TAMARACK ENERGY, INC.

WATERTOWN RENEWABLE POWER PROJECT

TERRESTRIAL ECOLOGY

OCTOBER 2007

Prepared by:

Kleinschmidt
Energy & Water Resource Consultants

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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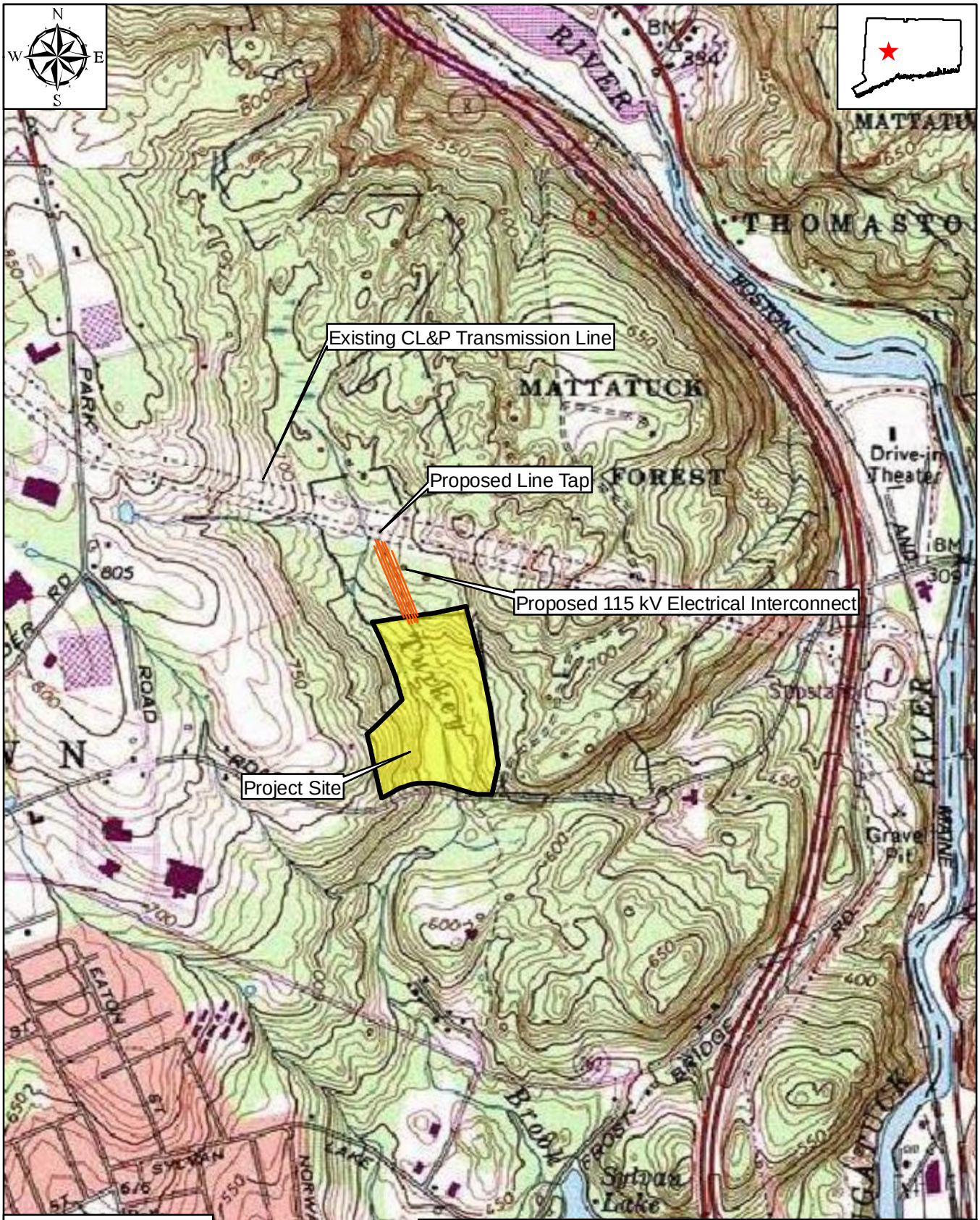
TERRESTRIAL ECOLOGY

1.0 INTRODUCTION

Tamarack Energy, Inc. proposes to construct the Watertown Renewable Energy Project, a 30MW (megawatt) biomass energy facility with attendant structures on a 33–acre industrially zoned parcel of land located in Watertown, Connecticut. The facility will be fueled solely by wood (biomass) and will utilize advanced, low-emission fluidized bed gasification technology. The project's principal source of wood fuel will consist of forest management residue, although it is anticipated that some amount of primary mill waste and recycled wood waste may also be made available. The facility will not accept painted or treated wood and as designed, will purchase and consume approximately 360,000 tons of clean waste wood per year to produce 30 MW of clean, renewable energy.

The 33-acre parcel is located within the central Naugatuck valley on Echo Lake road approximately one mile west of the Naugatuck River and Route 8 (Figure 1–1). To the east and north of the parcel are undeveloped tracts of land associated with the Mattatuck State Forest. Immediately to the west of the site is an industrial park. Bisecting the site is the perennial Turkey Brook which originates in a large wetland complex situated off of the property and to the northwest. Floodplain wetlands associated with Turkey Brook occupy a significant portion of the center of the property. The entire 33-acre site was clearcut approximately 10 years ago and is now densely overgrown.

Approximately 1000 feet to the north of the site are two, existing 115 kV Connecticut Light & Power (CL&P) transmission lines including (1) Frost Bridge to Campville Line No. 1191 and (2) Frost Bridge to Carmel Hill Line No. 1238. As proposed, the Project's switchyard will connect with one of these lines by means of a buried 115kV electrical interconnect. The proposed interconnect route will utilize an existing ATV trail that passes through the Mattatuck State Forest and a conditional easement has been granted by the Connecticut Department of Environmental Protection (DEP).



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Drawn By:	KPN
Date Drawn:	09-13-2007

Tamarack Energy, Inc.
Essex, CT

Watertown Biomass Facility
Biological Characterization

Site Locus

1 of 1

1-1

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2.0 METHODS

The methods used to characterize the resources affected by the project are presented within this section. Natural resources examined included wetland plant communities; upland plant communities; wildlife; rare, threatened, and endangered species and habitat; and Turkey Brook aquatic habitat. Agency correspondence letters are provided in Appendix A and a report issued by a CT Certified Soil Scientist is provided in Appendix B.

2.1 Plant Community Characterization

The assessment of plant communities on the facility site consisted of the following components:

- A characterization of the species composition of each plant community based on reconnaissance surveys;
- A delineation of the vegetative communities or cover types present on the basis of field observations, including the identification and delineation of any unusual habitats or natural communities;
- Documentation of the composition of these communities through the use of representative sample plots;
- A screening-level assessment of impacts to sensitive plants associated with air emissions in accordance with the thresholds established in the USEPA document "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (USEPA, 1980); and
- Identification and evaluation of reasonable mitigation measures regarding the vegetation impacts identified.

Plant communities encountered on the facility site were sampled with 22 semi–randomly located 5 meter (m) x 5 m square plots and 22 nested 1m x 1m herb plots on August 29, 2007 (Figure 2–1). In sum, a total of 550 m^2 (0.12 acres) were sampled. Plots were situated within each plant community/cover type encountered so as to be representative of general conditions. Within each plot, tree, shrub, herb, fern, lichen, and moss species present in the plot were identified to the level of species where possible.

Legend

Project Boundary

Study Plots

Feet

0 150 300 450 600

Scale: AS SHOWN	Tamarack Energy, Inc. Essex, CT
Project No: 1523-001	Watertown Biomass Facility Biological Characterization
Filename: StudyPlots.mxd	Location of Study Plots
Drawn By: KPN	
Date Drawn: 09-14-2007	

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Each plant species encountered in the plot, in addition to non-vegetated cover, i.e. leaf litter, was assigned an estimated percent cover. For each habitat type sampled, four descriptive metrics were reported including (1) species richness; (2) relative dominance; (3) relative frequency; and (4) an Importance Value identifying those plant species that are essentially most important, i.e. most dominant and occur most frequently within the given community (Table 2–1).

Table 2–1. Summary of plant community metrics.

Metric	Formula	Variables Defined
Species Richness (R)	NA	R = numbers of species
Relative Dominance (D_R)	$D_R = 100 * \frac{\left(\sum_{i=1}^{n} PC_{species}\right) / A_{TOTAL}}{\sum_{i=1}^{n} D_{species}}$	$PC_{species}$ = summed percent cover for species *x* in plots 1…n; A_{total} = total area sampled $D_{species}$ = summed dominance for species 1…*n*
Relative Frequency (F_R)	$F_R = 100 * \frac{\left(\sum_{i=1}^{n} n_{species}\right) / N_{TOTAL}}{\sum_{i=1}^{n} F_{species}}$	$n_{species}$ = number of plots *1…n* in which species *x* occurs; N_{total} = total number of plots sampled; $F_{species}$ = summed frequency for species 1…*n*
Importance Value (IV_{ave})	$IV_{ave} = (D_R + F_R)/2$	D_R = relative dominance F_R = relative frequency

The proposed 1,000 foot 115kV electrical interconnect route was surveyed by Kleinschmidt ecologists on August 29, 2007. The field activities were geared towards characterizing general plant community composition and type within the boundaries of the proposed corridor, with the ATV trail used as the centerline. Plant communities were also assessed within the vicinity of the proposed line tap. Plant community types encountered along the proposed 115kV electrical interconnect route were characterized with a qualitative, meander survey. Tree, shrub, herb, fern, lichen, and moss species were identified to the level of species where possible. Plant communities were sketched onto a scaled site plan, digitized, and then plotted onto a plant community cover type map.

2.2 Wetlands and Watercourses

The assessment of Connecticut jurisdictional alluvial soils on the site was conducted by Soil Resource Consultants under the auspices of David H. Lord, a CT

certified soil scientist. Wetland and watercourse boundaries were delineated with blue flagging (flag series WF–1 through WF–86). Wetland and alluvial soil boundary flags were surveyed by a licensed land surveyor and then plotted onto a scaled site plan.

Wetland plant communities encountered on the facility site were sampled by Kleinschmidt Associates with randomly located 5m x 5m square plots on August 29, 2007. Plots were situated so as to be representative of general conditions. Within each plot, tree, shrub, herb, fern, lichen, and moss species present in the plot were identified to the level of species where possible. Each plant species encountered in the plot, in addition to non–vegetated cover, i.e. standing water, muck etc., were assigned an estimated percent cover. Wetland plant communities encountered along the 115kV electrical interconnect route were assessed qualitatively and the dominant plant species were determined visually.

Turkey Brook aquatic habitat was assessed qualitatively and included recording information on channel width, depth, geometry, substrate type, flow. Water temperature was also treated qualitatively whereby temperatures were described in the field as being cold, cool, warm etc.

Using the wetland field data, a Wetland Functions and Values Assessment conducted in accordance with the ACOE Highway Methodology was used to help assess the probable nature of direct and indirect impacts. As discussed in "The Highway Methodology Workbook Supplement: Wetland Functions and Values (A Descriptive Approach)", wetland functions are defined as those properties that are intrinsic to the wetland system, e.g. nutrient cycling, hydrology etc. In contrast, wetland values are properties ascribed to the wetland system by society. In large part, the values ascribed to a wetland stem from the functions themselves.

The descriptive approach referred to in the Highway Methodology supplement is a means through which the principles of basic wetland science and the societal aspects of wetlands are brought together. Ultimately, through a synthesis of the descriptive approach and best professional judgment, the extent and nature of wetland impacts can be

arrived at. Wetland functions and values are also used to compare project alternatives, avoid and minimize project impacts, and weigh environmental impacts against project benefits.

As defined in the ACOE Highway methodology guidance, there are eight wetland functions and five wetland values. Considerations and Qualifiers specific to each function and value are used to justify the assignment of wetland functions and values to a resource. The following sections define each of the wetland functions and values.

Wetland Functions

Groundwater Recharge/Discharge – This function considers the potential for a wetland to serve as groundwater recharge and/or a recharge area. As it applies in this case, recharge includes those waters that contribute to an aquifer, whereas discharge refers to the discharge of groundwater to the surface.

Floodflow Alteration (Storage and Desynchronization) – This function considers the effectiveness of the wetland in reducing flood damage by attenuating floodwaters following heavy precipitation events.

Fish and Shellfish Habitat – This function considers the effectiveness of seasonal or permanent waterbodies associated with the wetland in question for fish and shellfish habitat.

Sediment/Toxicant/Pathogen Retention – This function reduces or prevents degradation of water quality.

Nutrient Removal/Retention/Transformation – This function relates to the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters.

Production/Export (Nutrient) – This function relates to the effectiveness of the wetland to produce food or useable products for humans and other living organisms.

Sediment/Shoreline Stabilization – This function relates to the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.

Wildlife Habitat – This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge.

Wetland Values

Recreation (Consumptive and Non–Consumptive) – This value considers the effectiveness of the wetland and associated watercourses to provide recreational opportunities.

Educational/Scientific Value – This value considers the effectiveness of the wetland to serve as a site for an outdoor classroom.

Uniqueness/Heritage – This value relates to the effectiveness of the wetland or its associated waterbodies to produce certain special values, e.g. unique plant species.

Visual Quality/Aesthetics – This value relates to the visual and aesthetic qualities of the wetland.

Threatened or Endangered Species Habitat – This value relates to the effectiveness of the wetland or associated waterbodies to support threatened or endangered species.

Using the data collected in the field, functions and values were ascribed to each wetland in accordance with the guidance provided in "The Highway Methodology Workbook Supplement: Wetland Functions and Values (A Descriptive Approach)". Justification for each wetland function and value associated with each wetland and

watercourse was based upon the considerations/qualifiers provided in "Appendix A: Wetland Evaluation Supporting Documentation; Reproducible Forms" of the Highway Methodology Workbook.

2.3 Wildlife

The facility site and 115kV electrical interconnect route was surveyed for general wildlife species by Kleinschmidt ecologists on August 29, 2007. The wildlife survey activities were geared towards characterizing habitat composition, identifying habitat types, and assessing their potential to support wildlife species either directly or indirectly. It is worth noting that species not observed on the site may have been missed due to the timing of the survey and may actually be present. This environmental report incorporates a summary of the following site–specific information:

- A characterization of wildlife including mammals, birds, amphibians, and reptiles that occur on or within the vicinity of the project site based on reconnaissance surveys and supplemented by available data, including an identification and delineation of any unusual habitats or natural communities which could support listed species or species of special concern;
- A list of the species of mammals, birds, amphibians, and reptiles reasonably likely to occur on, or within the vicinity of the project site based on site observations and supplemented by publicly available sources;
- An analysis of the impact of operation on the wildlife (including listed rare species or species of special concern, that have been identified by resource agencies as potentially occurring on or within the vicinity of the site), wildlife habitats, and wildlife travel corridors; and
- An identification and evaluation of reasonable mitigation measures regarding wildlife impacts identified.

Within each plant community sampled, wildlife habitat attributes were noted, e.g. snags, and observed wildlife species were identified to the level of species. As an added measure, published accounts of species occurrences by habitat type described in DeGraaf & Rudis (1986) were used to generate master taxa lists by habitat type. In addition to the

direct observation of individual species, indirect evidence of wildlife presence, e.g. scat, tracks, vocalizations, burrows were also recorded.

2.4 Rare, Threatened, and Endangered Species

According to correspondence received by the Connecticut Department of Environmental Protection Natural Diversity Database (NDDB) (Julie Victoria, Franklin Swamp Wildlife Management Area) dated June 14, 2007, the American kestrel (*Falco sparverius*) has been noted within the vicinity of the project site. In this regard, NDDB mapping prepared by the CTDEP indicates that rare species and associated habitats occur approximately 1.25 miles to the northeast of the site (Figure 2–2). As such, a habitat based approach was used to assess the likelihood of the presence of the American kestrel on the property, rather than a full survey for the species. The following sections summarize the autecology of the American kestrel, i.e. the relationship of the given organism with its environment, in addition to a summary of specific threats and approved mitigation measures.

American Kestrel (*Falco sparverius*)

The American kestrel is characterized by pointed wings; a reddish back and tail; and two black stripes on each side of white sides of head. The male has blue-gray wings; averages 27 cm long; with a wingspan that measures 58 cm. This species is slightly smaller than the Eurasian kestrel, which has only a single black mark on each side of the head. The average territory size for the American kestrel is 109.4 hectares (ha) and 129.6 ha as reported in two western U.S. studies (Cade, 1982). The home range diameter during the breeding season ranges from approximately 0.5–2.4 km.

Preferred breeding habitats for the American kestrel include various open and semi-open habitats including riparian edges; woodland streams; cliff; cropland/hedgerow; grassland/herbaceous; old field; savanna; suburban/orchard; and woodlands. Non–breeding habitat includes various open and semi–open habitats. As an obligate secondary cavity nester, special habitat features include standing snags/hollow tree; natural holes in

trees; abandoned woodpecker holes; holes in buildings or cliffs; abandoned magpie nests; and similar sites. The American kestrel will readily use nest boxes, which may dramatically increase density of nesting pairs in some areas.

The immature kestrels are carnivores/invertivores, whereas the adult food preference shifts and becomes strictly that of a carnivore. During the summer, the American kestrel feeds on insects such as grasshoppers and crickets, in addition to small vertebrates including snakes, lizards, birds, mice, and in some instances, bats. In the winter, the kestrel feeds mainly on birds and mice.

Surveys have indicated a significant decline in the kestrel population in northeastern North America, particularly in Connecticut. Kestrel surveys within the northeastern United States estimate a statistically significant declining trend in the kestrel population size of –1.4 % per year during the1976–2003 time period (p <0.05). Historically, human-related causes of death, including shooting and road kills were a significant source of mortality. The American kestrel also was affected by dichloro-diphenyl-trichloroethane (DDT), but the extent of effects at the population level is not known. Presently, the status of the species globally and in the U.S. and Canada is considered secure, although it is considered imperiled in both Connecticut and Newfoundland.

STATE AND FEDERAL LISTED SPECIES
AND SIGNIFICANT NATURAL COMMUNITIES
WATERTOWN, CT

LEGEND

- Listed Species and Natural Communities *
- State Boundary
- County Boundary
- Town Boundary
- Railroads
- Primary Route
- Secondary Route
- Local Road
- Water, Shore
- Intermittent Water
- Dam
- Dredged Channel
- Aqueduct
- Water
- Intermittent Water
- Tidal, Sand Flats
- Rocks in Water
- Inundated Area
- Marsh
- Dam

TO USE MAP

Locate project boundaries and any additional affected areas on the map. If the project is not within a shaded area; or overlapping a lake, pond or wetland that has any shading; or upstream or downstream (by less than 1/2 mile) from a shaded area, the project is unlikely to affect any known occurrence of listed species or significant natural community. If any part of the project is within a shaded area; or overlapping a lake, pond, or wetland that has any shading; or upstream or downstream (by less than 1/2 mile) from a shaded area, then the project may have a potential conflict with a species or natural community. Complete a Data Base Request Form and submit to the Natural Diversity Data Base along with a project description and a copy of a map clearly showing the project boundaries.

DATA SOURCES

BASE MAP INFORMATION - Political boundaries, railroads, and hydrography originally derived from 1:24,000 scale 7.5 Minute U.S. Geological Survey Digital Line Graphs and enhanced by the Connecticut Department of Environmental Protection. The data is based on 1:24,000 scale Topographic Quadrangle maps published between 1969 and 1984. The roads and road names are based on the Connecticut Street Network State Plane, TIGER/Line 2000 database a statewide database of address-ranged street segments compiled from the Census 2000 TIGER/Line files by the University of Connecticut Center for Geographic Information and Analysis. Annotation derived in part from U.S. Geological Survey Geographic Names Information System and information on file at the Connecticut Department of Environmental Protection. The base map data may be neither current nor complete.

* NDDB INFORMATION - Locations of listed species and natural communities are based on data collected by the CT Department of Environmental Protection, private conservation groups and the scientific community and compiled by the Natural Diversity Data Base. The information is not necessarily the result of comprehensive or site-specific field investigations; in some cases locations have been derived from literature or museum searches or historic records. Exact locations have been buffered to produce generalized locations. The exact species or community location falls somewhere within the shaded area and not necessarily in the center. Information on this map does not include Natural Area Preserves, designated wetland areas or wildlife concentration areas.

Date of Map: December 2006,
Natural Diversity Database Digital Data

For inquiries about the State and Federal Listed Species and Significant Natural Communities map: Contact DEP, Bureau of Natural Resource, Wildlife Division. Tel: 860-424-3011

State Plane Coordinate System of 1983, Zone 3526
Lambert Conformal Conic Projection
North American Datum of 1983

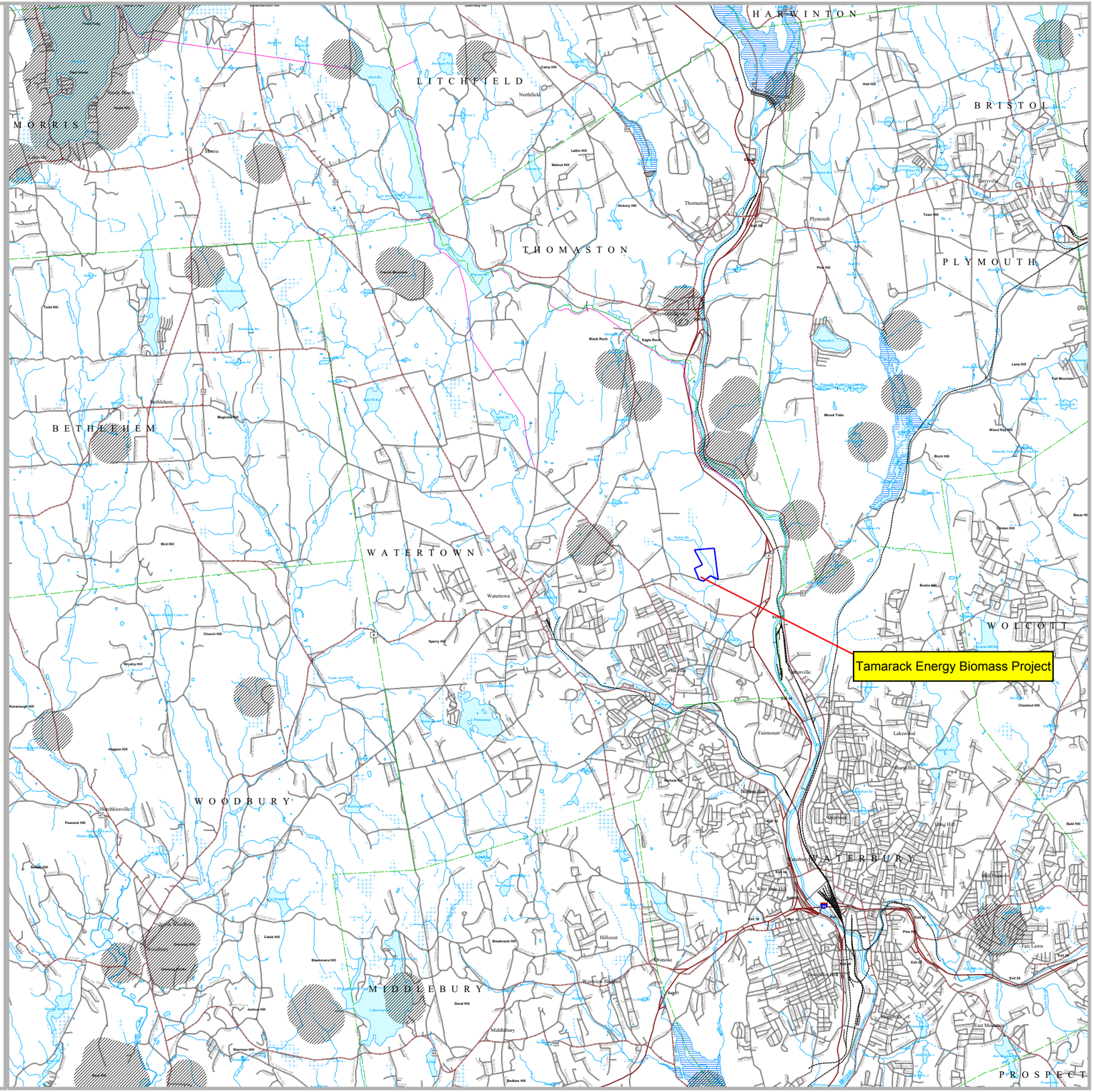
SCALE

STATE OF CONNECTICUT
DEPARTMENT OF
ENVIRONMENTAL PROTECTION
79 Elm Street
Hartford, CT 06106-5127

Gina McCarthy, Commissioner

Map & Digital Data Available at the
DEP Store
79 Elm St, Hartford, CT 06106-5127
860.424.3555 fax 860.424.4068
depstore@po.state.ct.us

NOTE: This map is not colorfast. Protect from light and moisture.



3.0 RESULTS

3.1 Upland Plant Communities (Facility Site)

With the exception of the wetland that comprises the central portion of the property, the plant communities have been altered by previous owners through activities ranging from the localized dumping of bulk solid waste to the extensive clearcutting of mature vegetation. Of the two disturbance types, the clearcutting had the most significant impact and has largely shaped the plant communities observed on the site. In this regard, the facility site supports a total of two overarching upland plant community types including (1) an old field community; and (2) an extremely dense hardwood stand comprised of stump sprouts. This latter community is comprised of three sub–stands observed on the eastern edge of the site; the western hillside; and the northeastern corner of the property (Table 3–1; Figure 3–1).

Table 3–1. Approximate areal extent of upland plant communities.

Plant Community Type	**Acreage**
Quercus rubra Sapling Stand	3.96
*Betula populifolia - Quercus ru*bra Sapling Stand	14.30
Viburnum acerifolium - Quercus alba Stand	8.00
Old Field	0.38
TOTAL	26.6

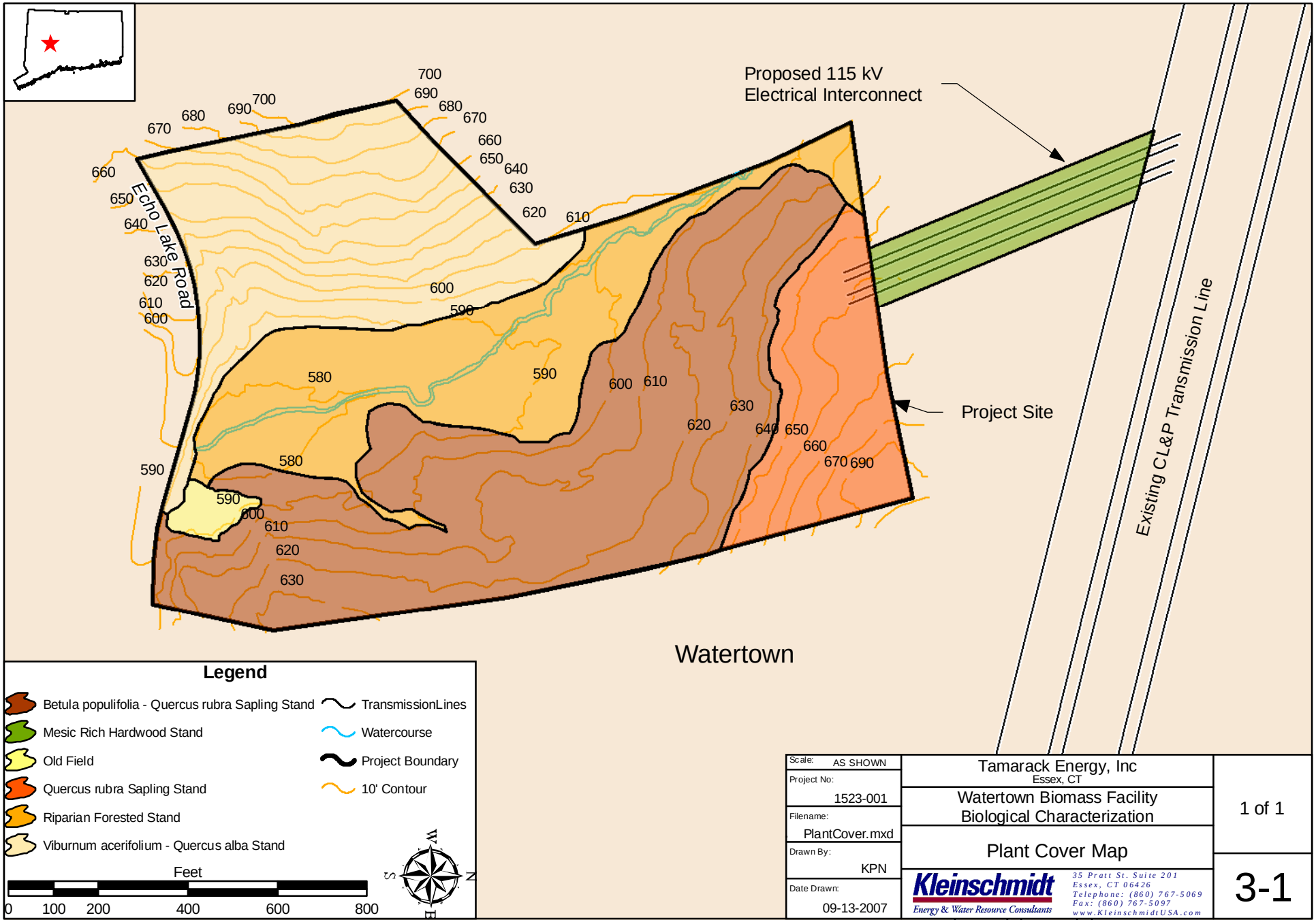
3.1.1 Old field Community

The old field community was noted within a small opening in the southeastern portion of the site adjacent to Echo Lake road, and was punctuated by scattered clumps of shrubs such as *Sambucus canadensis* (American elder). Overall, this community comprises a small percentage of the plant communities on the site and has been disturbed by dumping activities. Specifically, piles of bulk solid waste, e.g. hot water heaters and scrap metal, were observed. An ATV trail passes through this community type.

Plant species in the old field community include a suite of herbs and grasses dominated by *Solidago canadensis* (gray's goldenrod) with lesser amounts of *Shizachyrium scoparium* (little bluestem). Patches of *Polygonum cuspidatum* (Japanese knotweed) and *Impatiens capensis* (spotted touch me not) were observed in mesic soil conditions located adjacent to the riparian forest community (Table 3–2). Total plant species richness is 12 and importance values range from 2.9 to 25.3.

Table 3–2. Old field community.

Scientific Name	Common Name	D_R	F_R	IV_{ave}
Solidago canadensis	grays goldenrod	28.4698	22.2222	25.34599
Schizachyrium scoparium	little bluestem	33.8078	5.55556	19.68169
Polygonum cuspidatum	Japanese knotweed	21.3523	11.1111	16.23171
Impatiens capensis	spotted touch me not	7.11744	5.55556	6.336497
Polytrichum commune	polytrichum moss	0.71174	11.1111	5.911427
Rubus sp.	blackberry	0.71174	11.1111	5.911427
Coreopsis lanceolata	lance-leaved coreopsis	1.77936	5.55556	3.667457
Sambucus canadensis	american elder	1.77936	5.55556	3.667457
Solidago graminifolia	lance leaved goldenrod	1.77936	5.55556	3.667457
Spiraea latifolia	meadowsweet	1.77936	5.55556	3.667457
Comptonia peregrina	sweet fern	0.35587	5.55556	2.955714
Ipomoea purpurea	morning glory	0.35587	5.55556	2.955714



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Project No:	1523-001
Filename:	PlantCover.mxd
Drawn By:	KPN
Date Drawn:	09-13-2007

Tamarack Energy, Inc
Essex, CT

Watertown Biomass Facility
Biological Characterization

Plant Cover Map

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3.1.2 Hardwood Sapling Stand Communities

This community type comprised a bulk of the vegetated cover on the site and consists of secondary hardwood growth generated from stump sprouts and saplings recruited from seed rain originating from adjacent forested stands. Stem densities are extremely high with diameter at breast height (dbh) size classes in the 1–2 inch range. Passage through portions of the stand was, at times, hindered by closely spaced stems and heavy vine growth. The transition between this dense, cut–over stand and more open, adjacent undisturbed stands is pronounced.

A total of three, somewhat distinct stand types were observed including a *Betula populifolia-Quercus rubra* stand along the eastern portion of the site; a *Quercus alba–Viburnum acerifolium* stand along the steep western hillside; and a *Quercus rubra* stand with scattered patches of *Carex pennsylvanica* in the understory within the northeastern portion of the site. It is likely that the differences in species composition across the three stands reflect edaphic (soil) heterogeneity and potentially, percent slope.

3.1.3 *Betula populifolia–Quercus rubra* sapling stand

This stand was observed in the eastern portion of the site where Charlton soils with 3–15% slopes were observed (Soil Resource Consultants, 2007). Grey birch and northern red oak sapling stem densities were extremely high and the understory was poorly developed (Table 3–3). Those few herbaceous species observed in the stand likely established shortly after the clearcutting, although some of the species are reasonably tolerant of the understory light environment, which was estimated to be <5% of ambient sunlight. Species observed in the understory included gray's goldenrod, dewberry, and Canada mayflower. Although herbaceous and woody species are present in the understory, leaf litter is the most important component of the forest floor. Total plant species richness is 19 and the range in importance values range from 1.7 to 14.2.

Table 3–3. *Betula populifolia-Quercus rubra* sapling stand.

Scientific Name	Common Name	D_R	F_R	IV_{ave}
Betula populifolia	grey birch	18.75	9.677419	14.21371
leaf litter	leaf litter	17.1875	6.451613	11.81956
Carex pennsylvanica	pennsylvania sedge	11.40625	9.677419	10.54183
Quercus rubra	northern red oak	9.375	9.677419	9.52621
Lindera benzoin	spicebush	8.59375	6.451613	7.522681
Quercus alba	white oak	9.375	3.225806	6.300403
Betula lenta	sweet birch	7.8125	3.225806	5.519153
Rubus flagellaris	dewberry	3.125	6.451613	4.788306
Maianthemum canadense	canada mayflower	6.25	3.225806	4.737903
Amelanchier canadensis	serviceberry	1.5625	6.451613	4.007056
Spiraea latifolia	meadowsweet	0.3125	6.451613	3.382056
Viburnum recognitum	northern arrowwood	3.125	3.225806	3.175403
Acer rubrum	red maple	0.78125	3.225806	2.003528
Smilacina racemosa	false solomons seal	0.78125	3.225806	2.003528
Vitus labrusca	fox grape	0.78125	3.225806	2.003528
Aralia nudicaulis	sarsaparilla	0.15625	3.225806	1.691028
Gaultheria procumbens	teaberry	0.15625	3.225806	1.691028
Sassafras albidum	sassafras	0.15625	3.225806	1.691028
Solidago canadensis	grays goldenrod	0.15625	3.225806	1.691028
Vitus aestivalus	summer grape	0.15625	3.225806	1.691028

3.1.4 *Quercus alba–Viburnum acerifolium* sapling stand

This stand was observed along the steep hillside that comprises the western portion of the site. Soils observed on the hillside include a Charlton-Hollis soil complex with 8–35% slopes (Soil Resource Consultants, 2007). Although stem dbh in this stand is similarly narrow, stem densities were not as high as those observed in the eastern portion of the site (Table 3–4). The most dominant and frequently occurring species is mapleleaf viburnum. Other important tree species observed include white oak, sweet birch, black cherry, shagback hickory, red maple, (rarely) eastern red cedar, and sugar maple. Comparatively larger numbers of invasive species and naturalized exotics were observed in this stand type including Japanese berberry and eastern burning bush. Understory light levels were estimated to be slightly higher in this stand (5–7% of ambient sunlight). Total plant species richness is 23 and importance values range from 1.16 to 14.5.

Table 3–4. *Quercus alba-Viburnum acerifolium* sapling stand.

Scientific Name	Common Name	D_R	F_R	IV_{ave}
Leaf litter	leaf litter	22.47807	6.666667	14.57237
Viburnum acerifolium	mapleleaf viburnum	13.26754	8.888889	11.07822
Quercus alba	white oak	13.15789	4.444444	8.80117
Berberis thunbergii	japanese berberry	9.429825	6.666667	8.048246
Acer rubrum	red maple	7.127193	8.888889	8.008041
Betula lenta	sweet birch	9.320175	6.666667	7.993421
Carya ovata	Shagbark hickory	11.51316	4.444444	7.978801
Amelanchier canadensis	serviceberry	2.192982	6.666667	4.429825
Maianthemum canadense	canada mayflower	1.315789	6.666667	3.991228
Acer saccharum	sugar maple	3.399123	4.444444	3.921784
Parthenocissus quinquefolia	virginia creeper	1.20614	4.444444	2.825292
Carex pennsylvania	pennsylvania sedge	0.657895	4.444444	2.55117
Polystichum achrostichoides	christmas fern	1.096491	2.222222	1.659357
Arisaema triphyllum	jack in the pulpit	0.548246	2.222222	1.385234
Euonymous atropurpurea	eastern burning bush	0.548246	2.222222	1.385234
Juniperus virginiana	eastern red cedar	0.548246	2.222222	1.385234
Prunus serotina	black cherry	0.548246	2.222222	1.385234
Rubus odoratus	large purple flower raspberry	0.548246	2.222222	1.385234
Rubus sp.	blackberry	0.548246	2.222222	1.385234
Fraxinus pennsylvanica	white ash	0.109649	2.222222	1.165936
Lindera benzoin	spicebush	0.109649	2.222222	1.165936
Ribes americanum	wild black currant	0.109649	2.222222	1.165936
Solanum dulcamara	enchanters nightshade	0.109649	2.222222	1.165936
Solidago canadensis	grays goldenrod	0.109649	2.222222	1.165936

3.1.5 *Quercus rubra* sapling stand

This stand type was observed along gradual slopes in the northeastern portion of the site. Soils observed on the hillside include a Charlton-Hollis soil complex with 3-15% slopes (Soil Resource Consultants, 2007). Northern red oak is a dominant species in this community and stem densities were extremely high with estimated dbh size classes in the 1–2 inch range. Other tree species observed included (rarely) white pine, white oak, white ash, (rarely) paper birch, black cherry, and grey birch (Table 3–5). Within the understory, *Carex pennsylvanica* is a dominant species along with an admixture of Canada mayflower, Virginia creeper, blackberry, and serviceberry seedlings. Leaf litter is also an important component of the understory given the low light levels. Total plant species richness is 21 and importance values range from 1.4 to 17.2.

Table 3–5. *Quercus rubra* sapling stand.

Scientific Name	Common Name	D_R	F_R	IV_{ave}
Quercus rubra	northern red oak	23.21429	11.11111	17.1627
Carex pennslyvanica	pennsylvania sedge	13.21429	8.333333	10.77381
leaf litter	leaf litter	11.90476	8.333333	10.11905
Pinus strobus	white pine	11.90476	2.777778	7.34127
Lindera benzoin	spicebush	8.928571	5.555556	7.242063
Quercus alba	white oak	8.333333	5.555556	6.944444
Maianthemum canadense	canada mayflower	3.095238	8.333333	5.714286
Parthenocissus quinquefolia	virginia creeper	2.380952	5.555556	3.968254
Aralia nudicaulis	sarsaparilla	4.761905	2.777778	3.769841
Prunus serotina	black cherry	1.190476	5.555556	3.373016
Ilex verticillata	winterberry	0.714286	5.555556	3.134921
Betula populifolia	grey birch	2.380952	2.777778	2.579365
Acer rubrum	red maple	1.785714	2.777778	2.281746
Amelanchier canadensis	serviceberry	1.190476	2.777778	1.984127
Sassafras albidum	sassafras	1.190476	2.777778	1.984127
Fraxinus americana	white ash	0.714286	2.777778	1.746032
Acer saccharum	sugar maple	0.595238	2.777778	1.686508
Betula papyrifera	paper birch	0.595238	2.777778	1.686508
Carya ovata	shagbark hickory	0.595238	2.777778	1.686508
Rubus sp.	blackberry	0.595238	2.777778	1.686508
Viburnum acerifolium	mapleleaf viburnum	0.595238	2.777778	1.686508
Juniperus virginiana	eastern red cedar	0.119048	2.777778	1.448413

3.2 Interconnect Plant Communities

The plant community observed within the 115kV electrical interconnect is that of a mature, mesic, rich hardwood stand. In that the electrical interconnect route follows a four-foot wide ATV trail, a mixture of disturbance tolerant and less disturbance tolerant plant species were observed. Within the tree layer, species including northern red oak, white ash, American beech (*Fagus grandifolia*), shellbark hickory, green ash (*Fraxinus pennsylvanica*), sweet birch, red maple, white pine (rarely), eastern red cedar (standing dead), hemlock (rarely), and European white birch were observed. Estimated mean stem dbh range is 6–14 inches and mean estimated stand height ranges from 60–70 feet. The stand is open, with widely spaced stems, and canopy cover ranges from 90–100%.

Within the understory, shrub species observed included spicebush, *Rosa multiflora* (multiflora rose), Japanese berberry, eastern burning bush, and winterberry. Observed vine species included blackberry. Within wetter sections of the stand adjacent to the site boundary, herbaceous species included sensitive fern and cinnamon fern.

Elsewhere, species observed in the ground layer included grays goldenrod, Virginia creeper, dewberry, and sarsaparilla.

3.3 Wetlands (Facility Site)

Wetlands identified on the site include a large (6.96 acre) forested riparian wetland associated with Turkey Brook. This wetland occupies the center of the site and is driven largely by groundwater discharge, which emanates from a large wetland complex located to the north of the property. Wetland soils identified by Soil Resource Consultants include the following series: Leicester extremely stony soils (0–5% slopes); and Pootatuck fine sandy loam (0–3% slopes). Although the wetland is primarily associated with Turkey Brook, there is a narrow and shallow swale that extends well into the upland. The primary hydrologic input for the swale appears to be groundwater seepage.

3.3.1 Riparian Forest Community

Dominant species in the riparian forest community associated with Turkey Brook include a suite of tree species that can be found primarily in mesic and hydric soil conditions: *Acer saccharum* (sugar maple); *Betula allegheniensis* (yellow birch); *Ostrya viginiana* (American hophornbeam); red maple and *Acer platanoides* (Norway maple) (Table 3–7). Many of the mesic tree species were observed in drier portions along the edge of the riparian forest. Other species observed in this community include cinnamon fern, *Symplocarpus foetidus* (skunk cabbage), and the hydric shrub species *Lindera benzoin* (spicebush). Total plant species richness is 38 and the importance values range from 0.8 to 8.2. In general, this was an open stand type and leaf litter was the dominant forest floor substrate type. The width of the riparian forest becomes greater within the southern portions of the site along Echo Lake road.

Table 3–7. Riparian forest community.

Scientific Name	Common Name	D_R	F_R	IV_{ave}
Acer saccharum	sugar maple	13.2714	3.0769	8.1742
Ostrya virginiana	american hophornbeam	11.2807	4.6154	7.9480
Acer platanoides	norway maple	13.2714	1.5385	7.4049

Scientific Name	Common Name	D_R	F_R	IV_{ave}
leaf litter	leaf litter	6.3703	4.6154	5.4928
Lindera benzoin	spicebush	1.3271	9.2308	5.2790
Carex stricta	tussock sedge	3.9814	6.1538	5.0676
Betula allegheniensis	yellow birch	6.6357	3.0769	4.8563
Arisaema triphyllum	jack in the pulpit	5.3086	3.0769	4.1927
Quercus alba	white oak	6.6357	1.5385	4.0871
Tsuga canadensis	eastern hemlock	5.9721	1.5385	3.7553
Osmunda cinnamomea	cinnamon fern	3.9814	3.0769	3.5292
Quercus rubra	northern red oak	5.3086	1.5385	3.4235
Betula lenta	sweet birch	0.6636	4.6154	2.6395
Berberis thunbergii	Japanese berberry	0.1327	4.6154	2.3740
Polytrichum commune	polytrichum moss	0.1327	4.6154	2.3740
Acer rubrum	red maple	1.3271	3.0769	2.2020
Calamagrostis canadensis	bluejoint	1.3271	3.0769	2.2020
Dennsatedtia punctilobula	hay scented fern	0.6636	3.0769	1.8702
Onoclea sensibilis	sensitive fern	0.6636	3.0769	1.8702
Cornus amomum	silky dogwood	1.9907	1.5385	1.7646
Maianthemum canadense	Canada mayflower	1.3271	1.5385	1.4328
Smilacina racemosa	false solomons seal	0.9954	1.5385	1.2669
Fraxinus americana	white ash	0.6636	1.5385	1.1010
Ilex verticillata	winterberry	0.6636	1.5385	1.1010
Osmunda regalis	royal fern	0.6636	1.5385	1.1010
Polystichum achrostichoides	christmas fern	0.6636	1.5385	1.1010
Populus tremuloides	quaking aspen	0.6636	1.5385	1.1010
UID Shrub	UID shrub	0.6636	1.5385	1.1010
UID vine	UID vine	0.6636	1.5385	1.1010
Vaccinium corymbosum	highbush blueberry	0.6636	1.5385	1.1010
Viburnum acerifolium	mapleleaf viburnum	0.6636	1.5385	1.1010
Rosa multiflora	multiflora rose	0.3318	1.5385	0.9351
Symplocarpus foetidus	skunk cabbage	0.3318	1.5385	0.9351
Celastrus orbiculatus	bittersweet	0.1327	1.5385	0.8356
Polygonum cuspidatum	Japanese knotweed	0.1327	1.5385	0.8356
Rhus toxicodendron	poison ivy	0.1327	1.5385	0.8356
Rubus flagellaris	dewberry	0.1327	1.5385	0.8356
Sassafras albidum	sassafras	0.1327	1.5385	0.8356
Thalictrum polygamum	tall meadow rue	0.1327	1.5385	0.8356

Turkey Brook itself consists of a highly sinuous and rectangular channel that ranges in width from eight to ten feet. Banks were well defined, approximately one to two feet in height, and did not exhibit any signs of erosion; even along the outer (convex) banks. Channel substrate consists of a heterogeneous mixture of sand and cobbles although scattered boulders were observed further upstream. The embeddedness of the stream (cobbles and gravels buried in sand) was observed within those reaches of the stream close to the southern boundary of the site. Flow within the channel was somewhat sluggish at

the time of the field investigation, with water depths that averaged 1–3 inches in depth. Water temperatures were cold during the August survey, which is indicative of a groundwater influence.

3.3.2 Wetland Functions and Values

Wetland functions and values associated with this forested riparian wetland system include groundwater recharge/discharge; floodflow alteration (storage and desynchronization); production export; sediment/shoreline stabilization; and wildlife habitat.

The ACOE considerations/qualifiers for the function of groundwater recharge/discharge that apply to this wetland: (4) gravel or sandy soils present in or adjacent to the wetland; (5) fragipan does not occur in the wetland; (6) fragipan, impervious soils, or bedrock does not occur in the wetland; and (13) signs of groundwater discharge are present.

Applicable considerations/qualifiers for floodflow alteration include (9) wetland receives and retains overland sheet flow runoff from adjacent uplands.

Considerations/qualifiers for production export include: (1) wildlife food sources grow within this wetland.

Considerations/qualifiers for sediment/shoreline stabilization include: (7) wide wetland (>10') borders watercourse (Turkey Brook), lake, or pond; (12) dense vegetation borders watercourse, lake, or pond; and (13) high percentage of energy absorbing emergent plants and/or shrubs border a watercourse, lake, or pond.

With respect to the 24 ACOE considerations/qualifiers for the function of wildlife habitat, the following apply to this wetland: (6) wetland is contiguous with other wetland systems connected by a watercourse or lake; (7) wildlife overland access to other wetlands is present; (8) wildlife food sources are within

this wetland or nearby; (13) density of the wetland vegetation is high; (16) plant/animal indicator species are present; (17) animal signs observed; and (21) wetland has a high avian utilization or potential.

3.4 Wildlife (Facility Site)

3.4.1 Old Field

The small patch of old field habitat present along the southeastern provides habitat for species that utilize early successional plant communities, and also those generalists that pass between patch types. This herb and shrub dominated habitat would provide excellent cover for a range of bird species and a suite of small mammals (Table 3–8). Observed bird species included the American goldfinch, gray catbird; common yellowthroat; song sparrow; and field sparrows.

Mammals observed within this habitat type include eastern cottontail and the white–tailed deer (tracks and scat). Other mammals that are expected in this habitat type include woodchuck; Virginia opossum; eastern chipmunk; gray squirrel; and the raccoon. The small mammal community however, is expected to be dominated by white footed mice and deer mice.

No reptiles were observed on the site during this current survey. However, a number of snake species are expected to utilize this patch type, in addition to the mounds of soil and rocks scattered throughout the site. With regard to amphibians, some of the more common species including the American toad and the eastern garter snake are expected.

Table 3–8. Observed and expected wildlife species within the old field.

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Amphibians and Reptiles			
Coluber c. constrictor	Northern black racer		X
Thamnophis s. sirtalis	Eastern garter snake		X
Bufo americanus	American toad		X

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Plethodon cinereus	Redback salamander		X
Birds			
Colinus virginianus	Northern bobwhite		X
Scolopax minor	American woodcock		X
Zenaida macroura	Mourning dove	X	
Empidonax virescens	Acadian flycatcher		X
Tyrannus tyrannus	Eastern kingbird		X
Dumetella carolinensus	Gray catbird	X	
Toxostoma rufum	Brown Thrasher		X
Bombycilla cedrorum	Cedar waxwing		X
Vireo griseus	White-eyed vireo		X
Vermivora pinus	Blue-winged warbler		X
V. peregrina	Tennessee warbler		X
Dendroica petechia	Yellow warbler		X
Geothlypis trichas	Common yellowthroat		X
Passerina cyanea	Indigo bunting		X
Carduelis tristis	American goldfinch	X	
Melospiza melodia	Song sparrow		X
Spizella pusilla	Field sparrow	X	
M. lincolnii	Lincoln's sparrow		X
Zonotrichia albicollis	White-throated sparrow		X
Mammals			
Scolophus aquaticus	Eastern mole		X
Didelphus virginiana	Virginia opossum		X
Sylvilagus floridanus	Eastern cottontail		X
S. transitionalis	New England cottontail		X
Sciurus carolinensis	Gray squirrel		
Marmota monax	woodchuck		X
Peromyscus luecopus	White footed mouse		X
Microtus pennsylvanicus	Meadow vole		X
Napaeozapus insignis	Woodland jumping mouse		X
Mephitis mephitis	Striped skunk		X
Odocoileus virginianus	White-tailed deer		X

3.4.2 Hardwood Sapling Stands

The large patches of dense hardwood sapling stands present on the site provide habitat for species that utilize thickets and dense, cut-over hardwood stands, which cover a significant proportion of the site. Many of the vines and brambles observed along the margins of the stand are berry-bearing and provide an excellent food source for a range of avian species (Table 3–9). Observed bird species included the gray catbird (vocalizations only) and the black–capped chickadee, which was present at the interface of the hardwood sapling stand and the considerably more mature Mattatuck State Forest. Expected species include the ring–necked pheasant and the chestnut–sided warbler.

Mammals observed within this habitat type include the woodchuck (winter burrow). Other mammals that are expected in this habitat type include the least shrew and the New England cottontail.

With respect to the presence of amphibians and reptiles (herptiles) the redback salamander will likely be encountered in this habitat type.

Table 3–9. Observed and expected wildlife species within the hardwood sapling stand.

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Amphibians and Reptiles			
Plethodon cinereus	Redback salamander		X
Birds			
Phasianus colchicus	Ring-necked pheasant		X
Empidonax traillii	Willow flycatcher		X
Dumetella carolinensis	Gray catbird	X	
Dendroica pennsylvanica	Chestnut–sided Warbler		X
Icteria virens	Yellow chat		X
Pheucticus ludovicianus	Rose-breasted grosbeak		X
Pipilo erythrophthalmus	Rufous-sided towhee		X
Melospiza lincolnii	Lincoln's sparrow		X
Parus atricapillus	Black capped chickadee	X (close to Mattatuck Forest edge)	

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Mammals			
Cryptotis parva	Least shrew		X
Sylvilagus transitionalis	New England cottontail		X
Marmota monax	woodchuck	X (winter burrow)	

3.4.3 Riparian Forested Wetland

This community consisted of one of the most open forested stands on the site and provides excellent habitat for a range of bird species and a suite of small mammals that utilize riparian forested wetlands (Table 3–10). Observed bird species included the gray catbird (vocalizations only). Expected bird species include the belted kingfisher and the cerulean warbler amongst others.

Evidence of habitat usage by beaver includes gnawed saplings. Other mammals expected to occur in this habitat type include Virginia opossum and the eastern mole. Amphibians expected to occur in this habitat type include red spotted newt, whereas observed species included the green frog.

Table 3–10. Observed and expected wildlife species within the Riparian forested wetland.

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Amphibians and Reptiles			
Rana clamitans melanota	Green frog	X	
Birds			
Scolopax minor	American woodcock		X
Cerycle alcyon	Belted kingfisher		X
Dumetella carolinensis	Gray catbird	X	
Catharus fuscescens	Veery		X
Hylocichla mustelina	Wood thrush		X
Dendroica cerulea	Cerulean warbler		X
Protonotary warbler	Protothonary warbler		X
Seiurus motacilla	Louisiana waterthrush		X
Geothylpis trichas	Common yellowthroat		X
Icteria virens	Yellow breasted chat		X
Melospiza melodia	Song Sparrow		X
Carduelis tristis	American goldfinch		X

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Mammals			
Didelphus virginiana	Virginia opossum		X
Scalopus aquaticus	Eastern mole		X
Castor canadensis	Beaver	X (gnawed saplings)	

3.5 Interconnect Route Wildlife

This community is comprised of a short segment of the Mattatuck state forest that has been impacted by an ATV trail that leads out to the CL&P electrical transmission ROW. However, given the presence of extensive forested stands on either side of the proposed easement, it seems likely that forest interior bird species may occur within the vicinity of the proposed route including the ovenbird (Table 3–11). Observed bird species included the black-capped chickadee, while expected bird species include the downy woodpecker and the red-eyed vireo amongst others. Mammals expected to occur in this habitat type include the eastern cottontail, while observed species include the white tailed deer (droppings only).

Table 3–11. Observed and expected wildlife species within the interconnect route.

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Amphibians and Reptiles			
Storeria o. occipitomaculata	Northern redbelly snake		X
Plethodon cinereus	Redback salamander		X
Birds			
Accipiter striatus	Sharp shinned hawk		X
A. gentilis	Northern goshawk		X
Buteo platypterus	Broad-winged hawk		X
Picoides pubescens	Downy woodpecker		X
P. villosus	Hairy woodpecker		X
Contopus virens	Eastern wood peewee		X
Empidonax virescens	Acadian flycatcher		X
E. minimus	Least flycatcher		X
Cyanocitta cristata	Blue jay		X
Parus atricapillus	Black-capped chickadee	X	X
Sitta carolinensus	White-breasted nuthatch		X
Hycichla mustelina	Wood thrush		X

GENUS AND SPECIES	COMMON NAME	OBSERVED	EXPECTED
Vireo flavifrons	Yellow-throated vireo		X
V. olivaceus	Red-eyed vireo		X
Seiurus aurocapillus	ovenbird		X
Dendroica caerulescens	Black-throated blue warbler		X
Mniotilta varia	Black-and-white warbler		X
Geothlypis trichas	Common yellowthroat		X
Piranga olivacea	Scarlet tanager		X
Mammals			
Sylvilagus floridanus	Eastern cottontail		X
Peromyscus leucopus	White footed mouse		X
Odocoileus virginianus	White tailed deer	X	

3.6 Rare, Threatened, and Endangered Species

Suitable habitat for the American kestrel was not observed on this site, which has a great deal to do with the fact that the site is nearly exclusively dominated by a dense tangle of vines and closely–spaced hardwood saplings. In fact, this negative association between the density of vegetation and American kestrel numbers has been demonstrated in other studies, whereby the dense understory created by pine regeneration in cut or unburned forests exerted an adverse effect on southeastern American kestrel populations (Hoffman, 1988). Based upon published species accounts, Kestrels need open areas with low stature vegetation in which to hunt their prey, and also require natural tree cavities for nesting. Although a small patch of old field is present adjacent to Echo Lake road, much of the vegetation was estimated to measure at least 3–4 feet in height and patches of tall shrubs were present. Furthermore, dead trees (snags) suitable for nesting with tight–fitting entrances for nests were not observed adjacent to the old field patch type.

4.0 IMPACTS

The project has been designed to avoid and minimize impacts to (1) Turkey Brook wetlands; (2) upland plant communities; and (3) commonly occurring wildlife to the greatest extent possible. Notwithstanding, direct and indirect impacts to resources will occur during construction and operation of the facility itself. The nature of probable impacts related to the construction, operation and maintenance of the facility are discussed in the following sections.

4.1 Upland Plant Communities

Impacts to upland plant communities will include the *Betula populifolia–Quercus rubra*; *Quercus rubra* hardwood sapling stands; and the old field community type. Habitat related impacts associated with the clearing for construction laydown areas are anticipated to be temporary and cleared areas will be allowed to re–vegetate naturally following construction. Of the area affected by the site, a total of 13.5 acres of the upland plant communities observed on the site will be impacted by development. This total accounts for approximately 40% of the vegetated areas on the entire 33 acre site.

Impacts to plant communities present within the proposed 115kV electrical interconnect ROW will involve limited clearing of the mesic, rich hardwood stand and maintaining the cleared area to accommodate service vehicles and maintenance activities. This forested community would be converted to, and permanently arrested at, an early successional stage and the ROW plant community would be comprised of grasses, herbs, and scattered shrubs. The microclimate within the new ROW would be altered such that irradiance levels would be higher, and there would be a shift in CO_2 levels and an increase in evaporative losses. The shift in microclimate will have a number of implications with respect to determining the types of plant species that recruit from seed sources.

Air Emission Impacts

The proposed project will be a Major Stationary Source, subject to Prevention of Significant Deterioration (PSD) and Non-attainment New Source Review (NNSR) requirements. Criteria pollutants analyzed as part of this permit application include particulate matter less than 10 *u*m (PM_{10}); particulate matter less than 2.5 *u*m ($PM_{2.5}$) NO_2; SO_2; carbon monoxide (CO); volatile organic compounds (VOCs); carbon dioxide (CO_2); and lead (Pb).

Impacts to sensitive plants associated with certain of these criteria pollutants were assessed with the direct impact ambient screening concentrations provided in the USEPA document "*A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals*" (USEPA, 1980). Plant species present on the site that are considered sensitive species include *Betula populifolia* (grey birch) and *Pinus strobus* (white pine). Impacts to these species associated with NO_2, SO_2, CO, and Pb were assessed by comparing modeled results with the Air Quality Related Value (AQRV) screening concentrations presented in the guidance document. Direct impact screening criteria have not been developed for either CO_2 or VOCs, and as such are not presented in the USEPA guidance document.

Refined air quality dispersion modeling was performed with USEPA's AERMOD model (ISC-AERMOD View by Lakes Environmental Software) to evaluate air quality impacts of SO_2, NO_2, CO, and Pb. Estimated potential emission rates and other stack parameters from the proposed fluidized bed gasifier (FBG) power plant operating at a maximum rated capacity were input to the model. Modeling was performed using rural dispersion coefficients and five (5) consecutive years of meteorological data from the nearby Waterbury-Oxford Airport meteorological monitoring site. The Waterbury-Oxford meteorological data is considered representative of the project site in Watertown with respect to EPA criteria, including proximity to the project site, similarity in terrain features, similarity in wind direction and speed frequency distribution, and location with respect to the Naugatuck River valley influences on meteorology.

All modeling analyses were performed in accordance with procedures specified in the CTDEP Ambient Impact Analysis Guideline or otherwise recommended by CTDEP. Since this analysis is concerned with onsite impacts, receptor rings were spaced at 10 degree intervals on 36 radials originating at the FBG stack and placed at 25–meter intervals out to 100 meters and 50–meter intervals out to 500 meters from the stack. All receptors were assumed to be in flat terrain, at the same terrain height as the stack base elevation.

The results of the modeling analysis indicate that all criteria compounds are well below the corresponding AQRV screening concentration, with modeled results comprising less than 2% of the corresponding AQRV screening concentration and in many instances, < 0.5% (Table 4–1). Based upon these results, none of the modeled emissions will impact sensitive plant species.

Table 4–1. Comparison of ambient screening criteria (ug/m^3), averaging time, and modeled FBG ambient impacts.

Screening Criterion	Averaging Time	AQRV Screening Concentration (ug/m^3)	Modeled On-site FBG Impacts (ug/m^3)	% of AQRV Screening Concentration
SO2	1 hr	917	5	0.55
	3 hr	786	4	0.51
	24 hr	--	2	NA
	Annual	18	0.3	1.67
NO2	4 hr	3,760	8	0.21
	8 hr	3,760	7	0.19
	Monthly	564	1	0.18
	Annual	100	0.5	0.50
CO	1 hr	--	13	NA
	8 hr	--	11	NA
	Weekly	1,800,000	7	0.0004
Pb	3 Month	1.5	0.001	0.07

4.2 Wetlands

Filling-related impacts to wetlands will occur within a narrow, finger-like swale that extends into the uplands. Total wetland impacts will equal 4,000 square feet (0.091 acres). The wetland swale itself occurs within a depression located in the hardwood sapling stand and plant species observed included dense growth of saplings including quaking aspen, northern red oak, and white ash. Shrub species included spicebush, while

species in the understory included Canada mayflower, sensitive fern, sassafras seedlings, and Polytrichum moss.

Although likely an expression of groundwater discharge, given the small size of the swale and its disturbed nature, wetland functions and values were not ascribed. For this reason, wetland functions and values will not be compromised as part of the filling. That is, groundwater discharge will still occur within the wetland system associated with Turkey Brook, regardless of the filling activity. Furthermore, groundwater discharge will still occur within the swale, albeit at a point further downgradient of the fill material.

4.3 Wildlife

Temporary displacement and avoidance of active construction areas would have a localized effect on commonly occurring wildlife present on the site by causing them to abandon feeding, breeding (where applicable), and resting activities. Small mammals, reptiles, and amphibians that utilize upland areas adjacent to wetland areas on the site will be displaced during construction activities. Foraging and breeding opportunities for those wildlife species that utilized portions of the site that were cleared during construction and allowed to re–vegetate would be disrupted until vegetation re-establishes. These activities would resume however, shortly after the completion of construction activities. Finally, the proposed activities will have no effects on the movement of wildlife species along the Turkey Brook riparian corridor.

Given the small amount of habitat that will be affected by the interconnect route, it seems highly unlikely that the change will result in any population level effects. With respect to the composition of the terrestrial wildlife community, the numbers of predators including *Molothrus ater* (brown headed cowbird) could possibly increase locally within the narrow cleared area maintained above the electrical interconnect route, in response to the increase in edge habitat. Edge habitat is widely recognized to be a population “sink” due to the effects of increased predation and the associated reduction in prey population size.

Although the impacts to plant communities on the facility site may appear serious, it is important to note that they are early successional plant communities that have developed in response to severe disturbance. As such, they are not unique plant communities with a correspondingly unique suite of wildlife with acute habitat specificity. Rather, many of the observed wildlife species and those species expected to utilize this type of site are going to be habitat generalists and will make use of undisturbed habitat types remaining on the site and potentially the large tracts of undeveloped land associated with the Mattatuck State Forest that surround the site. The assumption that adjacent properties (particularly) will remain undeveloped is based upon the fact that they are presently state owned lands.

4.4 Rare, Threatened, and Endangered Species

As previously discussed, suitable habitat for the American kestrel is not present on the site given the absence of large expanses of short stature grassland habitat in addition to suitable nesting trees adjacent to low–stature grassland habitat. For this reason, impacts to the American kestrel and associated habitat will not occur.

5.0 MITIGATION

This project has been designed to minimize impacts to upland plant communities; wetlands; Turkey Brook; and wildlife to the greatest extent practicable. Specifically, the footprint associated with the facility and attendant structures has been configured to preferentially utilize previously disturbed habitats and the site development has been condensed to avoid impacts to sensitive resources including Turkey Brook and the associated floodplain wetlands. Moreover, the utility interconnects have been situated so as to maximize the use of previously disturbed sections of the Mattatuck State Forest. Notwithstanding, direct and indirect impacts to biota and associated habitats will occur during construction and once the plant is in operation. Mitigation measures to offset impacts resulting from the construction, operation, and maintenance of the facility are discussed in the following sections.

5.1 Upland Plant Communities

Mitigating measures used to minimize the effects of development are primarily focused on reducing the alteration of plant communities to the greatest extent possible and also include a provision for adequate buffers so that the attributes of the habitat are not degraded. As an added measure, efforts to improve existing habitat functions through planting native plant species or other appropriate means have been specified.

Once construction begins near sensitive resource areas, e.g. wetlands, exposed soils should be stabilized within 14 days including all disturbed areas that may not be at final grade but will remain undisturbed for periods longer than an additional 30 calendar days. In this regard, it is suggested that the "New England Roadside Matrix Upland Seed Mix" be used to re–vegetate all upland areas with exposed soils. This seed mix is particularly appropriate for roadsides, industrial sites, or cut and fill slopes and blends native grasses, wildflowers and shrubs together in a native matrix seed mix. Plant species contained in the mix include several grasses: creeping red fescue (*Festuca rubra*), switch grass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), Virginia wild rye (*Elymus virginicus*); a number of wildflowers: partridge pea (*Chamaecrista fasciculata*), wild blue

lupine (*Lupinus perennis*), showy tick trefoil (*Desmodium canadense*), New England aster (*Aster novae-angliae*), wild senna (*Cassia hebecarpa*), butterfly milkweed (*Asclepias tuberosa*), round-headed bush clover (*Lespedeza capitata*), white vervain (*Verbena urticifolia*); in addition to several shrub species: gray dogwood (*Cornus racemosa*) and staghorn sumac (*Rhus typhina*).

In areas that may be frequently disturbed, the warm season grasses will dominate. In those areas that are not as frequently disturbed, the wildflower component will become dominant. Along cuts and side slopes that may never be mowed, the shrub component will add structural diversity and excellent wildlife habitat.

Apart from the seed mix, it is recommended that plantings within the upland area should consist only of native species and include trees such as *Pinus strobus* (white pine), shrubs including *Myrica pennsylvanica* (bayberry) and *Rhus typhina* (staghorn sumac), while warm season grasses can include species such as *Schizachyrium scoparium* and *Panicum virgatum* (switchgrass). Both of these grasses have significant wildlife value.

Standard Best Management practices (BMPs) and soil and erosion control measures will be implemented in order to minimize indirect impacts to wetlands and terrestrial communities adjacent to the electrical interconnect ROW. Specifically, to minimize the potential for erosion and sedimentation during construction, mitigation measures, including hay bales and silt fence, will be placed in appropriate locations along the interconnect routes. These mitigation measures will prove to be especially effective along the interconnect route in those instances where wetlands are situated at the base of steep grades.

5.2 Wetlands

Although direct filling–related impacts to wetlands are minor and will not compromise identified wetland functions and values, indirect impacts to wetlands associated with Turkey Brook will require mitigation. Indirect impacts include increased overland flow resulting from an increase in impervious area, in addition to the deposition of suspended solids into onsite wetlands. The mitigation of indirect impacts to wetlands

will include (1) BMPs; (2) the enhancement of wetland buffer zone with transitional plantings; and (3) the creation of wetlands designed to handle stormwater. Wetlands designed to handle stormwater are discussed more fully in the restoration plan developed for the site entitled *Stormwater Wetland: Water Quality Basin and Planting Details* (Soil Resource Consultants, 2007) (Appendix C).

To minimize the potential for erosion and sedimentation during construction, mitigation measures, including hay bales and silt fence, will be placed in appropriate locations on the site to both protect wetlands and to minimize the erosion of soil from stockpiles on the site. Prior to construction, erosion control devices would be placed between the work area and wetlands that are situated downgradient of construction activities. In addition to these standard BMPs there are other approaches to minimizing soil erosion that can be undertaken including grass waterways, rip–rap splash pads etc. In those instances where clearing and construction activities are required at the very edge of the wetland, a smaller piece of equipment will be utilized to minimize impacts. The construction corridor will be clearly marked with orange snow fence to ensure that construction equipment does not stray further into adjacent and undisturbed areas. Each of these measures and others are discussed more fully in the Soil and Erosion Control Plan developed for the site.

The addition of woody vegetation to the wetland buffer zone would serve to dissipate the energy of overland sheet flow entering the Turkey Brook wetlands through increased surface area. The vegetation would also exert a filtering effect, thereby removing water borne suspended solids and maintaining Turkey Brook water quality. Enhancement wetland buffer zone plantings could include transitional wetland shrub species such as *Cornus racemosa* (gray dogwood), and *Amelanchier canadensis* (common serviceberry), while tree species could include a number of fast growing, early successional tree species such as *Juniperus virginiana* (eastern red cedar), a species that tolerates full sun to partial sun conditions.

As proposed, stormwater detention basins will be constructed adjacent to the northeastern edge of the Turkey Brook wetland. Given their close proximity to the

wetland, the hydrologic regime would be such that a “soft–engineered” approach to basin design would work fairly well and would also serve to offset the wetland filling impacts. In this regard, it is recommended that a palustrine emergent wetland be the target plant community within the detention basin, with an admixture of scattered berry–bearing shrubs as a structural element for wildlife, e.g. *Vaccinium corymbosum* (highbush blueberry). In order to develop the emergent wetland plant community, plant species including lurid sedge (*Carex lurida*), green bulrush (*Scirpus atrovirens*) can be planted. Shrub species could be scattered along the margins of the basin and include *Viburnum lentago* (nannyberry).

6.0 LITERATURE CITED

DeGraaf, R.M. and D.D. Rudis. 1986. New England Wildlife: Habitat, Natural History, and Distribution. Northeast Forest Experiment Station, General Technical Report NE-108.

Hoffman, M. L.; Collopy, M. W. 1988. Historical status of the American kestrel (*Falco sparverius paulus*) in Florida. Wilson Bulletin. 100(1): 91-107.

USEPA (United States Environmental Protection Agency). 1980. A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals.

APPENDIX A

AGENCY CORRESPONDENCE LETTERS

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Natural Resources
Division of Wildlife
79 Elm Street, 6th Floor
Hartford, CT 06106
Natural Diversity Data Base

June 6, 2007

Mr. William G. Carter
Tamarack Energy, Inc.
35 Pratt Street, Suite 101
Essex, CT 06426

re: Watertown Renewable Power Project
in Watertown, Connecticut

Dear Mr. Carter:

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed construction of the Watertown Renewable Power Project in Watertown, Connecticut. According to our information, there are records for State Threatened *Falco sparverius* (American kestrel) from the vicinity of this project site. I have sent your letter to Julie Victoria (DEP-Wildlife; 860-642-7239) for further review. Ms. Victoria will write to you directly with her comments.

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

Please contact me if you have further questions at 424-3592. Thank you for consulting the Natural Diversity Data Base. Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Sincerely,

Dawn M. McKay
Biologist/Environmental Analyst 3

Cc: Julie Victoria, NDDB # 15362

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRANKLIN WILDLIFE MANAGEMENT AREA
391 ROUTE 32
NORTH FRANKLIN, CT 06254
TELEPHONE: (860) 642-7239

June 14, 2007

Mr. William G. Carter
Tamarack Energy, Inc.
35 Pratt Street, Suite 101
Essex, CT 06426

re: Watertown renewable power project, Watertown

Dear Mr. Carter:

Your request was forwarded to me on 6/8/07 by Dawn McKay of the Department of Environmental Protection's (DEP) Natural Diversity Data Base. Their records indicate that a threatened species, American kestrel, (*Falco sparverius*) occurs in the vicinity of this project site.

American kestrels nest in late March - April in open areas like woodland edges, parks, and open field habitat. They are cavity nesters and seek out abandoned woodpecker or flicker holes to nest. They catch and eat mice, voles, shrews and insects. They winter over much of the nesting range. Kestrels are cavity nesters and will nest in artificial nesting boxes that are placed in the area. Artificial nesting box plans will be provided at your request. Nesting boxes and silvicultural practices that maintain high densities of nesting and roosting cavities in trees with a minimum diameter of 30.5 cm will benefit this species.

If this work will be conducted in any American kestrel habitat, the Wildlife Division recommends that a ornithologist familiar with the habitat requirements of these species conduct surveys. A report summarizing the results of such surveys should include habitat descriptions, avian species list and a statement/resume giving the ornithologist' qualifications. The DEP doesn't maintain a list of qualified ornithologists. A DEP Wildlife Division permit may be required by the ornithologist to conduct survey work, you should ask if your ornithologist has one. The results of this investigation can be forwarded to the Wildlife Division and, after evaluation, recommendations for additional surveys, if any, will be made.

The Wildlife Division has not been provided with details or a timetable of the work to be done. Consultation with the Wildlife Division should not be substituted for site-specific surveys that may be required for environmental assessments. Please be advised that should state permits be required or should state involvement occur in some other fashion, specific restrictions or conditions relating to the species discussed above may apply. In this situation, additional evaluation of the proposal by the DEP Wildlife Division should be requested. If you have any additional questions, please feel free to contact me at Julie.Victoria@po.state.ct.us during the field season (April – August), please reference the NDDB # at the bottom of this letter when you e-mail. Thank you for the opportunity to comment.

Sincerely,

Julie Victoria
Wildlife Biologist
Franklin Swamp Wildlife Management Area
391 Route 32
N. Franklin, CT 06254

cc: NDDB – 15362

APPENDIX B

SOIL REPORT BY A CT CERTIFIED SOIL SCIENTIST

SOIL RESOURCE CONSULTANTS

David H. Lord

P.O. BOX 752
Meriden, CT 06450
(203) 634-3389

CERTIFIED SOIL SCIENTIST &
ENVIRONMENTAL CONSULTANT

STATEMENT

To: J. Terrence Meyers
Meyers Associates
60 Linden Street
Waterbury, CT 06702

Re: Tamarack Energy Site
Echo Lake Road
Watertown, CT

SRC Job No. 07-66

Billing Date July 18, 2007

Delineation of Wetlands & Watercourses & Report = $ 640.00

Please pay directly to Soil Resource.

Thank you

PLEASE INDICATE THE ABOVE SRC JOB NUMBER WITH YOUR REMITTANCE

PLEASE REMIT WITHIN 14 DAYS

Thank You For Contacting Soil Resource Consultants

SOIL RESOURCE CONSULTANT

P.O. Box 752 Meriden, CT 06450

July 18, 2007

SRC Job No. 07 -66

J. Terrence Meyers
Meyers Associates
60 Linden Street
Waterbury, CT 06702

Dear Mr. Meyers:

Re: **Wetland Delineation - Tamarack Energy Site - 1020 Echo Lake Road - Watertown, CT**

At your request, I have completed an onsite investigation of this site. The purpose of my investigation was to identify and delineate the onsite inland wetlands and watercourse boundaries. The field work was completed on June 29, 2007.

The wetland and watercourse boundaries were marked with blue plastic flagging numbered **WF -1** through **WF-86**. Please refer to the enclosed sketch for the approximate location of the inland wetland and watercourse boundaries and selected wetland flag numbers. The sketch is not drawn to scale but is a field drawn representation of wetland and watercourse configurations. Flag numbers at property lines and other readily identifiable landmarks can be used to locate wetland lines in the field..

The wetland soil map prepared for this site is a refinement of data found in the **Soil Survey of Litchfield County**. Each map unit is composed of a unique combination of soils. Areas with the same symbol have a similar soil composition.

The map units described below are based on data collected at this particular site. Soil surveys in Connecticut were originally conducted for primarily agricultural purposes and do not provide site specific information. The minimum area delineated on a soil survey map sheet is approximately 2-3 acres in size. For this reason there may be some differences between the following information and that published in the Soil Survey.

INLAND WETLAND SOILS

The identification of inland wetland areas on this site is based on my field observations of test borings and the guidelines of the **National Cooperative Soil Survey Program**. Test borings were done using a shovel and or hand auger.

In Connecticut inland wetland soil categories include poorly drained soils, very poorly drained soils, alluvial and flood plain soils.

Lc
The **Lc** map unit is composed primarily of Leicester extremely stony soils on 0 to 5 percent slopes. Leicester soils are very deep, poorly drained soils which formed in loamy glacial till derived from gneiss and schist. Typically they have fine sandy loam textures to a depth of 60 inches or more.

Pv
The **Pv** map unit consists primarily of Pootatuck soils on 0 to 3 percent slopes. These soils are very deep and moderately well drained. They formed in alluvial sediments. Typically Pootatuck soils have fine sandy loam textures overlying stratified sand and gravel to a depth of 60 inches or more.

W\C
The **W\C** designation refers to the existence of a watercourse and intermittent watercourses on the subject property. The watercourse and intermittent watercourse channels are well defined swales or ditch areas that convey excess surface water runoff from ground water seepage areas and or inland wetland soil areas. The only difference between the two channels is that the watercourse appears to convey persistent to perennial flows.

NON-WETLAND SOILS

The non-wetland soils were not studied or mapped in detail. Some observations were made of these soils during the process of identifying the inland wetland areas. Random soil boring locations were flagged with pink & black stripped plastic ribbon. The following map unit descriptions do not constitute a detailed soil investigation of these upland areas, but may be used as a guide in site planning.

Ca
The **Ca** map unit is composed primarily of Charlton soils on 3 to 15 percent slopes. These are very deep and well drained. They formed in loose glacial till and have fine sandy loam textures to a depth of 60 inches or more.

Cr
The **Cr** soil map unit consists primarily of two soils that are so intermingled on the ground that they could not be separated on the map. Slopes range from 3 to 15 percent. The dominant soil is named Charlton. Charlton soils are very deep and well drained. Typically they formed in fine sandy loam textured soils materials to a depth of 60 inches or more.

They other soil is named Hollis. Hollis soils are shallow and well drained. They have fine sandy loam textures overlying consolidated bedrock at a depth of 10 to 20 inches. These soils do not have a water table within their 20 inch depth.

Hx
The **Hx** soil map unit consists primarily of two soils that are so intermingled on the ground that they could not be separated on the map. Slopes range from 8 to 35 percent. The dominant soil is named Hollis. Hollis soils are shallow and well drained. They have fine sandy loam textures overlying consolidated bedrock at a depth of 10 to 20 inches. Exposures of fractured and

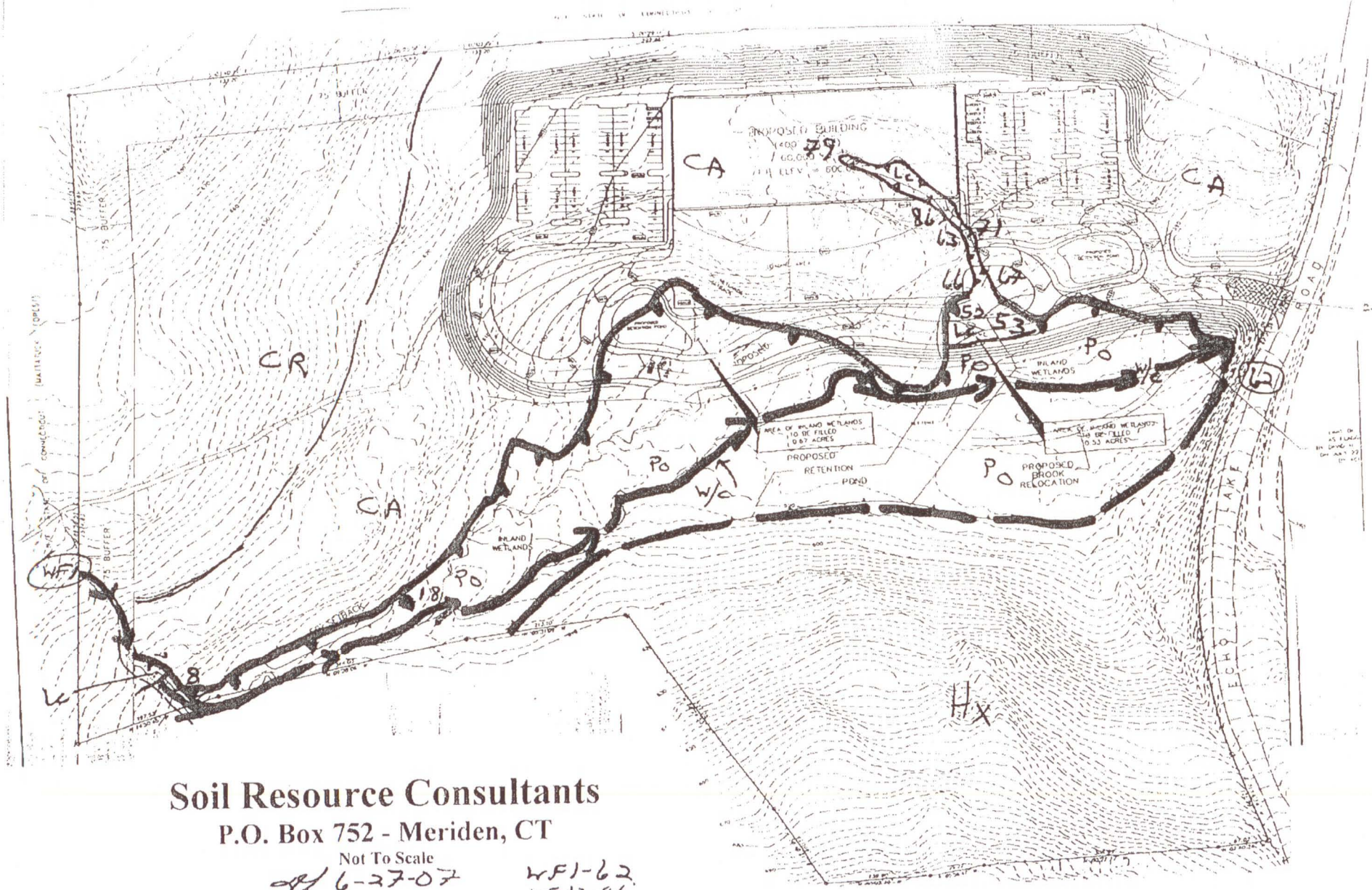
consolidated bedrock may be found within this map unit area. This soil does not have a water table within the upper 20 inch depth.

The other soil is named Charlton. Charlton soils are very deep and well drained. Typically they formed in fine sandy loam textured soils materials to a depth of 60 inches or more.

If you have any questions regarding this report, or need additional assistance with this site, please contact me. Environmental planning and wetland impact evaluation services are also available upon request. I am available to attend Inland Wetland Commission meetings and site walks.

Sincerely,

David H. Lord
Certified Soil Scientist
& Environmental Consultant



Soil Resource Consultants

P.O. Box 752 - Meriden, CT

Not To Scale

6-27-07 WF1-62

WF63-86

RP 7-16-07

APPENDIX C

STORMWATER WETLAND: WATER QUALITY BASIN AND PLANTING DETAILS (SOIL RESOURCE CONSULTANTS, 2007)

MEYERS ASSOCIATES P.C.
60 LINDEN STREET, WTBY, CT 06702
PH# 203-575-0350 FAX# 203-757-4489

facsimile transmittal

To:	CLIFF ORVEDAL	Fax:	860-767-6897
From:	TERRY MEYERS	Date:	9/13/2007
Re:	SOILS REPORTS	Pages:	14 (INCLUDES COVER SHEET)
CC:			

☐ Urgent ☐ For Review ☐ Please Comment/ Reply ☐ Hard Copy to be mailed

Materials provided to P+Z Monday 9/10/07

SOIL RESOURCE CONSULTANTS

P.O. Box 752 Meriden, CT 06450

September 9, 2007

SRC Job No. 07-66

J. Terrence Meyers
Meyers Associates
60 Linden Street
Waterbury, CT 06702

Dear Mr. Meyers:

Re: Review of CT DEP Natural Diversity Database Mapping - Tamarack Energy Site - 1020 Echo Lake Road - Watertown, CT

At your request, I have reviewed the latest available mapping from the Natural Diversity Database office of CT DEP. The purpose of my review was to determine if that office had any sightings or listings for state and federal recognized rare, threatened, or endangered plant or animal species on or nearby to the above described. property.

Based on the latest mapping available, June 2007, no listing of any sightings for the above plant or animal species have been made at or within close proximity to the above described property.

I have attached for your review/use copies of the relevant mapping as well as the printing date for the complete map.

If you have any questions regarding this matter or need additional assistance please contact my office.

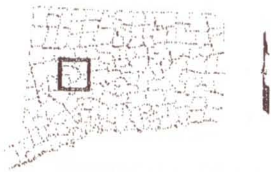
Sincerely,

David H. Lord
Certified Soil Scientist
& Environmental Consultant


Site
Echo L Bk
Smith Pd Bk
Watertown

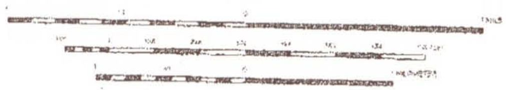
Date of Map: June 2007,
Natural Diversity Database Digital Data

For inquiries about the State and Federal Listed Species and Significant Natural Communities map: Contact DEP, Bureau of Natural Resource, Wildlife Division, Tel: 860-424-3011



State Plane Coordinate System of 1983, Zone 3526
Lambert Conformal Conic Projection
North American Datum of 1983

SCALE



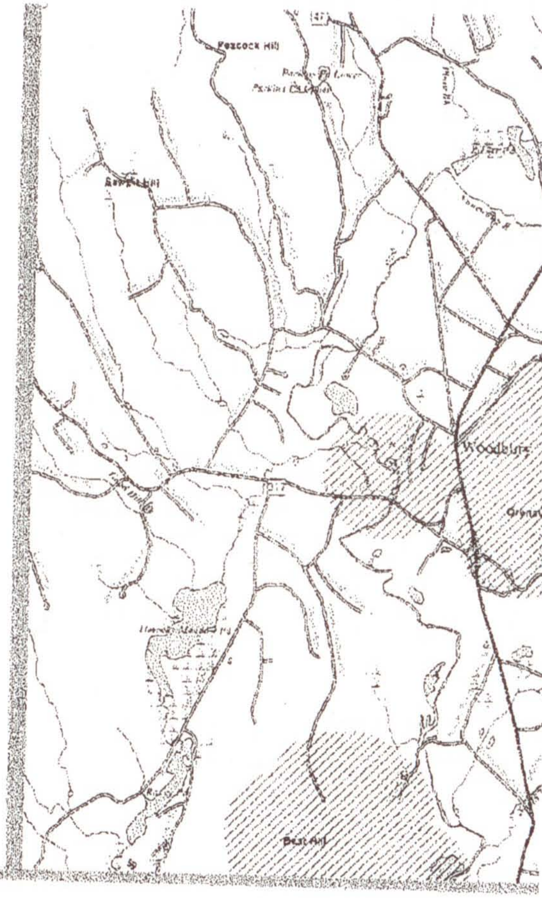
STATE OF CONNECTICUT
DEPARTMENT OF
ENVIRONMENTAL PROTECTION
79 Elm Street
Hartford, CT 06106-5127

Gina McCarthy, Commissioner

Map & Digital Data Available at the
DEP Store
79 Elm St, Hartford, CT 06106-5127
860.424.3555 fax 860.424.4088
depstore@po.state.ct.us

NOTE: This map is not colorfast. Protect from light and moisture.

Printing: May 25, 2007 08:20 PM



Storm Water Wetland

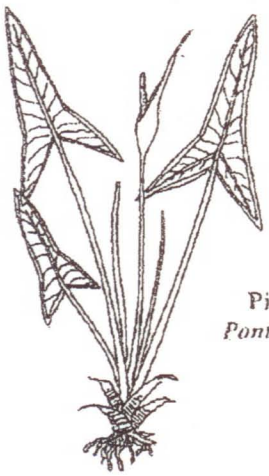
Water Quality Basin & Planting Details

September 10, 2007

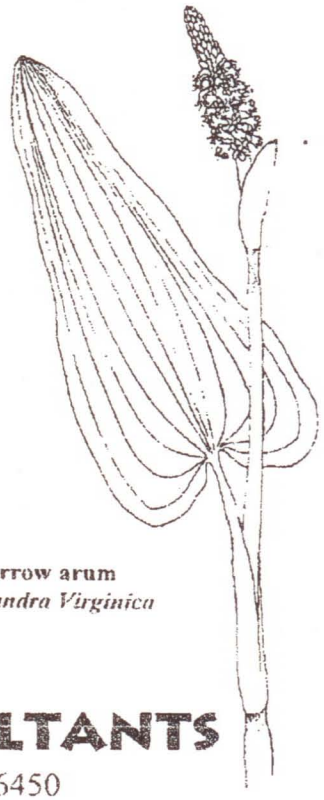
Watertown Renewable Power, LLC

1020 Echo Lake Road

Watertown, CT



Pickerelweed
Pontederia cordata



Arrow arum
Peltandra Virginica

SOIL RESOURCE CONSULTANTS
P.O. Box 752 Meriden, CT 06450

SRC Job No. 07-127

STORMWATER WETLAND CREATION & PLANTINGS

Purpose

The purpose of this plan is to establish diverse shallow emergent vegetation within the bottom area of the Stormwater Wetland type water quality basin (refer to Page 2) proposed for this development. The Stormwater Wetland has been designed to act in conjunction with a treatment train of "Best Management Practices" to treat site generated storm water runoff before it is released to on-site wetlands. Best Management Practices for site generated storm water runoff include catchbasin sumps; sediment forebays at each discharge point into the multi-level wet bottom water quality basin structure. The water quality basin has been designed with extended flow patterns, micro-topography, and micro-pool elements.

The proposed treatment train of best management practices will exceed the CT DEP goal of 80% removal of Total Suspended Solids (TSS). The Stormwater Wetland has been designed to collect and retain the Water Quality Volume (first 1" of runoff) from the contributing drainage areas.

A "sump" area has been designed below the low flow outlet port elevation (El. 603) in the basin. The sump area (between elevations 601 and 603) will create shallow water and saturated soil conditions within the proposed bottom area of the basin. Plantings have been designed to vegetate the bottom areas within the 604 contour with plant species especially selected for their ability to remove contaminants from the storm water column.

Hydrology

Site design has provided for stormwater runoff from roadway and impervious surfaces to flow to the proposed storm water wetland basin.

The combination of existing ground water table conditions and site generated surface water runoff will be used to provide sufficient hydrology for the water quality basin.

Construction Sequence

The following construction sequence will be followed for the water quality basin. Details of individual sequence elements can be found later in this plan.

1. A pre-construction meeting will be held prior to any earth moving activities or vegetative clearing associated with the proposed water quality basin. The pre-construction meeting will be attended by Town IW staff, the supervising wetland scientist, and all other parties involved in any way with the basin.

2. The proposed basin area will be marked in the field by the project surveyor.

3. Sediment filter fencing will be established entirely around the storm water wetland basin area as indicated on the approved site plan drawings.

4. All vegetation within the stormwater wetland basin will be removed.

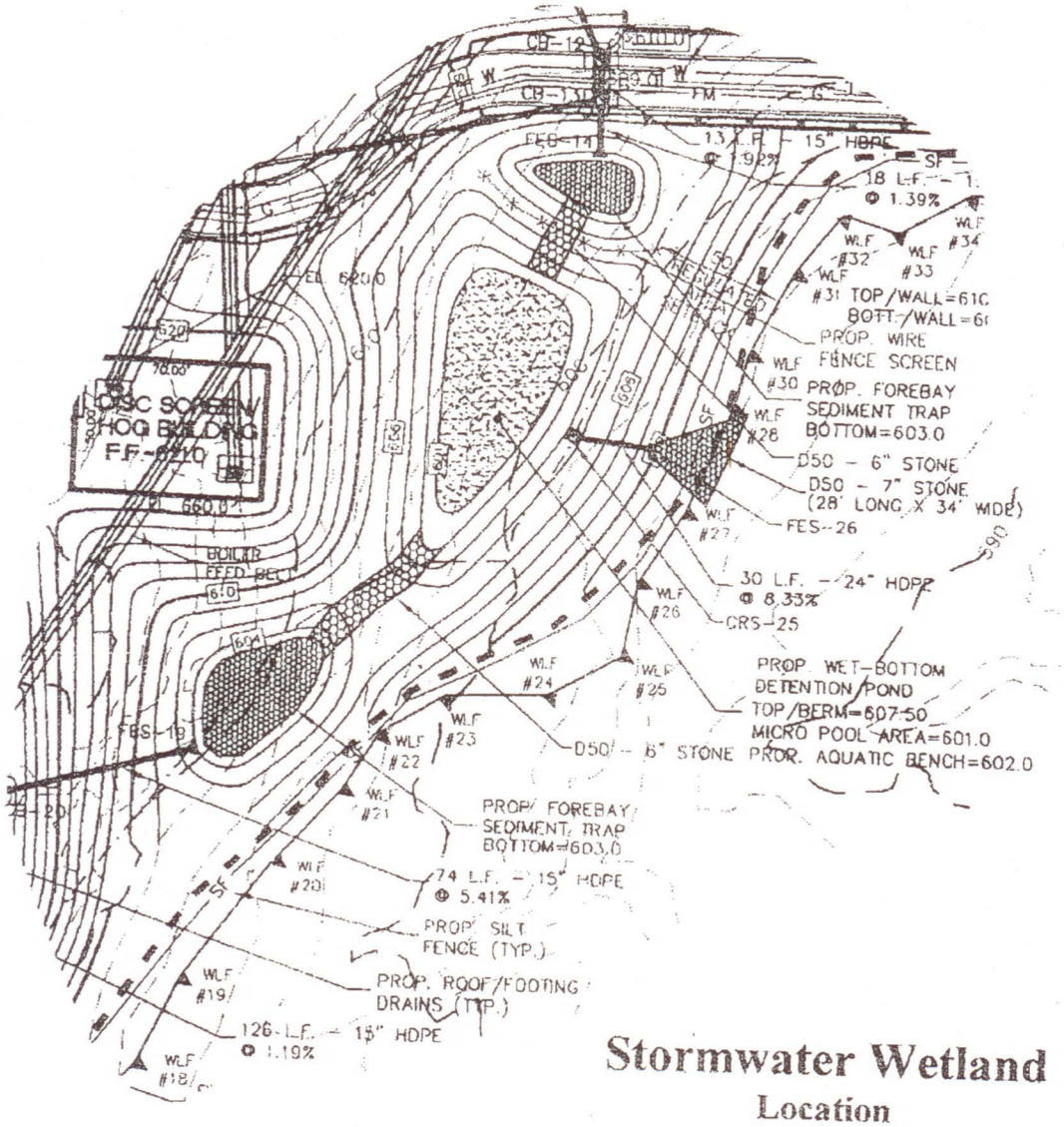
5. Topsoil from the basin area will be removed and stockpiled separately.

SOIL RESOURCE CONSULTANTS

Watertown Renewable Power, LLC

1020 Echo Lake Road

Watertown, CT



Stormwater Wetland Location

Scale 1"=60'

6. Subsoil materials will be excavated down to grades approximately 6 inches below proposed final grades as indicated on approved site plan drawings. SRC will approve the final grading within the basin bottom area before the next sequence (topsoiling) is commenced.

7. Topsoil from the above storm water wetland area stockpile will be backfilled to a depth of approximately 6 inches over the entire surface of the basin bottom area. The wetland scientist will approve the final grading of all topsoil backfill.

8. Proposed plantings will proceed to completion under the direction of the wetland scientist who must inspect all plant materials prior to placement in pre-selected and marked planting pods within the basin bottom area.

9. All bare soil areas above the proposed wetland water surface elevation will be fertilized, seeded and mulched according to the specifications contained with the approved plan.

10. The wetland scientist will certify to the Town IWEO that all proposed planting has been completed.

11. Post completion inspections will be performed by the wetland scientist who will prepare a written report to be submitted to all required landuse agencies.

STORMWATER WETLAND BASIN & UPLAND REVIEW ZONE REVEGETATION

Plant materials have been selected for the bottom area of the basin that are ideally suited for long term growth within soil conditions ranging from saturated to shallow persistent pools. Plant species have also been selected for their ability to remove certain constituents from the storm water column as it passes through the basin area. Overall residence time within the basin has been enhanced by use of the meandering flow paths, the stone separation swales, and sediment forebays. A micro-pool has also been included near the outlet structure to provide an additional type of "treatment" area within the basin.

Planting Areas

Two (2) planting areas have been planned for the storm water wetland on this site. The planting areas, shown on page 4,will include both upland and wetland type soil saturation conditions.

A second type of planting area has been established for all upland review zone areas disturbed as part of the proposed grading activities indicated on the approved site plan drawing. A generalized planting plan has been prepared for the areas within 50 feet of the delineated wetland boundary where revegetation is possible.

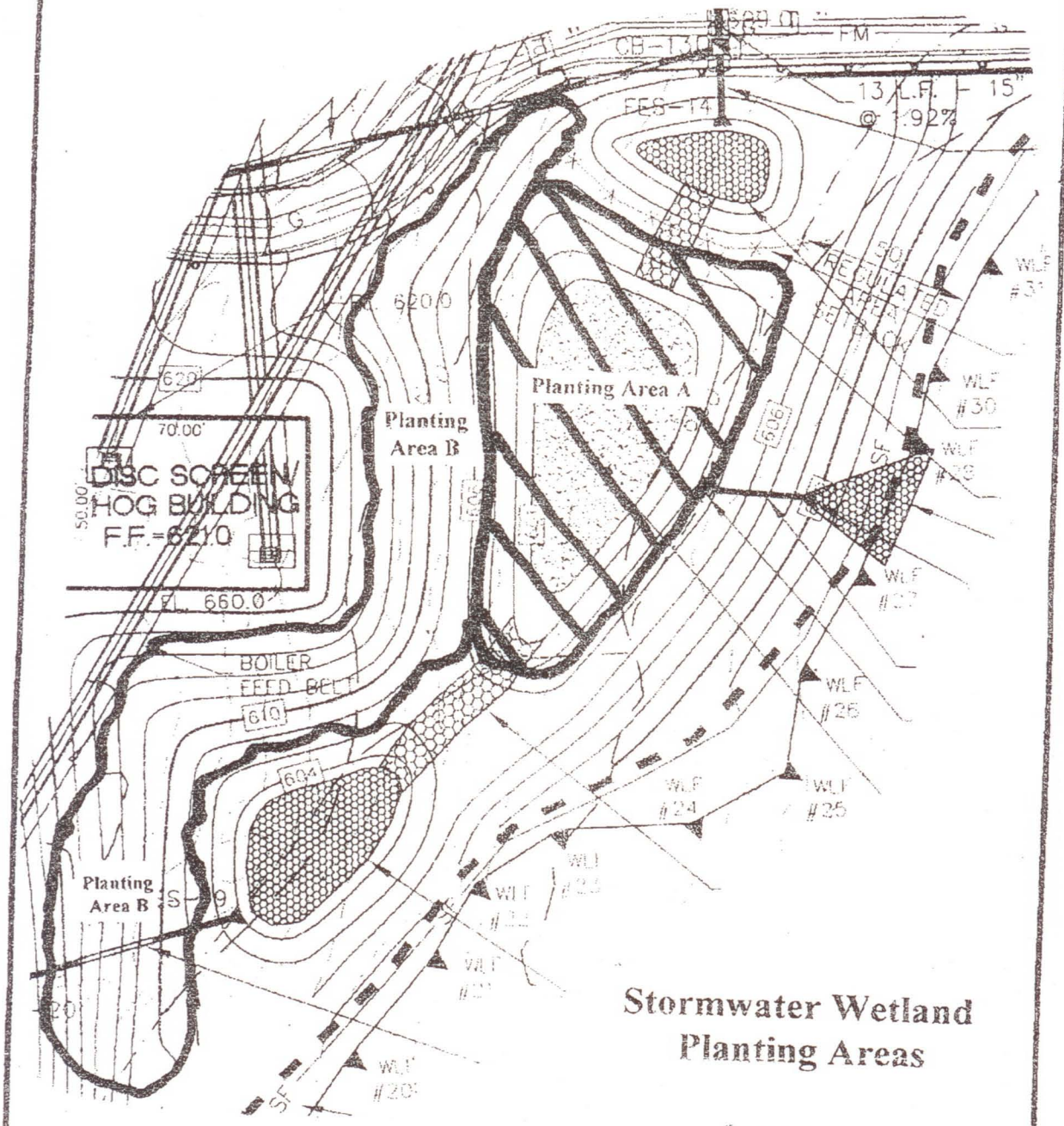
Planting Area A is associated with the bottom area of the storm water wetland type water quality basin within the 604 contour elevation. This area (approx. 7,100 s.f.) will be planted to a mixture of emergent plant species that have been selected to enhance storm water quality renovation as well as wildlife habitat functioning.

SOIL RESOURCE CONSULTANTS

Watertown Renewable Power, LLC

1020 Echo Lake Road

Watertown, CT



Stormwater Wetland Planting Areas

Scale 1"=40'

Planting Area B is associated with the upland soil area around the stormwater wetland basin. The upland soil areas, excluding the basin berm area, will be seeded to a no-mow herbaceous ground cover mix and planted to a mixture of evergreen trees and berry producing shrubs to: (1) provide a buffer screening of the basin area from the adjacent development and (2) enhance wildlife habitat functioning by providing food sources.

Planting Area C (not shown) includes all disturbed soil areas within the 50 foot Upland Review Zone where permanent revegetation is possible. A generalized planting plan, consisting of five (5) trees and ten (10) shrubs for each 1,000 s.f. of these areas has been designed and will be implemented based on field measurements taken after final grading and or construction activities have been completed.

New Plant Materials

New plant stock will be utilized to meet the goals of: (1) providing for enhanced storm water treatment; (2) enhanced wildlife habitat functioning; and (3) increasing the overall diversity of vegetation on this site. The following species will be utilize within the designated planting areas:

Number By Planting Area			Species	Minimum Size to be Planted
A	B	C		
100			**Arrow Arum** *Peltandra virginica*	Bare root nursery stock
200			**Burreed** *Sparganium americanum*	Bare root nursery stock
100			**Duck Potato** (Arrowhead) *Sagittaria latifolia*	Bare root nursery stock
100			**Green Bulrush** *Scirpus atrovirens*	Bare root nursery stock
200			**Hard-Stem Bulrush** *Scirpus acutus*	Bare root nursery stock
100			**Lurid Sedge** *Carex lurida*	Bare root nursery stock
100			**Pickerelweed** *Pontederia cordata*	Bare root nursery stock
200			**Woolgrass** *Scirpus cyperinus*	Bare root nursery stock
	5	1	**Black Cherry** *Prunus serontina*	36" Min. Ht.
	5	1	**Pin Oak** *Quercus palustris*	36" Min. Ht.
	20	2	**Red Cedar** *Juniperus virginiana*	36" Min. Ht.
	10	1	**White Pine** *Pinus strobus*	36" Min. Ht.

Number By Planting Area A	B	C	Species	Minimum Size to be Planted
	10	2	**Arrowwood Viburnum** *Viburnum dentatum*	36" Min. Ht.
		2	**Gray Dogwood** *Cornus racemosa*	36" Min. Ht.
	10		**Highbush Blueberry** *Vaccinium corymbosum*	36" Min. Ht.
	10	2	**Nannyberry** *Viburnum lentago*	36" Min. Ht.
		2	**Northern Bayberry** *Myrica pennsylvanica*	36" Min. Ht.
	20	2	**Winterberry** *Ilex verticillata*	36" Min. Ht.

In the event that sufficient numbers of the above species cannot be readily obtained, substitutions of suitable replacement species can be made subject to the consent of both SRC and the Town IWEO.

Spacing
All plantings will be conducted under the supervision of SRC who will first inspect all plant materials and mark or delineate the planting pods/subareas for each species. Herbaceous ground cover plant material will be planted at minimum intervals of 2' centers. All plantings will be done in a random manner to prevent an artificial appearance.

Permanent Vegetative Stabilization
The following seed mixture or suitable substitute from the 2002 "CT Soil Erosion and Sediment Control" handbook will be used in all bare soil areas associated with the proposed stormwater wetland basin area.

Seed Mixture	lbs./acre	lbs./1,000 s.f.
Creeping Red Fescue	20	.45
Redtop	2	.05
Tall Fescue or Smooth Bromegrass	20	.45
Total	42	.95

Permanent vegetative cover may be established only during the normal growing season of

April 15 through June 15 & August 15 through October 1

unless irrigation is available and a watering plan is prepared.

Temporary Vegetative Stabilization
The following seeding will be used for all disturbed soil areas that will not be permanently stabilized within 30 days, outside the dates for permanent seeding, or when work is halted for the season. Temporary seeding dates are 3/1 to 6/15 and 8/1 to 10/1. Outside these dates only straw mulch should be used.

Seed Mixture	Lbs./acre	Lbs./1,000 s.f.
Annual Ryegrass or	40	1.00
Winter Rye	120	3.00

Fertilizing
Apply limestone and fertilizer to all disturbed basin upland soil areas according to a soil test. If soil tests are not conducted due to the small size of the area or where timing is critical, fertilizer may be applied at the rate of 300 lbs. per acre or 7.5 lbs. per 1,000 s.f. using 10-10-10 or equivalent. Apply limestone at a rate of 90 to 135 lbs. er 1,000 s.f..

Mulching
All seeded areas (permanent and or temporary) should be covered with clean straw mulch at a rate of 90 lbs. per 1,000 s.f..

Each tree and shrub planting location shall have minimum 4 inch thick layer of wood chips/shredded bark placed in a three (3) foot diameter around it to control weeds and inhibit competition from other woody vegetation. A woven geo-textile fabric specifically designed as a "weed barrier" can also be used under the wood chips to provide additional control of completing vegetation.

Maintenance & Monitoring
Upon completion of all vegetation work within the water quality basin area on this site, the wetlands specialist shall inspect all plantings to determine plant survival and vigor. Inspections shall be conducted on a schedule of 30 days and 6 months, and annually for years 1 to 3 from the date of the completion of all plantings. Inspection dates will be seasonally adjusted based to conform to a growing season of April 15th through October 15th.

A minimum survival threshold of 80 percent (total plant population for emergents) has been established for all tree, shrub, ground cover and herbaceous emergent vegetation. Beginning at the first annual inspection the 80 percent threshold must be met or additional plantings or seedings will be required.

Invasive species such as Phragmites, *Phragmites australis*, Russian Olive, *Elaeagnus angustifolia*, Purple Loosestrife, *Lythrum salicaria*, and Multiflora rose, *Rosa multiflora* will be controlled/removed from the planting areas during the post completion monitoring period. Small stands of these invasive can be removed by hand or by chemical treatment with a systemic herbicide. For larger stems such as Russian olive or multiflora rose the stems should be cut off at ground level and the stumps treated with a systemic herbicide. Treated stumps should not be removed by any means as ground disturbance of any kind is to be avoided.

A written report will be prepared annually, along with photographs, by the wetland scientist to document the monitoring inspections. Copies of the written inspection report will be forwarded to the Watertown Inland Wetland Commission. The report will include: (1) the percent establishment of ground cover or herbaceous vegetation; (2) the types and numbers of any dead trees, shrubs or emergent vegetation as well as documenting their replacement.

-END-

David H. Lord
Certified Soil Scientist
& Environmental Consultant

Plant Materials - Herbaceous

Arrow Arum, *Peliandra virginica*. A deep green plant that grows in 1-3 feet of water. This plant provides excellent cover protection and food sources for waterfowl. Improves water quality in stormwater wetlands and detention basins.

Burreed, *Sparganium americanum*. Prefers shallow water along the edge of pools and basin bottom areas. Excellent in the uptake and removal of nutrients (fertilizers) from the storm water column.

Duck Potato (Arrowhead), *Sagittaria latifolia*. This plant which grows in1-2 feet of water, is an important food source for wildlife. Excellent for pollutant renovation/removal with storm water wetlands and detention basins.

Green Bulrush, *Scirpus atrovirens*. A good soil stabilizer, this plant adapts to changing hydrology including periods of drought.

Hard-Stem Bulrush, *Scirpus acutus*. This plant does well in deep marsh (1-3' water) conditions. Excellent for the uptake of nutrients and heavy metals from the storm water column within stormwater wetland basins.

Lurid Sedge, *Carex lurida*. Excellent pioneer species for newly constructed wet areas especially those containing gravelly or sandy soils.

Pickerelweed, *Pontederia cordata*. The deep green leaves and purple flowers of Pickerelweed add beauty as well as diversity to wetlands and water quality basins. Growing in up to 1 foot f water, this plant is is excellent for the uptake of dissolved phosphorus.

Woolgrass, *Scirpus cyperinus*. Woolgrass is an aggressive rooting plant excellent for stabilizing newly constructed sites. Tolerant of a wide range of soil moisture conditions, woolgrass provides dense cover protection for wildlife species.