STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
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APPLICATION OF NTE CONNECTICUT, LLC FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE CONSTRUCTION, MAINTENANCE AND OPERATION OF AN ELECTRIC POWER GENERATING FACILITY OFF LAKE ROAD, KILLINGLY, CONNECTICUT	:	DOCKET NO. 470
	:	OCTOBER 27, 2016

APPEAL OF AND RESPONSES TO THE
MUNICIPAL REGULATE AND RESTRICT ORDERS

On October 13, 2016, NTE Connecticut, LLC (NTE), received copies of the Killingly Inland Wetlands and Watercourses Commission (IWWC) and Planning and Zoning Commission (PZC) Regulate and Restrict Orders (collectively the Municipal Orders), issued pursuant to Conn. Gen, Stat. Section 16-50x(d). NTE and its entire development team thank the Town of Killingly (Town), the IWWC, the PZC, the Town's professional staff and TRC, the Town's environmental consultant, for the thoughtful and thorough effort in compiling these Municipal Orders.

As they were intended to do, the Municipal Consultation and Regulate and Restrict Order processes undertaken by NTE and the Town resulted in the development of helpful recommendations, conditions and orders for the Council's consideration. While NTE believes that the Killingly Energy Center (KEC) facility, as originally proposed, satisfies all of the Council's criteria and requirements for an electric generating facility and is well designed to address environmental and land use considerations raised, NTE values the input of the Town the IWWC and the PZC and, where practicable, has made every effort to incorporate these

Municipal Orders. In those instances, where the Municipal Orders could not be incorporated into the KEC plan, NTE APPEALS those orders, in whole or in part, to the Council.

Several of the Municipal Orders require certain Application and KEC facility plan modifications. These modifications, including citations to the specific sections of the Application to be modified by the Municipal Orders, are summarized in a memorandum from Lynn Gresock of Tetra Tech entitled Killingly Energy Center - Updates to CSC Application Associated with Project Refinements (Exhibit 1). In addition, NTE has attached a modified KEC facility Site Plan (Revised Site Plan) (Exhibit 2); a Revised Stormwater Pollution Protection Plan (Revised SWPPP) (Exhibit 3); an Updated Acoustic Modeling Analysis (Exhibit 4); an Updated Erosion and Sedimentation Control Plan (Updated E&S Plan) (Exhibit 5); and a memorandum from REMA Ecological Service, LLC regarding Updates on Wetland Issues and Surface Water Quality Sampling/End of Season Survey at Wetland A1 (Exhibit 6).

I. INLAND WETLANDS AND WATERCOURSES COMMISSION ORDERS

1. Based upon the outlet of the proposed drainage structure and regrading of the site, there is concern that wetlands Al, A3, and X will not receive adequate overland flow resulting in their destruction. A potential solution to this concern is described in the "Recommendations for CSC Conditions and Third Party Review" by TRC Environmental Corporation (TRC) as:

- Rainfall recharge to groundwater feeding the wetlands will be significantly impacted by the project through the extensive loss of the forested loose understory layer, site regrading and compaction of the site soils. To provide positive means of groundwater recharge a continuous crushed stone filled trench shall be installed along the limits of grading from Wetland Al to Wetland A3.
- The trench shall be a minimum of 3 feet wide by 5 foot deep and shall be completely enclosed with filter fabric and covered with 1 foot of topsoil.

- The bioretention basin crushed stone underdrains shall be tied into the crushed stone trench. This system will provide additional treated stormwater runoff storage for recharge immediately up gradient from the wetland system.
- Soil breaks in the stone filled trench shall be provided between the bioretention basins to ensure even distribution of water along the entire limits of grading.

The IWWC believes that this potential solution will not only allow the wetlands to receive flows as and where they do currently, it will also be a benefit for the applicant as they could do away with the proposed wet basin, avoiding a potential "decoy" vernal pool.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART

The primary storm water basin has been reassessed to incorporate a crushed stone layer into the design to encourage further infiltration. Two additional basins at the headwaters of Wetland A1 and A3 have been added and incorporated into the storm water design (*See* Exhibit 3 - Revised SWPPP and Exhibit 5 - Updated E&S Plan). The two additional basins will also incorporate a crushed stone layer to encourage infiltration. Further, NTE will provide an infiltration mechanism as recommended (i.e., a crushed stone trench) between the two new additional basins and wetlands A1 and A3, respectively. NTE has verified that the two additional basins, two additional crushed stone trenches, and the addition of crushed stone to all three basins will allow for more than the recommended infiltration volume. Therefore, NTE APPEALS the limited portion of the order calling for the installation of a trench between KEC's limits of grading and the entirety of wetlands A1 to A3.

It should also be noted that proposed crushed stone surfaces in these features will serve as a further opportunity for infiltration and groundwater recharge at the completion of construction. The "wet pool" feature has been removed from the primary stormwater basin as requested. Although the original design was protective of both the wetland function and potential vernal pool usage, the updated design will also support wetland and vernal pool functions effectively.

2. The proposed oil tank and containment area pose a number of problems, namely: The size of the containment area forces a large increase in grading towards the wetlands (Al); The drainage inside the containment area could potentially allow for a fuel spill to enter the wetlands; The fabric containment area has to be laid by hand and each seam must be joined adequately or there is a risk of a spill getting into the ground water.

- The IWWC recommends a double walled or tank within a tank configuration rather than the proposed single wall tank and containment area along with a smaller containment area directly surrounding the proposed tank.

Per the report submitted by TRC:

- Eliminate the oil storage tank spill containment berm and change the welded steel tank design to a double-wall or "tank in a tank" design.
- The bottom of the tank shall have a double floor with interstitial leak detection monitoring. The tank bottom shall have an engineered cathodic protection system.
- The welded steel tank shall be designed and constructed in accordance with API Standards and shall comply with seismic design standards. Hydrostatic and leak

testing and inspection shall be under the direction of a competent third party licensed professional engineer.

- Underground fuel piping shall be double walled with interstitial leak detection sensing.
- The fuel unloading area shall have spill containment suitable to handle the largest tanker capacity used to offload fuel to the storage tank and shall conform to 40CFR112.
- A Spill Prevention, Control and Countermeasures Plan and Facilities Response Plan conforming to 40 CFR 112 shall be prepared and implemented. The operator shall and facility personnel shall receive and keep updated the required spill response training and shall retain the services of an on-call Connecticut licensed spill response contractor to assist with larger spills.

Response and Comment:

ORDER ACCEPTABLE.

Although the bermed and lined spill containment design for the ULSD storage tank as originally proposed is a commonly used and accepted design, NTE has revised the ULSD storage tank to include a secondary steel containment (i.e. tank in a tank) as requested, which allows for elimination of the bermed spill containment area (*See* Exhibit 2 - Revised Site Plan). The tank will include a double floor with engineered cathodic protection and will be designed, fabricated and constructed in accordance with American Petroleum Institute (API) standards applicable to Welded Steel Storage Tanks for Oil Storage (API-650) and associated appendices for under tank leak detection. The tank will be subject to scheduled inspections as per API-653 (Tank Inspection, Repair and Alteration). Below

grade piping shall be comprised of double wall pipe with interstitial leak detection, and the loading areas will be designed in accordance with 40 CFR-112 with spill containment capability suitable to handle the largest tanker capacity used to offload fuel to the storage tank. As required, a spill prevention plan will be prepared and implemented in accordance with 40 CFR-112, which will include contact information for a licensed spill response contractor.

3. The 25 foot no disturbance buffer in the Killingly IWWC regulations section 6.3 is not being upheld.

Section 6.3 states: No disturbance wetland buffer - 25 feet. Separation distances listed above may be increased by the Commission if deemed necessary for the protection and preservation of the natural and indigenous character of the wetlands and/or watercourses system and riparian corridors due to site specific factors such as topography, slope, soil type, presence of rare, endangered and/or species of concern, unique or uncommon habitats, etc.

- The commission recommends that this buffer be increased to a minimum of 75 feet from wetlands A1 and A3 where ever feasible.

The report by TRC agrees with the commission's recommendation:

- Within the main plant parcel, move the limits of all grading activities, clearing and disturbance a minimum of 75 feet from all wetland boundaries and maintain the tree canopy in this zone.
- The location of the administration building, compressor station, main plant facility, tanks and other site features shall be moved to accomplish the required separation.

- Slopes should be no greater than 2 horizontal to 1 vertical and shall have turf established to stabilize the surface from erosion.
- Erosion netting or turf reinforcing mat shall be used on all slopes equal to or steeper than 3 horizontal to 1 vertical along the north side of the site along the wetlands.

The commission also agrees with TRC that a 2:1 vegetated slope should be required, however if it is feasible to have 3:1 slopes the commission would prefer that all slopes be at 3:1.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

The majority of KEC layout was located more than 25 feet from wetlands, with the exception of the very tip of Wetland A3 (which came within 20 feet of proposed grading) and the area where a retaining wall was constructed to avoid impact to Wetland X. However, in response to this order, certain elements (i.e., air cooled condenser, gas compressor building, ring road) on the Generating Facility Site have been relocated or reconfigured to increase the separation distance from all wetlands boundaries to a minimum of 25 feet as required by the Town IWWC Regulations (*See* Exhibit 2 - Revised Site Plan). NTE has increased that separation distance/buffer further, to comply with the requested 75-foot separation, where feasible. Side slopes on the Revised Site Plan are predominantly 2:1 and will be vegetated; the only location where a 1:1 slope is required is a 2,500-square foot area adjacent to Wetland X where that steeper slope is required to comply with the 25-foot no disturbance buffer from Wetland X as defined in the Killingly IWWC Regulations. For this limited area, NTE APPEALS that portion of the order calling for a maximum 2:1 slope. Instead, rip-rap will be employed in this limited area for

stabilization of the 1:1 slope. In all other areas, permanent turf reinforcement matting will be utilized as specified in the previously submitted plans and in the order.

4. The proposed Updated E&S Plan is too broad and does not go into enough specifics for the challenges of the site.

- In many instances the proposed silt fence and hay bales may not be enough to stop all sedimentation, especially during construction when retention basins may not be in place and functioning.
- An independent inspector should be onsite to monitor E&S and drainage, in addition to periodic inspections performed by town staff.
- The commission also recommends that temporary drainage basins should be constructed prior to grading the areas around wetlands Al, A3, and X. Runoff shall be directed at the drainage basins.

The TRC report also addresses this recommendation:

- Temporary sediment basins shall be added upgradient of Wetlands Al and A3 and shall be properly sized in accordance with the CT Water Quality Manual.

Killingly Inland Wetlands and Watercourses Regulations section 6.3 states:
No system, at any distance from such watercourse or inland wetland, shall be constructed or maintained in such a manner so as to allow untreated surface drainage into any such watercourse or inland wetlands. Guidelines are available in the 2004 Storm Water Quality Manual, available from the Inland Wetlands Agency, the Department of Environmental Protection (DEP), or from the DEP. website: http://dep.state.ct.us.wtr/stormwater/stormwtrindex.htm. (Effective date: May 15, 2011).

Response and Comment:

ORDER ACCEPTABLE.

NTE concurs that the discharge of untreated stormwater runoff to wetlands and significant resource areas is unacceptable, and has not, therefore, included that type of discharge in its stormwater design. Temporary sediment basins have been added upgradient of Wetlands A1 and A3 (*See* Exhibit 5 - Updated E&S Plan) as requested, and these features, along with the other best management practices identified in the Updated E&S Plan, will be among the first measures implemented during initial site disturbance activities. The construction contractor will conduct regular inspections, as will NTE, during construction to affirm that BMPs are properly installed, maintained and functioning for the intended purpose. As required by CTDEEP, monthly inspection reporting will be completed by a licensed professional engineer or certified professional in stormwater quality (CPSWQ). In addition, NTE expects the Council to require that a third-party inspector be utilized during construction and Town and CTDEEP staff will also have authority to visit the site for construction inspections. These various checks and balances will provide assurance that appropriate BMPs are selected and implemented to keep the work area stabilized and prevent off-site concerns.

5. The commission recommends that at least one hydrodynamic chamber that also removes suspended solids be installed in-line with the proposed catch basins prior to the exit to the proposed drainage basin(s). This is in line with past practices on industrial and commercial sites.

Response and Comment:

ORDER ACCEPTABLE.

NTE will comply with this order and has amended its project Site Plan and SWPPP accordingly. The original KEC plan specified a hydrodynamic separator with oil isolation capabilities at the single discharge point of the stormwater collection system. The drainage design in the Revised SWPPP has been modified to create 3 separate discharge points with hydrodynamic separators for each discharge. (*See* Exhibit 3).

6. The proposed 15,000 square feet of wetlands disturbance at the proposed switchyard site (Wetland D) requires a permit from the US Army Corps of Engineers (USACE). NTE is proposing a reclamation site of approximately 17,000 sq/ft of created wetland.

- Typically, when an applicant proposes a reclaimed / created wetland it is done at a 1.5:1 (past practice). NTE should propose a larger mitigation area and created wetland.
- Detailed plans and plantings should be submitted to the Killingly IWWC for review.
- This wetland should also be monitored by an independent inspector and maintained after project completion to insure the wetland characteristics remain.
- The created wetland should be monitored for a period of two growing seasons after full establishment.

The TRC report expounds on this:

- Wetland mitigation is proposed to offset the direct impact to Wetland D associated with the construction of the switchyard. A wetland replication area consisting of approximately 17,000 square feet (0.39 acre) is proposed.
- The proposed grading, planting and monitoring plans and details associated with the wetland replication area has not yet been completed.

- However, since the replication area is greater than 5,000 square feet, an application will need to be submitted to the New England District of the USACE. The New England District has detailed wetland creation plan submission requirements that should ensure that sufficient detail is provided in the future.
- The Town of Killingly shall be given an opportunity to review and approve this plan.

Response and Comment:

ORDER ACCEPTABLE.

NTE agrees that the proposed wetland fill, of 12,500 square feet (not the 15,000 square feet referenced in the order), requires filing with the USACE to affirm coverage under its General Permit program. As a part of that filing, additional detail will be developed regarding mitigation. NTE has proposed 17,000 square feet of wetland replication, which will provide several hydrologic regimes, not just the "seasonally saturated" regime of the existing wetland, and support a higher diversity of flora and fauna, including amphibians. The resulting created wetland has the potential to provide more function and value than the existing wetland area, which is transitional in nature and replete with invasive plants. NTE is willing to increase this to 18,750 square feet to reflect a 1.5:1 ratio.

In addition to the 18,750 square feet of created wetlands now proposed within a – 0.77-acre conservation easement, NTE previously identified in its Application proposed wetland enhancements, including 35,000 square feet on the Generating Facility Site and 18,000 square feet on the Switchyard Site. NTE discussed this proposed mitigation strategy with the USACE during a pre-application meeting on September 28, 2016. At that

meeting, the USACE discouraged the use of replication as a mitigation strategy and suggested that an In-Lieu Fee, coupled with the proposed enhancements, was a more appropriate strategy. However, as noted above, NTE is willing to continue to provide for replication and is willing to do so at a 1.5:1 ratio.

As noted, additional details will be provided in the USACE pre-construction notification and will be shared with the Killingly IWWC. Section 5.2 of the *Wetland Report: Proposed Conditions* references evaluation through two growing seasons and notes that additional detail regarding monitoring provisions will be provided in the mitigation plan. However, in order to better align with USACE wetland mitigation guidance, monitoring and requisite maintenance will be expanded to five years post-implementation and will include invasive plant control and eradication. Monitoring will be conducted by a qualified inspector (i.e., wetland scientist or wetland ecologist) with appropriate reports submitted to both the USACE and the IWWC.

7. There have been no submissions to the IWWC for permitting of any proposed gas lines and water lines.

- The IWWC requires that all permits for water and gas be applied for and approved prior to the construction of the proposed energy generating facility.

Per the TRC report:

- Water supply from Connecticut Water Company, involving the Killingly system interconnection with the Plainfield system, shall receive permit and other necessary approvals from the Connecticut Department of Energy and Environmental Protection and the Connecticut Department of Health before any work on the site shall commence.

- In addition the plans for installation of water mains shall receive all local and Connecticut Department of Transportation road disruption and restoration permits, including detailed plans for maintenance and protection of traffic before site work shall commence.
- Plans for the installation of sewer, water main and gas pipelines in Lake Road, including detailed plans for maintenance and protection of traffic, shall require submission to the Town of Killingly for review and approval before any site work shall commence.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE is committed to work with the Connecticut Water Company (CWC), Yankee Gas Services Company (Yankee Gas) and the Town to obtain all necessary State and local permits and approvals for the extension of water, sewer and natural gas service to the KEC facility, including all necessary road disruption and restoration permits needed to complete these improvements. NTE expects, however, that these permitting procedures will run concurrently with certain site construction activity and do not need to be completed before "any site work shall commence". NTE, therefore, APPEALS only this limited portion of this order.

8. NTE is showing an increase in peak runoff from the switchyard site to the neighboring property.

- The IWWC requires that the peak runoff be equal to current peak runoff. Stormwater retention as well as treatment of any runoff shall be submitted and reviewed by the IWWC prior to approval.

- NTE should follow MS4 guidelines for monitoring all stormwater on site prior to any discharge to neighboring properties.

The IWWC would like to be informed of the Siting Councils ruling, and the procedure followed to procure that ruling. The IWWC would also like to be informed of any modifications to this proposal by either the Siting Council or NTE. Should there be a need to follow through on any recommendations made, please feel free to contact the IWWC staff, Eric Rumsey at (860) 779-5310, or via email at erumsey@killinglyct.org. Referral back to the IWWC should be a condition of approval, any recommendations made by the IWWC will be submitted to the Siting Council for their approval and/or to keep the Siting Council informed of the actions taken by the IWWC and the applicant.

Response and Comment:

ORDER ACCEPTABLE.

A stormwater basin with low level outlet has been designed and placed adjacent to the switchyard to limit peak runoff and discharge at or below pre-construction conditions (*see* Exhibit 3 – Revised SWPPP and Exhibit 5 - Updated E&S Plan). As required, MS4 guidelines and procedures for stormwater monitoring will be upheld during construction. Peak runoff increases for the switchyard area were minor with the previous design, and the revised design will ensure that the peak runoff will be equivalent to the current peak runoff.

II. PLANNING AND ZONING COMMISSION ORDERS

The following regulations and restrictions are listed under the sections of the Town of Killingly Zoning Regulations for a Site Plan Review that they would apply to.

S. 470.9.1 - Public Safety

Emergency Management Services

1) That proper access for fire and all emergency response equipment shall be maintained throughout all stages of the construction period, on site and along Lake Road.

Response and Comment:

ORDER ACCEPTABLE.

2) The owner/operator shall prepare and keep current an emergency response plan and shall maintain at all times a designated team of on-site personnel trained to respond to emergency situations. The plan shall identify Town of Killingly (TOK) fire, police and emergency units, Town Officials, and Town Staff that will be notified in the event of an emergency situation.

Response and Comment:

ORDER ACCEPTABLE.

3) That the owner / operator put in place an emergency response plan, to include a spill prevention control and countermeasure plan; said plan must be created in conjunction with the proper town staff and emergency personal.

Response and Comment:

ORDER ACCEPTABLE.

4) The Fire Marshal, the Town Manager, and all other appropriate town staff shall be notified as soon as practical within the first hour of occurrence of any spills and/or non-routine, unexpected situations that arise at the facility that may pose a heightened risk to the public.

Response and Comment:

ORDER ACCEPTABLE.

5) The owner/applicant must provide access to an on-site first aid station to all employees during the construction phase of the project.

Response and Comment:

ORDER ACCEPTABLE.

Water Supply

1) Engineering drawings for the design for the improvements to the water system (from Plainfield) shall be submitted to the Town of Killingly (Engineering Department/Planning Department) for review to verify that there will be enough water in said supply for the proper fire protection through the construction phase and thereafter.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE will share the Town's request to review engineering design drawings with the CWC and will comply with all applicable state and local laws and regulations related to water supply improvements, the connection of the Killingly and Plainfield water systems and the adequacy of that water supply to the KEC facility. However, NTE cannot unilaterally commit to the Town's request without the consent of CWC and, therefore, APPEALS only this limited portion of the order.

2) (1) Water supply improvements from Connecticut Water Company, involving the Killingly system interconnection with the Plainfield system, shall receive permit and other necessary approvals from the CT Department of Energy and Environmental Protection and from the CT Department of Health before any work on the main site shall commence. (2) In addition, the plans for installation of water mains shall receive all local and CT Department of Transportation road disruption and restoration permits, including detailed plans for maintenance

and protection of traffic before any work on the main site shall commence.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE and the Connecticut Water Company will comply with all applicable State and local requirements related to water supply improvements associated with the connection of the Killingly and Plainfield systems, including any road opening permits or approvals. Work related to these improvements will likely occur concurrently, with other on and off-site project improvements. However, NTE does not believe that the water system improvements, need to be completed before the commencement of "any work on the main [project] site". NTE, therefore, APPEALS this limited portion of the Commission's order.

3) That the owner/applicant shall confirm to the Town of Killingly (Engineering Department/ Planning & Development Department) after construction and all improvements; that there is sufficient water supply to provide for the operation of the plant under all circumstances and for the fire protection for the duration of the project. (Reference is hereby made to the correspondence from CT Water Company, stating the project is to be revisited annually.)

Response and Comment:

ORDER ACCEPTABLE.

NTE will provide the Town with information from the CWC regarding the sufficiency of the water supply as requested.

4) Appropriate bonds shall be provided to the Town of Killingly to ensure road repair and maintenance and protection of traffic associated with any failure, settlement, defect or other similar associated cost associated with water main installation.

Response and Comment:

ORDER ACCEPTABLE.

NTE recognizes that it must comply with all local requirements for any work that may occur within local roadways, including any and all necessary bonding requirements.

Utilities

1) Plans for the installation of sewer, water main and gas pipelines in Lake Road, including detailed plans for maintenance and protection of traffic, shall require submission to the Town of Killingly (Engineering Department/Planning & Development Department) for review and approval before any site work shall commence.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE, in cooperation with CWC, Yankee Gas and the Town will comply with this order and submit all plans for sewer, water and gas line work in Lake Road to the Town prior to the commencement of work within Lake Road. However, NTE does not believe that the commencement of this permitting for work within Lake Road needs to occur "before any site work shall commence". NTE, therefore, APPEALS only this limited portion of this order.

2) Natural gas system interconnection and improvements necessary to supply fuel for the project shall receive all local, state and federal approvals required before any site construction shall commence. All such approvals shall be filed with the Town of Killingly (Engineering Department/Planning & Development Department)

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE will receive all necessary local, state and federal permits and approvals for the natural gas interconnection service required for the KEC facility, and agrees to file all such approvals with the Town. NTE expects that permitting for the gas line interconnection will occur concurrently with other site development activity and does not need to occur "before any site work shall commence". NTE, therefore, APPEALS only this limited portion of this order.

3) Appropriate bonds shall be provided to the Town of Killingly to ensure road repair and maintenance and protection of traffic associated with any failure, settlement, defect or other similar associated cost associated with utility installations.

Response and Comment:

ORDER ACCEPTABLE.

Widening of Lake Road and Traffic

1) The commission would like to see the switchyard be moved across the street (to the north side of roadway) onto the main location of the proposed energy power plant. The reasoning behind this is as follows:

a) the removal of high tension lines over the roadway:

b) less impact on the rural neighborhood;

c) minimize the impact on the cemetery that is located on the present switchyard site;

d) would allow the minimization of the curve radius on the widening of Lake Road.

Response and Comment:

ORDER APPEALED.

NTE APPEALS this order for the following reasons, in response to the PZC's four listed concerns:

a) Due to the current configuration, location and size of structures of the existing transmission line right of way east of the Generating Facility Site, as well as the topography on the Generating Facility Site and the existing transmission line right of way, the interconnection with the Eversource 345 kV transmission system would still be required to take place south of Lake Road, on the Switchyard Site. Therefore, the transmission lines would still be required to cross Lake Road, even if the switchyard itself was located on the Generating Facility Site.

b) There are currently four transmission lines (two 115 kV, two 345 kV) crossing Lake Road approximately 550 linear feet from the location of KEC's proposed Lake Road crossing. The proposed location of the switchyard is immediately adjacent to this major transmission corridor. The location of the switchyard and transmission line crossing over Lake Road is not inconsistent with what currently exists in this area. In addition, placement of the utility switchyard north of Lake Road would significantly lessen the amount of equipment setback to Lake Road, as well as increasing the required amount of grading, potential blasting and potential tree clearing close to the property boundary required, thereby increasing visual impact of the entire project.

c) The cemetery will be protected and enhanced even with the Utility Switchyard on the Switchyard Site. Buffer has been maintained where

possible, and a retaining wall has been incorporated into the design to maximize separation where a buffer cannot be established NTE will work with the State Historic Preservation Office to implement construction and operational measures to prevent impact and to better showcase the cemetery as a local historical resource.

d) The design of the curve radius is independent of the location of the Utility Switchyard. Rather, the location of existing transmission line towers, neighboring properties, and the cemetery are the key factors. Notwithstanding, NTE is proposing to widen the width of the road to accommodate two WB-62 Design vehicles traveling in opposite directions. The design of the roadway will be coordinated with the Town engineering department and all applicable CTDOT and Town specifications will be met.

2) Engineering drawings for the widening and realignment of Lake Road shall be submitted to the Town of Killingly (Engineering Department/Planning Department) for review and approval. The design shall allow safe travel way and sight distance for large tractor trailer trucks/tankers (WB-62 design vehicles) and Town of Killingly fire trucks traveling east of the plant entrance.

Response and Comment:

ORDER ACCEPTABLE.

3) Other signage needed to restrict truck traffic west of the site entrance shall be provided at the Town of Killingly's direction (Engineering Department)

Response and Comment:

ORDER ACCEPTABLE.

4) Any stone walls / fences disturbed by the road realignment shall be restored at a safe distance from the edge of the travel way to maintain the rural character of the road. The owner/applicant shall bear the burden of the cost of said restoration.

Response and Comment:

ORDER ACCEPTABLE.

5) All project construction traffic shall be required to enter from the east and leave to the east toward Attawaugan Crossing Road /1-395 along Lake Road. Traffic shall not be permitted to travel west on Lake Road toward Route 101.

Response and Comment:

ORDER ACCEPTABLE.

NTE assumes for the purposes of this response that "construction traffic" does not include personal vehicles driven by construction workers and employees at the NTE site. Passenger vehicles may well use portions of Lake Road to the west of the site in accordance with current restrictions.

6) When traffic volumes and deliveries during construction create traffic issues, the contractor shall be required to comply with the Town of Killingly's request to provide manual traffic control support or modify activities to alleviate congestion and ensure public safety. Non-compliance will result in project shut-down until measures correct the issues to the Town of Killingly's satisfaction. The contractor is required to alert the Town of Killingly of any deliveries of oversize vehicles that may need traffic control.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE will comply with this order and will work with the Council and the Town

throughout the construction of the KEC to ensure adequate and appropriate traffic and public safety measures are in place and will alert the Town prior to delivery of any over-sized vehicles, equipment or facility components. NTE disagrees that non-compliance should result in shut-down of KEC construction activities; rather, should an issue arise, NTE and the Town would determine the specific cause and immediately agree on measures to address the particular issue of concern. Therefore, NTE APPEALS only this limited portion of the PZC order.

7) The Town of Killingly requires that inspection of all road construction along Lake Road is inspected by either the Town, or in its sole discretion is designated representative, paid for by NTE, (to make sure that all construction is done to the proper standards and that public safety is recognized and properly required traffic controls, and construction matters are in place at all times). The Town shall have the authority to direct the owner/applicant to cure deficiencies in workmanship; non-compliance will result in road construction project shut-down until measures to correct the issues to the Town of Killingly's satisfaction.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE will comply with this order and will work with the Council and the Town throughout the construction of the KEC to ensure adequate and appropriate traffic controls and public safety measures are in place for road construction along Lake Road. NTE disagrees that non-compliance should result in shut-down of KEC construction activities; rather, should an issue arise, NTE and the Town would determine the specific cause and immediately agree on measures to address the particular issue of concern. Therefore, NTE APPEALS only this limited portion of the PZC order.

8) The Town of Killingly will require that the road widening of Lake Road is completed prior to the commencement of site construction activities. Also, owner/applicant must provide the Town of Killingly with a plan on how they are going to acquire the property in order to complete the widening of Lake Road.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

Lake Road widening and property acquisition plans will be developed and submitted to the Town for review prior to the commencement of any road widening improvements. Other site construction activities may commence prior to the approval of the Lake Road widening plans. Reconstruction of the roadway will likely be completed early in the construction process but does not need to occur "prior to the commencement of site construction activities". Therefore, NTE APPEALS only this limited portion of the PZC order.

9) The Town of Killingly will require bonding to ensure that all road work is constructed and completed properly and on time.

Response and Comment:

ORDER ACCEPTABLE.

NTE will comply with all bonding requirements for the Lake Road improvements.

Pre-Construction and Construction

1) The Town of Killingly requires a copy of any construction sequencing and management plan to include but not be limited to detailed project schedules for all work activities with weekly work plans, lay down areas, worker numbers, worker parking, traffic management, delivery routes, coordination with local authorities regarding any potentially

disruptive deliveries. The Town of Killingly requires they receive a copy of said construction sequencing and management plan, and that said plan be delivered in a prompt and timely manner, including any changes thereto.

Response and Comment:

ORDER ACCEPTABLE.

NTE will comply with this order and fully expects that the described construction sequencing and management plan will be required as a part of the Council's D&M Plan.

2) A pre-construction meeting with key town staff (Engineering Department/ Planning & Development / Building Office / Fire Marshal) is required no less than eight weeks in advance of any proposed construction commencement including initial site clearing and preparation.

Response and Comment:

ORDER ACCEPTABLE.

3) Notification shall be provided to the Town of Killingly and key town staff (Engineering Department/ Planning & Development / Building Office / Fire Marshal no less than three weeks in advance of:

a) Commencement of facility construction:

b) Commencement of facility testing;

c) Commencement of commercial operation;

d) Commencement of any routine maintenance which generates loud or unusual noises; and

e) Permanent termination of any operation of the project.

Response and Comment:

ORDER ACCEPTABLE.

4) Notification shall be provided to the Town of Killingly of any unscheduled maintenance which generates loud or unusual noises shall be made as soon as the need is apparent.

Response and Comment:

ORDER ACCEPTABLE.

5) The Town of Killingly requires copies of any required construction reports submitted to the Siting Council that are part of the Siting Council's regulations and restrictions; including but not limited to: Quarterly progress reports, starting with the commencement of construction and ending with the commencement of commercial operation.

Response and Comment:

ORDER ACCEPTABLE.

6) The Town of Killingly and key town staff (Engineering / Planning & Development / Building Office / Fire Marshal) shall receive copies, notices and the opportunity to review any other applications, petitions or amendments that may be required in conjunction with this project and/or necessary for its interconnection into the public water supply lines, the electrical transmission grid and/or fuel pipeline, or any other related activity.

Response and Comment:

ORDER ACCEPTABLE.

7) The Town of Killingly requires that an independent third party engineering/environmental professional be hired by the Town to act as its representative, paid for by the owner / applicant, to be on site every day during the construction period to verify that all

proper procedures, regulations, restrictions, etc. on the federal, state and local level are being met and followed by the owner /applicant and its representatives. The third party (town representative) shall have the authority to direct the contractor to cure deficiencies in workmanship, including requiring additional sedimentation and erosion control measures and dust control. If deficiency is not cured the Town of Killingly shall have the authority to shut down the project until the deficiencies are cured.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE does not object to the request that the project hire a third party engineering/environmental professional to monitor construction activity. NTE would look to the Council to provide the scope of work to be performed and inspection frequency by a third-party professional. NTE APPEALS that limited portion of the order that attempts to dictate the need for daily site inspections.

8) The entire site during the construction phase and after shall be surrounded by security fencing, and said security fencing shall be gated at night to protect the public.

Response and Comment:

ORDER ACCEPTABLE.

Oil Storage Tank

1) (1) Eliminate the oil storage tank spill containment berm and change the welded steel tank design to a double wall or "tank-in-a-tank" design. The bottom of the tank shall have a double floor with interstitial leak detection monitoring. The tank bottom shall have an engineered cathodic protection system. Exterior tank coating shall be a neutral beige/tan color to be selected by the Town of Killingly (Engineering Department). The welded steel tank shall be

designed and constructed in accordance with API Standards and shall comply with seismic design standards. Hydrostatic and leak testing and inspection shall be under the direction of a competent third party licenses professional engineer. (2) Underground fuel piping shall be double walled with interstitial leak detection sensing. (3) The fuel unloading area shall be designed and constructed with spill containment suitable to handle the largest tanker capacity used to offload fuel to the storage tank and shall conform to 40CFR112. A Spill Prevention, Control and Countermeasures Plan and Facilities Response Plan conforming to 40CFR112 shall be prepared and implemented. (4) The operator shall and facility personnel shall receive and keep updated all of their required spill response training and shall retain the services of an on-call Connecticut licensed spill response contractor to assist with large spills throughout the lifetime of the power generating plant.

Response and Comment:

ORDER ACCEPTABLE.

***See* NTE's response to the IWWC Order No. 2 above.**

S. 470.9.2 - Storm Drainage

1) We defer to the Inland Wetlands & Watercourses Commission; we also refer to our consultant's comments on this matter as listed in their attached report.

Response and Comment:

***See* NTE's responses to IWWC orders above.**

2) The Town of Killingly also requires that the owner/applicant be held to the standards listed in the "2002 Connecticut Guidelines for Soil Erosion and Sediment Control" (by the Connecticut Council on Soil and Water Conservation in Cooperation with the Connecticut Department of Environmental Protection *I* now DEEP); and the "2004 Connecticut Stormwater

Quality Manual" (by the Connecticut Department of Environmental Protection / now DEEP).

Response and Comment:

ORDER ACCEPTABLE.

S.470.9.3 – Pedestrian and Vehicular Access

1) The owner/applicant must provide safe and secure pedestrian access to and from the employee parking lot and the main construction site.

Response and Comment:

ORDER ACCEPTABLE.

2) That at all times (pre-construction, construction, and post construction) the owner/applicant must make sure that there is an ingress and egress available to emergency services vehicles.

Response and Comment:

ORDER ACCEPTABLE.

3) No permanent access is shown on any plans with regard to the switchyard if the switchyard stays on the southern side of Lake Road. This is a concern for public health, safety, and general welfare.

Response and Comment:

ORDER ACCEPTABLE.

Permanent access to the switchyard site is shown on the original site plan included as a part of the NTE Application on Figure 2-8.

S.470.9.4 – Noise Abatement

1) The State of Connecticut noise standard and the Town of Killingly noise ordinance defines ambient/background sound as the L_{90} (not L_{EQ}) standard. Noise analysis and

background noise levels shall be rerun using this standard for compliance. The standard also has a numerical definition for prominent discrete tones that shall also be included in the report. If a prominent discrete tone sound is generated by the project, then the allowable 51 dBA limit is reduced by 5 dBA.

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. The Connecticut noise regulations and the Town of Killingly noise ordinance identify the L_{90} to characterize background noise; however, background noise is not used to determine compliance unless measured levels are in excess of the standards, which is referred to as 'high-background noise'. If measured levels are in excess of the standards (51 dBA), a sound source is not permitted to exceed the background noise level by 5 dBA.

The measured L_{90} values presented in Section 7.4 of the CSC Application are well below the most stringent 51 dBA standard; therefore, the area surrounding the KEC Site is not considered to have high-background noise and the absolute standards apply. KEC meets the most stringent 51 dBA sound level limit applicable at the property boundaries. Additionally, no discrete tones are expected to be associated with normal operation of the KEC.

2) The modeling results shall be presented for discrete residential location property lines to show if compliance with the noise standards is achieved, since the ambient measurement locations are not necessarily at the actual residences. The standards apply at the residential property lines.

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. The Connecticut noise regulations and the Town of Killingly noise ordinance identify the point of compliance as the property boundary. The analysis completed for the KEC includes modeling results at discrete locations that confirm compliance at the property boundary; therefore, normal operation of the KEC will be in compliance with state and local noise standards. The isopleth map, provided in Figure 7-5 of the CSC Application and in the Updated Acoustic Modeling Analysis, illustrates the level of sound resulting from KEC's normal operation in areas surrounding the KEC Site.

3) There is no analysis in the application of the potential impact that the modeled operational sound levels may result in non-conformance with noise standards. The analysis shall be expanded to show the modeled project sound levels at discrete residential locations, the measured late night ambient L_{90} (not L_{EQ}) sound levels, and what increases over ambient are expected at night. Showing compliance with the regulatory limits is required, but simply meeting a limit does not necessarily mean that no impacts will occur. A basis or rationale for determining if the expected project noise levels and/or the increase over ambient conditions are significant shall also be provided.

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. Normal operation of the KEC has been demonstrated to comply with applicable state and local standards, which do not require comparison to ambient conditions unless a project setting is identified as a high-

background noise area (as outlined in Section 22a-69-3.6 of the Connecticut noise regulations). As noted above, the area surrounding the KEC Site is not considered a high-background noise area.

4) A statement is made that there would not be perceptible change in sound at locations near Alexander Lake, yet, there is no analysis of this within the report. Further, no ambient measurements were conducted near Alexander Lake to support this assertion. NTE indicates the noise contours show Project levels of 27 dBA or lower, and that the lowest nighttime measured anywhere was 26 dBA. However, the contours provided by NTE dearly show Project levels of greater than 30 dBA at Alexander Lake. Increased levels of 3 dBA or more are considered perceptible and applicant's data therefore indicates a perceptible change.

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. Modeled sound levels near Alexander Lake show decibel values ranging from the mid-20s to the low-30s dBA in the Application (Figure 7-5) and even lower levels for more of the Alexander Lake area in the Updated Noise Modeling, which reflects the layout refinements and the effect of intervening structures. KEC has demonstrated compliance with the stringent 51 dBA limit applicable at the property boundaries and sound levels at Alexander Lake are well below that limit. Imperceptibility or inaudibility under all operating conditions is not required by the Town of Killingly or the State of Connecticut, and is an unrealistic expectation for this Project or any other industrial or commercial activity.

5) It is stated that construction may occur 7 days per week, and that construction could last for 3 years. This would have the potential to result in an adverse impact. Some

numerical analysis of construction noise levels shall be provided to support the assertion that no adverse or long- term impacts will occur.

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. Both the state and local noise requirements list construction, including loud noises such as blasting, as exceptions to the requirements, if created during daytime hours. NTE has committed to restricting particularly loud construction activities (i.e., blasting, steam blows) to daytime hours. Although a numerical analysis could be conducted, it could only employ assumptions based on the anticipated range of activities during certain phases of construction, which would vary depending on construction progress and would not be particularly meaningful. NTE will establish a procedure prior to the start of construction to address the handling of construction noise-related complaints.

6) The owner/applicant shall provide to the Town of Killingly staff (Engineering Dept. / Planning Dept.) the name and number of the owner/applicant's key personnel to contact that can resolve an issue the Town of Killingly may have with noise.

Response and Comment:

ORDER ACCEPTABLE.

7) The owner/applicant shall also provide notification to the Town of Killingly staff (Engineering / Planning & Development / Building Office / Fire Marshal) if there is going to be noise for an extensive period of time so the public may be notified.

Response and Comment:

ORDER ACCEPTABLE.

8) In the event that a noise abatement issue cannot be resolved, in the Town of Killingly's sole discretion in a timely and effective manner; the Town of Killingly shall follow and enforce its existing noise ordinance found in its Code of Ordinances Chapter 12.5 (Planning and Development) Article VI (Noise Ordinance, Sections 12.5-120, et seq, and as may be amended.

Response and Comment:

ORDER ACCEPTABLE.

S.470.9.5 – Other Pollution or Related Problems

Air Quality

1) The Commission requests that the CT Siting Council review and consider additional analysis regarding the effect of emissions on nearby sensitive receptors. The additional analysis should include an evaluation through the CT Department of Health on the effect that air emission from the plant will have on the incidence(s) of asthma and other respiratory ailments in the Town of Killingly and surrounding communities. The Town of Killingly is concerned with the effects upon young children and the elderly, as there are schools and elderly care facilities all located within an approximately a 2.00 / 3.00 mile radius of the proposed site development. The commission refers the CT Siting Council to the following - Centers for Disease Control (https://www.cdc.gove/air/pollutants.htm); and the CT Department of Health (http://www.ct.gov/dph/cwp/view.asp?a=3137&q=398480).

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. The KEC has been designed to comply with the National Ambient Air Quality Standards (NAAQS), which have been established by the

U.S. Environmental Protection Agency to protect the most sensitive populations, such as children, elderly, and individuals suffering from respiratory disease. These and other air quality requirements are addressed in NTE's pending air permit application now undergoing CTDEEP review. Additionally, operation of the KEC will displace older, less-efficient generating units, improving the air quality of the surrounding area.

2) For the emergency generator and fire pump respectively. Tier 2 and Tier 3 emission standards are proposed. These comply with NSPS IIII. But for BACT, one must consider available and innovative technologies. It is reasonable to reject Tier IV engines, which would typically use SCR. But there are Tier III (Less polluting) engines widely available at the rating specified for the emergency generator.

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. No Tier 3 standards have been promulgated for engines greater than 560 kilowatt (kW); the emergency generator proposed for KEC is 1,500 kW. KEC's proposed fire pump engine (228 kW) meets the Tier 3 standard.

3) Emission for formaldehyde from the CTG are based upon the MACT floor emission rate determined by USEPA for the National Emission Standard for Hazardous Air Pollutants (NESHAP) Subpart YYYY, as representative for a CTG equipped with DLN combustors and an oxidation catalyst, Subpart *YYYY* applies to major sources of HAPs. The project is an area source. Subpart YYYY does not apply to duct burners. The application should either use vendor data for formaldehyde emissions, or use AP42 emission factors and the heat input as 59F [2,871 MMBtu/hr (CTG) + 895 MMBtu/hr (DB)] the uncontrolled PTE of

formaldehyde would be: (2,871 +895)*8.760*0.00071/2000=11.7 tpy. Note that a source with a PTE of 10- tpy of a single HAP is a major source of HAPS. The actual stack concentration (ASC) of formaldehyde would be approximately twice the maximum allowable stack concentration (MASC) [i.e., it would not comply w/ CT air toxics regulations],

Response and Comment:

ORDER APPEALED.

NTE respectfully APPEALS this order. AP-42 emission factors are based upon emissions testing conducted more than 20 years ago on uncontrolled and now-obsolete combustion turbine generators (CTGs), and are inappropriate to apply to the unit proposed for the KEC facility, which is a new state-of-the-art CTG equipped with dry low nitrogen oxide (NO_X) combustors and an oxidation catalyst. USEPA's MACT Floor evaluation involved extensive testing of similar state-of-the-art CTGs equipped with similar emission controls. As a result, NTE believes the Subpart YYYY values represent the most applicable formaldehyde emission factor for the KEC CTG. The formaldehyde emission rates used by KEC are identical to the limits approved by CTDEEP as BACT in the most recent combined cycle turbine project in Connecticut (Towantic Energy), as well as those proposed in the most recent application currently before the CTDEEP (Bridgeport Harbor).

It should also be noted that the Subpart YYYY regulation actually does not apply to major sources of HAP; rather, it applies to a CTG located at a major source of HAP, as determined by potential emissions from the entire facility, not just from the CTG. *See* 40 CFR 63.6085. KEC is not a major source of HAP, and therefore it is correct that Subpart YYYY does not apply to the KEC CTG. However, Subpart YYYY remains relevant as

setting forth up-to-date and representative emission factors for the KEC CTG. Also, although duct burners are not directly covered under Subpart YYYY, in cases such as this where such equipment would be integral and difficult to separately monitor, it is common practice to incorporate duct burner emissions into the CTG emission figures.

4) The Town of Killingly shall be given the opportunity to review Air Permit conditions imposed by the CT DEEP and if there are changes to the plant design and operation, the Town of Killingly shall be given sufficient time to review and respond.

Response and Comment:

ORDER ACCEPTABLE.

While outside the scope of the Siting Council's authority, the Town currently has reviewed and will continue to have the opportunity to review and comment on the NTE Air Permit application now being reviewed by the CTDEEP.

Erosion and Sediment (E&S) and Dust Control

1) Phasing and details of the grading activities shall be provided, with additional E&S control information shown for each phase on the drawings. Locations for soil, topsoil and rock stockpiles shall be provided, with appropriate means to control erosion and sedimentation. Location for the placement of rock crushing and screening operations shall be shown along with appropriate means of E&S Control. Total quantities of estimated earth excavation, rock excavation and fill volumes shall be provided. Any soil material brought to the site and used on the project shall be tested at a frequency of 1 sample per 1000 cubic yards for all constituents to determine compliance with the CT DEEP standards for Residential Direct Exposure and GA Pollutant Mobility Criteria.

Response and Comment:

ORDER ACCEPTABLE

Should the project be approved by the Council, NTE will prepare and submit a detailed phasing and construction sequencing plan in conjunction with registration under the CTDEEP General Permit for the Discharge of Stormwater Associated with Construction Activities. This registration will be prepared by a licensed professional engineer and will require a 3rd party review by a second licensed professional engineer prior to submittal to the CTDEEP.

NTE expects approximately 220,000 cubic yards of material to be relocated on site, resulting in a balanced cut and fill. As described in Section 3.2.1 of the Application (Volume I), the intent of the grading plan is to minimize the total net import or export of material to or from the site. Limited quantities of structural fill may need to be brought to the site if adequate material is not present. Imported soils will be subject to appropriate testing.

2) Temporary sediment basins shall be added upgradient of Wetland A1 and A3 and shall be properly sized in accordance with the CT WQM.

Response and Comment:

ORDER ACCEPTABLE.

***See* Exhibit 3 – Revised SWPPP and Exhibit 5 – Updated E&S Plan.**

3) The CT General Permit for Stormwater for Construction Activities requires that for site disturbances of 15 acres or more the Stormwater Pollution Prevention Plan (SWPP) and stormwater system design must be reviewed and certified by a third-party independent Connecticut Licensed Professional Engineer not connected to the project. This shall be a

condition of approval.

Response and Comment:

ORDER ACCEPTABLE.

4) A detailed plan for dust control and management for site grading and on-site soil/rock processing shall be required. Significant volumes of water will be required to prevent fugitive dust and tracking onto Lake Road. Provisions for water supply, water tanker, sprinklers and equipment water sprays shall be provided and in place before site work begins.

Response and Comment:

ORDER ACCEPTABLE.

5) The Town of Killingly requires that the applicant shall become familiar with the Town of Killingly Earth Filling and Excavation Regulations (Section 560 - Town of Killingly Zoning Regulations); and that the applicant follow said regulations as a requirement. The Commission requires that the applicant provide the Commission with the detailed plan for dust control and management as noted above.

Response and Comment:

ORDER ACCEPTABLE.

S.470.9.6 - Landscaping and Screening

Site Plan Conditions/Grading

1) The Town of Killingly requires that within the main plant parcel, the owner/applicant shall move the limits of all grading activities, clearing and disturbance a minimum of 75 feet from all wetland boundaries and maintain the tree canopy in this zone.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

***See* NTE's response to IWWC Order No. 3 above.**

2) The Town of Killingly requires that the location of the administration building, compressor station, main plant facility, tanks and other site features shall be moved to accomplish the required separation.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

***See* NTE's response to IWWC Order No. 3 above.**

3) The Town of Killingly requires that slopes should be no greater than two (2) horizontal to one (1) vertical and shall have turf established to stabilize the surface from erosion. Erosion netting or turf reinforcing mat shall be used on ail slopes equal to or steeper than three (3) horizontal to one (1) vertical along the north side of the site along the wetlands. (That is if the CSC allows the slopes to be greater than 2:1).

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

***See* NTE's response to IWWC Order No. 3 above.**

Landscaping

1) The Town of Killingly requires that NTE provide a complete landscaping plan for the main plant site and the switchyard site prepared by a licensed landscape architect. The plan shall be submitted to the Town of Killingly PZC for review and approval. The plan shall provide adequate tree and shrub plantings to provide an effective visual screen from Lake Road and the residential property abutting on the west. Areas of the site disturbed by site grading activities

that are not part of the active facility shall be replanted with trees to reestablish wooded / forested coverage. There must be enough soil (12" – 18" of combined top spoil and sub soil) to sustain such forested coverage.

Response and Comment:

ORDER ACCEPTABLE.

The revised grading plan and elimination of the fuel tank berm will allow the project to maintain greater vegetated buffers along the western property boundary. Where possible, existing vegetation along Lake Road and the western boundary will also be maintained. Where grading requires removal of vegetation in areas that are not part of the active facility, forested coverage will be re-established to provide visual screening. A landscaping/planting plan will be prepared and presented as a part of the D&M Plan for review by the Town and approval by the Council.

2) The Town of Killingly requires that buffers be doubled (*see* minimum setback chart attached hereto and incorporated herein by reference) within certain areas of the site, where possible to limit the impact upon the surrounding residential area.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE will attempt, where possible, to maintain existing vegetation along the perimeter of the KEC site and increase the size of that buffer nearest the adjacent residential neighbors. NTE cannot commit, at this point, to the "doubling" of these buffers and therefore appeals this portion of the PZC order.

3) The Town of Killingly requires that the owner / applicant shall comply with the necessary lighting to adhere to the Town of Killingly's Dark Sky regulations found in the Town

of Killingly Subdivision Regulations Article IV Section 17 Lighting – "Outdoor lighting, if proposed and in the Commission necessary, shall be designed to provide the minimum lighting necessary to ensure adequate safety, night vision, and comfort, and shall not create or cause excessive glare on adjacent properties and public street rights-of-way. Streetlights shall be avoided in subdivisions located in rural areas of Town."

Response and Comment:

ORDER ACCEPTABLE.

S. 470.9.7 – Neighborhood Impact

1) Should the CT Siting Council and/or CT DEEP find that factors and reasons for not moving the switchyard override the PZC's preference for the move, the PZC requires the owner/applicant do research in the graveyard area, outside of the stone walls to verify that the switchyard will not interfere with any possible grave sites located outside of the stone walls.

Response and Comment:

ORDER ACCEPTABLE.

NTE will comply with this order by working with the State Historic Preservation Office (SHPO) to identify appropriate measures in areas where the 50-foot buffer recommended by the SHPO cannot be maintained.

S. 470.9.8 Architectural and Aesthetic Impact

1) As stated earlier the commission requests that where it can be accomplished that buffer zones be doubled, where they cannot be doubled, that they be maximized, and that plantings / landscaping are put in place that buffers the energy plant from the surrounding area.

Response and Comment:

ORDER ACCEPTABLE IN PART AND APPEALED IN PART.

NTE will attempt, where possible to maintain existing vegetation along the perimeter of the KEC site and increase the size of that buffer nearest the adjacent residential neighbors. NTE cannot commit, at this point to the "doubling" of these buffers and therefore appeals this portion of the PZC order.

2) The commission would like the total project to be on one parcel of real estate.

Response and Comment:

ORDER APPEALED.

***See* NTE's Response and Comment - Widening of Lake Road and Traffic No. 1 on pages 22-24 above.**

S. 470.9.9 Zoning Regulations

1) The commission requires the owner / applicant must be aware of other Town of Killingly Zoning Regulations that apply to this project and should be followed;

a) Section 450 et seq.; – Dimensional Regulations

b) Section 470 et seq.; – Site Plan Review

c) Section 560 et seq.; – Earth Filling & Excavation

d) Section 700 et seq.; – Special Permits

e) Section 790. – Bonding

Response and Comment:

ORDER ACCEPTABLE.

NTE is familiar with the identified provisions of the Killingly Zoning Regulations.

Respectfully submitted,

NTE CONNECTICUT, LLC

By _____

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597
Its Attorneys

CERTIFICATE OF SERVICE

I hereby certify that on this 27th day of October, 2016, a copy of the foregoing was sent via first class mail, postage prepaid, to the following:

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Mary Mintel Miller, Esq.
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Sean Hendricks, Town Manager
Town of Killingly
172 Main Street
Killingly, CT 06239

Kenneth C. Baldwin

EXHIBIT 1

TETRA TECH

MEMO

To:	NTE Connecticut, LLC
From:	Lynn Gresock
Date:	October 27, 2016
Subject:	Killingly Energy Center – Updates to CSC Application Associated with Project Refinements

In response to local comments, including Regulate and Restrict Orders submitted by the Killingly Inland Wetlands and Watercourses Commission and Planning and Zoning Commission, on the Killingly Energy Center (KEC) CSC Application, NTE Connecticut, LLC (NTE) has considered the comments and implemented refinements to the KEC layout and erosion and sedimentation control and stormwater design. This memorandum provides information as a guide to where the updated information has implications to the CSC Application as submitted, utilizing the CSC Application table of contents as a framework. In general, the changes result in improvements to the wetland and stormwater impacts, with other impacts remaining similar to the levels reflected in the CSC Application.

Executive Summary – No change to this section results from the KEC refinements.

1.0 Introduction – No change to this section results from the KEC refinements.

2.0 Project Description – Elements of the proposed facility layout have changed as a result of the KEC refinements, although no material change in level of impact results. The description of KEC equipment in Section 2.2 has not changed, although some of the smaller structures have been repositioned and the ultra-low sulfur distillate (ULSD) tank design has been revised to respond to Town of Killingly recommendations by removing the berm and utilizing steel wall containment (i.e., tank in a tank). The internal layout shifts have allowed for greater separation distance between the KEC footprint and nearby wetlands; stormwater management features and grading have also been adjusted in response to Town feedback. Revised Figure 2-4 (KEC Site Layout and Grading), Revised Figure 2-5 (KEC Plot Plan), and Revised Figure 2-8 (Details of Electric Transmission Interconnection) are attached (Figure and Table Updates). The revisions do not significantly change the rendering provided in Figure 2-6 (since all major equipment remains positioned as shown); therefore, that has not been updated. The descriptive information in this section remains materially the same.

Revised Table 2-1 reflects changes associated with the ongoing air permit application review process. Since this application was filed, additional precedent has been identified that reduces the nitrogen oxide (NOx) emission rate when firing ULSD from 5.0 parts per million (ppm) to 4.0 ppm. Additional reduction in carbon monoxide (CO) levels under ULSD firing has also been incorporated. These adjusted emission levels will be utilized in confirmatory air dispersion modeling updates that will be submitted under separate cover; no material change in impacts will result and KEC will continue to comply with the National Ambient Air Quality Standards (NAAQS).

Although updates to the stormwater calculations and Stormwater Pollution Prevention Plan (SWPPP) and the noise analysis have been undertaken, as discussed later in this memorandum, none of those changes materially affect the narrative in this section. Although the design of the ULSD tank has been adjusted, the ability for containment and other information in Section 2.13.4 (Oil and Chemical Delivery, Storage and Management) remains the same.

Tetra Tech, Inc.
2 Lan Drive, Suite 210, Westford, MA 01880
Tel 978.203.5352 Fax 978.62.4592 tetratech.com

3.0 Earth Resources – This section remains unchanged. The refinements to the SWPPP and grading plan (see Exhibit 3, Updated Appendix D, SWPPP) continue to utilizing the measures discussed in this section and to respond to site conditions and Connecticut Department of Energy and Environment (DEEP) standards and requirements.

4.0 Natural Resources – This section remains unchanged. Exhibit 6 (Updated Wetland Information) provides specifics to adjust information that was provided in Appendix E-1, Wetland Proposed Conditions, to reflect the additional benefits associated with the layout refinements. With the additional stormwater revisions, the amount of tree clearing on the Switchyard Site has increased from less than 1.5 to 2.6 acres. Other impacts described remain the same.

5.0 Air Resources – This section has not materially changed. As previously noted, minor reductions in NOx and CO emission levels under ULSD firing have been incorporated. Revised Table 5-3 (Summary of KEC Emissions and Applicable PSD Thresholds) and Revised Table 5-4 (Proposed CTG LAER and BACT Emission Rates) are provided in Attachment 1. Because some minor adjustment of structures has occurred with the layout refinements, NTE has undertaken an updated air dispersion modeling analysis to confirm that the revised layout still complies with NAAQS. The Updated Ambient Air Quality Assessment information will be submitted to the Council, as well as to DEEP to support the air permit review. No material changes will result in the prior impact levels.

6.0 Water Resources – The information in this section has not materially changed. While additional detail regarding stormwater management during construction and updated information regarding operational measures is now reflected in Exhibit 3 and Exhibit 5, the descriptive information in the CSC Application narrative remains valid.

7.0 Community Resources – No change associated with the layout refinements results to Section 7.1 (Land Use, Zoning, and Planning); Section 7.2 (Traffic and Transportation); Section 7.3 (Visual Resources and Aesthetics); Section 7.5 (Electric and Magnetic Fields); Section 7.6 (Cultural Resources); or Section 7.7 (Socioeconomics). The noise impact assessment (Section 7.4) has been updated to reflect the layout refinements. Exhibit 4 provides information updating the operational noise modeling assessment that confirms compliance with residential standards at the property boundaries.

8.0 Project-Related Interconnections – Other than reducing the distance required for natural gas pipeline lateral within Lake Road due to the relocation of the gas metering area within the layout to be closer to the point of interconnection with the natural gas pipeline, no change to this section results from the KEC refinements.

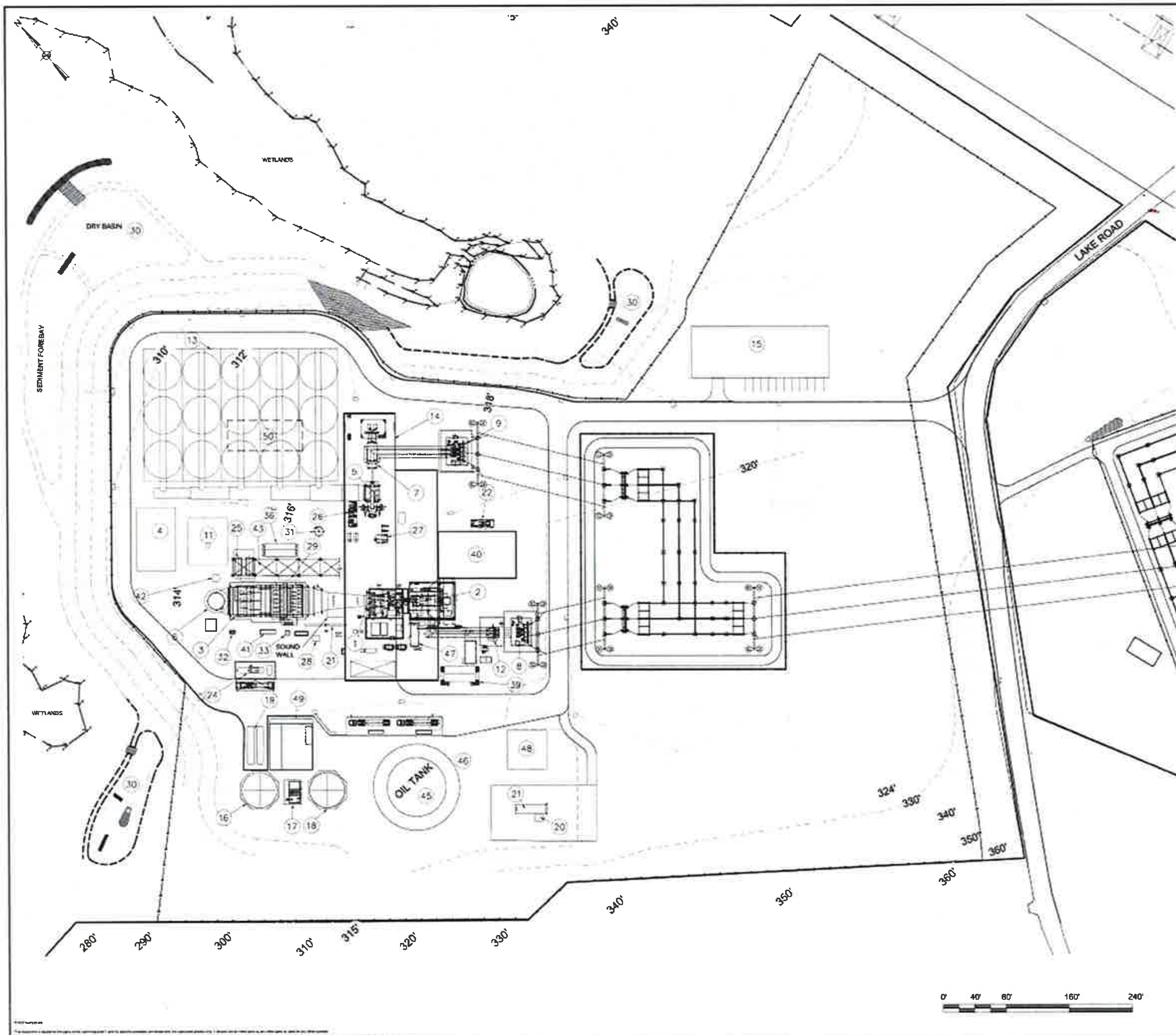
9.0 Alternatives – No change to this section results from the KEC refinements, although the refined site layout represents a further iteration of the Layout Alternatives discussed in Section 9.3.4.

10.0 Required Permits and Approvals – No change to this section results from the KEC refinements.

11.0 References – No change to this section results from the KEC refinements.

UPDATED FIGURES AND TABLES

- Revised Figure 2-4 KEC Site Layout and Grading
- Revised Figure 2-5 KEC Plot Plan
- Revised Figure 2-8 Details of Electric Transmission Interconnection
- Revised Table 2-1 KEC LAER and BACT Emissions Rates (steady-state)
- Revised Table 2-2 KEC Facility-Wide Annual Potential Emissions (tons per year [tpy])
- Revised Table 5-3 Summary of KEC Emissions and Applicable PSD Thresholds
- Revised Table 5-4 Proposed CTG LAER and BACT Emission Rates



Revised Figure 2-4
KEC Site Layout and Grading

Killingly Energy Center

Legend

1. COMBUSTION TURBINE (GT)
2. COMBUSTION TURBINE GENERATOR (GTG)
3. HEAT RECOVERY STEAM GENERATOR (HRSG)
4. CLOSED COOLING WATER
5. STEAM TURBINE (ST)
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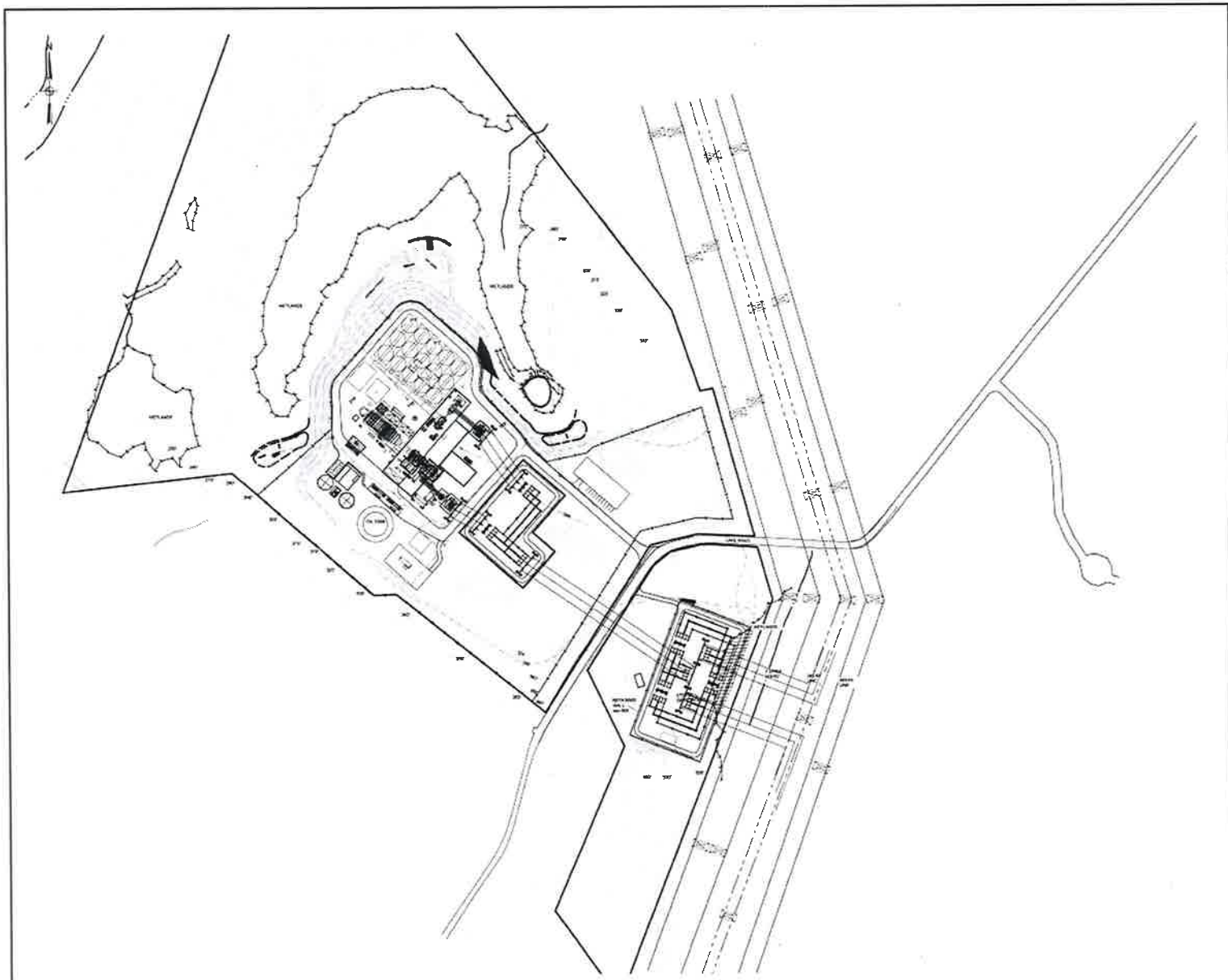

Revised Figure 2-5
KEC Plot Plan

Killingly Energy Center

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KILLINGLY CONNECTICUT

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SIEMENS 8000H

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CONSTRUCTION
RELEASE WITH
DRAWERS STAMP
AT CONSTRUCTION
PHASE
ANNOTATION

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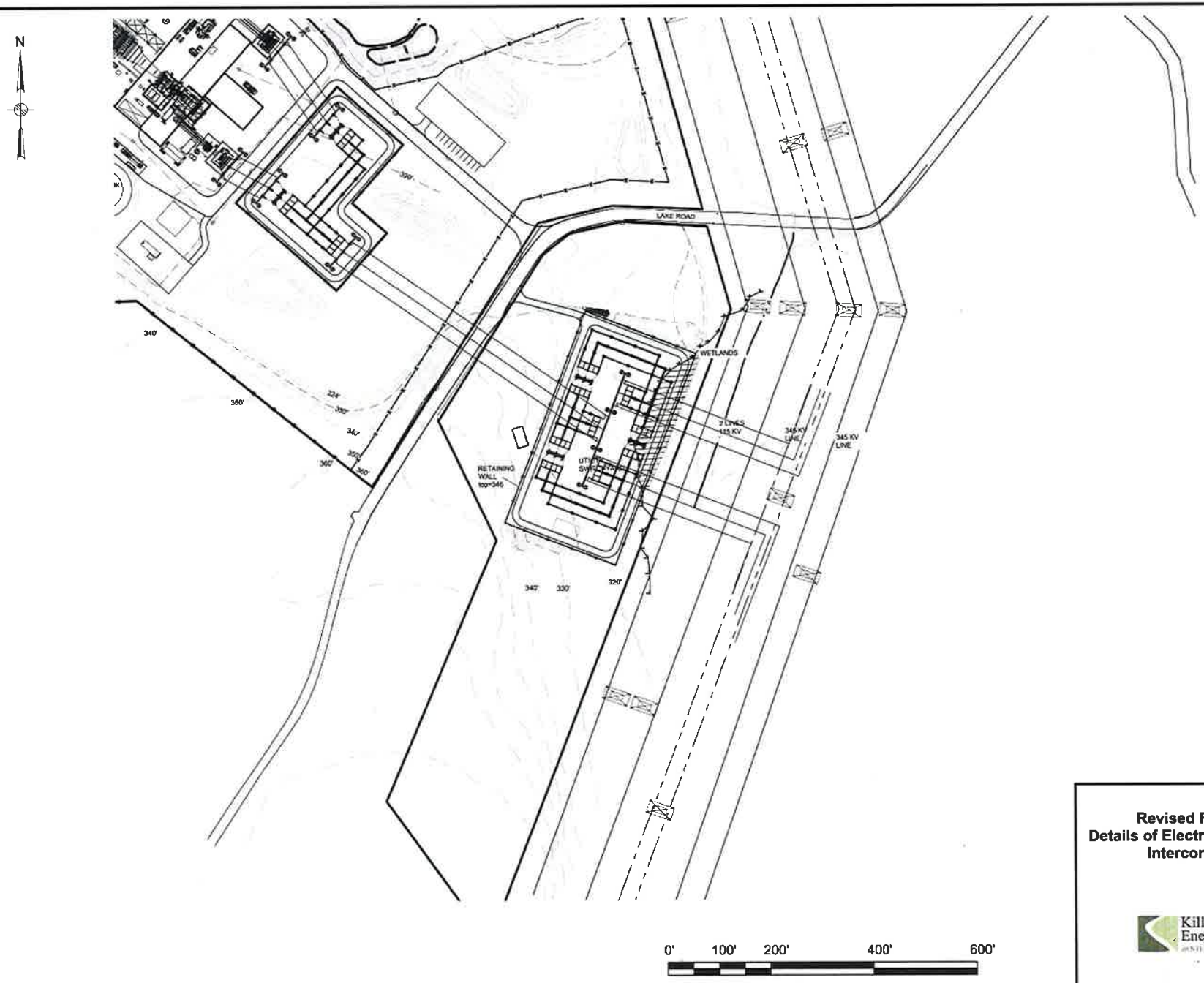
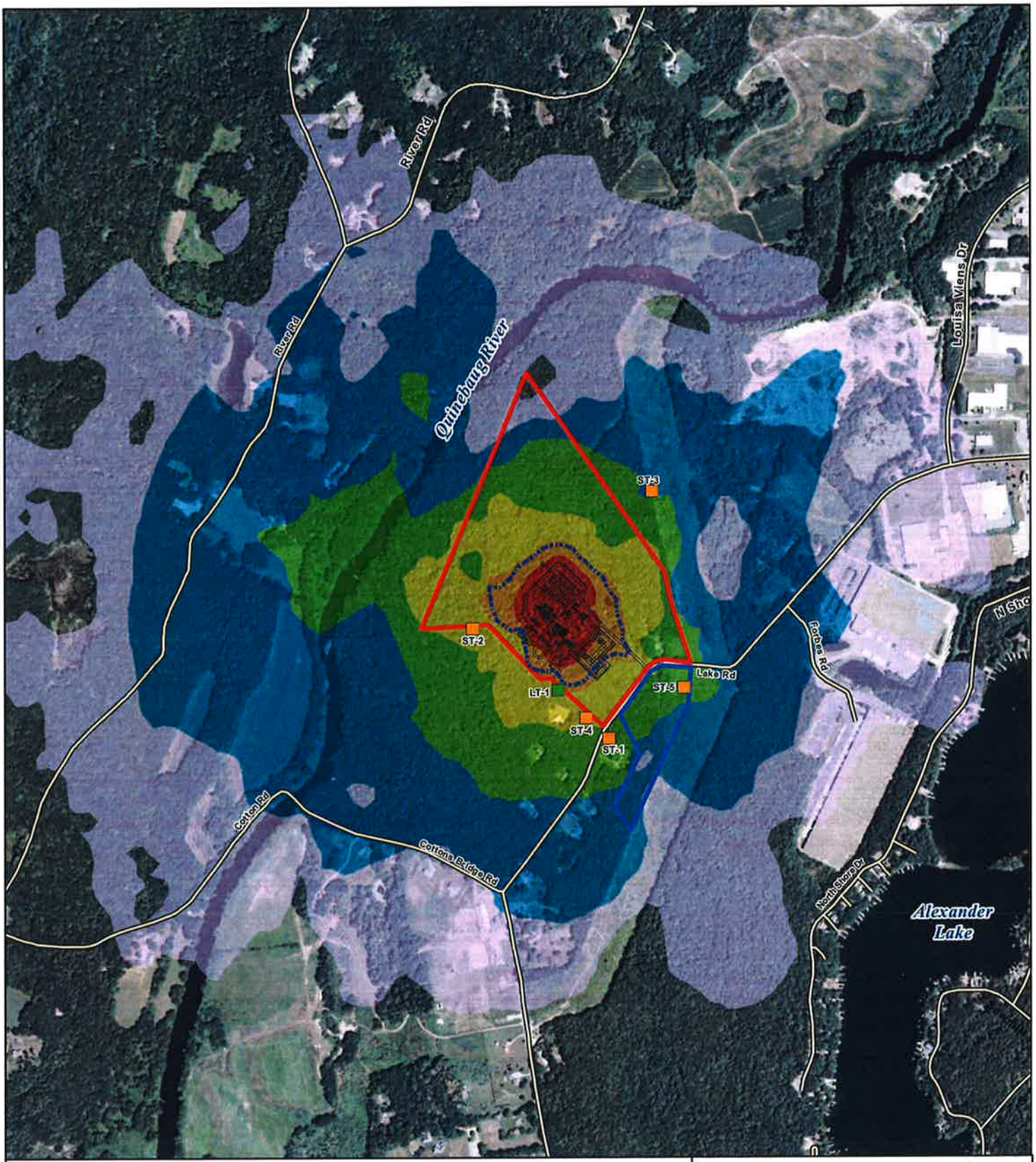


Revised Figure 2-8
Details of Electric Transmission Interconnection

Killingly Energy Center



Legend

- Generating Facility Site
- Switchyard Site
- Short Term Monitoring Location
- Long Term Monitoring Location
- 51 contour

Sound Level Contour Ranges (dBA):

- 30-35 dBA
- 35-40 dBA
- 40-45 dBA
- 45-50 dBA
- 50-55 dBA
- >55 dBA

N

0 250 500 Feet

Revised Figure 7-5
Results of Acoustical Modeling

Killingly Energy Center
an NTE Energy Project

R:\PROJECTS\KILLINGLY_5545\NOISE\MAPS\Figure_1_Noise_Levels_rev102616.mxd

Table 2-1: KEC LAER and BACT Emissions Rates (steady-state)

Pollutant	Gas Firing (no duct firing)	Gas Firing (duct firing)	ULSD Firing
NO_X	2.0 ppmvdc[a]	2.0 ppmvdc	4.0 ppmvdc
CO	0.9 ppmvdc	1.7 ppmvdc	2.0 ppmvdc
VOC	1.0 ppmvdc	2.0 ppmvdc	2.0 ppmvdc
SO_2	Fuel sulfur limit	Fuel sulfur limit	Fuel sulfur limit
$PM_{10}/PM_{2.5}$[b]	Vendor Specifications	Vendor Specifications	Vendor Specifications
Sulfuric Acid (H_2SO_4)	Fuel sulfur limit	Fuel sulfur limit	Fuel sulfur limit
NH_3	2.0 ppmvdc	2.0 ppmvdc	5.0 ppmvdc

[a] ppmvdc = parts per million by volume dry at 15 percent oxygen.

[b] PM_{10} = particulate matter with a diameter of less than 10 microns; $PM_{2.5}$ = particulate matter with a diameter of less than 2.5 microns.

Table 2-2: KEC Facility-Wide Annual Potential Emissions (tons per year [tpy])

Pollutant	CTG and Duct Burners	Auxiliary Boiler	Natural Gas Heater	Emergency Generator	Fire Pump	Facility Total
NO_x[a]	130.0	1.64	0.12	2.92	0.30	135.0
CO[a]	133.8	7.14	0.37	1.60	0.26	143.1
VOC[a]	48.3	0.78	0.03	0.15	0.02	49.2
SO_2	24.7	0.29	0.02	0.003	0.0005	25.1
$PM_{10}/PM_{2.5}$	100.8	0.97	0.05	0.09	0.02	102.0
Greenhouse Gas (GHG) (as CO_2 equivalent [CO_{2e}])	1,966,937	22,610	1,170	308	49	1,991,622[a]
H_2SO_4	8.76	0.02	0.001	0.0002	0.00003	8.8
Lead (Pb)	0.0018	$9.5x10^{-5}$	$4.9x10^{-6}$	$1.4x10^{-6}$	$2.3x10^{-7}$	0.002
NH_3	49.5	N/A	N/A	N/A	N/A	49.5
Max Individual HAP (hexane)	7.06	0.35	0.02	N/A	N/A	7.4
Total Hazardous Air Pollutants (HAPs)	14.1	0.36	0.02	0.01	0.003	14.5

[a] Includes 547 tpy of fugitive GHG emissions from circuit breakers and natural gas handling.

The values in Table 2-2 are based on the following simultaneous assumptions, operating at 100% load:

- CTG operating up to 8,760 hours per year at 59°F, firing natural gas with duct firing;
- CTG operating up to 720 hours per year at -10°F, firing ULSD;
- Auxiliary boiler operating 4,600 hours per year;
- Natural gas heater operating 4,000 hours per year; and
- Emergency generator and fire pump engines each operating 300 hours per year.

Table 5-3: Summary of KEC Emissions and Applicable PSD Thresholds

Pollutant	KEC Annual Potential Emissions (tpy)	PSD Major Source Threshold (tpy)	PSD Significant Emission Rate (tpy)	PSD Review Applies
CO[a]	143.1	100	100	Yes
NO_x[a]	135.0	100	40	Yes
SO_2	25.1	100	40	No
PM	102.0	100	25	Yes
PM_{10}	102.0	100	15	Yes
$PM_{2.5}$	102.0	100	10	Yes
VOC[a]	49.2	100	40	Yes
Pb	0.002	100	0.6	No
H_2SO_4	8.8	100	7	Yes
GHGs (as CO_2e)	1,991,622[b]	N/A	75,000	Yes

[a] Includes incremental emissions due to startup and shutdown.

[b] Incudes 547 tpy of fugitive GHG emissions from circuit breakers and natural gas handling.

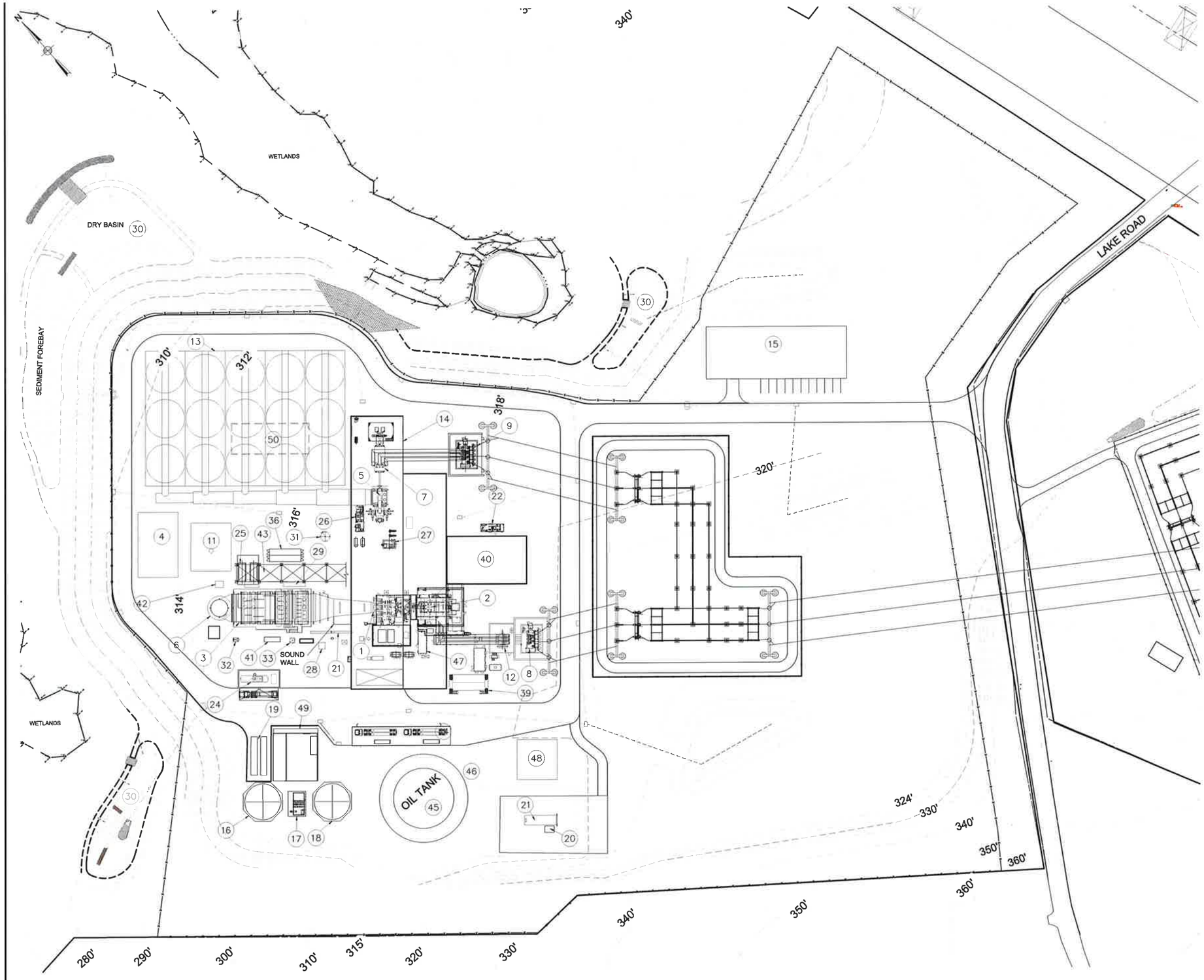
Table 5-4: Proposed CTG LAER and BACT Emission Rates

Pollutant	Natural Gas Firing (without duct firing)	Natural Gas Firing (with duct firing)	ULSD Firing
NO_x	2.0 ppmvdc	2.0 ppmvdc	4.0 ppmvdc
VOC	1.0 ppmvdc	2.0 ppmvdc	2.0 ppmvdc
CO	0.9 ppmvdc	1.7 ppmvdc	2.0 ppmvdc
$PM_{10}/PM_{2.5}$[a]	0.0055 lb/MMBtu	0.0059 lb/MMBtu	0.0155 lb/MMBtu
H_2SO_4	0.00056 lb/MMBtu	0.00053 lb/MMBtu	0.00054 lb/MMBtu
GHG	7,273 Btu/kW-hr (net, annual, natural gas firing at ISO full load, no supplemental firing)		
SO_2	0.0015 lb/MMBtu (≤0.5 gr S/100 scf)	0.0015 lb/MMBtu (≤0.5 gr S/100 scf)	0.0015 lb/MMBtu (≤15 ppmw S)
NH_3	2.0 ppmvdc	2.0 ppmvdc	5.0 ppmvdc

[a] $PM_{10}/PM_{2.5}$ lb/MMBtu emission rates cover all operating loads at or above minimum emissions compliance load (MECL)

lb/MMBtu = pounds per million British thermal units of fuel fired; Btu/kWh = British thermal units of fuel fired per kilowatt-hour of electricity generated; ppmw = parts per million weight; S = sulfur.

EXHIBIT 2



Notes

Legend

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50. ACC MECHANICAL/ELECTRICAL EQUIPMENT ENCLOSURE

Reference Drawings

Rev	Date	Drawn	Description	Chk'd	Appr'd
K	10/27/15	AF	FOR CLIENT REVIEW	KP	JW
J	10/26/15	AF	FOR CLIENT REVIEW	KP	JW
I	09/07/15	AF	FOR CLIENT REVIEW	KP	JW
H	07/14/15	AF	FOR CLIENT REVIEW	KP	JW
G	06/26/15	AF	FOR CLIENT REVIEW	KP	JW
F	05/24/15	AF	FOR CLIENT REVIEW	KP	JW
E	05/20/15	AF	FOR CLIENT REVIEW	KP	JW
D	05/04/15	AF	FOR CLIENT REVIEW	KP	JW
C	04/12/15	AF	FOR CLIENT REVIEW	KP	JW
B	04/11/15	AF	FOR CLIENT REVIEW	KP	JW
A	04/07/15	AF	FOR CLIENT REVIEW	KP	JW

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Client

NTE ENERGY

KILLINGLY ENERGY CENTER
KILLINGLY CONNECTICUT

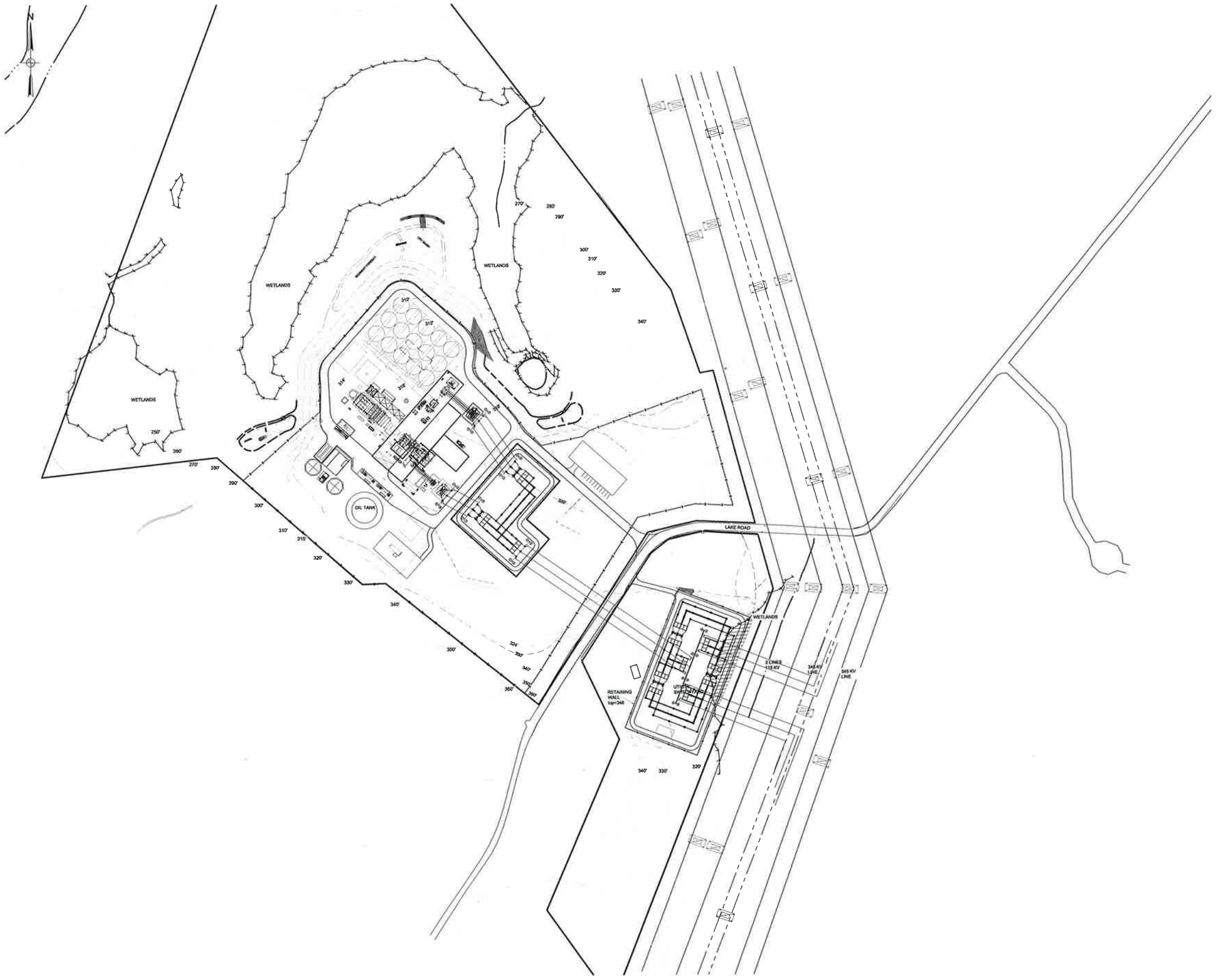
Title

GENERAL ARRANGEMENT
SIEMENS 8000H

PRELIMINARY
NOT FOR CONSTRUCTION
REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION

Designed	-	Eng check	JW
Drawn	AF	Approved	
Dwg check	KP	Project Mngr	JW
Scale at ANSI E	1" = 40'-0"	Date	04/07/15
			Rev K

Drawing Number
334954CT-GA-203



Notes

Legend

Reference Drawings

Rev	Date	Drawn	Description	Chk'd	App'd
J	10/27/18	AF	FOR CLIENT REVIEW	KP	JW
I	10/26/18	AF	FOR CLIENT REVIEW	KP	JW
H	09/07/18	AF	FOR CLIENT REVIEW	KP	JW
G	07/14/18	AF	FOR CLIENT REVIEW	KP	JW
F	05/29/18	AF	FOR CLIENT REVIEW	KP	JW
E	05/29/18	AF	FOR CLIENT REVIEW	KP	JW
D	4/27/18	AF	FOR CLIENT REVIEW	KP	JW
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B	04/11/18	AF	FOR CLIENT REVIEW	KP	JW
A	04/07/18	AF	FOR CLIENT REVIEW	KP	JW

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NOT FOR CONSTRUCTION
REPLACE WITH ENGINEER'S STAMP AT CONSTRUCTION AND/OR FABRICATION

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Drawn	AF	Approved	-
Dwg check	KP	Project Mngr	JW
Scale at ANSI E		Date	Rev
1" = 100'-0"		04/07/18	J

Drawing Number
334954CT-SA-203

EXHIBIT 3

STORMWATER POLLUTION PREVENTION PLAN

Prepared for

NTE CONNECTICUT, LLC
LAKE ROAD
KILLINGLY CONNECTICUT

August 2016
Revised to October 2016

Prepared for

Proposed Natural Gas Power Plant

Prepared by

Normand Thibeault Jr., P.E.
CT License #22834

CONTENTS

SECTION 6: INSPECTIONS AND REPORTING

6.1 Inspection Procedure
6.2 Reporting
6.3 Keeping Plans Current

SECTION 7: TURBIDITY MONITORING REQUIREMENTS

7.1 Monitoring Frequency
7.2 Sample Collection
7.3 Sampling Locations
7.4 Monitoring Reports
7.5 Reporting & Record Keeping Requirements

ATTACHMENTS

Attachment 1 – USDA-NRCS Soils mapping
Attachment 2 – CTDEEP Natural Diversity Database Mapping
Attachment 3 - HydroCAD Drainage Calculation Summaries (with drainage area maps)
Attachment 4 - Water Quality Basin Calculations
Attachment 5 – Temporary Sedimentation Basin Requirements
Attachment 6 – Sample Stormwater Construction Inspection Report

Grading Plans, Erosion and Sedimentation Control Plans & Details – Separate Enclosure

1. Site Evaluation, Assessment & Planning

1.1 Project/Site Description

NTE Connecticut, LLC is seeking local and state approvals to develop the Killingly Energy Center (KEC), an approximately 550-MW air-cooled electric generating facility and related electrical interconnection switchyard to be located on an approximately 73-acre site off Lake Road in the Town of Killingly, Connecticut; a natural gas lateral will provide fuel to the Generating Facility. Approximately 63-acre parcel north of Lake Road is the proposed location of the Generating Facility and a 10-acre portion of the property located south of Lake Road is the proposed location of the Switchyard. KEC will be located in an area designated in the Town's Plan of Conservation and Development for future industrial development in the northern portion of Killingly.

Structural stormwater collection systems have been designed to collect stormwater from paved and crushed stone surfaces for conveyance to stormwater detention/treatment basins. The basins have been positioned to discharge to the headwaters of existing wetlands systems to preserve the recharge and functionality of these systems. The basins incorporate water quality volume treatment into the design, a low level outlets and high level weir overflows, and below grade crushed stone levels to assist in groundwater recharge. The main basin will discharge to a level spreader positioned on flat terrain (3% slope) approximately 60' from the nearest wetland which also incorporates below grade storage. The stormwater outlet will be reinforced with riprap outlet protection and the level spreaders outfall will sheet flow overland through natural vegetation.

Conveyance of stormwater from the switchyard (southern portion of the site) will be via sheet flow over a crushed stone surface, to a grassed swale, and to a stormwater basin with a low level outlet and overflow weir. This basin will also serve as a recharge mechanism to the existing wetlands as well as to a proposed 18,400 square foot wetland mitigation area adjacent to the switchyard.

Where ever possible, sheet flow and overland discharge from pervious surfaces is incorporated into the design with limited storm drain installation and the construction of shallow depressions within the landscape to encourage infiltration and the preservation of natural terrain and ground cover adjacent to wetland resource areas Also, in accordance with the State of Connecticut 2004 Water Quality Guideline recommendations, stormwater runoff from impervious areas will be treated for water quality prior to discharge to the wetland resource areas.

1.2 Contact Information – Responsible Parties

Operator(s):

NTE Connecticut, LLC
24 Cathedral Place, Suite 300
St. Augustine, Florida

SWPPP Contact(s):

NTE Connecticut, LLC
24 Cathedral Place, Suite 300
St. Augustine, Florida
Mark Mirabito
904-687-1857

Killingly Engineering Associates
114 Westcott Road
P.O. Box 421, Dayville, CT
Normand Thibeault, Jr, P.E.
SWPPP Preparation
(860) 779-7299

SWPPP Preparation Date:

October 2016

Estimated Project Dates:

Project Start Date: Summer 2017
Project Completion Date: Spring/Summer 2020

Site Center Location:

Lake Road, Killingly, CT

N 875,990 E 1,227,084

1.3 Soils

According to the USDA-NRCS Web Soil Survey, the site consists of the following soils:

- Ridgebury, Leicester and Whitman soils - map unit 3;
- Walpole sandy loam – map unit 13;
- Ninigret and Tisbury soils – map unit 21;
- Hinckley loamy sand – map unit 38;
- Sutton fine sandy loam – map unit 52;
- Gloucester gravelly sandy loam – map unit 58;
- Canton & Charlton soils – map units 31 & 62;
- Charlton-Chatfield complex – map unit 73;
- Hollis-Chatfield-rock outcrop – map unit 75;

The presence of these soil series and soil mapping units were verified in the field by the project soil scientist in the course of delineating regulated wetlands and watercourses.

The bulk of the land disturbance and development will be conducted in areas shown as Canton and Charlton soils. These soils are well drained and stony but suitable for land development projects. For specific soil descriptions, please refer to the NRCS Web Soil Survey mapping provided as Attachment 1.

Borings were performed throughout the site and in the area of the main stormwater basin as part of a geotechnical analysis, performed by Haley and Aldrich (H&A). The results of the borings showed consistent soil characteristics throughout the site. The soils more than a few feet below grade predominantly consist of very dense glacial till type soils, and therefore the stormwater basins have been designed entirely above grade with a crushed stone base to encourage infiltration and recharge to the adjacent wetlands. As a conservative measure, the design calculations do not assume infiltration from the lower glacial till layer, though there will be some.

1.4 Existing Conditions

The site consists of approximately 73-acres and is located on the northern and southern sides of Lake Road. The site is divided by Lake Road that runs essentially in a northeast-southwest direction. The eastern 10.099-acre property where the switchyard will be constructed is wooded at the higher elevation on the southwestern end, and drains down gradient to the north and east toward an existing agricultural field and ultimately to a wetland system adjacent to the Connecticut Light and Power right of way. The larger northern portion of the property drains predominantly to the north to a large centrally located wetland system. This system flows off site to the northwest to a small depression shown on FEMA mapping as flood zone "A" (flood elevation undetermined). This area is more than 40' lower in elevation than the proposed development.

The existing drainage area to these wetlands is approximately 45 acres. The Quinebaug River is located further to the north and west from the proposed development; the project

will not result in any direct stormwater discharge to the Quinnebaug River. A small western and northwestern section of the site separated from the bulk of the site by a prominent ridgeline, drains directly to the Quinebuag River via a seasonal watercourse.

The bulk of the area slated for development has been historically utilized for activities associated with agricultural purposes. Numerous on-site fam dump areas were identified adjacent to wetland resource areas. These on-site disposal areas are not uncommon to the area or with agricultural activities and contain household wastes (bottles & cans), paper and cardboard, appliances, and automobile and farm equipment parts.
The following statements can be made regarding the project:

- The project is not located within the Coastal Boundary and therefore a coastal site plan approval in accordance with Sections 22a-92 and 22a-93(15) of the Connecticut General Statutes is not required.
- The project is not located within an aquifer protection area. Statewide aquifer protection mapping available from the CTDEEP website http://cteco.uconn.edu/map_catalog/maps/state/stateAPA.pdf shows no aquifer protection areas in the area of the development.
- There will not be any direct stormwater discharge to the Quinebaug River. The nearest point of disturbance will be greater than 1000' from the river and is protected by conservation land and higher terrain.
- Plan review certification will be provided by a qualified professional engineer.
- No direct wetland impacts are proposed on the northern portion of the project.

1.5 Proposed Conditions

Development on the northern side of Lake Road for the generating facility will result in the disturbance of approximately 24 acres of land (including construction laydown) and will require some significant grading to create a usable surface. Slopes throughout the site of the generating facility will be approximately 2% and surfaces will be comprised predominantly of pervious materials. Of the 24-acre disturbance on the north side of Lake Road, only 2.1 acres of paved surfaces are proposed and additional 4.0 acres of building for a total of 6.0 acres.

The site does not and will not discharge directly to a perennial surface water body (the Quinebaug River). The discharges from proposed detention basins have been designed to drain adjacent to on-site wetlands. The discharges have been designed with the appropriate outlet protection and/or treatment in accordance with the state stormwater quality guidelines. After the discharge point, overland sheet flow is incorporated into the design prior to final discharge to existing on-site wetlands.

Development on the south side of Lake Road for the switchyard will result in the disturbance of approximately 5 acres of land with a direct wetland impact of approximately 12,500 square feet. Total area of disturbance includes the construction laydown area. Grading at the south-southwest portion of the site will be minimized with the construction of a retaining wall and grades across the switchyard will be less than 3%.

Total impervious surface around the perimeter of the switchyard will be 15,600 square feet. The remainder of the switchyard surface will be comprised of a crushed stone surface.

In order to offset for the loss of wetlands, the eastern agricultural field adjacent to the switchyard will be mitigated in return at the completion of construction. Wetland replication shall take place within a portion of the agricultural field, adjacent to existing wetland areas. This shall take place at the completion of construction and staging activities and includes creation of 18,400 square feet of additional wetlands, the removal of an additional 18,000 square feet of wetlands enhancement by removal of invasive vegetation, and the designation of a 33,550 s.f. (0.77 acres) of land to conservation.

The drainage design and water quality mechanisms have been designed in accordance with the State of Connecticut 2004 Stormwater Quality Manual. Construction erosion and sedimentation control mechanisms follow the recommendations of the 2002 Connecticut Guidelines for soil erosion and sediment control.

1.6 Potential Sources of Pollution

Sources of water pollution on construction sites include: diesel and oil; paint, solvents, cleaners and other chemicals; and construction debris and dirt. When land is cleared it creates the potential for soil erosion which may lead to silt-bearing run-off, wind-blown soils and sediment, and sediment erosion into resource areas. Silt and soil that runs into natural waterways may turn them turbid, which ultimately restricts sunlight filtration and may affect aquatic life. The erosion and sedimentation controls during construction and water quality treatments designed for post construction assure that resource areas will not be detrimentally impacted by this project.

1.7 Endangered, Protected or Species of Concern

Reference to the June 2016 Natural Diversity Database Mapping shows the property may be subject to known listed species. The construction activity will not threaten the continued existence of any species listed pursuant to section 26-306 of the Connecticut General Statutes as endangered or threatened and will not result in the destruction or adverse modification of habitat designated as essential to such species (see Appendix A).

1.8 Historic Preservation

Phase I and Phase II Archeological investigations were conducted on site. Any areas of archeological sensitivity or concern as identified by the SHPO will be preserved.

2. Erosion & Sedimentation Control BMP's

Detailed Erosion and Sedimentation control measures have been outlined on the plans and are in accordance with the 2002 Guidelines.

2.1 Minimize Disturbed Areas and Protect Natural Features

The primary function of erosion and sediment controls is to absorb erosional energies and reduce runoff velocities that force the detachment and transport of soil and/or encourage the deposition of eroded soil particles before they reach any sensitive area.

2.1.1 Keep Land Disturbance Minimized

The more land that is in vegetative cover, the more surface water will infiltrate into the soil, thus minimizing stormwater runoff and potential erosion. Keeping land disturbance to a minimum not only involves minimizing the extent of exposure at any one time, but also the duration of exposure. Phasing, sequencing and construction scheduling are interrelated. Phasing divides a large project into distinct sections where construction work over a specific area occurs over distinct periods of time and each phase is not dependent upon a subsequent phase in order to be functional. A sequence is the order in which construction activities are to occur during any particular phase. A sequence should be developed on the premise of "first things first" and "last things last" with proper attention given to the inclusion of adequate erosion and sediment control measures. A construction schedule is a sequence with time lines applied to it and should address the potential overlap of actions in a sequence which may be in conflict with each other.

- Limit areas of clearing and grading. Protect natural vegetation from construction equipment with fencing, tree armoring, and retaining walls or tree wells.
- Route traffic patterns within the site to avoid existing or newly planted vegetation.
- Phase construction so that areas which are actively being developed at any one time are minimized and only that area under construction is exposed. Clear only those areas essential for construction.
- Sequence the construction of storm drainage systems so that they are operational as soon as possible during construction. Ensure outlets are stable before conveying storm drainage flow into them.
- Schedule construction so that final grading and stabilization is completed as soon as possible.

2.2 Phase Construction Activities

The project will disturb a total of approximately 29 acres over the duration of the construction (generation facility and switchyard). This disturbance consists of grading to create minimally sloped areas for site facilities and buildings, access roadway, facilities

building, support buildings and parking. The clearing and grading activities will commence prior to any buildings or infrastructure with all required tree removal conducted as a single phase. Site work will be done per the sequence outlined on the design plans and as listed below. All construction will be conducted in accordance with the 2002 CTDEEP Guidelines for Soil Erosion and Sediment Control (the Guidelines"). The construction will generally proceed as follows:

1. Flag the limits of construction disturbance necessary to facilitate the pre-construction meeting.
2. Contact Call Before You Dig at 1-800-922-4455 to mark out existing utilities.
3. Hold the pre-construction meeting.
4. Install the anti-tracking construction entrance.
5. Cut trees within the defined clearing limits and remove cut wood. Chip brush, branches and small trees and stockpile chips for use on site for erosion and sedimentation control.
6. Install perimeter erosion and sedimentation controls.
7. Remove stumps and transport off site. No stumps shall be buried on site.
8. Remove topsoil and grade construction staging and laydown area. Install crushed stone or rolled gravel surface and grade to provide positive drainage to perimeter of laydown area. Construct temporary sediment basin and install perimeter erosion controls in accordance with plans.
9. Strip and stockpile topsoil within the footprint of the construction phase area. Install perimeter erosion and sedimentation controls around stockpiles.
10. Make required cuts and fills and construct proposed retaining walls as fills are being placed adjacent to wetlands area and as cuts are made for the switchyard. Required rock blasting shall be conducted in accordance with Section 3.6 of this Plan and with applicable state and local regulations.
11. Establish the subgrade for topsoil areas, buildings, perimeter roadway and parking areas. Bench buildings to a subgrade and allow for sufficient area around building footprints for construction activities.
12. Begin building and equipment construction.
13. Install surface water controls such as temporary sedimentation basins, diversions, and stone or wood chip dikes and insure that discharge locations are stable. Engineer shall evaluate unstable conditions for recommended alternatives prior to installing surface controls.
14. Construct Stormwater basin, outlet and outlet protection and utilize basin as a temporary sedimentation basin during construction. Plug low level outlet until all areas on site have been stabilized and basin vegetation is established.
15. Install all utilities and drainage systems to within 5' of the buildings and facilities or as modified by the site engineer for specific site conditions.
16. Prepare sub-base, slopes, parking areas, shoulder areas, access roads and any additional areas of disturbance for final grading.
17. Install topsoil on fill and cut slopes, seed disturbed areas and install erosion control fabric to protect against runoff erosion or raindrop impact.
18. Install and compact processed aggregate for pavement areas.
19. Install crushed stone surfaces where call for on the design plans.

20. Place remaining topsoil where required and complete perimeter landscaping. Fine grade, rake, seed and mulch to within 2' of curbs or paved areas.
21. Upon substantial completion of the building(s) and plant equipment areas, complete the balance of the site work and stabilization of remaining disturbed areas. Install first course of paving.
22. When all other work has been completed, repair and sweep all paved areas for final course of paving. Inspect drainage system and stormwater basin and remove accumulated sediment.
23. Install final course of pavement and unplug low level outlet from stormwater basin.
24. After site is stabilized, remove all erosion and sedimentation controls such as geotextile silt fence. Stone or wood chip berms may be left in place upon the completion of construction.
25. With the exception of blasting, sequence is essentially repeated for both sides of Lake Road.

2.3 Control Stormwater Flowing onto and Through the Project

2.3 .1 Slow the Flow

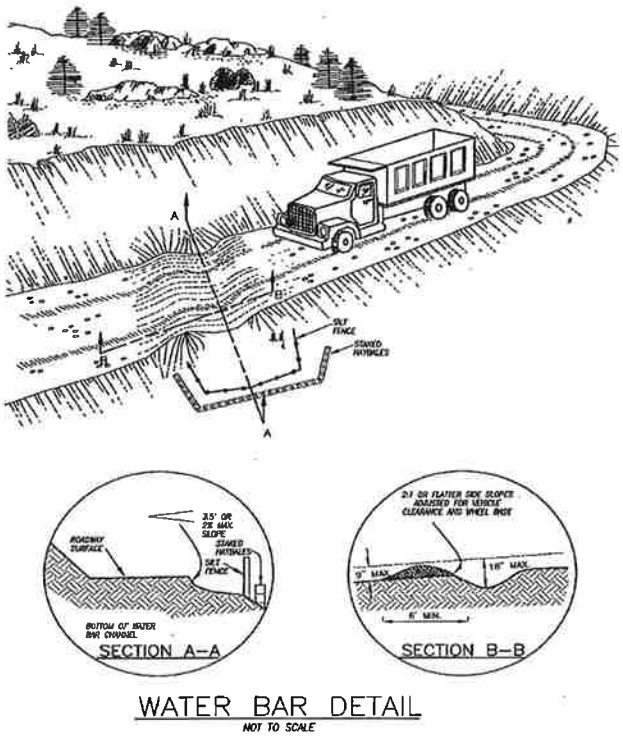
Detachment and transport of eroded soil must be kept to a minimum by absorbing and reducing the erosive energy of water. The erosive energy of water increases as the volume and velocity of runoff increases. The volume and velocity of runoff increases during development as a result of reduced infiltration rates caused by the removal of existing vegetation, removal of topsoil, compaction of soil and the construction of impervious surfaces.

- Use diversions, stone dikes, silt fences and similar measures to break flow lines and dissipate storm water energy.
- Avoid diverting one drainage system into another without evaluating the potential for downstream flooding or erosion.

2.3.2 Keep Clean Runoff Separated

Clean runoff should be kept separated from sediment laden water and should not be directed over disturbed areas without additional controls. Additionally, prevent the mixing of clean off-site generated runoff with sediment laden runoff generated on-site until after adequate filtration of on-site waters has occurred.

- Segregate construction waters from clean water.
- Divert site runoff to keep it isolated from wetlands, watercourses and drainage ways that flow through or near the development until the sediment in that runoff is trapped or detained.



WATER BAR DETAIL
NOT TO SCALE

2.4 Preserve & Stabilize Soils

The preserved areas of existing vegetation, as identified on the site plans, will be flagged in the field prior to clearing. Vehicles and equipment will be kept away from these areas. Topsoil stripped from the immediate construction area will be stockpiled as identified on the site plans. The stockpiles will be in areas that will not interfere with construction phases and at least 15 feet away from areas of concentrated flows or pavement. The slopes of the stockpiles will not exceed 2:1 to prevent erosion. A silt fence or wood chip berm will be installed around the perimeter of each stockpile immediately upon formation. Stockpiles that will stand for more than 30 days will be stabilized with temporary seeding PER Figure TS-2.

- Topsoiling including the stripping and reapplication of topsoil to promote the growth of vegetation following establishment of final grades. Distribute topsoil evenly to a minimum depth of 4".
- Land Grading Restrictions such as minimizing slope lengths, reverse benches for slopes exceeding 15' in height, and compacting cuts and fills to reduce erosion for establishment of a stable slope.
- Provide Surface Roughening with tracked machinery up and down slopes to create horizontal depressions in the soil.

Figure TS-2 Temporary Seeding Rates and Dates

Species[4]	Seeding Rates (pounds) /Acre	Seeding Rates (pounds) /1000 sq. ft.	Optimum Seed Depth[2] (inches)	Optimum Seeding Dates[1] 3/1 – 10/15	Plant Characteristics
Annual ryegrass Lolium multiflorum	40	1.0	0.5		May be added in mixes. Will mow out of most stands
Perennial ryegrass Lolium perenne	40	1.0	0.5		Use for winter cover. Tolerates cold and low moisture
Winter Rye Secale cereale	120	3.0	1.0		Quick germination and heavy spring growth. Dies back in June with little regrowth
Oats Avena sativa	80	2.0	1.0		In northern CT, will winter kill with the first killing frost and may through out the state in severe winters.
Winter Wheat Triticum aestivum	120	3.0	1.0		Quick germination with moderate growth. Dies back in June with no regrowth
Millet Echinochloa crusgalli	20	0.5	1.0		Warm season small grain. Dies with frost in September
Sudangrass Sorghum sudanense	30	0.7[3]	1.0		Tolerates warm temperatures and drought conditions
Buckwheat Eqopyrum esculentum	15	0.4	1.0		Hardy plant that will reseed itself and is good as a green manure crop.
Weeping lovegrass Eragostis curbula	5	0.2	0.25		Warm-season perennial. May branch. Tolerates hot, dry slopes and infertile soils. Excellent nurse crop. Usually winter kills
DOT All Purpose Mix[5]	150	3.4	0.5		Suitable for all conditions

[1] May be planted throughout summer if soil moisture is adequate or can be irrigated. Fall seeding may be extended 15 days in the coastal areas.

[2] Seed at twice the indicated depth for sandy soils.

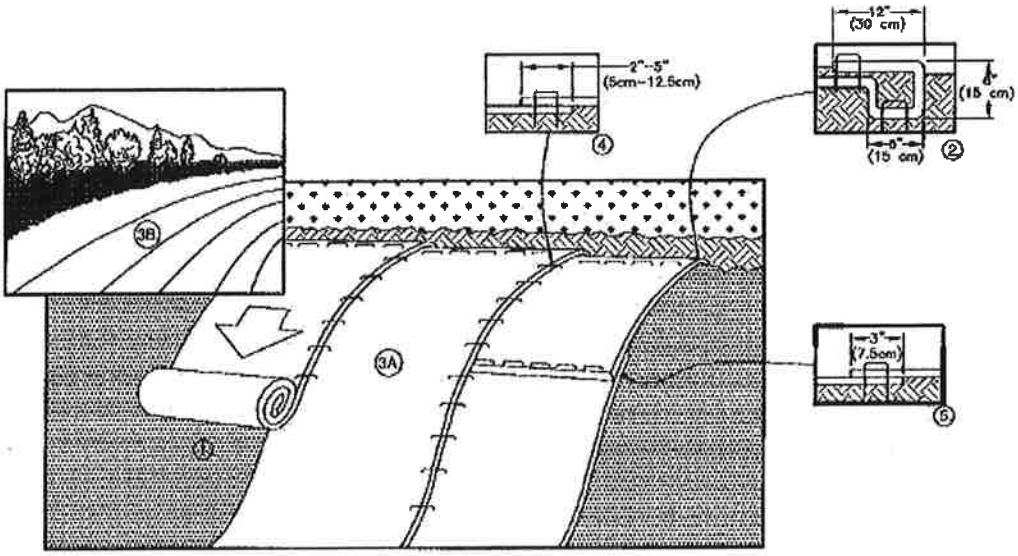
[3] See Permanent Seeding **Figure PS-3** for seeding mixture requirements.

[4] Listed species may be used in combinations to obtain a broader time spectrum. If used in combinations, reduce each species planting rate by 20% of that listed.

2.5 Protect Slopes

Provide erosion control blanketing/turf reinforcement Mats on slopes greater than 3:1.

Geotextile erosion control blankets or jute netting will be used to provide stabilization for slopes. The blanket will cover the entire area of the graded slopes which will be seeded and mulched before the blanket is applied. The blanket will be installed by digging a small trench on the upside of the slope, 12 inches wide by 6 inches deep, and stapling the leading edge of the blanket in the trench. The blanket will be rolled down the slope slowly to maintain soil contact and stapled in 12-inch intervals. If the blanket cannot cover the entire slope, the blankets will be overlapped (minimum of 2 inches) and stapled at the overlapped edge. The erosion control blanket will always be installed according to the manufacturer's instructions and specifications.



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM™, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" (5cm-12.5cm) OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.

NOTES:

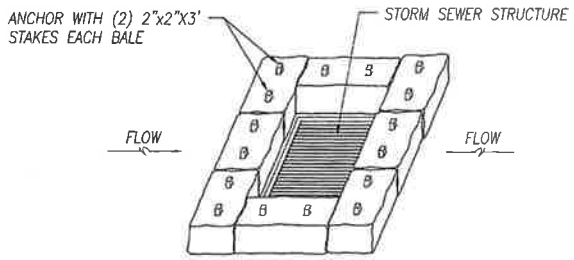
1. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
2. TURF REINFORCEMENT MAT SHALL BE NORTH AMERICAN GREEN P-300® OR APPROVED EQUIVALENT.

TURF REINFORCEMENT MAT INSTALLATION

NOT TO SCALE

2.6 Protect Storm Drain Inlets

Storm drains may be protected from sediment by installation of staked haybales prior to paving. After the first course of pavement has been installed, silt socks or sacks, crushed stone berms or stone filled geotextile may be used.

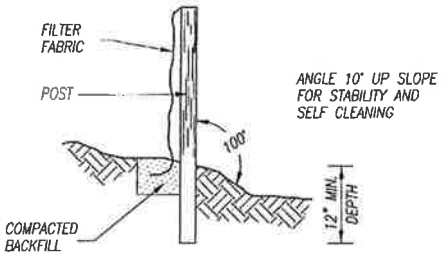


HAYBALE INSTALLATION
AT CATCH BASIN

2.7 Establish Perimeter Controls & Sediment Barriers

While it may seem less complicated to collect all waters to one point of discharge for treatment and just install a perimeter control, it can be more effective to apply internal controls to many small sub-drainage basins within the site. By reducing sediment loading from within the site, the chance of perimeter control failure and the potential off-site damage that it can cause is reduced. It is generally more costly to correct off-site damage than it is to install proper internal controls.

- Control erosion and sedimentation in the smallest drainage area possible. It is easier to control erosion than to contend with sediment after it has been carried downstream and deposited in unwanted areas.
- Direct runoff from small disturbed areas to adjoining undisturbed vegetated areas to reduce the potential for concentrated flows and increase settlement and filtering of sediments.
- Concentrated runoff from development should be safely conveyed to stable outlets using rip rapped channels, waterways, diversions, storm drains or similar measures.
- Determine the need for sediment basins. Sediment basins are required on larger developments where major grading is planned and where it is impossible or impractical to control erosion at the source. Sediment basins are needed on large and small sites when sensitive areas such as wetlands, watercourses, and streets would be impacted by off-site sediment deposition. Do not locate sediment basins in wetlands or permanent or intermittent watercourses. Sediment basins should be located to intercept runoff prior to its entry into the wetland or watercourse.

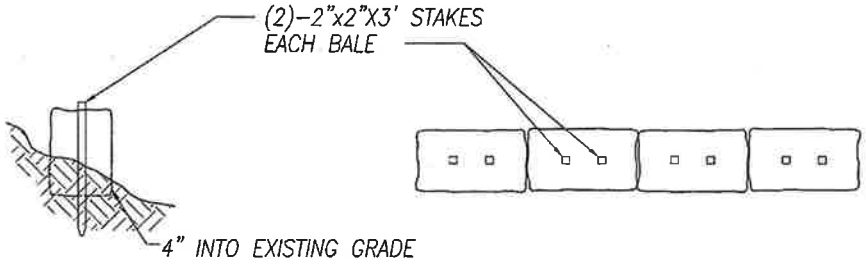


SILT FENCE

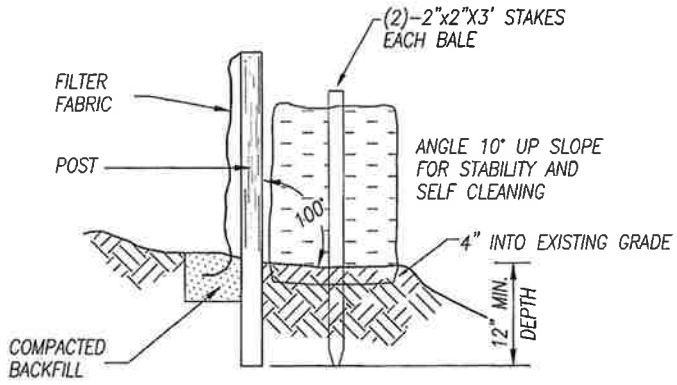
NOT TO SCALE

The silt fence barrier will be installed by excavating a 6-inch-deep trench. Wooden posts supporting the silt fence will be spaced 2 to 3 feet apart and driven securely into the ground; a minimum of 18 to 20 inches deep. The bottom edge of the silt fence will extend across the bottom of the trench and the trench will be backfilled and compacted to prevent stormwater and sediment from discharging underneath the silt fence.

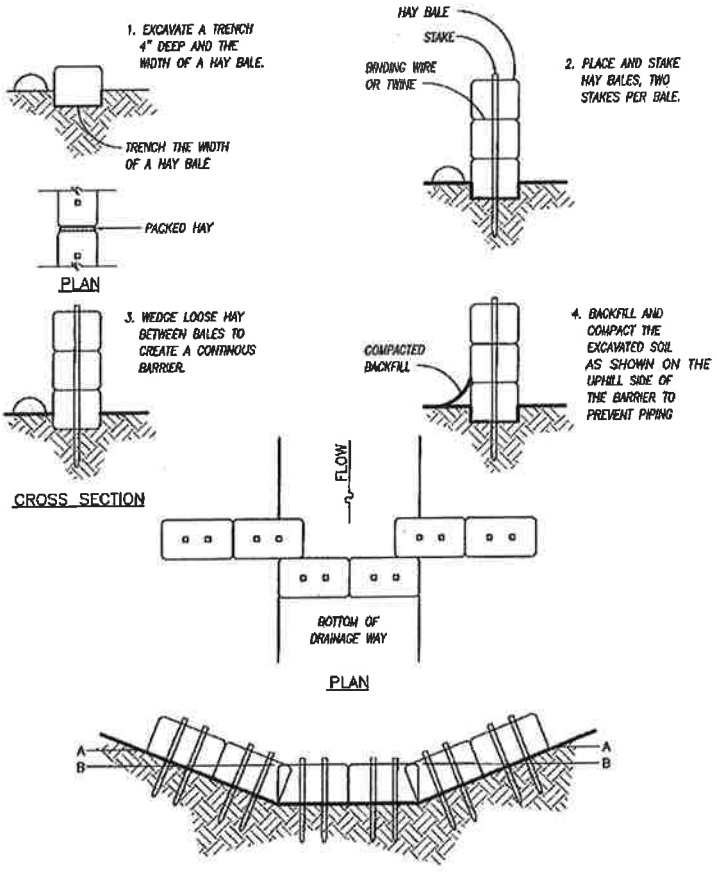
Hay bales may be utilized in lieu of silt fencing or as backing for silt fence in areas of excessive or problematic erosion. Bales may also be utilized as check dams in temporary swales or as protection around catch basins prior to paving.



HAYBALE BARRIER



SILT FENCE – BACKED WITH HAYBALES



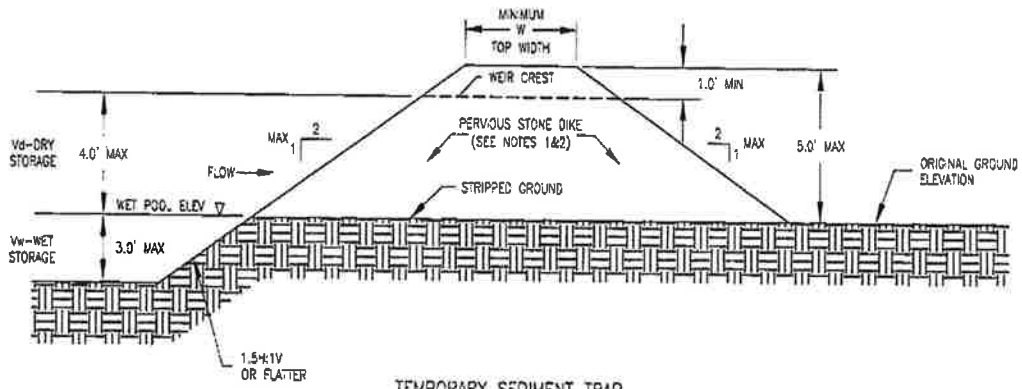
HAYBALE CHECK DAM

NOT TO SCALE

2.8 Construct Temporary Sediment Basins & Diversion Channels

Temporary Sediment Basins are designed and installed to intercept and retain sediment during construction. They prevent erosion and sediment near the source and reduce and/or abate water body impacts, prevent deposition of sediment into undeveloped or undisturbed areas. Basins should be constructed with controlled outlets and designed to have wet and dry storage capacities. Basins may be created by constructing a dam to trap and impound surface water (an embankment basin) or by excavation (an excavated sediment basin), or a combination of both. Method of construction shall be as shown in the detail below and in the locations shown on the design plans.

Diversion channels are constructed with a berm of tamped or compacted soil placed in a manner to divert runoff flows. They are typically constructed to divert sediment laden soils from disturbed areas to temporary sediment basins or to divert clean runoff away from disturbed areas of 25 acres or less. Refer to Figure TD-1 from the 2002 Guidelines. For diversions with slopes of greater than 2%, the necessity for stabilization of the channel should be evaluated (e.g. temporary seeding, riprap, erosion control blankets). For these channels, stone or wood chip check dams should be installed at every 2' of grade change to slow and filter sediment laden stormwater.



TEMPORARY SEDIMENT TRAP
EMBANKMENT CROSS SECTION
NOT TO SCALE

TOP WIDTH VS. HEIGHT

H = HEIGHT OF EMBANKMENT
W= TOP WIDTH OF EMBANKMENT

H(ft)	W(ft)
1.5	2.0
2.0	2.0
2.5	2.5
3.0	2.5
3.5	3.0
4.0	3.0
4.5	4.0
5.0	4.5

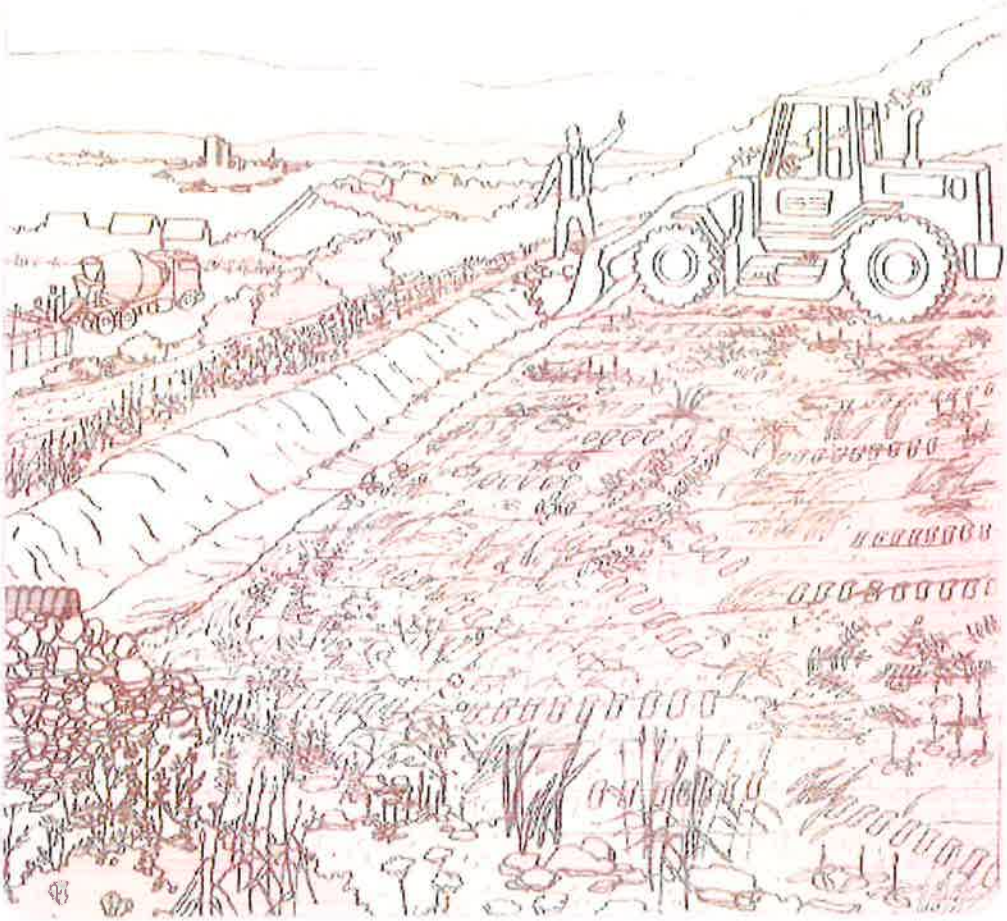
NOTES:

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE 2002 CONNECTICUT GUIDELINES FOR SOIL AND EROSION CONTROL, SECTIONS 5-11-25 THRU 5-11-29.
2. PERVIOUS STONE DIKE SHALL BE CONSTRUCTED OF MODIFIED RIPRAP (CTDOT M.12.02) WITH #3 STONE ON FACE (CTDOT M.01.01).
3. NON-OVERFLOW PORTIONS AND ABUTMENTS OF TEMPORARY SEDIMENT TRAPS MAY BE CONSTRUCTED OF ENGINEER APPROVED BACKFILL COMPACTED IN 9" LAYERS. USE ONLY MATERIAL FOR THE EMBANKMENT THAT IS FREE FROM EXCESSIVE ORGANICS, DEBRIS, ROCKS OVER 6" IN DIAMETER OR OTHER UNSUITABLE MATERIALS.
4. IF, IN THE JUDGEMENT OF THE ENGINEER, MATERIALS FROM ON-SITE EXCAVATION ACTIVITIES ARE NOT SUITABLE FOR CONSTRUCTION OF SEDIMENT TRAP EMBANKMENTS, MATERIALS SHALL BE IMPORTED TO THE SITE.
5. EARTHEN EMBANKMENTS SHALL BE STABILIZED WITH TEMPORARY SEEDING, PERMENANT SEEDING OR STONE SLOPE PROTECTION IMMEDIATELY AFTER INSTALLATION.
6. TEMPORARY SEDIMENT TRAP(S) SHALL BE INSPECTED AT LEAST ONCE PER WEEK AND WITHIN 24 HOURS OF THE END OF A STORM OF 0.5 INCHES OF RAINFALL OR GREATER. REMOVE ACCUMULATED SEDIMENT WHEN ONE HALF OF THE MINIMUM WET STORAGE VOLUME HAS BEEN FILLED. DISPOSE OF REMOVED SEDIMENT IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.

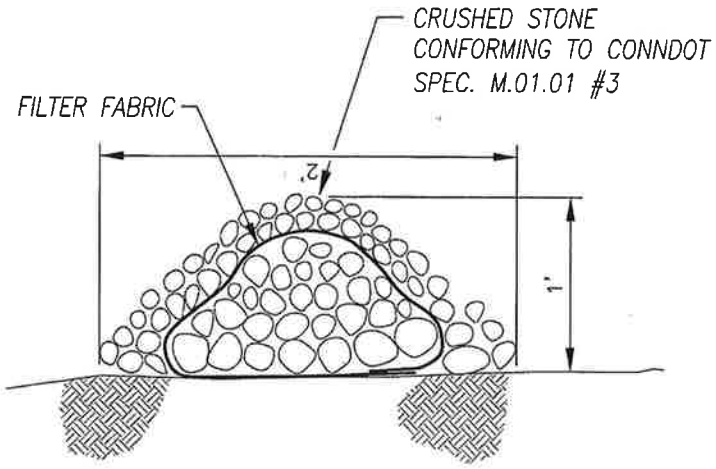
The erosion and sedimentation control design calls for temporary diversion channels during construction per figure TD-1 above to convey overland runoff from and around disturbed areas to temporary sediment basins. Temporary diversions are typically constructed with a berm of tamped or compacted soil placed in a manner to divert flows. Their purpose is to:

- Divert sediment-laden runoff from a disturbed area to a sediment-trapping facility such as a temporary sediment trap, sediment basin r vegetative filter.
- Divert water originating from undisturbed areas away from where construction activities are taking place.
- Fragment disturbed areas which thereby reduce the velocity and concentration of runoff.

Figure TD-1 Requirements for Non-Engineered Temporary Diversions



Stone check dams placed at 50' intervals within the temporary diversions will assist in reducing velocities and providing a filtering mechanism for removal of sediment.

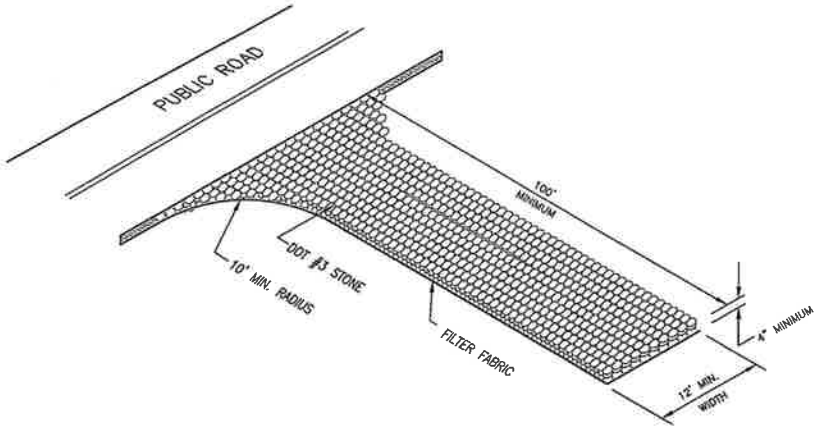


STONE CHECK DAM

NOT TO SCALE

2.9 Establish Stabilized Construction Entrances

Install stabilized construction entrances/anti tracking pads at any and all access/egress points to the site to prevent tire tracked soils and sediment onto paved surfaces.



CONSTRUCTION ENTRANCE

NOT TO SCALE

Construction shall be in accordance with 5-12-2 of the 2002 guidelines. These pads shall be maintained by the addition of stone or lengthening of the entrances as necessary to alleviate sediment transport.

2.10 Additional BMP's

2.10.1 Dust Control

Dust control measures should be taken when it has been determined that other measures for stabilization cannot be practically applied.

- Mechanical Sweeping shall be used on paved areas where dust and fine materials accumulate as a result of truck traffic or wind and water deposits from adjacent areas. Sweep daily in heavily trafficked areas.
- Apply water to exposed soil surfaces and unpaved travel ways.
- Non-asphaltic soil tackifiers may be use consisting of an emulsified liquid soil stabilizer of organic, inorganic or mineral origin. The solutions shall be non-toxic to human, animal or plant life, non-corrosive and nonflammable. Materials shall meet local, state nd federal guidelines for intended use and shall be applied per the manufacturer's recommendations.

2.10.2 Wood Chips

Clearing of brush and woody vegetation for the purposes of construction will generate wood chips when unmarketable wood is chipped and slashed on site. These chips may be utilized as berms around the perimeter of site disturbances, check dams in swales where slopes are 3% or less, reinforcement behind silt fencing in areas of persistent problematic erosion. They may also be utilized as mulch and spread over exposed surfaces to prevent erosion from rain drop impact; an approved per EPA National Pollutant Discharge Elimination System (NPDES). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=41

Chips may also be combined with compost to create filter berms to prevent sediment transport. In a combined effort, the Connecticut Department of Transportation and the CTDEEP collaborated on a 2-year research project to demonstrate the effectiveness of this application.
http://www.ct.gov/deep/cwp/view.asp?A=2718&Q=325354

3 Good Housekeeping BMP's

3.1 Material Handling & Housekeeping

This section sets forth the requirements for handling, storage, and disposal of material. It specifically addresses the requirements for storing material in open areas; stacking bagged material; storing material in bulk; storing lumber; storing bricks and masonry blocks; handling and storing cement and lime; handling and storing reinforcing sheet and structural steel; handling and storing pipe, conduit, and cylindrical material; storing sand, gravel, and crushed stone; handling and storing flammable and combustible liquids; handling asphalt and tar products; handling liquefied petroleum gas & diesel; and housekeeping.

Materials shall be stored in a manner that does not endanger worker safety. Hazardous materials shall be stored in accordance with the individual requirements. Store all materials on pallets and immediately clean up spills and leaks that could create environmental issues.

- Stack lumber on level and solidly supported sills so that the stacks are stable. Do not pile lumber more than 16 feet high.
- Bagged concrete, mortar or lime shall be stacked on pallets and kept covered at all times. Broken or torn bags shall be removed and disposed of offsite.
- Make sure cylindrical materials are stable when storing or handling. Stacking. Place pipe, conduit bar stock, and other cylindrical materials in racks or stack and block them on a firm, level surface to prevent spreading, rolling, or falling. Use either a pyramided or battened stack. Step back battened stacks at least one unit per tier and securely chock them on both sides of the stack.
- Locate stockpiles to provide safe access for withdrawing material. Material or vertical faces must not overhang. Stockpiles shall be surrounded with silt fence, staked haybales or wood chip berms to prevent erosion from the stockpiles or flow of water into them. Topsoil stockpiles left for more than 30 days shall be over seeded in accordance with Table TS-2, Section 2.4.
- Most flammable and combustible liquids are highly toxic. Use them only after determining their toxic characteristics. In handling toxic liquids, follow the appropriate safety and health requirements in the "Occupational Health" section.
- Closed tanks and containers for combustibles shall not exceed the requirements as outlined in the following table:

-Maximum allowable size of containers and portable tanks, combustible

	Flammable liquids			Liquids	
Container type	Class IA	Class IB	Class IB	Class II	Class III
Glass	1 pint	1 quart	1 gallon	1 gallon	5 gallons
Metal	1 gallon	5 gallons	5 gallons	5 gallons	5 gallons
Safety cans	2 gallon	5 gallons	5 gallons	5 gallons	5 gallons
Metal drums	60 gallons	60 gallons	60 gallons	60 gallons	60 gallons
Approved portable tanks	660 gallons	660 gallons	660 gallons	660 gallons	660 gallons
Polyethylene	1 gallon	5 gallons	5 gallons	60 gallons	60 gallons

- **Outdoor Housekeeping -** Keep the areas adjacent to facilities free from rubbish, waste, and tall, dry vegetation. Place combustible waste materials stored outdoors to await subsequent disposal at least 20 feet away from facilities.
- **Tools and Equipment** - To prevent tripping or injury, keep areas clear of tools and portable equipment. Adequately secure tools, materials, and equipment where a tripping hazard exists.
- **Wind** - Store loose or light materials on roofs or unenclosed height only if they are safely tied down or secured.
- **Sacks and Bags** - Remove empty bags that contained cement, lime, or other dust-producing material from the work area at least daily.
- **Excavated Materials** - Keep drives and walkways clear of excavated materials wherever possible. Where this is not possible, adequately post or barricade these areas and provide alternative access.

3.2 Construction Staging Areas

Construction staging areas shall be located as shown on the plans or within locations approved by the site inspector or engineer. Designate where vehicles or construction trailers will turn around or park, where excavated soil or building materials will be stockpiled, where excavation equipment will be unloaded and loaded, where job-site waste will be stored for recycling, etc. Setting up and ensuring use of staging areas requires installation of a packed pervious surface, free of organics or erodible soils. In areas of soft soils, installation of a geogrid prior to placement of a packed pervious surface may be necessary to stabilize surfaces for support of construction equipment and

materials. Staging areas will be evaluated prior to the start of construction to assess surface treatment needs.

3.3 Designate Vehicle Fueling and Maintenance Areas

Designated fueling areas shall be designed to prevent stormwater runoff and spills. It is recommended that fuel-dispensing areas be paved with cement, concrete, or an equivalent impervious surface, with a two to four percent slope to prevent ponding, and separated from the rest of the site by a grade break or berm that prevents run-on of stormwater.

Where practical, fuel dispensing areas should be covered, and the cover's minimum dimensions must be equal to or greater than the area within the grade break or the fuel dispensing area. The cover should not drain onto the fuel dispensing area. Use a perimeter drain or slope the surface inward so that runoff drains to a blind sump. It might be necessary to install and maintain an oil control device in catch basins that might receive runoff from the fueling area.

For fueling with a mobile fuel truck, consider establishing a designated fueling area. Place temporary "caps" over nearby catch basins or manhole covers so that if a spill occurs it is prevented from entering the storm drain). A form of secondary containment should be used when transferring fuel from the tank truck to the fuel tank. Storm drains in the vicinity should also be covered. Install vapor recovery nozzles to help control drips as well as reduce air pollution. Fueling areas should have a spill prevention plan and necessary spill kits located nearby.

General Fueling Requirements:

- When fueling must occur onsite, the contractor shall select and designate an area to be used, subject to approval of the Project Engineer or designee of the Town.
- Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.
- Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Dedicated fueling areas shall be protected from storm water run-on and runoff, and shall be located at least 100 feet from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended.
- Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.
- Fuel tanks shall not be "topped-off."

- Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.
- Absorbent spill clean-up materials shall be available in fueling and maintenance areas and used on small spills instead of hosing down or burying techniques. The spent absorbent material shall be removed promptly and disposed of properly.
- Federal, state, and local requirements shall be observed for any stationary above ground storage tanks.
- Mobile fueling of construction equipment throughout the site shall be minimized. Whenever practical, equipment shall be transported to the designated fueling area.
- Fueling areas and storage tanks shall be inspected regularly.
- Keep an ample supply of spill cleanup material on the site.
- Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.

3.4 Vehicle Washing & Maintenance

The plans as presented do not consider on-site vehicle washing. Ideally, vehicle maintenance and washing occurs in garages and wash facilities, not on active construction sites. However, if these activities must occur onsite, operators should follow appropriate BMPs to prevent untreated nutrient-enriched wastewater or hazardous wastes from being discharged to surface or ground waters. Appropriate BMPs include the following:

- Provide a covered, paved area dedicated to vehicle maintenance and washing;
- Ensure that the areas are properly connected to a liquids collection system;
- Develop a spill prevention and cleanup plan;
- Prevent hazardous chemical leaks by properly maintaining vehicles and equipment;
- Properly cover and provide secondary containment for fuel drums and toxic materials;
- Properly handle and dispose of vehicle wastes and wash water;

Inspect construction vehicles daily, and repair any leaks immediately. Dispose of all used oil, antifreeze, solvents and other automotive-related chemicals according to manufacturer instructions. These wastes require special handling and disposal. Used oil, antifreeze, and some solvents can be recycled at designated facilities, but other chemicals must be disposed of at a hazardous waste disposal site.

Designate areas for vehicle repair. If cleaning is necessary, use blowers or vacuums instead of water to remove dry materials from vehicles if possible. Water alone can remove most dirt adequately, use high-pressure water spray without detergents at vehicle washing areas. If detergents must be used avoid phosphate- or organic-based cleansers to reduce nutrient enrichment and biological oxygen demand in wastewater. Use only

biodegradable products that are free of halogenated solvents. Clearly mark all washing areas.

3.5 Spill Prevention & Control

Small spills (5 gallons or less) of fuels, oils, chemicals or solvents at the site can be cleaned up in accordance with the following procedure:

1. Have proper protective equipment available for personnel cleaning up the spill.
2. Contain the spill - Oil Absorbent Socks are a containment option for smaller spills. Often used for quick containment around vehicles, valves, small leaks and machines, these absorbents are flexible enough to be quickly molded and curved to fit around a spill area
3. If the spill is from an equipment leak, stop the leak while using the proper protective equipment and ventilation.
4. Clean up small spills and leaks immediately using mops, rags, cloth, sawdust or compatible chemical binders such as bentonite, vermiculite or sawdust. If leak occur on a soil surface, remove the contaminated soil completely as soon as practical.
5. Place solvent-laden materials and/or binders in a covered, solvent-resistant metal container.
6. Arrange for proper waste disposal

For larger spills, contact local and state authorities:

Dayville Fire Department: 911 or 860-774-5525

CTDEEP Emergency Response & Spill Prevention: 866-377-7745

3.6 Rock Blasting

A. Best Management Practices for Blasting.

All activities related to blasting shall follow Best Management Practices (BMP's) to prevent contamination of ground and surface water including:

- Preparing, reviewing and following an approved blasting plan;
- Proper drilling, explosive handling and loading procedures;
- Evaluating blasting performance;
- Handling and storage of blasted rock.
- Groundwater well monitoring

(1) Loading practices

The following blast hole loading practices to minimize environmental effects shall be followed

(a) Drilling logs shall be maintained by the driller and communicated directly to the blaster. The logs shall indicate depths and lengths of voids, cavities, and fault zones or other weak zones encountered as well as groundwater conditions.

(b) Explosive products shall be managed on-site so that they are either used in the bore hole, returned to the the delivery vehicle, or placed in secure containers for off-site disposal.

(c) Spillage around the borehole shall either be placed in the borehole or cleaned up and returned to an appropriate vehicle for handling or placement in secured containers for off-site disposal.

(d) Loaded explosives shall be detonated as soon as possible and shall not be left in the blastholes overnight, unless weather or other safety concerns reasonably dictate that detonation should be postponed.

(e) Loading equipment shall be cleaned in an area where wastewater can be properly contained and handled in a manner that prevents release of contaminants to the environment.

(f) Explosives shall be loaded to maintain good continuity in the column load to promote complete detonation. Industry accepted loading practices for priming, stemming, decking and column rise shall be attended to.

(2) Explosive Selection.

The following BMPs shall be followed to reduce the potential for ground or surface water contamination when explosives are used:

(a) Explosive products shall be selected that are appropriate for site conditions and safe blast execution.

(b) Explosive products shall be selected that have the appropriate water resistance for the site conditions present to minimize the potential for effect of the product upon ground or surface water.

(3) Prevention of Misfires.

Appropriate practices shall be developed and implemented to prevent misfires.

(4) Muck Pile Management.

Muck piles (the blasted pieces of rock) and rock piles shall be managed in a manner to reduce the potential for contamination by implementing the following measures:

(a) Remove the muck pile from the blast area as soon as reasonably possible.
(b) Manage the interaction of blasted rock piles and stormwater to prevent contamination of surface water.

(5) Groundwater Well Monitoring

A pre-blast survey of existing conditions shall be performed to evaluate structures of concern and all structures located within 250' of blasting locations, including groundwater wells. Well levels will be monitored throughout the entirety of the blasting process.

4. Post Construction BMP's

For the purposes of this report, post construction BMP's for impervious surfaces are separated into 3 categories:

1. Overland Flow Erosion Control – Minimizing the release and suspension of pollutants, particularly erosion of roadway or paved surfaces shoulders by drainage. Erosion control BMPs typically are installed in the form of pervious cover (vegetation, etc.) or energy dissipation devices.
2. Roadway Drainage Conveyance – Effectively and safely removing water from the roadway or other critical areas of the infrastructure (i.e. steep roadway shoulders or banks). Conveyance BMPs operate as either open (spillway, channel, etc.) or closed (culvert, conduit pipe, etc.) systems.
3. Water Quality and Treatment – Water quality and treatment BMPs focus on the treatment (pollutant displacement/removal) of stormwater before discharging to and/or beyond the storm drain. Treatment BMPs operate by means of sedimentation, infiltration, filtration, and biological degradation.

The plans, drainage computations and stormwater management methods will need to be reviewed and approved by the CTDEEP in conjunction with a 401 Water Quality Certification and for the General Permit for Discharge of Stormwater Associated with Construction Activities. All proposed discharges and pre-treatment prior to this discharge points were designed to be in accordance with the 2004 Water Quality Guidelines. Where ever possible, non-structural methods of stormwater treatment have been implemented.

- Post construction control measures include promotion of groundwater recharge through pervious surfaces, as well as the construction of stormwater depressions for roof drainage, overland flow and sheet flow from pavement. A large portion of the stormwater from paved surfaces will be collected and treated by a large stormwater basin and discharged to a riprap level spreader constructed on level ground.
- Suspended solid and floatable removal is provided with sumped catch basins with hoods or elbow inserts. The goal of 80% of the annual anticipated sediment load can be achieved with these mechanisms.

- Velocity dissipation is achieved by the design and installation of riprap outlet protection. Flows from these devices discharge to gently sloped vegetated surfaces prior to final discharge to resource areas.
- Runoff reduction is accomplished by encouraging infiltration where practical and extended overland flows.

At the completion of construction, all stormwater collection and treatment devices should be inspected and cleaned in accordance with the plans, including but not limited to the removal of sediment from catch basin sumps & treatment devices, removal of silt fencing adjacent to stabilized areas, inspection of outlets for evidence of erosion or accumulation of sediment, inspection of detention & retention basins and removal of debris and sediment, removal of construction entrances. In addition, paved areas should be thoroughly swept and vegetated surfaces should be inspected to determine whether replacement plantings are necessary.

5. Drainage Summary

The drainage calculations separate drainage into 3 discharge points with a final analysis at the property boundary. More than half of the watershed analyzed will remain in its existing wooded condition.

The calculations utilized HydroCAD® Stormwater Modeling System, a computer model, to analyze pre and post development drainage conditions, and to aid in the design of the stormwater detention/infiltration system. The model used the Soil Conservation Service TR-20 method with a Type III 24-hour rainfall to calculate the runoff. The 2, 10 and 100-year extreme precipitation storms were analyzed to evaluate peak runoff flow to 3 wetlands sections, the switchyard and site and perimeter for pre and post construction conditions. All HydroCAD summaries and drainage area maps are included for reference herein as Attachment 3.

5.1 Drainage to Wetlands

Table 1 summarizes the proposed peak runoff flows to the eastern wetland (Drainage Area 1S to 1R). This drainage area is defined on the enclosed drainage area mapping and has been rounded to the nearest 0.1 CFS

Table 1: Summary of Existing and Proposed Peak Flows to East Wetland (1R)*

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.32	3.5 CFS	2.0 CFS
10-Year	5.16	17.3 CFS	9.7 CFS
100-Year	8.09	49.6 CFS	25.0 CFS

*All flows are in CFS (cubic feet per second)

Table 2: Summary of Existing and Proposed Peak Flows to West Wetland (2R)

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.32	2.1 CFS	3.2 CFS
10-Year	5.16	10.5 CFS	13.3 CFS
100-Year	8.09	30.4 CFS	39.4 CFS

As shown in Table 2, the post-construction peak runoff rates at this point are higher than pre-construction for all design storms. However, these increases are contained on site and do not peak simultaneously with the other analyzed points. The net result are decreases in peak runoff rates at the point at which runoff discharges from the property as seen below in table 3.

Table 3: Summary of Existing and Proposed Peak Flows from Central Wetlands At Eastern Property Line

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.32	7.0 CFS	5.9 CFS
10-Year	5.16	34.4 CFS	30.1 CFS
100-Year	8.09	99.0 CFS	99.5 CFS

As shown in Table 3, the post-construction peak runoff rates are equal to or less than pre construction for all design storms with the exception of the 100-year storm which results in a negligible increase of 0.5%. This has been accomplished by re-routing drainage areas to proposed detention/water quality basins which include sediment forebays and/or bioretention and dry basins for groundwater recharge. Replacement of forested terrain with grassed, gravel and paved areas due to the construction of the proposed facility require these basins.

A small portion of the northern site (the Generating Facility site) discharges east via sheet flow; flow in this direction will continue in the same manner. Table 2 summarizes existing and proposed peak discharge rates at the eastern property boundary (Drainage Area 4S).

Table 2: Summary of Existing and Proposed Peak Flows East

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.32	0.4 CFS	0.1 CFS
10-Year	5.16	2.7 CFS	1.8 CFS
100-Year	8.09	8.1 CFS	8.8 CFS

As the calculations demonstrate, there will be slight increases in peak runoff rates east for the 100-year frequency storm but these peaks will be metered by construction of a small depression in the landscape to act as a retention area. The increase will be negligible as it is not a direct (point) discharge from the property.

The switchyard on the southern side of Lake Road will be comprised substantially of a crushed stone surface that will sheet flow to wetlands located predominantly off site and within the CL&P right of way. The site drains in the same manner presently. Table 3 summarizes existing and proposed peak flows to this wetland area.

Table 5: Summary of Existing and Proposed Peak Flows from Switchyard

Design Storm	Depth (in)	Existing Peak	Proposed Peak
2-Year	3.32	1.8 CFS	0.5 CFS
10-Year	5.16	7.1 CFS	6.1 CFS
100-Year	8.09	18.2 CFS	16.1 CFS

Peak runoff rates from the Switchyard will sheet flow overland through the proposed crushed stone surface, to the proposed basin, and ultimately discharge to the wetlands system associated with the existing CL&P right of way. Peak runoff rates will be slightly reduced for all design storms.

5.2 Discharge Volume

Although the discharge rate to the central wetlands is significantly reduced for most design storms, it is important to preserve the hydrology of this area. Increased volumes will not adversely affect the wetland or cause erosion of stream banks, on and off the subject site as discharge rates are controlled.

The following table lists pre and post construction discharge volumes to the wetlands for each design storm:

Table 4: Summary of Existing and Proposed Discharge Volume To Central Wetlands in acre-feet

Design Storm	Depth (in)	Existing Volume	Proposed Volume
2-Year	3.32	1.598	1.999
10-Year	5.16	3.72	4.999
100-Year	8.0.9	8.25	12.326

The central portion wetland on site will continue to discharge off site to the northeast as it does presently. As shown in the computations, this wetland acts as a natural attenuator for existing and proposed flow discharges.

The calculations demonstrate that with construction of the tiered stormwater basin, overland flow and the creation of shallow depressions within the terrain, peak discharge rates to the wetlands will be reduced while the total volume of water to the wetlands will not be. Drainage from impervious areas will be collected, treated and discharged to the basins which ultimately will continue to recharge the wetland areas.

Some of the drainage from building rooftops and overland will be discharged to the ground or to shallow points in the terrain where ever possible to encourage sheet flow, infiltration, and to slow the rate of water movement throughout the site. Roof coverings will be comprised of painted standing seam surfaces which are not prone to corrosion or the release of contaminants with rain events.

5.3 Infiltration/Groundwater Recharge

Groundwater recharge volume (GRV) is calculated using the hydrologic soil group approach per the State of CT 2004 Stormwater Quality Manual. For hydrologic soil group "B", average annual recharge is 12" per year and the recharge depth (D) is 0.25". The net increase in impervious surface for the runoff to the proposed stormwater basin is 39.3%. Utilizing this information, the required GRV is (D)(A)(I)/12 = (0.25)(16.3)(.39)/12 = 0.132 acre-feet (5,770 cubic feet).

Due to the presence of a till layer for most of the soils throughout the property, it is generally presumes that any water that percolates through the topsoil and subsoil layers will follow the till layer generally toward the wetlands. This condition was evidenced in the spring of this year as discharge of groundwater was noted adjacent to wetlands areas. Much of the site will be stripped deeply into the till layer and final grades will be met by amending the till with subsoil that will be stripped from the site prior to replacement of topsoil; thereby encouraging the same movement of groundwater through the site.

Although some infiltration will be achieved when the site is complete, the drainage design incorporates "storage" of water in stone layers within the stormwater basins and recharge trenches that will slowly infiltrate after the termination of storm events. Following is a summary of the proposed storage of water to be utilized for recharge:

Table 5: Summary of Groundwater Recharge Volume

Basin	Volume (c.f.)	Volume (ac-ft)
Basin 1	2,642	0.06
Basin 2	1,152	0.026
Basin 3	7,761	0.178
TOTAL	11,555	0.264

The required GRV is nearly double the required amount. Additional groundwater recharge is accomplished by the construction of small depressions in the terrain

throughout the site as well as within the proposed crushed stone surfaces; these volumes are not accounted for in the computations.

6. Inspections & Reporting

6.1 Inspection Procedure

Within the first 30 days following the commencement of construction activity, the permittee shall contact the Town of Killingly or the project inspecting engineer to review site conditions. The site shall be inspected at least monthly during the first 90 days to insure proper installation of erosion control measures.

The site shall be routinely inspected for compliance with the General Permit and the Plan for the site until a Notice of Termination has been submitted. At least once a week and within 24 hours of a storm that generates a discharge, the qualified inspector shall inspect (at a minimum) the following:

- Disturbed areas of construction activity that have not been stabilized;
- All erosion and sedimentation control measures;
- All structural control measures; soil stockpile areas;
- Washout areas and site entrances;

These areas shall be inspected for evidence of or the potential for off-site impacts and sediment tracking. For storms that fall on a weekend, holiday or after a point where regular working hours will not commence for greater than 24-hours, inspections are required only for storms that equal or exceed 0.5".

The qualified inspector shall evaluate the effectiveness of E&S controls, structural controls, stabilization practices, and any other controls implemented to prevent pollution and determine if it is necessary to install, maintain or repair such controls and/or practices to improve the quality of stormwater discharges.

6.2 Reporting

Reports shall be prepared and retained as part of the SWPPP and shall contain the following information:

- Scope of the inspection;
- Name & qualifications of the qualified inspector generating the report;
- Date & weather conditions at the time of the inspection;
- Major observations regarding E&S controls;
- Descriptions of Stormwater Discharges;
- Any stormwater monitoring conducted during the inspection.

A sample report form is enclosed herein as Attachment 7; completed reports may be added to this section as record of inspections. The report should state whether the site is in compliance or out of compliance with the terms of the plans and permit. If the site is out of compliance, the report shall state the remedial actions required to bring the site back into compliance. Non-engineered corrective actions (i.e. silt fence repair, sediment removal, addition of E&S measures) shall be corrected within 24 hours of reporting. Engineered corrective actions (re-design of engineered controls) shall be implemented within 7 days of reporting and shall be incorporated into revised plans within 10 days of reporting.

Inspectors from the DEEP and Town may inspect the site ate any time for compliance with the anticipated General Permit or in terms of approval conditions from state and local authorities. These inspections may take place at any time while construction activities are being conducted or to review post-construction stormwater management measures.

6.3 Keeping Plans Current

The Permittee is responsible for keeping their Plan in compliance with the General Permit at all times, including the following:

A. The Plan shall be amended by the Permittee if the actions required by the plan fail to prevent pollution or fail to otherwise comply with any provisions of the General Permit. The plan shall be immediately amended upon a change in contractor, change in design or construction, operation or maintenance at the site which has the potential for discharge of pollutants to the waters of the state which has not been otherwise addressed in the Plan.

B. The Commissioner of the CTDEEP (the "Department") may notify the Permittee at any time that the Plan and/or the site do not meet one or more of the one or more of the minimum requirements of the General Permit. The Permittee shall make any required changes within 7 days upon receipt of such notification and then shall submit certification to the Commissioner within 15 days that the requested changes have been made and implemented.

7. Turbidity Monitoring Requirements

Turbidity monitoring shall be conducted monthly at least monthly with sampling procedure consistent with 40 CFR Part 136.

7.1 Monitoring Frequency

a. Sampling shall be conducted when there is a discharge from the site while construction activity is ongoing, until final stabilization of the drainage areas associated with each outfall is achieved.

b. The Permittee is only required to take samples during regular work hours. If sampling is discontinued at the end of regular working hours, sampling shall resume the next working day as long as the discharge continues.
c. Sampling may be suspended if at any time conditions exist that may reasonably pose a threat to the safety of the person sampling. Such conditions may include high winds, lighting, intense rainfall or other hazardous condition. When the unsafe condition is no longer present, sampling may resume.

7.2 Sample Collection

a. All samples shall be collected from discharges resulting from a storm event that occurs at least 24 hours after any previous storm event that generates a stormwater discharge. Sampling of snow or ice melt without a storm event is not a valid sample.
b. Samples shall be grab samples taken at least three (3) separate times during a storm event and shall be representative of the flow and characteristics of the discharge. Samples may be taken manually or with an in-situ turbidity probe or other automatic sampling device equipped to take turbidity readings. The first sample shall be taken within the first hour of stormwater discharge from the site. If samples are collected manually and the discharge begins outside of normal working hours, the first sample shall be taken at the start of normal working hours and shall be noted.

7.3 Sampling Locations

Sampling is required from point discharges of stormwater from disturbed areas. Sampling points shall be at proposed stormwater outfalls as they are installed throughout the project.

7.4 Monitoring Reports

A. Within thirty (30) days following the end of each month, permittees shall enter the stormwater sampling result(s) on the Stormwater Monitoring Report (SMR) form (available at www.ct.gov/deep/stormwater) and submit it in accordance with the NetDMR provisions as described below, or, if the permittee has opted out of NetDMR, to the following address:

Bureau of Materials Management and Compliance Assurance
Water Permitting and Enforcement Division (Attn: DMR Processing)
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

If there was no discharge during any given monitoring period, the permittee shall submit the form as required with the words "no discharge" entered in place of the monitoring results.

If the permittee monitors any discharge more frequently than required by this general permit, the results of this monitoring shall be included in additional SMRs for the month in which the samples were collected.
If sampling protocols are modified due to the limitations of normal working hours or unsafe conditions in accordance with Section 5(c)(1)(A)(ii) or (iii) above, a description of and reason for the modifications shall be included with the SMR.

If the permittee samples a discharge that is representative of two or more substantially identical discharge points, the permittee shall include the names or locations of the other discharge points.

NetDMR Reporting Requirements

Prior to one-hundred and eighty (180) days after the issuance of a permit, the
Permittee may either submit monitoring data and other reports to the Department in hard copy form or electronically using NetDMR, a web-based tool that allows Permittees to electronically submit stormwater monitoring reports through a secure internet connection. Unless otherwise approved in writing by the commissioner, no later than one-hundred and eighty (180) days after the issuance of the permit the Permittee shall begin reporting electronically using NetDMR. Specific requirements regarding subscription to NetDMR and submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

Submittal of NetDMR Subscriber Agreement

On or before fifteen (15) days after the issuance of a permit, the Permittee and/or the person authorized to sign the Permittee"s discharge monitoring reports ("Signatory Authority") as described in RCSA Section 22a-430-3(b)(2) shall contact the Department at deep.netdmr@ct.gov and initiate the NetDMR subscription process for electronic submission of Stormwater Monitoring Report information. Information on NetDMR is available on the Department"s website at www.ct.gov/deep/netdmr on or before ninety (90) days after issuance of this permit the Permittee shall submit a signed and notarized copy of the Connecticut DEEP NetDMR Subscriber Agreement to the Department

Submittal of Reports Using NetDMR

Unless otherwise approved by the commissioner, on or before one-hundred and eighty (180) days after issuance of this permit, the Permittee and/or the Signatory Authority shall electronically submit SMRs required under the permit to the Department using NetDMR in satisfaction of the SMR submission requirements of Sections 5(c)(2)(A) of this permit.

SMRs shall be submitted electronically to the Department no later than the 30th day of the month following the completed reporting period. Any additional monitoring conducted in accordance with 40 CFR 136 shall be submitted to the Department as an

electronic attachment to the SMR in NetDMR. Once a Permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of SMRs to the Department. NetDMR is accessed from: http://www.epa.gov/netdmr

Submittal of NetDMR Opt-Out Requests

If the Permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for electronically submitting SMRs, the commissioner may approve the submission of SMRs in hard copyform ("opt-out request"). Opt-out requests must be submitted in writing to the Department for written approval on or before fifteen (15) days prior to the date a Permittee would be required under this permit to begin filing SMRs using NetDMR. This demonstration shall be valid for twelve (12) months from the date of the Department's approval and shall thereupon expire. At such time, SMRs shall be submitted electronically to the Department using NetDMR unless the Permittee submits a renewed opt-out request and such request is approved by the Department.

All opt-out requests and requests for the NetDMR subscriber form should be sent to the following address or by email at deep.netdmr@ct.gov:

Attn: NetDMR Coordinator
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

7.5 Reporting and Record Keeping Requirements

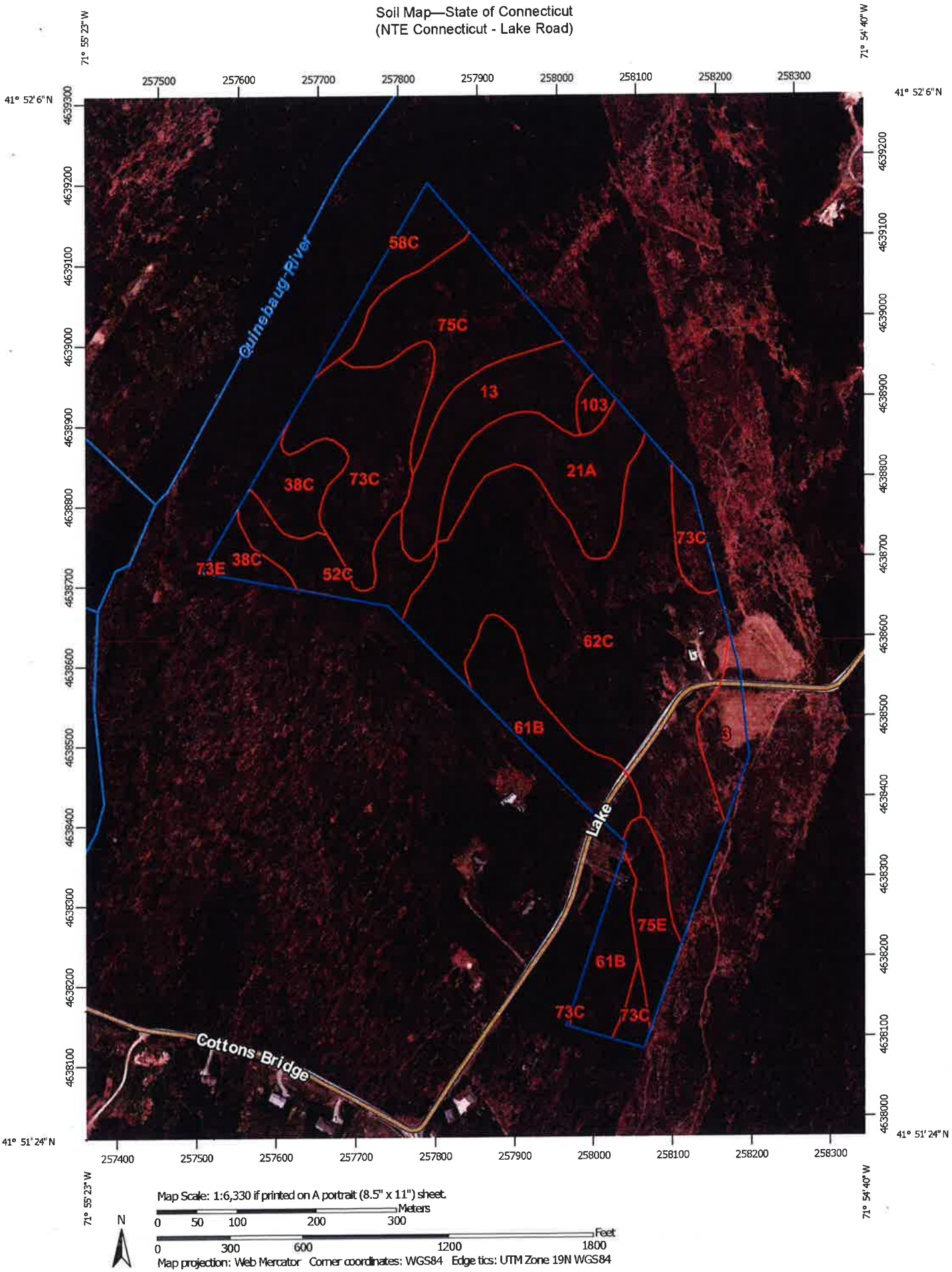
A. For a period of at least five years from the date that construction is complete, the permittee shall retain copies of the Plan and all reports required by the General Permit, and records of all data used to complete the registration for the General Permit, unless the commissioner specifies another time period in writing. Inspection records must be retained as part of the Plan for a period of five (5) years after the date of inspection.

B. The permittee shall retain an updated copy of the Plan required by this general permit at the construction site from the date construction is initiated at the site until the date construction at the site is completed.

ATTACHMENT 1

USDA-NRCS WEB SOIL SURVEY MAPPING

Soil Map—State of Connecticut
(NTE Connecticut - Lake Road)



MAP LEGEND

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

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

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

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

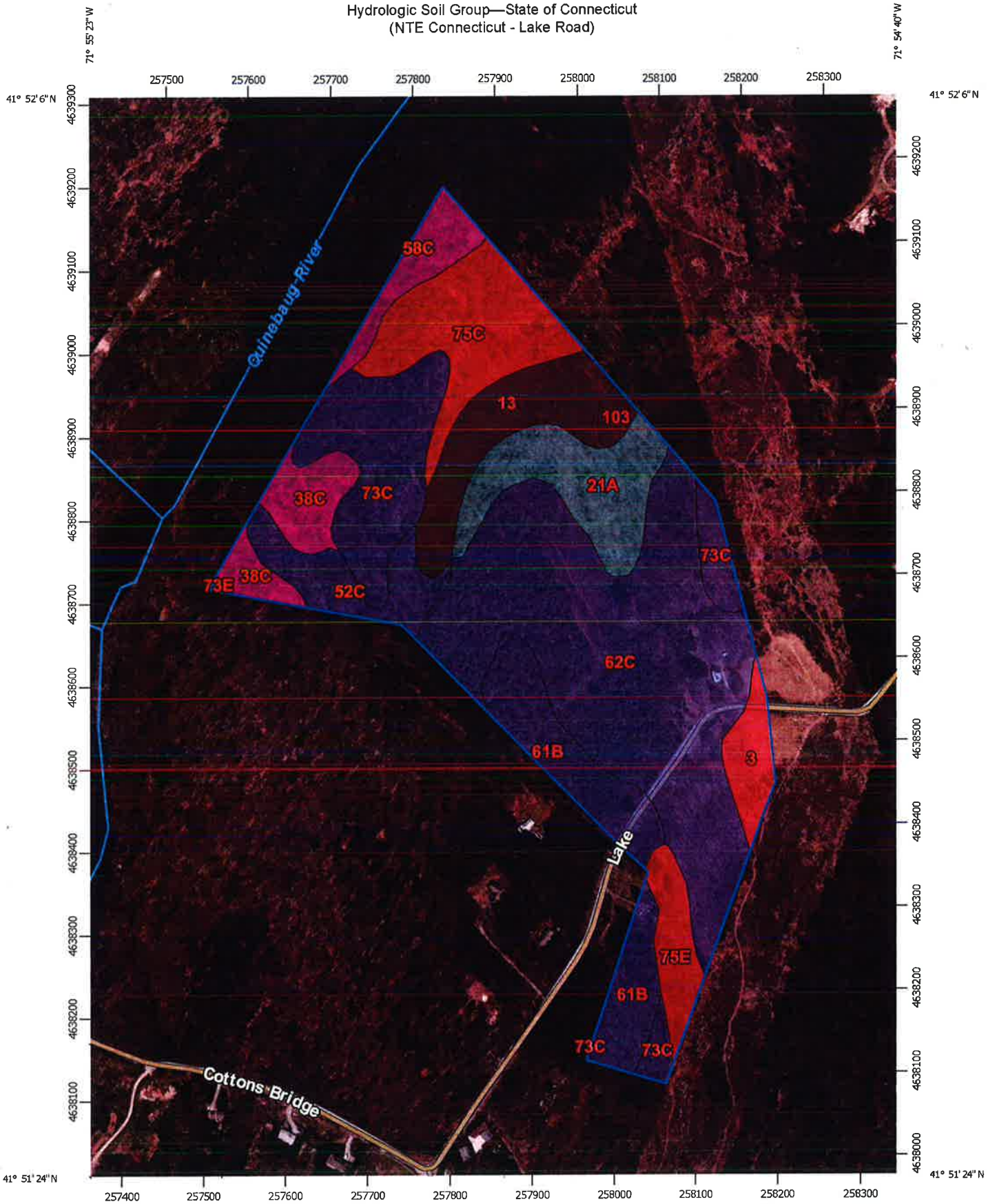
Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

State of Connecticut (CT600)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	2.0	2.6%
13	Walpole sandy loam, 0 to 3 percent slopes	5.3	7.0%
21A	Ninigret and Tisbury soils, 0 to 5 percent slopes	6.0	7.9%
38C	Hinckley loamy sand, 3 to 15 percent slopes	3.5	4.6%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	3.5	4.6%
58C	Gloucester gravelly sandy loam, 8 to 15 percent slopes, very stony	2.3	3.1%
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	7.2	9.5%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	26.6	35.1%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	9.2	12.1%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	0.1	0.1%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	7.2	9.5%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	2.5	3.2%
103	Rippowam fine sandy loam	0.6	0.8%
Totals for Area of Interest		**75.8**	**100.0%**

Hydrologic Soil Group—State of Connecticut
(NTE Connecticut - Lake Road)



Map Scale: 1:6,330 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

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

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — State of Connecticut (CT600)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	2.0	2.6%
13	Walpole sandy loam, 0 to 3 percent slopes	B/D	5.3	7.0%
21A	Ninigret and Tisbury soils, 0 to 5 percent slopes	C	6.0	7.9%
38C	Hinckley loamy sand, 3 to 15 percent slopes	A	3.5	4.6%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	B	3.5	4.6%
58C	Gloucester gravelly sandy loam, 8 to 15 percent slopes, very stony	A	2.3	3.1%
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	B	7.2	9.5%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	B	26.6	35.1%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	B	9.2	12.1%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	B	0.1	0.1%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	D	7.2	9.5%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	D	2.5	3.2%
103	Rippowam fine sandy loam	B/D	0.6	0.8%
Totals for Area of Interest			**75.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

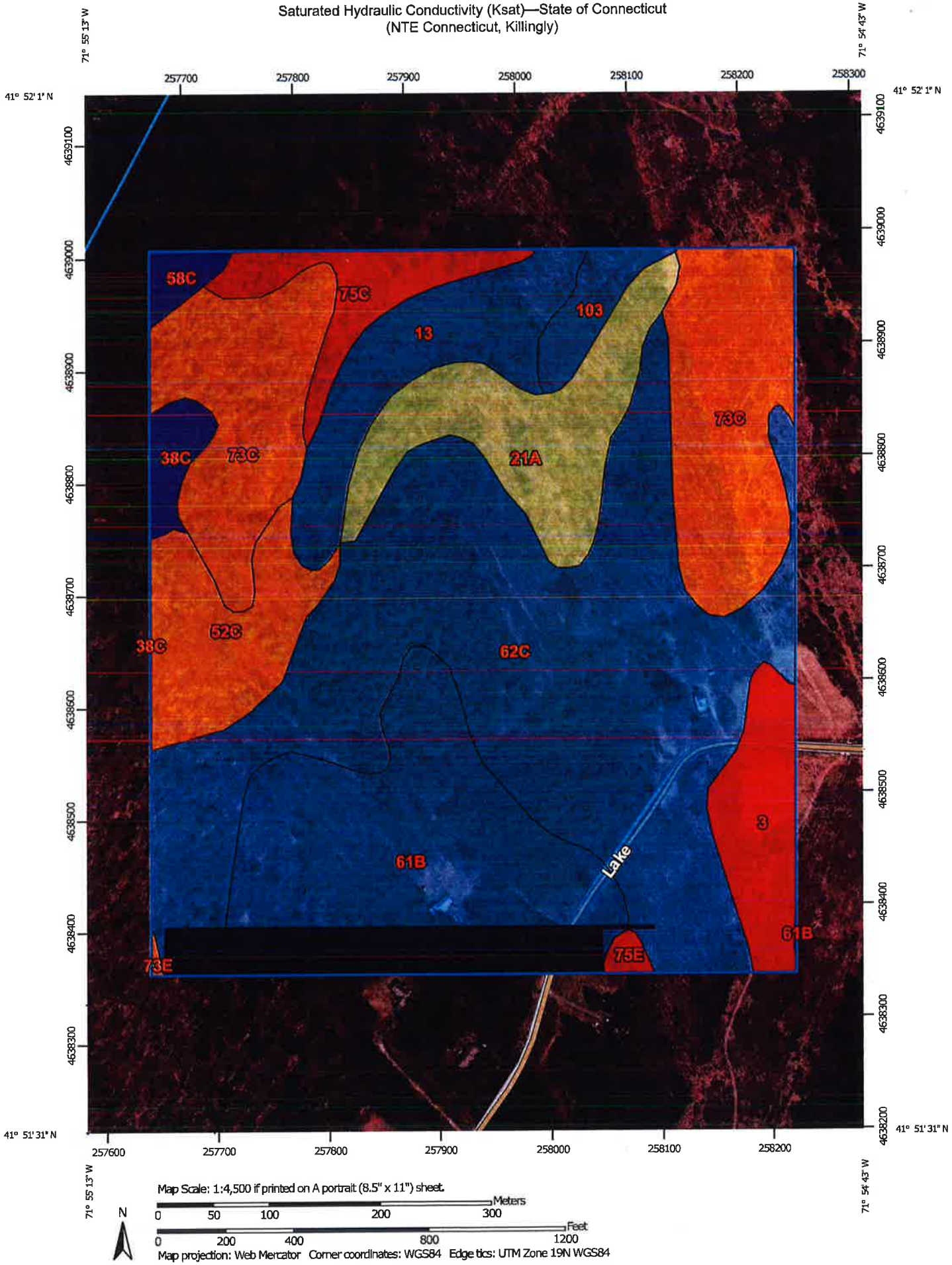
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Saturated Hydraulic Conductivity (Ksat)—State of Connecticut
(NTE Connecticut, Killingly)



MAP LEGEND

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

Soils

Soil Rating Polygons
- <= 10.0139
- > 10.0139 and <= 24.9231
- > 24.9231 and <= 34.7253
- > 34.7253 and <= 44.6703
- > 44.6703 and <= 100.0000
- Not rated or not available

Soil Rating Lines
- <= 10.0139
- > 10.0139 and <= 24.9231
- > 24.9231 and <= 34.7253
- > 34.7253 and <= 44.6703
- > 44.6703 and <= 100.0000
- Not rated or not available

Soil Rating Points
- <= 10.0139
- > 10.0139 and <= 24.9231
- > 24.9231 and <= 34.7253
- > 34.7253 and <= 44.6703
- > 44.6703 and <= 100.0000
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 14, Sep 22, 2015

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

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Saturated Hydraulic Conductivity (Ksat)

Saturated Hydraulic Conductivity (Ksat)— Summary by Map Unit — State of Connecticut (CT600)				
Map unit symbol	**Map unit name**	**Rating (micrometers per second)**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	5.1044	3.9	4.2%
13	Walpole sandy loam, 0 to 3 percent slopes	40.6593	5.7	6.1%
21A	Ninigret and Tisbury soils, 0 to 5 percent slopes	34.7253	7.0	7.6%
38C	Hinckley loamy sand, 3 to 15 percent slopes	100.0000	1.1	1.2%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	24.9231	5.2	5.5%
58C	Gloucester gravelly sandy loam, 8 to 15 percent slopes, very stony	93.0769	0.7	0.8%
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	39.6703	16.1	17.3%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	39.6703	33.2	35.7%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	21.5714	15.2	16.3%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	21.5714	0.1	0.1%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	10.0139	3.0	3.2%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	10.0139	0.3	0.3%
103	Rippowam fine sandy loam	44.6703	1.5	1.6%
Totals for Area of Interest			**92.9**	**100.0%**

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: *None Specified*

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 0

Bottom Depth: 36

Units of Measure: Inches

ATTACHMENT 2

JUNE 2016

NATURAL DIVERSITY DATABASE MAP

Natural Diversity Data Base Areas

KILLINGLY, CT

June 2016

State and Federal Listed Species & Significant Natural Communities

Town Boundary

NOTE: This map shows general locations of State and Federal Listed Species and Significant Natural Communities. Information on listed species is collected and compiled by the Natural Diversity Data Base (NDDB) from a number of data sources . Exact locations of species have been buffered to produce the general locations. Exact locations of species and communities occur somewhere in the shaded areas, not necessarily in the center. A new mapping format is being employed that more accurately models important riparian and aquatic areas and eliminates the need for the upstream/downstream searches required in previous versions.

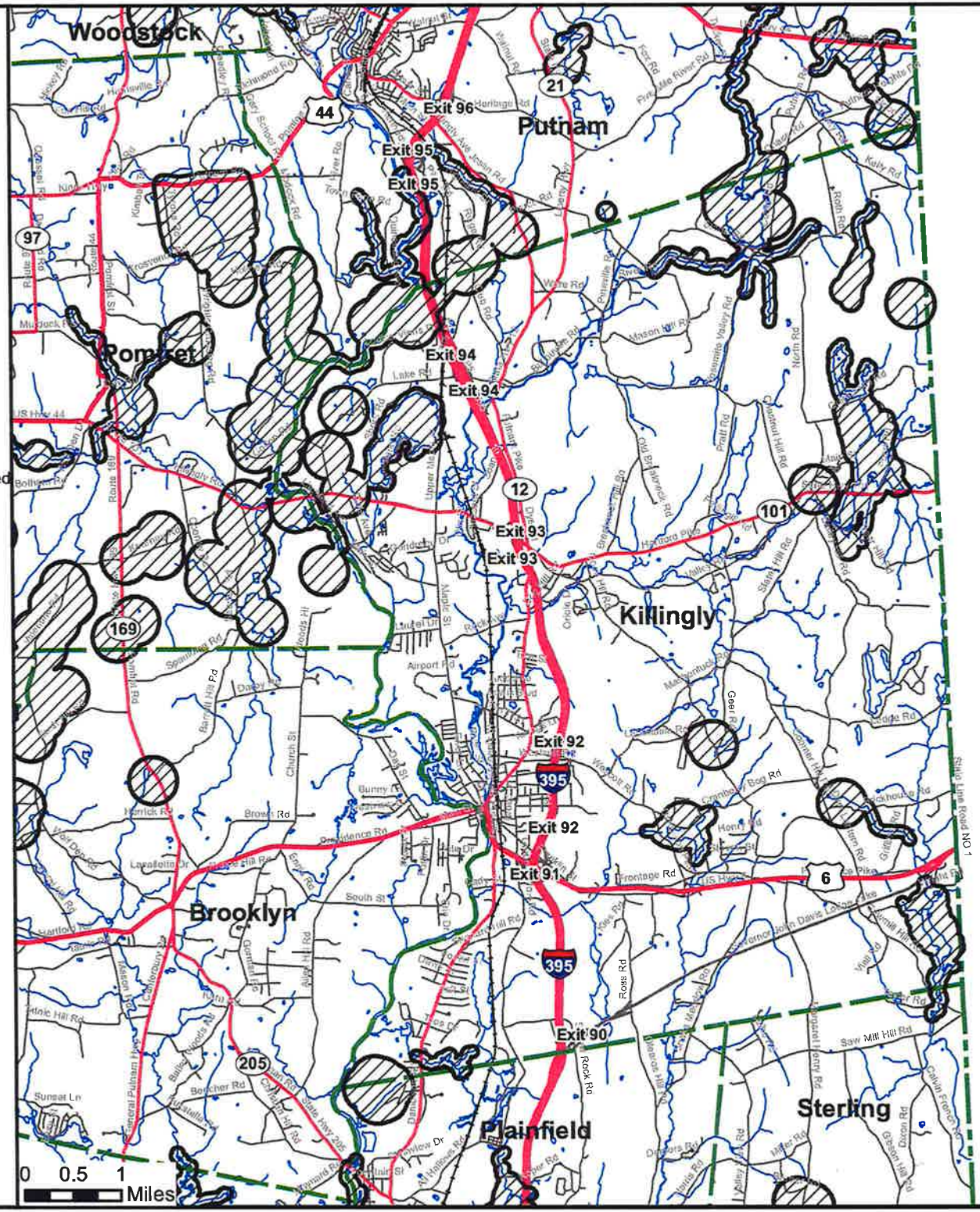
This map is intended for use as a preliminary screening tool for conducting a Natural Diversity Data Base Review Request. To use the map, locate the project boundaries and any additional affected areas. If the project is within a shaded area there may be a potential conflict with a listed species. For more information, complete a Request for Natural Diversity Data Base State Listed Species Review form (DEP-APP-007), and submit it to the NDDB along with the required maps and information. More detailed instructions are provided with the request form on our website.

www.ct.gov/deep/nddbrequest

Use the CTECO Interactive Map Viewers at www.cteco.uconn.edu to more precisely search for and locate a site and to view aerial imagery with NDDB Areas.

QUESTIONS: Department of Energy and Environmental Protection (DEEP)
79 Elm St., Hartford CT 06106
Phone (860) 424-3011

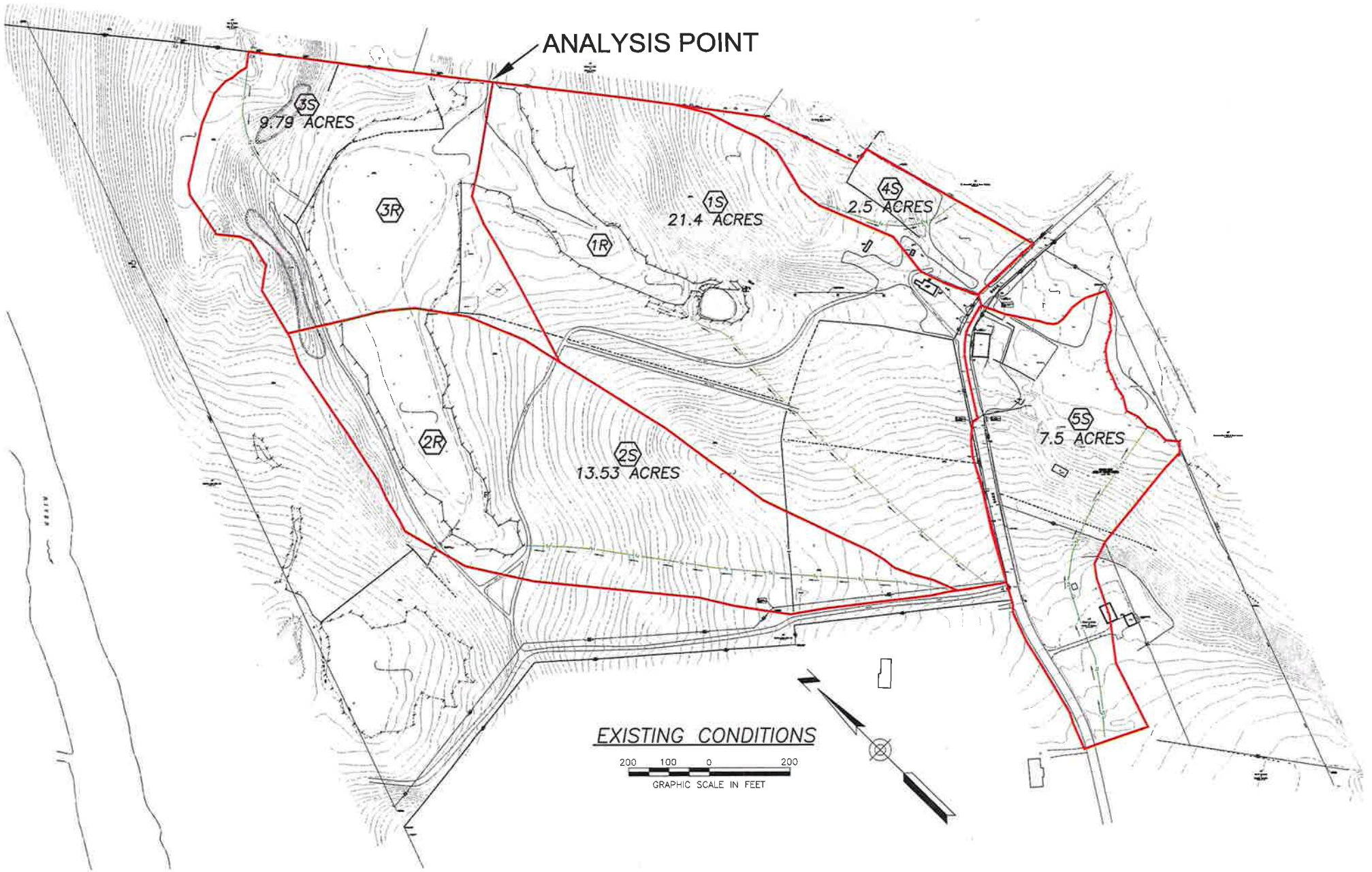
Connecticut Department of Energy & Environmental Protection
Bureau of Natural Resources
Wildlife Division

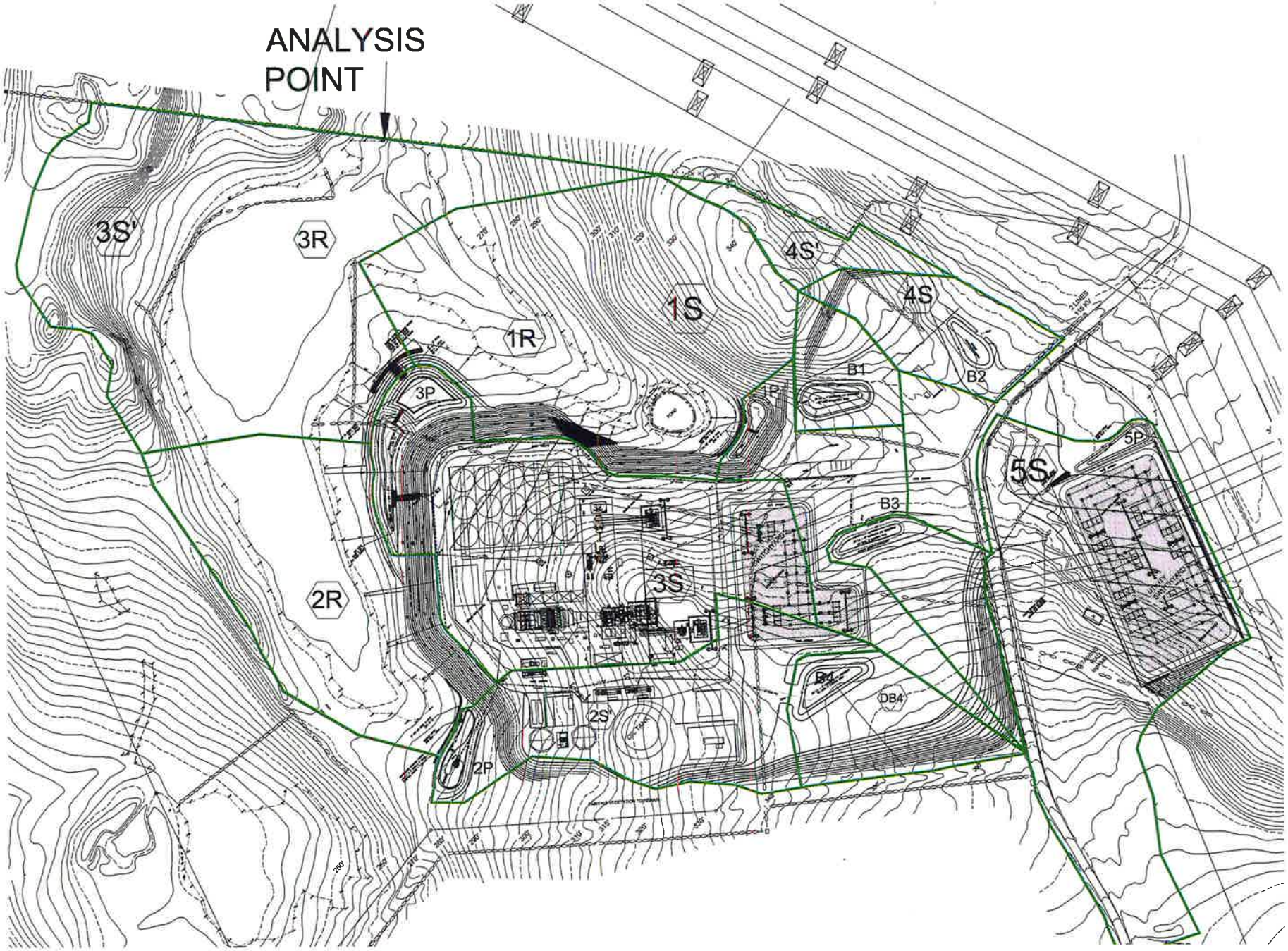


ATTACHMENT 3

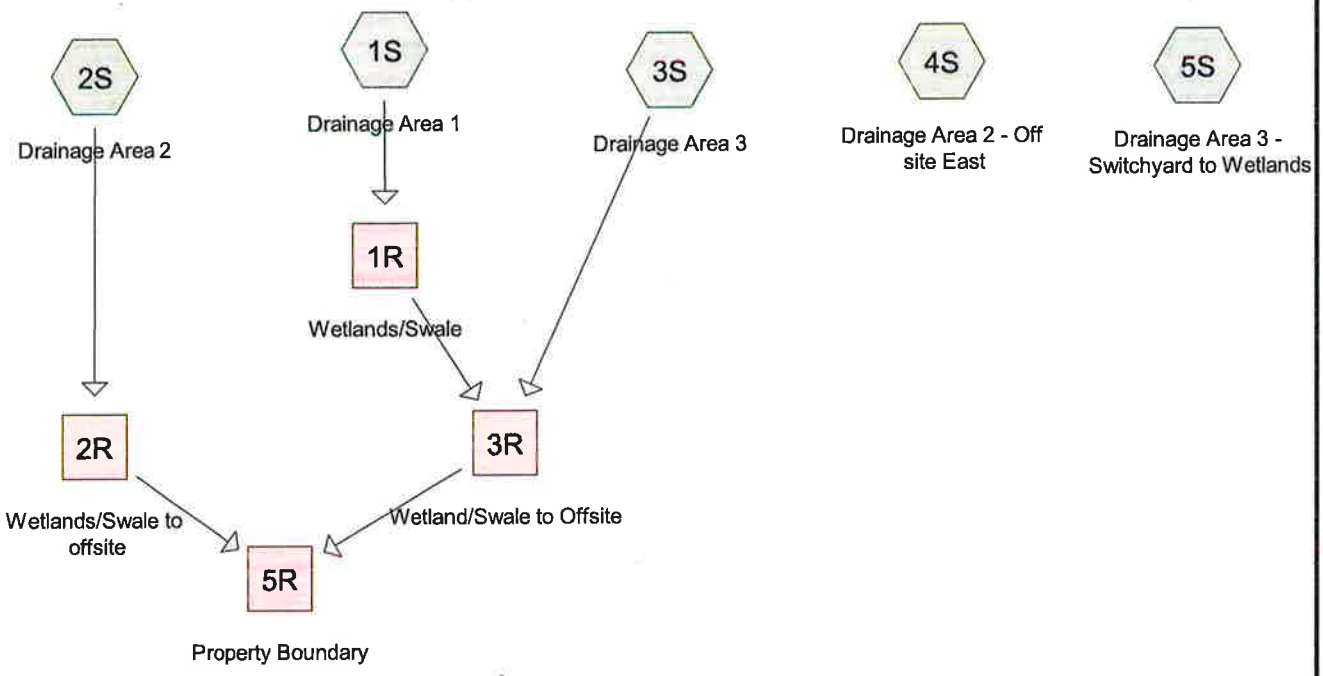
HydroCAD DRAINAGE CALCULATION SUMMARIES

(With drainage area maps)


ANALYSIS POINT
3S
9.79 ACRES
3R
1S
21.4 ACRES
1R
4S
2.5 ACRES
2R
2S
13.53 ACRES
5S
7.5 ACRES
EXISTING CONDITIONS
200 100 0 200
GRAPHIC SCALE IN FEET


ANALYSIS
POINT
3S'
3R
1S
1R
4S'
4S
3P
1P
B1
B2
5P
5S
B3
3S
2R
B4
DB4
2S
2P

EXISTING CONDITIONS DRAINAGE COMPUTATIONS
2, 10 & 100-YEAR STORMS



Subcat Reach Pond Link

Routing Diagram for Existing Drainage-Revised
Prepared by Microsoft, Printed 10/27/2016
HydroCAD® 10.00 s/n 07240 © 2011 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: Drainage Area 1

Runoff = 3.70 cfs @ 12.48 hrs, Volume= 0.680 af, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	2.110	77	Woods, Good, HSG D (Wetlands)
	18.740	55	Woods, Good, HSG B
	0.550	70	1/2 acre lots, 25% imp, HSG B
	21.400	58	Weighted Average
	21.262		99.36% Pervious Area
	0.137		0.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8	1,038	0.0750	0.79		**Lag/CN Method, Tc-2**

Summary for Subcatchment 2S: Drainage Area 2

Runoff = 2.71 cfs @ 12.45 hrs, Volume= 0.469 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	2.400	77	Woods, Good, HSG D (Wetlands)
	11.130	55	Woods, Good, HSG B
	13.530	59	Weighted Average
	13.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	1,078	0.0780	0.84		**Lag/CN Method, Tc-2s**

Summary for Subcatchment 3S: Drainage Area 3

Runoff = 3.45 cfs @ 12.42 hrs, Volume= 0.499 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	3.920	77	Woods, Good, HSG D (Wetlands)
	5.870	55	Woods, Good, HSG B
	9.790	64	Weighted Average
	9.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	300	0.1460	0.22		**Sheet Flow, Tc-3a** Woods: Light underbrush n= 0.400 P2= 3.32"
1.2	115	0.0950	1.54		**Shallow Concentrated Flow, Tc-3b** Woodland Kv= 5.0 fps
24.1	415	Total			

Summary for Subcatchment 4S: Drainage Area 2 - Off site East

Runoff = 0.44 cfs @ 12.20 hrs, Volume= 0.073 af, Depth> 0.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (ac)	CN	Description
1.650	55	Woods, Good, HSG B
0.700	58	Meadow, non-grazed, HSG B
0.150	70	1/2 acre lots, 25% imp, HSG B
2.500	57	Weighted Average
2.462		98.50% Pervious Area
0.037		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	350	0.1080	0.75		**Lag/CN Method, Tc-2**

Summary for Subcatchment 5S: Drainage Area 3 - Switchyard to Wetlands

Runoff = 1.83 cfs @ 12.50 hrs, Volume= 0.306 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	0.900	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	5.600	55	Woods, Good, HSG B
	7.500	61	Weighted Average
	6.600		88.00% Pervious Area
	0.900		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	850	0.0770	0.83		**Lag/CN Method, Tc-3**
6.3	567	0.0900	1.50		**Shallow Concentrated Flow, 597** Woodland Kv= 5.0 fps
3.1	225	0.0300	1.21		**Shallow Concentrated Flow, Tc-4c** Short Grass Pasture Kv= 7.0 fps
26.4	1,642	Total			

Summary for Reach 1R: Wetlands/Swale

Inflow Area = 21.400 ac, 0.64% Impervious, Inflow Depth > 0.38" for 2-Year event
Inflow = 3.70 cfs @ 12.48 hrs, Volume= 0.680 af
Outflow = 3.45 cfs @ 12.72 hrs, Volume= 0.671 af, Atten= 7%, Lag= 14.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.40 fps, Min. Travel Time= 7.7 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 13.4 min

Peak Storage= 1,592 cf @ 12.59 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 2.00' Flow Area= 146.7 sf, Capacity= 1,259.44 cfs

110.00' x 2.00' deep Parabolic Channel, n= 0.035
Length= 645.0' Slope= 0.0279 '/'
Inlet Invert= 284.00', Outlet Invert= 266.00'

‡

Summary for Reach 2R: Wetlands/Swale to offsite

Inflow Area = 13.530 ac, 0.00% Impervious, Inflow Depth > 0.42" for 2-Year event
Inflow = 2.71 cfs @ 12.45 hrs, Volume= 0.469 af
Outflow = 2.09 cfs @ 12.97 hrs, Volume= 0.457 af, Atten= 23%, Lag= 30.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.68 fps, Min. Travel Time= 17.1 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 28.9 min

Peak Storage= 2,155 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.00' Flow Area= 120.0 sf, Capacity= 415.63 cfs

180.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 700.0' Slope= 0.0114 '/'
Inlet Invert= 274.00', Outlet Invert= 266.00'

‡

Summary for Reach 3R: Wetland/Swale to Offsite

Inflow Area = 31.190 ac, 0.44% Impervious, Inflow Depth > 0.45" for 2-Year event
Inflow = 6.03 cfs @ 12.63 hrs, Volume= 1.170 af
Outflow = 5.00 cfs @ 13.12 hrs, Volume= 1.141 af, Atten= 17%, Lag= 29.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.63 fps, Min. Travel Time= 16.9 min
Avg. Velocity = 0.38 fps, Avg. Travel Time= 28.0 min

Peak Storage= 5,080 cf @ 12.84 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 3.00' Flow Area= 700.0 sf, Capacity= 3,229.60 cfs

350.00' x 3.00' deep Parabolic Channel, n= 0.035
Length= 640.0' Slope= 0.0047 '/'
Inlet Invert= 266.00', Outlet Invert= 263.00'

‡

Summary for Reach 5R: Property Boundary

Inflow Area = 44.720 ac, 0.31% Impervious, Inflow Depth > 0.43" for 2-Year event
Inflow = 6.95 cfs @ 13.08 hrs, Volume= 1.598 af
Outflow = 6.95 cfs @ 13.08 hrs, Volume= 1.598 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: Drainage Area 1

Runoff = 17.86 cfs @ 12.35 hrs, Volume= 2.229 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	2.110	77	Woods, Good, HSG D (Wetlands)
	18.740	55	Woods, Good, HSG B
	0.550	70	1/2 acre lots, 25% imp, HSG B
	21.400	58	Weighted Average
	21.262		99.36% Pervious Area
	0.137		0.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8	1,038	0.0750	0.79		**Lag/CN Method, Tc-2**

Summary for Subcatchment 2S: Drainage Area 2

Runoff = 12.17 cfs @ 12.34 hrs, Volume= 1.486 af, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	2.400	77	Woods, Good, HSG D (Wetlands)
	11.130	55	Woods, Good, HSG B
	13.530	59	Weighted Average
	13.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	1,078	0.0780	0.84		**Lag/CN Method, Tc-2s**

Summary for Subcatchment 3S: Drainage Area 3

Runoff = 11.36 cfs @ 12.36 hrs, Volume= 1.367 af, Depth> 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	3.920	77	Woods, Good, HSG D (Wetlands)
	5.870	55	Woods, Good, HSG B
	9.790	64	Weighted Average
	9.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	300	0.1460	0.22		**Sheet Flow, Tc-3a** Woods: Light underbrush n= 0.400 P2= 3.32"
1.2	115	0.0950	1.54		**Shallow Concentrated Flow, Tc-3b** Woodland Kv= 5.0 fps
24.1	415	Total			

Summary for Subcatchment 4S: Drainage Area 2 - Off site East

Runoff = 2.74 cfs @ 12.13 hrs, Volume= 0.248 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

Area (ac)	CN	Description
1.650	55	Woods, Good, HSG B
0.700	58	Meadow, non-grazed, HSG B
0.150	70	1/2 acre lots, 25% imp, HSG B
2.500	57	Weighted Average
2.462		98.50% Pervious Area
0.037		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	350	0.1080	0.75		**Lag/CN Method, Tc-2**

Summary for Subcatchment 5S: Drainage Area 3 - Switchyard to Wetlands

Runoff = 7.06 cfs @ 12.41 hrs, Volume= 0.910 af, Depth> 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	0.900	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	5.600	55	Woods, Good, HSG B
	7.500	61	Weighted Average
	6.600		88.00% Pervious Area
	0.900		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	850	0.0770	0.83		**Lag/CN Method, Tc-3**
6.3	567	0.0900	1.50		**Shallow Concentrated Flow, 597** Woodland Kv= 5.0 fps
3.1	225	0.0300	1.21		**Shallow Concentrated Flow, Tc-4c** Short Grass Pasture Kv= 7.0 fps
26.4	1,642	Total			

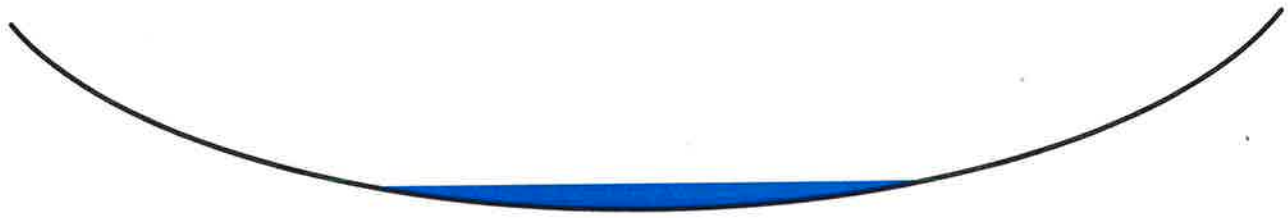
Summary for Reach 1R: Wetlands/Swale

Inflow Area = 21.400 ac, 0.64% Impervious, Inflow Depth > 1.25" for 10-Year event
Inflow = 17.86 cfs @ 12.35 hrs, Volume= 2.229 af
Outflow = 17.17 cfs @ 12.50 hrs, Volume= 2.215 af, Atten= 4%, Lag= 8.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.29 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 10.0 min

Peak Storage= 4,853 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 2.00' Flow Area= 146.7 sf, Capacity= 1,259.44 cfs

110.00' x 2.00' deep Parabolic Channel, n= 0.035
Length= 645.0' Slope= 0.0279 '/'
Inlet Invert= 284.00', Outlet Invert= 266.00'



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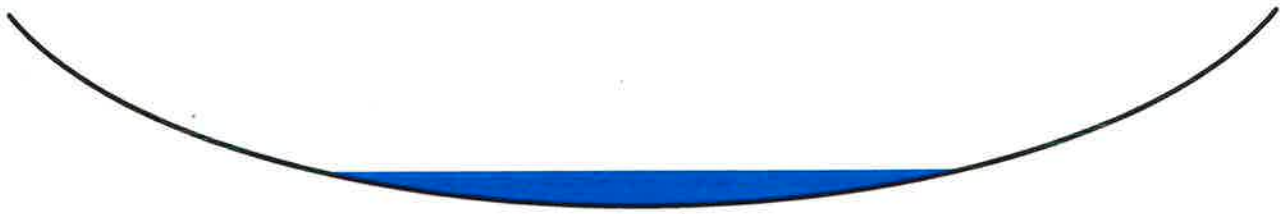
Summary for Reach 2R: Wetlands/Swale to offsite

Inflow Area = 13.530 ac, 0.00% Impervious, Inflow Depth > 1.32" for 10-Year event
Inflow = 12.17 cfs @ 12.34 hrs, Volume= 1.486 af
Outflow = 10.51 cfs @ 12.66 hrs, Volume= 1.466 af, Atten= 14%, Lag= 19.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.12 fps, Min. Travel Time= 10.4 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 21.8 min

Peak Storage= 6,598 cf @ 12.49 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 120.0 sf, Capacity= 415.63 cfs

180.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 700.0' Slope= 0.0114 '/'
Inlet Invert= 274.00', Outlet Invert= 266.00'



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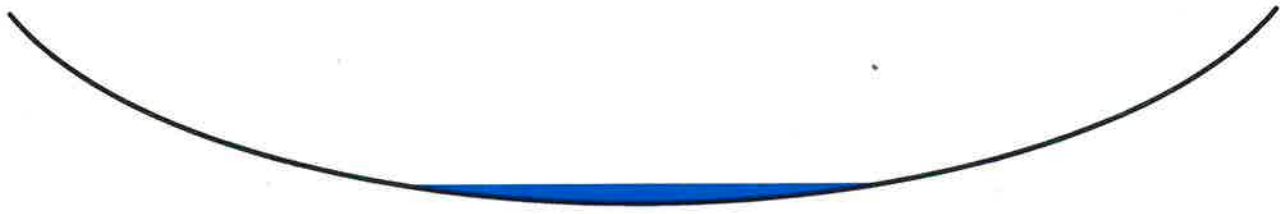
Summary for Reach 3R: Wetland/Swale to Offsite

Inflow Area = 31.190 ac, 0.44% Impervious, Inflow Depth > 1.38" for 10-Year event
Inflow = 27.58 cfs @ 12.46 hrs, Volume= 3.582 af
Outflow = 24.43 cfs @ 12.77 hrs, Volume= 3.534 af, Atten= 11%, Lag= 18.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.03 fps, Min. Travel Time= 10.4 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 21.8 min

Peak Storage= 15,246 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 3.00' Flow Area= 700.0 sf, Capacity= 3,229.60 cfs

350.00' x 3.00' deep Parabolic Channel, n= 0.035
Length= 640.0' Slope= 0.0047 '/'
Inlet Invert= 266.00', Outlet Invert= 263.00'



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Summary for Reach 5R: Property Boundary

Inflow Area = 44.720 ac, 0.31% Impervious, Inflow Depth > 1.34" for 10-Year event
Inflow = 34.43 cfs @ 12.75 hrs, Volume= 4.999 af
Outflow = 34.43 cfs @ 12.75 hrs, Volume= 4.999 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: Drainage Area 1

Runoff = 50.36 cfs @ 12.32 hrs, Volume= 5.638 af, Depth> 3.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	2.110	77	Woods, Good, HSG D (Wetlands)
	18.740	55	Woods, Good, HSG B
	0.550	70	1/2 acre lots, 25% imp, HSG B
	21.400	58	Weighted Average
	21.262		99.36% Pervious Area
	0.137		0.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8	1,038	0.0750	0.79		**Lag/CN Method, Tc-2**

Summary for Subcatchment 2S: Drainage Area 2

Runoff = 33.30 cfs @ 12.31 hrs, Volume= 3.690 af, Depth> 3.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	2.400	77	Woods, Good, HSG D (Wetlands)
	11.130	55	Woods, Good, HSG B
	13.530	59	Weighted Average
	13.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	1,078	0.0780	0.84		**Lag/CN Method, Tc-2s**

Summary for Subcatchment 3S: Drainage Area 3

Runoff = 27.31 cfs @ 12.34 hrs, Volume= 3.127 af, Depth> 3.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	3.920	77	Woods, Good, HSG D (Wetlands)
	5.870	55	Woods, Good, HSG B
	9.790	64	Weighted Average
	9.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	300	0.1460	0.22		**Sheet Flow, Tc-3a** Woods: Light underbrush n= 0.400 P2= 3.32"
1.2	115	0.0950	1.54		**Shallow Concentrated Flow, Tc-3b** Woodland Kv= 5.0 fps
24.1	415	Total			

Summary for Subcatchment 4S: Drainage Area 2 - Off site East

Runoff = 8.10 cfs @ 12.12 hrs, Volume= 0.638 af, Depth> 3.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

Area (ac)	CN	Description
1.650	55	Woods, Good, HSG B
0.700	58	Meadow, non-grazed, HSG B
0.150	70	1/2 acre lots, 25% imp, HSG B
2.500	57	Weighted Average
2.462		98.50% Pervious Area
0.037		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	350	0.1080	0.75		**Lag/CN Method, Tc-2**

Summary for Subcatchment 5S: Drainage Area 3 - Switchyard to Wetlands

Runoff = 18.20 cfs @ 12.38 hrs, Volume= 2.183 af, Depth> 3.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	0.900	98	Roof & Pavement
	1.000	58	Meadow, non-grazed, HSG B
	5.600	55	Woods, Good, HSG B
	7.500	61	Weighted Average
	6.600		88.00% Pervious Area
	0.900		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	850	0.0770	0.83		**Lag/CN Method, Tc-3**
6.3	567	0.0900	1.50		**Shallow Concentrated Flow, 597** Woodland Kv= 5.0 fps
3.1	225	0.0300	1.21		**Shallow Concentrated Flow, Tc-4c** Short Grass Pasture Kv= 7.0 fps
26.4	1,642	Total			

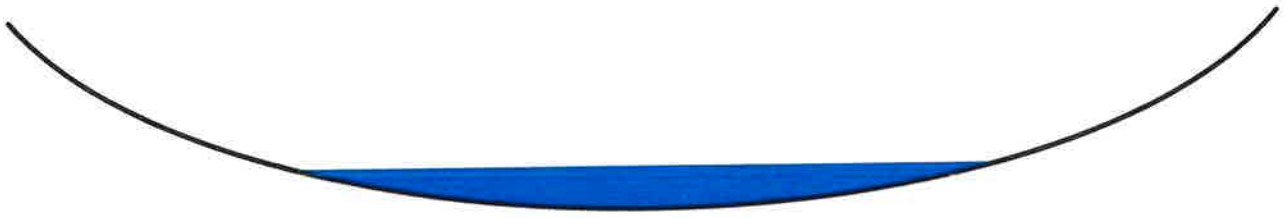
Summary for Reach 1R: Wetlands/Swale

Inflow Area = 21.400 ac, 0.64% Impervious, Inflow Depth > 3.16" for 100-Year event
Inflow = 50.36 cfs @ 12.32 hrs, Volume= 5.638 af
Outflow = 49.28 cfs @ 12.42 hrs, Volume= 5.616 af, Atten= 2%, Lag= 6.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.17 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 8.1 min

Peak Storage= 10,050 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00' Flow Area= 146.7 sf, Capacity= 1,259.44 cfs

110.00' x 2.00' deep Parabolic Channel, n= 0.035
Length= 645.0' Slope= 0.0279 '/'
Inlet Invert= 284.00', Outlet Invert= 266.00'



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Summary for Reach 2R: Wetlands/Swale to offsite

Inflow Area = 13.530 ac, 0.00% Impervious, Inflow Depth > 3.27" for 100-Year event
Inflow = 33.30 cfs @ 12.31 hrs, Volume= 3.690 af
Outflow = 30.39 cfs @ 12.54 hrs, Volume= 3.658 af, Atten= 9%, Lag= 13.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.55 fps, Min. Travel Time= 7.5 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 17.7 min

Peak Storage= 13,796 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.00' Flow Area= 120.0 sf, Capacity= 415.63 cfs

180.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 700.0' Slope= 0.0114 '/'
Inlet Invert= 274.00', Outlet Invert= 266.00'

‡

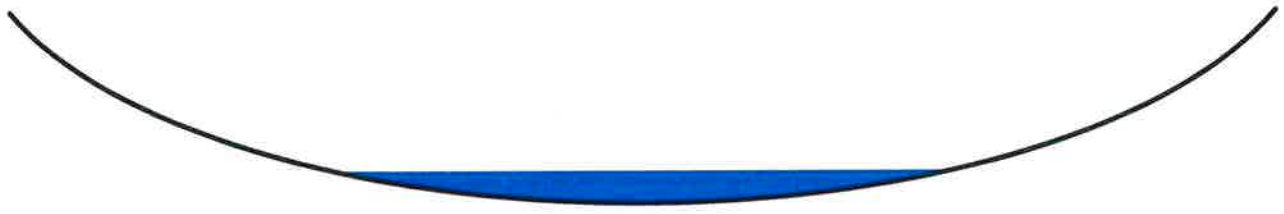
Summary for Reach 3R: Wetland/Swale to Offsite

Inflow Area = 31.190 ac, 0.44% Impervious, Inflow Depth > 3.36" for 100-Year event
Inflow = 75.58 cfs @ 12.40 hrs, Volume= 8.743 af
Outflow = 69.83 cfs @ 12.62 hrs, Volume= 8.668 af, Atten= 8%, Lag= 13.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.42 fps, Min. Travel Time= 7.5 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 18.0 min

Peak Storage= 31,601 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 3.00' Flow Area= 700.0 sf, Capacity= 3,229.60 cfs

350.00' x 3.00' deep Parabolic Channel, n= 0.035
Length= 640.0' Slope= 0.0047 '/'
Inlet Invert= 266.00', Outlet Invert= 263.00'



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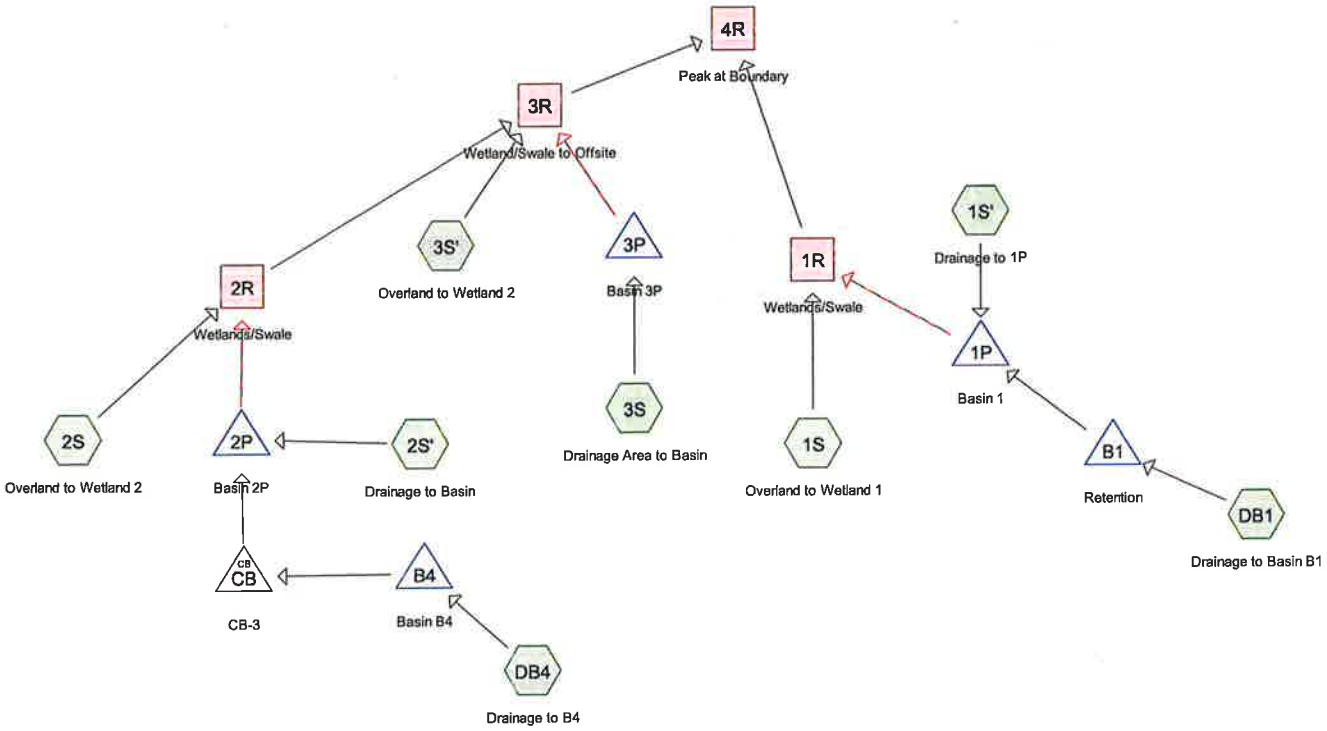
Summary for Reach 5R: Property Boundary

Inflow Area = 44.720 ac, 0.31% Impervious, Inflow Depth > 3.31" for 100-Year event
Inflow = 99.04 cfs @ 12.60 hrs, Volume= 12.326 af
Outflow = 99.04 cfs @ 12.60 hrs, Volume= 12.326 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

PROPOSED CONDITIONS DRAINAGE COMPUTATIONS
2, 10 & 100-YEAR STORMS



Subcat Reach Pond Link

Routing Diagram for Proposed Drainage-Revised
Prepared by Microsoft, Printed 10/27/2016
HydroCAD® 10.00 s/n 07240 © 2011 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: Overland to Wetland 1

Runoff = 2.14 cfs @ 12.49 hrs, Volume= 0.312 af, Depth> 0.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	2.110	77	Woods, Good, HSG D (wetlands)
	6.120	55	Woods, Good, HSG B
	0.510	61	>75% Grass cover, Good, HSG B
	8.740	61	Weighted Average
	8.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.9	250	0.0960	0.17		**Sheet Flow, Tc-1S-1** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	270	0.1920	2.19		**Shallow Concentrated Flow, Tc-1S-2** Woodland Kv= 5.0 fps
26.0	520	Total			

Summary for Subcatchment 1S': Drainage to 1P

Runoff = 2.69 cfs @ 12.31 hrs, Volume= 0.272 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (sf)	CN	Description
	89,580	74	>75% Grass cover, Good, HSG C
*	9,550	87	Crushed stone, HSG C
	15,070	98	Paved parking, HSG C
	114,200	78	Weighted Average
	99,130		86.80% Pervious Area
	15,070		13.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	250	0.1200	0.29		**Sheet Flow, Tc-1a** Grass: Dense n= 0.240 P2= 3.20"
6.5	480	0.0310	1.23		**Shallow Concentrated Flow, Tc-1a-2** Short Grass Pasture Kv= 7.0 fps
0.1	106	0.1200	19.75	24.24	**Pipe Channel, HDPE from CB-9** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
21.1	836	Total			

Summary for Subcatchment 2S: Overland to Wetland 2

Runoff = 3.02 cfs @ 12.19 hrs, Volume= 0.288 af, Depth> 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	2.400	77	Woods, Good, HSG D (wetlands)
	0.590	61	>75% Grass cover, Good, HSG B
	2.900	55	Woods, Good, HSG B
	5.890	65	Weighted Average
	5.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	75	0.0600	0.11		**Sheet Flow, Tc-2s** Woods: Light underbrush n= 0.400 P2= 3.20"

Summary for Subcatchment 2S': Drainage to Basin

Runoff = 6.51 cfs @ 12.24 hrs, Volume= 0.601 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	1.900	61	>75% Grass cover, Good, HSG B (fill slopes)
*	2.110	87	Crushed Stone, HSG C
	1.230	98	Paved parking, HSG C
	5.240	80	Weighted Average
	4.010		76.53% Pervious Area
	1.230		23.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	589	0.0150	0.58		**Lag/CN Method, Tc-2S'**

Summary for Subcatchment 3S: Drainage Area to Basin

Runoff = 11.08 cfs @ 12.20 hrs, Volume= 0.953 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	3.010	98	Impervious roof & pavement
*	3.900	72	Crushed Stone surface, HSG B
	1.390	61	>75% Grass cover, Good, HSG B
	8.300	80	Weighted Average
	5.290		63.73% Pervious Area
	3.010		36.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	560	0.0200	0.66		**Lag/CN Method, Tc-1**

Summary for Subcatchment 3S': Overland to Wetland 2

Runoff = 3.42 cfs @ 12.44 hrs, Volume= 0.454 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	3.920	77	Woods, Good, HSG D (wetlands)
*	0.270	61	>75% Grass cover, Good, HSG B (fill slopes)
	6.650	55	Woods, Good, HSG B
	10.840	63	Weighted Average
	10.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	300	0.1460	0.21		**Sheet Flow, Tc 3S-1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	115	0.0950	1.54		**Shallow Concentrated Flow, Tc 3S-2** Woodland Kv= 5.0 fps
24.5	415	Total			

Summary for Subcatchment DB1: Drainage to Basin B1

Runoff = 1.10 cfs @ 12.19 hrs, Volume= 0.094 af, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
48,285	74	>75% Grass cover, Good, HSG C
48,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	225	0.1350	0.29		**Sheet Flow, Tc-B1** Grass: Dense n= 0.240 P2= 3.20"

Summary for Subcatchment DB4: Drainage to B4

Runoff = 1.80 cfs @ 12.24 hrs, Volume= 0.168 af, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
86,400	74	>75% Grass cover, Good, HSG C
86,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	250	0.1200	0.29		**Sheet Flow, Tc-DB4** Grass: Dense n= 0.240 P2= 3.20"
1.5	110	0.0300	1.21		**Shallow Concentrated Flow, Tc-DB4-2** Short Grass Pasture Kv= 7.0 fps
16.0	360	Total			

Summary for Reach 1R: Wetlands/Swale

Inflow Area = 12.470 ac, 2.77% Impervious, Inflow Depth > 0.49" for 2-Year event
Inflow = 2.14 cfs @ 12.49 hrs, Volume= 0.512 af
Outflow = 1.97 cfs @ 12.80 hrs, Volume= 0.501 af, Atten= 8%, Lag= 18.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 9.1 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 12.7 min

Peak Storage= 1,078 cf @ 12.65 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 2.00' Flow Area= 146.7 sf, Capacity= 1,259.44 cfs

110.00' x 2.00' deep Parabolic Channel, n= 0.035
Length= 645.0' Slope= 0.0279 '/'
Inlet Invert= 284.00', Outlet Invert= 266.00'

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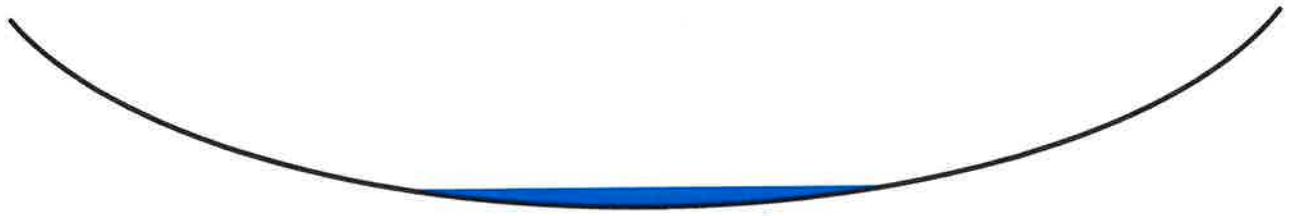
Summary for Reach 2R: Wetlands/Swale

Inflow Area = 13.113 ac, 9.38% Impervious, Inflow Depth > 0.76" for 2-Year event
Inflow = 3.47 cfs @ 12.45 hrs, Volume= 0.836 af
Outflow = 3.04 cfs @ 12.89 hrs, Volume= 0.806 af, Atten= 12%, Lag= 26.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.76 fps, Min. Travel Time= 15.3 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 21.5 min

Peak Storage= 2,791 cf @ 12.63 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 120.0 sf, Capacity= 415.63 cfs

180.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 700.0' Slope= 0.0114 '/'
Inlet Invert= 274.00', Outlet Invert= 266.00'



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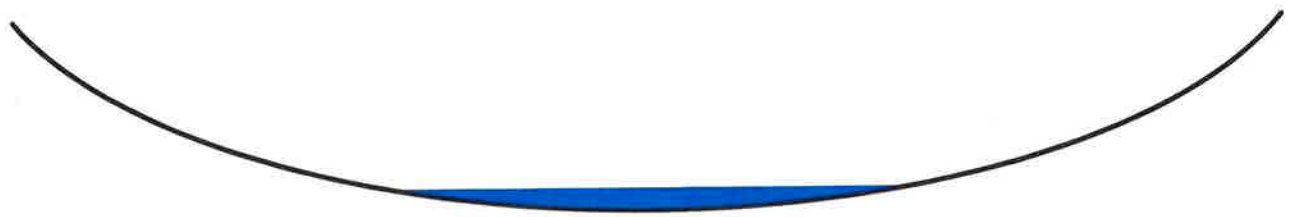
Summary for Reach 3R: Wetland/Swale to Offsite

Inflow Area = 32.253 ac, 13.15% Impervious, Inflow Depth > 0.65" for 2-Year event
Inflow = 5.70 cfs @ 12.70 hrs, Volume= 1.736 af
Outflow = 5.05 cfs @ 13.37 hrs, Volume= 1.648 af, Atten= 11%, Lag= 40.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 20.0 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 25.9 min

Peak Storage= 6,055 cf @ 13.04 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00' Flow Area= 233.3 sf, Capacity= 517.60 cfs

350.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 640.0' Slope= 0.0047 '/'
Inlet Invert= 266.00', Outlet Invert= 263.00'



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Summary for Reach 4R: Peak at Boundary

Inflow Area = 44.724 ac, 10.25% Impervious, Inflow Depth > 0.58" for 2-Year event
Inflow = 6.51 cfs @ 13.32 hrs, Volume= 2.149 af
Outflow = 6.51 cfs @ 13.32 hrs, Volume= 2.149 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin 1

Inflow Area = 3.730 ac, 9.27% Impervious, Inflow Depth > 1.16" for 2-Year event
Inflow = 3.16 cfs @ 12.31 hrs, Volume= 0.361 af
Outflow = 0.64 cfs @ 13.44 hrs, Volume= 0.200 af, Atten= 80%, Lag= 67.8 min
Primary = 0.64 cfs @ 13.44 hrs, Volume= 0.200 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 274.60' @ 13.44 hrs Surf.Area= 5,002 sf Storage= 8,552 cf
Flood Elev= 278.00' Surf.Area= 7,415 sf Storage= 29,355 cf

Plug-Flow detention time= 184.5 min calculated for 0.199 af (55% of inflow)
Center-of-Mass det. time= 103.9 min (927.9 - 824.0)

Volume	Invert	Avail.Storage	Storage Description
#1	272.00'	29,355 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
272.00	1,000	0	0
274.00	4,650	5,650	5,650
276.00	5,820	10,470	16,120
278.00	7,415	13,235	29,355

Device	Routing	Invert	Outlet Devices
#1	Primary	274.00'	**12.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 274.00' / 274.00' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	277.00'	**12.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.64 cfs @ 13.44 hrs HW=274.60' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.64 cfs @ 1.87 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=272.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Basin 2P

Inflow Area = 7.223 ac, 17.03% Impervious, Inflow Depth > 1.21" for 2-Year event
Inflow = 6.69 cfs @ 12.24 hrs, Volume= 0.730 af
Outflow = 2.01 cfs @ 12.77 hrs, Volume= 0.548 af, Atten= 70%, Lag= 31.4 min
Primary = 2.01 cfs @ 12.77 hrs, Volume= 0.548 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 278.55' @ 12.77 hrs Surf.Area= 6,559 sf Storage= 12,400 cf

Plug-Flow detention time= 132.3 min calculated for 0.548 af (75% of inflow)
Center-of-Mass det. time= 63.4 min (898.5 - 835.2)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	22,943 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
275.00	1,090	0	0
277.00	3,440	4,530	4,530
277.50	4,066	1,877	6,407
278.00	6,000	2,517	8,923
280.00	8,020	14,020	22,943

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	277.50'	**6.0" Round Culvert X 3.00** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.50' / 277.50' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Primary OutFlow Max=2.01 cfs @ 12.77 hrs HW=278.55' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 2.01 cfs @ 3.41 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=275.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 3P: Basin 3P

Inflow Area = 8.300 ac, 36.27% Impervious, Inflow Depth > 1.38" for 2-Year event
Inflow = 11.08 cfs @ 12.20 hrs, Volume= 0.953 af
Outflow = 0.98 cfs @ 14.24 hrs, Volume= 0.476 af, Atten= 91%, Lag= 122.2 min
Primary = 0.98 cfs @ 14.24 hrs, Volume= 0.476 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 276.44' @ 14.24 hrs Surf.Area= 21,435 sf Storage= 25,119 cf

Plug-Flow detention time= 221.5 min calculated for 0.474 af (50% of inflow)
Center-of-Mass det. time= 138.6 min (947.1 - 808.5)

Volume	Invert	Avail.Storage	Storage Description
#1	272.00'	6,413 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 16,032 cf Overall x 40.0% Voids
#2	274.50'	77,837 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		84,250 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
272.00	8,016	0	0
274.00	8,016	16,032	16,032

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.50	4,205	0	0
275.00	7,438	2,911	2,911
276.00	12,723	10,081	12,991
278.00	15,906	28,629	41,620
280.00	20,311	36,217	77,837

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.00'	**16.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	277.50'	**8.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.50' / 275.00' S= 0.1250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Primary	276.00'	**10.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#4	Primary	273.00'	**4.0" Round Culvert** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 272.50' / 273.00' S= -0.0096 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf

Primary OutFlow Max=0.98 cfs @ 14.24 hrs HW=276.44' (Free Discharge)
- **2=Culvert** (Controls 0.00 cfs)
- **3=Culvert** (Inlet Controls 0.52 cfs @ 1.78 fps)
- **4=Culvert** (Outlet Controls 0.46 cfs @ 5.29 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=272.00' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B1: Retention

Inflow Area = 1.108 ac, 0.00% Impervious, Inflow Depth > 1.02" for 2-Year event
Inflow = 1.10 cfs @ 12.19 hrs, Volume= 0.094 af
Outflow = 0.47 cfs @ 12.55 hrs, Volume= 0.089 af, Atten= 58%, Lag= 21.8 min
Primary = 0.47 cfs @ 12.55 hrs, Volume= 0.089 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.14' @ 12.55 hrs Surf.Area= 5,089 sf Storage= 975 cf

Plug-Flow detention time= 36.7 min calculated for 0.089 af (95% of inflow)
Center-of-Mass det. time= 18.5 min (840.2 - 821.7)

Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	19,555 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	312.00'	384 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
			960 cf Overall x 40.0% Voids
		19,939 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
315.00	3,590	0	0
316.00	10,660	7,125	7,125
317.00	14,200	12,430	19,555

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	480	0	0
314.00	480	960	960

Device	Routing	Invert	Outlet Devices
#1	Primary	316.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	313.00'	**4.0" Round Culvert**
			L= 115.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 313.00' / 300.00' S= 0.1130 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.09 sf

Primary OutFlow Max=0.47 cfs @ 12.55 hrs HW=315.14' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└—**2=Culvert** (Inlet Controls 0.47 cfs @ 5.35 fps)

Summary for Pond B4: Basin B4

Inflow Area = 1.983 ac, 0.00% Impervious, Inflow Depth > 1.02" for 2-Year event
Inflow = 1.80 cfs @ 12.24 hrs, Volume= 0.168 af
Outflow = 0.19 cfs @ 14.40 hrs, Volume= 0.129 af, Atten= 90%, Lag= 129.8 min
Primary = 0.19 cfs @ 14.40 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 321.56' @ 14.40 hrs Surf.Area= 6,451 sf Storage= 3,437 cf

Plug-Flow detention time= 184.2 min calculated for 0.128 af (76% of inflow)
Center-of-Mass det. time= 125.0 min (949.2 - 824.2)

Volume	Invert	Avail.Storage	Storage Description
#1	318.00'	360 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
			900 cf Overall x 40.0% Voids
#2	321.00'	27,168 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		27,528 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
318.00	300	0	0
321.00	300	900	900

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
321.00	4,850	0	0
322.00	7,175	6,013	6,013
324.00	13,980	21,155	27,168

Device	Routing	Invert	Outlet Devices
#1	Primary	318.00'	**3.0" Round Culvert**
			L= 150.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 318.00' / 315.12' S= 0.0192 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.05 sf
#2	Primary	323.00'	**30.0' long x 40.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.19 cfs @ 14.40 hrs HW=321.56' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.19 cfs @ 3.82 fps)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond CB: CB-3

Inflow Area = 1.983 ac, 0.00% Impervious, Inflow Depth > 0.78" for 2-Year event
Inflow = 0.19 cfs @ 14.40 hrs, Volume= 0.129 af
Outflow = 0.19 cfs @ 14.40 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 14.40 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.32' @ 14.40 hrs
Flood Elev= 321.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	315.12'	**15.0" Round Culvert**
			L= 650.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 315.12' / 277.00' S= 0.0586 '/' Cc= 0.900
n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.18 cfs @ 14.40 hrs HW=315.32' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.18 cfs @ 1.50 fps)

Summary for Subcatchment 1S: Overland to Wetland 1

Runoff = 8.28 cfs @ 12.40 hrs, Volume= 0.959 af, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	2.110	77	Woods, Good, HSG D (wetlands)
	6.120	55	Woods, Good, HSG B
	0.510	61	>75% Grass cover, Good, HSG B
	8.740	61	Weighted Average
	8.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.9	250	0.0960	0.17		**Sheet Flow, Tc-1S-1** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	270	0.1920	2.19		**Shallow Concentrated Flow, Tc-1S-2** Woodland Kv= 5.0 fps
26.0	520	Total			

Summary for Subcatchment 1S': Drainage to 1P

Runoff = 5.75 cfs @ 12.29 hrs, Volume= 0.577 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (sf)	CN	Description
	89,580	74	>75% Grass cover, Good, HSG C
*	9,550	87	Crushed stone, HSG C
	15,070	98	Paved parking, HSG C
	114,200	78	Weighted Average
	99,130		86.80% Pervious Area
	15,070		13.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	250	0.1200	0.29		**Sheet Flow, Tc-1a** Grass: Dense n= 0.240 P2= 3.20"
6.5	480	0.0310	1.23		**Shallow Concentrated Flow, Tc-1a-2** Short Grass Pasture Kv= 7.0 fps
0.1	106	0.1200	19.75	24.24	**Pipe Channel, HDPE from CB-9** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
21.1	836	Total			

Summary for Subcatchment 2S: Overland to Wetland 2

Runoff = 9.74 cfs @ 12.17 hrs, Volume= 0.788 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	2.400	77	Woods, Good, HSG D (wetlands)
	0.590	61	>75% Grass cover, Good, HSG B
	2.900	55	Woods, Good, HSG B
	5.890	65	Weighted Average
	5.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	75	0.0600	0.11		**Sheet Flow, Tc-2s** Woods: Light underbrush n= 0.400 P2= 3.20"

Summary for Subcatchment 2S': Drainage to Basin

Runoff = 13.35 cfs @ 12.24 hrs, Volume= 1.234 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	1.900	61	>75% Grass cover, Good, HSG B (fill slopes)
*	2.110	87	Crushed Stone, HSG C
	1.230	98	Paved parking, HSG C
	5.240	80	Weighted Average
	4.010		76.53% Pervious Area
	1.230		23.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	589	0.0150	0.58		**Lag/CN Method, Tc-2S'**

Summary for Subcatchment 3S: Drainage Area to Basin

Runoff = 22.72 cfs @ 12.20 hrs, Volume= 1.956 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	3.010	98	Impervious roof & pavement
*	3.900	72	Crushed Stone surface, HSG B
	1.390	61	>75% Grass cover, Good, HSG B
	8.300	80	Weighted Average
	5.290		63.73% Pervious Area
	3.010		36.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	560	0.0200	0.66		**Lag/CN Method, Tc-1**

Summary for Subcatchment 3S': Overland to Wetland 2

Runoff = 11.84 cfs @ 12.37 hrs, Volume= 1.314 af, Depth> 1.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	3.920	77	Woods, Good, HSG D (wetlands)
*	0.270	61	>75% Grass cover, Good, HSG B (fill slopes)
	6.650	55	Woods, Good, HSG B
	10.840	63	Weighted Average
	10.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	300	0.1460	0.21		**Sheet Flow, Tc 3S-1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	115	0.0950	1.54		**Shallow Concentrated Flow, Tc 3S-2** Woodland Kv= 5.0 fps
24.5	415	Total			

Summary for Subcatchment DB1: Drainage to Basin B1

Runoff = 2.56 cfs @ 12.18 hrs, Volume= 0.213 af, Depth> 2.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

Area (sf)	CN	Description
48,285	74	>75% Grass cover, Good, HSG C
48,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	225	0.1350	0.29		**Sheet Flow, Tc-B1** Grass: Dense n= 0.240 P2= 3.20"

Summary for Subcatchment DB4: Drainage to B4

Runoff = 4.24 cfs @ 12.22 hrs, Volume= 0.381 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

Area (sf)	CN	Description
86,400	74	>75% Grass cover, Good, HSG C
86,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	250	0.1200	0.29		**Sheet Flow, Tc-DB4** Grass: Dense n= 0.240 P2= 3.20"
1.5	110	0.0300	1.21		**Shallow Concentrated Flow, Tc-DB4-2** Short Grass Pasture Kv= 7.0 fps
16.0	360	Total			

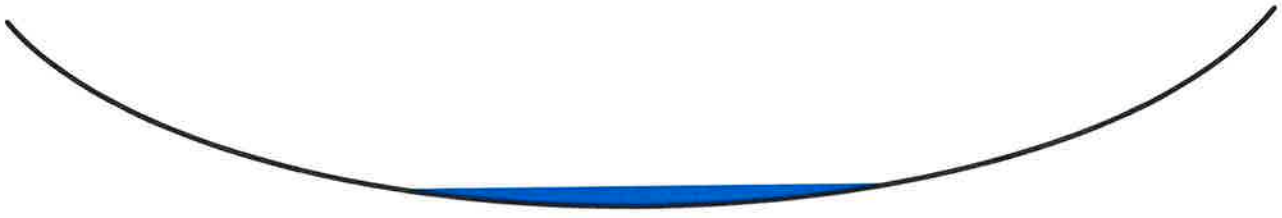
Summary for Reach 1R: Wetlands/Swale

Inflow Area = 12.470 ac, 2.77% Impervious, Inflow Depth > 1.51" for 10-Year event
Inflow = 10.07 cfs @ 12.45 hrs, Volume= 1.573 af
Outflow = 9.74 cfs @ 12.62 hrs, Volume= 1.557 af, Atten= 3%, Lag= 10.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.93 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 9.8 min

Peak Storage= 3,265 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 146.7 sf, Capacity= 1,259.44 cfs

110.00' x 2.00' deep Parabolic Channel, n= 0.035
Length= 645.0' Slope= 0.0279 '/'
Inlet Invert= 284.00', Outlet Invert= 266.00'



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Summary for Reach 2R: Wetlands/Swale

Inflow Area = 13.113 ac, 9.38% Impervious, Inflow Depth > 1.82" for 10-Year event
Inflow = 14.76 cfs @ 12.42 hrs, Volume= 1.985 af
Outflow = 12.81 cfs @ 12.67 hrs, Volume= 1.948 af, Atten= 13%, Lag= 15.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.19 fps, Min. Travel Time= 9.8 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 18.3 min

Peak Storage= 7,576 cf @ 12.51 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 1.00' Flow Area= 120.0 sf, Capacity= 415.63 cfs

180.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 700.0' Slope= 0.0114 '/'
Inlet Invert= 274.00', Outlet Invert= 266.00'

‡

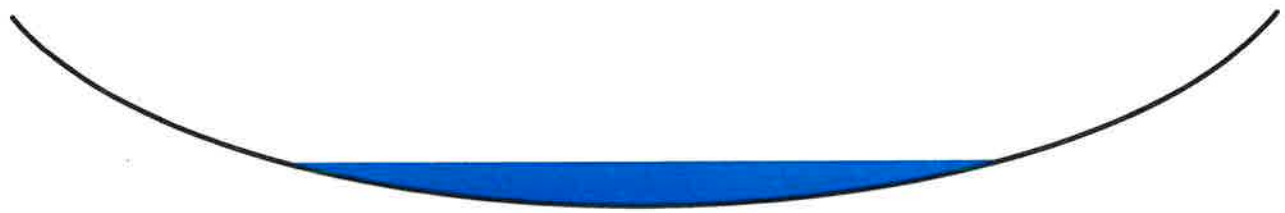
Summary for Reach 3R: Wetland/Swale to Offsite

Inflow Area = 32.253 ac, 13.15% Impervious, Inflow Depth > 1.74" for 10-Year event
Inflow = 24.16 cfs @ 12.61 hrs, Volume= 4.667 af
Outflow = 22.44 cfs @ 12.94 hrs, Volume= 4.549 af, Atten= 7%, Lag= 19.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.84 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 21.2 min

Peak Storage= 17,021 cf @ 12.73 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 233.3 sf, Capacity= 517.60 cfs

350.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 640.0' Slope= 0.0047 '/'
Inlet Invert= 266.00', Outlet Invert= 263.00'



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Summary for Reach 4R: Peak at Boundary

Inflow Area = 44.724 ac, 10.25% Impervious, Inflow Depth > 1.64" for 10-Year event
Inflow = 29.94 cfs @ 12.88 hrs, Volume= 6.106 af
Outflow = 29.94 cfs @ 12.88 hrs, Volume= 6.106 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin 1

Inflow Area = 3.730 ac, 9.27% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 6.25 cfs @ 12.30 hrs, Volume= 0.785 af
Outflow = 2.55 cfs @ 12.77 hrs, Volume= 0.614 af, Atten= 59%, Lag= 28.4 min
Primary = 2.55 cfs @ 12.77 hrs, Volume= 0.614 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 275.44' @ 12.77 hrs Surf.Area= 5,494 sf Storage= 12,970 cf
Flood Elev= 278.00' Surf.Area= 7,415 sf Storage= 29,355 cf

Plug-Flow detention time= 116.4 min calculated for 0.614 af (78% of inflow)
Center-of-Mass det. time= 63.2 min (880.1 - 816.8)

Volume	Invert	Avail.Storage	Storage Description
#1	272.00'	29,355 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
272.00	1,000	0	0
274.00	4,650	5,650	5,650
276.00	5,820	10,470	16,120
278.00	7,415	13,235	29,355

Device	Routing	Invert	Outlet Devices
#1	Primary	274.00'	**12.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 274.00' / 274.00' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	277.00'	**12.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=2.55 cfs @ 12.77 hrs HW=275.44' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 2.55 cfs @ 3.25 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=272.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Basin 2P

Inflow Area = 7.223 ac, 17.03% Impervious, Inflow Depth > 2.31" for 10-Year event
Inflow = 13.53 cfs @ 12.24 hrs, Volume= 1.388 af
Outflow = 9.37 cfs @ 12.44 hrs, Volume= 1.197 af, Atten= 31%, Lag= 12.4 min
Primary = 3.15 cfs @ 12.44 hrs, Volume= 1.034 af
Secondary = 6.23 cfs @ 12.44 hrs, Volume= 0.163 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 279.72' @ 12.44 hrs Surf.Area= 7,741 sf Storage= 20,768 cf

Plug-Flow detention time= 99.9 min calculated for 1.193 af (86% of inflow)
Center-of-Mass det. time= 57.2 min (865.8 - 808.6)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	22,943 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
275.00	1,090	0	0
277.00	3,440	4,530	4,530
277.50	4,066	1,877	6,407
278.00	6,000	2,517	8,923
280.00	8,020	14,020	22,943

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	277.50'	**6.0" Round Culvert X 3.00** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.50' / 277.50' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Primary OutFlow Max=3.14 cfs @ 12.44 hrs HW=279.72' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 3.14 cfs @ 5.34 fps)

Secondary OutFlow Max=6.13 cfs @ 12.44 hrs HW=279.72' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 6.13 cfs @ 1.15 fps)

Summary for Pond 3P: Basin 3P

Inflow Area = 8.300 ac, 36.27% Impervious, Inflow Depth > 2.83" for 10-Year event
Inflow = 22.72 cfs @ 12.20 hrs, Volume= 1.956 af
Outflow = 3.39 cfs @ 12.98 hrs, Volume= 1.405 af, Atten= 85%, Lag= 46.9 min
Primary = 3.39 cfs @ 12.98 hrs, Volume= 1.405 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 277.88' @ 12.98 hrs Surf.Area= 23,727 sf Storage= 46,100 cf

Plug-Flow detention time= 183.7 min calculated for 1.405 af (72% of inflow)
Center-of-Mass det. time= 120.0 min (912.3 - 792.3)

Volume	Invert	Avail.Storage	Storage Description
#1	272.00'	6,413 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 16,032 cf Overall x 40.0% Voids
#2	274.50'	77,837 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		84,250 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
272.00	8,016	0	0
274.00	8,016	16,032	16,032

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.50	4,205	0	0
275.00	7,438	2,911	2,911
276.00	12,723	10,081	12,991
278.00	15,906	28,629	41,620
280.00	20,311	36,217	77,837

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.00'	**16.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	277.50'	**8.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.50' / 275.00' S= 0.1250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Primary	276.00'	**10.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#4	Primary	273.00'	**4.0" Round Culvert** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 272.50' / 273.00' S= -0.0096 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf

Primary OutFlow Max=3.39 cfs @ 12.98 hrs HW=277.88' (Free Discharge)
- **2=Culvert** (Inlet Controls 0.34 cfs @ 1.65 fps)
- **3=Culvert** (Inlet Controls 2.51 cfs @ 4.59 fps)
- **4=Culvert** (Outlet Controls 0.55 cfs @ 6.30 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=272.00' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B1: Retention

Inflow Area = 1.108 ac, 0.00% Impervious, Inflow Depth > 2.31" for 10-Year event
Inflow = 2.56 cfs @ 12.18 hrs, Volume= 0.213 af
Outflow = 0.51 cfs @ 12.77 hrs, Volume= 0.208 af, Atten= 80%, Lag= 35.1 min
Primary = 0.51 cfs @ 12.77 hrs, Volume= 0.208 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.53' @ 12.77 hrs Surf.Area= 7,844 sf Storage= 3,307 cf

Plug-Flow detention time= 63.3 min calculated for 0.208 af (98% of inflow)
Center-of-Mass det. time= 54.2 min (857.7 - 803.6)

Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	19,555 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	312.00'	384 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
			960 cf Overall x 40.0% Voids
		19,939 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
315.00	3,590	0	0
316.00	10,660	7,125	7,125
317.00	14,200	12,430	19,555

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	480	0	0
314.00	480	960	960

Device	Routing	Invert	Outlet Devices
#1	Primary	316.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	313.00'	**4.0" Round Culvert**
			L= 115.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 313.00' / 300.00' S= 0.1130 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.09 sf

Primary OutFlow Max=0.51 cfs @ 12.77 hrs HW=315.53' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└—**2=Culvert** (Inlet Controls 0.51 cfs @ 5.85 fps)

Summary for Pond B4: Basin B4

Inflow Area = 1.983 ac, 0.00% Impervious, Inflow Depth > 2.30" for 10-Year event
Inflow = 4.24 cfs @ 12.22 hrs, Volume= 0.381 af
Outflow = 0.20 cfs @ 16.42 hrs, Volume= 0.154 af, Atten= 95%, Lag= 251.8 min
Primary = 0.20 cfs @ 16.42 hrs, Volume= 0.154 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 322.53' @ 16.42 hrs Surf.Area= 9,264 sf Storage= 10,616 cf

Plug-Flow detention time= 202.7 min calculated for 0.154 af (41% of inflow)
Center-of-Mass det. time= 114.2 min (920.3 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1	318.00'	360 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 900 cf Overall x 40.0% Voids
#2	321.00'	27,168 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		27,528 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
318.00	300	0	0
321.00	300	900	900

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
321.00	4,850	0	0
322.00	7,175	6,013	6,013
324.00	13,980	21,155	27,168

Device	Routing	Invert	Outlet Devices
#1	Primary	318.00'	**3.0" Round Culvert** L= 150.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 318.00' / 315.12' S= 0.0192 '/' Cc= 0.900 n= 0.012, Flow Area= 0.05 sf
#2	Primary	323.00'	**30.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.20 cfs @ 16.42 hrs HW=322.53' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.20 cfs @ 4.10 fps)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond CB: CB-3

Inflow Area = 1.983 ac, 0.00% Impervious, Inflow Depth > 0.93" for 10-Year event
Inflow = 0.20 cfs @ 16.42 hrs, Volume= 0.154 af
Outflow = 0.20 cfs @ 16.42 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 16.42 hrs, Volume= 0.154 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.32' @ 16.42 hrs
Flood Elev= 321.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	315.12'	**15.0" Round Culvert** L= 650.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 315.12' / 277.00' S= 0.0586 '/' Cc= 0.900
n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.20 cfs @ 16.42 hrs HW=315.32' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.20 cfs @ 1.53 fps)

Summary for Subcatchment 1S: Overland to Wetland 1

Runoff = 21.34 cfs @ 12.38 hrs, Volume= 2.344 af, Depth> 3.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	2.110	77	Woods, Good, HSG D (wetlands)
	6.120	55	Woods, Good, HSG B
	0.510	61	>75% Grass cover, Good, HSG B
	8.740	61	Weighted Average
	8.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.9	250	0.0960	0.17		**Sheet Flow, Tc-1S-1** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	270	0.1920	2.19		**Shallow Concentrated Flow, Tc-1S-2** Woodland Kv= 5.0 fps
26.0	520	Total			

Summary for Subcatchment 1S': Drainage to 1P

Runoff = 10.98 cfs @ 12.29 hrs, Volume= 1.119 af, Depth> 5.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (sf)	CN	Description
	89,580	74	>75% Grass cover, Good, HSG C
*	9,550	87	Crushed stone, HSG C
	15,070	98	Paved parking, HSG C
	114,200	78	Weighted Average
	99,130		86.80% Pervious Area
	15,070		13.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	250	0.1200	0.29		**Sheet Flow, Tc-1a** Grass: Dense n= 0.240 P2= 3.20"
6.5	480	0.0310	1.23		**Shallow Concentrated Flow, Tc-1a-2** Short Grass Pasture Kv= 7.0 fps
0.1	106	0.1200	19.75	24.24	**Pipe Channel, HDPE from CB-9** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
21.1	836	Total			

Summary for Subcatchment 2S: Overland to Wetland 2

Runoff = 22.94 cfs @ 12.16 hrs, Volume= 1.804 af, Depth> 3.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	2.400	77	Woods, Good, HSG D (wetlands)
	0.590	61	>75% Grass cover, Good, HSG B
	2.900	55	Woods, Good, HSG B
	5.890	65	Weighted Average
	5.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	75	0.0600	0.11		**Sheet Flow, Tc-2s** Woods: Light underbrush n= 0.400 P2= 3.20"

Summary for Subcatchment 2S': Drainage to Basin

Runoff = 24.81 cfs @ 12.23 hrs, Volume= 2.340 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	1.900	61	>75% Grass cover, Good, HSG B (fill slopes)
*	2.110	87	Crushed Stone, HSG C
	1.230	98	Paved parking, HSG C
	5.240	80	Weighted Average
	4.010		76.53% Pervious Area
	1.230		23.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	589	0.0150	0.58		**Lag/CN Method, Tc-2S'**

Summary for Subcatchment 3S: Drainage Area to Basin

Runoff = 42.19 cfs @ 12.19 hrs, Volume= 3.710 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	3.010	98	Impervious roof & pavement
*	3.900	72	Crushed Stone surface, HSG B
	1.390	61	>75% Grass cover, Good, HSG B
	8.300	80	Weighted Average
	5.290		63.73% Pervious Area
	3.010		36.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	560	0.0200	0.66		**Lag/CN Method, Tc-1**

Summary for Subcatchment 3S": Overland to Wetland 2

Runoff = 29.09 cfs @ 12.35 hrs, Volume= 3.105 af, Depth> 3.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	3.920	77	Woods, Good, HSG D (wetlands)
*	0.270	61	>75% Grass cover, Good, HSG B (fill slopes)
	6.650	55	Woods, Good, HSG B
	10.840	63	Weighted Average
	10.840		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	300	0.1460	0.21		**Sheet Flow, Tc 3S-1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	115	0.0950	1.54		**Shallow Concentrated Flow, Tc 3S-2** Woodland Kv= 5.0 fps
24.5	415	Total			

Summary for Subcatchment DB1: Drainage to Basin B1

Runoff = 5.20 cfs @ 12.17 hrs, Volume= 0.432 af, Depth> 4.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

Area (sf)	CN	Description
48,285	74	>75% Grass cover, Good, HSG C
48,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	225	0.1350	0.29		**Sheet Flow, Tc-B1** Grass: Dense n= 0.240 P2= 3.20"

Summary for Subcatchment DB4: Drainage to B4

Runoff = 8.55 cfs @ 12.22 hrs, Volume= 0.773 af, Depth> 4.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

Area (sf)	CN	Description
86,400	74	>75% Grass cover, Good, HSG C
86,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	250	0.1200	0.29		**Sheet Flow, Tc-DB4** Grass: Dense n= 0.240 P2= 3.20"
1.5	110	0.0300	1.21		**Shallow Concentrated Flow, Tc-DB4-2** Short Grass Pasture Kv= 7.0 fps
16.0	360	Total			

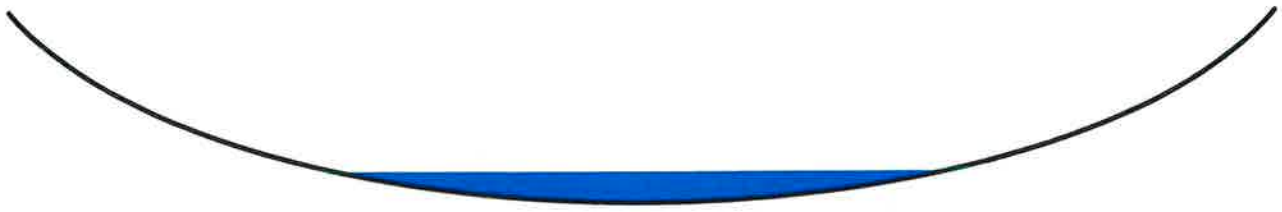
Summary for Reach 1R: Wetlands/Swale

Inflow Area = 12.470 ac, 2.77% Impervious, Inflow Depth > 3.53" for 100-Year event
Inflow = 25.52 cfs @ 12.39 hrs, Volume= 3.668 af
Outflow = 24.98 cfs @ 12.51 hrs, Volume= 3.639 af, Atten= 2%, Lag= 7.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.57 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 1.30 fps, Avg. Travel Time= 8.3 min

Peak Storage= 6,280 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00' Flow Area= 146.7 sf, Capacity= 1,259.44 cfs

110.00' x 2.00' deep Parabolic Channel, n= 0.035
Length= 645.0' Slope= 0.0279 '/'
Inlet Invert= 284.00', Outlet Invert= 266.00'



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Summary for Reach 2R: Wetlands/Swale

Inflow Area = 13.113 ac, 9.38% Impervious, Inflow Depth > 3.99" for 100-Year event
Inflow = 44.01 cfs @ 12.22 hrs, Volume= 4.363 af
Outflow = 38.53 cfs @ 12.43 hrs, Volume= 4.313 af, Atten= 12%, Lag= 13.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.67 fps, Min. Travel Time= 7.0 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 15.8 min

Peak Storage= 16,296 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.00' Flow Area= 120.0 sf, Capacity= 415.63 cfs

180.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 700.0' Slope= 0.0114 '/'
Inlet Invert= 274.00', Outlet Invert= 266.00'

‡

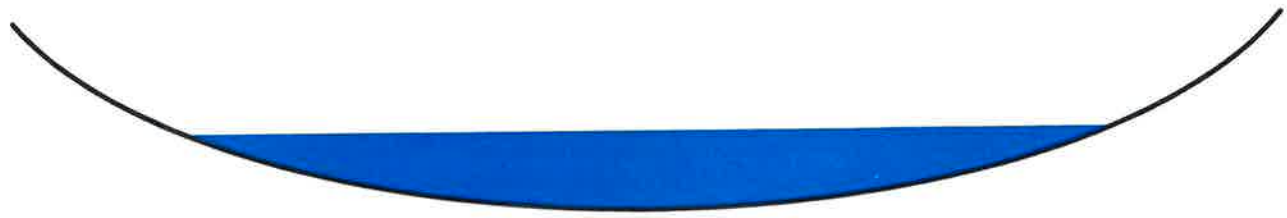
Summary for Reach 3R: Wetland/Swale to Offsite

Inflow Area = 32.253 ac, 13.15% Impervious, Inflow Depth > 3.89" for 100-Year event
Inflow = 85.13 cfs @ 12.44 hrs, Volume= 10.464 af
Outflow = 76.59 cfs @ 12.69 hrs, Volume= 10.294 af, Atten= 10%, Lag= 15.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.23 fps, Min. Travel Time= 8.7 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 18.3 min

Peak Storage= 39,835 cf @ 12.55 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.00' Flow Area= 233.3 sf, Capacity= 517.60 cfs

350.00' x 1.00' deep Parabolic Channel, n= 0.035
Length= 640.0' Slope= 0.0047 '/'
Inlet Invert= 266.00', Outlet Invert= 263.00'



‡

Summary for Reach 4R: Peak at Boundary

Inflow Area = 44.724 ac, 10.25% Impervious, Inflow Depth > 3.74" for 100-Year event
Inflow = 98.52 cfs @ 12.67 hrs, Volume= 13.933 af
Outflow = 98.52 cfs @ 12.67 hrs, Volume= 13.933 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin 1

Inflow Area = 3.730 ac, 9.27% Impervious, Inflow Depth > 4.91" for 100-Year event
Inflow = 11.51 cfs @ 12.29 hrs, Volume= 1.527 af
Outflow = 4.84 cfs @ 12.72 hrs, Volume= 1.324 af, Atten= 58%, Lag= 25.9 min
Primary = 4.74 cfs @ 12.72 hrs, Volume= 1.323 af
Secondary = 0.11 cfs @ 12.72 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 277.02' @ 12.72 hrs Surf.Area= 6,631 sf Storage= 22,454 cf
Flood Elev= 278.00' Surf.Area= 7,415 sf Storage= 29,355 cf

Plug-Flow detention time= 98.8 min calculated for 1.324 af (87% of inflow)
Center-of-Mass det. time= 55.2 min (876.7 - 821.5)

Volume	Invert	Avail.Storage	Storage Description
#1	272.00'	29,355 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
272.00	1,000	0	0
274.00	4,650	5,650	5,650
276.00	5,820	10,470	16,120
278.00	7,415	13,235	29,355

Device	Routing	Invert	Outlet Devices
#1	Primary	274.00'	**12.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 274.00' / 274.00' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	277.00'	**12.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=4.73 cfs @ 12.72 hrs HW=277.02' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.73 cfs @ 6.03 fps)

Secondary OutFlow Max=0.06 cfs @ 12.72 hrs HW=277.02' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.32 fps)

Summary for Pond 2P: Basin 2P

Inflow Area = 7.223 ac, 17.03% Impervious, Inflow Depth > 4.59" for 100-Year event
Inflow = 25.01 cfs @ 12.23 hrs, Volume= 2.764 af
Outflow = 24.63 cfs @ 12.27 hrs, Volume= 2.559 af, Atten= 1%, Lag= 2.2 min
Primary = 3.35 cfs @ 12.27 hrs, Volume= 1.619 af
Secondary = 21.28 cfs @ 12.27 hrs, Volume= 0.941 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 279.99' @ 12.27 hrs Surf.Area= 8,007 sf Storage= 22,841 cf

Plug-Flow detention time= 69.9 min calculated for 2.551 af (92% of inflow)
Center-of-Mass det. time= 45.0 min (835.8 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	22,943 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
275.00	1,090	0	0
277.00	3,440	4,530	4,530
277.50	4,066	1,877	6,407
278.00	6,000	2,517	8,923
280.00	8,020	14,020	22,943

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.50'	**24.0' long x 7.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.42 2.53 2.70 2.69 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.67 2.69 2.71 2.76
#2	Primary	277.50'	**6.0" Round Culvert X 3.00** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.50' / 277.50' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Primary OutFlow Max=3.35 cfs @ 12.27 hrs HW=279.98' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 3.35 cfs @ 5.68 fps)

Secondary OutFlow Max=20.96 cfs @ 12.27 hrs HW=279.98' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 20.96 cfs @ 1.81 fps)

Summary for Pond 3P: Basin 3P

Inflow Area = 8.300 ac, 36.27% Impervious, Inflow Depth > 5.36" for 100-Year event
Inflow = 42.19 cfs @ 12.19 hrs, Volume= 3.710 af
Outflow = 20.06 cfs @ 12.49 hrs, Volume= 3.046 af, Atten= 52%, Lag= 17.9 min
Primary = 5.96 cfs @ 12.49 hrs, Volume= 2.531 af
Secondary = 14.11 cfs @ 12.49 hrs, Volume= 0.515 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 279.47' @ 12.49 hrs Surf.Area= 27,167 sf Storage= 73,859 cf

Plug-Flow detention time= 148.7 min calculated for 3.036 af (82% of inflow)
Center-of-Mass det. time= 100.7 min (878.0 - 777.3)

Volume	Invert	Avail.Storage	Storage Description
#1	272.00'	6,413 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 16,032 cf Overall x 40.0% Voids
#2	274.50'	77,837 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		84,250 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
272.00	8,016	0	0
274.00	8,016	16,032	16,032

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.50	4,205	0	0
275.00	7,438	2,911	2,911
276.00	12,723	10,081	12,991
278.00	15,906	28,629	41,620
280.00	20,311	36,217	77,837

Device	Routing	Invert	Outlet Devices
#1	Secondary	279.00'	**16.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	277.50'	**8.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 277.50' / 275.00' S= 0.1250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#3	Primary	276.00'	**10.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 276.00' / 275.00' S= 0.0313 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#4	Primary	273.00'	**4.0" Round Culvert** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 272.50' / 273.00' S= -0.0096 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf

Primary OutFlow Max=5.96 cfs @ 12.49 hrs HW=279.47' (Free Discharge)
- **2=Culvert** (Inlet Controls 1.70 cfs @ 4.87 fps)
- **3=Culvert** (Inlet Controls 3.62 cfs @ 6.64 fps)
- **4=Culvert** (Outlet Controls 0.63 cfs @ 7.26 fps)

Secondary OutFlow Max=13.98 cfs @ 12.49 hrs HW=279.47' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 13.98 cfs @ 1.85 fps)

Summary for Pond B1: Retention

Inflow Area = 1.108 ac, 0.00% Impervious, Inflow Depth > 4.68" for 100-Year event
Inflow = 5.20 cfs @ 12.17 hrs, Volume= 0.432 af
Outflow = 0.57 cfs @ 13.22 hrs, Volume= 0.408 af, Atten= 89%, Lag= 62.9 min
Primary = 0.57 cfs @ 13.22 hrs, Volume= 0.408 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 316.08' @ 13.22 hrs Surf.Area= 11,418 sf Storage= 8,356 cf

Plug-Flow detention time= 149.2 min calculated for 0.408 af (94% of inflow)
Center-of-Mass det. time= 129.3 min (916.7 - 787.4)

Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	19,555 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	312.00'	384 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 960 cf Overall x 40.0% Voids
		19,939 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
315.00	3,590	0	0
316.00	10,660	7,125	7,125
317.00	14,200	12,430	19,555

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	480	0	0
314.00	480	960	960

Device	Routing	Invert	Outlet Devices
#1	Primary	316.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	313.00'	**4.0" Round Culvert** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 313.00' / 300.00' S= 0.1130 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf

Primary OutFlow Max=0.57 cfs @ 13.22 hrs HW=316.08' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└—**2=Culvert** (Inlet Controls 0.57 cfs @ 6.49 fps)

Summary for Pond B4: Basin B4

Inflow Area = 1.983 ac, 0.00% Impervious, Inflow Depth > 4.67" for 100-Year event
Inflow = 8.55 cfs @ 12.22 hrs, Volume= 0.773 af
Outflow = 2.90 cfs @ 12.65 hrs, Volume= 0.423 af, Atten= 66%, Lag= 26.1 min
Primary = 2.90 cfs @ 12.65 hrs, Volume= 0.423 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 323.10' @ 12.65 hrs Surf.Area= 11,229 sf Storage= 16,360 cf

Plug-Flow detention time= 141.0 min calculated for 0.423 af (55% of inflow)
Center-of-Mass det. time= 62.8 min (852.8 - 790.1)

Volume	Invert	Avail.Storage	Storage Description
#1	318.00'	360 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 900 cf Overall x 40.0% Voids
#2	321.00'	27,168 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		27,528 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
318.00	300	0	0
321.00	300	900	900

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
321.00	4,850	0	0
322.00	7,175	6,013	6,013
324.00	13,980	21,155	27,168

Device	Routing	Invert	Outlet Devices
#1	Primary	318.00'	**3.0" Round Culvert** L= 150.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 318.00' / 315.12' S= 0.0192 '/' Cc= 0.900 n= 0.012, Flow Area= 0.05 sf
#2	Primary	323.00'	**30.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=2.87 cfs @ 12.65 hrs HW=323.10' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.21 cfs @ 4.27 fps)
└—**2=Broad-Crested Rectangular Weir** (Weir Controls 2.66 cfs @ 0.86 fps)

Summary for Pond CB: CB-3

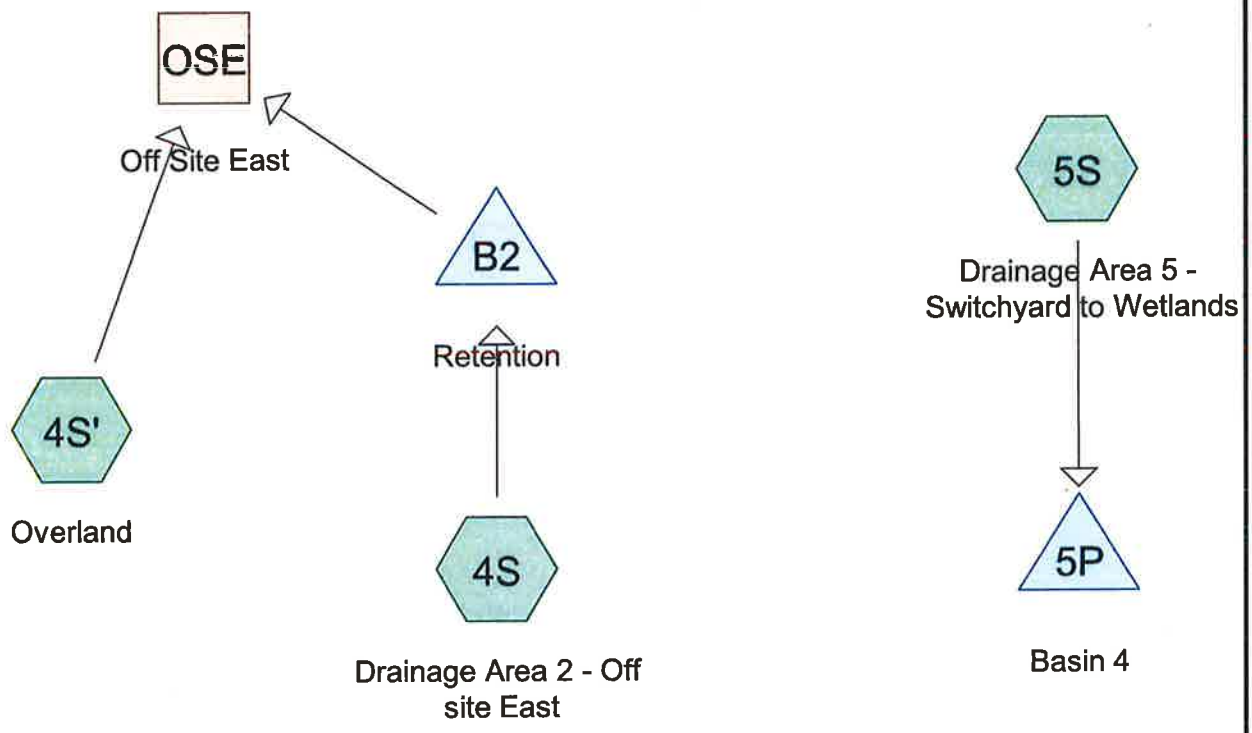
Inflow Area = 1.983 ac, 0.00% Impervious, Inflow Depth > 2.56" for 100-Year event
Inflow = 2.90 cfs @ 12.65 hrs, Volume= 0.423 af
Outflow = 2.90 cfs @ 12.65 hrs, Volume= 0.423 af, Atten= 0%, Lag= 0.0 min
Primary = 2.90 cfs @ 12.65 hrs, Volume= 0.423 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 315.99' @ 12.65 hrs
Flood Elev= 321.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	315.12'	**15.0" Round Culvert** L= 650.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 315.12' / 277.00' S= 0.0586 '/' Cc= 0.900
n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.89 cfs @ 12.65 hrs HW=315.99' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 2.89 cfs @ 3.17 fps)



Subcat Reach Pond Link

Routing Diagram for Switchyard and off site Drainage
Prepared by Microsoft, Printed 10/27/2016

Summary for Subcatchment 4S: Drainage Area 2 - Off site East

Runoff = 1.13 cfs @ 12.20 hrs, Volume= 0.102 af, Depth> 0.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
22,565	55	Woods, Good, HSG B
52,200	74	>75% Grass cover, Good, HSG C
74,765	68	Weighted Average
74,765		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	250	0.0880	0.38		**Sheet Flow, Tc 4S-1** Grass: Short n= 0.150 P2= 3.32"
1.0	112	0.0710	1.87		**Shallow Concentrated Flow, Tc 4s-2** Short Grass Pasture Kv= 7.0 fps
12.1	362	Total			

Summary for Subcatchment 4S': Overland

Runoff = 0.10 cfs @ 12.48 hrs, Volume= 0.018 af, Depth> 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

Area (sf)	CN	Description
39,244	55	Woods, Good, HSG B
39,244		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	205	0.1460	0.20		**Sheet Flow, Tc-4S'** Woods: Light underbrush n= 0.400 P2= 3.32"

Summary for Subcatchment 5S: Drainage Area 5 - Switchyard to Wetlands

Runoff = 2.51 cfs @ 12.92 hrs, Volume= 0.459 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.32"

	Area (ac)	CN	Description
*	0.810	98	Roof & Pavement
	0.730	71	Meadow, non-grazed, HSG C
	4.760	55	Woods, Good, HSG B
*	1.600	89	Crushed stone surface, HSG C
	7.900	68	Weighted Average
	7.090		89.75% Pervious Area
	0.810		10.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	200	0.0300	0.06		**Sheet Flow, Tc-4a** Woods: Dense underbrush n= 0.800 P2= 3.32"
6.2	567	0.0920	1.52		**Shallow Concentrated Flow, Tc-4B** Woodland Kv= 5.0 fps
60.5	767	Total			

Summary for Reach OSE: Off Site East

Inflow Area = 2.617 ac, 0.00% Impervious, Inflow Depth > 0.08" for 2-Year event
Inflow = 0.10 cfs @ 12.48 hrs, Volume= 0.018 af
Outflow = 0.10 cfs @ 12.48 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 5P: Basin 4

Inflow Area = 7.900 ac, 10.25% Impervious, Inflow Depth > 0.70" for 2-Year event
Inflow = 2.51 cfs @ 12.92 hrs, Volume= 0.459 af
Outflow = 0.53 cfs @ 15.66 hrs, Volume= 0.175 af, Atten= 79%, Lag= 164.4 min
Primary = 0.53 cfs @ 15.66 hrs, Volume= 0.175 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 309.41' @ 15.66 hrs Surf.Area= 5,120 sf Storage= 13,126 cf

Plug-Flow detention time= 242.0 min calculated for 0.175 af (38% of inflow)
Center-of-Mass det. time= 142.7 min (1,014.4 - 871.7)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	16,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	2,580	0	0
308.00	4,064	6,644	6,644
310.00	5,560	9,624	16,268

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**12.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 309.00' / 307.00' S= 0.0222 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	309.50'	**8.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.53 cfs @ 15.66 hrs HW=309.41' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.53 cfs @ 1.72 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=306.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B2: Retention

Inflow Area = 1.716 ac, 0.00% Impervious, Inflow Depth > 0.72" for 2-Year event
Inflow = 1.13 cfs @ 12.20 hrs, Volume= 0.102 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 313.46' @ 20.00 hrs Surf.Area= 3,114 sf Storage= 4,460 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	6,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	2,990	0	0
314.00	3,160	6,150	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=312.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 4S: Drainage Area 2 - Off site East

Runoff = 3.15 cfs @ 12.18 hrs, Volume= 0.261 af, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

Area (sf)	CN	Description
22,565	55	Woods, Good, HSG B
52,200	74	>75% Grass cover, Good, HSG C
74,765	68	Weighted Average
74,765		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	250	0.0880	0.38		**Sheet Flow, Tc 4S-1** Grass: Short n= 0.150 P2= 3.32"
1.0	112	0.0710	1.87		**Shallow Concentrated Flow, Tc 4s-2** Short Grass Pasture Kv= 7.0 fps
12.1	362	Total			

Summary for Subcatchment 4S': Overland

Runoff = 0.65 cfs @ 12.28 hrs, Volume= 0.071 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

Area (sf)	CN	Description
39,244	55	Woods, Good, HSG B
39,244		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	205	0.1460	0.20		**Sheet Flow, Tc-4S'** Woods: Light underbrush n= 0.400 P2= 3.32"

Summary for Subcatchment 5S: Drainage Area 5 - Switchyard to Wetlands

Runoff = 7.01 cfs @ 12.86 hrs, Volume= 1.178 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.16"

	Area (ac)	CN	Description
*	0.810	98	Roof & Pavement
	0.730	71	Meadow, non-grazed, HSG C
	4.760	55	Woods, Good, HSG B
*	1.600	89	Crushed stone surface, HSG C
	7.900	68	Weighted Average
	7.090		89.75% Pervious Area
	0.810		10.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	200	0.0300	0.06		**Sheet Flow, Tc-4a** Woods: Dense underbrush n= 0.800 P2= 3.32"
6.2	567	0.0920	1.52		**Shallow Concentrated Flow, Tc-4B** Woodland Kv= 5.0 fps
60.5	767	Total			

Summary for Reach OSE: Off Site East

Inflow Area = 2.617 ac, 0.00% Impervious, Inflow Depth > 1.03" for 10-Year event
Inflow = 1.81 cfs @ 12.52 hrs, Volume= 0.225 af
Outflow = 1.81 cfs @ 12.52 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 5P: Basin 4

Inflow Area = 7.900 ac, 10.25% Impervious, Inflow Depth > 1.79" for 10-Year event
Inflow = 7.01 cfs @ 12.86 hrs, Volume= 1.178 af
Outflow = 6.14 cfs @ 13.12 hrs, Volume= 0.881 af, Atten= 12%, Lag= 15.6 min
Primary = 1.78 cfs @ 13.12 hrs, Volume= 0.524 af
Secondary = 4.36 cfs @ 13.12 hrs, Volume= 0.357 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 309.86' @ 13.12 hrs Surf.Area= 5,453 sf Storage= 15,483 cf

Plug-Flow detention time= 101.2 min calculated for 0.878 af (74% of inflow)
Center-of-Mass det. time= 44.4 min (896.1 - 851.7)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	16,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	2,580	0	0
308.00	4,064	6,644	6,644
310.00	5,560	9,624	16,268

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**12.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 309.00' / 307.00' S= 0.0222 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	309.50'	**8.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.78 cfs @ 13.12 hrs HW=309.86' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.78 cfs @ 2.49 fps)

Secondary OutFlow Max=4.32 cfs @ 13.12 hrs HW=309.86' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 4.32 cfs @ 1.52 fps)

Summary for Pond B2: Retention

Inflow Area = 1.716 ac, 0.00% Impervious, Inflow Depth > 1.83" for 10-Year event
Inflow = 3.15 cfs @ 12.18 hrs, Volume= 0.261 af
Outflow = 1.32 cfs @ 12.54 hrs, Volume= 0.155 af, Atten= 58%, Lag= 21.8 min
Primary = 1.32 cfs @ 12.54 hrs, Volume= 0.155 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 313.63' @ 12.54 hrs Surf.Area= 3,129 sf Storage= 5,000 cf

Plug-Flow detention time= 147.1 min calculated for 0.155 af (59% of inflow)
Center-of-Mass det. time= 66.9 min (881.6 - 814.7)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	6,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	2,990	0	0
314.00	3,160	6,150	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.31 cfs @ 12.54 hrs HW=313.63' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.31 cfs @ 0.98 fps)

Summary for Subcatchment 4S: Drainage Area 2 - Off site East

Runoff = 7.06 cfs @ 12.17 hrs, Volume= 0.573 af, Depth> 4.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

Area (sf)	CN	Description
22,565	55	Woods, Good, HSG B
52,200	74	>75% Grass cover, Good, HSG C
74,765	68	Weighted Average
74,765		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	250	0.0880	0.38		**Sheet Flow, Tc 4S-1** Grass: Short n= 0.150 P2= 3.32"
1.0	112	0.0710	1.87		**Shallow Concentrated Flow, Tc 4s-2** Short Grass Pasture Kv= 7.0 fps
12.1	362	Total			

Summary for Subcatchment 4S': Overland

Runoff = 2.07 cfs @ 12.25 hrs, Volume= 0.195 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

Area (sf)	CN	Description
39,244	55	Woods, Good, HSG B
39,244		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	205	0.1460	0.20		**Sheet Flow, Tc-4S'** Woods: Light underbrush n= 0.400 P2= 3.32"

Summary for Subcatchment 5S: Drainage Area 5 - Switchyard to Wetlands

Runoff = 15.62 cfs @ 12.83 hrs, Volume= 2.590 af, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.09"

	Area (ac)	CN	Description
*	0.810	98	Roof & Pavement
	0.730	71	Meadow, non-grazed, HSG C
	4.760	55	Woods, Good, HSG B
*	1.600	89	Crushed stone surface, HSG C
	7.900	68	Weighted Average
	7.090		89.75% Pervious Area
	0.810		10.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	200	0.0300	0.06		**Sheet Flow, Tc-4a** Woods: Dense underbrush n= 0.800 P2= 3.32"
6.2	567	0.0920	1.52		**Shallow Concentrated Flow, Tc-4B** Woodland Kv= 5.0 fps
60.5	767	Total			

Summary for Reach OSE: Off Site East

Inflow Area = 2.617 ac, 0.00% Impervious, Inflow Depth > 3.03" for 100-Year event
Inflow = 8.80 cfs @ 12.22 hrs, Volume= 0.660 af
Outflow = 8.80 cfs @ 12.22 hrs, Volume= 0.660 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 5P: Basin 4

Inflow Area = 7.900 ac, 10.25% Impervious, Inflow Depth > 3.93" for 100-Year event
Inflow = 15.62 cfs @ 12.83 hrs, Volume= 2.590 af
Outflow = 16.08 cfs @ 12.80 hrs, Volume= 2.278 af, Atten= 0%, Lag= 0.0 min
Primary = 2.56 cfs @ 12.80 hrs, Volume= 0.799 af
Secondary = 13.53 cfs @ 12.80 hrs, Volume= 1.479 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 310.23' @ 12.80 hrs Surf.Area= 5,560 sf Storage= 16,268 cf

Plug-Flow detention time= 55.5 min calculated for 2.270 af (88% of inflow)
Center-of-Mass det. time= 22.3 min (857.5 - 835.2)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	16,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	2,580	0	0
308.00	4,064	6,644	6,644
310.00	5,560	9,624	16,268

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**12.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 309.00' / 307.00' S= 0.0222 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	309.50'	**8.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.55 cfs @ 12.80 hrs HW=310.23' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 2.55 cfs @ 3.25 fps)

Secondary OutFlow Max=13.47 cfs @ 12.80 hrs HW=310.23' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 13.47 cfs @ 2.30 fps)

Summary for Pond B2: Retention

Inflow Area = 1.716 ac, 0.00% Impervious, Inflow Depth > 4.01" for 100-Year event
Inflow = 7.06 cfs @ 12.17 hrs, Volume= 0.573 af
Outflow = 6.77 cfs @ 12.21 hrs, Volume= 0.465 af, Atten= 4%, Lag= 2.6 min
Primary = 6.77 cfs @ 12.21 hrs, Volume= 0.465 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 313.90' @ 12.21 hrs Surf.Area= 3,151 sf Storage= 5,827 cf

Plug-Flow detention time= 78.9 min calculated for 0.464 af (81% of inflow)
Center-of-Mass det. time= 29.4 min (826.6 - 797.2)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	6,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	2,990	0	0
314.00	3,160	6,150	6,150

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.65 cfs @ 12.21 hrs HW=313.89' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 6.65 cfs @ 1.69 fps)

ATTACHMENT 4

WATER QUALITY BASIN CALCULATIONS

Water Quality Volume Requirements

Basin

Drainage Area to Basin 1 = 3.73 Acres

Impervious Area = 0.346 Acres

% Impervious = 9.27%

WQV = 1" (R) (A) / 12

R = 0.05 + 0.009 (I) = 0.05 + 0.009 (9.27) = 0.1334

WQV = 1" (0.1334) (3.73) /12 = 0.0414 Acre feet = 1,806 Cubic Feet

Total Provided

Total = 2,311 C.F.

Basin 2

Drainage Area to Basin 2 = 7.223 Acres

Impervious Area = 1.23 Acres

% Impervious = 17.03%

WQV = 1" (R) (A) / 12

R = 0.05 + 0.009 (I) = 0.05 + 0.009 (17.3) = 0.2057

WQV = 1" (0.2057) (7.223) /12 = 0.1238 Acre feet = 5,393 Cubic Feet

Total Provided

Total = 6,407 C.F.

Basin 3

Drainage Area to Basin 3 = 8.3 Acres

Impervious Area = 3.01 Acres

% Impervious = 36.27%

WQV = 1" (R) (A) / 12

R = 0.05 + 0.009 (I) = 0.05 + 0.009 (36.27) = 0.3764

WQV = 1" (0.3764) (8.3) /12 = 0.26 Acre feet = 11,341 Cubic Feet

Total Provided

Total = 14,314 C.F.

Basin 5 (Switchyard)

Drainage Area to Basin 5 = 7.9 Acres

Impervious Area = 0.81 Acres

% Impervious = 10.25%

WQV = 1" (R) (A) / 12

R = 0.05 + 0.009 (I) = 0.05 + 0.009 (10.25) = 0.1423

WQV = 1" (0.1423) (7.9) /12 = 0.0936 Acre feet = 4,077 Cubic Feet

Total Provided

Total = 4,985 C.F.

ATTACHMENT 5

TEMPORARY SEDIMENTATION BASIN REQUIREMENTS

ATTACHMENT 5

TEMPORARY SEDIMENTATION BASIN REQUIREMENTS

SEMI- ANNUAL STORMWATER COMPREHENSIVE SITE INSPECTION

Inspector:	
Date of Inspection:	
Weather Conditions:	

1. **Review the Stormwater Pollution Prevention Plan including the Site Map, Material Inventory/Potential Pollutants, Stormwater Control Measures, and Pollution Prevention Team Roster.**

Are there any changes? ☐ *Yes* ☐ *No*

If "Yes", note changes here and revise the Stormwater Pollution Prevention Plan as needed.

2. **Review visual and analytical Stormwater Monitoring Reports since last inspection.**

Are there any changes? ☐ *Yes* ☐ *No*

If "Yes", note changes here and revise the Stormwater Pollution Prevention Plan as needed.

3. **Review routine inspection reports and maintenance records, spill reports, etc. since last inspection.**

Are there any changes? ☐ *Yes* ☐ *No*

If "Yes", note changes here and revise the Stormwater Pollution Prevention Plan as needed.

Additional Comments:

I have discussed the results of this inspection with the Stormwater Pollution Prevention Team members.

_____ _____

Signature of Inspector **Date**

COMPREHENSIVE SITE INSPECTION (CSI)

CSI Date: ____/____/____
CSI Start Time: _____
CSI End Time: _____
CSI Conducted During Rainfall Event? YES or NO
Page ____ **of** ____

Stormwater Management Measures and Spill Response Equipment	Location	Inspection Points – Verify That Each of the Following Conditions is Acceptable.	Conditions Acceptable? (Check One)		Explanation of Unacceptable Conditions, Remedial Action(s) Taken, Date(s) of Remedial Action(s), and Other Comments
Spill Response Equipment	In bins near transfer station tipping floor and in trailer load out area	• Adequate amount of absorbent booms, pads, Speedi-Dri® present and easily accessible			
Erosion Control Measures	Throughout site	• Erosion control measures being used as necessary during site construction and repair work			
Drainage Structures – Catch Basins, Sedimentation Basins, Infiltration Basins Channels/Swales, Outfalls	Located throughout site, see site plans	• In good physical condition			
		• Clear of debris			
		• No visible sheen or floating scum			
		• No excessive sediment build-up			

Any Additional Comments or Observations: _____

Name(s) of Inspector(s) and Organization(s): _____

Signature(s) of Inspector(s): _____ **Date:** _____

Connecticut Department of
Energy & Environmental Protection
Bureau of Materials Management & Compliance Assurance
Water Permitting & Enforcement Division

General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, issued 8/21/13, effective 10/1/13
Stormwater Monitoring Report

SITE INFORMATION

Permittee: _____

Mailing Address: _____

Business Phone: _____ ext.: _____ Fax: _____

Contact Person: _____ Title: _____

Site Name: _____

Site Address: _____

Receiving Water (name, basin): _____

Stormwater Permit No. GSN _____

SAMPLING INFORMATION (Submit a separate form for each outfall)

Outfall Designation: _____ Date/Time Collected: _____

Outfall Location(s) (lat/lon or map link): _____

Person Collecting Sample: _____

Storm Magnitude (inches): _____ Storm Duration (hours): _____

Size of Disturbed Area at any time: _____

MONITORING RESULTS

Sample #	Parameter	Method	Results (units)	Laboratory (if applicable)
1	Turbidity			
2	Turbidity			
3	Turbidity			
4	Turbidity			

(provide an attachment if more than 4 samples were taken for this outfall) Avg =

STATEMENT OF ACKNOWLEDGMENT

I certify that the data reported on this document were prepared under my direction or supervision in accordance with the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities. The information submitted is, to the best of my knowledge and belief, true, accurate and complete.

Authorized Official: _____

Signature: _____ Date: _____

Please send completed form to:

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION
BUREAU OF MATERIALS MANAGEMENT AND COMPLIANCE ASSURANCE
79 ELM STREET
HARTFORD, CT 06106-5127
ATTN: NEAL WILLIAMS

EXHIBIT 4

TETRA TECH

To: NTE Connecticut, LLC
From: Kevin Fowler, Lynn Gresock
Subject: Killingly Energy Center – Updated Acoustic Modeling Analysis
Date: October 27, 2016

Tetra Tech previously prepared an acoustic modeling analysis for the Killingly Energy Center (KEC) dated June 2016 and submitted to the Connecticut Siting Council (CSC) as Appendix L of KEC's CSC Application. As a result of the local review process, recommendations have been made that have resulted in some minor layout revisions. This memo describes the results of the acoustical modeling analysis incorporating the site layout changes and demonstrates that compliance with Connecticut and Killingly noise requirements continues to be achieved.

Noise Level Requirements and Guidelines

Potential noise impacts resulting from the normal operation of KEC were evaluated with respect to the Connecticut regulations for the Control of Noise established by the Connecticut Department of Energy and Environmental Protection (DEEP) at Section 22a-69. In addition, Chapter 12.5, Article VI (Sections 120-131) of the Town of Killingly Code of Ordinances contains guidance pertaining to noise, which is generally consistent with the DEEP noise regulations.

Connecticut Department of Energy and Environmental Protection

The DEEP noise control regulations in Section 22a-69-3.1, which prescribe noise limits along property boundaries according to land use category, as reflected by zoning, are shown in Table 1.

Table 1. DEEP Noise Limits

Emitter	Receptor (dBA)			
	Class C	Class B	Class A Daytime (7:00 am – 10:00 pm)	Class A Nighttime (10:00 pm – 7:00 am)
Class C – Industrial	70	66	61	51
Class B – Commercial and Retail Trade	62	62	55	45
Class A – Residential Areas and Other Sensitive Areas	62	55	55	45

The regulations also prescribe provisions for impulse noise, not allowing impulse noise in excess of 80 dB (peak) during nighttime hours in any Class A zone and not allowing impulse noise in excess 100 dB (peak) at any time to any zone. Audible discrete tones also require special consideration. A limit of 100 dB pertains to infrasonic and ultrasonic noise. Construction noise is exempt from the DEEP noise regulations.

Town of Killingly Code of Ordinance

The Town of Killingly provides noise level standards applicable to KEC under Chapter 12.5, Article VI (Sections 120-131) of the Code of Ordinances. The Town noise-level standards are consistent with those prescribed by the DEEP, although the definition of daytime varies. The Town of Killingly considers daytime Monday through Saturday to be 7:00 am to 9:00 pm, and on Sundays it is 9:00 am to 9:00 pm.

Acoustic Modeling Methodology and Inputs

Acoustic modeling was conducted using the DataKustic GmbH CadnaA, a computer-aided noise abatement program (v 4.5.153), which conforms to algorithms contained within the International Organization for Standardization (ISO) standard 9613-2, "Attenuation of Sound during Propagation Outdoors". The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric

absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects (not assumed in this model), and meteorological conditions. The CadnaA acoustic modeling analysis incorporated site-specific topographic and terrain data and a mixed (semi-reflective) ground factor of G=0.5 applied for the surrounding receptors. The ground absorption factor applied for the Project site was G=0.

KEC's updated general arrangement was reviewed and directly imported into the acoustic model so that on-site equipment could be easily identified, buildings and structures could be added, and sound power data could be assigned to sources as appropriate. The primary noise sources during baseload operation are the air cooled condenser (ACC), steam turbine generator (STG), combustion turbine generator (CTG), main step-up transformers, air inlet face and filter housing, the exhaust stack, and HRSG. Reference sound power levels input to Cadna-A® were provided by equipment manufacturers, based on information contained in reference documents, or developed using empirical methods. The source levels used in the predictive modeling are based on estimated sound power levels that are generally deemed to be conservative. The projected operational noise levels are based on vendor-supplied guaranteed sound power level data for the major sources of equipment including the power generation package. The sound power level (abbreviated "L_W") is defined as ten times the logarithm (to the base 10) of the ratio of a given sound power to the reference sound power of 1 picowatt. Sound power is defined as the rate per unit time at which sound energy is radiated from a source and is expressed in terms of watts. Table 2 summarizes the equipment sound power level data used as inputs to the modeling analysis; it is unchanged from the previous model, with the exception of adjusted levels for the fuel gas compressor.

Table 2. Modeled Octave Band Sound Power Levels for Major Pieces of Project Equipment

Equipment Description	Octave Band Sound Power Level (dB)									Broadband
	31.5	63	125	250	500	1000	2000	4000	8000	dBA
Air Cooled Condenser	108	109	106	102	96	95	95	97	95	103
Closed Cooling Water Fan Array	91	94	92	91	91	89	88	86	84	95
Fuel Gas Piping	104	100	89	81	80	86	88	91	89	96
HRSG Stack - Lower Portion	103	104	88	79	76	79	56	46	20	83
HRSG Stack - Upper Portion – with 10ft Silencer	100	97	84	68	64	46	50	42	21	73
HRSG Stack Exit - w/o directivity - with 10ft Silencer	113	110	108	99	101	87	80	81	83	100
HRSG Transition Duct - Upstream with Increased Casing Thickness	111	110	102	95	95	96	93	92	71	100
HRSG Transition Duct - Downstream with Increased Casing Thickness	111	110	102	95	95	96	93	92	71	100
HRSG Body - Upstream Portion	114	118	102	97	92	89	86	82	61	97
HRSG Body - Downstream Portion	108	113	96	91	85	80	73	67	46	90
Lagged HRSG Duct Burner Gas Piping	104	108	106	93	80	76	75	71	71	92
Hydraulic Supply Skid	110	103	95	100	99	98	94	93	89	103
Fuel Oil Pumping Skid	98	114	101	104	107	107	109	105	98	113
Water Injection Pump	99	115	100	106	105	105	105	101	98	111
GT Enclosure Walls	98	101	86	81	77	82	83	86	82	91

Table 2. Modeled Octave Band Sound Power Levels for Major Pieces of Project Equipment

Equipment Description	Octave Band Sound Power Level (dB)									Broadband
	31.5	63	125	250	500	1000	2000	4000	8000	dBA
Gas Turbine Enclosure Air Inlet Vents with Silencer	89	95	84	80	73	71	76	77	83	85
Gas Turbine Enclosure Air Discharge Vents with Silencer	91	96	88	84	75	74	74	73	78	83
Turbine Exhaust Diffuser	129	126	111	109	106	104	102	96	73	110
Generator S-Gen 1000A	102	114	107	96	89	88	86	82	65	96
ST-Total K+N Turbine (w/o Generator)		115	116	111	110	105	106	106	100	113
Unlagged Hot Box during base load	101	98	91	86	82	79	95	76	65	96
Lube Oil Unit		110	105	105	105	101	98	98	94	106
Hydraulic Supply Unit		109	103	105	104	105	100	99	96	109
Condensate Pump	92	106	101	99	99	98	98	93	91	104
Gas Turbine Generator	117	123	120	112	113	109	113	111	108	118
Enclosed Lube Oil Skid	94	94	100	95	97	98	89	85	80	98
Boiler Feed Water Pumps	89	95	93	87	88	97	95	91	81	100
Air Inlet Filter Housing	116	106	97	82	72	88	69	75	90	92
Air Inlet Filter Housing Duct	118	109	104	94	79	88	71	88	95	97
Fuel Gas Compressor	80	76	81	80	78	81	81	79	74	87
Generator Step-up Transformer	88	88	92	89	95	87	77	72	66	93
Unit Auxiliary Transformer	70	70	74	71	77	69	59	54	48	75
STG Step-up Transformer	87	87	91	88	94	86	76	71	65	92
Ammonia Injection Skid	89	96	92	89	90	90	88	85	80	101
Demineralized Water Pump	77	71	71	74	81	84	85	81	73	90

The KEC design has incorporated silencers for the HRSG exhaust stack as well as for the CTG enclosure are inlet and discharge vents. The design also includes increased casing thickness for the HRSG transition duct and lagging for the HRSG duct burner gas piping to reduce the noise levels. KEC has also been designed such that several large components, including the hydraulic supply unit, fuel oil pumping skid, combustion turbine enclosure, water injection pump skid, gas turbine generator, steam turbine generator, hot box, lube oil unit, and condensate pumps, are enclosed in the Turbine High Bay and Low Bay Buildings. A transmission loss rating was incorporated into the wall and roof assemblies of the Turbine High Bay and Low Bay Buildings based on recommended Sound Transmission Class (STC) ratings to reduce noise propagation. The recommended ratings for the Turbine High Bay and Low Bay Buildings are summarized in Table 3 (unchanged from the original modeling). Note that the selected mitigation reflected by these values is intended to reflect the feasibility of achieving the resulting level of impact; final design may incorporate different mitigation in order to achieve the same objective.

Table 3: Noise Level Reductions for the Turbine Buildings

Type of Construction or Acoustical	Modeled Noise Level Reductions (dB re: 20 µPa) by Octave Band Center Frequency dBL								
	31.5	63	125	250	500	1k	2k	4k	8k
Wall Panel STC 44	13	19	25	35	39	45	52	58	59

The following mitigation measures, in addition to assumptions reflected in Tables 2 and 3, were included in this analysis to demonstrate that compliant sound levels can be readily achieved by KEC. Note that these measures are the same as in the original modeling, with the exception of the additional attenuation assumed for the fuel gas compressor.

- HRSG Exhaust Stack: The HRSG exhaust stack will incorporate a 10 foot silencer system that will reduce the noise from the upper stack portion and the exhaust stack exit (see Table 2).
- Turbine Exhaust Diffuser: The turbine exhaust diffuser will incorporate 40-foot high sound barrier wall located on the west side of the diffuser. Alternatively, lagging or increased casing could be incorporated into the design to reduce the sound power level of the turbine diffuser to 98 dBA, equivalent to a sound pressure level of 88 dBA at 3 feet.
- HRSG Transition Duct: The HRSG transition duct will incorporate an acoustical shroud to reduce the overall sound power level to 91 dBA, equivalent to a sound pressure level of 81 dBA at 3 feet.
- HRSG Duct Burner Gas Piping: The HRSG duct burner gas piping will incorporate acoustical lagging to reduce the overall sound power level to 92 dBA, equivalent to a sound pressure level of 82 dBA at 3 feet.
- Fuel Gas Piping: The fuel gas piping will incorporate acoustical lagging to reduce the overall sound power level to 85 dBA, equivalent to a sound pressure level of 75 dBA at 3 feet.
- Fuel Gas Heater Stack: The fuel gas heater stack will incorporate a silencer to reduce the overall sound power level to 83 dBA, equivalent to a sound pressure level of 73 dBA at 3 feet.
- ACC: The ACC will be a low noise design incorporating noise reduction measures to achieve a far-field sound pressure level of 46 dBA at 650 feet, equivalent to a net sound power level of 103 dBA.
- Closed Cooling Water System: The closed cooling water fin-fan cooler will be a low noise design incorporating noise reduction measures to achieve net sound power level of 95 dBA, equivalent to a sound pressure level of 85 dBA at 3 feet.
- Gas Turbine Enclosure Air Inlet Vents: The air inlet vents for the gas turbine enclosure will incorporate a silencer system to the reduce the overall sound power level to 85 dBA, equivalent to a sound pressure level of 75 dBA at 3 feet.
- Gas Turbine Enclosure Air Discharge Vents: The air discharge vents for the gas turbine enclosure will incorporate a silencer system to reduce the overall sound power level to 83 dBA, equivalent to a sound pressure level of 73 dBA at 3 feet.
- Fuel Gas Compressor: The fuel gas compressor will incorporate an enhanced enclosure that will reduce the overall sound power level to 87 dBA, equivalent to a sound pressure level of 77 dBA at 3 feet.

- Demineralized Water Pumps: These pumps would be housed within a building assuming an STC rating of 35.

The treatments with the acoustic performance as outlined above relate to the dominant noise sources. These mitigation measures were incorporated into the noise assessment to demonstrate the feasibility of KEC to meet applicable noise requirements. Final design may incorporate different mitigation measures in order to achieve the same objective as demonstrated in this assessment

Noise Prediction Model Results

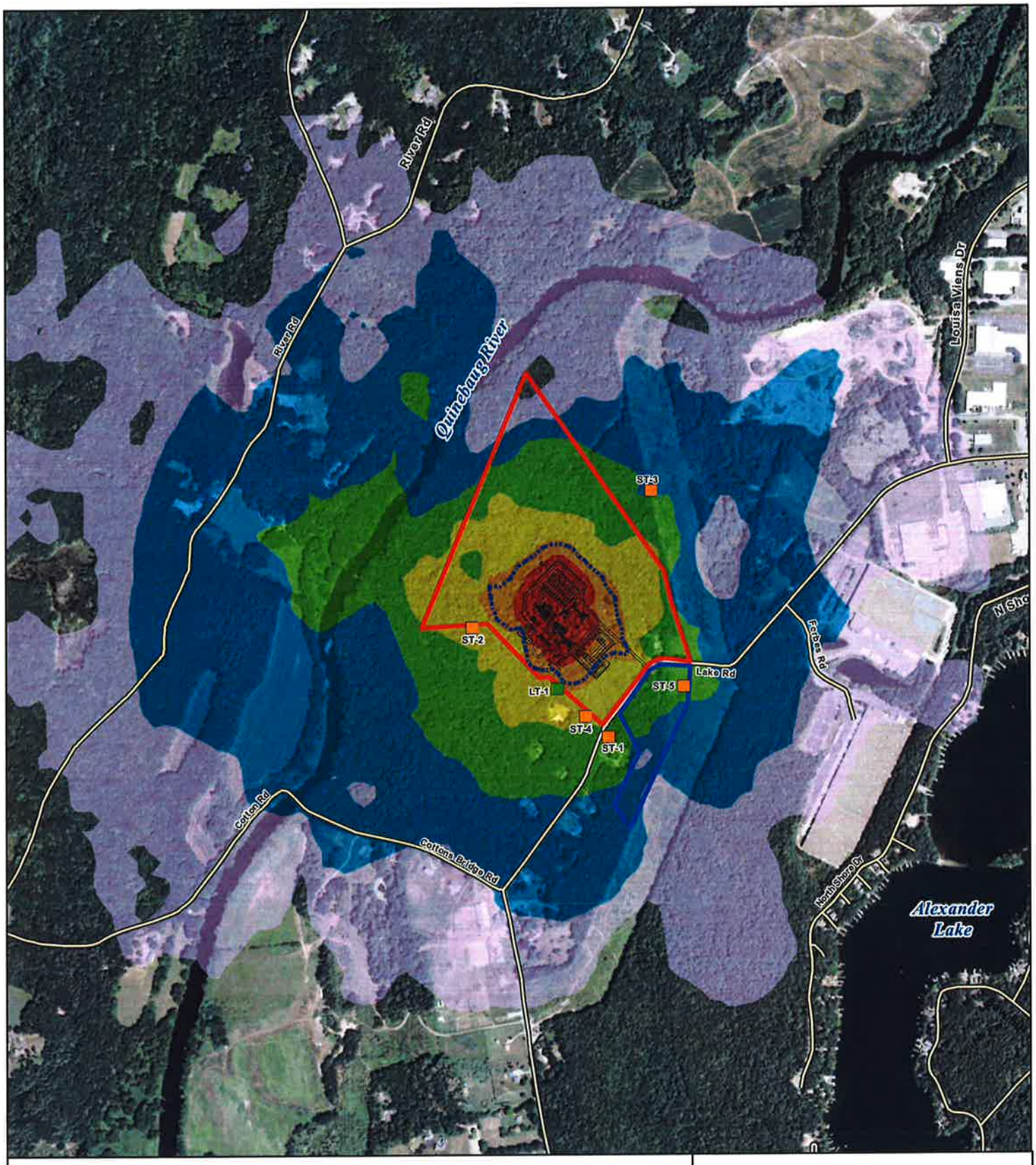
Broadband (dBA) sound pressure levels were calculated at an elevation of 1.5 meters (5 feet) above the ground, the height of the ears of a standing person, for expected normal KEC operation assuming that all components identified previously are operating continuously and concurrently at the representative manufacturer-rated sound levels. The sound energy was then summed to determine the equivalent A-weighted sound pressure level at a point of reception during normal operation. Sound contour plots displaying broadband (dBA) sound levels presented as color-coded noise isopleths in 5-dBA intervals are provided in Figure 1. In addition, an isopleth is shown that corresponds to the DEEP and Town of Killingly noise limit required for a Class C industrial land use (such as KEC) to a Class A residential land use receiver during the most stringent nighttime period (51 dBA).

The noise contours are graphical representations of the cumulative noise associated during normal operation of the individual equipment components and show how operational noise would be distributed over the surrounding area. The contour lines shown are analogous to elevation contours on a topographic map (i.e., the noise contours are continuous lines of equal noise level around some source, or sources, of noise).

Table 4 shows the projected exterior sound levels resulting at all the representative monitoring locations under the mitigated design. Note that ST-2 and LT-1 are essentially along the KEC property boundary and reflect compliance with the 51 dBA standard. For all locations beyond the property boundary, sound levels continue to drop off rapidly.

Table 4. Acoustic Modeling Results Summary – Mitigated Design

Location	Project Sound Level, dBA – Original Layout	Project Sound Level, dBA – Revised Layout
ST-1	44	44
ST-2	49	47
ST-3	40	39
ST-4	46	46
ST-5	41	42
LT-1	49	50



Revised Figure 7-5
Results of Acoustical Modeling

Killingly Energy Center
an NTE Energy Project

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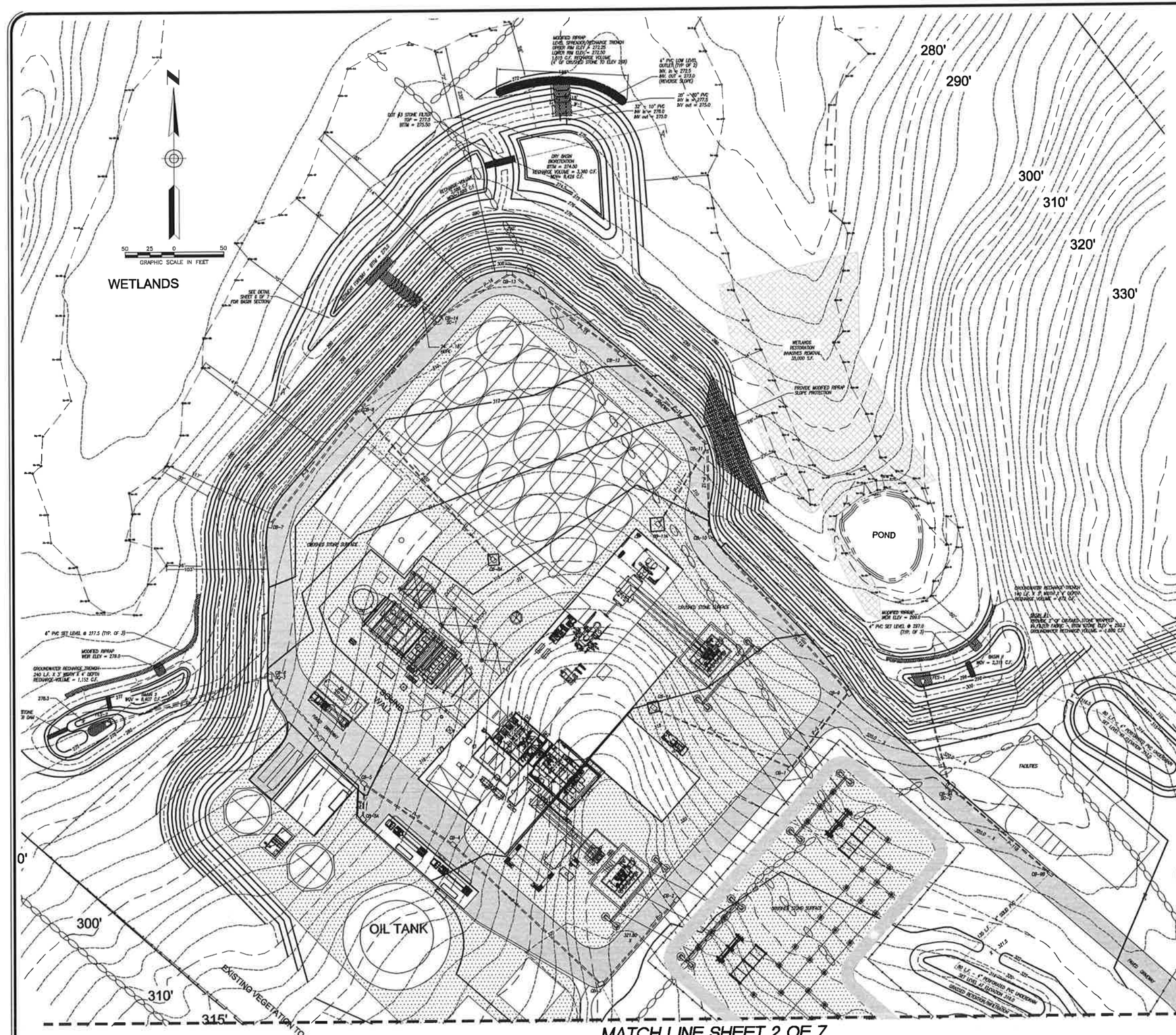

STORM DRAINAGE STRUCTURE SCHEDULE

STRUCTURE ID	STRUCTURE TYPE	FRAME ELEV.	PIPE INVERT ELEVATION N	S	E	W	SUMP
CB-1A	TYPE C-L	317.75		OUT: 313.25 (SE)			309.25
CB-1	TYPE C	319.80	IN: 311.71 (NW)		OUT: 311.61 (NE)		307.61
CB-2	TYPE C	321.00		OUT: 316.50 (SW)			312.50
CB-3	TYPE C	321.00			IN: 315.22 (NE)	OUT: 315.12 (NW)	311.12
CB-4	TYPE C	315.34			IN: 310.58 (SE)	OUT: 310.48 (NW)	306.48
CB-5A	TYPE C-L	315.00			OUT: 311.48 (NE)		307.48
CB-5	TYPE C	313.36		IN: 310.00 (SW)		OUT: 308.90 (NW)	308.90
CB-6	TYPE C	312.25	OUT: 307.30		IN: 307.40 (SE)		303.30
SC-3	STORMCEPTOR EOS 15-1000 OIL-GRIT SEPARATOR						
CB-7	TYPE C	310.00		IN: 305.50	OUT: 305.40 (NE)		
CB-8A	TYPE C-L	313.00				OUT: 309.00 (NW)	305.00
CB-8	TYPE C	309.20		IN: 303.50 (SW)	IN: 303.50 (SE)	OUT: 303.40 (NW)	299.40
CB-9	TYPE C	319.00		IN: 310.69 (SE)		OUT: 310.59 (NW)	306.59
CB-9A	TYPE C-L	319.00		IN: 313.59 (SE)		OUT: 313.49 (NW)	309.49
SC-2	STORMCEPTOR EOS 15-1000 OIL-GRIT SEPARATOR						
CB-9B	TYPE C	319.00				OUT: 314.79 (NW)	310.79
CB-10	TYPE C	316.64	OUT: 308.63	IN: 308.73			304.63
CB-11A	TYPE C-L	316.80			OUT: 312.80 (NE)		308.80
CB-11	TYPE C	313.60	OUT: 307.00	IN: 307.10		IN: 307.10	303.00
CB-12	TYPE C-L	311.20	OUT: 305.59	IN: 305.69			301.59
CB-13	TYPE C	308.20	OUT: 303.50 (NW)	IN: 303.60			299.50
CB-14 SC-1	TYPE C	309.20		IN: 301.00 (SW)	IN: 301.00 (NE)	OUT: 300.90 (NW)	296.90
	STORMCEPTOR EOS 18-1000 OIL-GRIT SEPARATOR						

PIPE SCHEDULE

PIPE ID	OUTLET DIA. (IN.)	MATERIAL	LENGTH (FT.)	SLOPE (%)
P-1	12	HDPE	154	1.0%
P-2	12	HDPE	92	1.0%
P-3	12	HDPE	126	1.0%
P-4	15	HDPE	227	2.0%
P-5	15	HDPE	102	1.0%
P-6	8	D.I.P	50	1.0%
P-7	15	HDPE	185	1.52%
P-8	15	HDPE	153	1.17%
P-9	15	HDPE	156	1.22%
P-10	12	HDPE	211	2.6%
P-11	15	HDPE	108	16.5%
P-11A	15	HDPE	210	2.0%
P-11B	12	HDPE	130	1.0%
P-12	15	HDPE	153	1.0%
P-13	12	HDPE	114	5.0%
P-14	15	HDPE	131	1.0%
P-15	15	HDPE	152	1.3%
P-16	15	HDPE	100	2.5%
P-17	18	HDPE	24	3.8%
P-18	15	RCP	140	TBD

STRUCTURE ID	TYPE	INVERT ELEVATION
FES-1	FLARED END	296.00
W-1	OVERFLOW WEIR	277.00
FES-2	FLARED END	278.00
FES-3	FLARED END	297.00
FES-4	FLARED END	310.50

EXHIBIT 5

DATE	DESCRIPTION
10/25/2016	PER R&R

REVISIONS

PROPOSED GRADING & DRAINAGE

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates

Civil Engineering & Surveying

114 Westcott Road
P.O. Box 421
Killingly, Connecticut 06241
(860) 779-7299
www.killinglyengineering.com

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DWG. No: CLIENT FILE	JOB No: 16042

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50 25 0 50
GRAPHIC SCALE IN FEET

OIL TANK

SEDIMENT TO REMAIN

MATCH LINE SHEET 1 OF 7

MATCH LINE SHEET 1 OF 7

2 LINES
115 KV

LAKE ROAD

10/25/2016	PER R&R
DATE	DESCRIPTION
REVISIONS	

PROPOSED GRADING & DRAINAGE

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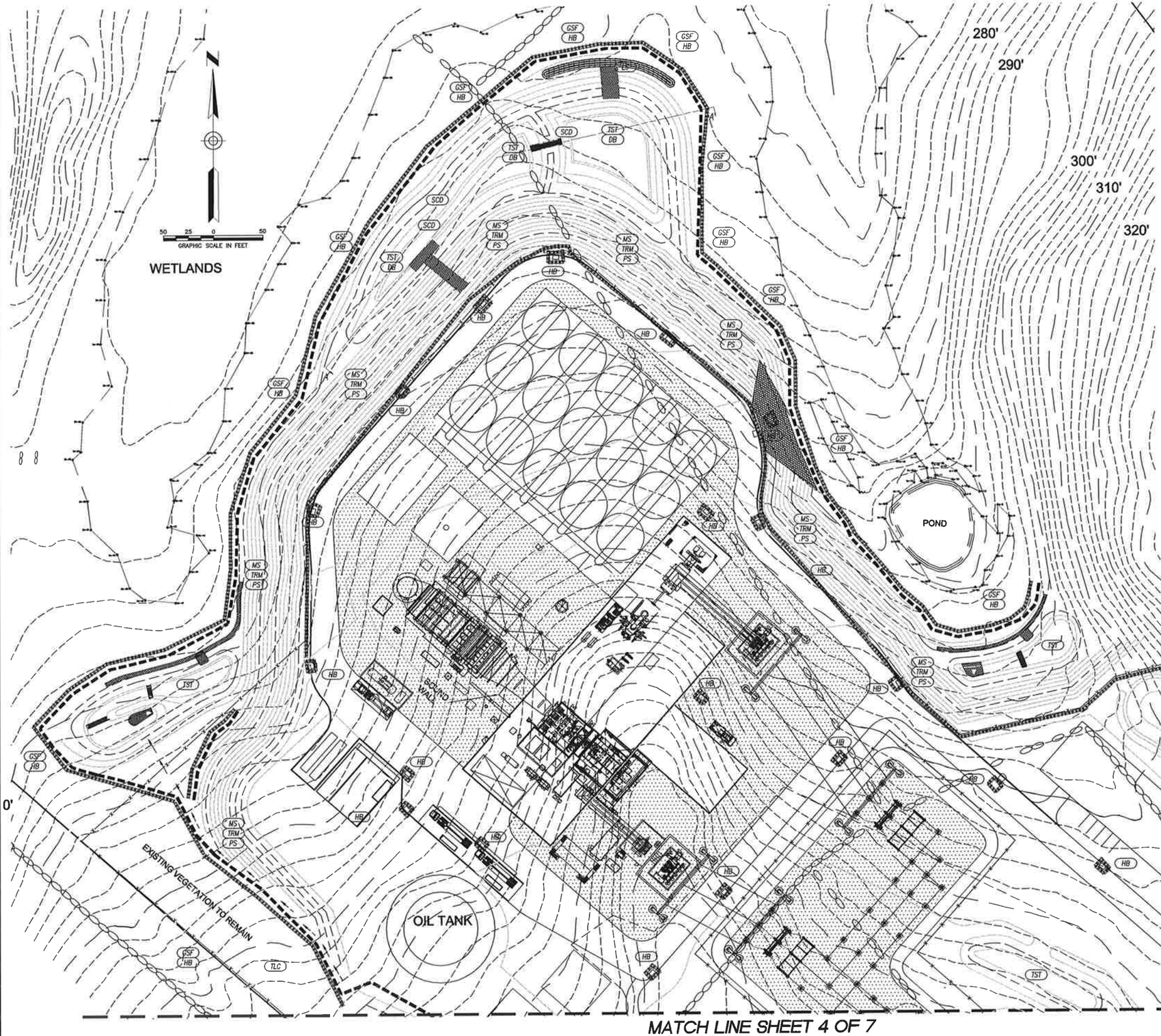

MEASURE	KEY	DESCRIPTION
Permanent Seeding	PS	Establishment of permanent stand of grass and/or legumes by seeding and mulching exposed soils with a seed mixture appropriate for long term stabilization. See Erosion Control Narrative for seed mix requirements.
Mulch for Seed	MS	Application of a mulch that will protect the soil surface on a temporary basis and promote the establishment of temporary or permanent seedings.
Construction Entrance	CE	A stone stabilized pad sometimes associated with a mud rack, automotive spray, or other measures located at points of vehicular ingress and egress on a construction site.
Geotextile Silt Fence	GSF	A temporary sediment barrier consisting of a geotextile fabric pulled taut and attached to supporting posts and entrenched.
Stone Check Dam	SCD	A temporary or permanent stone dam placed across a drainageway.
Haybale Barrier	HB	A temporary sediment barrier consisting of a row of entrenched and anchored bales of hay or straw.
Water Bar	WB	A channel with a supporting berm on the down slope side constructed across a construction access road, driveway, log road or other access way.
Temporary Lined Channel	TLC	A channel designed to convey flows on a short term basis and lined with an erosion resistant covering.
Temporary Sediment Trap	TST	A temporary ponding area with a stone outlet formed by excavation and/or constructing an earthen embankment.
Detention Basin	DB	An impoundment made by constructing a dam or an embankment (embankment detention basin) or by excavating a pit or dugout (excavated detention basin).
Level Spreader	LS	An outlet for diversions and other water conveyences consisting of an escavated depression with a broad stable point of discharge constrcuted at zero grade across a slope
Permanent Turf Reinforcement Mat	TRM	A manufactured mat composed of non-biodegradable polymer or synthetic fibers mechanically, structurally, or chemically bound to form a continuous matrix.

New England Erosion Control/Restoration Mix (temporary seeding)

The New England Erosion Control/Restoration Mix For Dry Sites provides an appropriate selection of native and naturalized grasses to ensure that dry and recently disturbed sites will be quickly revegetated and the soil surface stabilized. It is an appropriate seed mix for road cuts, pipelines, steeper slopes, and areas requiring quick cover during the ecological restoration process. The mix may be applied by hydro-seeding, by mechanical spreader, or on small sites it can be spread by hand. Lightly rake, or roll to ensure proper soil-seed contact. Best results are obtained with a Spring or late Summer seeding. Late Spring through Mid-Summer seeding will benefit from a light mulching of weed-free straw to conserve moisture. If conditions are drier than usual, watering will be required.
Fertilization is not required unless the soils are particularly infertile. Preparation of a clean weed free seed bed is necessary for optimal results.

APPLICATION RATE: 35 lb/acre | 1250 sq ft/lb

SPECIES: Creeping Red Fescue, (Festuca rubra), Canada Wild Rye, (Elymus canadensis), Annual Ryegrass, (Lolium multiflorum), Perennial Ryegrass, (Lolium perenne), Blue Grama, (Bouteloua gracilis), Little Bluestem, (Schizachyrium scoparium), Indian Grass, (Sorghastrum nutans), Rough Bentgrass, (Agrostis scabra), Upland Bentgrass, (Agrostis perennans).

NOTES:

1. CONSTRUCTION LAYDOWN AND STAGING AREAS SHALL BE RE-ESTABLISHED AS GREEN AREAS AT THE TERMINATION OF CONSTRUCTION. PORTIONS MAY BE ESTABLISHED AS OVERFLOW OR EMERGENCY PARKING WITH GRASS PAVE OR AN ENGINEER APPROVED TURF REINFORCEMENT OPTION.
2. TURF REINFORCEMENT MAT ON FILL AND CUT SLOPES SHALL BE ERONET C-125 LONG-TERM PHOTODEGRADABLE DOUBLE-NET BLANKET OR APPROVED EQUAL.
3. SEED MIX ON SLOPES SHALL BE NEW ENGLAND ROADSIDE MATRIX MIX DISTRIBUTED BY NEW ENGLAND WETLANDS PLANTS, INC. APPLY AT A RATE OF 35 POUNDS PER ACRE AND SUPPLEMENT WITH 5% ANNUAL RYE GRASS (BY WEIGHT) AT TIME OF APPLICATION.

DATE	DESCRIPTION
10/25/2016	PER R&R

REVISIONS

EROSION AND SEDIMENTATION CONTROL PLAN

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates
Civil Engineering & Surveying
114 Westcott Road
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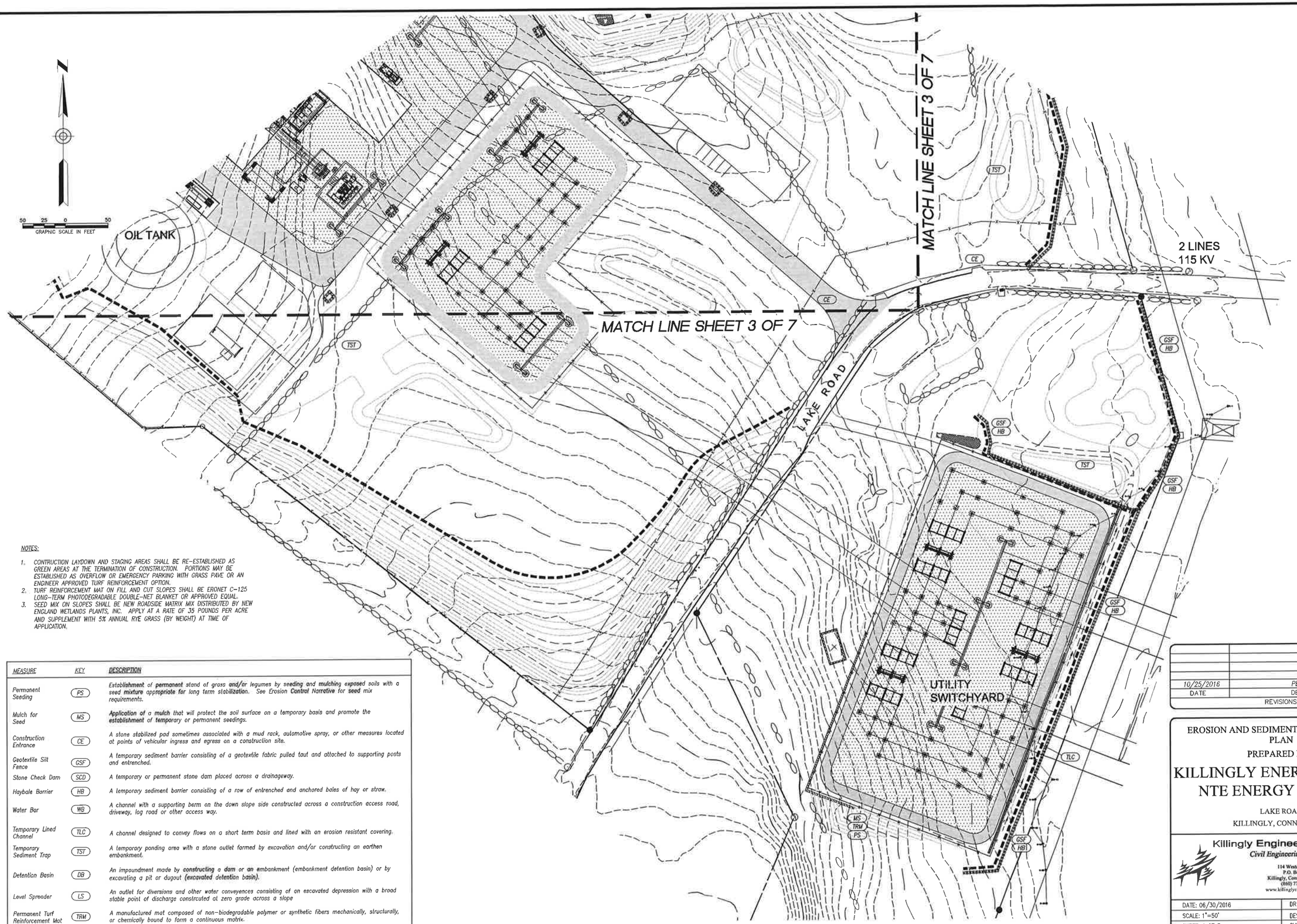

NOTES:

1. CONTRUCTION LAYDOWN AND STAGING AREAS SHALL BE RE-ESTABLISHED AS GREEN AREAS AT THE TERMINATION OF CONSTRUCTION. PORTIONS MAY BE ESTABLISHED AS OVERFLOW OR EMERGENCY PARKING WITH GRASS PAVE OR AN ENGINEER APPROVED TURF REINFORCEMENT OPTION.
2. TURF REINFORCEMENT MAT ON FILL AND CUT SLOPES SHALL BE ERONET C-125 LONG-TERM PHOTODEGRADABLE DOUBLE-NET BLANKET OR APPROVED EQUAL.
3. SEED MIX ON SLOPES SHALL BE NEW ROADSIDE MATRIX MIX DISTRIBUTED BY NEW ENGLAND WETLANDS PLANTS, INC. APPLY AT A RATE OF 35 POUNDS PER ACRE AND SUPPLEMENT WITH 5% ANNUAL RYE GRASS (BY WEIGHT) AT TIME OF APPLICATION.

MEASURE	KEY	DESCRIPTION
Permanent Seeding	PS	Establishment of permanent stand of grass and/or legumes by seeding and mulching exposed soils with a seed mixture appropriate for long term stabilization. See Erosion Control Narrative for seed mix requirements.
Mulch for Seed	MS	Application of a mulch that will protect the soil surface on a temporary basis and promote the establishment of temporary or permanent seedings.
Construction Entrance	CE	A stone stabilized pad sometimes associated with a mud rack, automotive spray, or other measures located at points of vehicular ingress and egress on a construction site.
Geotextile Silt Fence	GSF	A temporary sediment barrier consisting of a geotextile fabric pulled taut and attached to supporting posts and entrenched.
Stone Check Dam	SCD	A temporary or permanent stone dam placed across a drainageway.
Haybale Barrier	HB	A temporary sediment barrier consisting of a row of entrenched and anchored bales of hay or straw.
Water Bar	WB	A channel with a supporting berm on the down slope side constructed across a construction access road, driveway, log road or other access way.
Temporary Lined Channel	TLC	A channel designed to convey flows on a short term basis and lined with an erosion resistant covering.
Temporary Sediment Trap	TST	A temporary ponding area with a stone outlet formed by excavation and/or constructing an earthen embankment.
Detention Basin	DB	An impoundment made by constructing a dam or an embankment (embankment detention basin) or by excavating a pit or dugout (excavated detention basin).
Level Spreader	LS	An outlet for diversions and other water conveyences consisting of an escavated depression with a broad stable point of discharge constrcuted at zero grade across a slope
Permanent Turf Reinforcement Mat	TRM	A manufactured mat composed of non-biodegradable polymer or synthetic fibers mechanically, structurally, or chemically bound to form a continuous matrix.

10/25/2016	PER R&R
DATE	DESCRIPTION
REVISIONS	

EROSION AND SEDIMENTATION CONTROL PLAN

PREPARED FOR

KILLINGLY ENERGY CENTER NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

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SHEET: 4 OF 7	CHK BY: ---
DWG. No: CLIENT FILE	JOB No: 16042

EROSION AND SEDIMENT CONTROL PLAN:

REFERENCE IS MADE TO:

1. Connecticut Guidelines for Soil Erosion and Sediment Control 2002 (2002 Guidelines).
2. NRCS WSS (Web Soil Survey)

DEVELOPMENT CONTROL PLAN:

1. Development of the site will be performed by the Contractor, who will be responsible for the installation and maintenance of erosion and sediment control measures required throughout construction.
2. The sedimentation control mechanisms shall remain in place from start of PutnamKillingly will be notified when sediment and erosion control structures are initially in place. Any additional soil & erosion control measures requested by the Town or its agent, shall be installed immediately. Once the proposed development, seeding and planting have been completed, the representative shall again be notified to inspect the site. The control measures will not be removed until this inspection is complete.
3. All stripping is to be confined to the immediate construction area. Topsoil shall be stockpiled so that slopes do not exceed 2 to 1. A hay bale sediment barrier is to surround each stockpile and a temporary vegetative cover shall be provided.
4. Dust control will be accomplished by spraying with water. The application of calcium chloride is not permitted adjacent to wetland resource areas or within 100' of these areas.
5. The proposed planting schedule is to be adhered to during the planting of disturbed areas throughout the proposed construction site.
6. Final stabilization of the site is to follow the procedures outlined in "Permanent Vegetative Cover". If necessary a temporary vegetative cover is to be provided until a permanent cover can be applied.

SILT FENCE INSTALLATION AND MAINTENANCE:

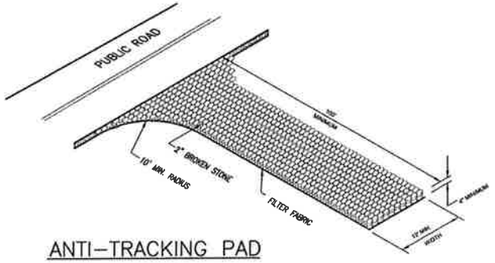
1. Dig a 6" deep trench on the uphill side of the barrier location.
2. Position the posts on the downhill side of the barrier and drive the posts 1.5 feet into the ground.
3. Lay the bottom 8" of the fabric in the trench to prevent undermining and backfill.
4. Inspect and repair barrier after heavy rainfall.
5. Inspections will be made at least once per week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inch or greater to determine maintenance needs.
6. Sediment deposits are to be removed when they reach a height of 1 foot behind the barrier or half the height of the barrier and are to be deposited in an area which is not regulated by the inland wetlands commission.
7. Replace or repair the fence within 24 hours of observed failure. Failure of the fence has occurred when sediment fails to be retained by the fence because:
   - the fence has been overtopped, undercut or bypassed by runoff water,
   - the fence has been moved out of position (knocked over), or
   - the geotextile has decomposed or been damaged.

HAY BALE INSTALLATION AND MAINTENANCE:

1. Bales shall be placed as shown on the plans with the ends of the bales tightly abutting each other.
2. Each bale shall be securely anchored with at least 2 stakes and gaps between bales shall be wedged with straw to prevent water from passing between the bales.
3. Inspect bales at least once per week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs.
4. Remove sediment behind the bales when it reaches half the height of the bale and deposit in an area which is not regulated by the Inland Wetlands Commission.
5. Replace or repair the barrier within 24 hours of observed failure. Failure of the barrier has occurred when sediment fails to be retained by the barrier because:
   - the barrier has been overtopped, undercut or bypassed by runoff water,
   - the barrier has been moved out of position, or
   - the hay bales have deteriorated or been damaged.

SEQUENCE OF CONSTRUCTION

1. Flag the limits of construction disturbance necessary to facilitate the pre-construction meeting.
2. Contact Call Before You Dig at 1-800-922-4455 to mark out existing utilities.
3. Hold the pre-construction meeting.
4. Install the anti-tracking construction entrance.
5. Cut trees within the defined clearing limits and remove cut wood. Chip brush, branches and small trees and stockpile chips for use on site for erosion and sedimentation control.
6. Install perimeter erosion and sedimentation controls.
7. Remove stumps and transport off site. No stumps shall be buried on site.
8. Remove topsoil and grade construction staging and laydown area. Install crushed stone or rolled gravel surface and grade to provide positive drainage to perimeter of laydown area. Construct temporary sediment basin and install perimeter erosion controls in accordance with plans.
9. Strip and stockpile topsoil within the footprint of the construction phase area. Install perimeter erosion and sedimentation controls around stockpiles.
10. Make required cuts and fills and construct proposed retaining wall as fills are being placed adjacent to wetlands area.
11. Establish the subgrade for topsoil areas, buildings, perimeter roadway and parking areas. Bench buildings to a subgrade and allow for sufficient area around building footprints for construction activities.
12. Begin building and equipment construction.
13. Install surface water controls such as temporary sedimentation basins, diversions, and stone or wood chip dikes and insure that discharge locations are stable. Engineer shall evaluate unstable conditions for recommended alternatives prior to installing surface controls.
14. Construct Stormwater basin, outlet and outlet protection and utilize basin as a temporary sedimentation basin during construction. Plug low level outlet until all areas on site have been stabilized and basin vegetation is established.
15. Install all utilities and drainage systems to within 5' of the buildings and facilities or as modified by the site engineer for specific site conditions.
16. Prepare sub-base, slopes, parking areas, shoulder areas, access roads and any additional areas of disturbance for final grading.
17. Install topsoil on fill and cut slopes, seed disturbed areas and install erosion control fabric to protect against runoff erosion or raindrop impact.
18. Install and compact processed aggregate for pavement areas.
19. Install crushed stone surfaces where call for on the design plans.
20. Place remaining topsoil where required and complete perimeter landscaping. Fine grade, rake, seed and mulch to within 2' of curbs or paved areas.
21. Upon substantial completion of the building(s) and plant equipment areas, complete the balance of the site work and stabilization of remaining disturbed areas. Install first course of paving.
22. When all other work has been completed, repair and sweep all paved areas for final course of paving. Inspect drainage system and stormwater basin and remove accumulated sediment.
23. Install final course of pavement and unplug low level outlet from stormwater basin.
24. After site is stabilized, remove all erosion and sedimentation controls such as geotextile silt fence. Stone or wood chip berms may be left in place upon the completion of construction.
25. Sequence is essentially repeated for both sides of Lake Road.



ANTI-TRACKING PAD

NOT TO SCALE

EROSION AND SEDIMENT CONTROL NARRATIVE:

PRINCIPLES OF EROSION AND SEDIMENT CONTROL

The primary function of erosion and sediment controls is to absorb erosional energies and reduce runoff velocities that force the detachment and transport of soil and/or encourage the deposition of eroded soil particles before they reach any sensitive area.

KEEP LAND DISTURBANCE TO A MINIMUM

The more land that is in vegetative cover, the more surface water will infiltrate into the soil, thus minimizing stormwater runoff and potential erosion. Keeping land disturbance to a minimum not only involves minimizing the extent of exposure at any one time, but also the duration of exposure. Phasing, sequencing and construction scheduling are interrelated. Phasing divides a large project into distinct sections where construction work over a specific area occurs over distinct periods of time and each phase is not dependent upon a subsequent phase in order to be functional. A sequence is the order in which construction activities are to occur during any particular phase. A sequence should be developed on the premise of "first things first" and "last things last" with proper attention given to the inclusion of adequate erosion and sediment control measures. A construction schedule is a sequence with time lines applied to it and should address the potential overlap of actions in a sequence which may be in conflict with each other.

- Limit areas of clearing and grading. Protect natural vegetation from construction equipment with fencing, tree armoring, and retaining walls or tree wells.
- Route traffic patterns within the site to avoid existing or newly planted vegetation.
- Phase construction so that areas which are actively being developed at any one time are minimized and only that area under construction is exposed. Clear only those areas essential for construction.
- Sequence the construction of storm drainage systems so that they are operational as soon as possible during construction. Ensure all outlets are stable before outletting storm drainage flow into them.
- Schedule construction so that final grading and stabilization is completed as soon as possible.

SLOW THE FLOW

Detachment and transport of eroded soil must be kept to a minimum by absorbing and reducing the erosive energy of water. The erosive energy of water increases as the volume and velocity of runoff increases. The volume and velocity of runoff increases during development as a result of reduced infiltration rates caused by the removal of existing vegetation, removal of topsoil, compaction of soil and the construction of impervious surfaces.

- Use diversions, stone dikes, silt fences and similar measures to break flow lines and dissipate storm water energy.
- Avoid diverting one drainage system into another without calculating the potential for downstream flooding or erosion.

KEEP CLEAN RUNOFF SEPARATED

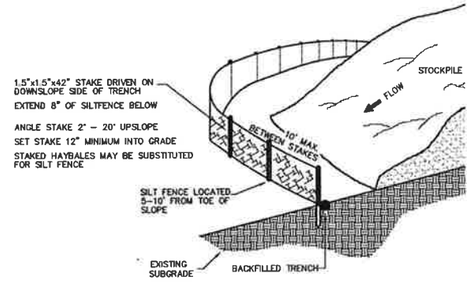
Clean runoff should be kept separated from sediment laden water and should not be directed over disturbed areas without additional controls. Additionally, prevent the mixing of clean off-site generated runoff with sediment laden runoff generated on-site until after adequate filtration of on-site waters has occurred.

- Segregate construction waters from clean water.
- Divert site runoff to keep it isolated from wetlands, watercourses and drainage ways that flow through or near the development until the sediment in that runoff is trapped or detained.

REDUCE ON SITE POTENTIAL INTERNALLY AND INSTALL PERIMETER CONTROLS

While it may seem less complicated to collect all waters to one point of discharge for treatment and just install a perimeter control, it can be more effective to apply internal controls to many small sub-drainage basins within the site. By reducing sediment loading from within the site, the chance of perimeter control failure and the potential off-site damage that it can cause is reduced. It is generally more expensive to correct off-site damage than it is to install proper internal controls.

- Control erosion and sedimentation in the smallest drainage area possible. It is easier to control erosion than to contend with sediment after it has been carried downstream and deposited in unwanted areas.
- Direct runoff from small disturbed areas to adjoining undisturbed vegetated areas to reduce the potential for concentrated flows and increase settlement and filtering of sediments.
- Concentrated runoff from development should be safely conveyed to stable outlets using rip rapped channels, waterways, diversions, storm drains or similar measures.
- Determine the need for sediment basins. Sediment basins are required on larger developments where major grading is planned and where it is impossible or impractical to control erosion at the source. Sediment basins are needed on large and small sites when sensitive areas such as wetlands, watercourses, and streets would be impacted by off-site sediment deposition. Do not locate sediment basins in wetlands or permanent or intermittent watercourses. Sediment basins should be located to intercept runoff prior to its entry into the wetland or watercourse.
- Grade and landscape around buildings and septic systems to divert water away from them.



SILT FENCE @ TOE OF SLOPE APPLICATION

NOT TO SCALE

TEMPORARY VEGETATIVE COVER:

SEED SELECTION

Grass species shall be appropriate for the season and site conditions. Appropriate species are outlined in Figure TS-2 in the 2002 Guidelines.

TIMING CONSIDERATIONS

Seed with a temporary seed mixture within 7 days after the suspension of grading work in disturbed areas where the suspension of work is expected to be more than 30 days but less than 1 year.

SITE PREPARATION

Install needed erosion control measures such as diversions, grade stabilization structures, sediment basins and grassed waterways.

Grade according to plans and allow for the use of appropriate equipment for seedbed preparation, seeding, mulch application, and mulch anchoring.

SEEDBED PREPARATION

Loosen the soil to a depth of 3-4 inches with a slightly roughened surface. If the area has been recently loosened or disturbed, no further roughening is required. Soil preparation can be accomplished by tracking with a bulldozer, discing, harrowing, raking or dragging with a section of chain link fence. Avoid excessive compaction of the surface by equipment traveling back and forth over the surface. If the slope is tracked, the cleat marks shall be perpendicular to the anticipated direction of the flow of surface water.

If soil testing is not practical or feasible on small or variable sites, or where timing is critical, fertilizer may be applied at the rate of 300 pounds per acre or 7.5 pounds per 1,000 square feet of 10-10-10 or equivalent. Additionally, lime may be applied using rates given in Figure TS-1 in the 2002 Guidelines.

SEEDING

Apply seed uniformly by hand cyclone seeder, drill, cultipacker type seeder or hydroseeder at a minimum rate for the selected species. Increase seeding rates by 10% when hydroseeding.

MULCHING

Temporary seedings made during optimum seeding dates shall be mulched according to the recommendations in the 2002 Guidelines. When seeding outside of the recommended dates, increase the application of mulch to provide 95%-100% coverage.

MAINTENANCE

Inspect seeded area at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inch or greater for seed and mulch movement and rill erosion.

Where seed has moved or where soil erosion has occurred, determine the cause of the failure. Repair eroded areas and install additional controls if required to prevent reoccurrence of erosion.

Continue inspections until the grasses are firmly established. Grasses shall not be considered established until a ground cover is achieved which is mature enough to control soil erosion and to survive severe weather conditions (approximately 80% vegetative cover).

Figure TS-1 Temporary Seeding Rates and Dates

Species[4]	Seeding Rates (pounds) /Acre	1000 sq ft	Optimum Seed Depth (inches)	Optimum Seeding Dates[1]	Plant Characteristics
				3/15 4/15 5/15 6/15 7/15 8/15 9/15 10/15 / 3/1 4/1 5/1 6/1 7/1 8/1 9/1 10/1	
Annual ryegrass (Lolium multiflorum	40	1.0	0.5		May be added in mixes. Will winter out of most stands
Perennial ryegrass (Lolium) perenne	40	1.0	0.5		Use for winter cover. Tolerates mild and low elevations
Winter Rye (Secale cereale	120	3.0	1.0		Quick germination and heavy spring growth. Dies back in June with late regrowth
Oats (Avena sativa)	86	2.0	1.0		Intolerant of wet soils and cold. Will winter kill with the first killing frost and may thought out the state as a cover winter.
Winter Wheat (Triticum aestivum)	120	3.0	1.0		Quick germination with moderate growth. Dies back in June with no regrowth
Millet (Echinochloa crusgalli)	20	0.5	1.0		Warm season small grain. Dies with frost in September
Sudangrass (Sorghum sudanense	30	0.7	1.0		Tolerates warm temperatures and droughty conditions
Buckwheat (Fagopyrum esculentum)	35	0.8	1.0		Hardy plant that will re-seed itself and is good as a green manure crop
Creeping Bentgrass (Agrostis stolonifa	5	0.2	0.25		Warm-season perennial. May tolerate hot, dry slopes, acid infertile soils. Excellent snow crop. Usually winter kills.
DOT All Purpose Mix[5]	100	3.0	0.5		Suitable for all conditions

[1] May be planted throughout summer if soil moisture is adequate or can be irrigated. Fall seeding may be extended 15 days in the coastal towns.
[2] Seed at rate for indicated depth for sandy soils.
[3] See Permanent Seeding Figure PS-3 for seeding mixture requirements.
[4] Listed species may be used in combinations to obtain a broader time spectrum. If used in combinations, reduce each species planting rate by 20% of that listed.

PERMANENT VEGETATIVE COVER:

Refer to Figure PS-2, Permanent Seeding Measure in the 2002 Guidelines for specific applications and details related to the installation and maintenance of a permanent vegetative cover. In general, the following sequence of operations shall apply:

1. Topsoil will be replaced once the excavation and grading has been completed. Topsoil will be spread at a minimum compacted depth of 4".
2. Once the topsoil has been spread, all stones 2" or larger in any dimension will be removed as well as debris.
3. Apply agricultural ground limestone at a rate of 2 tons per acre or 100 lbs. per 1000 s.f. Apply 10-10-10 fertilizer or equivalent at a rate of 300 lbs. per acre or 7.5 lbs. per 1000 s.f. Work lime and fertilizer into the soil to a depth of 4".
4. Inspect seedbed before seeding. If traffic has compacted the soil, retill compacted areas.
5. Apply the chosen grass seed mix. The recommended seeding dates are: April 1 to June 15 & August 15 - October 1.
6. Following seeding, firm seedbed with a roller. Mulch immediately following seeding. If a permanent vegetative stand cannot be established by September 30, apply a temporary cover on the topsoil such as netting, mat or organic mulch.

Figure PS-1 Seed Mixtures for Permanent Seeding

No.	Seed Mixture (Variety)[1]	Lbs/Acre	Lbs/1,000 Sq. Ft.
1[5]	Kentucky Bluegrass	20	.45
	Creeping Red Fescue (Pennlawn, Wintergreen)	20	.45
	Perennial Ryegrass (Overleg, Manhattan)[4]	5	.10
		Total 45	1.00
2[5]	Creeping Red Fescue (Pennlawn, Wintergreen)	20	.45
	Redtop (Streeker, Common)	2	.05
	Tall Fescue (Kentucky 31) or Smooth Bromegrass (Saratoga, Lincoln)	25	.45
		Total 47	.95
3[5]	Creeping Red Fescue (Pennlawn, Wintergreen)	20	.45
	Bird's-foot Trefoil (Empire, Viking) with inoculant[2]	8	.20
	Tall Fescue (Kentucky 31) or Smooth Bromegrass (Saratoga, Lincoln)	20	.45
		Total 48	1.10
4[5]	Creeping Red Fescue (Pennlawn, Wintergreen) or Tall Fescue (Kentucky 31)	20	.45
	Redtop (Streeker, Common)	3	.05
	Bird's-foot Trefoil (Empire, Viking) with inoculant[2]	8	.20
		Total 30	.70
5[5]	White Clover	10	.25
	Perennial Rye Grass	2	.05
		Total 12	.30
6[5]	Creeping Red Fescue	20	.50
	Redtop (Streeker, Common)	2	.05
	Perennial Rye Grass	20	.50
		Total 42	1.05
7[5]	Smooth Bromegrass (Saratoga, Lincoln)	15	.35
	Perennial Ryegrass (Nyalea, Manhattan)	5	.10
	Bird's-foot Trefoil (Empire, Viking) with inoculant[2]	10	.25
		Total 30	.70
8[5]	Switchgrass (Blackwell, Shelter, Cave-in-rock)	10[3]	.25
	Weeping lovegrass	5	.07
	Little Bluestem (Blaze, Aldous, Camper)	10[3]	.25
		Total 25	.57
9[5]	Creeping Red Fescue (Pennlawn, Wintergreen)	10	.25
	Crown Vetch (Chesmung, Penngift) with inoculant[2]	15	.35
	(or Flatpea (Lathco) with inoculant[2])	(30)	(.75)
		Total 25 or 45	.60 or 1.03
10[5]	Creeping Red Fescue (Pennlawn, Wintergreen)	20	.45
	Redtop (Streeker, Common)	2	.05
	Crown Vetch (Chesmung, Penngift) with inoculant[2]	15	.35
	(or Flatpea (Lathco) with inoculant[2])	(30)	(.75)
		Total 37 or 57	.85 or 1.30
11[5]	Bird's-foot Trefoil (Empire, Viking) with inoculant[2]	8	.20
	Crown Vetch (Chesmung, Penngift) with inoculant[2]	15	.35
	Creeping Red Fescue (Pennlawn, Wintergreen) or Tall Fescue (Kentucky 31)		

Figure PS-3 Seed Mixtures for Permanent Seeding (con't)

No.	Seed Mixture (Variety)[1]	Lbs/Acre	Lbs/1,000 Sq. Ft.
12[5]	Switchgrass (Blackwell, Shelter, Cave-in-rock)	10[3]	.25
	Perennial Ryegrass (Nyalea, Manhattan)	5	.10
	Crown Vetch (Chesmung, Pennglift) with inoculant[2]	15	.35
		Total 45	1.05
13[5]	Crown Vetch (Chesmung, Pennglift) with inoculant[2]	30	.75
	(or Flatpea (Lathco) with inoculant[2])	(30)	(.75)
	Switchgrass (Blackwell, Shelter, Cave-in-rock)	50	1.0
	Perennial Ryegrass (Nyalea, Manhattan)	5	.10
		Total 85 or 110	1.85 or 2.50
14[5]	Crown Vetch (Chesmung, Pennglift) with inoculant[2]	15	.35
	(or Flatpea (Lathco) with inoculant[2])	(30)	(.75)
	Perennial Ryegrass (Nyalea, Manhattan)	10	.25
		Total 25 or 40	.60 or 1.00
15[5]	Switchgrass (Blackwell, Shelter, Cave-in-rock)	5	.10
	Big Bluestem (Niagra, Kaw) or Little Bluestem (Blaze, Aldous, Camper)	5	.10
	Perennial Ryegrass (Nyalea, Manhattan)	5	.10
	Bird's-foot Trefoil (Empire, Viking) with inoculant[2]	5	.10
		Total 20	.40
16[5]	Tall Fescue (Kentucky 31)	20	.45
	Flatpea (Lathco) with inoculant[2]	30	.75
		Total 50	1.20
17[6]	Deer Tongue (Tioga) with inoculant[2]	10[3]	.25
	Bird's-foot Trefoil (Empire, Viking) with inoculant[2]	8	.20
	Perennial Ryegrass (Nyalea, Manhattan)	3	.07
		Total 21	.52
18[6]	Deer Tongue (Tioga) with inoculant[2]	10[3]	.25
	Crown Vetch (Chesmung, Pennglift) with inoculant[2]	15	.35
	Perennial Ryegrass (Nyalea, Manhattan)	3	.07
		Total 28	.67
19[5]	Chewings Fescue	35	.80
	Red Fescue	30	.70
	Colonial Bentgrass	5	.10
	Bird's-foot Trefoil (Empire, Viking)	10	.40
	Perennial Ryegrass	20	.50
		Total 100	2.00
20[5]	Deleted due to invasive species		
21[5]	Creeping Red Fescue (Pennlawn, Wintergreen)	Total 60	1.35
22[5]	Creeping Red Fescue (Pennlawn, Wintergreen)	40	.90
	Tall Fescue (Kentucky 31)	20	.45
		Total 60	1.35
23[5]	Creeping Red Fescue (Pennlawn, Wintergreen)	15	.35
	Flatpea (Lathco) with inoculant[2]	30	.75
		Total 45	1.00
24[5]	Tall Fescue (Kentucky 31)	Total 190	3.60

Figure PS-2 Selecting Seed Mix to Match Need

Area To Be Seeded	Mixture Number[1] Mowing Desired	Mowing Not Required
BORROW AREAS, ROADSIDES, DIKES, LEVEES, POND BANKS AND OTHER SLOPES AND BANKS		
A) Well or excessively drained soil[2]	1, 2, 3, 4, 5 or 8	3, 6, 7, 8, 9, 10, 11, 12, 16, 22
B) Somewhat poorly drained soils[2]	2	5, 6
C) Variable drainage soils[2]	2	5, 6, 11
DRAINAGE DITCH AND CHANNEL BANKS		
A) Well or excessively drained soils[2]	1, 2, 3, or 4	9, 10, 11, 12
B) Somewhat poorly drained soils[2]	2	
C) Variable drainage soils[2]	2	
DIVERSIONS		
A) Well or excessively drained soils[2]	2, 3 or 4	9, 10, 11
B) Somewhat poorly drained soils[2]	2	
C) Variable drainage soils[2]	2	
EFFLUENT DISPOSAL		5 or 6
GRAVEL PITS[3]		26, 27, 28
GULLIED AND ERODED AREAS		3, 4, 5, 6, 10, 11, 12
MINESPOIL & WASTE, AND OTHER SPOIL BANKS (If toxic substances & physical properties not limiting)[3]		15, 16, 17, 18, 26, 27, 28
SHORELINES (Fluctuating water levels)		5 or 6
SKI SLOPES		4, 10
SOD WATERWAYS AND SPILLWAYS	1, 2, 3, 4, 6, 7, or 8	1, 2, 3, 4, 6, 7, or 8
SUNNY RECREATION AREAS (Picnic areas and playgrounds or driving and archery ranges, nature trails)	1, 2 or 23	
CAMPING AND PARKING, NATURE TRAILS (Shaded)	19, 21 or 23	
SAND DUNES (Blowing sand)	25	
WOODLAND ACCESS ROADS, SKID TRAILS AND LOG YARDING AREAS		9, 10, 16, 22, 26
LAWNS AND HIGH MAINTENANCE AREAS	1, 19, 21 or 29	

[1] The numbers following in these columns refer to seed mixtures in Figure PS-3. Mixes for shady areas are in **bold-italics** print (including mixes 20 through 24).
[2] See county soil survey for drainage class. Soil surveys are available from the County Soil and Water Conservation District Office.
[3] Use mix 26 when soil passing a #200 mesh sieve is less than 15% of total weight. Use mix 26 & 27 when soil passing a #200 mesh sieve is between 15 and 20% of total weight. Use mix 26, 27 & 28 when soil passing a #200 mesh sieve is above 20% of total weight.

Figure PS-3 Seed Mixtures for Permanent Seeding (con't)

No.	Seed Mixture (Variety)[1]	Lbs/Acre	Lbs/1,000 Sq. Ft.
25[5]	American Beachgrass (Cape)	50-100 culms/acre	1.3-2.5 culms/ 100 sq. ft.
26[5]	Switchgrass (Blackwell, Shelter, Cave-in-rock)	4.0	.10
	Big Bluestem (Niagra, Kaw)	4.0	.10
	Little Bluestem (Blaze, Aldous, Camper)	2.0	.05
	Sand Lovegrass (NE-27, Bend)	1.5	.03
	Bird's-foot Trefoil (Empire Viking)	2.0	.05
		Total 13.5	.33
27[5]	Flatpea (Lathco)	10	.20
	Perennial Pea (Lancer)	2	.05
	Crown Vetch (Chesmung, Pennglift)	10	.20
	Tall Fescue (Kentucky 31)	2	.20
		Total 24	.65
28[5]	Orchardgrass (Pennlate, Eay, Potomac)	4	.10
	Tall Fescue (Kentucky 31)	10	.20
	Redtop (Streeker, Common)	2	.05
	Birds-foot Trefoil (Empire Viking)	5	.10
		Total 22	.45
29	Turf Type Tall Fescue (Bonanza, Mustang, Rebel II, Spanton, Jaguar) or Perennial Rye (Future 2000 mix, Fiesta II, Blazer II, and Barber II)	175 to 350	6 to 8

[1] Use proper inoculant for legume seeds, use four times recommended rate when hydroseeding.
[2] Use Pure Live Seed (PLS) = $\frac{\%\ \text{Germination}\ \&\ \%\ \text{Purity}}{100}$

EXAMPLE: Common Bermuda seed with 70% germination and 80% purity =

$\frac{70 \times 80}{100}$ or $\frac{56}{100}$ or 56%

$\frac{10\ \text{lbs PLS/acre}}{56\%}$ = 17.9 lbs/acre of bagged seed

[3] DOT All purpose mix
[4] Wild flower mix containing Nets: England Aster, Baby's Breath, Black Eye Susan, Calsilfy, Dead Columbine, Purple Coneflower, Lance-leaved Coreopsis, Gonflower, Grey Daisy, Daisy, Basket, Scarlet Flax, Foxglove, Gayfeather, Rocky Larkspur, Spanish Lakspur, Corn Poppy, Spurred Snapdragon, Wallflower and/or Yarrow may be added to any seed mix given. Most seed suppliers carry a wild flower mixture that is suitable for the Northeast and contains a variety of both annual and perennial flowers. Seeding rates for the specific mixtures should be followed.
[5] Considered to be a cool season mix.
[6] Considered to be a warm season mix

DATE	DESCRIPTION
	REVISIONS

EROSION AND SEIMENTATION CONTROL NARRATIVE AND DETAILS

PREPARED FOR

KILLINGLY ENERGY CENTER NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates
Civil Engineering & Surveying
114 Westcott Road
P.O. Box 421
Killingly, Connecticut 06241
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DATE: 06/30/2016	DRAWN: NET
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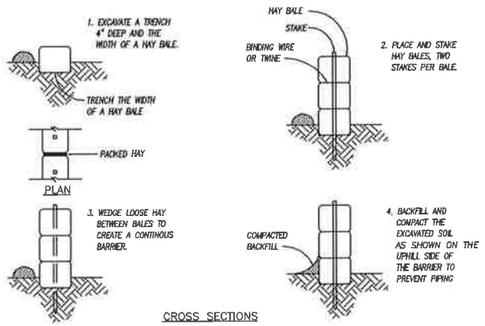
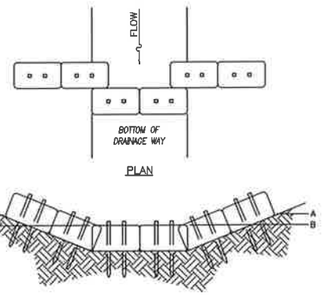


HAYBALE BARRIER

NOT TO SCALE



HAYBALE CHECK DAM

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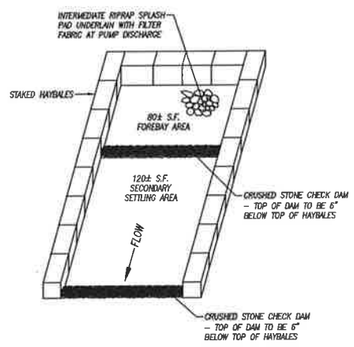
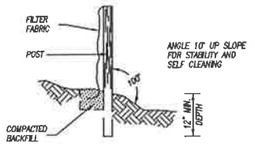


PUMPING OUTLET BASIN

NOT TO SCALE

NOTES:
1.) TO BE USED IN THE EVENT THAT CUTOFF TRENCH DEWATERING IS REQUIRED
2.) LOCATE BASINS OUTSIDE OF WETLANDS UPLAND REVIEW AREAS



SILT FENCE

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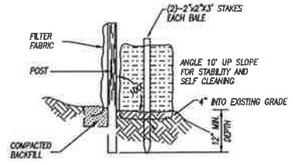
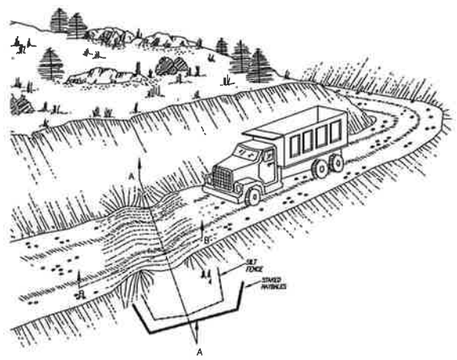


SILT FENCE – BACKED WITH HAYBALES

NOT TO SCALE



WATER BAR DETAIL

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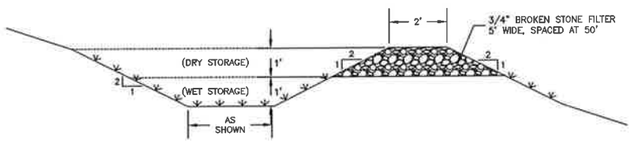
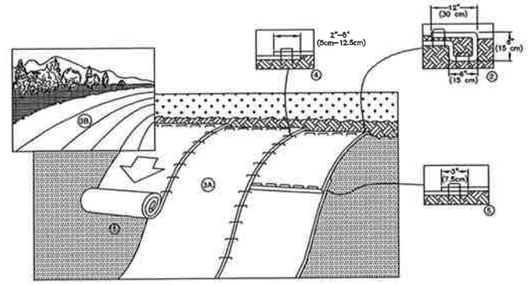


TEMPORARY SEDIMENTATION BASIN

NOT TO SCALE

NOTES:

1. Inspect the BASIN at least once a week (preferably twice) and after rainfall events of 0.5" or greater.
2. Remove sediment when deposits reach approximately 1/2 the height of the swale. Sediment shall be deposited in an area which is not regulated by the Inland Wetlands Commission.
3. Replace or repair within 24-hours of observed failure. Failure may include:
   - –Overtopping, undercutting or bypassed by runoff water.
   - –Stone filter has been moved or knocked over.



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM™, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"–5" (5cm–12.5cm) OVERLAP. DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.

NOTES:

1. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
2. TURF REINFORCEMENT MAT SHALL BE NORTH AMERICAN GREEN ERONET C–125 LONG TERM PHOTODEGRADEABLE BLANKET OR APPROVED EQUIVALENT.

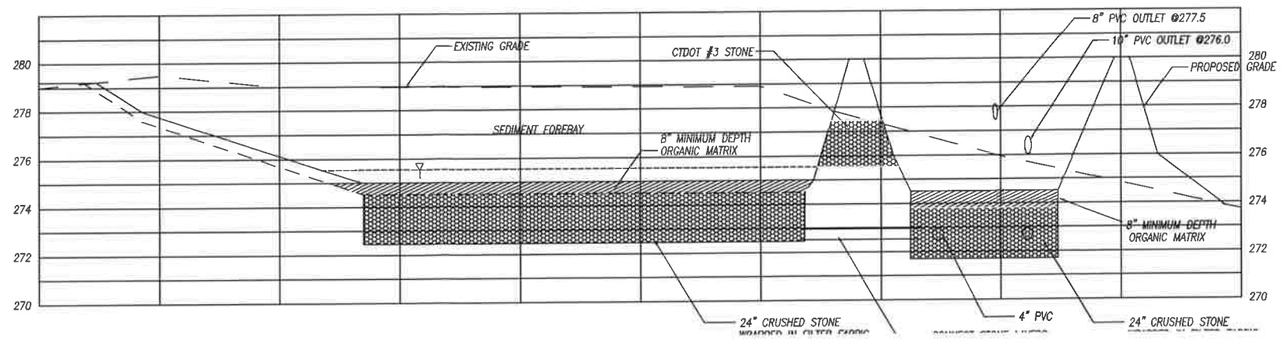
TURF REINFORCEMENT MAT INSTALLATION

NOT TO SCALE

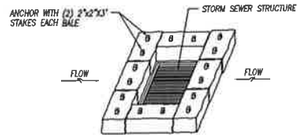
New England Roadside Matrix Upland Seed Mix (Slope seed mix)

Botanical name	Common name Indicator
Elymus canadensis	Canada Wild Rye FACU+
Schizachyrium scoparium	Little Bluestem FACU
Festuca rubra	Creeping Red Fescue FACU
Andropogon gerardii	Big Bluestem FAC
Sorghastrum nutans	Indian Grass UPL
Chamaecrista fasciculata	Partridge Pea FACU
Panicum virgatum	Switch Grass FAC
Rhus typhina	Staghorn Sumac
Cornus amomum	Silky Dogwood FACW
Cornus racemosa	Grey Dogwood FAC
Asclepias syriaca	Common Milkweed FACUZizia
aurea	Golden Alexanders FAC
Desmodium canadense	Showy Tick Trefoil FAC
Lespedeza capitata	Bush Clover/Roundhead Lespedeza FACUHeliopsis
helianthoides	Ox Eye Sunflower UPL
Monarda fistulosa	Wild Bergamot UPL
Rudbeckia hirta	Black Eyed Susan FACUAster
laevis	Smooth Blue Aster UPL
Euthamia graminifolia	Grass Leaved Goldenrod FAC
Solidago juncea	Early Goldenrod

The New England Roadside Matrix Upland mix is designed for use along roads and highways. The mix is
unusual in that it contains native grasses, wildflowers, and shrubs that are blended together as a native matrix seed mix. In areas that receive frequent mowing, the grasses will dominate such as those closest to the roadway shoulder. In areas farther from the road, which may be mown only once each year, or in hard to mow areas, such as around sign posts, the wildflower component will become dominant. Along cuts and side slopes which may never be mown, the shrub component will add diversity, beauty and wildlife habitat to the roadside plantings. It is a particularly appropriate seed mix for roadsides, industrial sites, or cut and fill slopes. The mix may be applied by hydro–seeding, by
mechanical spreader, or on small sites it can be spread by hand. Lightly rake, or roll to ensure proper seed to soil contact. Best results are obtained with a Spring seeding. Late Spring and early
Summer seeding will benefit with a light mulching of weed–free straw to conserve moisture. If conditions are drier than usual, watering may be required. Preparation of a clean weed free seed bed is necessary for optimal results.

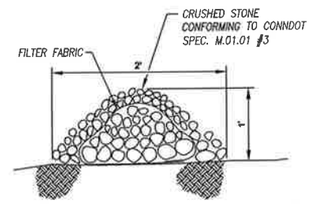


SECTION THROUGH DETENTION/WATER QUALITY BASIN



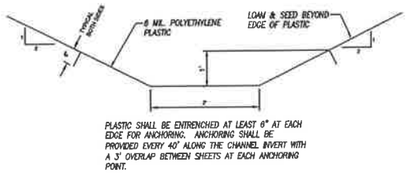
HAYBALE INSTALLATION AT CATCH BASIN

NOT TO SCALE



STONE CHECK DAM

NOT TO SCALE



PLASTIC SHALL BE ENTRENCHED AT LEAST 6" AT EACH EDGE FOR ANCHORING. ANCHORING SHALL BE PROVIDED EVERY 40' ALONG THE CHANNEL INVERT WITH A 3' OVERLAP BETWEEN SHEETS AT EACH ANCHORING POINT.

TEMPORARY LINED CHANNEL

NOT TO SCALE

10/25/2016	PER R&R
DATE	DESCRIPTION
REVISIONS	

EROSION AND SEDIMENTATION CONTROL DETAILS

PREPARED FOR

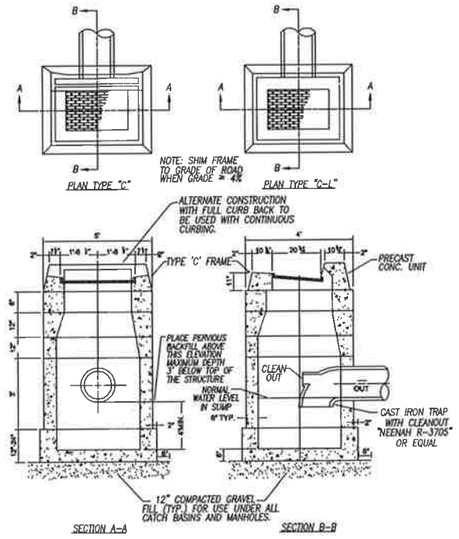
KILLINGLY ENERGY CENTER NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

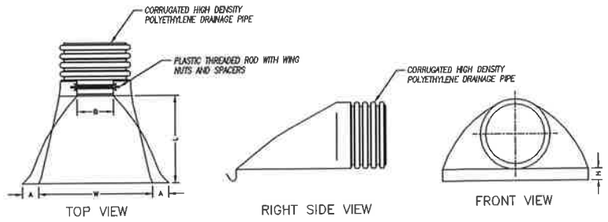
Killingly Engineering Associates
Civil Engineering & Surveying
114 Westcott Road
P.O. Box 421
Killingly, Connecticut 06241
(860) 779-7299
www.killinglyengineering.com

DATE: 06/30/2016	DRAWN: NET
SCALE: 1"=50'	DESIGN: NET
SHEET: 6 OF 7	CHK BY: ---
DWG. No: CLIENT FILE	JOB No: 16042



HOODED CATCH BASIN DETAIL

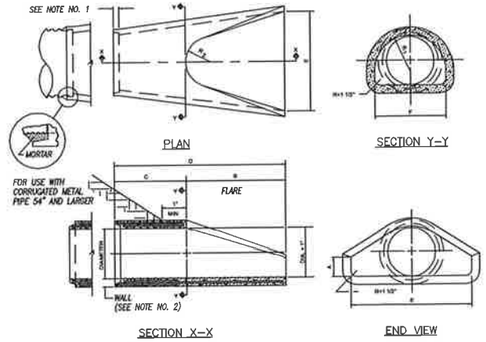
NOT TO SCALE



PIPE SIZE (IN)	A (IN)	B (IN, MAX)	H (IN)	L (IN)	W (IN)
12	6.50	10.00	6.50	25.00	29.00
15	6.50	10.00	6.50	25.00	29.00
18	7.50	15.00	6.50	32.00	35.00
24	7.50	18.00	6.50	36.00	45.00
30	7.50	12.00	8.60	58.00	63.00
36	7.50	25.00	8.60	58.00	63.00

FLARED END DETAIL

NOT TO SCALE

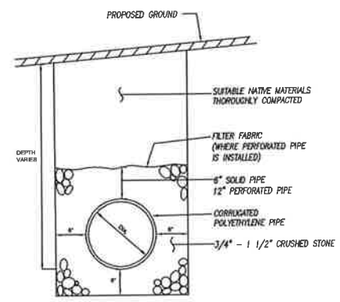


NOTE:
1. JOINTS SHALL BE TONGUE AND GROOVE OR BELL AND SPIGOT AS REQUIRED TO CONFORM TO PIPE INSTALLED
2. WALL THICKNESS SHALL CONFORM TO PIPE THICKNESS

DIMENSIONS FOR REINFORCED CONCRETE CULVERT END									FLARED REINFORCEMENT	
DIA.	A	B	C	D	E	F	R_1	R_2	[illegible]	[illegible]
12"	4"	2'-0"	4'-0 3/8"	6'-0 3/8"	7'-0"	1'-1 15/16"	1'0 1/4"	9"	0.048	0.048
15"	6"	2'-3"	3'-10"	6'-1"	7'-6"	2'-0 5/16"	1'-0 1/2"	1'-1"	0.054	0.054
18"	9"	2'-3"	3'-10"	6'-1"	7'-6"	2'-0"	1'-3 1/2"	1'-0"	0.060	0.060
21"	9"	2'-11"	3'-2"	6'-1"	7'-6"	2'-7 1/2"	1'-6"	1'-1"	0.066	0.066
24"	@ 1'-2"	3'-7 1/2"	2'-4"	6'-1 1/2"	7'-6"	2'-9 3/16"	1'-4 13/16"	1'-2"	0.072	0.072
30"	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	8'-0"	3'-0"	1'-8 1/2"	1'-3"	0.084	0.084
36"	1'-3"	5'-3"	3'-10 3/4"	6'-1 3/4"	8'-0"	3'-11 9/16"	2'-0 5/16"	1'-6"	0.096	0.096
42"	1'-6"	5'-3"	3'-11"	6'-2"	8'-0"	4'-8 7/8"	2'-3 1/2"	1'-10"	0.108	0.108
48"	2'-0"	5'-3"	3'-11"	6'-2"	7'-0"	4'-8 1/2"	2'-4 1/2"	1'-11"	0.120	0.120
54"	2'-3"	5'-3"	3'-11"	6'-4"	7'-0"	5'-8 1/2"	2'-8 1/8"	2'-0"	0.132	0.132
60"	2'-6"	5'-3"	3'-3"	6'-3"	8'-0"	6'-0 1/2"	3'-0 11/16"	2'-0"	0.144	0.144

CULVERT END

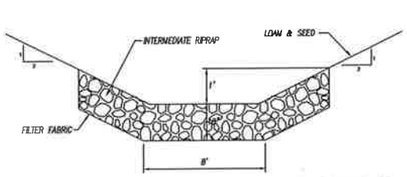
NOT TO SCALE



DRAINAGE PIPE INSTALLATION DETAIL

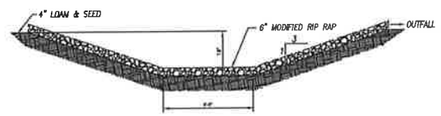
NOT TO SCALE

NOTE: PROVIDE WATER TIGHT GASKETED PIPE FOR INSTALLATIONS IN FILL SLOPES



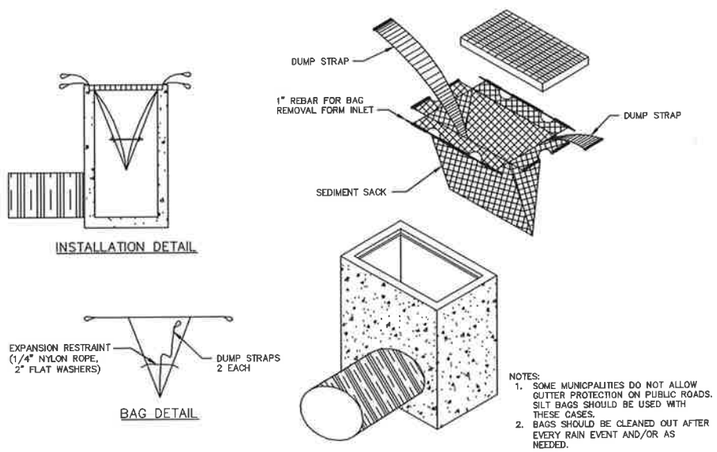
INTERMEDIATE RIPRAP SWALE

NOT TO SCALE



SECTION THROUGH LEVEL SPREADER

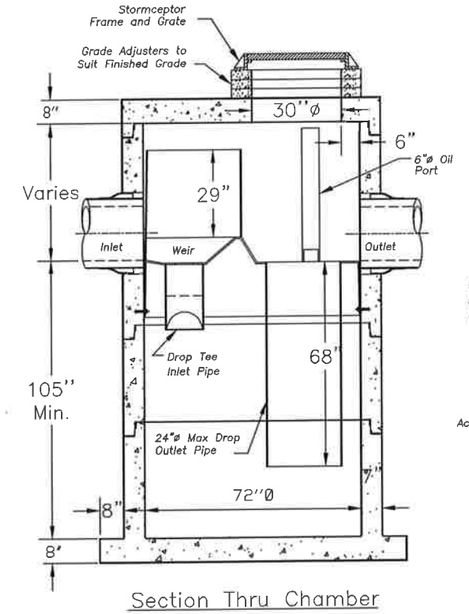
NOT TO SCALE



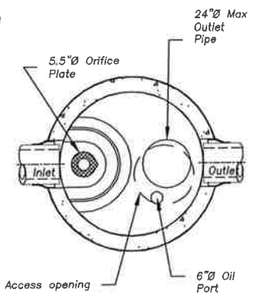
SILTBAG INLET SEDIMENT CONTROL DEVICE

NOT TO SCALE

MAY BE USED IN LIEU OF OR IN COMBINATION WITH STAKED HAYBALES

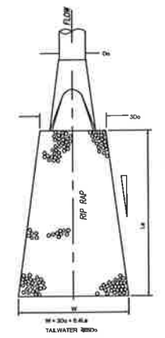


Section Thru Chamber



Plan View

EOS 18-1000 Precast Concrete Stormceptor
(1000 U.S. Gallon Oil Capacity)



PLAN

SECTION

RIP RAP OUTFALL

NOT TO SCALE

10/25/2016	PER R&R
DATE	DESCRIPTION
REVISIONS	

STORMWATER CONSTRUCTION DETAILS

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates

Civil Engineering & Surveying

114 Westcott Road
P.O. Box 421
Killingly, Connecticut 06241
(860) 779-7299
www.killinglyengineering.com

DATE: 06/30/2016	DRAWN: NET
SCALE: 1"=50'	DESIGN: NET
SHEET: 7 OF 7	CHK BY: ---
DWG. No: CLIENT FILE	JOB No: 16042

Memo *(via e-mail)*

EXHIBIT 6

To: Lynn Gresock, VP
Tetra Tech

From: George T. Logan, MS, PWS, CSE
Rema Ecological Services, LLC

Date: October 27, 2016

Re: **NTE – Killingly Energy Center, Lake Road, Killingly, CT**
Wetland Information Update

REMA evaluated the Killingly Energy Center (KEC) in its *Wetland Report: Proposed Conditions*, and concluded that the proposed configuration represented the feasible and prudent alternative in regard to direct and indirect, short-term and long-term impacts to wetlands and watercourses. No significant or adverse impacts to wetlands or watercourses, on or off-site, resulted from KEC, and a mitigation package was identified that more than offset the proposed impacts. Under the original configuration, the site's wetlands would continue to provide major functions and values in the post-construction phase, at very similar levels as existing conditions.

REMA has been involved in the site layout refinements now proposed, and continues to affirm that impacts have been minimized and that no significant or adverse impacts to wetlands or watercourses will result. Responding to comments from the Town of Killingly, additional wetland replication area has been added to bring the mitigation ratio to 1.5:1. A more detailed review of the updated stormwater management system relative to wetland and watercourse issues is provided below, followed by an update of additional end-of-season field efforts.

Stormwater Management System

REMA reviewed the revised stormwater management system (SMS) for its effectiveness in renovating stormwater runoff, and its ability to protect the water quality of downgradient receiving waters (i.e., wetlands and watercourses). The revised SMS conveys and treats runoff at the Generating Facility Site (GFS) via three water quality basins (i.e., Basins 1, 2,

and 3). Basins 1 and 2 are located just above the headwaters of Wetlands A1/A2 and A3, in order to maximize contributions to the hydrology of these regulated resources.

In accordance with CTDEEP's 2004 *Stormwater Quality Manual* (the Manual), each basin has been designed and sized to retain the water quality volume (WQV), which is the runoff generated during a 1-inch rain event. According to the project engineer, the WQV is exceeded at each of three basins at the GFS. Groundwater recharge volume (GRV) have been calculated, per the Manual, for the site as a whole and also for the catchment areas of each water quality basin. To maximize infiltration to groundwater each basin has either a 2-foot crushed stone bed, below the basin bottom, or a groundwater recharge trench, or both. Per the Manual the GRV can be subtracted from the WQV. This would reduce the necessary size of a water quality basin. However, at this site this has not been proposed, resulting in significant conservative factor.

As seen on the submitted revised plans, the runoff capture and conveyance system associated with each water quality basin includes deep sump catch basins with hooded outlets, and a hydrodynamic separator. These structures combined with routine sweeping and clean outs will ensure that the water quality basins' effectiveness in treating runoff constituents would be exceptionally high. For instance, in REMA's professional opinion, the annual removal efficiency for total suspended solids (TSS) at each of the three systems (i.e., Basin 1, 2, and 3) would exceed 95%, with 80% being the minimum requirement by regulatory agencies (i.e., CT DEEP).

At the Switchyard Site, an additional water quality basin (i.e., Basin 5) is being proposed. This will treat runoff from approximately 7.9 acres, including the switchyard facility, and 0.9 acres of Lake Road. Under existing conditions, runoff from Lake Road is eroding a channel at this site, which has the potential of impacting wetland resources. Treated water from Basin 5 will be discharged to the proposed wetland replication area, which would further polish water prior to any discharge from the site to off-site wetlands and watercourses. As a result, any water quality degradation of the intermittent stream that drains the off-site wetland under Lake Road is not anticipated.

Surface Water Quality Sampling

On 9/23/16, REMA measured water quality parameters and collected surface water samples, at the inlet to Wetland A1 (man-made pond), midway between the edge of the pond and the springhouse (see attached annotated photos). Observed flows were very low at the time. In the previous 10 days leading to the surface water sampling 0.46 inches of precipitation had been recorded at Killingly.

Samples were collected in late morning, preserved in the field and kept on ice, and relinquished at Phoenix Environmental Laboratories, Inc. within approximately two hours of collection. Table C (attached) summarizes the results (full analytical report attached).

Pond Survey

On 9/22/16, and again on 9/23/16, sweeping with an aquatic net took place along the edge of the man-made pond (Wetland A1) (see attached annotated photos). Approximately 70% of the pond edge was covered during each survey day. The most abundant species collected was green frog (*Lithobates clamitans*), both juveniles and larvae. Roughly 60% of the sweeps captured green frog. The second most abundant species captured was smallmouth bass (*Micropterus dolomieu*), all fingerlings. In addition, a variety of aquatic organisms were captured, including crayfish (*Orconectes* sp.).

Killingly Energy Center, Lake Road, Killingly, CT
Photos taken September 2016, by REMA Ecological Services, LLC

Photo 1: Wetland A1 (man-made pond) on 9/22/16; facing northerly

Photo 2: Wetland A1; edge of pond; note floating duckweed; the edge of the pond were swept with an aquatic net

Killingly Energy Center, Lake Road, Killingly, CT
Photos taken September 2016, by REMA Ecological Services, LLC

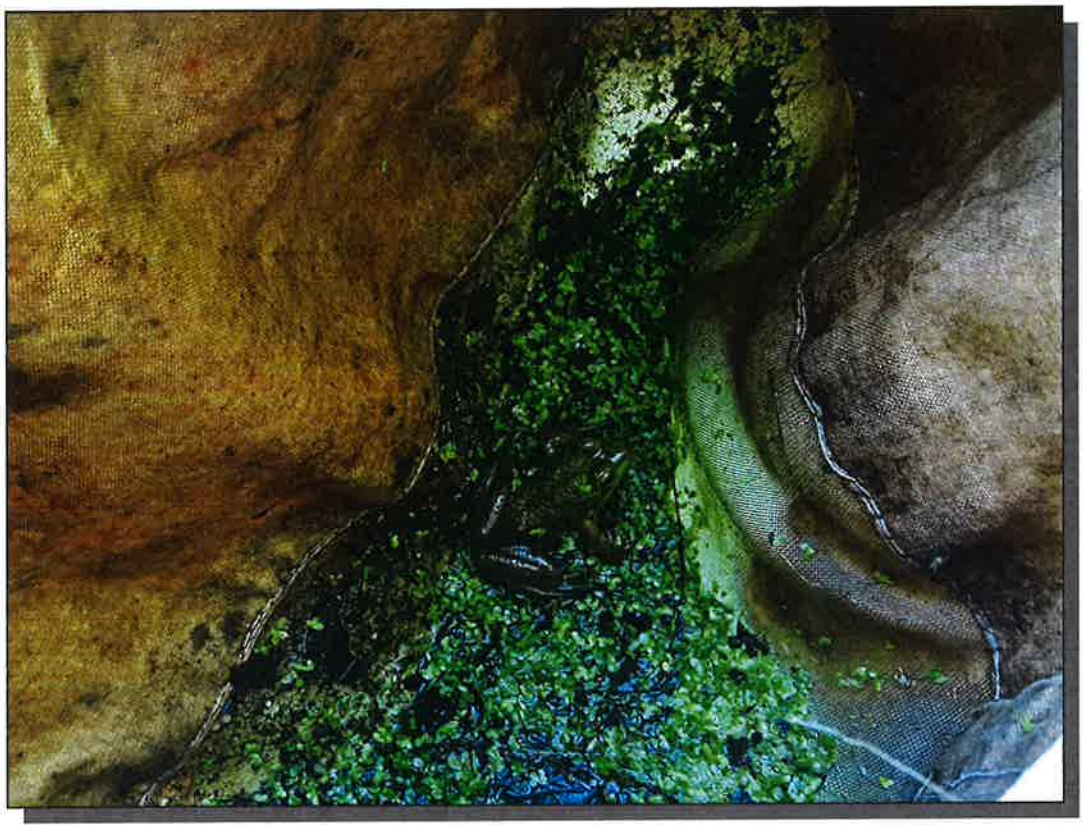


Photo 3: Juvenile green frog (*Lithobates clamitans*) was the most abundant amphibian netted at Wetland A1 (man-made pond) on 9/22/16 and 9/23/16

Photo 4: Wetland A1; low flows at pond outlet; 9/22/16; facing southeasterly

Killingly Energy Center, Lake Road, Killingly, CT
Photos taken September 2016, by REMA Ecological Services, LLC

Photo 5: Water quality measured and samples collected at inlet to man-made pond (Wetland A1) from springhouse; 9/23/16

Table C. Surface water analytical results for a sample taken on 9-23-16 at the NTE Generating Facility, 189 Lake Road, Killingly, Connecticut: *Station #1C*, inlet stream to man-made pond (Wetland A1), 18' downstream of spring house

Sampling Stations:	*Station #1C (WA1)*	*CT Standards*
Sampled on 9-23-16	Inlet stream to pond	
Sampling Time:	11:32 AM	
Conductivity (µ S/cm)	107.7	NE
pH	6.61	NE
Salinity (PPT)	0.0	NE
Temperature *(degrees C)*	13.0	as naturally occurs[1]
Total Phosphorus as P (µg/l)	370.00	only of natural origin[1], 23[2]
Ortho Phosphorus as P (µg/l)	30.00	NE
Nitrate-N + nitrite-N (mg/l)	1.06	0.31[2] (includes Nitrite-N)
Ammonia (mg/l)	0.07	1.9[3] (chronic)
Total Kjeldahl Nitrogen (mg/l)	1.60	5[1]; 1.26[2]
Alkalinity (mg/l) (CaCO3)	21.00	NE
Hardness (mg/l) (CaCO3)	32.50	NE

NOTES:

N/A = Not applicable

NE = No standard established

mg/L = milligrams per Liter; µg/L = micrograms per Liter

[1] The State of Connecticut Water Quality Standards for Class A Waters.

[2] USEPA Nutrient Criteria (draft) for EcoRegion IV, Level 11 Ecoregion 59 (coastal

[3] USEPA Freshwater Ambient Criteria (chronic toxicity) (2013); @ pH 7.0, Temp. 2

PHOENIX
Environmental Laboratories, Inc.

Friday, September 30, 2016

Attn:
Rema Ecological Services
164 East Center Street
Suite 8
Manchester CT 06040

Project ID: NTE KEC
Sample ID#s: BV23089

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext. 200.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #MA-CT-007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Analysis Report

September 30, 2016

FOR: Attn:
Rema Ecological Services
164 East Center Street
Suite 8
Manchester CT 06040

Sample Information		Custody Information		Date	Time
Matrix:	SURFACE WATER	Collected by:		09/23/16	11:32
Location Code:	REMA	Received by:	LK	09/23/16	13:31
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GBV23089
Phoenix ID: BV23089

Project ID: NTE KEC
Client ID: INLET TO POND

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Hardness (CaCO3)	32.5	0.1	mg/L	1	09/26/16		E200.7
Alkalinity-CaCO3	21	20.0	mg/L	1	09/26/16	RR/EG	SM2320B-97
Ammonia as Nitrogen	0.07	0.05	mg/L	1	09/29/16	WHM	E350.1
Nitrite-N	< 0.010	0.010	mg/L	1	09/23/16 18:57	GD	E353.2
Nitrate-N	1.06	0.02	mg/L	1	09/23/16 18:57	GD	E353.2
Ortho-Phosphate-P	0.03	0.01	mg/L	1	09/23/16 19:39	GD	SM4500PF-99
Nitrogen Tot Kjeldahl	1.60	0.10	mg/L	1	09/29/16	WHM	E351.1
Phosphorus, as P	0.37	0.02	mg/L	2	09/29/16	JR	SM4500PE-99
Total Metals Digestion	Completed				09/23/16	AG/AG/BF	

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

Ortho-Phosphate was not field filtered within 15 minutes of collection.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

Phyllis Shiller, Laboratory Director
September 30, 2016
Reviewed and Released by: Deb Lawrie, Project Manager

PHOENIX

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

QA/QC Report

September 30, 2016

QA/QC Data

SDG I.D.: GBV23089

Parameter	Blank	Blk RL	Sample Result	Dup Result	Dup RPD	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 360094 (mg/L), QC Sample No: BV22792 (BV23089)													
Nitrate-N	BRL	0.02	0.17	0.17	0	105			99.8			85 - 115	20
Nitrite as Nitrogen	BRL	0.01	<0.01	<0.01	NC	98.8			90.4			85 - 115	20
QA/QC Batch 360355 (mg/L), QC Sample No: BV22833 (BV23089)													
Alkalinity-CaCO3	BRL	5.00	6.0	6.4	NC	107						85 - 115	20
QA/QC Batch 360100 (mg/L), QC Sample No: BV23089 (BV23089)													
Ortho-Phosphate-P	BRL	0.01	0.03	0.03	NC	94.2			106			85 - 115	20
QA/QC Batch 360716 (mg/L), QC Sample No: BV23138 (BV23089)													
Phosphorus, as P	BRL	0.01	0.64	0.62	3.20	109			78.3			85 - 115	20
QA/QC Batch 360521 (mg/L), QC Sample No: BV29204 (BV23089)													
Ammonia as Nitrogen	BRL	0.05	<0.05	<0.05	NC	105			100			85 - 115	20
Nitrogen Tot Kjeldahl	BRL	0.10	1.09	1.10	0.90	93.6			77.0			85 - 115	20

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference

Phyllis Shiller, Laboratory Director
September 30, 2016

Sample Criteria Exceedences Report

GBV23089 - REMA

Criteria: None

State: CT

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units

*** No Data to Display ***

Cooler: Yes [X] No [ ]
Coolant: IPK [ ] ICE [X] No [ ]
Temp 8 °C Pg of

CHAIN OF CUSTODY RECORD

PHOENIX Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: info@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-8726

Data Delivery:
[ ] Fax #:
[X] Email: REMA@AOL.COM

Customer: REMA ECOLOGICAL SERVICES
Address: 164 EAST CENTER ST SUITE B MANCHESTER, CT 06040
Project: NTE-ICEC
Report to: REMA
Invoice to:
Phone #: 860-649-7362
Fax #:
Project P.O:

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature _____ Date: _____

Matrix Code:
DW=Drinking Water GW=Ground Water SW=Surface Water WW=Waste Water
RW=Raw Water SE=Sediment SL=Sludge S=Soil SD=Solid W=Wipe
OIL=Oil B=Bulk L=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	TKN	NO2-NO3	NH4	TP	OPPO-P	ALKALINITY	HARDNESS	Soil VOA Vials [ ] methanol [ ] H2O	GL Soil container ( ) oz ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H2SO4	PL As is [ ]250ml [ ]500ml [X]1000ml	PL H2SO4 [ ]250ml [ ]500ml [X]1000ml	PL HNO3 250ml	PL NaOH 250ml	Bacteria (as is)	Bacteria (w/thio)
23089	INLET TO POND	SW	9-23-16	11:32A	X	X	X	X	X	X	X					1	1	1				

Relinquished by:	Accepted by:	Date:	Time:
[signature]	Claudine	9/23/16	1331

Comments, Special Requirements or Regulations:

Turnaround:
[ ] 1 Day*
[ ] 2 Days*
[ ] 3 Days*
[X] Standard
[ ] Other
* SURCHARGE APPLIES

RI
[ ] Direct Exposure (Residential)
[ ] GW
[ ] Other

CT
[ ] RCP Cert
[ ] GW Protection
[ ] SW Protection
[ ] GA Mobility
[ ] GB Mobility
[ ] Residential DEC
[ ] I/C DEC
[ ] Other

MA
[ ] MCP Certification
[ ] GW-1
[ ] GW-2
[ ] GW-3
[ ] S-1
[ ] S-2
[ ] S-3
[ ] MWRA eSMART
[ ] Other

State where samples were collected: _____

Data Format
[ ] Excel
[ ] PDF
[ ] GIS/Key
[ ] EQuIS
[ ] Other

Data Package
[ ] Tier II Checklist
[ ] Full Data Package*
[ ] Phoenix Std Report
[ ] Other
* SURCHARGE APPLIES