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Wetland Replication Protocol
Prospect Hill Estates
Bellingham, MA
DEP File No. 105-940

Prepared by:



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Introduction: The proposed Prospect Hill Subdivision is depicted on a Definitive Subdivision Plan set prepared by GLM Engineering Consultants Inc. ("GLM"). The Subdivision Plan set also serves as the wetlands Notice of Intent ("NOI") plan set. As detailed on Sheet 19 of 25 "*Wetland Replication Plan*" the proposed subdivision roadway makes use of an existing gravel cart road that crosses a wetland system consisting of a mapped perennial stream and an associated area of Bordering Vegetated Wetland ("BVW"). The Replication Plan conservatively calculates proposed BVW impacts at the existing/ proposed wetland crossing to be 580 sf (340 sf on north side of the crossing and 240 sf on south side) to include the defined stream channel and areas below the Mean Annual High Water line of the stream.

The Massachusetts Wetland Regulations at 310 CMR 10.55(4)(b) state that discretionary wetland filling and replication may be allowed consistent with the criteria listed below ("and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area will function in a manner similar to the area that will be lost"). Although the project is filed as a "limited project" in accordance with 310 CMR 10.53(3)(e), which allows for potential deviation from the provisions of the Regulations, the following criteria for discretionary BVW filling have been followed. Although it is never possible to fully replicate the horizontal configuration of a wetland crossing in a replication area, it is EcoTec's opinion that the proposed replication area reasonably complies with the listed criteria:

1. the surface of the replacement area to be created ("the replacement area") shall be equal to that of the area that will be lost ("the lost area");
2. the ground water and surface elevation of the replacement area shall be approximately equal to that of the lost area;
3. The overall horizontal configuration and location of the replacement area with respect to the bank shall be similar to that of the lost area;
4. the replacement area shall have an unrestricted hydraulic connection to the same water body or waterway associated with the lost area;
5. the replacement area shall be located within the same general area of the water body or reach of the waterway as the lost area;
6. at least 75% of the surface of the replacement area shall be reestablished with indigenous wetland plant species within two growing seasons, and prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard U.S. Soil Conservation Service methods; and
7. the replacement area shall be provided in a manner which is consistent with all other General Performance Standards for each resource area in Part III of 310 CMR 10.00.

The Bellingham Wetlands Bylaw Regulations contain similar provisions with additional criteria, including the requirement that: "*The area of the wetland replication shall be at a 2:1 ratio to that area of wetland loss.*" As noted on the Replication Plan, an area of replication of 1,200 sf (2.1:1 ratio) is proposed. Details regarding construction, planting, and monitoring are proposed below.

BVV Replication Protocol:

1. Prior to initiating work at the replication area, the boundary of the existing BVW will be protected with a properly entrenched silt fence and minimum 6-inch staked straw wattle between the wetland and the work area, including access ways.
2. Access to the proposed replication area will be from the existing gravel road which is proposed to be upgraded to serve as the subdivision roadway.
3. Existing trees and other woody vegetation within the proposed replication area will be removed. A portion of this woody material will be set aside and used to provide coarse woody debris in the replication area, as described below (step #7).
4. The replication area will be excavated to subgrade. As indicated on the Replication Plan sheet, the precise depth of the subgrade excavation will be determined in the field by a qualified wetland scientist based upon soil features observed in the excavation. The goal is to achieve the hydrology of the adjacent wooded swamp. Subgrade will be 1-foot below the proposed finish grade. Side slopes will be

graded as indicated on the plans, no steeper than 3:1 (H:V) and allowing for 6-inches of topsoil placement. Excess soil will be removed from the replication area vicinity for use in other areas of the site or stockpiled outside of the wetland Buffer Zone.

5. To the extent feasible, organically enriched topsoil will be removed from the wetland proposed to be filled and transported to the replication area, where it will be mixed with on-site topsoil to provide a 1-foot layer of topsoil in the replication area. As feasible during this process, vegetation within the wetland to be filled will be excavated and translocated to the replication area. The wetland scientist will oversee this process to ensure that invasive plant species are not translocated to the replication area.
6. Topsoil will be spread throughout the replication area. The replication area soil surface will be graded with a +/- 6-inch variability to mimic the natural "pit and mound" topography of wooded swamp wetlands.
7. The coarse woody debris salvaged during the initial clearing shall be replaced within the replication area to mimic a natural forested wetland surface. This may include short vertical snags. A minimum of 200 linear feet of 2-inch diameter or larger logs and branches will be placed haphazardly throughout the replication area. Any stones encountered during the replication area excavation may also be allowed to remain.
8. Planting of the replication will be conducted, as summarized in Table 1, below.
 - a. Planting will be done only during the beginning (April 15 through June) or end (September 1 to November 15) of the growing season. Alternatively, planting in the mid-growing season is only acceptable if irrigation is provided.
 - b. The plant species identified in the table below will be planted in the replication area from nursery stock.
 - c. The red maple saplings will be distributed throughout the area.
 - d. The shrubs will be planted randomly throughout the area with the average spacing between shrubs approximately 6 feet on-center (including the red maples). The woody vegetation should not be planted in rows.
 - e. Woody vegetation planting will be conducted first, followed by herbaceous;
9. An erosion control barrier of silt fence or straw wattle will be placed around the outer edge of the replication area;
10. A minimum of 6-inches of topsoil will be spread throughout the side slopes and any other areas disturbed for construction of the replication area;
11. The side slopes and access path will be planted as indicated in Table 1.

12. The side-slopes of the wetland replication area and any additional disturbed areas required for access will be seeded with a grass/wildflower mixture designed to provide permanent cover. After seeding, the side-slopes may be mulched with a thin layer of straw to provide for temporary erosion control.
13. Monitoring of the replication area will be conducted by a qualified wetland scientist for two growing seasons. Monitoring will be conducted in the spring and fall, during leaf-out. Annual monitoring reports will be provided after the fall monitoring. Monitoring reports will include photographs and summarize the success of the replication area, including species composition, cover, and vigor; hydrology indicators, and presence of invasive species (which will be hand pulled if observed).
14. After the wetland replication area and side slopes have become vegetatively stabilized and following approval of the issuing authority, the perimeter siltation fence and all wooden stakes will be removed and disposed of properly.

Table 1: Planting Plan for Wetland Replication Area (1,200 sq. ft.)

SPECIES; SIZE; SPACING	NUMBER ¹
Saplings; min 6 to 8' height, container or balled, burlapped; 15' on-center avg.	
Red Maple (<i>Acer rubrum</i>)	6
Shrubs; 2.5 to 3' in height, min 1 gal container; 6' on-center average spacing (offset 6 ft from trees)	35 total ²
Highbush blueberry (<i>Vaccinium corymbosum</i>)	
Arrow-wood (<i>Viburnum recognitum</i>)	
Sweet pepperbush (<i>Clethra alnifolia</i>)	
Nannyberry (<i>Viburnum lentago</i>)	
Winterberry (<i>Ilex verticillata</i>)	
Silky dogwood (<i>Cornus amomum</i>)	
Herbaceous;	
New England Wetland Plants, New England Wetmix (or equivalent)	1 lb.
Side slopes:	
Saplings: White pine (<i>Pinus strobus</i>) 6-8 ft, 15-ft on-center avg	8 (estimate)
Shrubs: From the above list or other native species 6-ft on-center avg ³	30 (estimate)

¹ Woody plant material to be provided from nursery stock and limited translocated plants

² Depending upon availability from local nursery stock, at least four (4) of the listed species will be selected, with at least ten (10) specimens of each selected species planted, for a total of 60 shrubs.

³ Depending on availability, at least two (2) species, with at least ten (10) of each species