subsequently in this letter report.

Site observations indicated that groundwater breakout does contribute to supply the hydrology for this wetland system. This project as proposed, only proposes to disturb a small portion of the upland area adjacent to this wetland. It is anticipated that the modifications to stormwater flows from development will not impact the overall quality of the wetland area. It is reasonably likely that there will be no or minimal change to the wetland system as a whole. In addition, as the wetland grazes the corner of the property, a relatively small portion of the URA will be impacted as a result of this project. Although no impacts are proposed, due to the proximity of the work to the wetland, alternative project designs were considered.

ALTERNATIVES ANALYSIS

As always, there is the alternative to reduce the size of the buildings and parking areas. This alternative was not considered viable as the requirements of the medical facilities could not be reduced and maintain a viable project. In addition, due to the limited wetland area on the property it was not deemed prudent.

Wetland Alternate "WA" design was evaluated by LADA, P.C. was to maintain the parking area requirements for the use as well as the building mass but modify the layout. Please see the attached Wetland Alternative sketch. This alternative presents a more disjointed parking arrangement and does not allow for the stormwater wetland system to be created. This design causes a parking area to be closer to the wetlands and had many other engineering considerations which made this undesirable. Please see the alternatives discussion submitted as part of the application narrative.

The preferred, presented project design does not impact the wetland while providing a feasible design that provides the cost balance for a more creative and natural approach to managing stormwater instead of basic subsurface or detention basins. As shown on the project plans and described in Clark Engineering Stormwater Report, an advanced LID method for stormwater treatment has been selected. This design was adopted per University of New Hampshire Stormwater Center, Subsurface Gravel Wetlands for the Treatment of Stormwater. This stormwater treatment design provides a more ecologically sensitive treatment methods than standard stormwater basins, etc. The opportunity to implement such as design makes this preferred alternative. It also provides for more vegetative breaks in the parking areas, as well as other engineering and functionality benefits.

In general, this stormwater design is superior to a standard stormwater management in that it constructs a system that contains native vegetation within a treatment train. This train allows stormwater to be processed subsurface which reduces the water temperature of discharged, treated stormwater. In addition, the use of the vegetated bio-filter allows for the uptake of vital nutrients before discharging to nearby wetland resource areas. The end of this treatment design provides for stormwater that reduces impacts on wetland receiving stormwater discharge from the proposed development.

MITIGATION

Mitigation for this project includes a Low Impact Development LID stormwater treatment design. This includes the use of a wetland seed mix in the bottom of the basins and a meadow mix around the stormwater management features. Landscape woody plantings are also proposed as part of the proposed project. The vegetative design will provide for polishing stormwater, a food and nesting source for wildlife, as well as providing an esthetically pleasing landscape.

Other mitigation measures include the use of slope stabilization fabric, temporary stormwater controls during construction, barrier controls such as silt fence and haybales, construction entrances, and limited exposed soils to the maximum extent practicable.

RECOMMENDATIONS & CONCLUSIONS

It is understood that the SGW areas will be lined with an impermeable fabric to maintain hydrological conditions; designed so that stormwater "floods" the system for a 24-hour period before stormwater returns to its base elevation of approximately 4-inches below the wetland soil mix. As the base of the wetland is proposed to be stabilized with a wetland seed mix, it is recommended that the water levels be closely maintained and mechanically controlled as necessary until the seed stock has germinated. Managing the stormwater elevations during this time will prevent the seed stock from washing away before it starts to germinate. In addition, a fine mesh compostable erosion control blanket is recommended to be placed on top of the wetland soil and seed to aid in germination by retaining soil moisture, preventing birds from having direct access to the food source, and will weigh down the seed if there is a rise in water level prior to substantial germination. It is anticipated that successful germination will take anywhere from 2-4 weeks depending on weather conditions. Also, compostable pins may be appropriate in the design due to the presence of perforated piping in the design or as instructed by the designing engineer.

The project plan, Sheet L-6 currently show herbaceous plugs to be installed at the base of the basin. As the basin is designed to return to the standard water level within 24-hours post a storm event, it is anticipated that the wetland soils will likely stay moist due to capillary action, but not be inundated. Some of the plugs chosen require a greater duration of inundation. It is recommended that the wetland seed mix be applied and

managed for 2 full growing seasons. If adequate coverage has not been achieved by the end of the second growing season, the project wetland scientist shall evaluate the site conditions and specify plug plantings to finalize stabilizing the bottom of the basin. Therefore, no plugs are recommended to be installed at this time.

It is also recommended that all seed mix areas be maintained in a manner to promote survival of the intended species. The goal is to eliminate any colonization of invasive or aggressive species until the intended species colonize the area. This may be accomplished by increased maintenance during the 2-years post completion. The bottom of the basins are recommended to be surveyed in the spring and the fall for the establishment of any invasive species. Any invasive species observed shall be immediately removed and properly disposed.

It may be appropriate to substitute the Meadow Mix for the side slopes with a wildflower seed mix. If a wildflower seed mix is applied, it is recommended that the area be mowed on a schedule to encourage desired species growth. It is recommended that the area be mowed prior to June 1st to "knock down" more aggressive species faster growing species, providing light and nutrients for the intended slower growing species during the growing season. Mowing height shall be approximately 8-inches above the soil surface and completed for the first 2 years post establishment. A second mowing is recommended in the late fall and is recommended to be part of the long-term maintenance for the property. Long-term maintenance would require this area to be mowed annually, greatly reducing landscaping efforts while providing an esthetically pleasing landscape.

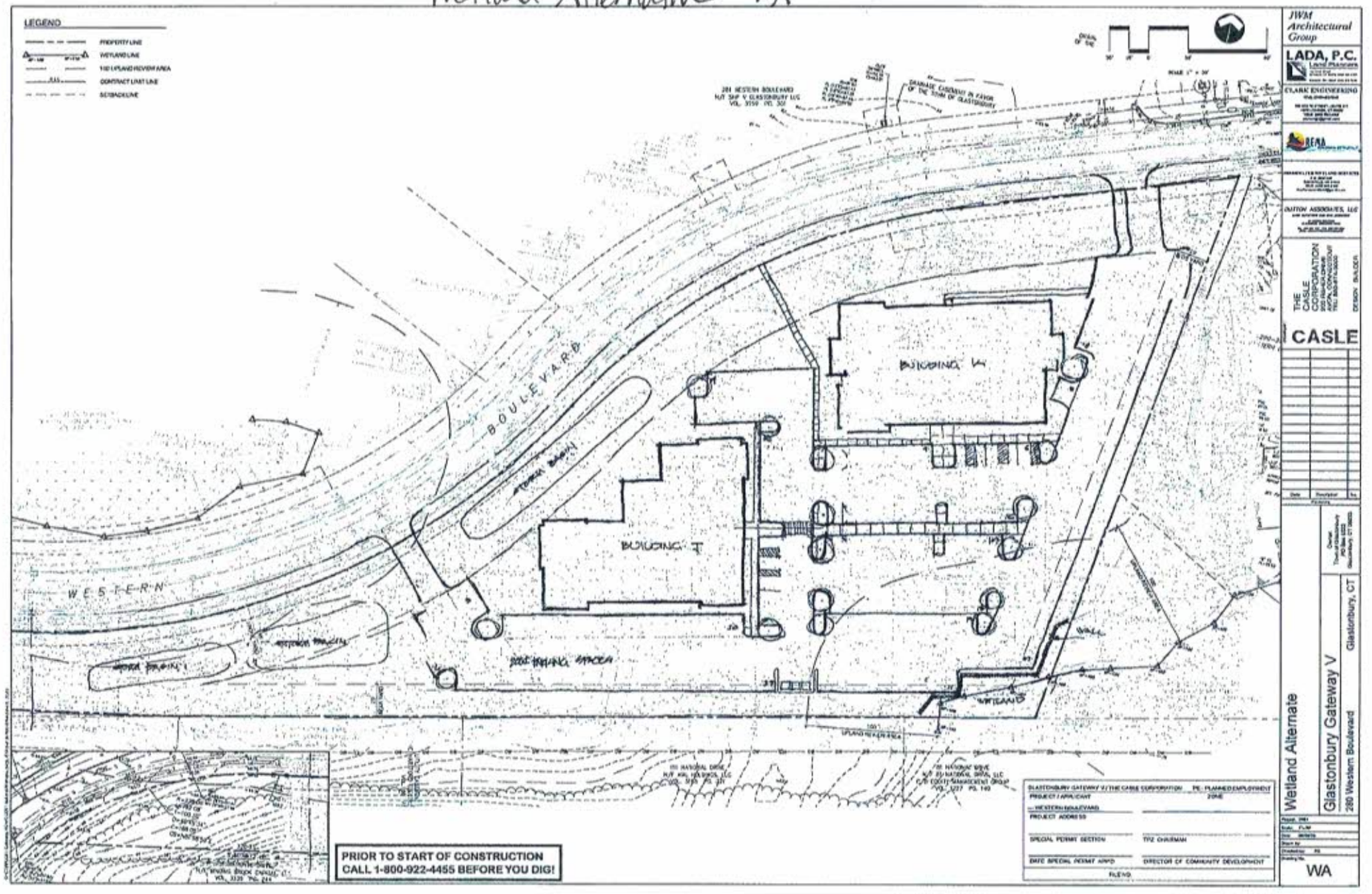
It is my professional opinion that the use of LID stormwater management design as well as standard mitigation strategies will preserve the functions and values of the adjacent wetland. In addition, utilizing such a design will provide enhanced stormwater management versus standard design practices. As always, please feel free to contact me at 413-695-2195 or freshwaterwetland@gmail.com with any comments or questions.

Sincerely,

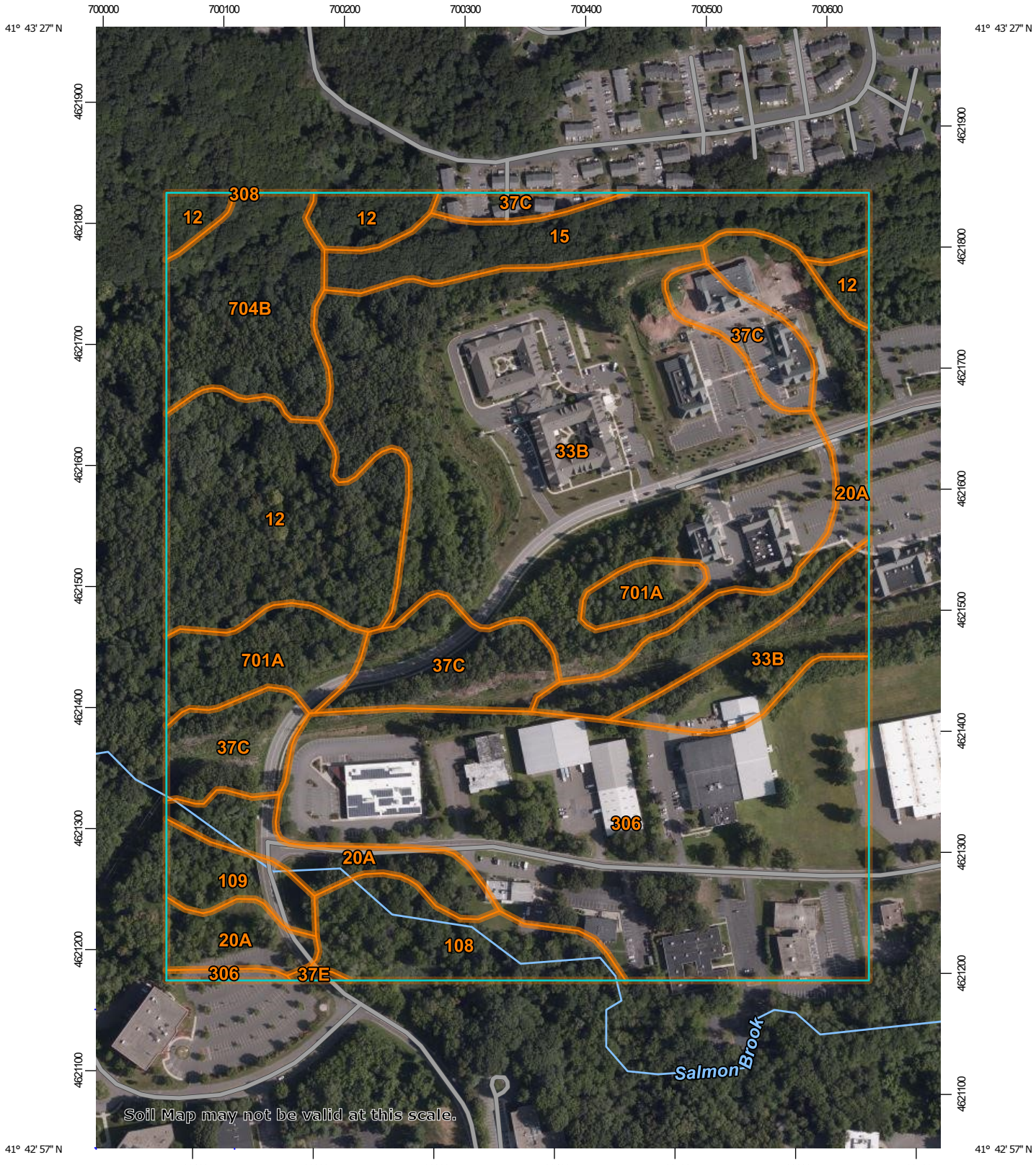
KATE BEDNAZ, PWS #1906
FRESHWATER WETLAND SERVICES
Registered Soil Scientist | President

ATTACHMENTS: NRCS SOIL MAP, WETLAND ALTERNATIVE DESIGN "WA"
CC: LADA, P.C.
CLARK ENGINEERIN

Wetland Alternative "WA"



Soil Map—State of Connecticut
(Glastonbury Gateway V - Western Boulevard, Glastonbury, CT)



Map Scale: 1:4,510 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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 19, Sep 13, 2019

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

Date(s) aerial images were photographed: Jul 15, 2019—Aug 29, 2019

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam	9.9	10.6%
15	Scarboro muck, 0 to 3 percent slopes	4.9	5.2%
20A	Ellington silt loam, 0 to 5 percent slopes	9.3	9.8%
33B	Hartford sandy loam, 3 to 8 percent slopes	27.1	28.8%
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	7.4	7.9%
37E	Manchester gravelly sandy loam, 15 to 45 percent slopes	0.1	0.1%
108	Saco silt loam	3.7	3.9%
109	Fluvaquents-Udifluvents complex, frequently flooded	1.5	1.6%
306	Udorthents-Urban land complex	21.6	22.9%
308	Udorthents, smoothed	0.0	0.0%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	3.6	3.8%
704B	Enfield silt loam, 3 to 8 percent slopes	5.0	5.3%
Totals for Area of Interest		**94.0**	**100.0%**

● Soil & Wetland Studies
● Ecology ● Application Reviews
● Listed Species Surveys ● GPS
● Environmental Planning & Management
● Ecological Restoration & Habitat Mitigation
● Expert Testimony ● Permitting

VIA EMAIL

June 15, 2020

LADA PC
104 West Street
Simsbury, CT 06070

ATTN: Philip E. Doyle

RE: ***Listed Species Survey***
Proposed Glastonbury Gateway V Commercial Facility
280 Western Boulevard, Glastonbury, CT

REMA Job No.: 20-2262-GLA32

Dear Mt. Doyle:

At your request, REMA Ecological Services, LLC (REMA), is providing herein the results of a targeted survey for a Connecticut-listed plant species reported from the vicinity of the subject site, in a letter from Karen Zyko of the CT DEEP's Wildlife Division, dated February 21st, 2020.

This information is needed as part of an application before the Town of Glastonbury Conservation Commission, which also acts as the Town's Inland Wetlands & Watercourses Agency (IWWA), for the above-referenced development proposal. This report includes descriptions of the habitats on the subject site, a 4.83-acre parcel slated as Phase V of the Gateway Commercial/Industrial Park. A vegetation inventory as well as representative annotated photographs of the site are included as attachments to this report.

1.0 INTRODUCTION

The targeted plant species is *Lygodium palmatum,* Hartford Climbing Fern. In both Connecticut and Massachusetts its State Status is "Species of Special Concern" with a rarity rank of S3 (probably at risk).

The CTDEEP letter also states that two Special Concern reptiles have also been recorded from the site vicinity: smooth green snake (*Opheodrys vernalis*) and Eastern box turtle (*Terrapene c. carolina*). They are both highly mobile and cryptic species. If found, avoiding construction activities at that specific sighting location would not always prevent harm, although green snake would typically quickly flee from construction activities. Because they are so well camouflaged, and often hide under vegetation, there is a substantial likelihood that they would not be found during a herptile survey, even if present. No survey will be conducted for them, but protective measures will be taken during construction, since habitat is quite suitable, following the established CT DEEP protocols. Eastern box turtle home ranges are usually less than five acres (2 hectares) (Mancuso 2011), so the site is not too small for them.

The electric right-of-way (ROW) located just off-site to the south, is also suitable habitat for the eastern box turtles, and quite often they are found in ROWs throughout Connecticut. In the past, before Western Boulevard was constructed (circa 2010), movement to the west and northwest was unfettered, to larger blocks of suitable habitat. Today, should box turtles exist at the site and along the off-site ROW, movement to and from the roughly 50 forested acres owned by Town of Glastonbury, located across Western Boulevard, has in all likelihood been somewhat hampered due to the roadway, but cannot be ruled out. The curbs along the roadway, while not ideal, can still be traversed by an adult turtle.

It should be noted, that on June 10, 2020, an +/- 18-year old male box turtle, was observed roughly 1/3 of a mile to the west of the site, along the corridor of the new multi-use trail currently under construction. It is likely that a small population of box turtles is present in that general locality, along the Salmon Brook and its riparian wetlands.

CTDEEP also mentioned potential adverse impacts to two state-listed fish species in the downgradient watercourse, Salmon Brook, which is altogether off-site: the Endangered burbot *(Lota lota*), and the state Special Concern blueback herring (*Alosa aestivalis*). It will

be up to the wetlands agency and the town to make sure that stormwater management in Phase V is state -of-the art, and that construction is rigorously monitored from an erosion control and thermal impacts standpoint, to protect sensitive resources in Salmon Brook.

While REMA's scope of work for this NDDB search did not include the downstream aquatic fauna, our review of the stormwater management BMPs would indicate that the site's system has been designed in accordance with CTDEEP's 2004 Stormwater Quality Manual. After discharge from the site to the existing drainage system within Western Boulevard and to the wetland across the roadway and to the northwest, the pathway of stormwater to Salmon Brook is sufficiently long, over 1,350 linear feet to Salmon's Brook southernly flowing unnamed perennial tributary. Therefore, it is reasonable to conclude that the development of the subject site will not have an adverse impact upon the aquatic resources associated with the Salmon River or its listed finfish.

2.0 TARGET PLANT SPECIES DESCRIPTION

The target plant *Lygodium palmata* (Hartford climbing fern) is the only species to occur in Connecticut in this largely tropical family, Lygodiaceae (formerly Schyzeae). It has a wide range, from southern New Hampshire where it is extremely rare, south to Mississippi and west to Ohio. This unusual fern has many pairs of hand-shaped pinnules (leaves) each with five to seven fingerlike lobes on a branching curving rachis (stem). The rachis is four or more feet long, wiry, smooth and brittle. Sterile pinnules are untoothed, and about two inches long. Fertile pinnules are borne only at the branching tip of the rachis, and are more deeply and irregularly cut. The sterile leaflets are evergreen, though the fertile leaflets are not.

Climbing fern grows well in full sun or partial shade, but not in deep shade. It requires acidic soil, rich in organic matter, either moist or wet. Streambanks, ravines, swales, bogs, and swamps, are all potential sites. It is often associated with mountain laurel.

3.0 SEARCH METHODS

A roughly two-hour search was conducted on March 17th, 2020, before leaf-out. The optimal time for a survey is outside the growing season, because the fern's evergreen foliage will

stand out well against a background of gray and brown, and will be easier to spot than it would be among other green foliage. The survey route followed the forest perimeter because the species needs at least a moderate light level; it will not be able to grow within dense, shaded forest, but does need other vegetation such as saplings or trees, for support. The search included shrubs and shrub mounds along the southern electric right-of-way to the south, and on the grassy slope bordering Western boulevard. Visibility through the interior of the woods was very good in mid-March. Several passes through the western and central forest were sufficient to rule out presence of the target fern in clearings or along the right-of-way.

A vegetation/habitat survey was also done on June 13th, 2020, since NDDB plant surveys always include compilation of a list of other plant species observed at the site, but many plants were not yet detectable in mid-March. Other than providing assurance of the searcher's competence, compilation of this list also increases the likelihood that other rare plant species, not yet entered into the CTDEEP database, will be observed and recorded, if present. It also improves understanding of habitats on the site, which helps with making recommendations on conservation of the listed species.

4.0 HABITATS SURVEYED

Maturing, second-growth forest occupies the central part of this triangular, pie-shaped parcel, a narrow strip at the west end, and five hundred feet wide at the east end. Meadow and scrub-shrub habitat are on the perimeter: to the south, in the electric right-of-way (ROW) and to the north, bordering Western Boulevard (also see annotated photographs, Attachment B).

4.1 Forested Habitats

On the west side of the site, the logged edge zone of the ROW grades into a narrow, but minimally disturbed dry, maturing oak-hickory forest. It has the characteristic native herbs of this forest-community, such as Solomon's Seals. Proceeding easterly, the forested swath broadens, and the soils grow gradually moister. The proportion of white pine increases until it is dominant. Moving easterly, young red maple becomes co-dominant with the white pine.

Then pine drops out and big-tooth aspen and pin oak join the forest community, which has moderately well drained soils.

The forest in the broad, eastern portion of the site is dominated by red maple and pin oak (several over 30" dbh), with a thick, healthy shrub layer of spicebush and lesser amounts of invasive glossy buckthorn. The mature pin oak trees are mostly along the eastern edge of the Phase V parcel. Princess pine (*Dendrolycopodium obscurum*), and sensitive fern are common in the herb stratum. A large patch of New York fern occurs in the southeastern corner, near the transition to the delineated wetlands in this parcel, a small lobe extending from the large preserved wetland in the southwestern Corner of the Gateway I Section. These wetlands, to be preserved, have shallow ponded water, saturated soils, deep organics, skunk cabbage and cinnamon fern. *Phragmites* is dense along the unshaded ROW.

4.1.1 Relevance to NDDB Species

Under existing conditions, forested habitat on the site is suitable for Eastern box turtles, with dense vegetation, ample shrub cover, woody debris, leaf litter, areas of moist soils, and organic soils within the wetland.

In well-drained forest, on the western side, the thick litter layer in an oak-dominated forest is rich in arthropods eaten by turtles, and they often dig shallow "forms" under the leaves, to hide during the heat of the day. The moisture regime in the well-drained forest is too dry for the target climbing fern. Light levels in the forest interior are also too low for climbing fern, except on the forest edges. They could climb up the young black birch and gray birch saplings on the western perimeter.

In the central and eastern forest, the moisture level is suitable for climbing fern, and light levels are not as low as in the white pine forest. Search effort was high here, especially where vegetation had been cleared for the ROW. The moist moderately well-drained, soils, and the adjacent even wetter regulated wetlands, would also be important for Eastern box turtles in hot dry weather, if they occupy the site.

4.2 Meadow and Shrubland Habitats

4.2.1 Utility Right of Way

While the utility right-of-way is located off-site immediately to the south, it was surveyed because of its relevancy to the targeted listed species. The forested edge ecotone is suitable habitat for the Hartford climbing fern, and the ROW is also suitable habitat for box turtle and smooth green snake. It has a meadow cover type under the lines and a recently logged edge zone with shrubs or forest or open habitats: arrowwood, maple-leaf viburnum, and winterberry. The herb stratum here is sparse, but small piles of woody debris have habitat value, and some tall forbs like goldenrods have colonized. Low shrubs in the central swath of the ROW under the wires include patches of lowbush blueberry, sawbriar (a.k.a. roundleaf greenbrier), and aromatic sweet fern. Native warm season grasses, prickly dewberry, and Pennsylvania sedge dominate the meadow, along with haircap mosses and cinquefoils, bracken fern, and patches of sheep sorrel. A several square meter patch of the uncommon ledge spike-moss (*Selaginella rupestris*) (a.k.a. northern selaginella) will not be harmed as it is off-site and in the middle of the ROW.

4.2.2 Roadside Swath

The thirty- to fifty-foot wide swath of roadside meadow and shrub habitat, along Western Boulevard is diverse, with very few invasives. The proportion of woody species increases, and soil moisture level also increases, proceeding westerly. The grade is variable, nearly level at the far west end, and quite steep in a short central section. Warm season grasses include little blue stem, deer tongue grass, bent grasses, sweet vernal grass, and poverty oat grass, intermixed with meadow mosses, cinquefoils, goldenrods. The shrub stratum has a large patch of low-growing blackberries (over 500 square feet), some staghorn sumac, spiraeas, occasional autumn olive, sweet fern, and birch seedlings and saplings.

A population of about thirty shrubby St. John's Wort (*Hypericum prolificum)* can be found here. This relatively low (under seven feet) symmetrical shrub has abundant, showy yellow flowers that have great appeal to pollinators. It is native to New York state, occasionally naturalized and planted in this state. Also, of value from the standpoint of pollinators, are multiple patches of wild bergamot, an outstanding bee plant. Goldenrods, summer daisies, and native asters are present as well, and the diverse grasses are of value as larval host plants as well as for seed-eating songbirds. A small population of *Carex tenera* is a species of

regional conservation concern (*Flora Novaeangliae*, 2013 by Arthur Haines, Native Plant Trust), though not on the Connecticut listed-species list.

4.2.3 Relevance to NDDB Species

The target fern could potentially grow over shrubs in the open cover types, and soils are moist enough, except at the far western end of the parcel, but the fern was not detected during our surveys.

Both the eastern box turtle and potentially the smooth green snake would also use the site's sunny open areas with meadow and low scrub-shrub cover type are well suited for use by turtles for sunning, nesting, for foraging for meadow invertebrates. Ample low-growing fruit (blackberries and dewberries) are also available for Eastern box turtle. Woody debris piles along the ROW are good foraging areas for both reptile species.

5.0 POTENTIAL IMPACTS AND PRECAUTIONARY MEASURES

The applicant would propose the usual procedures recommended by CTDEEP when Eastern Box Turtles have been recorded on or near a site: that a herptile expert be present as construction begins and remain close by as initial grubbing occurs in natural habitat, watching the ground around the equipment, able to remove any turtle from harm's way, onto the adjacent ROW. Barrier fencing would be erected after a particular construction area was cleared to prevent reentry from the ROW. The electric right-of-way off-site to the south, and open space to the northwest are the areas from which reentry could occur, as discussed above. Note that green snakes move very rapidly and will flee from construction equipment.

Connectivity among sub-populations is important for the listed reptiles. Eastern box turtle is known to suffer adverse effects such as poor egg viability if inbreeding occurs due to habitat fragmentation. The subject parcel is currently somewhat suitable for crossing. While traffic during certain times of a weekday may be problematic, curbs along Western Boulevard are such that this road does not currently constitute an unpassable barrier, especially for adult turtles, during seasonal movements in search of nesting sites, or to find mates.

REMA recommends the saving and stockpiling of native topsoil in areas to be heavily graded or converted to buildings or parking areas, in view of the low numbers of invasives and the

high native plant diversity, presumably also high microbial diversity. The top four to six inches of topsoil, from the northern roadside swath along Western Boulevard is very well suited, after brief stockpiling, to placement on the upper slopes and non- saturated portions of stormwater management areas and in the western and eastern side-setbacks. Guidelines for handling topsoil and mulch, recently issued by the Connecticut Invasive Plant Council, are attached. They include specific instructions for stockpiling salvaged topsoil (Attachment C).

The salvaged topsoil will contain innumerable plant seeds and other plant, invertebrate and microbe propagules, such that we are hopeful that most of the suite of plant species currently supporting a community of pollinators and other invertebrates on the site, will continue to do so. Hopefully the wild bergamot, and the shrubby St. John's wort will reappear in those areas, or they could be salvaged before topsoil removal and transplanted.

Forest topsoil is suitable for lawns and tree plantings. Glossy buckthorn, the only common woody invasive in the forest, will not be a problem in a mowed lawn, so reintroducing buckthorn seeds from the soil seed bank will not be an issue. But forest topsoil should not be respread in any areas where natural vegetation is planned, if it is not to be mowed or cut on a regular basis.

6.0 CONCLUSION

In conclusion, the target plant species was not observed. However, while its presence is highly unlikely, several habitats on the subject site, and immediately off-site within the electric right-of-way, are *potentially* suitable for climbing fern, and for the target reptiles. Even if the Eastern box turtles and the smooth green snake do not routinely use the site, connectivity between the site and undeveloped Town-owned land to the west and northwest is possible for these species, and certainly for other non-flying wildlife species. With regard to the two "listed" finish associated with the Salmon Brook, the site proposes more than adequate erosion and sedimentation controls to protect their habitats during construction, and the proposed stormwater management system follows all of the applicable guidelines, and will be protective of the water quality of the receiving waters post-construction.

A few recommendations have been provided, following the typical CT DEEP protocols for dealing with the herptiles during construction. Also, because the roadside swath is a

relatively high quality meadow/shrub community with some species of value to pollinators, and very few invasives, it is recommended that topsoil and propagules from this area, be reused where naturalized vegetation is suitable, such as on the well-drained perimeter of stormwater management area, and along herptile potential travel routes.

Please call us if you have any questions on the above or need further assistance.

Respectfully submitted,

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Attachments: A: Vegetation inventory
B: Annotated Photographs
C: BMPs for Movement of Topsoil

8.0 REFERENCES

Baker, J.M. 2009. Home range movement of the eastern box turtle (*Terrapene carolina*) in East Central Illinois. Masters Thesis. Graduate College of the University of Illinois. Urbana-Champaign.

Brumback, W.E. and Jessica Gerke. 2013. Flora Conservanda: New England 2012. The New England Plant Conservation Program (NEPCoP) List of Plants in Need of Conservation. Rhodora 115, No. 964 (313-408).

Dodd, C. Kenneth, Jr. 2001. *North American Box Turtles, A Natural History*. University of Oklahoma Press, Norman. 231 pp.

DeGraaf, R.M. and M. Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution. University Press of New England. 482 pp.

Ernst, C.H., J.E. Lovich, and R.W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press. 578 pp.

Arthur Haines, Arthur. 1913. Flora Novae-Angliae. Yale University Press & New England Wildflower Society. 973 pp.

M.L. Fernald. 1950. Gray's Manual of Botany, 8th Edition. American Book Company. NY. 1632 pp.

Gleason & Cronquist.1991. Manual of Vascular Plants of NE US and Adjacent Canada. New York Botanic Garden, Bronx, NY. 910 pp.

Greenspan, S.E., E.P. Condon, and L.L. Smith. June 2015. Home range and habitat selection in the eastern box turtle (*Terrapene carolina carolina*) in a longleaf pine (*Pinus palustris*) reserve. Herpetological Conservation Biology 10(1):99-111.

Klemens, M.W. 1993. *Amphibians and Reptiles of Connecticut and Adjacent Regions.* CT DEP Bulletin No. 112.

Mancuso, A. and T. Green. 2011. Factors affecting the home range of eastern box turtles at Brookhaven National Laboratory. Sienna College (SULI) and Brookhaven National Laboratory.

Raposa, K.B. and T.E. Kutcher. 2007. Home Range and Habitat Use Patterns of Eastern Box Turtles (*Terrapene carolina carolina*) on Prudence Island, Rhode Island. Narragansett Bay Research Reserve. Technical Report Series 2007:1.

Tucker, Gordon. 1995. The vascular Flora of SE Connecticut. Memoirs of the CT Botanical Society No. 3. 205 pp.

ATTACHMENT A: VEGETATION INVENTORY

HERBS:

Anthoxanthum odoraturm	sweet vernalgrass
Agrostis perennans	autumn bentgrass
Arisaema triphyllum	Jack-in-the-pulpit
Artemisia vulgaris	mugwort
Carex spp.	Laxiflorae sedges
Carex pensylvanica	Penn sedge
Carex swannii	swann's sedge
Carex tenera	delicate quill sedge
Chimaphila maculata	spotted wintergreen
Danthonia spicata	poverty oat grass
Dennstaedtia punctilobula	hay-scented fern
Denrolycopodium obscurum	princess pine
Dicanthelium spp.	rosette-panic grass
Dryopteris carthusiana	spinulose wood fern
Eurybia divaricata	white wood aster
Festuca ovina	sheep fescue
Gaultheria procumbens	Eastern wintergreen
Geum canadensis	white avens
Hieracium spp.	hawkweeds
Lespedeza capitata	bush clover
Monarda cf. fistulosa	wild bergamot
Onoclea sensibilis	sensitive fern
Osmundastrum cinnamomeum	cinnamon fern
Parathelypteris noveborecensis	New York fern
Panicum clandestinum	deer tongue grass
Potentilla canadensis	Canada cinquefoil
Potentilla simplex	European cinquefoil
Pteridium aquilinum	bracken fern
Physalis sp.	ground cherry
Maianthemum racemosum	false Solomon's seal
Selaginella rupestris	ledge spike-moss
Scyzachyrium scoparium	little blue stem
Sisyrinchium spp.	blue-eyed grass
Symplocarpus foetidus	skunk cabbage
Solidago rugosa	rough-stem goldenrod

Solidago spp.	goldenrods
Symphiotrichum spp.	asters
Verbascum blattaria	moth mullein
Verbascum thapsus	common mullein

SHRUBS AND WOODY VINES:

Celastrus orbiculatus	Asiatic bittersweet
Comptonia peregrina	sweetfern
Corylus cf.americana	American hazelnut
Gaylussaccia baccata	black huckleberry
Hypericum prolificum	shrubby St. John'swort
Ilex verticillata	winterberry viburnum
Lindera benzoin	spicebush
Lonicera morowii	morrow's honeysuckle
Kalmia angustifolia	sheep laurel
Kalmia latifolia	mountain laurel
Rhamnus frangula	glossy buckthorn
Rhus typhina	staghorn sumac
Rosa multiflora	multiflora rose
Rubus hispidus	bristly dewberry
Rubus flagellaris	prickly dewberry)
Rubus allegheniensis	Allegheny Blackberry
Smilax rotundifolia	roundleaf greenbrier
Toxidendron radicans	poison ivy
Vaccinium corymbosum	high-bush blueberry
Vaccinium vacillans	low-bush blueberry
Viburnum acerifolium	maple-leaf viburnum
Viburnum dentatum	arrowwood viburnum
Vitis aestivalis	summer grape
Vitis labrusca	fox grape

TREES:

Acer rubrum	red maple
Betula lenta	black birch
Betula populifolia	gray birch
Carya glabra	pignut hickory
Hamamelis virginiana	witch hazel

Fagus grandifolia	American beech
Juniperus virginiana	red cedar
Nyssa sylvatica	black gum
Pinus strobus	white pine
Prunus serotina	black cherry
Quercus alba	white oak
Quercus palustris	pin oak
Quercus rubra	northern red oak
Quercus velutina	black oak
Sassafras albidum	Sassafras

NOTE:

- Plant list was compiled on March 17th, and June 14th, 2020, by Sigrun N. Gadwa, MS, PWS, for REMA Ecological Services, LLC

ATTACHMENT B: Gateway Phase V, 280 Western Boulevard, Glastonbury, CT

Photos taken by REMA Ecological Services, LLC, March 17, 2020

Photo 1: Northerly view of dry upland forest and roadside meadow adjacent to Western Boulevard. Far west end of parcel.

Photo 2: Perennial sedge in heavy-seeding Laxiflorae tribe by woody debris with moss cover (upper right) & turkey fungus in western roadside meadow swath by forest edge.

Photo 3: Pole-size evergreen (white pine) woods on S. side of Western Boulevard in the central portion of the parcel, where bank is steep and less than 40 feet wide.

Photo 4: Shrubs, saplings & warm season native grasses and very few invasive plants on the open roadside slope along Western Boulevard. REMA recommends salvaging/reusing topsoil with its seedbank.

ATTACHMENT B: Gateway Phase V, 280 Western Boulevard, Glastonbury, CT

Photos taken by REMA Ecological Services, LLC, March 17 & June 13, 2020

Photo 5: Moist upland forest occupies much of the eastern part of site. Red maple and princess pine are shown in photo near edge. This is suitable habitat for the target plant, climbing fern, which was not found.

Photo 6: Easterly view of the electric ROW, just off-site and south of the parcel. Recently logged swath at left. ROW habitat in Glastonbury is documented habitat may provide connectivity for the two target herptiles.

Photo 7: In the ROW, a patch of uncommon, but not state-listed spikemoss *(Selaginella rupestris)* was found, a primitive vascular plant. Photo also shows wintergreen with a strong minty aroma and flavor.

Photo 8: June 13, 2020. A large blackberry patch (preferred food for box turtles), saplings & warm season native grasses (deer tongue grass in foreground) in eastern part of non-forested habitat along Western Blvd.

ATTACHMENT C:

Preventing the spread of invasive plant species:

Guidelines for Best Management Practices for movement of topsoil and gravel fill, mulch and equipment in Connecticut.

Revised March 2020

Dispersal of Invasive Plant species in Biologically Contaminated materials:

Many invasive plant species spread naturally through seed dispersal by wind, water or wildlife. However, others disseminate inadvertently through human activities such as the movement of excavated soil, sand, gravel, and mulches; or through the movement of mowing, logging, maintenance and excavation equipment from invaded sites to uninvaded sites.

Soil, sand, gravel, and mulches that are contaminated with viable seed or other propagules of invasive plant species (such as root or stem fragments from which a new plant can grow) can be considered Biologically Contaminated in that the transfer of this material to a site free of invasive plants will aid in the dispersal of the invasive species, and disrupt or damage the biological diversity of the native flora and fauna.

Adverse impacts and costs associated with Invasive Plants:

Invasive plant species adversely affect native ecosystems and may cause harm to human health or economic well-being. Invasive plants adversely impact ecosystems in a variety of ways by crowding out native plants and reducing plant diversity which results in a loss of food and shelter for wildlife and alterations in nutrient and water availability. Some invasive species such as giant hogweed present health risks to people while others such as Japanese barberry create habitats that favor rodents associated with elevated levels of Lyme disease-transmitting deer ticks. Other invasive plants (including mugwort and certain species of thistle and knapweed) are problematic weeds that cause economic damage in agricultural fields and grasslands in addition to the damage they cause in native habitats.

Some invasive species can be very destructive and problematic in the built environment as well. Vines and large shrubby invasive species in particular impair sight lines on roads, climb on and obscure street signs, and overgrow utility installations and infrastructure.

General principles for pro-active control of invasive plant spread

Since many invasive species are very difficult to eradicate once introduced, the most effective management strategy is to prevent invasive plant species from spreading into new habitats. Preventing the initial spread of invasive plant species is easier and less expensive than remediating a landscape after the invasive plants become established.

Once an invasive species spreads to new habitat, early detection and rapid response is the best course of action for preventing establishment. By detecting an invasion early and reacting quickly the cost of remediation can be greatly reduced.

Concerns associated with movement of fill, mulch and equipment:

These **Best Management Practices (BMPs)** were developed to assist landowners, work crews and supervisors in preventing the introduction and spread of invasive plant species on disturbed and managed land. The risk of inadvertent spread of invasive species is whenever materials (e.g. soil fill, gravel, mulch) and equipment are moved and natural plant cover is disturbed or removed; circumstances which are commonly associated with residential or commercial construction projects, road work and some agricultural management activities. This movement of materials and equipment spreads not only seeds but also viable stem and root fragments that can readily sprout to invade new habitat.

Roadsides provide a desirable habitat for invasive plants due to ample sunshine, disturbed and bare soils, and moist drainage channels. If bare areas are present or if vegetation is eliminated due to herbicide treatments, it is important to reestablish desirable vegetation, such as turfgrasses or native plants, before non-native plants invade the area.

The three keys principles in preventing the inadvertent spread of invasive plant species are AVOID, MINIMIZE, and MITIGATE. Whenever possible AVOID moving invasive species into uncontaminated sites. If that is not possible MINIMIZE the movement and impact through inspection, and always follow through with MITIGATION using quick remedial action.

Best Management Practices (BMPs):

Planning Pre- and Post- Growing Season

1. Start by hiring or appointing a competent invasive plant expert to coordinate invasive plant identification, training of work crews, pro-active site practices, species control, and follow-up monitoring.
2. Develop a plan to identify and map work areas with new and existing areas of invasive plants. Keep the entire crew engaged in the identification of new areas. It is much easier to eradicate a small, new area of invasive plants than an established, large one. Establish a schedule and prioritize your approach depending on the best time to control.

   The online invasive plant mapping database, EDDMapS has a map query function (https://www.eddmaps.org/tools/query/) that enables the downloading of site-specific invasive plant records for each Town in Connecticut. This database can be useful (particularly for determining if uncommon invasive species are nearby), but note that it is not a substitute for onsite examination because many records are not yet posted due to time-lags in the verification process, or because there has been no reporting for most sites.

3. As needed, develop species-specific control plans that include when to use herbicides or when to mow and/ or control in the vegetative phase. Repeat control for aggressive species, especially perennials.
4. Monitor work areas after soil disturbance and/or control treatment for at least two years (Note: some species like multiflora rose, Japanese stiltgrass have very long-lived seeds and will require much longer monitoring periods). Return to re-treat, as needed.

Soil and Excavated Material from site of origin: "Top" material - topsoil, gravel, etc - is frequently contaminated with invasive plant propagules such as seeds or rhizomes (underground stems, small fragments of which can sprout). Screened topsoil may be free of larger rocks, but it contains seeds, usually from several sites where soils were excavated.

1. Minimize soil disturbance and monitor excavation sites for emerging invasive species for at least two years.
2. If possible, avoid transporting soil, fill, stone, hay, or other materials (see HANDLING EXCAVATED MATERIAL FROM BIOLOGICALLY CONTAMINATED SITES below). If moving these materials is necessary, first verify that they are free of invasive plant fragments or seeds, and monitor the site with this deposited material for emergence of invasive plants for at least two years. Respond rapidly to any invasive plants found during monitoring.
3. Stabilize disturbed soils as soon as practical with acceptable seeding and mulch.
4. Do not use excavated material elsewhere unless it is free of invasive plant fragments or seeds.
5. Wherever possible, avoid excavation in areas containing Japanese knotweed, giant knotweed, purple loosestrife, mugwort, swallowwort, and phragmites. Plants will emerge from the root fragments of these extremely difficult to control species.

INSPECTION & MONITORING:

1. Inspect sites where soil and other fill or mulch is to be introduced. Record presence of invasive species already present. Use of a mapping tool such as EDDSmaps, iMapInvasives or similar free online-tool which also has an App may be of use, but is not a substitute for field examination. Treating invaded areas before introducing new material is recommended.
2. Inspect soil and gravel fill prior to movement. Before moving soils or gravel, inspect the area of origin (including but not limited to, surrounding ditches, top soil piles, gravel/sand piles, fence rows, roads, easement, rights-of-way, working area, storage areas, and buffer zone surrounding the entire area).
3. Inspect soils and gravel fill prior to spreading on new site.
4. Monitor sites where new fill or mulch is introduced. Treat newly emerging invasive species immediately. Monitor the site for at least two years, and until a desirable cover is established

Manage existing topsoil and dead plant material to reduce contamination by invasive plants.

1. Develop topsoil management plans on all projects that include grading or earthwork, prior to soil disturbance.

2. Save local existing, invasive-free topsoil for reuse. However, if topsoil and duff are found to be contaminated with invasive plants, do not reuse this material on a new site. Instead, a mitigation plan is in order (See HANDLING EXCAVATED MATERIAL FROM BIOLOGICALLY CONTAMINATED SITES)..
3. Identify on the worksite plans, where local topsoil and dead plant material should be:
    a. Removed or excavated
    b. Stockpiled
    c. Reapplied

4. When excavating local topsoil and removing duff material, minimize handling of the material to reduce soil compaction and detrimental impacts on microorganisms and soil health.
5. Stockpile clean, local topsoil and duff material in windrows no taller than ten feet for local topsoil and five feet for duff. Implement temporary erosion control measures to reduce the likelihood of invasive plant establishment and loss of material.
6. Seed local topsoil stockpiles that will remain in place for over six months with a fast-growing non-invasive (preferably native) plant species to maintain soil microorganisms. Seeding is the preferred covering for topsoil stockpiles, as opposed to impermeable barriers such as tarps or plastic sheeting, which may destroy living soil microorganisms.
7. Monitor stockpiles of topsoil and duff material regularly as they are highly susceptible to invasion by invasive plants. Determine management needs based on presence of invasive plants.

When using mulch:

1. Use weed-free mulch.
2. Apply mulch at the recommended thickness to suppress the establishment and growth of invasive plants. Ensure mulch remains on-site. Lighter mulches will blow away in areas prone to heavy wind; mulches can move if watering results in surface flow. Consider the use of Tackifiers (e.g. adhesive compounds used to increase the tack or stickiness of the surface) or biodegradable netting to stabilize mulch on erosion prone areas.
3. Supplement with additional mulch to retain thickness and effectiveness after it begins to decompose.

SOIL DISTURBANCE & STABILIZATION

1. Minimize soil disturbance whenever possible, as invasive plants readily colonize areas of disturbed soil. Monitor recent work sites for the emergence of invasive plants for a minimum of 2 years after project completion.
2. Stabilize disturbed soil as soon as possible by seeding with, and quickly establishing a dense cover of native species. A temporary cover of clean mulch or straw can be used to stabilize before native species are established. A cover of rip-rap or gravel may be appropriate on certain sites. All species listed on the Connecticut Invasive Plants Council list are considered invasive or potentially invasive; and none should be intentionally planted. It is illegal to plant those species prohibited by State statute. In addition, for the few species on the list exempted from regulation, State statutes prohibits the use of those species by State agencies or contractors.

3. Avoid using fill if possible, especially on sites that are not contaminated with invasive species. Materials such as fill, loam, mulch, straw, rip-rap, and gravel should not be brought into project areas from sites contained by invasive plants. If fill is used, monitor work sites for the emergence of invasive plants for a minimum of 2 years.

MOVEMENT & MAINTENANCE OF EQUIPMENT

1. Where invasive plants are present, mark areas where equipment should not be driven or parked to prevent the subsequent spread of invasive propagules (seeds, fragments etc) within the work area.
2. Require that undercarriages, wheel wells and parts of the equipment that come into contact with soil are cleaned prior to equipment being brought onto the site
3. When equipment needs to be moved, plan work flow so that equipment is moved from non-invaded sites to invaded sites. This is especially important during ditch cleaning and shoulder scraping.
4. Use staging areas that are free of invasive plants to avoid spreading seeds, clippings or plant fragments.

- If working in areas with invasive plants, clean all equipment, clothing, and hand tools of all visible soil and plant material before leaving the project site. Acceptable methods of cleaning include, but are not limited to:
    - Portable wash station that contains runoff from washing equipment (containment must be in compliance with wastewater discharge regulations);
    - High pressure air;
    - Brush, broom, or other hand tools (used without water).

5. If equipment will be used in invaded areas, remove above-ground invasive plant materials such as purple loosestrife, Phragmites, and Japanese knotweed prior to the start of work.
6. Excavated material taken from sites that contain invasive plants cannot be used away from the invaded site until all viable plant material is destroyed. Excavated material from areas containing invasive plants may only be reused within the *exact* limits of the invaded site. (See HANDLING EXCAVATED MATERIAL below).
7. Whenever possible, excavation should be avoided in areas containing Japanese knotweed, purple loosestrife, mugwort, swallowwort, Phragmites, and seed propagated species such as stiltgrass. If excavation does occur in these areas, the BMPs described for 'HANDLING EXCAVATED MATERIAL & INVASIVE PLANT MATERIAL' must be followed.
8. Ditched areas should be stabilized daily as part of the regular work operations. The disturbed soils and new ditch profile are to be protected as soon as possible by stone, erosion control materials or seeding and mulch from a source free of invasive plant material. Seeds of native species should be used whenever possible. Mulch may be straw or a manufactured product.

MOWING

1. Frequent mowing of areas infested with purple loosestrife, Phragmites, mugwort, and Japanese knotweed can be a viable method of suppressing the spread of these species. However, since these species can sprout from stem and root fragments, as well as from seed, it is imperative to avoid inadvertently spreading propagules when mowing.

2. Mow these areas BEFORE seed head formation.
3. Clean mowing equipment daily, and prior to transport to and from each location. This is particularly important if mowing is after seed maturation**.**

HANDLING EXCAVATED MATERIAL FROM BIOLOGICALLY CONTAMINATED SITES.

Excavated materials taken from infested areas should only be used onsite, unless all plant material including seed has been destroyed. Only use within exact limits of infestation.

1. Excavation should be avoided in areas containing purple loosestrife, Phragmites, mugwort, and Japanese knotweed.
2. Any excavated Biologically Contaminated material that cannot be reused within the limits of the work site must be stockpiled on an impervious surface and treated on site to destroy any viable plant material OR the material must be disposed of using a prescribed method.
3. Destroy removed plant material. Methods include:
    - Solarization: place on impervious surface and cover with clear plastic
    - Brush piles: not for plants with fruit or seed
    - Burying: minimum of 3-5 feet below grade (Note: the proper depth varies with species. Burial may not be an option for species, such as Japanese knotweed, that have robust underground storage organs).
    - Burning: have a designated burn pile for invasive plants and the proper burn permit
    - Herbicide: requires a licensed applicator (CT DEEP)
4. Whenever transporting soil or fill materials containing invasive species, cover the load during transport.

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References and resources:

Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers (3rd Edition). California Invasive Plant Council. https://www.cal-ipc.org/resources/library/publications/landmanagers/

BEST MANAGEMENT PRACTICES FOR ROADSIDE INVASIVE PLANTS IN THE ADIRONDACK PARK. New York State Department of Transportation. http://adkinvasives.com/wp-content/uploads/2016/01/BMPs-for-Roadside-Invasive-Plants-in-the-ADKs.pdf

Non-native Invasive Species Best Management Practices Guidance for the U.S. Forest Service Eastern Region. United States Department of Agriculture Forest Service. August 2012 https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5412628.pdf

A Land Manager's Guide to Best Management Practices (BMPs) to Prevent the Introduction and Spread of Invasive Species. The University of Georgia Center for Invasive Species and Ecosystem Heath. https://bugwoodcloud.org/mura/gist/assets/File/LMBMP.pdf

NAISMA WEED FREE GRAVEL MINIMUM CERTIFICATION STANDARDS. NORTH AMERICAN INVASIVE SPECIES MANAGEMENT ASSOCIATION (NAISMA). 2017. https://www.naisma.org/

Best Practices for Controlling Invasive Plant Species. PennDOT technical information sheet #184. 2017. http://www.dot7.state.pa.us/BPR_PDF_FILES/Documents/LTAP/TechSheets/TS_184.pdf

BEST PRACTICES For Managing Invasive Species on Utility Operations: A Pocket Guide for British Columbia's Utility Workers. 2014 EDITION. https://bcinvasives.ca/documents/Utilities_BMP_FINAL_WEB_05_16_2014.pdf

BEST MANAGEMENT PRACTICES FOR ROADSIDE INVASIVE PLANTS. New Hampshire Department of Transportation (2008). https://www.nh.gov/dot/org/projectdevelopment/environment/units/program-management/documents/BMPsforRoadsideInvasivePlants.pdf