



July 28, 2022

Mr. Stuart B. Popper, AICP
Director of Planning & Development
Town of Cromwell
41 West Street
Cromwell, CT 06416-0189

Re: Intervenor – REMA Preliminary Application Review
IWWA Application #22-02
Scannell Properties #576, LLC
210 Shunpike Road, Cromwell, CT

Dear Mr. Popper,

On behalf of Scannell Properties #576, LLC, All-Points Technology Corporation, P.C. ("APT") is pleased to provide responses to comments provided in a July 6, 2022 Rema Ecological Services, LLC ("REMA") Supplemental Application Review as submitted to the Town of Cromwell Inland Wetlands and Watercourses Agency by Benjamin R. Conroy through a Petition to Intervene.

The REMA comment headings are noted below as they appeared in their July 6, 2022 letter with discussion and response following.

Potentially Missed Wetlands

REMA speculates that potentially two wetland areas may exist which do not appear as Connecticut jurisdictional wetlands on Application #22-02 materials and plans. **No evidence was provided by REMA to substantiate these claims** other than remote observations of some "wetness" from an adjacent property or reference to a town wide wetland survey performed more than 30 years ago. As described below, we have conclusively determined that neither of these areas should be classified as regulated wetlands.

Area 1

The first area noted by REMA is located in the southeastern portion of the site within the cultivated field. This area, noted as "Area 1" for identification purposes, was thoroughly investigated during our wetland delineation back in the fall of 2020 and found to contain moderately well drained soils, exhibiting agricultural disturbance, classified as Sudbury sandy loam (consistent with NRCS soil mapping). As is common with moderately well drained soils, these soils can exhibit intermittent saturation near the soil surface but the hydrology is not sustained long enough during the growing season to develop poorly drained soil profile characteristics (i.e., reduced chroma matrix colors and

mottling). In addition, geotechnical investigation of the site included two test borings (B18 and B30) within Area 1, which noted groundwater levels of 3.6 feet and 6.5 feet, respectively. Although those borings were performed in August 2021, one would still expect to see groundwater levels closer to the soil surface than the levels reported at that time of year. A Test Location Plan and boring logs are attached. To further provide conclusive evidence that the area in question is not a regulated wetland, recent hand dug test pits were performed and detailed soil profile characteristics recorded to document that the soils within this area are not poorly drained soils and therefore would not be classified as a regulated wetland. Logs of the recorded soil characteristics for the two soil test pits are attached along with a map indicating there GPS surveyed location.

Area 2

Area 2 is located northwest of the farm pond just north of a windrow of trees that partially separates the field areas and just south of the gas line ROW. This area was also investigated during our 2020 wetland delineation and found to contain agriculturally disturbed moderately well drained soils. Although this area was mapped as a wetland over 30 years ago during a town wide wetland survey, that survey did not represent actual delineation of wetland boundaries. It should be noted that there have been advances in soil classification methodologies in the past 30 years that have modified how wetland soils are now classified that could explain the possible discrepancy of a wetland feature identified during an outdated survey that was performed at a town-wide scale (and does not represent an actual intensive delineation).

In addition, geotechnical investigation of the site included two test borings (B6 and B7) within Area 2, which noted groundwater levels of 4.0 feet at each location. Although those borings were performed in August 2021, one would still expect to see groundwater levels closer to the soil surface than the levels reported at that time of year. A Test Location Plan and boring logs are attached. To further provide conclusive evidence that the area in question is not a regulated wetland, recent hand dug test pits were performed and detailed soil profile characteristics recorded to document that the soils within this area are not poorly drained soils and therefore would not be classified as a regulated wetland. Logs of the recorded soil characteristics for the two soil test pits are attached along with a map indicating there GPS surveyed location.

Vernal Pool Conservation

The Town of Cromwell Inland Wetlands and Watercourses Regulations (latest date March 7, 2012, effective March 21, 2012) addresses vernal pool conservation by including a 200-foot upland review area specifically for vernal pools. There is no mention of the guidance document entitled *Best Development Practices, Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States* ("BDP", Calhoun and Klemens 2002) in the town's wetland regulations or in any written or unwritten policy used by the Town of Cromwell Inland Wetlands and Watercourses Agency or its staff. In addition, we are not aware of the Agency requiring a BDP analysis on other wetland permit applications in Cromwell that contained vernal pools. Therefore, the project design team focused on avoiding/minimizing activities with the 200-foot vernal pool upland review area.

Aside from the farm pond/Vernal Pool 7 that is proposed to be filled as part of this application, no development impact would occur to all the other remaining vernal pools' 200-foot upland review area

except for Vernal Pool 6. The design team has reassessed the proposed activities in the Vernal Pool 6 upland review area, which is limited to the controlled outfall structure from infiltration basin E-2. It is important to note that this infiltration basin captures surface runoff from adjacent property and does not receive any stormwater runoff from the proposed development. The design team has reevaluated the location of the outfall structure and has redesigned it further south of the original proposed location so that it is now completely outside of the 200-foot vernal pool upland review area. The separately attached plan (CG107, revised to July 28, 2022) reflects the updated design in proximity to Vernal Pool 6.

Landscape Connectivity

REMA claims that elimination of Vernal Pool 7 will adversely affect the long-term sustainability of Vernal Pool 6 and also Vernal Pool 4 due to metapopulation dynamics among these pools. REMA goes on to say two factors come into play when considering metapopulation dynamics and the loss of Vernal Pool 7: 1) Vernal Pool 7 is deeper, and can sustain sufficient hydrology for breeding during droughts, allowing for the recolonization of Vernal Pool 6, which has a much drier hydrologic regime; and 2) with the elimination of Vernal Pool 7, and the physical barrier that would be in place due to the development, Vernal Pool 4, which has an intermediate hydrology between the other two pools, could no longer be a source pool for the recolonization of Vernal Pool 6. As a result, REMA claims over time, Vernal Pool 6 will cease to be a productive vernal pool, and just be an ecological sink.

There are flaws with the REMA analysis, including that there is no consideration of the suboptimal terrestrial habitat quality that surrounds Vernal Pool 7, separating it from Vernal Pools 4 and 6. APT's response to comments provided by the Agency's peer review, dated May 2, 2022, relate to this topic.

The 51 spotted salamander egg masses identified during the 2021 vernal pool survey of Vernal Pool 7 are confirmed. It was surprising to see that level of productivity in this man-made former irrigation pond feature particularly given its location and the surrounding suboptimal terrestrial habitat associated with the adjacent cultivated agricultural fields. The 2022 vernal pool survey found a reduction in productivity with 29 spotted salamander egg masses observed. That reduction in productivity, or the surprising productivity observed in 2021, could be associated with cyclical breeding activity changes as well as field conditions during the different survey dates (i.e., deeper levels of inundation have occurred in 2022 as compared to 2021, which may contribute to some but not all of the drop in observed egg masses). What this does reveal is the opportunistic survival skills of vernal pool amphibians taking advantage of these types of anthropogenic features that were intended for other purposes, in this case an irrigation pond, that have unintentionally created relatively productive breeding habitat. These types of unintentional man-made vernal pools are somewhat common throughout Connecticut's highly suburbanized and urbanized landscape and such examples have been observed by APT on other sites and have been documented by other experienced wetland scientists.

The cultivated open fields that entirely surround Vernal Pool 7 and surround the western side of Vernal Pool 6 (half of which is located on the adjacent town-owned property) are considered to support suboptimal terrestrial habitat due to the lack of vegetative cover, the agricultural disturbances that can result in direct mortality from farm equipment and the higher level of predation that can occur due to a general lack of cover as adult amphibians migrate to and from the pool to breed and juveniles disperse. The vernal pool surveys provided evidence that there is the possibility of connectivity between the forested habitat around Vernal Pool 4, and by association Vernal Pool 4 itself, and Vernal

Pool 7. No such observations revealed a possible connection between Vernal Pool 7 and 6, which is separated by a longer expanse of cultivated field than that which separates Vernal Pools 7 and 4. Therefore, it is unlikely that Vernal Pool 7 plays a key role in linking all three pools. REMA's speculation about possible metapopulation impacts is not supported by the facts of this application.

Vernal Pool Filling Precedent

REMA claims that to their knowledge a Tier I vernal pool has never been filled in Connecticut and that this application would set a precedent. It is worth noting here that Vernal Pool 7 was unintentionally created through the efforts of a farmer who, 50 years ago, intentionally excavated a farm pond to support the agricultural activities on this site within the middle of a cultivated field that consisted of well drained upland soils; no wetland feature previously existed in this location of the property. Classification of vernal pools as Tier I is fairly ubiquitous throughout Connecticut since the minimum requirements for Tier I include two or more vernal pool indicator species breeding or 25 or more egg masses present and at least 75% of the vernal pool envelope (100 feet from pool) and at least 50% of the surround terrestrial habitat (100-750 feet from pool) are undeveloped. This "low bar" for Tier I rating allows pools that have half of the terrestrial habitat zone as developed encompasses a broad range of vernal pools including those in suburban and urbanized areas throughout Connecticut.

The Army Corps New England District Compensatory Mitigation Standard Operating Procedures (December 29, 2002) document provides guidance on compensatory mitigation ratios, including recommended compensatory mitigation ratios for direct permanent impacts to vernal pools. The existence of a federal agency mitigation procedure that explicitly addresses vernal pool mitigation belies REMA's statement that the proposed filling of Vernal Pool 7 sets a precedent.

Furthermore, an evaluation of vernal pool creation projects in New England from 1991-2000 reveals that three (3) vernal pools were filled in Connecticut resulting from federal action (i.e., requiring a wetland permit from the U.S. Army Corps of Engineers New England District) (Lichko and Calhoun 2003). Considering that many vernal pools fall within the Tier I rating, it is reasonable to expect that one or more of these three projects resulted in filling of a Tier I pool. It is also reasonable to expect that since 2000 there have been other projects among the thousands of wetland applications throughout Connecticut that have involved direct impact to vernal pools and that some of those were classified as Tier I.

For the reasons stated above, the proposed filling of Vernal Pool 7, a farm pond created in an upland agricultural field, would not be considered a new precedent.

Access Road Effects

Shunpike Road is the only practical option for access to the property for virtually any type of development consistent with the Site's current industrial zoning. The only other public street access would be from Geer Street or Court Street, both of which have residential development, and would not be a desirable access for non-residential development. With Wetland 4 running parallel to Shunpike Road for the entire Site's frontage, crossing of Wetland 4 is necessary and unavoidable. Using the former farm road crossing of Wetland 4 and its associated perennial stream is the most prudent and feasible option that minimizes wetland impacts to the greatest degree possible. This former crossing consisted of placement of fill and a culvert, restricting the stream flow, that has failed with washout of the fill and culvert; that failure is likely indicative of a general lack of engineering evaluation and

design. The new proposed box culvert maintains a natural stream bottom and satisfies the DEEP's natural stream crossing and openness ratio design criteria that will reestablish connectivity of the stream and wetland system and allow for unimpeded movement of aquatic organisms and wildlife. This crossing point drives the western end of the proposed access design and as the access moves eastward there is greater flexibility in changes to the orientation of the road.

As discussed in further detail below, the access road alignment was adjusted from Scannell's 2021 wetland application to maximize buffers to Vernal Pools 1, 2, and 9 to the north and Vernal Pool 4 to the south. This adjustment of the access road now places it well outside of the vernal pool 200' upland review areas and preserves large areas of terrestrial habitat where amphibian densities are expected to be lower than areas closer to the pool. By adjusting the road in this fashion, it reduces the impact to vernal pool indicator species.

In addition, the following structural mitigation measures have been incorporated into the access road design to facilitate movement of amphibians across the road and minimize impact and chances for incidental mortality:

- Road width has been minimized to the maximum extent possible.
- Full cutoff Dark Sky Compliant lighting with minimal light intensity fixtures will avoid light spillage beyond the limits of the access road.
- The access road will use low profile Cape Cod style curbing to minimize impediments to migrating herpetofauna.
- The access road's stormwater management will rely on 'soft' green infrastructure elements with sheet flow into stormwater quality swales and bioinfiltration basins and will avoid use of catch basins that could entrap migrating herpetofauna.
- Bioinfiltration basins will be fitted with permanent isolation barriers to avoid creation of decoy pools.
- Tree clearing along the road shoulders are minimized to the greatest extent possible.
- Access road shoulders are designed with gentle grades made of earthen fill (as opposed to stone) to avoid impediments to migrating herpetofauna.
- Erosion control fabric made with plastic netting for stabilization will be avoided to prevent wildlife entanglement.
- Traffic volumes are anticipated to be lower after dark when most amphibian overland movement would occur, further lessening incidental adult mortality to vernal pool indicator species.

To further lessen concerns over possible amphibian (and other species) mortality associated with the access road, the applicant and design team have considered incorporating wildlife openings at strategic locations along the proposed access. Four 14-foot wide open-bottom box culverts are proposed to be placed in areas along the access road that contain the documented highest quality terrestrial habitat for obligate vernal pool species, which represents the primary migratory vectors between Vernal Pools 1, 2, 4, and 9 and surrounding high quality terrestrial habitat. Each open-bottom culvert would be fitted with 30 feet of permanent wildlife fencing (Animex® wildlife isolation fencing AMX 40) either side of the opening to serve as "wing walls" to help guide wildlife into the openings and limit species traveling over the road surface. With this careful placement of wildlife openings, interactions between vehicle traffic and wildlife will be significantly reduced, limiting the potential for

mortality. These culverts are reflected on separately attached drawings CG101 and CG102, revised July 28, 2022.

REMA references Dr. Michael Klemens' involvement in the River Sound Development, LLC v. Inland Wetlands and Watercourses Commission of the Town of Old Saybrook (the "*River Sound* case"). In that case, Dr. Klemens testified that "[t]he wood frogs remove a lot of the detritus in the pools. The leaves' energy is transported through the wood tadpoles. They're one of the few species which you can say there's direct nexus biologically. And also, the actual quality of the water, physical parameters of the water, are affected by wood frog tadpoles, which is an important thing to take note of." The commission found that the development of the golf course would cause unacceptable fragmentation and isolation of the area, which would result in a substantial reduction in the capacity of the wetlands to maintain animal life, especially amphibians, and that it greatly would reduce the capacity for survivorship of amphibians and that the clearing of forests adversely would affect amphibian populations and nutrient and energy recycling within the wetlands.

Although the *River Sound* case recognizes the importance of wood frog biology to the sustainability of vernal pools through removal of detritus, it does not address the fact that there are a multitude of vernal pool biota that feed on detritus and play an equally important role in this nutrient cycle. Aquatic macroinvertebrates make up most of the biomass found in vernal pools, in contrast to the handful of obligate vernal pool amphibians that breed and feed in vernal pools (Colburn, Weeks, and Reed 2007). Invertebrates represent most of the animal species in vernal pools, by numbers and biomass and their ecological importance is proportional to their numbers (Strayer 2006). In our view, it would require a substantial reduction to the wood frog population to cause a physical impact to the vernal pool through reduction in uptake of biota that would result in eutrophication and excessive build-up of leaf litter, something which we do not believe will occur in this case, for several reasons.

The proposed project is very different from the project in the *River Sound* case. The River Sound Development was proposing 221 residential housing units, a golf course, a roadway network, associated structures and infrastructure that would result in significant removal of mature forest habitat in proximity to multiple vernal pools. By contrast, the proposed warehouse facility is situated within a cultivated field with minimal tree removal. There is already substantial fragmentation and isolation of habitats important to vernal pools on the site, namely large cultivated fields, former fields, nursery, and contractor yard that have perforated and disconnected mature forested terrestrial habitat important to vernal pool obligate species. The existing use of the site has already reduced the capacity of the wetlands (and vernal pools) to support amphibians, along with nutrient and energy recycling with the wetlands and vernal pools. The proposed warehouse facility would supplant those existing land uses detrimental to vernal pool species, not result in extensive forest clearing to an unaltered intact forested habitat, and therefore would not result in a significant decrease in vernal pool amphibian populations.

This application avoids impact to five of the six total vernal pools located on the subject property, avoids impact to the 200-foot vernal pool upland areas, preserves the great majority of the supporting high quality terrestrial forested habitat through a nearly 100-acre conservation easement, enhances impacted and poor quality terrestrial habitat to the benefit of vernal pool obligate amphibians, and creates a new vernal pool habitat that provides a creation/impact ratio of 2.8:1. As a result of these avoidance/minimization/mitigation strategies, the proposed project will not result in a substantial reduction to vernal pool obligate amphibian populations, including wood frogs, and therefore would

not result in a likely adverse physical impact to the site's vernal pools. In addition, an extensive and comprehensive mitigation plan is proposed that mitigates for short-term impacts with various protection measures during construction (isolation barriers, sweeps, contractor awareness training, etc.) and long-term impacts with permanent isolation barriers, restoration of developed and suboptimal terrestrial habitat to higher quality forest that supports obligate vernal pool amphibians, and creation of new wetland and vernal pool habitats.

We disagree with REMA's unfounded speculations that even a moderate drop in wood frog abundance, over a multi-year period, will cause the pool to get progressively shallower, until it no longer remains flooded long enough to support breeding of amphibians, including spotted salamanders, which need a pool that is flooded until late July to early August, in most cases.

It is reasonable to assume that current activities on the Site have already had an impact on the population of obligate vernal pool amphibians (and other wildlife) with the agricultural land use, particularly the regular cultivation of cropland that includes tillage of soils and use of other farming implements that could cause direct and indirect mortality to vernal pool species, the application of fertilizers, herbicides, and pesticides on soils where amphibians could come into direct contact with as they attempt to traverse the open fields and which could adversely impact water quality through runoff from the fields. Also, the existing contractor storage yard and its associated access road is located in close proximity to Vernal Pool 4, and likely causes some direct and indirect mortality to vernal pool species. There is direct evidence of impact from this Site usage with the documented siltation of former Vernal Pool 3 which has been impacted to such a degree that it no longer supports any breeding by vernal pool obligate species.

Rare Plant Surveys

The Town of Cromwell Inland Wetlands and Watercourses Regulations do not address State-listed rare species, as there is no mention in the town's wetland regulations or in any written or unwritten policy used by the Town of Cromwell Inland Wetlands and Watercourses Agency ("IWWA") or its staff that we are aware of. Therefore, the agency with sole jurisdiction over this project's possible effect to State-listed rare species lies with the Connecticut Department of Energy and Environmental Protection (DEEP), triggered by the project's need for a DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities. Since issuance of this general permit by DEEP would be considered a "state action", the DEEP is required to ensure that any activity authorized by it does not threaten the existence of endangered or threatened species. The applicant performed surveys in 2021 for all the listed plants noted in the February 1, 2021 letter issued by the DEEP Natural Diversity Data Base ("NDDDB"). The results of those surveys are provided in the attached report, partially redacted to protect the location of only one rare plant identified in the northern portion of the site well beyond the limits of disturbance associated with the proposed facility. This field research confirms that the project will not result in a likely adverse impact to listed species. It is worth noting that the nearly 100-acre conservation easement proposed as part of this project, protects potential habitat that may have historically supported one or more of the listed plant species, many of which come from historical records dating back to 1911. Significant changes to the subject property and properties adjacent to these habitats, including developments, have likely altered the habitat characteristics and resulting decline and extirpation of these species from possible habitat located on and in the vicinity of the site.

Since the IWWA has no jurisdiction over State listed species, it should not be considered in its deliberations. Should consultation with DEEP regarding the NDDDB review result in alteration of the project's regulated activities under the IWWA's purview, the applicant would be required to request a modification of the wetland permit should it approve of this project.

Alternatives

The alternatives analysis presented in APT's Wetland Assessment report, dated May 2022, satisfies the requirements in Sections 10.2 and 10.3 of the Town of Cromwell Inland Wetlands and Watercourses Regulations. Various alternative locations and orientations of the proposed development, including an evaluation of varying alignments of the access road, were reviewed and depicted on diagrams to substantiate that the proposed plan represents the most prudent and feasible alternative and that no other alternatives exist that would cause less environmental impact to wetlands or watercourses while still maintaining a viable project.

On behalf of Scannell Properties #576, LLC, thank you for your consideration of our responses. If you have any questions regarding the above-referenced information, please feel free to contact me by telephone at (860) 552-2033 or at dgustafson@allpointstech.com.

Sincerely,
All-Points Technology Corporation, P.C.



Dean Gustafson
Senior Wetland Scientist
Professional Soil Scientist

Attachments

cc: Daniel Madrigal, Scannell Properties #576, LLC
Thomas P. Cody, Robinson & Cole LLP

References

Calhoun, A.J.K. and M.W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Colburn, E.A. 2004. Vernal pools, natural history and conservation. The McDonald & Woodward Publishing Company.

Colburn, E.A., Weeks, S.C., Reed, S.K. 2007 Diversity and Ecology of Vernal Pool Invertebrates.

Leibowitz, S.G. and Brooks, R.T. 2008. Hydrology and Landscape Connectivity of Vernal Pools.

Lichko, L. E. and A.J.K. Calhoun. 2003. An Evaluation of Vernal Pool Creation Projects in New England: Project Documentation from 1991-2000. Environmental Management Vol. 32 No. 1 (pp. 141-151). Springer-Verlag New York Inc.

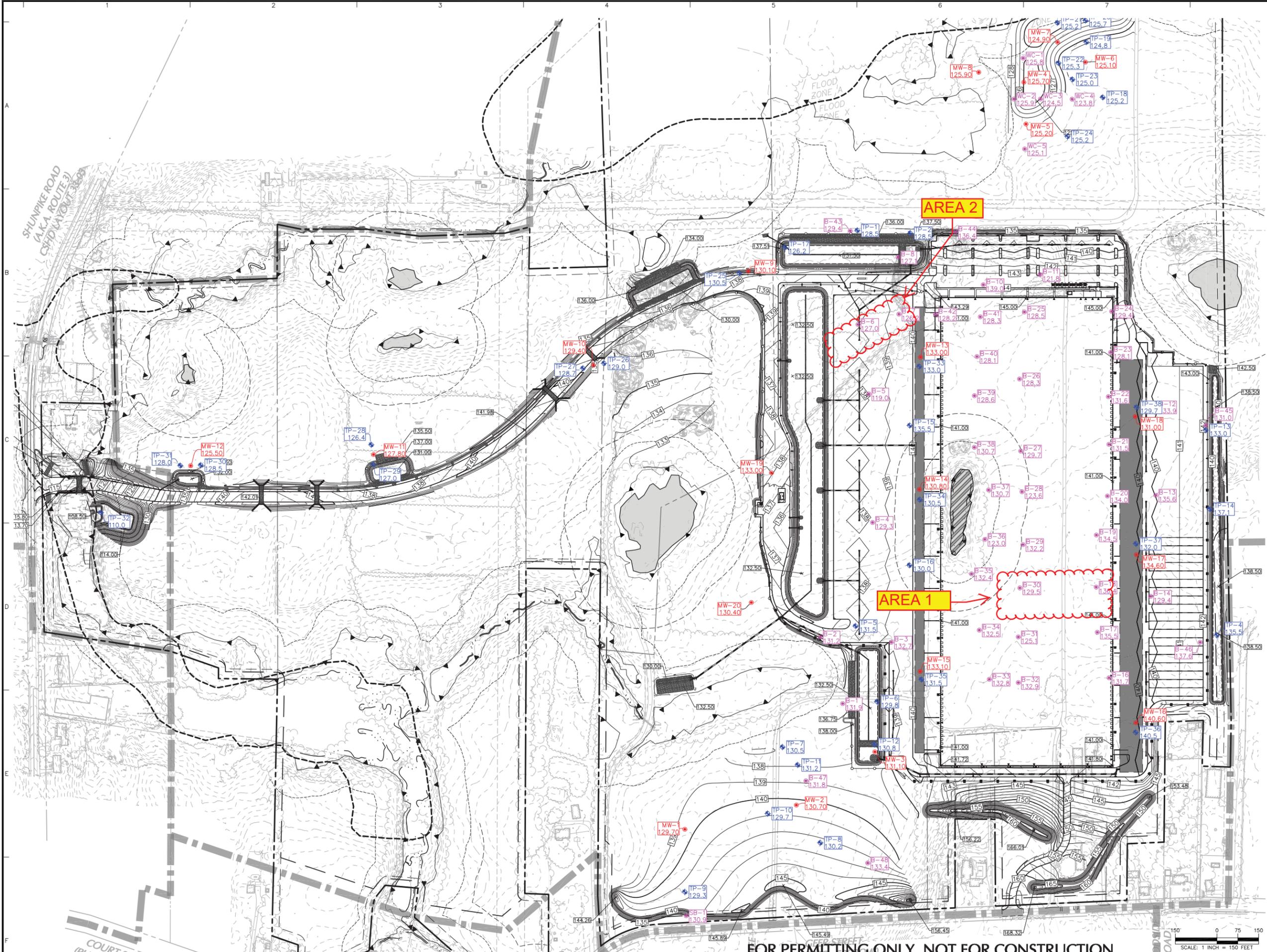
Strayer, D.L. 2006. Challenges for freshwater invertebrate conservation. Journal of the North American Benthological Society 25: 271-287.

UNITED STATES ARMY CORPS OF ENGINEERS, NEW ENGLAND DISTRICT, Vernal Pool Best Management Practices, January 2015, available at <https://www.nae.usace.army.mil/Portals/74/docs/regulatory/VernalPools/VPBMPsJan2015.pdf>

2021, December 15. Connecticut General Permit. *Department of the Army Regional General Permits for the State of Connecticut.*

(<https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/CT/Connecticut-General-Permit-2021.pdf>)

Geotechnical Testing Map and Boring Logs



NOTE: ELEVATIONS SHOWN FOR TEST LOCATIONS REFER TO THE OBSERVED GROUNDWATER ELEVATION.

Date	Description	No.
Revisions		
Signature		Date
LANGAN		
Langan CT, Inc. 555 Long Wharf Drive New Haven, CT 06511 T: 203.562.5771 F: 203.789.6142 www.langan.com		
Project		
PROJECT HIGHLANDS		
210 SHUNPIKE ROAD CONNECTICUT		
Drawing Title		
GEOTECHNICAL TEST LOCATION FIGURE		
Project No.	Drawing No.	
140225401	FG01	
Date	Drawn By	
02/16/2022	ALF	
Checked By	TSO	

FOR PERMITTING ONLY, NOT FOR CONSTRUCTION

BORING INFORMATION

LOCATION: See Plan.
 GROUND SURFACE EL. (ft): 140.0 DATE START/END: 8/18/2021 - 8/18/2021
 VERTICAL DATUM: DRILLING COMPANY: Seaboard Drilling, Inc.
 TOTAL DEPTH (ft): 22.0 DRILLER NAME: Dale Griffin
 LOGGED BY: B. Akereyeni RIG TYPE: Diedrich D-50 ATV

BORING

B18

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DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: NA / NA CORE BARREL TYPE:
 AUGER I.D./O.D.: 4.25 inch / NA DRILL ROD O.D.: NM CORE BARREL I.D./O.D.: NA / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): ∇ 3.6 8/18/2021 11:02 am

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description		
		Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD					
130	5	S1	0 to 2	24/20	2-2-15-22		GRAVELLY SAND	S1A (0-13"): WIDELY GRADED SAND (SW); ~90% fine sand, ~5% nonplastic fines, ~5% fine gravel, black-brown, damp, organic odor (TS) S1B (13-20"): SILTY SAND (SM); ~75% fine to coarse sand, ~15% nonplastic fines, ~10% fine gravel, light brown to reddish brown, dry.		
		S2	2 to 4	24/16	18-13-10-8			S2: WIDELY GRADED SAND WITH GRAVEL (SW); ~75% fine to coarse sand, ~20% fine to medium gravel, ~5% nonplastic fines, brown, damp to moist. Auger grinding at 2 to 4 ft. (cobbles)		
		S3	4 to 6	24/11	5-5-5-6		SAND	S3: NARROWLY GRADED SAND (SP); ~95% fine to coarse sand, ~5% nonplastic fines, reddish brown, wet.		
		S4	6 to 8	24/8	6-6-10-8			S4: Similar to S3, with grayish brown		
		15	10	S5	10 to 12		24/11	5-6-7-10	SILT	S5: CLAYEY SILT (CL-ML); 98.7% low plasticity fines, 1.3% fine sand, reddish brown, wet to damp.
				S6	15 to 17		24/13	5-8-9-8		S6: CLAYEY SILT (CL-ML); ~90% nonplastic to low plasticity fines, ~5% fine gravel, angular up to 0.25", ~5% fine to coarse sand, reddish brown, wet.

NOTE:

PROJECT NAME: Project Highlands

CITY/STATE: Cromwell, Connecticut

GEI PROJECT NUMBER: 2102942



GEI WOBURN STD 1-LOCATION-LAYER NAME 2102942_PROJ.HIGHLANDS BORING LOGS.GPJ_GEI DATA TEMPLATE 2013.GDT 10/13/21

BORING**B18**

PAGE 2 of 2

LOCATION: See Plan.

GROUND SURFACE EL. (ft): 140.0

DATE START/END: 8/18/2021 - 8/18/2021

VERTICAL DATUM:

DRILLING COMPANY: Seaboard Drilling, Inc.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
120	20	S7	20 to 22	24/17	7-10-10- 7		SILT	S7: CLAYEY SILT (CL-ML); ~90% nonplastic to low plasticity fines, ~5% v. fine sand, reddish brown, wet.
								End of boring at 22'. Planned Extent. Backfilled with drill cuttings.
	25							
110	30							
	35							

NOTE:

PROJECT NAME: Project Highlands

CITY/STATE: Cromwell, Connecticut

GEI PROJECT NUMBER: 2102942



BORING INFORMATION

LOCATION: See Plan.
 GROUND SURFACE EL. (ft): 136.0 DATE START/END: 8/16/2021 - 8/16/2021
 VERTICAL DATUM: DRILLING COMPANY: Seaboard Drilling, Inc.
 TOTAL DEPTH (ft): 22.0 DRILLER NAME: Dale Griffin
 LOGGED BY: B. Akereyeni RIG TYPE: Diedrich D-50 ATV

BORING

B30

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: NA / NA CORE BARREL TYPE:
 AUGER I.D./O.D.: 4.25 inch / NA DRILL ROD O.D.: NM CORE BARREL I.D./O.D. NA / NA
 DRILLING METHOD: Hollow Stem Auger
 WATER LEVEL DEPTHS (ft): ∇ 6.5 8/16/2021 7:08 am

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 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
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Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/22	5-4-5-7		S1: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% fine to coarse sand, ~15% fine to medium gravel, ~10% nonplastic fines, dark brown to reddish brown, damp. (19" TS)	
		S2	2 to 4	24/15	13-24-28-23		S2: WIDELY GRADED SAND WITH GRAVEL (SW); ~65% fine to coarse sand, ~30% fine to coarse gravel, ~5% nonplastic fines, reddish brown to brown, dry.	
	5	S3	4 to 6	24/18	19-20-17-20		S3: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% fine to coarse sand, ~15% fine to coarse gravel, ~10% nonplastic fines, brown, damp to moist.	
130		S4	6 to 8	24/17	10-10-10-9		S4: NARROWLY GRADED SAND WITH SILT (SW-SM); ~90% fine sand, ~10% nonplastic fines, reddish brown, wet.	
	10	S5	10 to 12	24/0	7-7-8-9		S5: No recovery.	
	15	S6	15 to 17	24/17	3-5-7-8		S6: WIDELY GRADED SAND WITH GRAVEL (SW); ~65% fine to coarse sand, ~30% fine to medium gravel, ~5% nonplastic fines, brown to orange brown, wet.	
120								

NOTE:

PROJECT NAME: Project Highlands

CITY/STATE: Cromwell, Connecticut
GEI PROJECT NUMBER: 2102942



GEI WOBURN STD 1-LOCATION-LAYER NAME 2102942_PROJ.HIGHLANDS BORING LOGS.GPJ_GEI DATA TEMPLATE 2013.GDT 10/13/21

BORING**B30**

PAGE 2 of 2

LOCATION: See Plan.

GROUND SURFACE EL. (ft): 136.0

DATE START/END: 8/16/2021 - 8/16/2021

VERTICAL DATUM:

DRILLING COMPANY: Seaboard Drilling, Inc.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	20	S7	20 to 22	24/17	13-6-6-6		GRAVELLY SAND	S7: WIDELY GRADED SAND WITH GRAVEL (SW); ~80% fine to coarse sand, ~15% fine to medium gravel, ~5% nonplastic fines, brown, wet.
								End of boring at 22'. Planned Extent. Backfilled with drill cuttings.

NOTE:

PROJECT NAME: Project Highlands

CITY/STATE: Cromwell, Connecticut

GEI PROJECT NUMBER: 2102942



Soil Logs & Map

**IWWA Application #22-02
 Scannell Properties #576, LLC
 210 Shunpike Road, Cromwell, CT**

**SOIL PROFILE LOGS – AREAS 1 & 2
 Investigation performed 7-22-22**

AREA 1 (Pits 1-3): General location: southeast cornfield, presently fallow. Agricultural disturbed soils observed in all pits due to active/historic agriculture. Deep furrow/mound microtopography from moldboard plowing. Areas of discontinuous buried A horizon noted in places at depth. Area 1 not classified as wetlands.

AREA 2 (Pits 4-5): General location: northwest corner at edge of cornfield. Area historically and more recently disturbed and revegetated. Significant grade and soil profile disturbance noted including tracks and ruts from large farm equipment. In winter of 2020/2021, active cuts and fills, soil stockpiles, etc. observed. Area 2 not classified as wetlands.

AREA 1					
Pit 1: 41.629203, -72.661815					
Depth	Matrix Color	Redox Features			Texture
		Type	Color	%	
0-10	10yr 3/2				Sandy loam
10-20+	10yr 4/4	C	10yr 4/4	10	Sandy loam
		C	7.5yr 4/6	5	
Pit 2: 41.628893, -72.661851					
Depth	Matrix Color	Redox Features			Texture
		Type	Color	%	
0-12	10yr 3/2				Sandy loam
12-18	10yr 2/1				Sandy loam
18-22+	10yr 4/6				Sandy loam
Pit 3: 41.629011, -72.661564					
Depth	Matrix Color	Redox Features			Texture
		Type	Color	%	
0-12	10yr 3/3				Sandy loam
12-20+	10yr 4/4	C	7.5yr 4/6	2	Sandy loam
		C	7.5yr 5/8	1	
AREA 2					
Pit 4: 41.63089, -72.666405					
Depth	Matrix Color	Redox Features			Texture
		Type	Color	%	
0-8	10yr 3/2				Sandy loam
8-18	10yr 3/3	C	7.5yr 4/6	2	Sandy loam
18-20+	10yr 4/4	C	10yr 4/6	10	Sandy loam
Pit 5: 41.630672, -72.666607					
Depth	Matrix Color	Redox Features			Texture
		Type	Color	%	
0-10	10yr 3/3				Sandy loam
10-16	7.5yr 4/4	C	7.5yr 5/8	1	Sandy loam
		C	7.5yr 4/6	2	
16-20+	10yr 4/4	C	7.5yr 5/8	1	Loamy sand
		C	7.5yr 4/6	1	



Pit 4

Pit 5

AREA 2

Pit 1

Pit 3

Pit 2

AREA 1

Rare Plant Survey Report



REPORT CONTAINS SENSITIVE RARE SPECIES DATA
LOCATIONAL DATA REDACTED TO PROTECT SPECIES

Biodiversity Studies • Wetland Delineation & Assessment • Habitat Management • GIS Mapping • Permitting • Forestry

State-listed Plant Survey Results Project Highlands

Shunpike Road and Geer Street
Cromwell, CT

Submitted To: Dean Gustafson
All Points Technology Corp.

Date: January 5, 2022

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Executive Summary

<u>Project Name:</u>	Project Highlands
<u>NDDB Determination:</u>	Preliminary Assessment No. 202014871 dated February 1, 2021
<u>Site Location:</u>	Shunpike Road and Geer Street, Cromwell, CT
<u>Target Species:</u>	Collins' sedge (<i>Carex collinsii</i>) Early coral root (<i>Corallorhiza trifida</i>) Twinflower (<i>Linnea borealis</i> spp. <i>americana</i>) Climbing fern (<i>Lygodium palmatum</i>) Three-leaved false Solomon's seal (<i>Maianthemum trifolium</i>) Bayard's white adder's mouth (<i>Malaxis bayardii</i>) Green adder's mouth (<i>Malaxis unifolia</i>) Northern adder's tongue (<i>Ophioglossum pusillum</i>) Field paspalum (<i>Paspalum laeve</i>) White-fringed orchid (<i>Platanthera blephariglottis</i>) Yellow-fringed orchid (<i>Platanthera ciliaris</i>) Elliot's goldenrod (<i>Solidago latissimifolia</i>) Northern stitchwort (<i>Stellaria borealis</i>)
<u>Survey Duration:</u>	March through November 2021
<u>Survey Results:</u>	Known location of one species, <i>Lygodium palmatum</i> , was confirmed. No other State Listed species were found.

General Site Characteristics

The survey area totals \pm 250-acres and consists of multiple parcels located east of Shunpike Road and north of Geer Street (“the Site” hereinafter). The Site is bordered to the north by the Rocky Hill-Cromwell boundary line. The survey area falls within the central portion of the Connecticut Valley ecoregion¹ and lies approximately 1.8 miles west of the Connecticut River. From a biogeographical perspective, the survey area is primarily influenced by glaciofluvial deposits. The soils are a complex of Manchester, Hartford, Sudbury, Walpole, and Branford sandy loams and Penwood loamy sand, with Raypol and Scarboro soils occupying wetland areas².

The area is made up of a series of agricultural fields interspersed with mixed hardwood forest. The agricultural fields include cropland and a fallow tree farm and have a generally flat aspect with gently rolling topography. The uncultivated areas are made up of three habitat types: (1) wet secondary growth forests and vernal pools; (2) wet to mesic meadows; and (3) mesic secondary growth forests. Forested areas are vegetated primarily by native species, with some incursions of invasive shrubby species.

A review of historical aerial photography shows that, while there is slight variation in the exact borders, the current fields south and east of the Vernal Pool 6 are present in 1934, with the exception of approximately six acres of the field just east of Vernal Pool 4, in the center of the Site and the Staging yard, which are forested³. By 1951, the field portion of the northern wetland is cleared and by 1970, the agricultural footprint has reached its greatest extent. By 1986 some portions of the northern wetland are regrowing. By 2004, the central material storage yard has been cleared and the use footprint is as it is today.⁴

Survey Protocol

Field surveys were conducted by botanists James Cowen and Aubree Keurajian and wildlife biologist Eric Davison throughout the 2021 growing season. Surveys were timed so as to include the bloom and fruiting times for all target species. Nine site visits were made, the first on March 11th, 2021, to determine potential habitat for target species and focus areas for subsequent

¹ <https://www.plantmaps.com/interactive-connecticut-ecoregions-l4-map.php>

² <http://cteco.uconn.edu/viewer/index.html?viewer=simple>

³ University of Connecticut Library Map and Geographic Information Center - MAGIC. (2018). *Neighborhood Change in Connecticut, 1934 to Present*. Retrieved from http://magic.lib.uconn.edu/mash_up/1934.html.

⁴ UConn Air Photo Archive, 1934, 1951, 1967 1970, 1986, 1990, 1995, 2004.

<https://connecticut.maps.arcgis.com/apps/View/index.html?appid=044e8e6266aa44dc8ccc9b6e2eecacb4&extent=-74.8197,40.6374,-70.2054,42.4665>

surveys, and the final on November 11, 2021, totaling 55.5 person hours. The November site visit was outside of the growing season, but the purpose was to evaluate the habitat suitability of the recently added parcels bordering Shunpike Road. Survey effort information is provided in Table 1 below. Surveys were conducted by slowly walking and visually the entirety of suitable habitat within the Site. Botanists utilized field and technical keys to identify target and companion species.

Survey Date	Weather	Total Person Hours (personnel)
March 11	Partly cloudy 60F	10 (JC and AK)
March 22	Sunny 64F	2.5 (AK)
May 13	Partly cloudy 68F	3 (AK)
May 20	Mostly sunny 77F	3 (AK)
June 9	Partly cloudy 88F	12 (ED, JC, and AK)
August 11	Partly cloudy 89F	5 (JC and AK)
September 14	Mostly sunny 75F	8 (JC and AK)
October 13	Mostly cloudy 70F	6 (JC and AK)
November 17	Sunny, 50F	6 (JC and AK)

JC = James Cowen; AK = Aubree Keurajian

Field surveys for suitable habitat were conducted by botanists James Cowen and Aubree Keurajian in March to determine habitat types and target survey areas for the remainder of the spring and summer survey period. The majority of the Site is in active cultivation with a variety of crops, primarily corn, but also many varieties of squash. The remainder of the site was surveyed for target species. It is made up of forested wetland and upland areas, uncultivated edges, fields and other unmaintained areas, particularly in wet areas, and areas with anthropogenic activity that does not necessarily conflict with target species habitat requirements, such as the staging yard and Christmas tree farm. The site is divided into 15 sections by their vegetation type, land use, location, and hydrology; these sections are described in more detail in the Survey Results below. The portion of the eastern field determined in the March habitat surveys to be a wet meadow was later observed to be a mesic portion of the cornfield.

An overview of target State-listed species is given in Table 2 below, followed by a description of each species, including identifying characteristics. Much of the State-listed species habitat provided by the NDDDB program (see Appendix B – *Rare Species Survey Habitat Mapping*) are

located to the north and east of the Site, with only five species shown within the bounds of the Site. These species are indicated with an asterisk in Table 2 below.

Table 2: NDDB preliminary species list noting listing status, habitat and bloom period

Common Name	Scientific Name	Listing Status	Habitat	Bloom Period
Collins' sedge*	<i>Carex collinsii</i>	SCH	Sphagnum bogs, Atlantic white cedar and red maple swamps	June - August
Early coral root	<i>Corallorhiza trifida</i>	SC	Swamps and wet woods	May-June
Twinflower	<i>Linnea borealis</i> ssp. <i>americana</i>	E	Dry to moist woods, swamps, and bogs	June
Climbing fern*	<i>Lygodium palmatum</i>	SC	Moist acidic woods, thickets, stream margins, meadows, usually on nutrient poor soil	Evergreen
Three leaved false Solomon's seal	<i>Maianthemum trifolium</i>	T	Sphagnum bogs and swamp forests	May-June
Bayard's white adder's mouth	<i>Malaxis bayardii</i>	SCH	Dry oak and pine woodlands and dry, sandy fields	June-August
Green adder's mouth	<i>Malaxis unifolia</i>	E	Sphagnum bogs, forested swamps, wetland borders, rich rocky woods, wet acidic sandy substrates, moist thickets	July-August
Northern adder's tongue	<i>Ophioglossum pusillum</i>	E	Moderately well drained to hydric open areas	Spring-September
Field paspalum*	<i>Paspalum laeve</i>	T	Moderately well-drained to hydric soils, sandy fields, thickets, and shores	August-September
White-fringed orchid*	<i>Platanthera blephariglottis</i>	E	Wet peat bogs	Late June
Yellow-fringed orchid	<i>Platanthera ciliaris</i>	E	Acidic hydric and moderately well drained sandy or peaty soils, with meadow, shrubby, or open forest vegetation	Late July – Early September
Elliott's goldenrod	<i>Solidago latissimifolia</i>	SCH	Swamps, thickets, borders of woods	August - September
Northern stitchwort*	<i>Stellaria borealis</i>	SC	Moist, usually shady places	May-August
<i>Listing Status: Special Concern (SC), Threatened (T), Endangered (E), and Special Concern Historic (SCH)</i>				

Collin's sedge (*Carex collinsii*) the only species in *Collinsiae* section found in Connecticut. It is distinguished by having a staminate terminal spike with usually 4 or 5 lower carpellate spikes, the lowest of which is subtended by a bract which has a blade and a sheath that measures greater

than 4mm. It has 8 to 15 mm long, glabrous perigynia with a 3 to 4 mm long beak, reflexed teeth, and terete to trigonous, narrow-obloid achenes with persistent styles. The flower has three stigmas. It is an obligate wetland species, growing most frequently on peat moss (*Sphagnum* spp.) under an Atlantic white cedar (*Chamaecyparis thyoides*) canopy.^{5,6}

Early coralroot (*Corallorhiza trifida*) is a member of the Orchidaceae family, and one of three members of its genus found in Connecticut.⁷ They are saprophytic plants recognized by a spike of small yellow-white flowers. They can be distinguished from their congeners by flowering in the spring, having flowers that lack red-purple spots and a nectar spur, yellow-green rather than purple to brown stems. They are found in forests, swamps, wetland margins, and some anthropogenic habitats.⁸

American twinflower (*Linna borealis* var. *americana*) is a member of the Caprifoliaceae family, and the only member of its genus in Connecticut.⁹ It is a small, trailing plant with pubescent, toothed, opposite simple leaves on an often red stem, with a pair of nodding, pink to white flowers with fused petals, each born on an upward angled pedicel which branches from a peduncle that rises well above the leaves. It is found in mesic to wet-mesic, evergreen and mixed evergreen-deciduous forests, talus and rocky slopes, and alpine or subalpine zones.¹⁰

Climbing fern (*Lygodium palmatum*) is the only member of the Lygodiaceae family found in Connecticut. As its name suggests, it is a climbing plant. It can be recognized by its dimorphic leaves, with larger, three to seven palmately lobed leaves often remaining green year-round, with much smaller, more finely lobed, spore bearing leaves growing in the summer. It is found in low forests, forest edges, and swamplands, primarily on peaty, acidic soils overlying sand.^{11,12}

⁵ Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. New England Wildflower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 104, 110, 118.

⁶ <https://gobotany.nativeplanttrust.org/species/carex/collinsii/>

⁷ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

⁸ Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. New England Wildflower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 198-201.

⁹ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

¹⁰ Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. New England Wildflower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 499-500.

¹¹ Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. New England Wildflower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 61.

¹² <http://www.ct-botanical-society.org/Plants/view/1878>

Three-leaved false Solomon's-seal (*Maianthemum trifolium*) is a member of the Ruscaceae family, and one of four members of its genus found in Connecticut.¹³ It can be recognized by having two to four glabrous, elliptic, entire leaves arranged alternately on a stem which bears a 2-6 cm long raceme of small, white, flowers with six, 2.5 to 6 mm long tepals. They are found in fens, bogs, and laggs, usually where there is at least partial canopy.¹⁴

Bayard's adder's-mouth (*Malaxis bayardii*) is a member of the Orchidaceae family, and one of three species in its genus found in Connecticut, all of which are state listed.¹⁵ The genus is recognized by having a single leaf from which a spike of minute, white-green, flowers arises. Bayard's adder's-mouth is distinguished by having a two-lobed labellum with basal auricles more than 0.6 times as long as the labellum and pedicels usually between 3.4 and 5.8 mm. The lower flowers are typically persistent on Bayard's adder's mouth whereas they are withered or shed by the anthesis of upper flowers on green adder's-mouth. Bayard's adder's-mouth is found in meadows, fields, shrublands or thickets, woodlands, and anthropogenic habitats.¹⁶

Green adder's mouth (*Malaxis unifolia*) is a member of the Orchidaceae family, and one of three species in its genus found in Connecticut, all of which are state listed.¹⁷ The genus is recognized by having a single leaf from which a spike of minute, white-green, flowers arises. White adder's-mouth is distinguished by having a two-lobed labellum with basal auricles less than 0.6 times as long as the labellum and pedicels usually between 5 and 10mm, as compared to Bayard's adder's mouth (*Malaxis bayardii*), which has pedicels up to 5.8 mm long. The lower flowers are typically withered or shed by the anthesis of upper flowers on green adder's mouth, whereas they are persistent on Bayard's adder's mouth. Green adder's mouth is found in swamps, wetland borders, forests cuts and openings, and cleared rights-of-way.¹⁸

Northern adder's tongue (*Ophioglossum pusillum*) is a member of the Ophioglossaceae family, and one of two members of its genus found in Connecticut.¹⁹ They can be recognized by having

¹³ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

¹⁴ Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. *New England Wildflower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England*. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 299-300.

¹⁵ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

¹⁶ Haines, A., 2011. *Flora Novae Angliae*. New England Wildflower Society. Westford, MA. pg. 198-206.

¹⁷ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

¹⁸ Haines, A., 2011. *Flora Novae Angliae*. New England Wildflower Society. Westford, MA. pg. 198-206.

¹⁹ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

simple, entire trophophores, reticulate venation, and sporangia on a linear sporophyte. Northern adder's tongue can be distinguished by having a trophophore that is lanceolate to elliptic or narrow-ovate, matte and not firm, and with a gradually tapering base, as well as its preference towards more open habitats. Northern adder's tongue is found in marshes, meadows and fields, wetland margins, and anthropogenic habitats.²⁰

Field beadgrass (*Paspalum laeve*) is a member of the Poaceae family and one of two members of its genus found in Connecticut. The more common species has three subspecies, one of which is believed to be extirpated.²¹ The beadgrasses can be recognized as small, synoecious grasses with unbranched, secund branches with ovoid to obovoid spikelets with flat glumes and lemmas and prominently hard upper lemmas that lack awns and are rigid to the slightly waved edges and lacking a hyaline border. They have spikelets which are not subtended by bristles and ciliate ligules. Field beadgrass can be distinguished from its more common congener by having longer spikelets, measuring 2.3 to 3.3 mm, which are solitary at each node, and longer ligules, measuring 1.5 to 3.8 mm long. It grows in mesic to wet-mesic fields, shorelines, meadows, and riverbanks.²²

White-fringed orchid (*Platanthera blephariglottis*) is a member of the Orchidaceae family, and one of 15 species or naturally occurring hybrids in its genus found in Connecticut.²³ Like many of its congeners, it is a short plant with a spike-like inflorescence. It can be distinguished by having leaves along the stem, and white flowers with a simple, short-fringed labellum and long nectar spur. It is typically found in bogs, fens, meadows, and fields, wetland margins, and anthropogenic habitat.²⁴

Yellow-fringed orchid (*Platanthera ciliaris*) is a member of the Orchidaceae family, and one of 15 species or naturally occurring hybrids in its genus found in Connecticut.²⁵ Like many of its congeners, it is a short plant with a spike-like inflorescence. It can be distinguished by having leaves along the stem, and orange flowers with a simple, long-fringed labellum and long nectar

²⁰ Haines, A., 2011. *Flora Novae Angliae*. New England Wildflower Society. Westford, MA. pg. 62-65.

²¹ Dreyer G.D., C. Jones, et al. 2014. Native and Naturalized Vascular Plants of Connecticut Checklist. Connecticut Botanical Society. New Haven, CT.

²² Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. New England Wildflower Society's *Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England*. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 213, 223-4,271.

²³ Dreyer G.D., C. Jones, et al. 2014. Native and Naturalized Vascular Plants of Connecticut Checklist. Connecticut Botanical Society. New Haven, CT.

²⁴ Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. New England Wildflower Society's *Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England*. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 207-9.

²⁵ Dreyer G.D., C. Jones, et al. 2014. Native and Naturalized Vascular Plants of Connecticut Checklist. Connecticut Botanical Society. New Haven, CT.

spur. It is typically found in meadows, and fields, swamps, wetland margins, and anthropogenic habitat.²⁶

Elliot's goldenrod (*Solidago latissimifolia*) is a member of the Asteraceae, it is one of twenty-three members of its genus found in Connecticut, two of which are State-Listed species.²⁷ It is distinguished from other species by having a nodding capitulescence with branches that have secund capitula, basally disposed leaves that are pinnately veined, the lower of which are gradually tapered to the base, and a creeping rhizomatous nature. The leaves and stem are usually glabrous, with hairs, when present, few in number and restricted to midvein of leaves and lines of decurrence from the leaf blades. The involucre is 4 to 6 mm tall with oblong to narrow-ovate bracts that are 0.7 to 1.2 mm wide with obtuse to rounded tips, and disk corollas 4 to 5.5 mm long.²⁸ Elliot's goldenrod grows in swamps, thickets, and meadows in the coastal plain of New England.

Northern stitchwort (*Stellaria borealis* ssp. *borealis*) is a member of the Caryophyllaceae family, and one of seven members of its genus found in Connecticut, four of which are introduced.²⁹ The stitchworts can be recognized by having hypogynous flowers with a di- or monochlamydeous perianth made of distinct (non-fused) tepals and three styles, a sessile ovary, and fruit a many-seeded capsule which dehisces by six valves. Northern stitchwort is distinguished from its congeners by having sessile, non-fleshy leaves that measure 7 to 60 by 2 to 8 mm long, flowers with petals that are shorter than or barely exceed the sepals, which measure between 2 and 5 mm, and are subtended by a green, herbaceous bract. The seed capsules are much longer than the persistent sepals and contain seeds that are 0.7 to 1 mm long and smooth or obscurely marked and roughened. Northern stitchwort grows in non-hyaline stream sides, springs, low fields, and swamps, and less frequently in gullies and wet-mesic areas above treeline.³⁰

Survey Results

²⁶ Haines, Arthur, Elizabeth Farnsworth, and Gordon Morrison. New England Wildflower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Framingham, Mass.: New England Wild Flower Society, 2011. Print. pg. 207-9.

²⁷ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

²⁸ Haines, A., 2011. *Flora Novae Angliae*. New England Wildflower Society. Westford, MA. pg. 361-363, 428-9.

²⁹ Dreyer G.D., C. Jones, et al. 2014. *Native and Naturalized Vascular Plants of Connecticut Checklist*. Connecticut Botanical Society. New Haven, CT.

³⁰ Haines, A., 2011. *Flora Novae Angliae*. New England Wildflower Society. Westford, MA. pg. 503-4, 523.

Of the thirteen target species, only one, climbing fern, was found on the Site. Two patches of climbing fern were located in the area that was provided by the NDDDB program, covering an area of 3,783 square feet (see Appendix A, Photo 1 and Appendix B – *Rare Species Habitat Map*). Field beadgrass, northern stitchwort, Collin's sedge, and white fringed orchid were not found in the areas indicated on the NDDDB mapping, nor elsewhere on the Site. None of the other eight species were found on the Site. A total of 19 congeners of target plants were found; they are highlighted in orange in Appendix D – *Species List*.

Roughly 122 acres of the Site is made up of cultivated fields and areas of active land disturbance activity. The remainder of the Site is comprised of areas that are wetlands, forests, or both. For the purposes of surveying, the Site was divided into 15 Habitat Units based on their location and vegetative characteristics. The majority of the noted ± 122 acres in active cultivation (or ongoing anthropogenic disturbance) are fields that are vegetated only by crop species and an insignificant amount of introduced weed species. Three areas, however, have a relatively high species diversity and were thus determined to be potentially suitable habitat and were surveyed in detail. These areas include the following Habitat Units: (1) Staging Yard, (2) Uncultivated Area, and (3) Mesic Meadow in the Eastern Field.

Starting from the southeast corner and going clockwise, the remaining Habitat Units are (4) the Southeastern Wetland, (5) the Christmas Tree Farm, (6) Vernal Pools 1, 2, and 3 and Associated Woods, (7) the Woods East of Staging Yard, (8) the Northwest Forest and Gas Line ROW, (9) the North Wetland, (10) Vernal Pools 4 and 5 and Associated Woods, (11) the Farm Pond, (12) Vernal Pool 6, (13) the Woods North of Vernal Pool 6, (14) the Woods on the Eastern Edge and (15) the Shunpike Access. These sections are described in greater detail below, and a full species list for all Habitat Units can be found in Appendix D.

Habitat Unit 1- The Staging Yard

The Staging Yard is an approximately 4.5-acre area consisting of large piles of fill materials, parking areas for vehicles, and areas of unmaintained vegetation (Appendix A: Photo 1). In the northwest corner of this area there is a record of field beadgrass; however, the area shows signs of substantial earth moving, and the vegetation is made up almost entirely of introduced species (Appendix A: Photo 2). The area of the previous field beadgrass record is vegetated by a mix of native and introduced species, primarily annual ragweed (*Ambrosia artemisiifolia*), purple

lovegrass (*Eragrostis spectabilis*), horseweed (*Erigeron canadensis*), eyebane sandmat (*Euphorbia nutans*), Canada goldenrod (*Solidago canadensis*) evening primrose (*Oenothera biennis*) black medick (*Medicago lupulina*), lambsquarters (*Chenopodium album*), orchard grass (*Dactylis glomerata*), Queen Anne's Lace (*Daucus carota*), hairy crabgrass (*Digitaria sanguinalis*), common plantain (*Plantago major*), red, white, and rabbit-foot clover (*Trifolium pratense*, *repens*, and *arvense*), yellow nutsedge (*Cyperus esculentus*), coltsfoot (*Tussilago farfara*), garlic mustard (*Allaria petiolata*), common reed (*Phragmites australis* var. *australis*), and mugwort (*Artemisia vulgaris*). The dominant vegetation in the rest of the Staging Yard, where it is not denuded by active earth moving activity, is primarily the same species, as well as white verbena (*Verbena urticifolia*), fall American asters (*Symphotrichum ericoides* and *pilosum*), gray goldenrod (*Solidago nemoralis*), pokeweed (*Phytolacca americana*), poor man's pepper-grass (*Lepidium virginicum*), and rattlebox (*Crotalaria sagittalis*). A complete list of all species is given in Appendix D, species found in the area of the previous field beadgrass record are bolded.

Habitat Unit 2- Uncultivated Area Northeast of Vernal Pool 4

This approximately six-acre area is comprised of an uncultivated low-lying area and a northeast running strip of forest which separates it from the cultivated field to the south (Appendix A: Photo 3). To its east, just north of the Farm Pond, is an area where there is active fill. The forest strip shares the characteristics of the rest of the woods surrounding Vernal Pools 4 and 5, which will be discussed in section 11 below. The remainder of the area is primarily vegetated by a mix of native and introduced herbaceous species. Although it is not a designated wetland, it is vegetated by many wetland species. It is primarily vegetated by devil's beggar-ticks (*Bidens frondosa*), sallow sedge (*Carex lurida*), rough barnyard grass (*Echinochola muricata*), flat top goldenrod (*Euthamia graminifolia*), purple-top tridens (*Tridens flavus*), early and rough-stemmed golderods (*Solidago juncea* and *rugosa*), switchgrass (*Panicum virgatum*), arrow-leaf tearthumb (*Persicaria sagittata*), India love grass (*Eragrostis pilosa*), sensitive fern (*Onoclea sensibilis*), and soft rush (*Juncus effusus*). With invasive mugwort, yellow nutsedge, bittersweet (*Celastrus orbiculatus*), and purple loosestrife (*Lythrum salicaria*). Large vehicle tracks indicate recent earth moving activity in this area.

Habitat Unit 3- Mesic Meadow in Eastern Field

This approximately four-acre portion of the eastern field was determined in the March surveys to be potentially suitable habitat for some of the wet-loving species, particularly northern adder's-tongue and Bayard's adder's mouth, due to its wet nature, relatively high species diversity, and proximity to evergreen conifers offsite. During later surveys it became apparent that this field is not, as it initially appeared, a hayfield, but rather is under active cultivation as a corn field, and as was evident later in the season, is subjected to a substantial amount of cultivation and other soil disturbance (Appendix A: Photo 4, 5, 6). In addition to the corn, which well overtopped all other species by midseason, it is vegetated primarily by introduced species. These include field garlic (*Allium vineale*), orchard grass, quickweed (*Galinsoga parviflora*), Queen Anne's lace, sweet vernal grass (*Anthoxanthum odoratum*), English and common plantain (*Plantago lanceolata* and *major*), Johnny jump-ups (*Viola tricolor*), narrow-leaved montia (*Montia linearis*), mouse-ear chickweed (*Cerastium vulgatum*), with invasive mugwort, field sorrel (*Rumex acetosella*) and yellow nutsedge. The few native species present in large numbers include deer-tongue grass (*Dichanthelium clandestinum*), white-top fleabane (*Erigeron annuus*), sweet and rough-stemmed goldenrod (*Solidago odora* and *rugosa*).

Habitat Unit 4- Southwestern Wetland

The southwestern wetland begins at the westernmost access road. It is comprised of a forested area which separates the two westernmost fields, as well as a margin of forest surrounding an open water area that expands greatly offsite to the north and west (Appendix A: Photo 7). To the south it is bound by private residence. To the north it is bound by the Christmas tree farm and upland forested area. Due to its proximity to residential and agricultural areas, this wetland is vegetated by many invasive species, particularly near the residences and the accesses between fields (Appendix A: Photo 8). The canopy is almost entirely comprised of red oak (*Acer rubrum*) with lesser amounts of black cherry (*Prunus serotina*) and red oak (*Quercus rubra*). The shrub layer is made up of native spicebush (*Lindera benzoin*), oblong-leaf serviceberry (*Amelanchier canadensis*), and staghorn sumac (*Rhus hirta*) and invasive morrow's honeysuckle (*Lonicera morrowii*) and multiflora rose (*Rosa multiflora*). The herb layer is made primarily of common copper-leaf (*Acalypha rhomboidei*), devil's beggar-ticks, deer-tongue grass, purple-leaved willowherb (*Epilobium coloratum*), flat-top goldenrod, rattlesnake grass (*Glyceria canadensis*), whitegrass (*Leersia virginicum*), clearweed (*Pilea pumila*), tall and rough-stemmed goldenrods (*Solidago altissima* and *rugosa*), skunk cabbage (*Symplocarpus foetidus*), jewelweed (*Impatiens*

capiensis), Japanese spurge (*Pachysandra terminalis*), and invasive mugwort, narrowleaf bittercress (*Cardamine impatiens*), dame's rocket (*Hesperis matronalis*), Japanese stiltgrass (*Microstegium vimineum*), common reed, and Asiatic bittersweet (*Celastrus orbiculatus*).

Habitat Unit 5- Christmas Tree Farm

The Christmas tree farm is characterized by rows of planted evergreen conifers. Amongst these rows are a mix of native and introduced herbaceous species, with some shrubs. The species are primarily made up of yarrow (*Achillea millefolium*), broom-sedge (*Andropogon virginicus*), white-top fleabane, flat-top goldenrod, little bluestem (*Schizachyrium scoparium*), Canada, early, gray, rough-stemmed, and elm-leaved goldenrods (*Solidago canadensis*, *juncea*, *nemoralis*, *rugosa*, and *ulmifolia*), Queen Anne's lace, oxeye daisy (*Leucanthemum vulgare*), yellow toadflax (*Linnarea vulgaris*), common mullein (*Verbascum thapsus*) and invasive mugwort and garlic mustard. The shrubs are primarily common blackberry (*Rubus allegheniensis*) and black raspberry (*Rubus occidentalis*), and invasive multiflora rose, Morrow's honeysuckle, and autumn olive (*Elaeagnus umbellata*) (Appendix A: Photo 9).

Habitat Unit 6- Vernal pools 1, 2, 3 and Associated Woods

The only State-Listed species found on the Site was located within this area. Two patches of climbing fern were located [REDACTED] northeast of Vernal Pool 1 (Appendix A: Photo 10).

The woods west of the Christmas tree farm are dominated by American beech (*Fagus grandifolia*) and white ash (*Fraxinus americana*), with a very sparse herb layer (Appendix A: Photo 11). The border between the Christmas tree farm and forested areas is vegetated primarily by invasive species, particularly autumn olive, multiflora rose, and Asiatic bittersweet.

Moving northward, towards potential vernal pools 1 and 2 the tree canopy becomes dominated by red maple, black cherry, and white pine, with shagbark and bitternut hickory (*Carya ovata* and *cordiformis*) with locally dense stands of eastern red cedar (*Juniperus virginiana*) and eastern white pine (*Pinus strobus*). The shrub layer is dominated by ironwood (*Carpinus caroliniana*), witch hazel (*Hamamelis virginiana*), blackhaw (*Viburnum prunifolium*), and lowbush and blue ridge blueberries (*Vaccinium pallidum* and *angustifolium*) in drier portions, with spicebush (*Lindera benzoin*), arrowwood (*Viburnum dentatum*), and highbush blueberry (*Vaccinium corymbosum*), as well as invasive burning bush (*Euonymus alatus*), barberry (*Berberis thunbergii*)

multiflora rose, morrow's honeysuckle and Asiatic bittersweet throughout, particularly near edges and old woods roads (Appendix A: Photo 12). The herb layer is relatively sparse in most places. It is dominated by wood anemone (*Anemone quinquefolia*), loose-flowered sedge (*Carex laxiflora*), Canada mayflower (*Maianthemum canadense*) shinleaf (*Pyrola elliptica*), white wood aster (*Eurybia divaricata*), Christmas fern (*Polystichum acrostichoides*), spotted cranesbill (*Geranium maculatum*), star-flower (*Trientalis borealis*), and wreath goldenrod (*Solidago caesia*), in drier areas and New York Fern (*Thelypteris noveboracensis*), skunk cabbage (*Symplocarpus foetidus*), gray's sedge (*Carex grayi*), marsh blue violet (*Viola cucullata*), cinnamon fern (*Osmunda cinnamomea*), stout wood-reedgrass (*Cinna arundinaceae*) and sensitive fern (*Onoclea sensibilis*) in and near wetlands. (Appendix A: Photo 13).

Vernal Pools 1 and 2 are almost entirely unvegetated (Appendix A: Photo 14, 15). Vernal Pool 3 is primarily fed by runoff from the staging yard and has areas of silt deposition. (Appendix A: Photo 16).

The wooded area between the Christmas tree farm and the staging yard is drier, with a greater proportion of evergreen conifers in the canopy, primarily eastern red cedar (*Juniperus virginiana*) and eastern white pine (*Pinus strobus*), in addition to the red and white oaks, the herb layer in this area is sparse, with a shrub layer of lowbush and blue ridge blueberries (*Vaccinium angustifolium* and *pallidum*) and witch hazel (*Hamamelis virginiana*).

Habitat Unit 7- Woods East of Staging Yard

The woods east of the staging yard has an American beech, red maple, red oak canopy with an ericaceous shrub layer dominated by highbush and blue ridge blueberries (*Vaccinium corymbosum* and *pallidum*). The herb layer is sparse, made up primarily of hay-scented fern (*Dennstaedtia punctilobula*), cinnamon fern (*Osmunda cinnamomea*), teaberry (*Gaultheria procumbens*), and shinleaf (*Pyrola elliptica*). There is a glade of eastern hemlock (*Tsuga canadensis*) in the northern portion of this section.

Habitat Unit 8- Northwest Forest and Gas Line ROW

The woods in the north-central portion of the Site (and to west) are uniquely acidic, with a tree canopy dominated by eastern white pine, white oak, black oak (*Quercus velutina*), sassafras (*Sassafras albidum*), and eastern hemlock (*Tsuga canadensis*) in drier areas, with red maple,

tulip poplar (*Liriodendron tulipifera*), and black tupelo (*Nyssa sylvatica*) in wetland areas. The shrub layer in drier areas is made of sheep laurel (*Kalmia angustifolia*), witch hazel, with sweet pepperbush (*Clethra alnifolia*), lowbush blueberry (*Vaccinium angustifolium*), spicebush (*Lindera benzoin*) in wetland areas, and invasive barberry, Morrow's honeysuckle, and multiflora rose throughout. The herb layer in dry areas is typical of that found in conifer dominated mixed hardwood forests. It is primarily partridgeberry (*Mitchella repens*), teaberry, wild sarsaparilla (*Aralia nudicaulis*), enchanter's nightshade (*Circaea canadensis*) and evergreen wood-fern (*Dryopteris intermedia*). Wetland areas are much more densely vegetated and dominated by bladder sedge (*Carex intumescens*), sallow sedge (*Carex lurida*), water pennywort (*Hydrocotyle americana*), stout wood-reedgrass, goldthread (*Coptis trifolia*), fowl manna grass (*Glyceria striata*), jewelweed, and New York Fern (Appendix A: Photos 17,18).

The Gas Line ROW west of the cultivated fields is vegetated by many of the same wetland species found surrounding Vernal Pool 1, such royal fern (*Osmunda regalis*), gray dogwood, and arrowwood, with drier areas vegetated by a mix of native and introduced species, notably mugwort, oldfield toadflax (*Nuttallanthus canadensis*), and Clasping venus' looking glass (*Triodanis perfoliata*), deertongue grass (*Dichantherium clandestinum*, and hairy rosette-panicgrass (*Dichantherium acuminatum*), birdsfoot trefoil (*Lotus corniculatus*), whorled loosestrife (*Lysimachia quadrifolia*), bracken fern (*Pteridium aquilinum*), and rough-stemmed and sweet goldenrods (Appendix A: Photos 19).

Habitat Unit 9- North Wetlands

The wetland which extends to the north from the northern edge of fields in the eastern portion of the Site is vegetated primarily by red maple, red cedar, eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula allegheniensis*), pussy willow (*Salix discolor*) and multiflora rose. Beyond the northeastern edge of the property is an extensive cattail (*Typha latifolia*) and invasive common reed (*Phragmites australis* ssp. *australis*) dominated wetland. Between this wooded area north of the property line and the cultivated fields there is a mesic area dominated by rough-stemmed and Canada goldenrods and introduced species, notably mugwort (Appendix A: Photo 20).

To the west of this field is an uncultivated area which is made up of two parts, an ericaceous shrub dominated swamp in the northern half, and a wet meadow in the southern half. The wet meadow is vegetated primarily by tall, Canada, late, sweet, and rough-stemmed goldenrods

(*Solidago altissima*, *canadensis*, *gigantea*, *odora*, and *rugosa*), sallow sedge, tussock sedge (*Carex stricta*), soft rush (*Juncus effusus*), swamp milkweed (*Asclepias incarnata* var. *pulchra*), Purplestem aster (*Symphotrichum puniceum*), sensitive fern, cinnamon fern, arrow-leaf tearthumb (*Persicaria sagittata*), rice cutgrass (*Leersia oryzoides*) bluejoint reedgrass (*Calamagrostis canadensis*), deertongue grass, jewelweed, boneset (*Eupatorium perfoliatum*), flat-top goldenrod, blue vervain (*Verbena hastata*), curly dock (*Rumex crispus*), and woolgrass (*Scirpus cyperinus*), with invasive mugwort, purple loosestrife (*Lythrum salicaria*), creeping thistle (*Cirsium arvense*), yellow nutsedge, and common reed (Appendix A: Photo 21).

This shrub and small tree area north of the herbaceous portion is dominated by bayberry (*Morella pensylvanica*), black chokeberry (*Aronia melanocarpa*), sweet pepperbush, sheep laurel (*Kalmia angustifolia*), setose blackberry (*Rubus setosus*), steeplebush (*Spiraea tomentosa*), and lowbush blueberry (*Vaccinium angustifolium*) with some red maple, gray birch (*Betula populifolia*), eastern white pine, and quaking aspen (*Populus tremuloides*). The herb layer is dominated by haircap (*Polytrichum commune*) and peat mosses (*Sphagnum* sp.), teaberry, cinnamon fern, and sensitive fern (Appendix A: Photo 22).

Habitat Unit 10- Vernal Pools 4 and 5 and Associated Woods

Like most of the wetlands on the Site, Vernal Pools 4 and 5 and their associated wooded areas are vegetated by a mixed hardwood canopy made primarily of red maple, with box elder (*Acer negundo*), shagbark hickory, eastern red cedar, white oak, scarlet oak (*Quercus coccinea*), pin oak (*Quercus palustris*), and red oak. Spicebush, highbush and blue ridge blueberry, winterberry (*Ilex verticillata*), elderberry (*Sambucus canadensis*), and speckled alder (*Alnus incana*) dominate the shrub layer with invasive multiflora rose, morrow's honeysuckle, burning bush and autumn olive. The edges in particular are dominated by invasive species, with common blackberry and groundnut (*Apios americana*) (Appendix A: Photo 23). The herbaceous layer is sparse, vegetated primarily by sensitive fern, skunk cabbage, eastern marsh fern (*Thelypteris palustris*) fowl manna grass (*Glyceria striata*), common woodrush (*Luzula multiflora*) and invasive moneywort (*Lysimachia nummularia*) and Japanese stiltgrass (Appendix A: Photo 24).

Vernal Pool 4 is a shrub-swamp wetland, made up of hummocks which host shrubs, notably highbush blueberry, spicebush, sweet pepperbush, and winterberry with swamp smartweed

(*Persicaria hydropiperoides*). (Appendix A: Photo 25, 26). Vernal Pool 5 is dominated by invasive honeysuckle and barberry.

Upland portions of this forested area, east of Vernal Pool 5 and between the wetland of Vernal Pools 4 and 5, the vegetation becomes drier and more thicket-like, with bush honeysuckle, hairy bittercress (*Cardamine hirsuta*) and mugwort, as well as American beech, gray dogwood, sassafras, spotted wintergreen (*Chimaphila maculata*).

Habitat Unit 11- Farm Pond

The farm pond is surrounded by a narrow border of cottonwood, scarlet oak, pin oak, red maple, and red oak with some invasive Tree of Heaven (*Ailanthus altissima*) and Norway maple (*Acer platanoides*). The herbaceous layer is dominated by switchgrass (*Panicum virgatum*), broomsedge (*Andropogon virginicus*), poison ivy (*Toxicodendron radicans*), path rush (*Juncus tenuis*), churchmouse threeawn (*Aristida dichotoma*), Purple-top tridens (*Tridens flavus* wild sensitive pea (*Chamaecrista nictans*), goosegrass (*Eleusine indica*), flat-top goldenrod, Canada, late, early, sweet, rough-stemmed, and elm-leaved goldenrods. The shrub layer is made up of staghorn sumac (*Rhus hirta*) with invasive Morrow's honeysuckle and Asiatic bittersweet (Appendix A: Photo 27). The pond itself is mostly unvegetated, with large areas of swamp smartweed and lesser duckweed (*Lemna minor*). (Appendix A: Photo 28)

Habitat Unit 12- Vernal Pool 6

Vernal Pool 6 is surrounded by herbaceous and shrubby vegetation. Along the wetland-upland interface the vegetation is dominated by swamp milkweed, fireweed (*Erechtites hieraciifolius*), soft rush, deertongue grass, sensitive fern, rough-stemmed and late goldenrods, Indian hemp (*Apocynum cannabinum*) and common blackberry, with some invasive mugwort and purple loosestrife. The wetland is vegetated primarily by buttonbush (*Cephalanthus occidentalis*), arrow-leaf tearthumb, woolgrass, swamp candles (*Lysimachia terrestris*), rice cutgrass (*Leersia oryzoides*), meadowsweet (*Spiraea alba*), sweet pepperbush, royal fern, swamp smartweed, tussock sedge (*Carex stricta*), fowl manna grass, and American bur-reed (*Sparganium americanum*), with lesser duckweed in areas of open water (Appendix A: Photo 29, 30).

Habitat Unit 13- Woods North of Vernal Pool 6

The woods north of Vernal Pool 6 are primarily upland and dominated by introduced species. The canopy is comprised of American Beech, pin oak, eastern white pine, and sassafras, and invasive Norway maple and Tree-of-Heaven, with common greenbrier (*Smilax rotundifolia*) and Asiatic bittersweet. The shrub layer is dominated by lowbush blueberry and witch hazel with glossy false buckthorn (*Frangula alnus*) and autumn olive. The herb layer is sparse, with common woodland species such as Canada mayflower, whorled loosestrife, common woodrush, white wood aster, and introduced species including cheatgrass (*Bromus tectorum*), mugwort, Queen Anne's Lace (*Daucus carota*), and English plantain (*Plantago lanceolata*) (Appendix A: Photo 31).

Habitat Unit 14- Woods on Eastern Edge

While the cultivated fields do go to the edge of the Site, the edges of these fields are characterized by the adjacent forested area. This forested area has a canopy comprised of red and white oaks, black cherry, and American beech with Asiatic bittersweet and poison ivy and a shrub layer of multiflora rose, Morrow's honeysuckle, autumn olive, and Japanese barberry (*Berberis thunbergii*). The herb layer is comprised of purple loosestrife, New England and smooth blue asters (*Symphotrichum novae-angliae* and *laeve*), and early, rough-stemmed, and flat-top goldenrods.

Habitat Unit 15- Shunpike Access

Habitat Unit 15 was surveyed on November 17, for the purposes of evaluating the potential for target species to occur based on the habitat characteristics present. Photographs of this portion of the Site are including as Appendix A-1. This survey area consists of a grouping of two parcels that were added to the Project limits later in the summer, as they may provide lands for an access road to the interior of the Site from Shunpike Road.

The 1934 aerial imagery shows the eastern half of the Shunpike Access in cultivation. This field has approximately the same shape as a depression that is visible on current aerial imagery and can be recognized on the ground by a ditched area separating this area from the main portion of the parcel to the east. Presumably, this ditch was dug to drain this area for agricultural use. By 1970 an additional field, of approximately two acres, was cleared. This area extends east of the middle of the already cleared area, the boundaries of this area can also be seen on current aerial photography, although they are less distinct in the field. The 1970 aerial imagery also shows the development directly north and south of the parcel along the frontage of Shunpike Road.

Cultivation stops at some point after 1995, with the 2004 aerial imagery showing regrowth in these fields.

The Habitat Unit is predominantly upland forested, with four wetlands present, including a western north-to-south draining system (Wetland 4, See Appendix A-1, Photo 1), a northern wetland system draining north (Wetland 5) and two small, isolated wetlands (Wetlands 10 and 13). Wetlands include two potential vernal pools (Potential Vernal Pools 8 and 9). Wetland 4 drains into the large beaver pond wetland associated with Habitat Unit 4. A significant amount of historic disturbance is present within Wetland 4. Most notably a north-south running ditched portion of Wetland 4 that marks the eastern boundary of this parcel (Appendix A-1: Photo 3), and an area of steep elevation change in the northwestern inset corner (Appendix A-1: Photo 4). Throughout, there is clear evidence of historic use as a dumping area (Appendix A-1: Photo 5, 6). Due to the timing of the survey, many plants, particularly herbaceous species, were not able to be identified to species, and others may have senesced entirely for the year. Upland areas have a canopy dominated by red maple (*Acer rubrum*) and black cherry (*Prunus serotina*) with an understory dominated by invasive species (Appendix A-1: Photo 7). There are a number of introduced species found in this area not found on the rest of the parcel, notably substantial numbers of thornless honey locust (*Gleditsia triacanthos* form *inermis*) and little-leaf basswood (*Tilia cordata*) (Appendix A-1: Photo 8,9), these species are highlighted in light red in the species list and indicate previous land use history. In addition to these species, there is what appears to be an old crabapple orchard in the southern half of the upland areas (Appendix A-1: Photo 10). The eastern half of these upland areas, which was released from cultivation in the latter half of the 1990s, is heavily dominated by invasive species, particularly Autumn olive (*Elaeagnus umbellata*) and Asiatic bittersweet (*Celastrus orbiculatus*) (Appendix A-1: Photo 11).

Where necessary, particularly in the southern portion of the survey area, wetland areas were surveyed visually from their limits due to deep mud and in order to minimize impact to natural hydrology. They are dominated by a canopy of red maple, with a shrub-herbaceous understory made up primarily of blueberry (*Vaccinium corymbosum*), elderberry (*Sambucus nigra* spp. *canadensis*), and multiflora rose (*Rosa multiflora*), with common reed (*Phragmites australis* var. *australis*) and numerous grasses not able to be identified at time of survey (Appendix A-1: Photos 12 and 13). Both potential vernal pools were sparsely vegetated at the time of survey. Potential Vernal Pool 8 is a small shallow depression embedded within Wetland 4. The vegetation consists of royal fern (*Osmunda regalis*), tree clubmoss (*Dendrolycopodium obscurum*), and highbush

blueberry (Appendix A-1: Photo 14). Potential Vernal Pool 9 is vegetated by royal fern, water horehound (*Lycopus* sp.), and arrowwood (*Viburnum dentatum*) (Appendix A-1: Photo 15). The frontage along Shunpike Road is vegetated by the same species as the rest of the upland areas (Appendix A-1: Photo 16).

A complete listing of species is included in Appendix D- *Shunpike Access Parcel*. Again, congeners of target species are highlighted in orange. A total of six congeners were found in this area, with two species found nowhere else in the survey area: rough-leaved goldenrod (*Solidago patula*), and Pennsylvania sedge (*Carex pennsylvanica*), as well as numerous sedges not able to be identified at the time of survey. Substantial suitable habitat was found for climbing fern in the northern portion of this survey area (Appendix A-1: Photo 17), although none was found, possibly due in part to the presence of deep leaf litter. Additionally, this parcel has suitable habitat for early coralroot, Bayard's and green adder's-mouth, Northern adder's tongue, northern stitchwort, and Elliot's goldenrod. While many of these species are known to grow in habitats with significant anthropogenic disturbance, the intensity and duration of anthropogenic impact on this site has likely degraded the habitat suitability to some degree. Finally, a number of invasive and introduced woody species were also noted in this Habitat Unit that were not observed on the remainder of the Site. Those species are highlighted in red.

Appendices

A: Site Photographs

A-1: Site Photographs (Shunpike Access)

B: Mapping

C: Survey Route Maps

D: Species List

E: NDDDB Preliminary Assessment Letter

F: Rare Plant Form

G: Summary of Qualifications

APPENDIX A – Site Photographs



Photo 1: Characteristic agricultural field in southern portion of property. Some fields, such as this one, are used as hayfields in first half of season, but are also cultivated crop fields in the latter half of the season.



Photo 2: Staging yard.



Photo 3: Northwestern corner of staging area, location of prior field beadgrass observation. Note large amount of mugwort and recently disturbed soil.



Photo 4: Area of uncultivated land just west of active fill area. Note standing water in bottom right, this is a ditch from vehicle tires.



Photo 5: Mesic meadow of eastern field, hayfield early in season.



Photo 6: Mesic meadow in eastern field is cornfield later in season.



Photo 7: Major soil disturbance from harvesting in cornfield in mesic area of eastern meadow.



Photo 8: Swamp portion of southwestern wetland.



Photo 9: Invasive dominated buffer between agricultural fields and southwestern wetland.



Photo 10: Most open area of Christmas tree farm.



Photo 11: Climbing fern, note dimorphic leaves.



Photo 12: American Beech and American Ash dominated upland forest west of Christmas tree farm.



Photo 13: Characteristic area of woods near PVP1 and 2, note densely vegetated area in background.



Photo 14: Wetland areas west of PVP 1, with many invasive species.



Photo 15: Potential Vernal Pool 1, with many areas of dense vegetation, including many invasive species, particularly multiflora rose.



Photo 16: Potential Vernal Pool 2.



Photo 17: PVP 3, note large amount of silt from staging yard runoff.



Photo 18: Sparsely vegetated forest floor between Christmas tree farm and staging yard.



Photo 19: Dry, needleleaf evergreen dominated portion of northwestern forest.



Photo 20: Ecotone between dry and wetland portions of northwest woods.



Photo 21: Densely vegetated wetland in the eastern portion of the northwest forest.



Photo 22: Photo taken looking west. Righthand treeline is the property edge, north of which extends a swamp.



Photo 23: Herbaceous wet meadow. Vegetation dominated by purple loosestrife and goldenrods. Note large patch of common reed in back righthand side.



Photo 24: Ericaceous dominated shrub-swamp.



Photo 25: Photo taken looking west along edge of woods north of PVP 5. Dominated by bittersweet and common blackberry.



Photo 26: Fern glade in the woods north of PVP5.



Photo 27: PVP 4, shrub-swamp wetland.



Photo 28: Moss covered shrub hummock characteristic of PVP 4.



Photo 29: PVP 5, more highly vegetated than other PVPs, including by many invasive species. 6/9/2021



Photo 30: Upper vegetation around farm pond, many goldenrods and invasive species.



Photo 31: Farm Pond.



Photo 32: PVP6, photo taken looking west from edge of property.



Photo 33: PVP 6. Photo taken looking east, towards edge of property.



Photo 34: Forest beyond the eastern edge of the Site.

APPENDIX A-1 – Site Photographs (Shunpike Access)



Photo 1: Stream in Wetland 5.



Photo 2: Stormwater outfall into southern end of Wetland 4.



Photo 3: Trench marking eastern boundary of the Site. Photo taken looking north, note dense invasive shrub species to the left-hand side of photo.



Photo 4: Intense anthropogenic elevation changed in northwestern corner of parcel. Wrong photo



Photo 5: Old trash dumping, found throughout property.



Photo 6: More recent trash dumping at southern end of property



Photo 7: Trench on eastern edge of property. Note invasive understory to the righthand side. Photo taken looking south.



Photo 8: Honey locust seed pods.



Photo 9: Introduced little-leaf basswood.



Photo 10: Apparent historic orchard area.



Photo 11: Dense invasive species in upland areas.



Photo 12: Southern end of Wetland 4.



Photo 13: Northwestern end of Wetland 5.



Photo 14: Potential vernal pool 8.



Photo 15: Potential vernal pool 9.



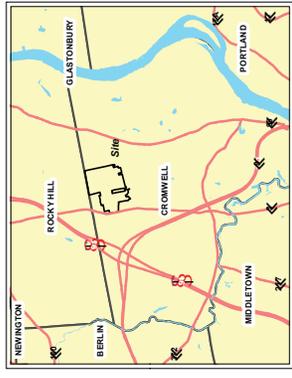
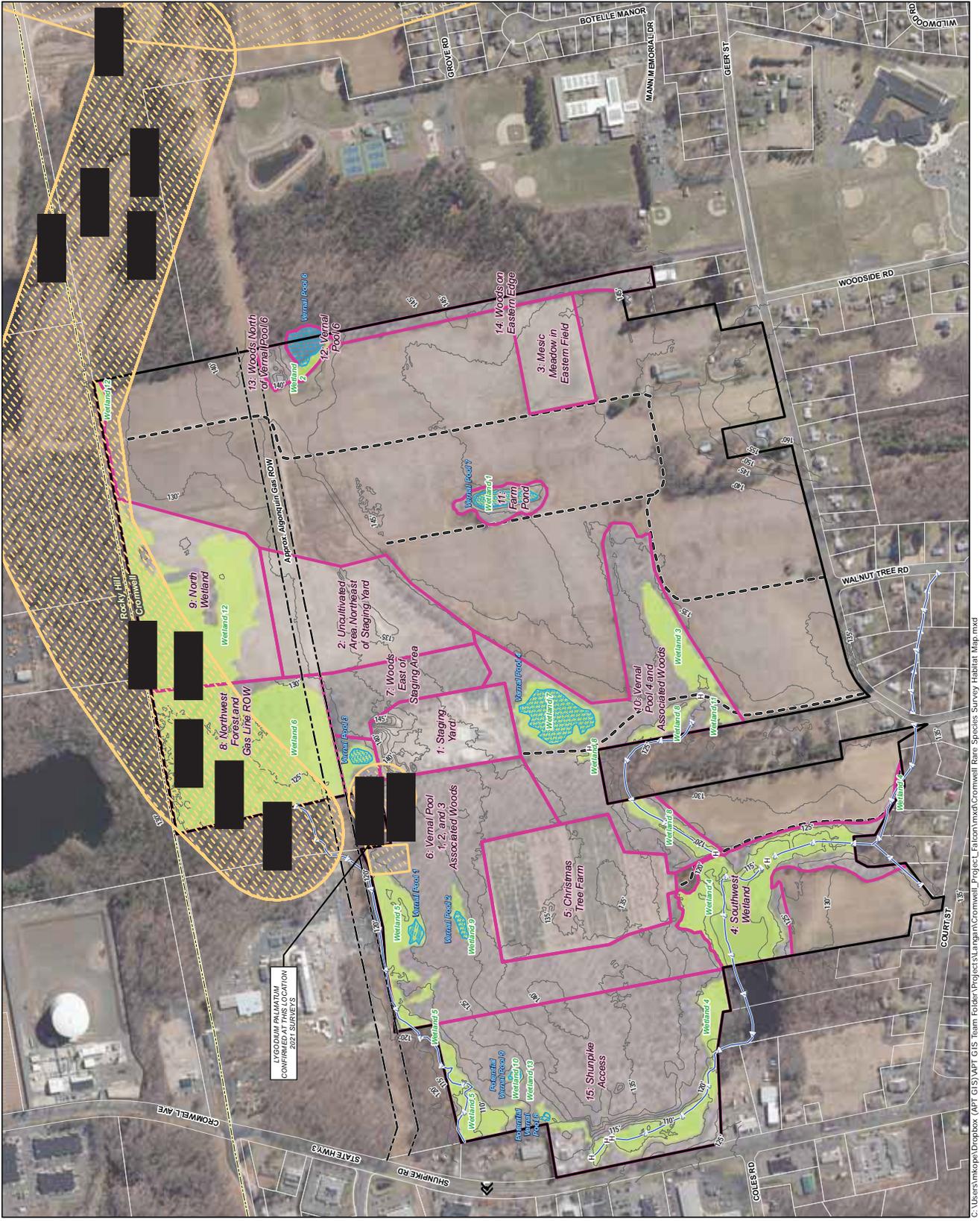
Photo 16: Frontage along Shunpike Road looking south along sewerline right-of-way.

APPENDIX B – Mapping

Rare Species Survey Habitat Map
 Project Highlands
 210 Shunpike Road
 Cromwell, Connecticut

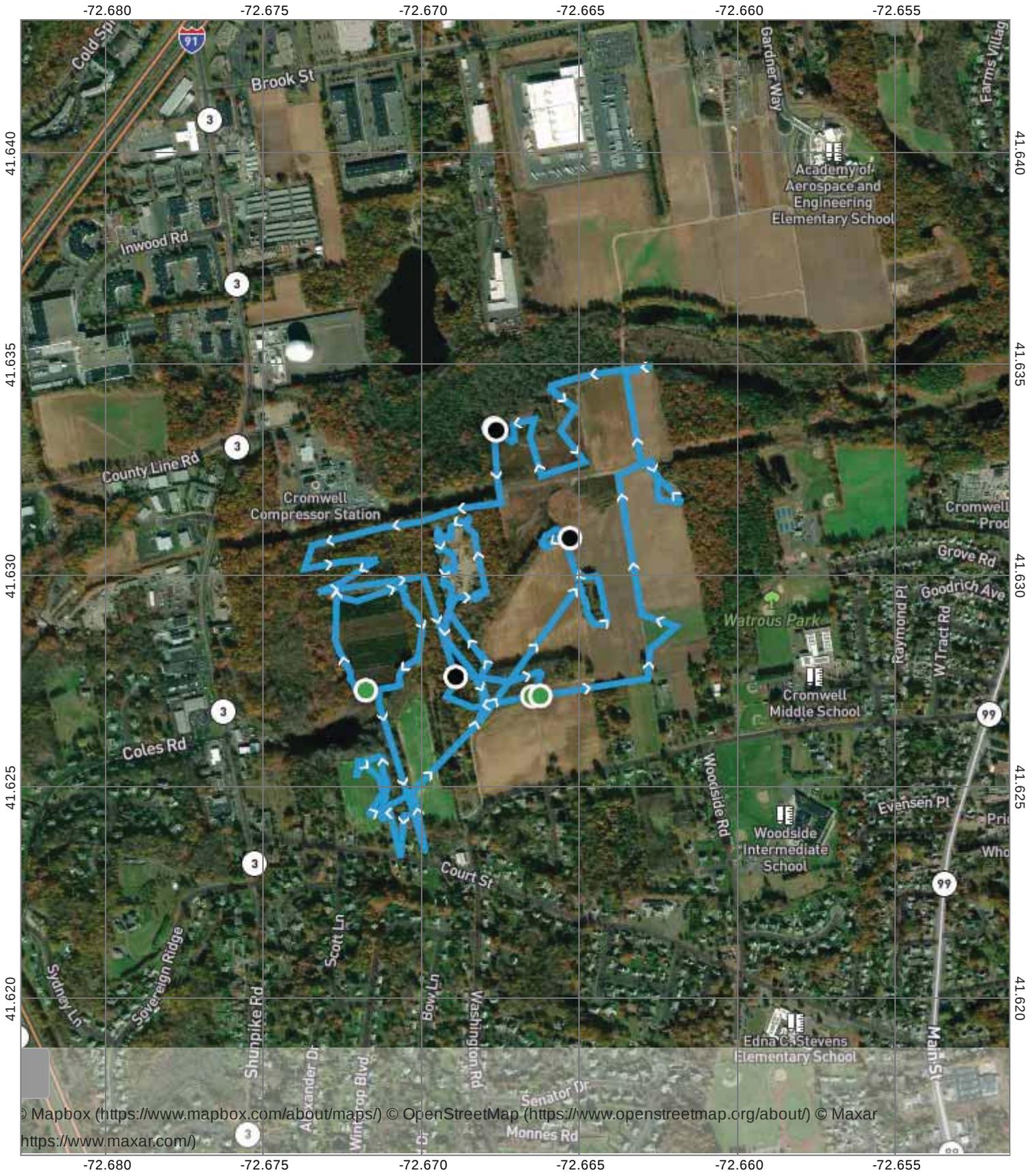
LANGAN

- Legend**
- Site
 - Rare Species Survey Habitat
 - Rare Species (NDRS Confidential Data)
 - Approximate Wetland Area
 - Potential Vernal Pool
 - Vernal Pool
 - Municipal Boundary
 - Existing Access Drive
 - Approximate Alperquin Gas Line ROW
 - Perennial Stream (Approximate)
 - 5-foot Contour Line
 - Existing Culvert
 - Parcel Boundary



Map Notes:
 Data Source: Natural resources field investigations conducted by AFP and Davison Environmental, LLC
 Ortho Base Map: State of Connecticut 2019 aerial imagery CTECO
 Elevation contours derived from LIDAR data maintained by CTECO
 Map Date: November 2021

APPENDIX C – Survey Route Maps



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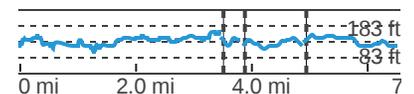


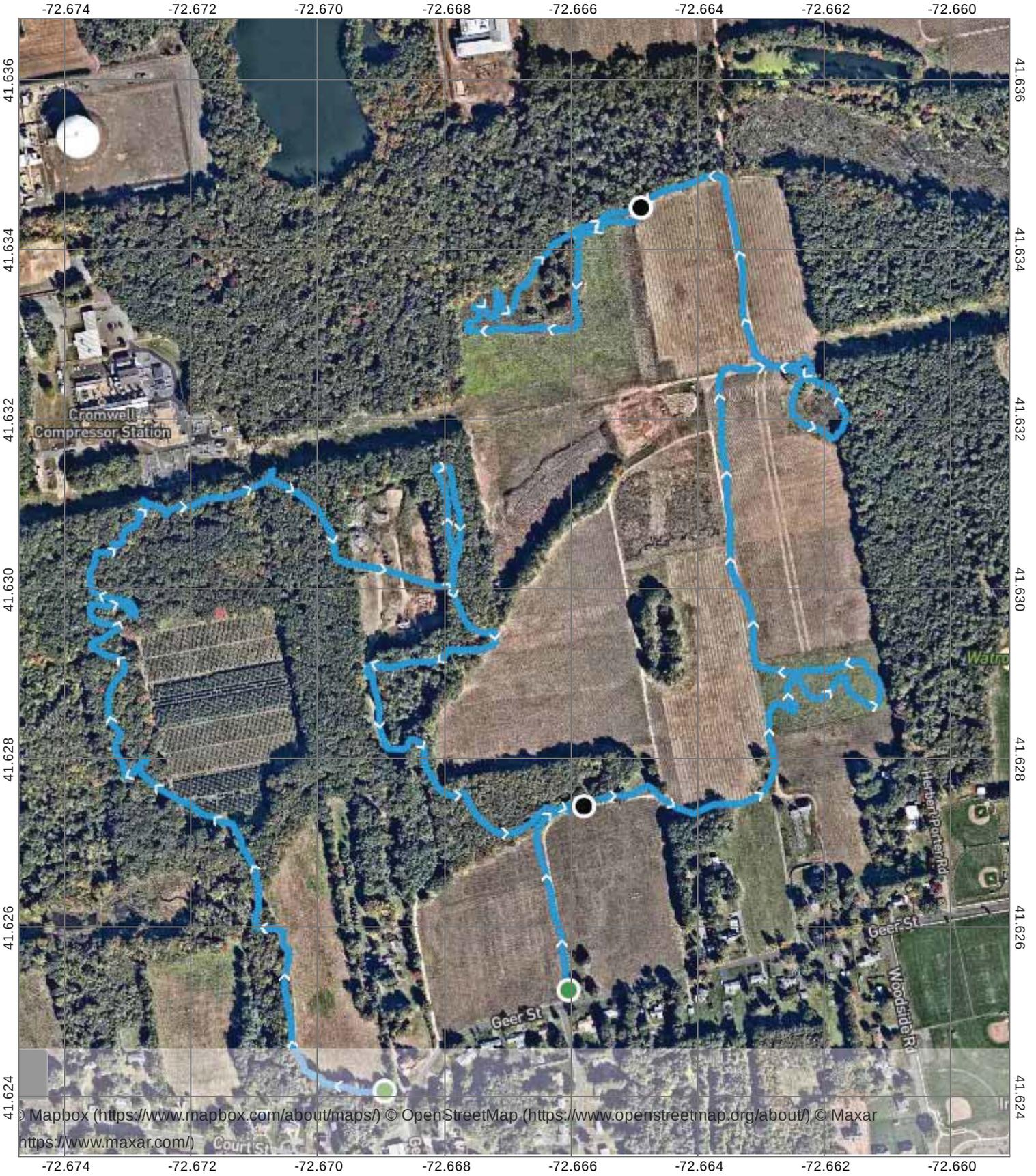
MN
13.7°W
10/29/21

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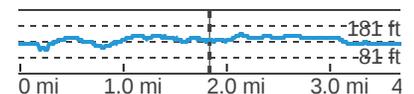
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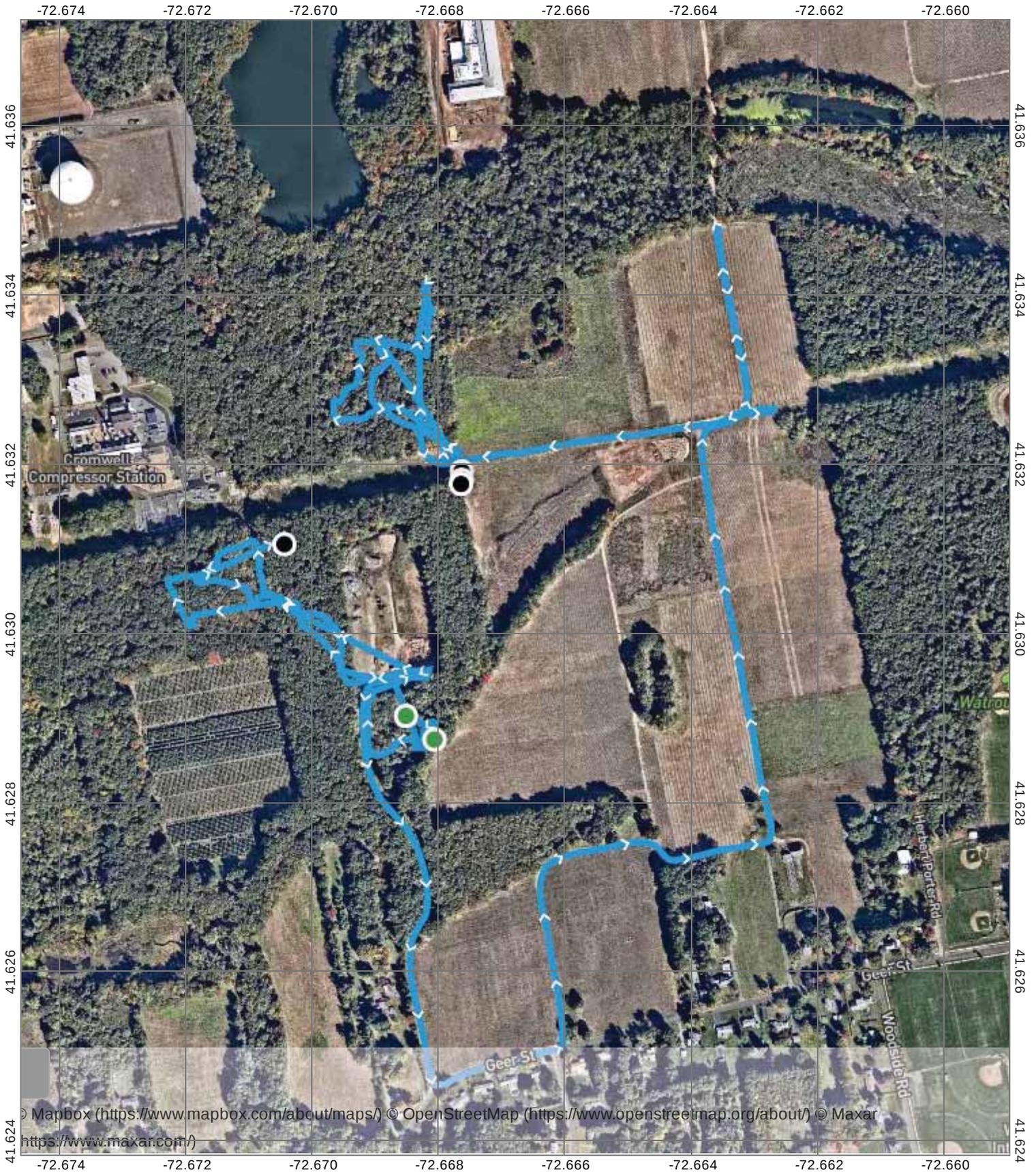
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MN ★
13.7°W
10/29/21

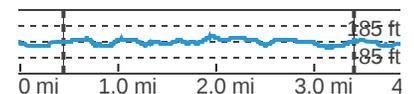
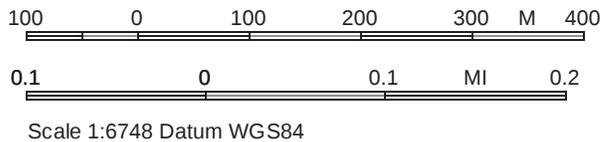


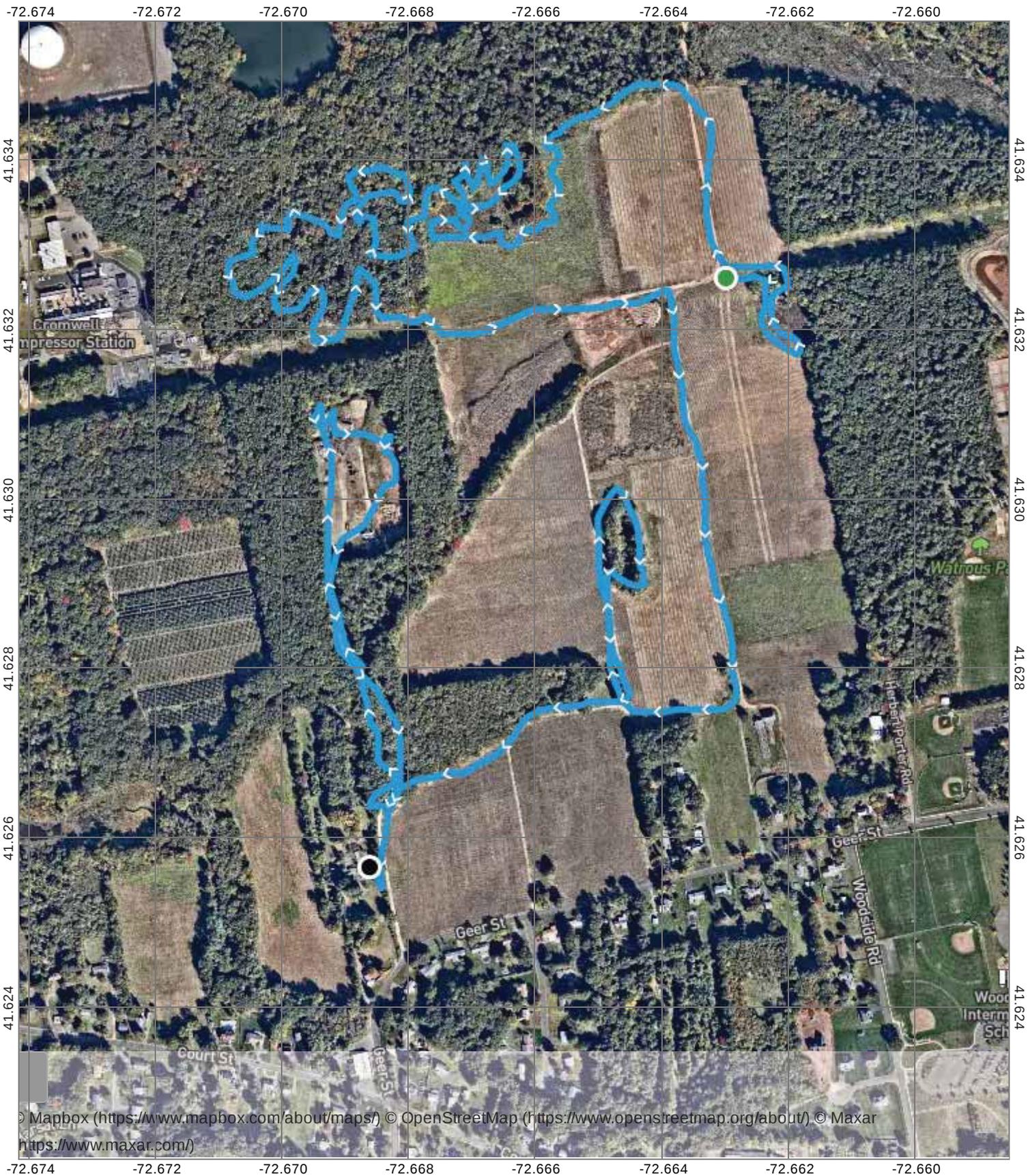


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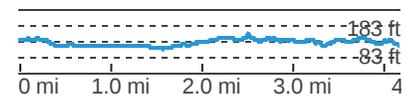
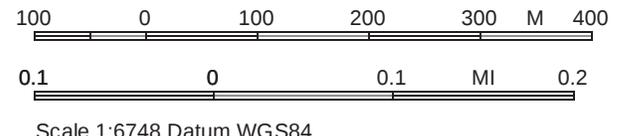


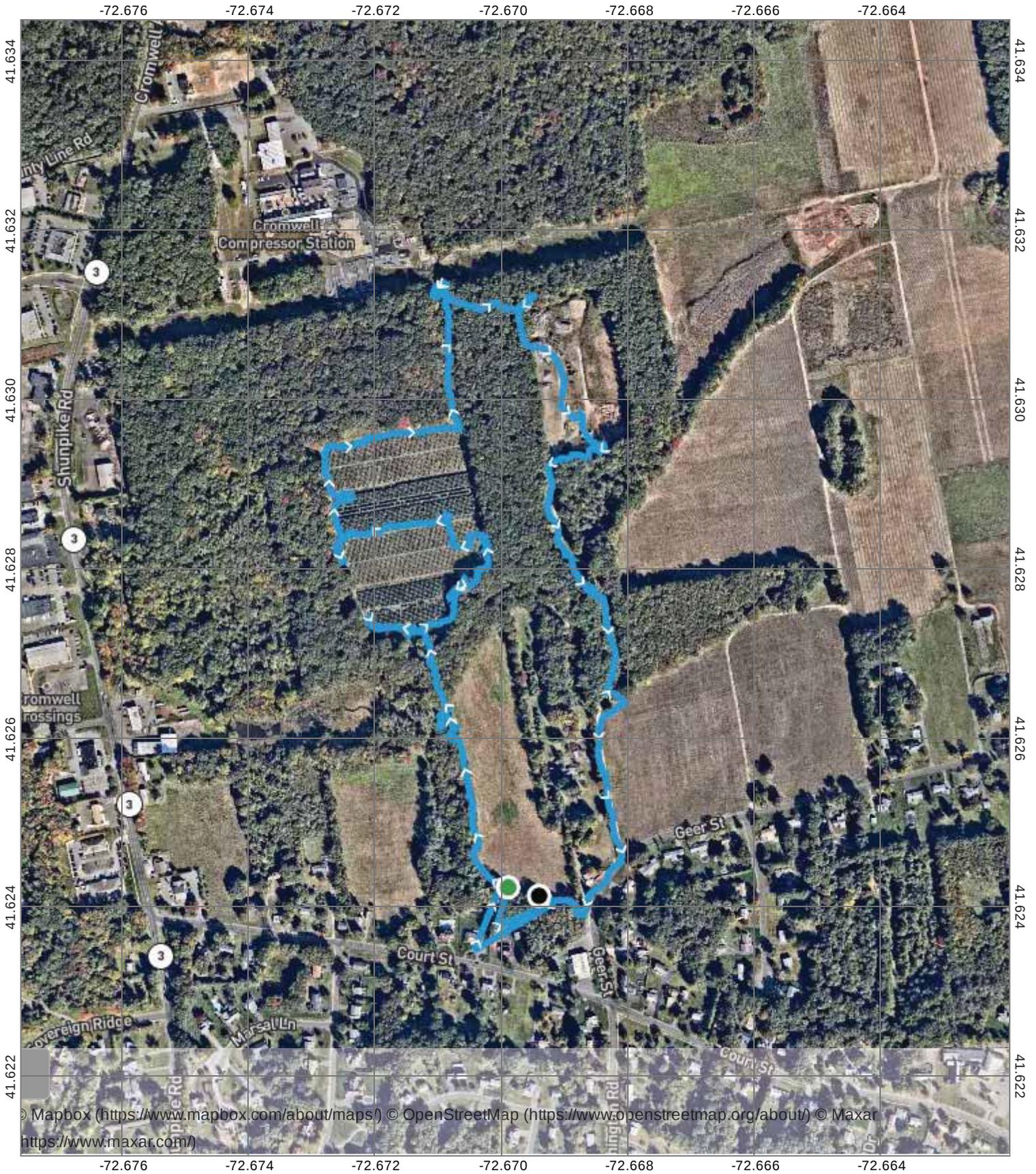


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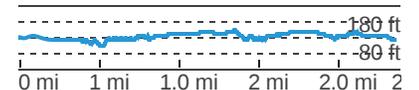


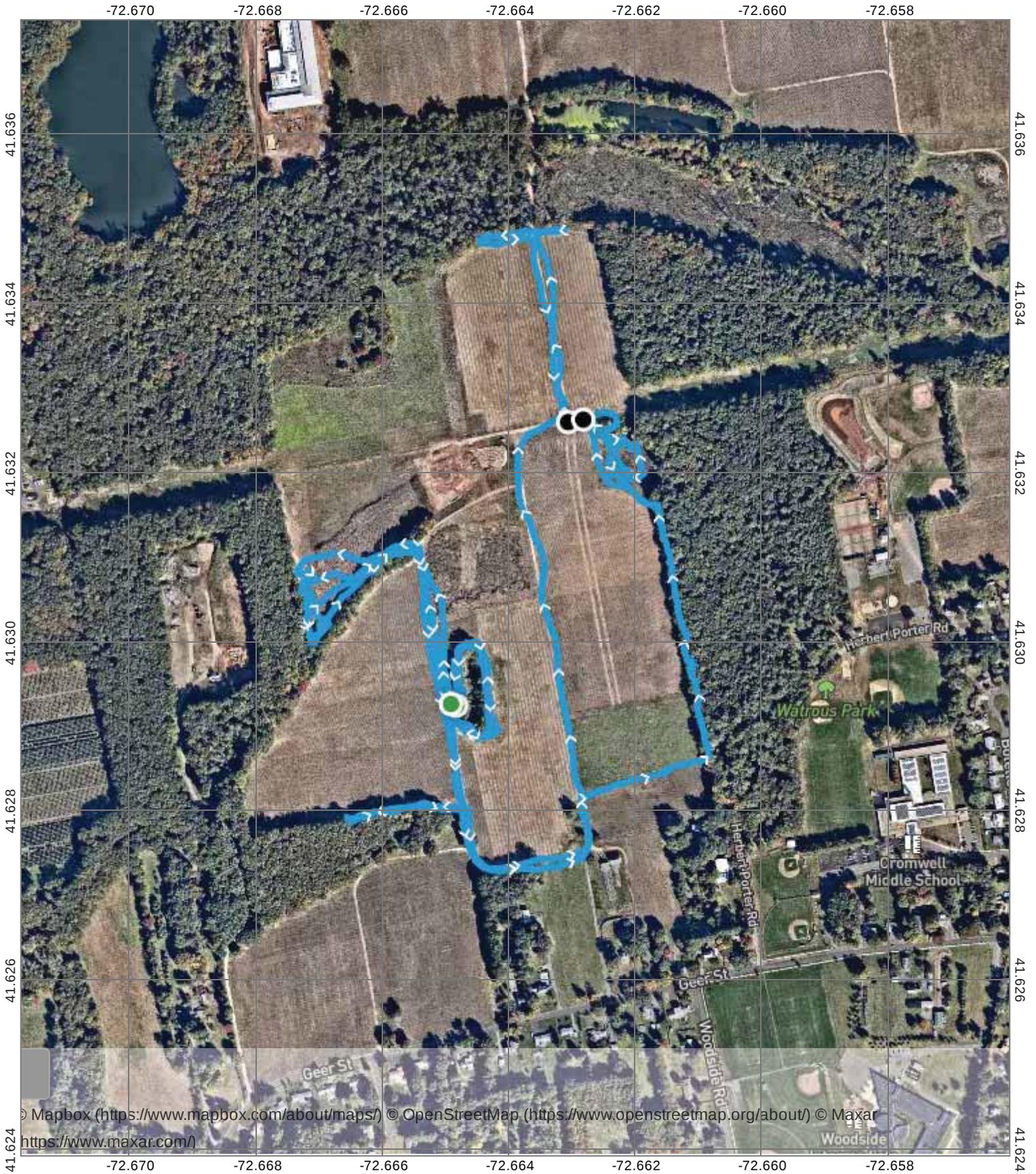
MN
13.7°W
10/29/21

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0.1 0 0.1 MI 0.2

Scale 1:6748 Datum WGS84





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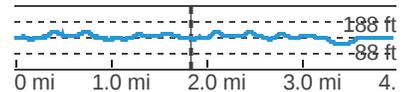


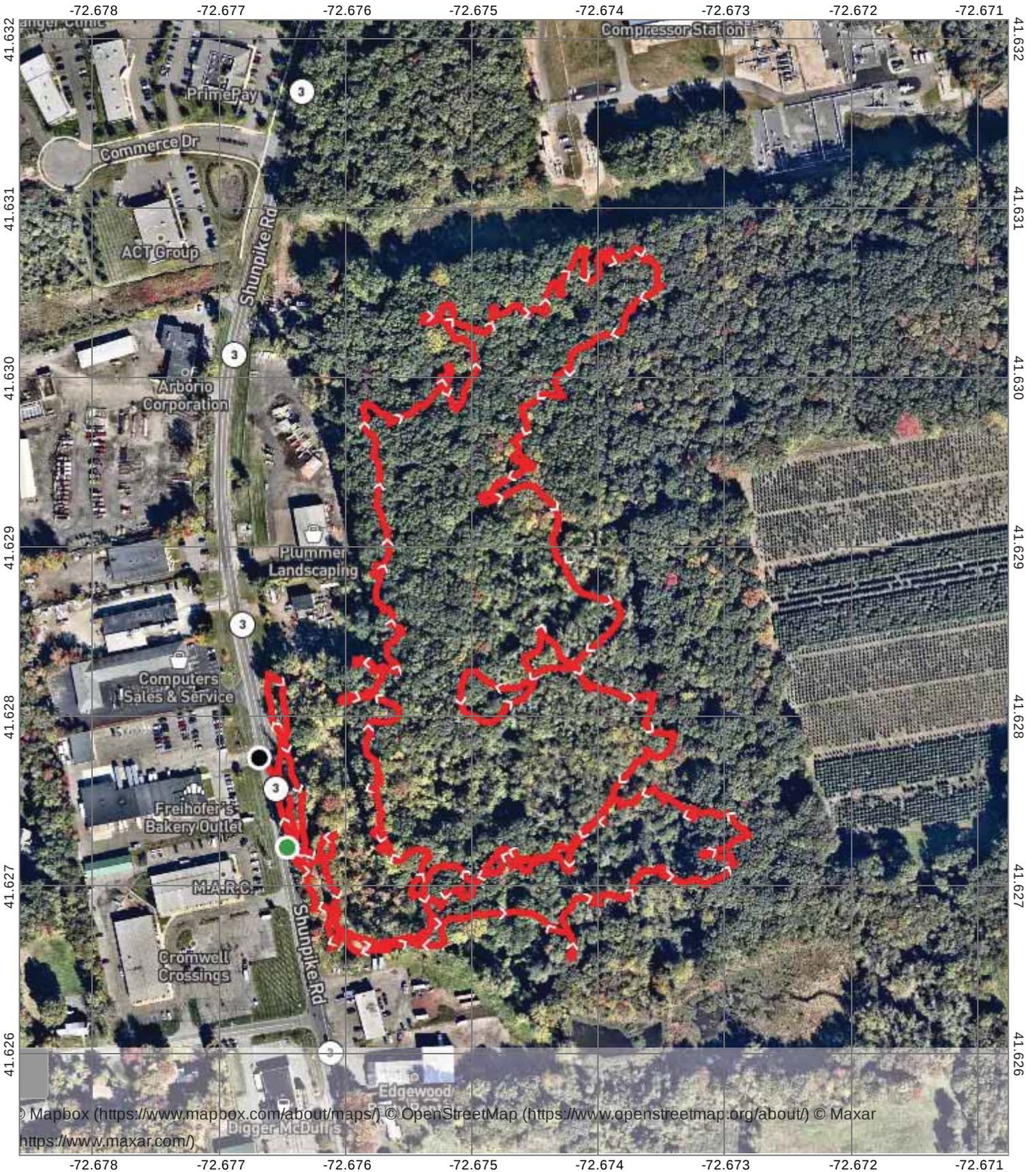
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10/29/21

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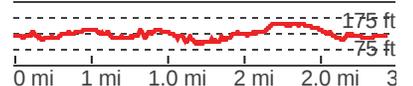
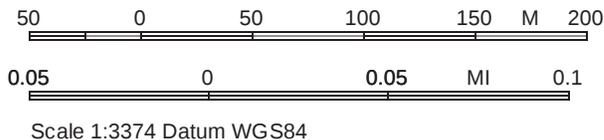




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MN
13.7°W
11/24/21



APPENDIX D – Species List

15. Shunpike Access Parcel

SCIENTIFIC NAME	STRATUM	COMMON NAME	IND		STATUS	COMMENTS		
			UPL	FAC		upland woods	wetlands	
<i>Acer platanoides</i>	Trees	Norway Maple	UPL		invasive			x
<i>Acer rubrum</i>	Trees	Red Maple	FAC		native			x
<i>Alliaria petiolata</i>	Herbs	Garlic Mustard	FACU-		invasive			x
<i>Alnus incana</i>	Shrubs	Speckled Alder	FACW+		native			x
<i>Amelanchier sp.</i>	Shrubs	Serviceberry			native	seedling		x
<i>Andropogon virginicus</i>	Herbs	Broom-sedge	FACU		native			x
<i>Aquilegia sp.</i>	Herbs	Columbine						x
<i>Arctium minus</i>	Herbs	Common Burdock	FACU		introduced			x
<i>Artemisia vulgaris</i>	Herbs	Common Mugwort	UPL		invasive			x
<i>Berberis thunbergii</i>	Shrubs	Japanese Barberry	FACU		invasive			x
<i>Betula alleghaniensis</i>	Trees	Yellow Birch	FAC		native			x
<i>Betula papyrifera</i>	Trees	White or Paper Birch	FACU		native			x
<i>Betula populifolia</i>	Trees	Gray Birch	FAC		native			x
<i>Cardamine hirsuta</i>	Herbs	Hairy bittercress	FACU		introduced			x
<i>Carex laxiflorae group</i>	Herbs	Loose-flowered sedges			native			x
<i>Carex pennsylvanica</i>	Herbs	Pennsylvania Sedge	NC		native			x
<i>Carex sp.</i>	Herbs	Sedge						x
<i>Carex stricta</i>	Herbs	Tussock Sedge	OBL		native			x
<i>Carpinus caroliniana</i>	Shrubs	Ironwood	FAC		native			x
<i>Carya ovata</i>	Trees	Shagbark Hickory	FACU-		native			x
<i>Celastrus orbiculatus</i>	Vines	Asiatic Bittersweet	UPL		invasive			x
<i>Centaurea jacea</i>	Herbs	Brown Knapweed	FACU		introduced			x
<i>Chelidonium majus</i>	Herbs	Greater Celandine	UPL		introduced			x
<i>Chimaphila maculata</i>	Herbs	Spotted Wintergreen	NC		native			x
<i>Chrysosplenium americanum</i>	Herbs	Golden Saxifrage	OBL		native			x
<i>Cinna arundinacea</i>	Herbs	Stout Wood-Reedgrass	FACW+		native			x
<i>Clematis virginiana</i>	Herbs	Virgin's Bower	FAC		native			x
<i>Daucus carota</i>	Herbs	Queen Anne's Lace	NC		introduced			x

<i>Dendrolycopodium obscurum</i>	Herbs	Tree Clubmoss	FACU	native			x
<i>Dennstaedtia punctilobula</i>	Herbs	Hay-scented Fern	UPL	native		x	
<i>Dichantheium clandestinum</i>	Herbs	Deer-tongue Grass	FAC+	native		x	
<i>Dichantheium</i> sp.	Herbs	Panicgrass		native		x	
<i>Diphasiastrum digitatum</i>	Herbs	Fan clubmoss	NC	native		x	
<i>Dryopteris cristata</i>	Herbs	Crested Shield-fern	FACW+	native			x
<i>Dryopteris intermedia</i>	Herbs	Evergreen Wood-fern	FACU	native			x
<i>Elaeagnus umbellata</i>	Shrubs	Autumn Olive	NC	invasive		x	
<i>Epilobium</i> sp.	Herbs	Willowherb		native		x	
<i>Eragrostis</i> sp.	Herbs	Lovegrass					x
<i>Euonymus alatus</i>	Shrubs	Winged Burning Bush	NC	invasive			x
<i>Eurybia divaricata</i>	Herbs	White Wood Aster	NC	native			x
<i>Euthamia graminifolia</i>	Herbs	Flat-top Goldenrod	FAC	native		x	
<i>Eutrochium</i> sp.	Herbs	Joe-pye weed		native		x	
<i>Fagus grandifolia</i>	Trees	American Beech	FACU	native		x	
<i>Fallopia japonica</i>	Herbs	Japanese Knotweed	FACU	invasive			x
<i>Frangula alnus</i>	Shrubs	Glossy False Buckthorn	FAC	invasive		x	
<i>Fraxinus pennsylvanica</i>	Trees	Green Ash	FACW	native			x
<i>Galium circaezans</i>	Herbs	Wild Licorice	FACU	native		x	
<i>Galium mollugo</i>	Herbs	Wild Madder	FACU	introduced		x	
<i>Gaultheria procumbens</i>	Herbs	Teaberry	FACU	native		x	
<i>Geum laciniatum</i>	Herbs	Rough Avens	FAC+	native		x	
<i>Glechoma hederacea</i>	Herbs	Gill-over-the-Ground	FACU	invasive		x	
<i>Gleditia triacanthos form inermis</i>	Trees	Thornless honey-locust	FAC	introduced		x	x
<i>Hamamelis virginiana</i>	Shrubs	Witch Hazel	FAC-	native		x	
<i>Ilex verticillata</i>	Shrubs	Winterberry Holly	FACW+	native			x
<i>Juncus effusus</i>	Herbs	Soft Rush	FACW+	native		x	
<i>Juniperus virginiana</i>	Trees	Eastern Red Cedar	FACU	native		x	
<i>Kalmia angustifolia</i>	Shrubs	Sheep Laurel	FAC	native		x	
<i>Lactuca</i> sp.	Herbs	Lettuce				x	
<i>Leonurus cardiaca</i>	Herbs	Motherwort	NC	introduced		x	
<i>Ligustrum</i> sp.	Shrubs	Privet		invasive		x	
<i>Linaria vulgaris</i>	Herbs	Yellow Toadflax	NC	introduced		x	
<i>Lindera benzoin</i>	Shrubs	Spicebush	FACW-	native			x

<i>Liriodendron tulipifera</i>	Trees	Tulip-tree	FACU	native		x	
<i>Lonicera japonica</i>	Vines	Japanese Honeysuckle	FAC-	invasive		x	
<i>Lonicera</i> sp.	Shrubs	Shrub honeysuckle	FACU	invasive		x	
<i>Lycopus</i> sp.	Herbs	Water Horehound					x
<i>Lythrum salicaria</i>	Herbs	Purple Loosestrife	FACW+	invasive		x	
<i>Malus</i> sp.	Trees	Crabapple		introduced		x	x
<i>Melilotus</i> sp.	Herbs	Sweetclover		introduced		x	
<i>Mitchella repens</i>	Herbs	Partridgeberry	FACU	native		x	
<i>Monotropa uniflora</i>	Herbs	Ghost Pipes	FACU-	native		x	
<i>Morella pensylvanica</i>	Shrubs	Northern Bayberry	FAC	native		x	
<i>Onoclea sensibilis</i>	Herbs	Sensitive Fern	FACW	native		x	x
<i>Osmunda cinnamomea</i>	Herbs	Cinnamon Fern	FACW	native			x
<i>Osmunda regalis</i>	Herbs	Royal Fern	OBL	native			x
<i>Ostrya virginiana</i>	Trees	Hop-hornbeam	FACU-	native		x	
<i>Oxalis stricta</i>	Herbs	Common Yellow Oxalis	FACU	native		x	
<i>Panicum virgatum</i>	Herbs	Switchgrass	FAC	native		x	
<i>Persicaria longiset</i>	Herbs	Cespiteose Smartweed	FACU-	invasive			x
<i>Phragmites australis</i> var. <i>australis</i>	Herbs	Common Reed	FACW	invasive			x
<i>Phytolacca americana</i>	Herbs	Pokeweed	FACU+	native		x	
<i>Pinus strobus</i>	Trees	Eastern White Pine	FACU	native		x	
<i>Polystichum acrostichoides</i>	Herbs	Christmas Fern	FACU-	native		x	
<i>Polytrichum commune</i>	Herbs	Haircap Moss	NC	native		x	
<i>Populus deltoides</i>	Trees	Eastern Cottonwood	FAC	native			x
<i>Potentilla simplex</i>	Herbs	Old Field Cinquefoil	FACU-	native		x	
<i>Prunus serotina</i>	Trees	Black Cherry	FACU	native		x	
<i>Pyrola elliptica</i>	Herbs	Shinleaf	FACU	native		x	
<i>Quercus coccinea</i>	Trees	Scarlet Oak	NC	native		x	
<i>Quercus palustris</i>	Trees	Pin Oak	FACW	native		x	
<i>Quercus rubra</i>	Trees	Red Oak	FACU-	native		x	
<i>Ranunculus</i> sp.	Herbs	Buttercup					x
<i>Rhamnus cathartica</i>	Shrubs	Common Buckthorn	FAC	invasive		x	
<i>Rhododendron</i> sp.	Shrubs	Azalea sp.		native		x	
<i>Robinia pseudoacacia</i>	Trees	Black Locust	FACU-	invasive		x	
<i>Rosa multiflora</i>	Shrubs	Multiflora Rose	FACU	invasive		x	x

<i>Rubus allegheniensis</i>	Shrubs	Common Blackberry	FACU	native		x	
<i>Rubus flagellaris</i>	Shrubs	Northern Dewberry	FACU	native		x	
<i>Rubus hispidus</i>	Shrubs	Bristly Dewberry	FACW	native			x
<i>Rubus occidentalis</i>	Shrubs	Black Raspberry	NC	native		x	
<i>Rudbeckia laciniata</i>	Herbs	Cut-Leaf Coneflower	FACW	native			x
<i>Salix babylonica</i>	Trees	Weeping Willow	FACW-	introduced		x	
<i>Salix</i> sp.	Trees	Willow					x
<i>Sambucus nigra</i> spp. <i>canadensis</i>	Shrubs	Common Elderberry	FACW-	native			x
<i>Sassafras albidum</i>	Trees	Sassafras	FACU-	native		x	
<i>Setaria pumila</i>	Herbs	Yellow Bristle Grass	FAC	introduced		x	
<i>Smilax glauca</i>	Shrubs	Cat Greenbrier	FACU	native		x	
<i>Solanum dulcamara</i>	Herbs	European Bittersweet	FAC-	introduced		x	
<i>Solidago caesia</i>	Herbs	Wreath Goldenrod	FACU	native		x	
<i>Solidago gigantea</i>	Herbs	Late Goldenrod	FACW	native		x	
<i>Solidago patula</i>	Herbs	Rough-leaved Goldenrod	OBL	native			x
<i>Solidago rugosa</i>	Herbs	Rough-stemmed Goldenrod	FAC	native		x	
<i>Sparganium americanum</i>	Herbs	American Bur-reed	OBL	native			x
<i>Spiraea alba</i>	Shrubs	White Meadowsweet	FAC+	native		x	x
<i>Symphotrichum ericoides</i>	Herbs	White Heath Aster	FACU	native		x	
<i>Symphotrichum laeve</i>	Herbs	Smooth Blue Aster	FACU	native		x	
<i>Symphotrichum</i> sp.	Herbs	Fall-blooming American Aster		native			x
<i>Symplocarpus foetidus</i>	Herbs	Skunk Cabbage	OBL	native			x
<i>Taraxacum officinale</i>	Herbs	Common Dandelion	FACU-	introduced		x	
<i>Thalictrum pubescens</i>	Herbs	Tall Meadow-Rue	FACW+	native			x
<i>Thelypteris noveboracensis</i>	Herbs	New York Fern	FAC	native			x
<i>Thuja</i> sp.	Trees	Arborvitae		cultivated	sapling	x	
<i>Tilia cordata</i>	Trees	Little-leaf basswood	NC	introduced		x	
<i>Toxicodendron radicans</i>	Vines	Poison Ivy	FAC	native		x	
<i>Trifolium pratense</i>	Herbs	Red Clover	FACU-	introduced		x	
<i>Tsuga canadensis</i>	Trees	Eastern Hemlock	FACU	native			x
<i>Typha latifolia</i>	Herbs	Common Cattail	OBL	native		x	
<i>Ulmus</i> sp.	Trees	Elm		native			x
<i>Vaccinium angustifolium</i>	Shrubs	Lowbush Blueberry	FACU-	native		x	
<i>Vaccinium corymbosum</i>	Shrubs	Highbush Blueberry	FACW-	native			x

<i>Vaccinium pallidum</i>	Shrubs	Blue Ridge Blueberry	NC	native		x	
<i>Viburnum acerifolium</i>	Shrubs	Maple-leaved Viburnum	UPL	native		x	
<i>Viburnum dentatum</i>	Shrubs	Smooth Arrowwood	FACW-	native		x	x
<i>Viburnum prunifolium</i>	Shrubs	Blackhaw	FACU	native		x	
<i>Vicia cracca</i>	Herbs	Cow Vetch	NC	introduced		x	
<i>Viola cucullata</i>	Herbs	Marsh Blue Violet	FACW+	native			x
<i>Viola</i> sp.	Herbs	Violet		native		x	
<i>Vitis labrusca</i>	Vines	Fox Grape	FACU	native		x	