APPENDIX E – WETLAND INFORMATION

E-1 Wetland Report: Proposed Conditions
E-2 Wetland Report: Existing Conditions

APPENDIX E-1 – WETLAND REPORT: PROPOSED CONDITIONS

WETLAND REPORT: PROPOSED CONDITIONS

KILLINGLY ENERGY CENTER

LAKE ROAD, KILLINGLY, CONNECTICUT

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Killingly Energy Center
an NTE Energy Project

REMA

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1.0 INTRODUCTION

NTE Connecticut, LLC (NTE) plans to develop the Killingly Energy Center (KEC), an approximately 550-megawatt combined cycle electric generating facility and related electrical interconnection switchyard on an approximately 73-acre site in Killingly, Connecticut (the KEC Site). Approximately 63 acres north of Lake Road will be the location of the generating facility (the Generating Facility Site), and the approximately 10-acre parcel south of Lake Road (the Switchyard Site) will be the location of the associated utility switchyard.

This *Wetland Report: Proposed Conditions* provides an analysis and discussion by Rema Ecological Services, LLC (REMA) of potential short-term and long-term impacts on the KEC Site's regulated wetlands and watercourses, and upon the functions and values provided by them. This report also discusses the proposed mitigation strategies that avoid, minimize, and offset direct and indirect wetland and watercourse impacts.

The regulated wetlands and watercourses referred to in this report have been described and characterized in *Wetland Report: Existing Conditions*, published in July, 2016. The reader should refer to that report for information regarding these resources' soils, hydrology, inventoried flora and fauna, landscape-setting, and past land-uses. The *Wetland Report: Existing Conditions* also includes an extensive photo-record of the regulated resources. *Wetland Report: Proposed Conditions* provides additional information, including annotated figures (specifically, Figure 2 of Attachment A, which depicts the various wetland units); annotated photographs to illustrate points made herein (Attachment B), and the basis for the wetland functions and values assessment (see Section 3.0 and Attachment C).

Additional site visits have been conducted by REMA staff since the last site visit (June 13, 2016) documented in the *Wetland Report: Existing Conditions*. Some of these visits were specifically targeting the proposed wetland impact area and the stormwater discharge area discussed in this report, while others were conducted as part of an ongoing effort to complete natural resource and ecological inventories for the KEC Site. Since June 13, 2016 REMA staff visited the KEC Site an additional six times, logging an additional 32 hours in the field. The last site visit covered in this document was conducted on July 28, 2016.

2.0 PROJECT OVERVIEW

The KEC Site encompasses approximately 73 acres of land in Killingly, Connecticut. Of this acreage, the approximately 63-acre Generating Facility Site is located north and northwest of Lake Road, while approximately 10-acre Switchyard Site is located to the south and southeast of Lake Road. The KEC Site is located west of Alexander Lake and Interstate 395, and few hundred feet south and east of the Quinebaug River (see Figure 1, Attachment A). An Eversource electric right-of-way abuts the KEC Site to the southeast.

In all, approximately 10.95 acres of regulated wetlands occur within the KEC Site's 73 acres (i.e., 15% of the total acreage). The central wetlands on the Generating Facility Site (i.e., Wetland Units A1, A2, and A3), which are the subject of much of the analysis and discussion in this report, are roughly 8.5 acres in size (see Figure 2, Attachment A). At the Switchyard Site, Wetland Unit D is about 0.51 acres, but this wetland unit extends offsite to the east within the Eversource electric right-of-way.

At the Generating Facility Site, the proposal calls for the disturbance of about 24 acres of uplands in association with KEC's construction. No direct wetland impacts are proposed on the Generating Facility Site. Earthwork will be required to create the level surface that will contain the various components of the generating facility, such as the turbine building; the air-cooled condenser; the administration, warehouse and water treatment buildings; the fuel oil tank and containment berm; and the generator step-up transformers and related electrical equipment. At the Switchyard Site, proposed development will result in the disturbance of approximately 4 acres of land, including a direct wetland impact of approximately 12,500 square feet upon Wetland Unit D.

At both the Generating Facility and Switchyard Sites, impervious surfaces have been minimized to the extent practicable. Of the combined 28 acres of land disturbance, only 6.84 acres will be impervious (i.e., 24.4%), while the balance will be pervious crushed stone surfaces that will allow significant infiltration of rainfall into the ground and the local groundwater regimes, which in part feed wetland/watercourse hydrology. At the Generating Facility Site, runoff generated on impervious surfaces will be handled through a piped stormwater management system (SMS) that includes a best management practice (BMP)-rich, treatment train that will renovate stormwater to such

a high degree that no impacts to the water quality of receiving waters (i.e., wetlands and watercourses), including the Quinebaug River, are expected.

From the inception of the KEC project, REMA has been involved with guiding the development team regarding potential impacts to the regulated resources. Even following the initial site reconnaissance in February 2016, and preliminary assessment of resource quality and sensitivity, REMA developed a set of minimum guidelines that would be met in order to avoid and minimize wetland and watercourse impacts. These guidelines encompassed wetland hydrology, surface water quality, special aquatic habitats (e.g., vernal pool habitats), wetland setbacks and buffer zones, and required mitigation for direct and indirect wetland impacts. An iterative process was followed, continually being informed as additional baseline data were gathered, and the development configuration and mitigation strategies were progressively adjusted, until all of the initial guidelines were met or exceeded.

3.0 WETLAND FUNCTION & VALUES ASSESSMENT

Functions and values were assessed for each of the major wetland units at the site, using the United States Army Corps of Engineers (USACE) Highway Methodology or the *Descriptive Approach*. This methodology was published in 1995 and amended in 1998. It has much in common with other assessment methodologies in use in the northeastern United States. To summarize, after a thorough and detailed wetland inventory and characterization has been completed, each wetland's properties are briefly outlined on the cover page and compared with lists of numbered rationales for each of 14 functions and values. The rationale lists are attached (Attachment C), and the columns to the left indicated whether they are applicable [(Y) or not (N]), and explanatory notes are added. The bottom of the sheet describes the overall conclusion for each wetland unit, as to whether the function/value is a *principal* function/value (P), *present* to some degree (Y), or *absent* (N).

The four evaluation units for the KEC Site include the three headwaters riparian corridors, located on the Generating Facility Site that flow northerly towards the Quinebaug River. Wetland Unit A1/A2 is easternmost, and includes the man-made pond (A1) at the southern end. Wetland Unit A3 is the broad, central corridor, which is joined by Wetland Unit A2, where the two seasonal streams join to form one stream that outlets the site at its eastern boundary. This stream flows approximately 1,800 feet

offsite, before discharging to the Quinebaug River. Wetland Unit B is westernmost and includes an embedded vernal pool habitat, with an outlet seasonal watercourse. At the Switchyard Site, east of Lake Road, Wetland Unit D was evaluated. This is also the only wetland associated with KEC that will be directly impacted.

3.1 Groundwater Recharge/Discharge

This is a *principal* function for all three stream corridors, but not for Wetland D, a seasonally saturated shrub swamp/wet meadow complex. In Wetlands A1 and A2 multiple seepage areas discharge groundwater, providing baseflow for the seasonal streams. This is consistent with a "groundwater slope" hydrogeomorphic setting, as indicated on the wetland inventory and characterization forms. In Wetland B as well, shallow groundwater is discharged at the base of a slope into a low-lying saturated wetland and a vernal pool habitat. The stream in Wetland A3 intercepts the sub-regional groundwater table in shallow sandy glacial outwash. Groundwater recharge is seasonally important in all of the wetlands, when the water table drops and precipitation and snow melt infiltrates.

3.2 Floodflow Alteration (Storage and Desynchronization)

This is a *principal* value for three of the evaluated wetlands. The man-made pond in Wetland A1 and the pool in Wetland B are rarely full to capacity and serve to hold floodwaters back, as do multiple smaller depressions along the broad Wetland A3 corridor. During large storm events, floodwaters can also overtop the stream channels and spread out onto the stream terraces. The outlet of Wetland A3 through a topographical restriction and gap in a stone wall would act to hold back floodwaters during an infrequent storm event (e.g., 25-year storm). Only Wetland Unit D (WD; on-site section), without a watercourse, has more limited flood storage value.[1] The functional value is *present* but not appreciably, even taking into account the balance of the wetland area, which occurs offsite to the east within the electric transmission right-of-way. However, there is effective infiltration, above the water table, on level, sandy terrain within Wetland Unit D. The primary manner in which the entire KEC Site

[1] The overall wetland unit, of which Wetland Unit D is a small part, extends off-site into the Eversource electric transmission right-of-way. The overall wetland has a restricted outlet at Lake Road, where a ditched seasonal watercourse is culverted under the roadway.

helps prevent flooding under existing conditions is the high proportion of infiltrated precipitation, slowly discharged as seepage, or used directly by transpiring vegetation.

3.3 Fish and Shellfish Habitat

The USACE methodology includes separate criteria for freshwater and marine fish and shellfish habitat. They are both addressed in this section.

Freshwater fish and shellfish habitat is lacking in all the wetlands except the man-made pond (Wetland A1), where it is *present*. This pond supports a population of small-mouth bass. None of the three streams are perennial, nor is the western vernal pool, though the presence of two-lined salamanders, case caddisflies, and other aquatic invertebrates indicates semi-perennial flow.[2] Wetland Unit D has no fisheries function as open water is lacking.

The marine fish and shellfish habitat function relates to the extent to which wetlands support marine and estuarine ecosystems, that is, whether anadromous fish can breed in the headwaters streams. Downriver dams without fish ladders along the Quinebaug and Willimantic Rivers preclude anadromous fish migration. However, each of the three shaded streams contribute to downgradient fisheries function and to marine and estuarine function, by exporting fine particulate leaf litter and cold water of high quality, in particular with a very low nutrient load. The USACE assessment methodology does not allow the assessor to make this point in the summaries for these functions, just as a comment.

3.4 Sediment/Toxicant/Pathogen Retention

Potential is high for this function, based on multiple rationales, such as dense vegetation, at least during the growing season. However, currently *opportunity* is very low; offsite pollution sources are lacking except potentially for several small farm dumps, and some minimal road/trail runoff (for Wetland Units B and D). The function is rated *present*, but not principal.

[2] Due to the "moderate drought" experienced in May through July of 2016, only the uppermost sections of the seasonal watercourses in Wetlands A2 and A3 were found flowing in late July 2016, still supported by baseflow. There was no flow at the outlet stream for Wetland B. Work done earlier in the spring served to characterize these areas during higher-flow conditions.

3.5 Nutrient Removal/Retention/Transformation

Potential is high for this function, but *opportunity* is very low; dense vegetation is present throughout all of the evaluated wetland units for nutrient uptake, and diffuse, intermittently saturated wetland boundaries are well suited to denitrification. Wetlands do not receive excessive nutrient loading from sources such as partially treated septic leachate and runoff from over-fertilized lawns. Nutrient concentrations were very low in all the water samples tested (see Attachment D in the July 2016 *Wetland Report: Existing Conditions*), indicating that natural nutrient sources are not an issue, though the expected early spring algal blooms were triggered by the abrupt release of nutrients from plant tissues decomposed over the winter. The algae are transformed via the food chain into amphibian and fish biomass, and utilized by higher plants as the growing season progresses.

3.6 Production Export

This function encompasses processes related to the food web and to breakdown of organic matter in aquatic systems. It also covers harvest of forest products. It is a *principal* function for the three northeastern riparian wetland units, which have diverse flora and fauna, complex food web interactions, and export of plant detritus via streams, both tree leaves and twigs, and sedge/grass leaves. However, a portion of the detritus simply settles to the substrate, especially in the low gradient A3 stream, adding to the organic soil. Wetland D lacks a flowing stream. This function is *present* here but not appreciably. The wetland's shrub thicket is dominated by invasive shrub species eaten by very few herbivorous insects, or deer. However, the wet meadow portions of this wetland, and also the locust and black cherry trees nearby, support an active food web and pollinators.

3.7 Sediment/Shoreline Stabilization

This function is *present* in the three wetlands that are associated with a seasonal watercourse (e.g., A1/A2, A3, and B), but not Wetland Unit D. This function considers the effectiveness of a wetland to stabilize stream banks and shorelines (e.g., of ponds and lakes) against erosion. In Wetland Units A3 and B, the seasonal streams are low-gradient, well protected by wide and well vegetated wetland terraces, and flows along the stream channels would not be erosive. In Wetland Unit A2, the upper portion of

the seasonal watercourse, just below the pond outlet (i.e., Wetland Unit A1), has a higher gradient and shows some minimal evidence of bank erosion. However, it is still well protected by vegetation growing on or near the banks.

3.8 Wildlife Habitat

The wildlife habitat function relates to the ecological integrity of the wetlands within the site's landscape setting. Because the site is surrounded by a high proportion of forest, wetland-dependent or wetland-associated fauna includes species such as barred owl (*Strix varia*), Louisiana waterthrush (*Parkesia matacilla*), broad winged hawk (*Buteo platypterus*), pickerel frog (*Lithobates palustris*), gray tree frog (*Hyla versicolor*), and wood frog (*Lithobates sylvaticus*), as well as diverse *Lepidopterans*. Habitat includes a variety of cover types and hydrologic regimes. It is suitable for the insect populations needed as prey for wildlife species diversity as expected for wetlands in this landscape, and this function is *principal* for the three riparian corridors. It is also a *principal* function for Wetland D, again because the rural landscape supports less common species like prairie warbler, indigo bunting, and milk snake. However, the assessment methodology evaluates the entire wetland ecologic unit, which in the case of Wetland D, is mostly off-site. Furthermore, the resolution of the methodology does not allow an assessment of the level to which a small portion of a wetland contributes to the overall assessment rating. The on-site portion of Wetland D is transitional in nature, and contains patches of dense invasive vegetation. Therefore, it does contribute greatly to the wildlife habitat function of the overall wetland unit.

3.9 Endangered Species Habitat

One Connecticut *Species of Special Concern*, the broad-winged hawk, was observed by REMA at the site. The sightings were on separate days and in separate areas. One sighting was at the Switchyard Site, within the deciduous forest to the southwest of Wetland D, while the other was just off-site, about 80 to 100 feet to the west of the Generating Facility Site's western property boundary, again in predominately deciduous forest. Broad-winged hawks are often observed within wetlands and riparian areas, feeding on a variety of prey: small birds, amphibians, and a variety of insects, and they are typically found in large blocks of unfragmented habitat, such as that at this site and its environs. However, they are not considered wetland-dependent, and no indication of nesting was encountered within any of the site's wetlands.

An acoustic bat survey was conducted by Tetra Tech wildlife biologists, targeting the federally and state-listed northern long-eared bat (*Myotis septentrionalis*) (NLEB). While NLEB was not detected, several other bat species were detected as potentially foraging or roosting at the site. Of the five bat species detected, four species – the eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), and little brown bat (*Myotis lucifugus*) – are "listed" in Connecticut. Of these four species, two are considered to be wetland-dependent based on feeding and roosting behavior (Whitlock et al. 1994).[3] These are the little brown bat ("Threatened"), and the silver-haired bat ("Special Concern.")

Therefore, this function is *present* for the wetlands at the Generating Facility Site, but absent for Wetland Unit D, at the Switchyard Site.

It should be noted that *Lepidopteran* surveys were conducted, based on documented presence in the site vicinity, for two "listed" moths and one "listed" butterfly (see Invertebrate Survey submitted separately). None of the targeted species were observed. Moreover, these moths and butterfly are not considered wetland-dependent.

3.10 Human Use Values

Human Use Values are comprised of assessment rationales (9) Recreation, (10) Educational/Scientific Value, (11) Uniqueness/Heritage, and (12) Visual Quality/Aesthetics. The suitability of the KEC Site for human use, as a site for *recreation,* environmental *education*, and for *aesthetic* enjoyment is assessed by overlapping sets of rationales. Key characteristics include access to the general public and parking for vehicles and school buses (currently lacking), safety, and accessibility. Although only a few informal paths traverse the site, the terrain is mostly walkable with low density understory, such that *recreational value* is *present*. For example, the terrain bordering Wetland Unit A3 is an open forest floor with a bed of deep pine/hemlock needles. The exception is Wetland Unit B, with dense ground-layer vegetation, and mucky footing, so this wetland unit received a lower rating for the human use values. Right-of-way management makes the meadow cover type of Wetland Unit D accessible, but the shrub thicket is too dense for recreational use. This

[3] Whitlock A. L., N. M. Jarman, and J. S. Larson. 1994. WEThings: Wetland Habitat Indicators for NonGame Species. Wetland-Dependent Amphibians, Reptiles, and Mammals of New England. Volume II. The Environmental Institute. University of Massachusetts.

functional value is *present* here mostly because of the off-site section and the maintained access trail that traverses through the Eversource electric transmission right-of-way.

Per established aesthetics principles, the views of the pond (Wetland Unit A1) and the emergent marsh inclusions in Wetland Units A1 and A3 are classified as very good. A notable 4-foot diameter oak, and contrasting, adjacent cliff faces also confer *aesthetic value*, contributing to a "*principal*" rating for Wetland Unit A3. The fact that rare species potentially use the wetlands at the Generating Facility Site increases the *educational/scientific value* but not enough for a principal rating.

All the human use values are integrated for the "*Uniqueness and Heritage" value*; its high standards are not met in any of the wetlands evaluated.

4.0 OVERVIEW OF POTENTIAL WETLAND & WATERCOURSE IMPACTS

4.1 Direct Wetland Impacts

According to the site plans developed for KEC, *direct* wetland impacts are limited to 12,500 square feet, which represents 2.62% of the wetlands within the KEC Site's 73 acres.

The area to be impacted is part of Wetland Unit D, the on-site portion of a larger wetland area that extends easterly into the Eversource electric transmission right-of-way (see Figure 3, and Photos 1 and 2, Attachments A and B). The impact area consists of both scrub-shrub and emergent wetland cover types, has poorly drained to somewhat poorly drained soils, and a seasonally saturated hydrologic regime.

The emergent cover type is a wet meadow dominated by goldenrods (*Solidago* spp.), sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), sedges (*Carex* sp.), and other forbs (see Photo 3). The scrub-shrub cover type includes saplings of red maple (*Acer rubrum*), gray birch (*Betula populifolia*), and white pine (*Pinus strobus*), but also fox grape (*Vitis labrusca*) and invasives such as autumn olive (*Eleagnus umbellata*) and glossy buckthorn (*Frangula alnus*) (see Photo 4). The presence of fox grape and autumn olive indicates that this area is transitional in nature, more moist than wet in habit, yet still a regulated or jurisdictional wetland.

The overall wetland unit, including off-site sections is roughly 5.6 acres in size (see Figure 3), and consists of the same matrix of emergent and scrub-shrub cover types, which are maintained within the electric transmission right-of-way. Therefore, the loss of 0.287 acres of a similar cover type is not a significant taking that would compromise the ecological integrity or functionality of the entire wetland unit. Moreover, as will be discussed in a following section, proposed mitigation in the form of wetland creation, restoration, and enhancement will more than offset the proposed wetland impact. Finally, as discussed in Section 4.2.5, the wetland functions and values provided by the overall wetland will not be impacted as a result. This wetland will continue to provide these functions and values assessed under existing conditions in the post-construction phase.

Alternative layouts for the utility Switchyard Site were considered during the planning process, in an effort to avoid any direct wetland impacts. However, the Switchyard Site's constraints and Eversource's required specifications for the utility switchyard did not allow complete avoidance (see further discussion in Section 5.0).

4.2 Indirect Wetland Impacts

Indirect or secondary impacts to a wetland or watercourse can occur as a result of activities outside of wetlands or watercourses. Such impacts can be *short-term* or *long-term*, and are typically associated with erosion and sedimentation, mostly during the construction period, the removal or disturbance of vegetation in upland areas but adjacent to wetlands or watercourses, the alteration of wetland hydrology or the flow regime of a watercourse, and the discharge of degraded surface water or groundwater, which may adversely impact the water quality of the regulated resources.

The potential for any of these indirect impacts to occur at the site as a result of the proposal depends on the regulated resources themselves, their sensitivity, and their ecological and physical characteristics. These potential impacts are discussed below.

4.2.1 Erosion and Sedimentation

If not properly controlled, the potential for soil erosion and subsequent deposition in wetlands or watercourses exists at construction sites that involve soil disturbance. At this site, the risk, or the potential for adverse impacts, from erosion and sedimentation

is considered low. The primary reasons for this assessment are: (1) a detailed erosion and sedimentation control plan has been prepared and submitted, which complies with the Connecticut Department of Energy and Environmental Protection's (CTDEEP's) 2002 *Connecticut Guidelines for Erosion and Sediment Control*; and (2) the dominant soils (i.e., Canton and Charlton soil series) in the areas to be graded and/or exposed have low to moderate erodibility (i.e., K-Factor 0.17 to 0.37; whole soil).

However, Wetland Unit A3, the Generating Facility Site's large central wetland is considered a somewhat sensitive resource, especially in the early portion of the growing season when there is flow in its watercourse and, therefore, diligent control maintenance and monitoring is necessary to ensure this resource is protected during the construction phase. This maintenance and monitoring will be required per the Stormwater Pollution Prevention Plan (SWPPP) (provided separately).

In addition to the traditional silt fence/haybale barriers, the SWPPP calls for the use of wood chip berms as yet another barrier to any fine sediment that may pass through the silt fence mesh and haybales. Properly sized and placed, these can be very effective in removing fines, even down to the colloidal fraction. As an extra precaution, in addition to the above perimeter barriers, "silt socks" will be utilized, as necessary, in certain areas, based on conditions encountered in the field during construction. These are 12-inch to 18-inch tubes filled with compost (minimum 2-year) that are placed downgradient of the primary barrier(s) and upgradient of the wetlands at the site.

In order to reduce unnecessary encroachment towards the wetlands at the Generating Facility Site, fill slopes greater than 3:1 are proposed facing Wetland Units A1/A2, and A3. Per the *Connecticut Guidelines for Soil Erosion and Sediment Control* (CTDEEP 2002), erosion control blankets are required for permanent stabilization. Before these blankets are applied, the graded slopes will be seeded with an appropriate seed mix, including the New England Roadside Matrix Upland Seed Mix (NEWP, Inc.), which includes grasses, legumes, and shrubs such as staghorn sumac (*Rhus typhina*), silky dogwood (*Cornus amomum*), and grey dogwood (*C. racemosa*). The intent of using the erosion control blankets and the specialized seed mixes is dual: (1) to provide robust and permanent stabilization of the fill slopes; and (2) to provide a very low maintenance vegetative cover type to complement upland habitat left undisturbed next to wetland resources (i.e., buffer zones; see also Section 4.2.2).

4.2.2 Removal of Native Vegetation and Habitat Loss

Habitat loss associated with land clearing, if not properly mitigated, has the potential of impacting wetlands and watercourses. At the Generating Facility Site, most of the habitat to be cleared and converted to pervious or impervious surfaces consists of areas that are wooded – mostly mixed deciduous/evergreen – and moderately sloping. Forest adjacent to wetlands not only provides protection during the construction phase, but also can contribute positively to their functions and values (e.g., wildlife habitat). Therefore, an effort was made through the planning process to minimize disturbance (i.e., earthwork, tree clearing) within 50 feet of Wetland Units A1, A2, and A3, to the extent practicable, and to also provide a wider setback to hard surfaces (i.e., pavement, buildings, structures).

Wetland Unit A3, the KEC Site's larger central wetland, was found to be somewhat higher functioning than the other wetland resources, and somewhat more sensitive with regard to its hydrology. Therefore, efforts to provide a substantial post-construction "wetland buffer zone" or "setback" are prioritized here. As can be seen from the submitted plans, the limit of disturbance is farther back than 50 feet in all cases, except in one relatively small section in the far southwestern portion of the wetland, where a vegetated fill slope would encroach an average of 38 feet within this zone (minimum is 20 feet). However, the average width of this undisturbed zone to Wetland Unit A3 from any proposed grading is roughly 80 feet. Moreover, the average distance from the edge of pavement to Wetland Unit A3 is over 190 feet.[4]

By heavily planting both the detention basin and the fill slope, which alone adds nearly 50 feet of additional *horizontal* separation from the wetland, the effective buffer zone is at least 100 feet in width for Wetland Unit A3. Moreover, the fill slope adds roughly 28 to 30 feet of *vertical* separation to the wetlands. This means that potential visual and auditory impacts to wetland-associated and wetland-dependent wildlife will be minimized by being well elevated and away from wetlands.

The proposed buffer zones to Wetland Units A1 (the man-made pond) and A2 are less than those for Wetland Unit A3, but only for the upper southernmost section. Again, approximately 200 feet below the pond, the undisturbed buffer zone will be more than

[4] Representative distances for the undisturbed wetland buffer and the wetland setback to "hard" surfaces are included in the submitted plan set.

50 feet, and over 100 feet taking the fill slope into account. The elevation of activities at the facility nearly 30 feet above the wetlands will also ameliorate long-term indirect impacts.

Based on this analysis, the proposed wetland buffer zones and setbacks are sufficient to protect wetland functions and values in the post-construction phase.

4.2.3 Potential Impacts to Wetland Hydrology and Stream Flow

The hydrologic and flow regimes of the Generating Facility Site's wetlands, and particularly those of Wetland Unit A3, are dependent to a great extent on contributions by shallow groundwater discharge originating in the land to be developed for the electric generating facility.

A great deal of site design and mitigation has focused on ensuring that wetland hydrology is maintained post-construction. For an analysis and discussion of this potential impact, refer to Section 4.2.5, which concludes that the groundwater recharge/discharge function of Wetland Unit A3 would not be adversely altered. Thus, wetland hydrology and stream flows would be maintained, post-construction.

4.2.4 Potential Water Quality Impacts

Stormwater runoff from impervious surfaces of industrial sites, if not properly managed, has the potential of degrading the water quality (i.e., surface and groundwater) of regulated resources. As a first step, two surface water sampling sessions at the Generating Facility Site's man-made pond (Wetland Unit A1), and the two seasonal streams associated with Wetland Units A2 and A3 were conducted. The first sampling session took place in March 2016, during "dry" weather, while the second was in May 2016, during a precipitation event.[5] The collected samples were tested for a variety of constituents including nutrients at a Connecticut-certified laboratory (Phoenix Environmental Laboratories, Inc.).[6] The results show that surface

[5] Sampling was conducted at the tail end of a precipitation event totaling +/- 0.95 inches.
[6] Note that REMA does not filter samples in the field for ortho-phosphate. While this procedure of filtering out particulates might be necessary for some applications, it is not necessary for baseline natural resource surveys. Inclusion of particulates would only raise the value for ortho-phosphate. This, however, was not the case at KEC site. The values were just above or near the detection limit, denoting excellent water quality.

waters at the Generating Facility Site are not polluted, and meet the State water quality standards for Class A surface waters. This was fully expected for the site's headwater streams, based on visual observations. These results form a baseline for the site that could be used to compare with any post-construction monitoring.

Generation of potential pollutants on impervious surfaces typically results from vehicular traffic over them. The more the "axle-miles" or the movements of vehicles over impervious surfaces, the higher is the loading of runoff constituents, including sediment, nutrients, and heavy metals. Even though the proposed facility is considered industrial, vehicular traffic over impervious surfaces during day to day operations is considered of low intensity. Therefore, generation of potential pollutants would also be low for this site.

The CTDEEP's 2004 *Stormwater Quality Manual* (the Manual) is used to guide the selection, design, siting, and sizing of appropriate BMPs, which are protective of surface and groundwater quality. The CTDEEP has adopted, through its General Permit for discharge of stormwater, an average annual 80% total suspended solids (TSS) minimum removal goal, because research has shown that the concomitant removal of other runoff constituents is high at these levels of TSS removal. Nevertheless, the designer of the appropriate BMPs must also be cognizant of the fact that attenuation of the soluble fraction of many runoff constituents, for example nutrients and metals, are not easily removed with sediment, to which many pollutants adsorb. With this in view, above-ground, vegetated water quality basins are necessary for the treatment of runoff, to maximize physical, chemical, and biological attenuation processes, and attenuate soluble constituents to a high degree.

For the Generating Facility Site, which has the most intense use, the proposed post-construction SMS design treats generated runoff in two different ways, depending on the type of surface materials. The bulk of the facility will consist of pervious surfaces (i.e., crushed stone) allowing precipitation and the bulk of the roof runoff to infiltrate directly into crushed stone surfaces, during all but the most intense of rainstorm events. Roof runoff is considered much cleaner than what is typically generated on impervious surfaces, and will be polished as it filters through the crushed stone layer and the underlying pervious substrata.

The full analytical results can be found in Attachment D: Surface Water Quality Sampling, of the *Wetland Report: Existing Conditions* (June 2016).

Only about 6.5 acres of impervious surfaces, mostly for the access driveway and the ring road around the perimeter of the facility, will generate runoff and be treated by a formal system.[7] This consists of a multi-element treatment train with the following components and practices:[8] (1) routine pavement sweeping and catch basin cleanouts; (2) deep sump catch basins with hooded outlets; (3) a hydrodynamic separator; (4) a large sediment forebay; (5) a stormwater wetland; (6) a bioretention basin, and (7) a large level spreader. Should the system discharge via the roughly 140-foot long level-spreader,[9] treated runoff would travel as overland flow for about 60 feet to the downgradient wetland resources, allowing for further polishing. Even then, the seasonal watercourse, which would be considered the more sensitive resource, is at least another 50 feet away.

In accordance with the Manual, the water quality volume (WQV) was conservatively calculated for the formal stormwater management system, as if runoff from all 6.5 acres of impervious surfaces, including roofs, were to be conveyed through the system. This is the volume of water generated as runoff during the 1-inch water quality storm. The calculation shows that the detention basin (i.e., forebay, stormwater wetland, bioretention basin) far exceeds the needed WQV.[10]

To aid in the design and to predict the performance of the Generating Facility Site's currently proposed BMPs, several regional reference studies (e.g., UNH-SC 2012)[11] were reviewed to determine expected percent removal of TSS for the site's SMS system, in view of the receiving surface waters (i.e., wetlands and watercourses). Using best professional judgment to find the closest match with regard to each of the SMS's BMPs (e.g., catch basins, hydrodynamic separator, bioretention basin, etc.), the expected average TSS removal efficiencies were estimated for the BMPs (see Table 1).

[7] An additional 0.637 acres of impervious surfaces within the containment area for the oil tank are "sealed off" from the drainage system during storm events. After a particular storm, and only after inspection, the collected water will be released to the drainage system.
[8] Refer to the Stormwater Pollution Prevention Plan (SWPPP) for more detailed information on periodic monitoring and maintenance of stormwater BMPs.
[9] Due to the capacity of the site's primary treatment system (i.e., sediment forebay, stormwater wetland, bioretention basin) to hold more than twice the required water quality volume (WQV), discharge from the system is not expected during most storm events. Treated runoff would be entirely infiltrated.
[10] Required WQV: 9,365 cubic feet; provided WQV: 20,800 cubic feet.
[11] University of New Hampshire Stormwater Center. 2012 Biennial Report.

The combined pollutant removal efficiency of BMPs in series can be evaluated using the equation:

$$E_T = [1 - (1 - E_1)(1 - E_2)(1 - E_3)(1 - E_4)] \text{ X } 100$$

Where: E_T = The total efficiency of BMPs in series
E_1 = Removal efficiency of BMP #1
E_2 = Removal efficiency of BMP #2
E_3 = Removal efficiency of BMP #3, etc.

Table 1: Estimated TSS Removal Efficiencies for Site's SMS

BMP	Removal Rate
Impervious Surfaces Sweeping[12]	10%
Catch Basins (with 4-foot deep sumps, snouts, and annual cleanout)	15%
Hydrodynamic Separator (with internal bypass)	75%
Bioretention Basin with sediment forebay and stormwater wetland pre-treatment	87%

$E_T = [1-(1-0.10)(1-0.15)(1-0.75)(1-0.87)] \text{ X } 100 =$ ***97.51%*** *(Total TSS Removal)*

Based on the proposed BMP-rich treatment train and the analysis of proposed stormwater management at the Generating Facility Site, the water quality of the receiving waters will be maintained, and no degradation is expected.

4.2.5 Potential Impacts to Wetland Functions & Values

Introduction

The foundation for the following discussion of potential impacts to the functions and values of the wetlands at the KEC Site is the assessment of functions and values under *existing* conditions (see Section 3.0, above). This includes both a narrative summary and a comprehensive matrix of rationales for each of the 14 USACE functions and values (see Attachment C).

As previously mentioned, the four wetland evaluation units for the KEC site include the three headwaters riparian corridors (i.e., Wetland Units A1/A2, A3, and B) located on the Generating Facility Site, and Wetland Unit D at the Switchyard Site.

[12] Based on an annual sweeping schedule.

Groundwater Recharge/Discharge

Groundwater inputs to Wetland Units A1 and A2 from the hillside to the east will be undiminished, because the eastern portion of the Generating Facility Site will be left undisturbed. Based on our field observations over the course of six months a larger proportion of hillside seepage feeding the man-made pond and the wetlands originates at the upper eastern edge of the pond and the eastern edge of Wetland Unit A2, which is likely the reason why the spring/well house was originally built there (see also Photo 5). However, some seepage also flows into the pond (WA1) and the stream corridor (WA2) from the west and northwest, where extensive grading is proposed.

KEC lies to the east and south of the broad Wetland Unit A3 and its seasonal watercourse. Because the western watershed of WA3 is dominated by a steep bedrock-dominated ridge with minimal groundwater discharge, WA3 is even more dependent for this function on groundwater discharged from the area that would be mostly occupied by the proposed electric generating facility.

With maintenance of wetland hydrology being a primary goal of the development plan, only about 6.5 acres of the 24 acres of land to be disturbed at the Generating Facility Site would be *impervious* and be handled directly by a piped stormwater management system. Runoff from most of the roofs will be discharged to areas that are conducive to significant infiltration, particularly for the more frequent storms, that make up the bulk of rainfall on an annual basis.[13] Thus, rainfall will continue to infiltrate into the proposed crushed stone substrate within the remaining 17.5 acres, some draining easterly, via shallow groundwater flow, into Wetland Units A1 and A2, and the rest draining westerly into Wetland Unit A3.

In the absence of transpiring trees, a somewhat higher volume of infiltrated rainfall would reach the groundwater table post-development, than under existing conditions, per unit area, which will compensate for the capturing and diversion of runoff from *impervious* surfaces to the proposed stormwater basin. In addition, the last cell of the stormwater basin is a bioretention area which would allow renovated stormwater to infiltrate to the ground and supply groundwater to the nearby wetlands. In conclusion,

[13] In the region, approximately 90% of rainfall is associated with rainstorms of one inch or less. These storms contribute to baseflow conditions in the great majority of wetlands and streams.

this function would not be significantly or adversely impacted for Wetland Units A1/A2 and A3.

At the Switchyard Facility site, only 0.358 acres of impervious surfaces are proposed for the roughly 4 acre total land disturbance, and runoff will for the most part be directed as sheet flow to infiltrate to the ground. Groundwater recharge function will not be affected at Wetland Unit D.

No impacts to the groundwater discharge/recharge function are expected for Wetland B and the other smaller western wetlands, as work is not proposed within their watersheds.

Floodflow Alteration (Storage and Desynchronization)

This will continue to be a *principal* function for all three riparian corridors, post construction. *Opportunity* may be marginally increased for the WA1/A2 corridor, but particularly for the WA3 corridor, because the roughly 24 acres of disturbance for the facility on the Generating Facility Site and the introduction of both pervious and impervious surfaces will reduce transpiration by trees and slightly increase runoff rates and runoff volumes, mostly during the higher frequency storms (i.e., 2-year and less). The volume of treated runoff that would be discharged to the central wetland (i.e., WA3) during a 2-year storm would increase, according to the SWPPP, from 1.19 acre-feet to 1.73 acre-feet. Realistically, this 45.3% percent increase can be easily handled by WA3 without any discernable impacts from the slight increase of the depth, duration, and extent of flooding. Additionally, since no direct filling of wetlands is proposed within the Generating Facility Site, there will be no reduction of flood storage capacity. This function is lacking in Wetland Unit D, the only wetland to be partially filled. Finally, there is no discharge of stormwater to Wetland Unit B, thus no alteration to its flood storage function.

Fish and Shellfish Habitat

This function is limited to the man-made pond (Wetland Unit A1), with a population of small mouth bass. Adverse impacts will be minimized by maintaining the existing pond-edge trees, for shade and leaf litter, and by rigorous erosion controls to prevent soil loss from the steep cut slopes: photodegradable, double–net straw/coconut erosion

control blankets. Comparable controls are also to be used on other steep slopes, upgradient Wetland Units A2 and A3. As the risk of sediment discharge is greatly minimized by the proposed measures, the headwater streams on the site will continue to support downgradient and off-site fisheries function, including that of the Quinebaug River (see Photos 6 and 7), with cool, unpolluted water.

The proposed stormwater basin will not have measurable thermal impacts on the site's seasonal outlet stream because the retained and infiltrated volume in a one-inch storm (prior to overflow) is more than double the required water quality volume (WQV),[14] and would be filtered through the media within the bioretention cell, prior to any discharge. Moreover, overheated runoff from roofs, etc. will not be released to the stream below, but be allowed to infiltrate within the site's crushed stone surfaces.

Sediment/Toxicant/Pathogen Retention

Opportunity for this function may increase slightly post-construction if not properly mitigated. Some residual construction fine sediment may be present, but is not anticipated based on the proposed mitigation measures.

Potential for pollutant attenuation will remain unchanged, except for the direct losses of vegetation in Wetland Unit D. Naturally occurring sediment export from the site – which also takes place during existing conditions – will settle in the man-made pond and seasonally flooded pools within the wetlands, and be filtered by wetland vegetation. Over time they will be sequestered in soil, or biodegraded. Wetland Unit A3 has broad areas with organic soils and slow-flowing water, which function especially well to adsorb metals, hydrocarbons, and fine particulates, although based on our review of the stormwater management system, the risk of such an occurrence is *de minimis.* Each of the forested wetlands has the potential to provide this function, both through filtration of residual air pollution by foliage, and through uptake with soil water. Pollutant concentrations are projected to be so low that the wetland ecosystems will not be adversely impacted as they continue to provide this functional value.

[14] According to CT DEEP's Stormwater Quality Manual (2004) the Water Quality Volume (WQV) is defined as the runoff volume generated with a particular catchment during a one-inch rain event.

Nutrient Removal/Retention/Transformation

As with the previous function, *opportunity* may slightly increase during construction, and to a lesser extent afterwards, as some fine sediment that may reach the wetlands will continue to release nutrients for a growing season or slightly longer. This is the case at any construction site, because some of the phosphorus and nitrogen in soil are exported when soils are disturbed, regardless of the quality of erosion controls, but the risk is much less with the coarse loamy to sandy soils at this site. This is because larger soil particles are entrained less readily by runoff. The organic soil in the wetlands north of Lake Road (Generating Facility Site) will remain undisturbed. South of Lake Road (Switchyard Site), nutrient transport via soil will be minimal due to the lack of a watercourse and a direct discharge, as well as the level terrain.

Potential is high as has already been shown in the assessment of functions and values under existing conditions in a previous section of the report. Both the dense vegetation and the extent of saturated soils affect nutrient removal/denitrification potential. These characteristics are not expected to change in Wetland Units A1/A2, A3, and B *unless* the hydrology of these riparian corridors should become significantly altered, either directly due to reduced groundwater discharge or more flashy (greater amplitude in water depth fluctuation). As discussed above (groundwater discharge/recharge function), the design of the generating facility makes this highly unlikely.

Production Export

For this function, the processes related to the food web involve nutrient uptake by plants and filter feeders, transformation, cycling, and finally mineralization back to simple nutrients from complex organic compounds. The myriad players are plant and animal species in several guilds. The function is most stable if the wetland food web is complex, involving many species and links, as is the case at this site.

Food Web

Post-construction, food web complexity may be somewhat less, especially in the two corridors south of Lake Road and adjacent to the generating facility. This is because a subset of wildlife currently feeding on wetland insects, frogs, foliage and stream insects, bark borers, etc. are somewhat less tolerant of nearby developed land uses.

They are termed "fragmentation sensitive" or forest interior species. In particular, Louisiana waterthrush and veery (*Catharus fuscescens*) will likely no longer be cycling nutrients in these wetlands; other species such as gray catbird (*Dumetella carolinensis*), great crested flycatcher (*Myiarchus crinitus*), green frog (*Lithobates clamitans*), and downy woodpecker (*Picoides pubescens*) will remain or even increase in density, and continue this function. Wood frogs (*Lithobates sylvaticus*) migrating from breeding areas to the north and east will also continue to feed on invertebrates in wetland leaf litter, and salamander larvae will continue to eat mosquito larvae in Wetland Unit B, well buffered by forest both under existing and proposed conditions.

With the planned proper erosion control monitoring and maintenance, both streams will continue to support sensitive aquatic species at the base of the food chain, such as mayflies, caddisflies, and two-lined salamanders.

Detritus Export

One major category of the production export function relates to waterborne export of biomass from aquatic cover types via streams or pond outlets. Post-construction, leaf litter will continue to fall into the streams, where it will be shredded and then washed downstream toward the Quinebaug River during larger rain storms. Export from Wetland Unit A3 will continue to include dead foliage of emergent plants, like tussock sedge (*Carex. stricta*) and other assorted sedges and grasses.

Only an unlikely, major lapse in erosion and sedimentation controls could result in large sediment dams that interfere with detritus transport, and excessive nutrient loading that would trigger algal blooms. The latter would cause excessive undesirable fine-particulate detritus export.

REMA has recommended back-up measures to prevent export of fine sediment to the regulated resources. Where grading is close to wetlands (<50 feet) and/or where slopes are steep between the fence and the wetland, silt fence and haybale barriers can be backed up with wood chip or compost berms or silt socks (mesh stuffed with compost). Compost berms can be effective for 2.5 years (the life of the construction project); and are the most effective barrier for fine sediment: made of *well-rotted* wood chips, about 16 inches high and two feet wide, placed immediately behind a well-trenched behind

silt fence. Socks or "logs" of mesh filled with compost, are also effective though more expensive and sometimes difficult to install after construction has commenced.

Nighttime Illumination

In wetlands, a major food source for avians, bats, frogs, and larger arthropods is flying insects, which usually develop on plants, in streams, or in detritus. The intensity and design of nighttime lighting and fencing at the facility will influence the extent to which populations of night-flying insects are disrupted/reduced. KEC will incorporate lighting for safety purposes, designed for minimal off-site impact.

Sediment/Shoreline Stabilization

The proposed stormwater management system controls both the rates and volumes of stormwater runoff. Moreover, and the velocities of discharged waters are controlled through the use of 140-long level spreader so that they are not erosive. Therefore, this function will be maintained within the site's wetlands and seasonal watercourses.

Wildlife Habitat

Impacts to the wildlife function closely parallel impacts to the production export function, though the scope is broader. This is rated a *principal* function in each wetland, as a result of both habitat features, such as diversity of vegetation structure, and landscape setting. It will remain a principal function, but this function may be diminished as some species drop out, or use wetland habitats to a lesser extent. However, this would be balanced out by an increase is species diversity associated with edge habitat, particularly with edge habitat that is diffuse and not abrupt, as will be the case at the site.

As noted in the previous section, the bird species in each wetland vary in their tolerance of forest fragmentation and other related anthropogenic disturbances (vehicle and machinery noise, nighttime artificial lighting, daytime visual disturbance, etc.). Fortunately, a large group of avian species, common throughout the less remote portions of Connecticut does not require large, unfragmented blocks of habitat. Other species typically associated with wetlands, like the veery, are found in unfragmented forest, but also near human activities, so long as the overall surrounding landscape has

a high proportion of forest. However, the Louisiana waterthrush is a less common wetland-dependent species that may vacate Wetland Unit A3, post-construction. Particular habitat components, such as large diameter trees, may be key, as for the pileated woodpecker (*Dryocopus pileatus*), which contributes to wetland wildlife function, even though it is equally at home in uplands.

With fauna other than birds, such as northern two-lined salamanders (*Eurycea bislineata*), sensitive species are not excluded by fragmentation per se, but rather by the degradation of water quality and habitat that is often – but not necessarily – associated with fragmentation. KEC will have state-of-the-art and conservative BMPs to protect water quality and prevent erosion and sedimentation, both on-site and off-site.

Endangered Species Habitat

This function is potentially *present* in the wetlands of the Generating Facility Site, based on the detection of two "listed" wetland-dependent bats (i.e., little brown bat, silver-haired bat). However, since no direct wetland impacts are being proposed at the Generating Facility Site's wetlands, no change to this function is expected. The special concern broad-winged hawk, heard calling twice, on or near the site, is unlikely to be impacted since much unfragmented, high quality, forest will remain at or near the site.

Human Use Values

The marginal existing suitability of the site for *recreation* and *educational* experiences for the general public might be further curtailed at the site, except for those portions left undisturbed to the far north, including the prominent ridgeline. It is likely, however, that a serious scientific investigator would be granted access; the assurance that the general public would not interfere could be a benefit, so *educational/scientific value* would continue to be *present* or even become a principal function. *Aesthetic* value would continue, but would no longer be a principal function. Various wetland criteria in the rationales list, such as absence of noise, will also no longer be present, reducing the human use values, even without the access issues.

The "*Uniqueness and Heritage" value,* with a long and strict set of criteria, was not determined to be present under existing conditions; nor will it be present after the proposed changes.

5.0 WETLAND MITIGATION

5.1 Introduction

As with every development proposal with direct wetland impacts, a hierarchical process is first followed. It begins with avoidance of impacts, then minimization, and finally, with compensatory mitigation. Once impacts have been avoided and/or minimized to the extent practicable, mitigation is proposed in the sequence of wetland restoration, enhancement, and creation.

For this development proposal, avoidance and minimization of impacts were explored within the confines of project objectives, which at Switchyard Site required a utility switchyard based on specific Eversource design requirements. Site constraints, such steep topography and cultural resources (i.e., family cemetery) also determined the location of the utility switchyard, which was positioned with the least direct wetland impact possible. It is this direct wetland impact of 12,500 square feet that a mitigation plan must address.

5.2 Wetland Replication

Since opportunities for wetland restoration, such as restoring a degraded and/or filled wetland, do not exist within the overall site, compensatory wetland mitigation in the form of wetland creation coupled with wetland enhancement is being proposed. A suitable site for wetland creation is the northeastern section of the Switchyard Site, currently an open field (see Photo 8).

The mitigation plan at the selected area was developed based on the soils, topography, hydrology, and existing habitat characteristics. The designed final vegetation classes for the wetland creation are wet meadow and emergent marsh with a native scrub-shrub transition zone. This would not only replace the vegetative cover types at the impact area, but would also complement the wetland habitats immediately off-site to the east within the Eversource electric transmission right-of-way.

Within a conservation easement of about 0.77 acres, the proposed created wetland area will be approximately 17,000 square feet in size (i.e., 0.39 acres). Presently the soils here are moderately well drained, with a seasonal high groundwater table at 21 to 28 inches below the ground surface. Grades are gentle (i.e., 3 to 4 percent), and the area is vegetated with grasses and forbs of moist habitats. Invasive plants are still limited here, but do include glossy buckthorn, multiflora rose (*Rosa multiflora*), and autumn olive. Therefore, topsoil free of invasives, such as screened forest topsoil from the Generating Facility Site, shall be used at the mitigation area, and be amended by mixing with high-quality compost (2-year minimum), to achieve a minimum organic matter content (by weight), of 10 percent.

Suitable wetland hydrology for the created wetland will be achieved through shallow excavation of 1 to 3 feet, and the area will be sculptured to provide moist to wet habits, and mircotopographical variation. The targeted hydrologic regimes shall be *seasonally saturated*, and *seasonally flooded*.

Selected native plants shall include species that provide flowers and berries during the beginning, middle, and end of the growing season, and also provide a variety of structural and growth habits (e.g., low to high shrubs, small trees, clonal spreaders, etc.). Additionally, both high quality seed mixes and emergent plant propagules have been selected, suitable for both moist and wet environments. The goal is to provide a floristic and structural diversity that is much higher than that of the wetland impact area.

Once implemented, and by the second growing season, the created wetland will function at a higher level than the wetland to be impacted, providing a higher vegetative diversity, a variety of hydrologic regimes, and numerous habitat elements (e.g., rotting logs, boards, microtopography, etc.). A detailed plan with implementation notes and planting materials tables will be prepared following the guidelines put forth by the USACE New England District. It will include monitoring provisions and reporting to federal, state, and local regulatory agencies.

5.3 Wetland Enhancement

Wetland enhancement in the form of invasive shrub/vine removal is being proposed both at the Generating Facility Site and at the Switchyard Site. Specifically, an area of approximately 35,000 square feet (minimum) is targeted at the Generating Facility Site, which includes the upper (i.e., southern) section of Wetland Unit A2, Wetland Unit X, the western shore of the man-made pond (i.e., Wetland Unit A1), and a swath of uplands immediately adjacent to these same wetlands (see submitted plans). At the Switchyard Site, approximately 18,000 square feet (minimum) of Wetland Unit D, and immediately adjacent on-site wetlands and uplands, are targeted for invasive shrub removal. Targeted invasive species at these areas include Asiatic bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), multiflora rose, and glossy buckthorn.

At the Generating Facility Site, Japanese barberry and multiflora rose are the primary targeted species (see Photo 9). These are locally dense, especially along the seasonal watercourse associated with Wetland Unit A2, but their overall density is not yet at a level of infestation. At Wetland Unit D, glossy buckthorn is the major invasive species, already forming dense monocultures, and Asiatic bittersweet is starting to appear (see Photo 10). Eradication of these specific species is necessary not only to enhance the portion of Wetland Unit D that is not to be directly impacted, but also to protect the adjacent proposed wetland replication area from this species. A multi-year invasive species control/eradication plan will be part of the submitted Wetland Replication Plan.

The invasive control methods to be used for invasive shrub control and eradication will be those that are promulgated by the CTDEEP and/or the Nature Conservancy. They will include a combination of mechanical and chemical protocols.

5.4 Post-Construction Invasives Control

Whenever new forest edges are created, such as upgradient and to the southeast of Wetland Unit A3, invasive species already in the seed bank, flourish. Some of these species are shade tolerant (e.g., Japanese barberry, winged euonymus [*Euonymus alatus*]), but typically invasive species encroachment extends 40 to 50 feet from the new edge. Therefore, an *Invasive Plant Control Plan* is proposed for the site that will

eradicate and control invasive species for a period of five years post-construction, within 50 feet of the new forest edge. Finally, a moderate size patch of Japanese knotweed (*Fallopia japonica*) was observed on the Switchyard Site, near the existing abandoned barn (see Photo 11). This is likely associated with direct runoff from Lake Road. During construction, this patch, and at least an additional 15 feet surrounding it, shall be excavated to a depth of 6 to 10 feet, depending on the results of an exploratory test pit, and be properly disposed of through burial or at a landfill. This is one of the highest priority invasives for removal in Connecticut, especially with regard to wetlands and riparian areas.

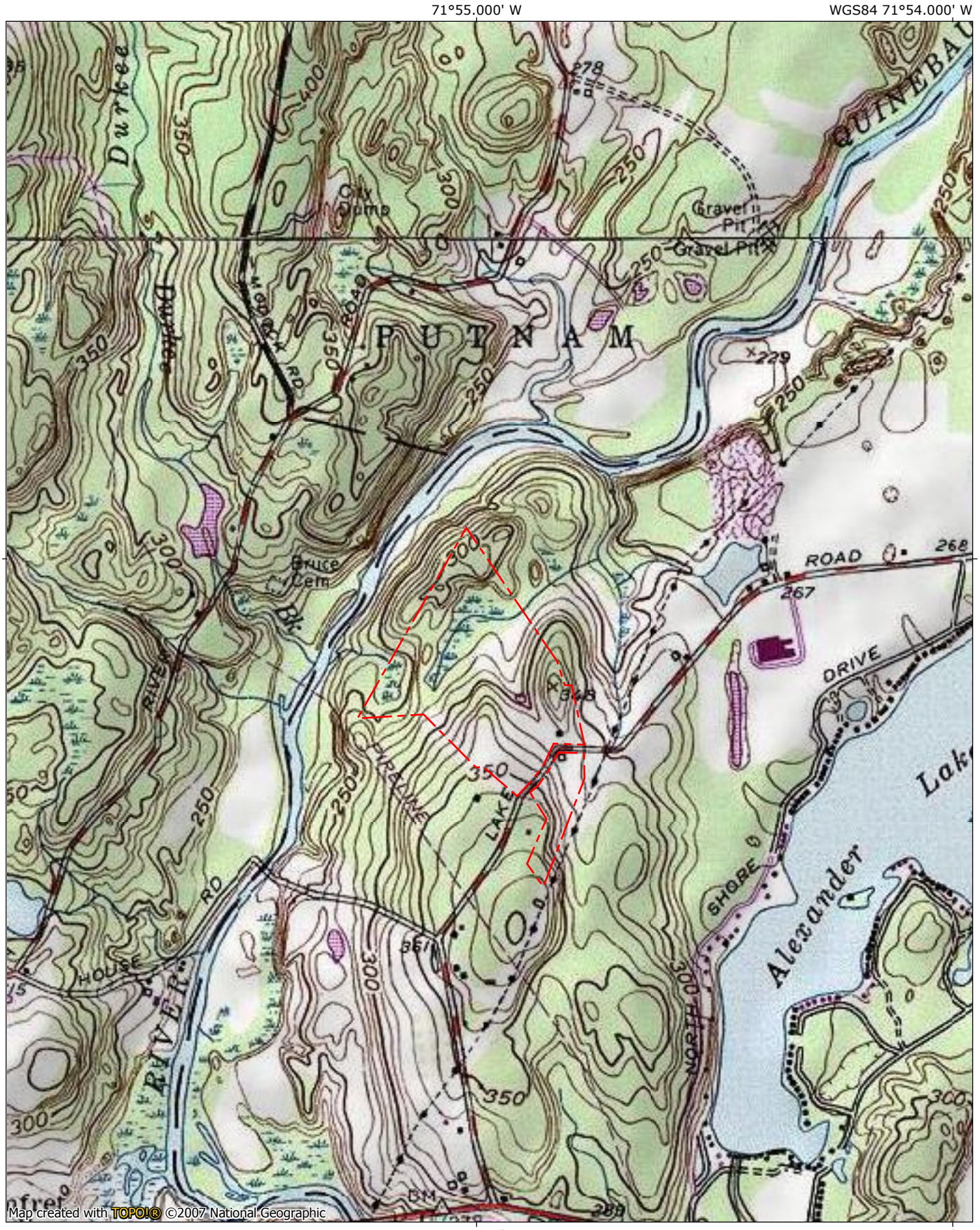
6.0 CONCLUSION

It is our professional opinion that the proposal represents the feasible and prudent alternative in regard to direct and indirect, short-term and long-term impacts to wetlands and watercourses. There will be no significant or adverse impacts to wetlands and watercourses, whether on-site or off-site, resulting from the proposed Killingly Energy Center.

Moreover, the proposed mitigation package, consisting of wetland habitat replication, enhancement, and preservation will more than off-set the proposed direct wetland impacts. The site's wetlands will continue to provide major functions and values in the post-construction phase, at very similar levels as under existing conditions.

ATTACHMENT A: Figures

FIGURE 1: Site Locus; Generating Facility and Switchyard Sites
Lake Road, Killingly, CT

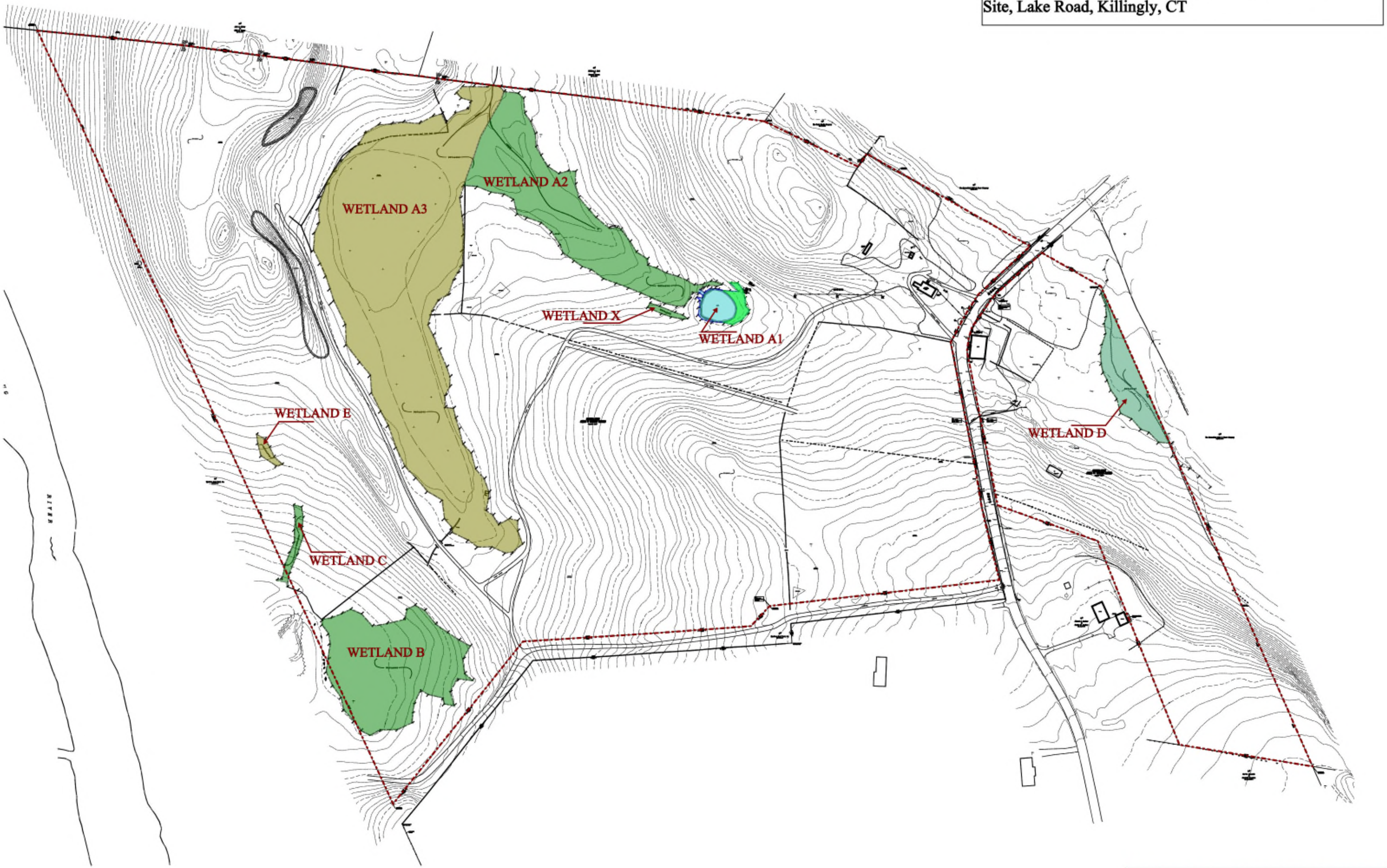


NATIONAL GEOGRAPHIC

0.0 0.1 0.2 0.3 0.4 0.5 miles
0.0 0.5 km

MN TN
14°
02/05/16

FIGURE 2: Wetland Units at the Killingly Energy Center Site, Lake Road, Killingly, CT



PRODUCED BY: REMA ECOLOGICAL SERVICES, LLC
DATE: 6-16-16 ***SCALE***: NTS

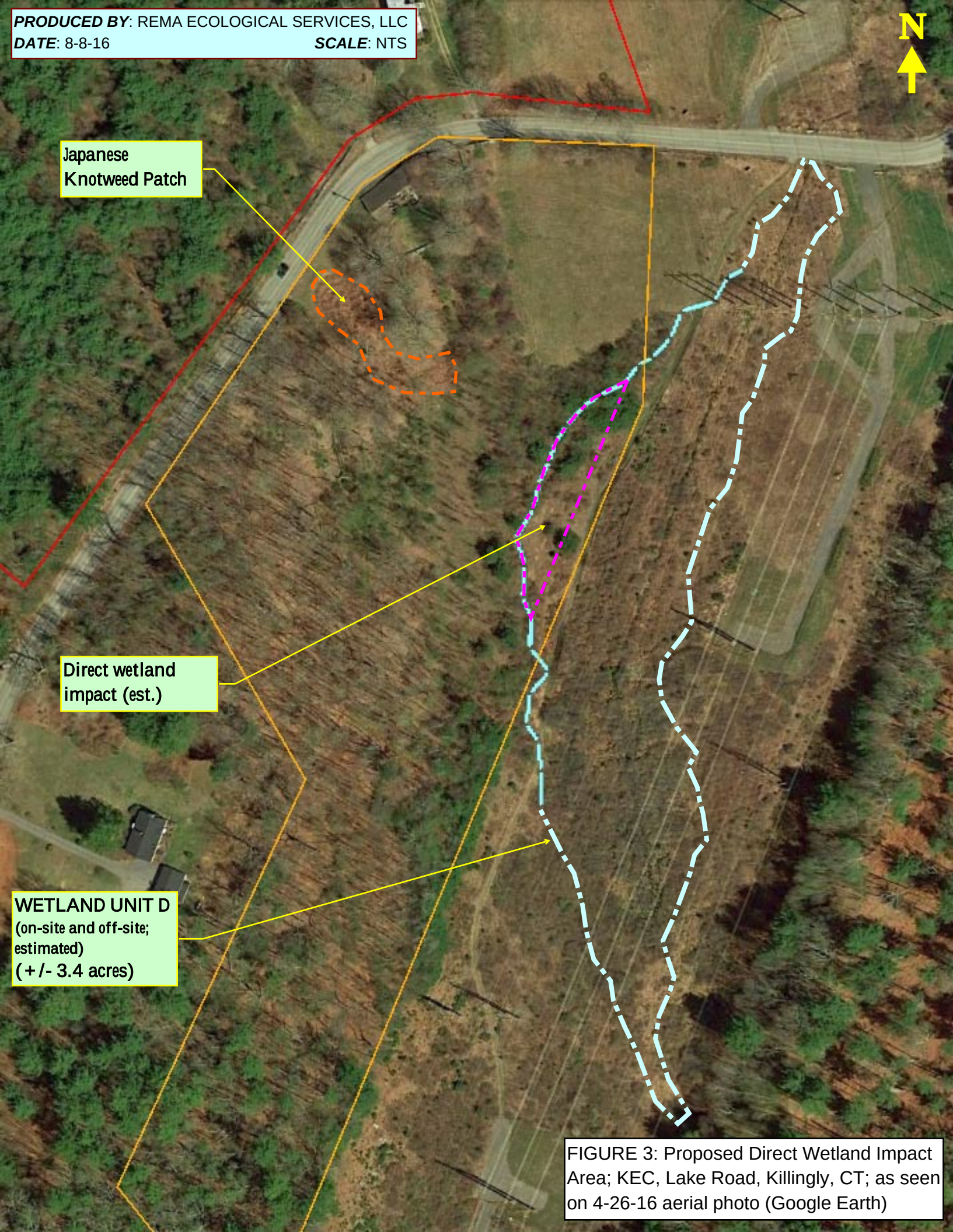


FIGURE 3: Proposed Direct Wetland Impact Area; KEC, Lake Road, Killingly, CT; as seen on 4-26-16 aerial photo (Google Earth)

ATTACHMENT B: Annotated Photographs

Wetland/Watercourse Resources associated with Killingly Energy Center, Lake Road, Killingly, CT
Photos taken March to July 2016, by REMA Ecological Services, LLC

Photo 1: Eversource electric ROW off-site to east of Switchyard Site; Wetland Unit D at far end of ROW; 7-21-16; facing northeasterly

Photo 2: Wetland Unit D (off-site); on-site portion barely visible on left of poles; 7-21-16; facing northeasterly

Photo 3: Wetland Impact Area (Wetland Unit D); emergent portion dominated by goldenrods and grasses; 7-21-16; facing northwesterly

Photo 4: Wetland Impact Area (Wetland Unit D); scrub shrub portion dominated by red maple, white pine, and glossy buckthorn; 7-21-16; facing southeasterly

Photo 5: Active seepage area adjacent to man-made pond during a moderate drought; 7-21-16; facing southerly

Photo 6: All of the site's wetlands drain towards the Quinebaug River; a few hundred feet northwest of site; facing northeasterly (upriver)

Photo 7: Quinebaug River west of site during moderate drought; 7-21-16; facing southwesterly (downriver)

Photo 8: Proposed Wetland Replication Area; moist meadow at northeasterly section of mowed field at Switchyard Site; 7-21-16; facing easterly

Photo 9: Japanese barberry to be removed along Wetland Unit A2 seasonal stream; 7-21-16; facing southerly (upstream)

Photo 10: Thicket of glossy buckthorn to be removed within Wetland Unit D at Switchyard Site; 7-21-16; facing northeasterly

Photo 11: Japanese knotweed, upper (western) section of patch to be removed at Switchyard Site; 4-13-16; facing easterly

ATTACHMENT C: Functions & Values Assessment: Rationales

The Highway Methodology Workbook:
Wetland Functions and Values, a Descriptive Approach

(US Army Corps of Engineers New England Division 1995)

Project: ***Killingly Energy Center, Killingly, Connecticut***

Summary of Wetland Characteristics *(from summary form)*

Wetlands A1, A2:	Excavated pond (A1) with overflow into intermittent stream bordered by forested wetland (A2)
Wetland A3:	Broad stream corridor with outwash soils draining via seasonal streeam towards Quinebaug River
Wetland B:	Forested hillside headwaters wetland with a vernal pool, draining to Quinebuag River via a seasonal stream
Wetland D:	Successional shrub swamp and wet meadow along utility corridor.

Total Area of wetland: *A1, A2: 2.23 acres A3: 6.26 acres B: 1.8 acres D: 0.51 acres*

Part of a wildlife Corridor ? A1, A2: *Yes* A3: *Yes* D: *Yes* Habitat Island? A1 A3: *No* B: *No D: No*

Adjacent Land use: A1, A2, A3: *Forest, single family residential;* *B: Forest, D: forest , road, and powerline*

Distance to nearest roadway/other development: *A1, A2: 200' A3: 500', B: 200', D: 300'*

Dominant Wetland Systems: *A1/A2: PFO1 A3: PFO1/3, PEM,R3UB1 B: PFO1/3, D: PSS1, PEM (See forms)*

Contiguous undeveloped buffer zone: *A1/A2: Yes A3: Yes B: Yes D: Yes*

Is the wetland a separate hydraulic system? A1/A2: *No A3: No B: No D: No*

If not, where does wetland lie in drainage basin? *A1/A2: upper A3: upper B: upper D: upper*

How many tributaries contribute to the wetland? *A1/A2: 1 A3: 1 B: 0* *(all: also small seepage rivulets)* *D: 0*

Wildlife and Vegetation Diversity and abundance: *(See report)*

Summary of Assessment Results *(rationales in following pages)*

	Wetland A1/A2	Wetland A3	Wetland B	Wetland D
1 GROUNDWATER RECHARGE/DISCHARGE	**P**	**P**	**P**	Y
2 FLOODFLOW ALTERATION (Storage & Desynchronization)	**P**	**P**	**P**	Y
3 FISH AND SHELLFISH HABITAT	Y	N	N	N
4 SEDIMENT/TOXICANT/PATHOGEN RETENTION	Y	Y	Y	Y
5 NUTRIENT REMOVAL/RETENTION/TRANSFORMATION	Y	Y	Y	Y
6 PRODUCTION EXPORT (Nutrient)	**P**	**P**	**P**	Y
7 SEDIMENT/SHORELINE STABILIZATION	Y	Y	Y	N
8 WILDLIFE HABITAT	**P**	**P**	**P**	**P**
9 RECREATION	Y	Y	N	Y
10 EDUCATIONAL/SCIENTIFIC VALUE	Y	Y	Y	Y
11 UNIQUENESS/HERITAGE	N	N	N	N
12 VISUAL QUALITY/AESTHETICS	**P**	**P**	Y	Y
13 ENDANGERED SPECIES HABITAT	Y	Y	Y	Y
14 FISH AND SHELLFISH HABITAT (Supporting marine resources)	N	N	N	N

Present? (Y/N) Principal? (P)

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Numbers correspond to numbers on ACOE Functional Values summary form.

GROUNDWATER RECHARGE/DISCHARGE

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
Y	Y	Y	N	1. Public or private wells occur downstream of the wetland. *Along Quinebaug River*
Y	Y	Y	N	2. Potential exists for public or private wells downstream of the wetland.
Y	Y	N	Y	3. Wetland is underlain by stratified drift. *Lower part of A2, B, and D*
Y	Y	N	Y	4. Gravel or sandy soils present in/or adjacent to the wetland.
Y	Y	Y	Y	5. Fragipan does not occur in the wetland.
N	N	N	N	6. Fragipan, impervious soils, or bedrock, does occur in the wetland.
Y	Y	Y	N	7. Wetland is associated with a perennial or intermittent watercourse.
Y	Y	Y	Y	8. Signs of groundwater recharge are present or piezometer data demonstrates recharge.
Y	Y	Y	N	9. Wetland is associated with a watercourse, but lacks a defined outlet or contains a constricted outlet.
Y	Y	Y	N	10. Wetland contains only an outlet. *Rivulets flow from seeps into these headwaters streams*
Y	Y	Y	Y	11. Groundwater quality of stratified drift aquifer within or downstream of wetland meets drinking water standards. *Water testing indicates excellent water quality*
Y	Y	Y	Y	12. Quality of water associated with the wetland is high.
Y	Y	Y	N	13. Signs of groundwater discharge are present (e.g. springs).
				14. Water temperature suggests it is a discharge site. *Temperatures not measured*
Y	Y	Y	Y	15. Wetland shows signs of variable water levels.
N	Y	N	Y	16. Gravel or sandy soils present in or adjacent to wetland.
				17. Piezometer data demonstrates discharge. *No peizometer data*
				18. Other
P	**P**	**P**	**Y**	Present? (Y/N) Principal? (P)

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FLOODFLOW ALTERATION (Storage & Desynchronization)

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
N	Y	Y	N	1. Area of this wetland is large relative to its watershed. *Broad terraces in WC*
Y	Y	Y	Y	2. Wetland occurs in the upper portions of its watershed.
Y	Y	Y	N	3. Effective flood storage is small or non-existent upslope of or above the wetland. *Level uplands by WD infiltrate floodwaters*
N	N	N	N	4. Wetland watershed contains a high degree of impervious surfaces. *Some impervious ledge*
Y	Y	Y	Y	5. Wetland contains hydric soils that are able to absorb and detain water.
Y	Y	Y	Y	6. Wetland exists in a relatively flat area that has flood storage potential. *In Wetland B, only lower portion is flat*
Y	Y	Y	N	7. Wetland has an intermittent outlet, ponded water, or signs are present of variable water level.
Y	Y	Y	N	8. During flood events, this wetland can retain higher volumes of water than under normal or average *WA1: deep ponding*
Y	Y	Y	Y	9. Wetland receives and retains overland or sheet flow runoff from surrounding uplands. *WB: at base of hill*
Y	Y	Y	N	10. In the event of a large storm, this wetland may receive and detain excessive flood water from a nearby watercourse.
Y	Y	Y	N	11. Valuable properties, structures or resources are located in or near the floodplain downstream from the wetland.
Y	Y	Y	Y	12. The watershed has a history of economic loss due to flooding. *Flood control dams have been built along Quinebaug*
Y	Y	Y	N	13. This wetland is associated with one or more watercourses.
N	N	N	Y	14. This wetland watercourse is sinuous or diffuse. *Large sections of streams have been channelized*
Y	Y	Y	N	15. This wetland outlet is constricted. *Pond & vernal pool outlets constricted, and stream in A3 crosses stone wall*
Y	Y	Y	N	16. Channel flow velocity is affected by this wetland. *Under high flow condtiions*
Y	Y	Y	Y	17. Land uses downstream are protected by this wetland. *Infiltration in WD lessens flood flows. Among many others.*
Y	Y	Y	Y	18.This wetland contains a high density of vegetation.
				19.Other
P	**P**	**P**	**Y**	Present? (Y/N) Principal? (P)

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FISH AND SHELLFISH HABITAT

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
Y	Y	Y	N	1. Forest land dominant in the watershed above this wetland.
Y	Y	Y	Y	2. Abundance of cover objects present.
				STOP HERE IF THIS WETLAND IS NOT ASSOCIATED WITH A PERENNIAL WATERCOURSE
				Wetland A3 is semiperennial, with flow through the summer in most years, and supporting aquatic macroinverts.
Y	N			3. Size of this wetland is able to support large fish/shellfish populations. *WA1 is a permanenet pond*
Y	Y			4. Wetland is part of a larger, contiguous watercourse. *WA2 & WB associated with small intermittent watercourse*
Y	N			5. Wetland has sufficient size and depth in open water areas so as not to freeze solid and retains some open water during winter.
N	Y			6. Stream width (bank to bank) is more than 50 feet.
Y	Y			7. Quality of the watercourse associated with this wetland is able to support healthy fish/shellfish populations.
Y	Y			8. Streamside vegetation provides shade for the watercourse.
Y	Y			9. Spawning areas are present (submerged vegetation or gravel beds). *gravel beds*
Y	Y			10. Food is available to fish/shellfish populations within this wetland.
N	Y			11. Barrier(s) to anadromous fish (such as dams, including beaver dams, waterfalls, road crossing, etc.) are absent from the stream reach associated with this wetland.
Y	N			12. Evidence of fish is present. *fish observed at man-made pond; small-mouth bass*
N	N			13. Wetland is stocked with fish.
Y	N			14. The watercourse is persistent. *Pond persistent, stream A3 has seasonal pools, channel is only 18-24" wide*
N	Y			15. Man-made streams are absent.
N	Y			16. Water velocities are not too excessive for fish usage.
N	Y			17. Defined stream channel is present.
Y	Y	Y		18. Other *These streams contribute steady, clean flow to the Quinebaug, enhancing the river's fisheries function*

Y	**N**	**N**	**N**	Present? (Y/N) Principal? (P)

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SEDIMENT/TOXICANT/PATHOGEN RETENTION

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS	
Y	Y	N	N	1. Potential sources of excess sediment are in the watershed above the wetland.	*Natural steep forested slopes*
Y	N	N	N	2. Potential or known sources of toxicants are in the watershed above the wetland.	*Appliances dump north of W A2*
Y	Y	Y	N	3. Opportunity for sediment trapping by slow moving water or deepwater habitat is present in this wetland.	
Y	Y	Y	Y	4. Mineral, fine grained, or organic soils are present.	
Y	Y	Y	N	5. Long duration water retention time is present in this wetland.	*A1 & B: Pond&pool; A3: low gradient, diffuseflow*
Y	Y	Y	Y	6. Public or private water sources occur downstream.	*just private water sources*
Y	Y	Y	Y	7. The wetland edge is broad and intermittently aerobic.	
Y	Y	Y	Y	8. The wetland is known to have existed for more than 50 years.	
N	N	N	Y	9. Drainage ditches have not been constructed in the wetland.	*Segments of all streams have been ditched for farming*
				STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.	
Y	Y	Y	N	10. Wetland is associated with an intermittent or perennial stream, or a lake.	
Y	Y	Y	N	11. Channelized flows have visible velocity decreases in the wetland.	*When banks overtopped & flow is thru vegetation.*
Y	N	Y	N	12. Effective floodwater storage in wetland is occurring. Areas of impounded open water are present.	
N	N	N	Y	13. No indicators of erosive forces are present. No high water velocities are present.	*Only moderate flow*
Y	Y	Y	Y	14. Diffuse water flows are present in the wetland.	
Y	Y	Y	Y	15. Wetland has a high degree of water and vegetation interspersion.	*In A1 and A3. especially, with EM*
Y	Y	Y	Y	16. Dense vegetation provides opportunity for sediment trapping and/or signs of sediment accumulation is present by dense vegetation.	
Y	Y	Y	N	17. Other	*Especially during large events when stream overtops defined channel, do wetlands trap sediment carried by the stream. Otherwise sediment trapping limited to overland flow.*
Y	**Y**	**Y**	**Y**	Present? (Y/N) Principal? (P)	***Potential for this function is high, though opportunity is currently low.***

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NUTRIENT REMOVAL/RETENTION/TRANSFORMATION

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
N	Y	Y	N	1. Wetland is large relative to the size of its watershed.
Y	N	Y	N	2. Deep water or open water habitat exists. *A1 & B: Pond & pool*
Y	Y	Y	Y	3. Overall potential for sediment trapping exists in the wetland. *W D: dense low herbs trap sed.*
Y	Y	N	N	4. Potential sources of excess nutrients present in the watershed above the wetland. *Steep rocky slopes*
Y	Y	Y	N	5. Wetland saturated for most of the season. Ponded water is present in the wetland.
N	Y	Y	N	6. Deep organic/sediment deposits are present.
Y	Y	Y	N	7. Slowly drained mineral, fine grained, or organic soils, are present.
Y	Y	Y	Y	8. Dense vegetation is present. *WD: in SS portion locally dense woody vegetation*
Y	Y	Y	Y	9. Emergent vegetation and/or dense woody stems are dominant.
Y	Y	Y	N	10. Aquatic diversity/abundance sufficient to utilize nutrients. *WC:Macroinvertebtrates not abundant*
Y	Y	Y	Y	11. Opportunity for nutrient attenuation exists. *Terrestrial fauna feeds in woody plants' foliage*
Y	Y	Y	Y	12. Vegetation diversity/abundance sufficient to utilize nutrients. *Many deep-rooted trees, shrubs*
				STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.
Y	Y	Y	Y	13. Waterflow through this wetland is diffuse (*Just EM part of A1 & seeps by A2), all of A3, B & D)*
Y	Y	Y	Y	14. Water retention/detention time in this wetland is increased by constricted outlet or thick vegetation.
Y	Y	Y	Y	15. Water moves slowly through this wetland. *Gradient is low along streams, microtopography*
				16. Other
Y	**Y**	**Y**	**Y**	Present? (Y/N) Principal? (P) ***Opportunty is low , potential high, for denitirfication as well as trapping***

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6. PRODUCTION EXPORT (Nutrient)

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
Y	Y	Y	Y	1. Wildlife food sources grow within this wetland.
Y	Y	Y	Y	2. Detritus development is present within this wetland
Y	Y	Y	Y	3. Economically or commercially used products found in this wetland. *Lumber, firewood*
Y	Y	Y	Y	4. Evidence of wildlife use found within this wetland. *Food chain: foliage insects; tree seeds & fruits*
Y	Y	Y	Y	5. Higher trophic level consumers are utilizing this wetland. *barred owl, fox , coyote, milk snake*
N	N	N	N	6. Fish or shellfish develop or occur in this wetland. *Small fish may visit intermittent streams*
Y	Y	Y	Y	7. High vegetation density is present.
Y	Y	Y	Y	8. Wetland exhibits high degree of plant community structure/species diversity.
Y	Y	Y	N	9. High aquatic diversity/abundance is present. WB: vernal pool, other frogs & salamanders
Y	Y	Y	N	10. Nutrients exported in wetland watercourses (permanent outlet present). *A1, A2, A3, B: Leaf litter detritus*
Y	Y	Y	N	11. "Flushing" of relatively large amounts of organic plant material occurs from this wetland. *Leaf detritus*
Y	Y	Y	Y	12. Wetland contains flowering plants that are used by nectar-gathering insects. *Dewberry, violets, spicebush, Clethra*
Y	Y	Y	Y	13. Indications of export are present.
N	N	N	Y	14. High production levels occurring however, no visible signs of export (assumes export is attenuated).
Y	Y	Y		15. Other *Export via food chain most important. Much detritus accumulates in slow-moving water rather than being exported*
P	**P**	**P**	**Y**	Present? (Y/N) Principal? (P)

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7. SEDIMENT/SHORELINE STABILIZATION

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
N	N	N	N	1. Indications of erosion or siltation present.
Y	Y	Y	N	2. Topographical gradient is present in wetland. *In Wetland A2, upper WA3, upper WB*
Y	Y	N	N	3. Potential sediment sources are present up-slope. *Some natural erosion from steep slopes of E. ridges* s
N	N	Y	Y	4. No distinct shoreline or bank is evident between the waterbody and the wetland or upland. Se. Only WD
Y	Y	N	N	5. A distinct step between the open waterbody or stream and the adjacent land exists (i.e. sharp bank) with dense roots throughout. *No watercourse in WD.*
Y	Y	Y	N	6. Wide wetland (>10') bordering watercourse, lake, or pond.
N	N	N	N	7. High flow velocities in the wetland. *No watercourse in WD. Slow velocities in streams.*
N	N	N	N	8. Potential sediment sources present upstream. *Only minor natural hillside erosion*
Y	Y	Y	N	9. The watershed is of sufficient size to produce channelized flow.
N	N	N	N	10. Open water fetch is present. *Open water in vernal pool (Wetland A1) is too small for erosive wave build-up*
N	N	N	N	11. Boating activity is present. *Boats were successfully used for data collection in pond(A1)*
Y	Y	Y	N	12. Dense vegetation is bordering watercourse, lake, or pond. *No watercourse in WD.*
Y	Y	Y	N	13. High percentage of energy absorbing emergents and/or shrubs bordering watercourse, lake or pond.
Y	Y	Y	N	14. Vegetation comprised of large trees and shrubs that withstand major flood events or erosive incidents and stabilize the shoreline on a large scale (feet). *Both woody & herbaceous shoreline vegetation is dense.*
Y	Y	Y	N	15. Vegetation comprised of dense resilient herbaceous layer that stabilizes sediments and the shoreline on a small scale (inches) during minor flood events or potentially erosive events. *Shear stress minimal in WA, WC*
Y	Y	Y	N	16. Other *If flow volumes & velocities increased substanially, function would be more important* *This is a largely a potential function for WA1, 2, & 3 & B*
Y	**Y**	**Y**	**N**	Present? (Y/N) Principal? (P)

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8. WILDLIFE HABITAT

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
Y	Y	Y	N	1. Wetland is not degraded by human activity. *Mowing of ROW encouraged invasive colonizationby buckthorn in WD*
Y	Y	Y		2. Water quality of the watercourse, pond, or lake associated with this wetland meets or exceeds Class A or B standards. *Nutrient levels in vernal pool slightly elevated after winter decompostion*
Y	Y	Y	Y	3. Wetland is not fragmented by development.
Y	Y	Y	Y	4. Upland surrounding this wetland is undeveloped. *Wetlands are all well buffered.*
Y	Y	Y	Y	5. More than 40% of this wetland edge is bordered by upland wildlife habitat (e.g., brushland, wood land, active farmland, or idle land) at least 500 feet in width.
Y	Y	Y	Y	6. Wetland contiguous with other wetland systems connected by watercourse or lake.
Y	Y	Y	Y	7. Wildlife overland access to other wetlands is present.
Y	Y	Y	Y	8. Wildlife food sources are within this wetland or are nearby.
Y	Y	Y	Y	9. Wetland exhibits a high degree of interspersion of vegetation classes and/or open water.
Y	Y	Y	Y	10. Two or more islands or inclusions of upland within the wetland are present.
Y	Y	Y	N	11. Dominant wetland class includes deep or shallow marsh or wooded swamp.
N	N	N	N	12. More than three acres of shallow permanent open water (less than 6.6 feet deep), including streams in or adjacent to wetland are present.
Y	Y	Y	Y	13. Density of the wetland vegetation is high.
Y	N	Y	N	14. Wetland exhibits a high degree of plant species diversity.
Y	Y	Y	Y	15. Wetland exhibits a high degree of diversity in plant community structure (e.g. tree, shrub, vine, grasses, mosses, etc.) *W B includes shrub clumps (willow, winterberry, spicebush, mature trees, and dense herbs*
Y	Y	Y	Y	16. Plant/animal indicator species present. *e.g. in WD Shrubland birds (prairie warble & reptiles (milk snake)*
Y	Y	Y	Y	17. Animal signs observed (tracks, scats. nesting areas, etc.) *Wood frog & spotted sal. egg masses in WA, WC*
Y	Y	Y	Y	18. Seasonal uses vary for wildlife, and wetland appears to support varied population diversity/abundance during different seasons.
Y	Y	Y	Y	19. Wetland contains or has potential to contain a high population of insects. *Especially foliage & bark insects*

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8. WILDLIFE HABITAT *(Continued)*

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS	
Y	Y	Y	N	20. Wetland contains or has potential to contain large amphibian populations.	Pond-breeding amphibians:just WB
Y	Y	Y	Y	21. Wetland has a high avian utilization or its potential.	*Expected avians for habitat & landscape setting*
Y	Y	Y	Y	22. Indications of less disturbance-tolerant species present.	*Seepage plant species in W2, forest interior birds*
N	N	N	N	23. Signs of wildlife habitat enhancement present (birdhouses, nesting boxes, food sources, etc.).	
Y	Y	Y	N	24. Other	*Ledges and rock outcrops provide dens for wetland associated wildlife*
P	**P**	**P**	**P**	Present? (Y/N) Principal? (P)	

9. RECREATION

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS	
N	N	N	N	1. Wetland is part of a recreation area, park, forest, or refuge.	*Privately owned*
N	N	N	N	2. Fishing is available within or from the wetland.	
Y	Y	Y	Y	3. Hunting is permitted in the wetland.	
Y	Y	N	N	4. Hiking occurs or has potential to occur within the wetland.	*A few woods roads, thin underbrush except in WD*
Y	Y	Y	Y	5. Wetland is a valuable wildlife habitat.	
Y	Y	Y		6. The watercourse, pond, or lake, associated with the wetland is unpolluted.	
Y	Y	Y	Y	7. High visual/aesthetic quality of this potential recreation site.	*Tall, mature evergreens, scenic tussock sedge marsh*
N	N	N	N	8. Access to water is available at this potential recreation site for boating, canoeing, or fishing.	
N	N	N	N	9. The watercourse associated with this wetland is wide and deep enough to accommodate canoeing and/or non-powered boating.	
N	N	N	N	10. Off-road public parking available at the potential recreation site.	*Not at present*
Y	Y	N	Y	11. Accessibility and travel ease is present at this site.	*Understory density is highin WB & WC, WD: meadow*
N	N	N	N	12. The wetland is within a short drive or safe walk from highly populated public and private areas.	
Y	Y	Y	Y	13. Other	*Quinnebaug River is nearby, suitable for boating & fishing.*
Y	**Y**	**N**	**Y**	Present? (Y/N) Principal? (P)	

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10. EDUCATIONAL/SCIENTIFIC VALUE

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
N	N	N	N	1. Wetland contains or is known to contain threatened, rare, or endangered species.
Y	Y	Y	Y	2. Little or no disturbance is occurring in this wetland. *Past quarrying and logging*
Y	N	N	Y	3. Potential educational site contains a diversity of wetland classes that are accessible or potentially accessible. *Each wetland has a unique cover class. Also a range of hydrogic regimes, geomorphic settings*
Y	Y	Y	N	4. Potential educational site is undisturbed and natural. *Wetland D is maintained as a power line*
Y	Y	Y	Y	5. Wetland is considered to be a valuable wildlife habitat. *Rural landscape setting increases bird diversity*
N	N	N	N	6. Wetland is located within a nature preserve or wildlife management area.
N	N	N	N	7. Signs of wildlife habitat enhancement present (bird houses, nesting boxes, food sources, etc.).
N	N	N	N	8. Off-road parking at potential educational site suitable for school bus access in or near wetland.
N	N	N	N	9. Potential educational site is within safe walking distance or a short drive to schools.
Y	Y	Y	Y	10. Potential educational site within safe walking distance to other plant communities.
N	N	N	N	11. Direct access to perennial stream at potential educational site available. *Quinnebaug River is very nearby*
Y	N	Y	N	12. Direct access to pond or lake at potential educational site available. *WA1, WB: Pond & Vernal pool*
N	Y	Y	Y	13. No known safety hazards within the potential educational site. *WA1(pond) is deep enough to be a drowning hazard*
Y	Y	Y	Y	14. Public access to the potential educational site is controlled.
N	N	N	N	15. Handicap accessibility is available.
N	N	N	N	16. Site is currently used for educational or scientific purposes.
Y	Y	Y	Y	17. Other *Diverse herbs and mosses of seepage wetlands of botanical interest*
Y	**Y**	**Y**	**Y**	Present? (Y/N) Principal? (P)

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11. UNIQUENESS/HERITAGE

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
N	N	N	N	1. Upland surrounding wetland primarily urban.
N	N	N	N	2. Upland surrounding wetland developing rapidly.
N	N	N	N	3. More than 3 acres of shallow permanent open water occur in wetlands (less than 6.6 feet deep) including streams.
N	Y	N	N	4. Three or more wetland classes present. Three wetland classes present on site,well-developed in diff. wetlands
Y	Y	Y	N	5. Deep and/or shallow marsh, or wooded swamp dominant.
N	Y	Y	N	6. High degree of interspersion of vegetation and/or open water occurring in this wetland.
Y	Y	Y	N	7. Well-vegetated stream corridor (15 feet on each side of the stream) occurs in this wetland.
N	N	N	N	8. Potential educational site is within a short drive or a safe walk from schools.
N	N	N	N	9. Off-road parking at potential educational site is suitable for school buses.
Y	N	N	N	10. No known safety hazards exist within this potential educational site.
N	N	N	N	11. Direct access to perennial stream or lake at potential educational site. *However, Quinnebaug River nearby*
Y	Y	Y	Y	12. Two or more wetland classes visible from primary viewing locations.
Y	Y	Y	Y	13. Low-growing wetlands (marshes, scrub-shrub, bogs, open water) visible from primary viewing locations.
N	N	N	N	14. Half an acre of open water or 200 feet of stream is visible from the primary viewing locations.
Y	Y	Y	Y	15. Large area of wetland is dominated by flowering plants, or plants that turn vibrant colors in different seasons. *Red maples, violets,*
Y	Y	Y	Y	16. General appearance of the wetland visible from primary viewing locations is unpolluted and/or undisturbed.
Y	Y	N	Y	17. Overall view of the wetland is available from the surrounding upland. *In winter at least*

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11. UNIQUENESS/HERITAGE *(Continued)*

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
Y	Y	Y		18. Quality of the water associated with the wetland is high.
Y	Y	Y	Y	19. Opportunities for wildlife observations are available.
N	N	N	N	20. Historical buildings occur within the wetland.
Y	N	Y	N	21. Presence of pond or pond site and remains of a dam occur within the wetland. *WB: vernal pool*
N	N	N	N	22. Wetland within 50 yards of the nearest perennial watercourse.
Y	N	N	N	23. Visible stone or earthen foundations, berms, dams, standing structures or associated features occur within the wetland. *Springhouse in W A1 , stone walls crossing W A3*
N	N	N	N	24. Wetland contains critical habitat for a state or federally listed threatened or endangered species.
N	N	N	N	25. Wetland is known to be a study site for scientific research.
N	N	N	N	26. Wetland is a natural landmark or recognized by the state natural heritage inventory authority as an exemplary natural community.
Y	Y	Y	Y	27. Wetland has local significance because it serves several functional values.
N	N	N	Y	28. Wetland has local significance because it has biological, geological, or other features that are locally rare or unique. *Good examples: WA3: Saturated stream terrace w.deep peat; WA2:seepage plants*
N	N	N	N	29. Wetland is known to contain an important archaeological site.
N	N	N	N	30. Wetland is hydrologically connected to a state or federally designated scenic river.
N	N	N	N	31. Wetland is located in an area experiencing a high wetland loss rate.
				32. Other
N	**N**	**N**	**N**	Present? (Y/N) Principal? (P)

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12. VISUAL QUALITY/AESTHETICS

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
Y	Y	N	Y	1. Multiple wetland classes visible from primary viewing locations.
Y	Y	Y	N	2. Emergent marsh and/or open water visible from primary viewing locations.
Y	Y	Y	Y	3. Diversity of vegetation species visible from primary viewing locations.
Y	Y	Y	Y	4. Wetland dominated by flowering plants, or plants that turn vibrant colors in different seasons.
Y	Y	Y	Y	5. Land use surrounding the wetland is undeveloped as seen from primary viewing locations.
Y	Y	Y	Y	6. Visible surrounding land use form contrasts with wetland. *Ridges rise up between wetlands. Evergreens contrast*
N	N	Y	Y	7. Wetland views absent of trash, debris, and signs of disturbance. *Appliance dump between Wetland A2 & A3.*
Y	Y	Y	Y	8. Wetland is considered to be a valuable wildlife habitat.
Y	Y	N	Y	9. Wetland is easily accessed. *WD: via meadow along woods edgeI, though Interior of shrub swamp poorly accessible*
Y	Y	Y	Y	10. Low noise level at primary viewing locations.
Y	Y	Y	Y	11. Unpleasant odors absent at primary viewing locations.
Y	Y	N	Y	12. Relatively unobstructed sight line exists through wetland. *In spring & winter season*
				13. Other

P	**P**	**Y**	**Y**	Present? (Y/N) Principal? (P)

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13. ENDANGERED SPECIES HABITAT

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
Y	Y	Y	N	1. Wetland contains or is known to contain threatened or endangered species.
N	N	N	N	2. Wetland contains critical habitat for a state or federally listed threatened or endangered species.
				3. Other
Y	**Y**	**Y**	**N**	Present? (Y/N) Principal? (P)

14. FISH AND SHELLFISH HABITAT (Supporting marine resources)

Wetland A1/2	Wetland A3	Wetland B	Wetland D	CONSIDERATIONS/QUALIFIERS
N	N	N	N	1. Special aquatic sites (tidal marsh, mud flats, eelgrass beds) are present.
Y	N	N	N	2. Suitable spawning habitat is present at the site or in the area. *Gravel beds*
N	N	N	N	3. Commercially or recreationally important species are present or suitable habitat exists.
N	N	N	N	4. The wetland/waterway supports prey for higher trophic level marine organisms.
N	N	N	N	5. The waterway provides migratory habitat for anadromous fish. *Downriver dams without fishways*
Y	Y	Y	Y	6. Other *As a steady source of clean water, low in nutrients, it supports estuarine function.*
N	**N**	**N**	**N**	Present? (Y/N) Principal? (P)