



December 2018

Assessment of Public-Private Partnership Opportunities for Pennichuck Watershed Water Quality Protection



Prepared for:



PENNICHUCK

25 Manchester Street
Merrimack, NH 03054

INTRODUCTION

Pennichuck Water Works (PWW) retained Comprehensive Environmental Inc. (CEI) to identify opportunities for establishing several pilot public/private partnerships (PPPs) within the Pennichuck water supply watershed. The goal of the PPPs would be for PWW to work cooperatively with private home and business owners on efforts to improve water quality and reestablish vegetated buffers within the Pennichuck water supply watershed, to serve as examples of what could be done on a relatively limited budget.

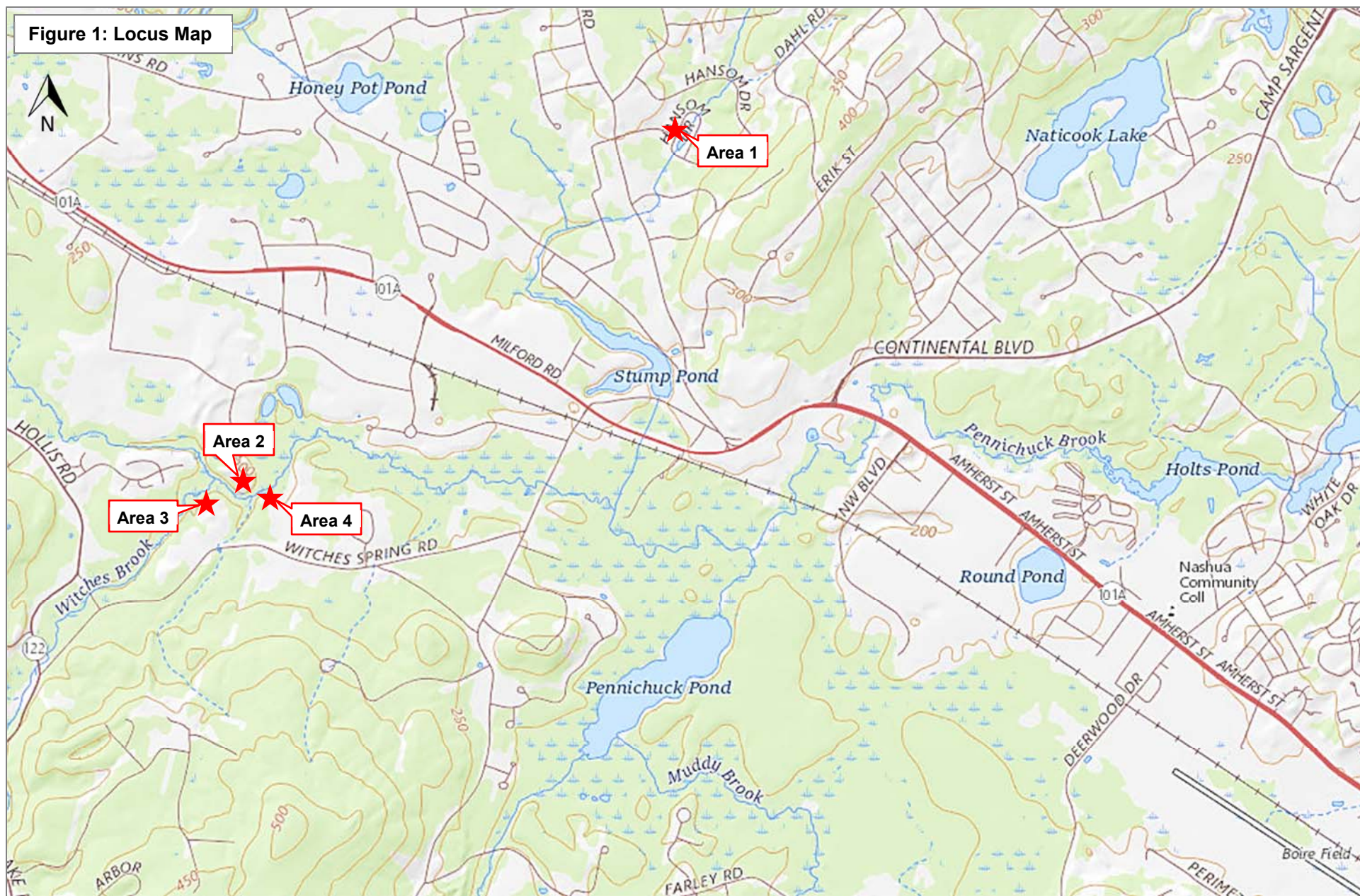
The *Reservoir Storage Estimates and Tributary and Pond Sediment Accumulation Monitoring* report (CEI, 2017) included a recommendation that PWW complete a project to identify potential PPPs to reestablish tributary buffers. Based on review of aerial drone surveys conducted by CEI under this project, several locations within the Pennichuck watershed had been identified as (1) areas on privately owned lands with limited stream buffers that could be improved, and/or (2) land uses proximate to streams with high potential for pollutant loading that could be attenuated with best management practices (BMPs). In some cases, the town in which the land is located may be able to work directly with the property owner if there is a violation of their bylaws (e.g. wetland ordinances, zoning regulations). In other cases, establishing a PPP may be an opportunity for PWW to assist private landowners with reestablishing vegetated buffer zones and reducing potential pollutant sources through construction of structural stormwater management BMPs.

Under Task 1 of this project, four (4) high priority areas for potential improvements were identified and analyzed through detailed review of drone imagery and follow-up field reconnaissance to collect more detailed information. Each area is immediately adjacent to a Pennichuck water supply tributary, with locations as listed below and presented on Figure 1.

Location	Adjacent Tributary
Ponded Area at Hansom Drive, Merrimack, NH	Unnamed tributary to Stump Pond
Vacant Land at 30 Northern Boulevard, Amherst, NH	Witches Brook
Junkyard at 80 Witches Spring Road, Hollis, NH	Witches Brook
Open land adjacent to farm, 100 Witches Spring Road, Hollis, NH	Witches Brook

Each area listed above was observed to have opportunities for improved vegetated buffers adjacent to water supply tributaries and/or contain land uses with potentially high pollutant loads. A summary of these areas, issues identified, and property information is provided on the following pages. Conceptual plans for each area are provided as Appendix A, including aerial images and site photographs with renderings to show the approximate locations of recommended BMPs and vegetated buffer improvements.

Following review of the information in this report, PWW could provide outreach to foster PPPs and implementation of the recommended improvements by forwarding the area summaries and conceptual renderings to the relevant municipal Conservation Commissions (Merrimack, Amherst, and Hollis) and land owners for each potential PPP site. PWW could also offer the recommended improvements as a topic for discussion at a public hearing for each of the Conservation Commissions.



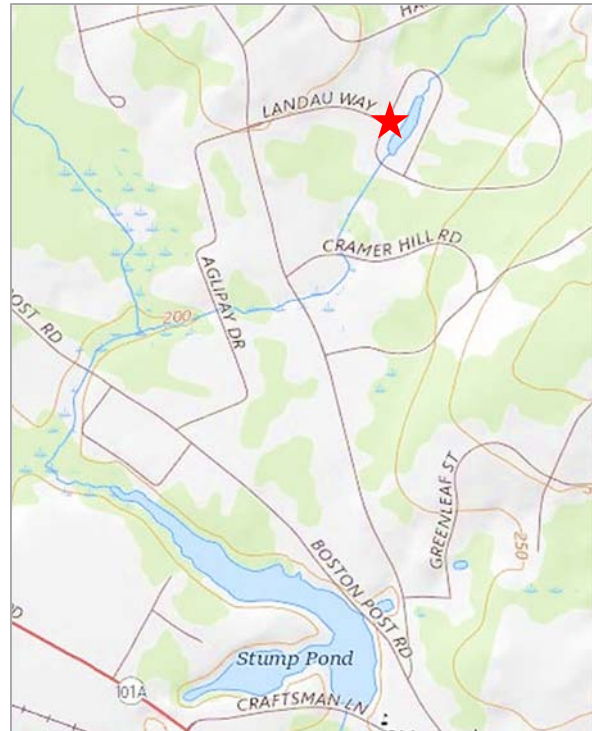
AREA 1:
Ponded Area, Hansom Drive, Merrimack, NH

Parcel Map-Lot Number: 2A-26

Address: Near intersection of Landau Way and Hansom Drive

Owner: Carriage Place (address N/A)

Near the eastern end of Landau Way, land adjacent to Hansom Drive includes a small pond which is an impoundment within an unnamed tributary to Stump Pond. The property surrounding the pond is owned by Carriage Place, with ownership split among multiple private owners. Information on the individual property owners was not available via the online Nashua Regional Planning Commission property database. The pond is approximately 1.5 acres and the property parcel is approximately 4.6 acres.



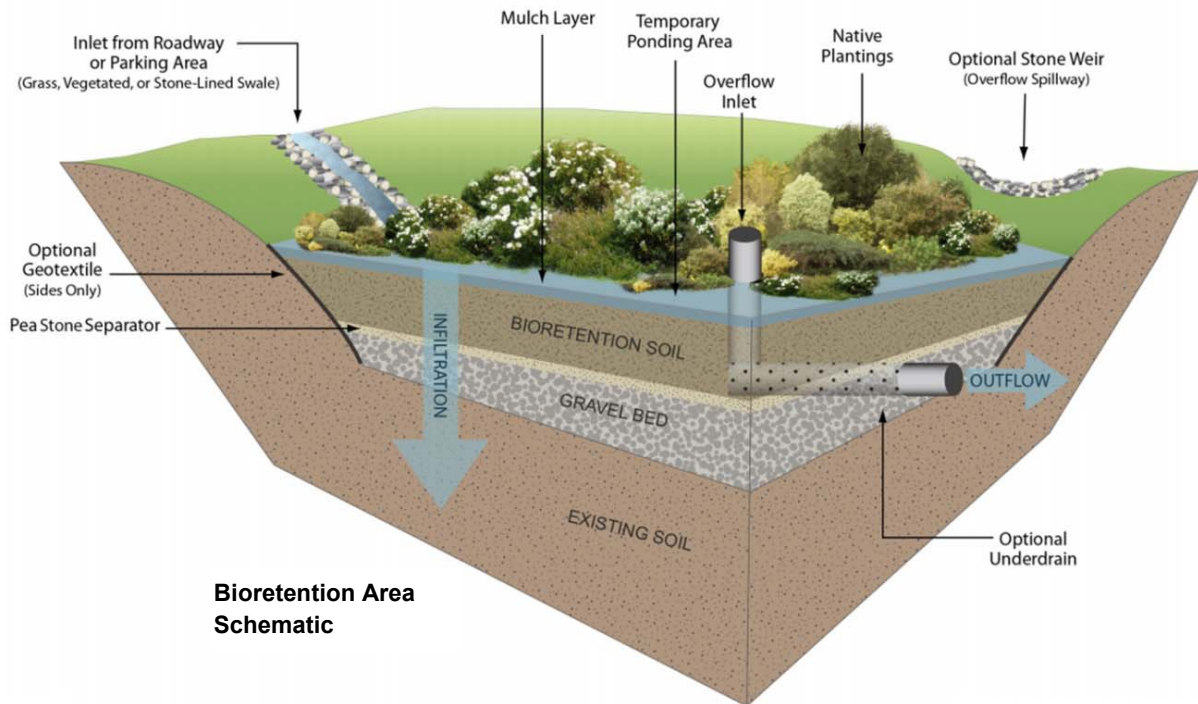
CEI identified the following potential areas for best management practices (BMPs) to reduce pollutant loading to the pond/tributary:

- The pond is mostly surrounded by vegetated buffer areas dominated by trees, shrubs, and bordering emergent wetland areas. However, on the west/northwest sides of the pond, immediately east of Hansom Road, there is an area of predominantly mowed grasses that extends approximately 70 feet to the pond perimeter. This area slopes significantly from the road to the pond. The grassed slope was observed to have been eroded due to stormwater runoff from the road. Improvements to this grassed buffer area could reduce the discharge of sediment and other pollutants from road runoff that enter the pond in this area.
- There is a drainage outfall that discharges directly to the grassed slope area with no outfall protection or additional water quality treatment before stormwater discharges overland through to the pond. This outfall appears to discharge stormwater runoff collected from a portion of Landau Way and Hansom Drive.

CEI recommends the following BMPs for this area to improve storm water runoff quality and reduce pollutant loading to the Pennichuck water supply watershed:

1. **Buffer Zone Plantings:** Install woody (tree/shrub) buffer zone plantings to improve pollutant attenuation along the west/northwest side of the pond. This BMP will slow down stormwater runoff, improve infiltration, and increase vegetative uptake of nutrients and other pollutants before they can enter the pond. The buffer plantings can be designed to be an aesthetically pleasing landscaping amenity to this park-like area, while still allowing views of the pond and easy water access in specified areas. CEI will work with Pennichuck and neighborhood landowners to develop a preferred planting list and finalize other design factors (e.g., buffer width, pond access points, etc.) under a future project, if desired.

2. **Outfall Bioretention Area:** Install a bioretention area at the drainage outfall located on the west side of the pond. In addition to treating and infiltrating water from drainage outfall, this BMP will also capture a portion of stormwater sheet runoff from the road. The bioretention area will also provide aesthetic benefits to this common area. CEI will work with Pennichuck and neighborhood landowners to discuss plant species selection (e.g., woody shrubs, perennial flowers, etc.) and other design factors (e.g., bioretention area extents, capacity/design storm, etc.) under a future project, if desired. Shown below is a cross section of a typical bioretention area.



3. **Water Quality Swale:** Install a road edge vegetated water quality swale along the eastern side of Hansom Drive (west/northwest of the pond). This BMP will capture, infiltrate, and treat stormwater runoff draining directly from the road. This BMP could be enhanced by constructing the swale as a series of linear bioretention cells connected by sections of vegetated swale. Shown below is an image of a typical water quality swale.



Water quality swales are vegetated open channels designed to treat the required water quality volume and to convey runoff from the 10-year storm without causing erosion. Unlike drainage channels, which are intended to be used only for conveyance, water quality swales and grass channels are designed to treat the required water quality volume and incorporate specific features to enhance their stormwater pollutant removal effectiveness. Water quality swales have higher pollutant removal efficiencies than grass channels

See attached Sheets C-1A and C-1B for the conceptual renderings of the BMPs described above.

AREA 2:
Vacant Land, 30 Northern Blvd., Amherst, NH

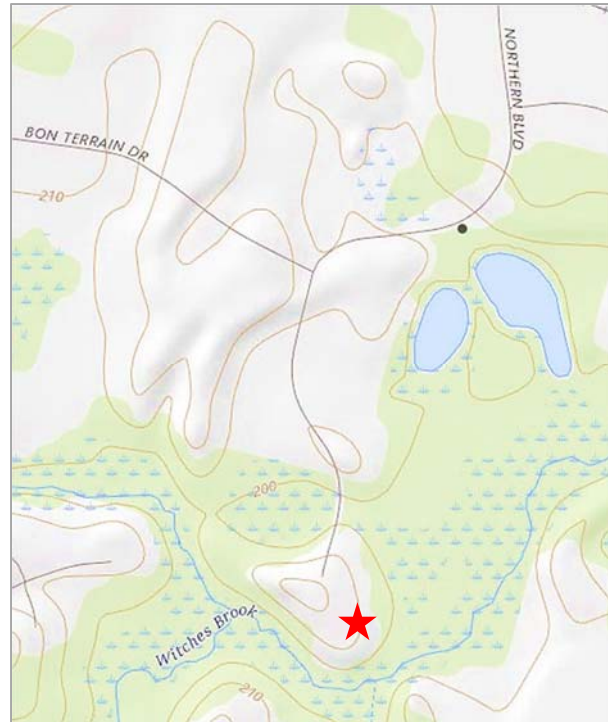
Parcel Map-Lot Number: 2-28-23

Address: 30 Northern Boulevard

Owner: Tana Properties, Limited Partnership
40 Temple St. Nashua, 30633

A 6.4-acre parcel of vacant land is located between the southern end of Northern Boulevard and Witches Brook. This property is bordered by several similar vacant lots to the north and northwest. Owner information was obtained on the online Nashua Regional Planning Commission property database.

Based on field observations and review of aerial imagery, the parcel is characterized by sandy soils and sparse vegetation. A narrow vegetated buffer (single layer of trees) separates the cleared land and areas of exposed soils from Witches Brook. Reported activities on this lot include unpermitted use as a shooting range and an ATV/bike course, which may contribute to soil erosion and prevent establishment of vegetation in trafficked areas. During storm events, sediment and pollutants may be transported overland into Witches Brook due to the limited vegetative buffer and non-stabilized soils.



CEI recommends the following to improve the quality of the vegetated buffer to Witches Brook, thereby reducing pollutant loading to the Pennichuck water supply system:

- **Revegetation:** Expand and re-establish a vegetative buffer along the southern extents of the property bordering Witches Brook. This BMP will slow down stormwater sheet runoff, and reduce sediment and pollutant loading to the brook. CEI will work with Pennichuck to reach out to the landowner in order to discuss potential options for implementing buffer improvements (including plant species selection and other design factors such as buffer width) under a future project, if desired.

A longer-term plan for improving the vegetated buffer at this site could include site-wide revegetation. The soils at the site do not appear to be optimal for planting, and it is likely that soil amendments (e.g., additional loamy topsoil) would have to be imported to support re-vegetation efforts.

- **Land Conservation:** Pennichuck could also coordinate with the property owner to investigate the potential for long-term conservation/protection of this undeveloped parcel (or a portion of the parcel nearest to Witches Brook) through a real estate tool such as a conservation restriction.

See attached Sheet C-2 for the conceptual drawing of the aforementioned buffer zone improvements.

AREA 3:
Junkyard, 80 Witches Spring Rd., Hollis, NH

Parcel Map-Lot Number: 46-15

Address: 80 Witches Spring Road, Hollis, NH

Owner: Bristol Farm LLC
80 Witches Spring Rd, Hollis, NH 03049

The junkyard at this property is bordered by Witches Brook to the north and northeast and is located across the brook from the Area 2 parcel at 30 Northern Boulevard. The junkyard area is approximately 9.2 acres and the property parcel is 58.9 acres. Witches Brook flows through the northern extent of the parcel, immediately adjacent to the junkyard. The parcel also includes forested and emergent wetland areas to the north of Witches Brook and agricultural land south and east of the brook. Owner information was obtained on the online Nashua Regional Planning Commission property database.



Based on CEI's review of aerial imagery, the parcel includes several exposed stockpile/storage areas, dirt paths, and sparse vegetation. Well over one hundred junked vehicles appeared to be stored at this site at the time the aerial imagery was taken. There is a relatively narrow strip of vegetated buffer separating the junkyard area from Witches Brook, with several gaps in the buffer. During storm events, sediment and pollutants from the junkyard and stockpile areas may be transported into Witches Brook due to the limited vegetated buffer.

CEI recommends the following to improve the quality of the vegetated buffer to Witches Brook, thereby reducing pollutant loading to the Pennichuck water supply system:

- **Buffer Zone Plantings:** Improve the width and continuity of the vegetated buffer along the northern and western boundary of the junkyard area bordering Witches Brook. This BMP will slow down stormwater runoff, and capture sediment and contaminants before they enter the brook. CEI will work with Pennichuck to reach out to the landowner in order to discuss potential options for implementing buffer improvements (including plant species selection and other design factors such as buffer width) under a future project, if desired.
- **Public Education:** Provide the landowner with relevant information on storage of materials with the potential to pollute, such as oil, antifreeze, fuel, etc. Also emphasize that any maintenance of vehicles should be performed under cover and on an impervious surface where possible, and that liquids should never be drained into the ground waterbody, or drainage system.

See attached Sheet C-3 for the conceptual drawing of the aforementioned buffer zone improvements.

AREA 4:
Open Land Adjacent to Farm, 100 Witches
Spring Rd., Hollis, NH

Parcel Map-Lot Number: 46-16

Address: 100 Witches Spring Road, Hollis, NH

Owner: Glover Family Trust: Glover, Robert M.,
TTEE & Glover, Timothy L., TTEE
100 Witches Spring Rd, Hollis, NH 03049

An area of open land (approximately 2.8 acres) at this site is located just south of Witches Brook and adjacent to a wheat farm (106 Witches Spring Road, owned by Gerald C. and Marie C. Glover).

The open land area is located across the brook from the vacant lot on Northern Boulevard (Area 2) and adjacent to the junkyard to the east (Area 3). The 9.4-acres property consists of a residence closer to Witches Spring Road, south of the open area. Owner information was obtained on the online Nashua Regional Planning Commission property database.



Based on field observations and review of aerial images, the backyard area is comprised of mowed grass, vehicle paths, some exposed sandy soils, and sparse vegetation. There is generally a narrow buffer (single layer of trees) separating the open land area from Witches Brook, although there are several gaps in the buffer.

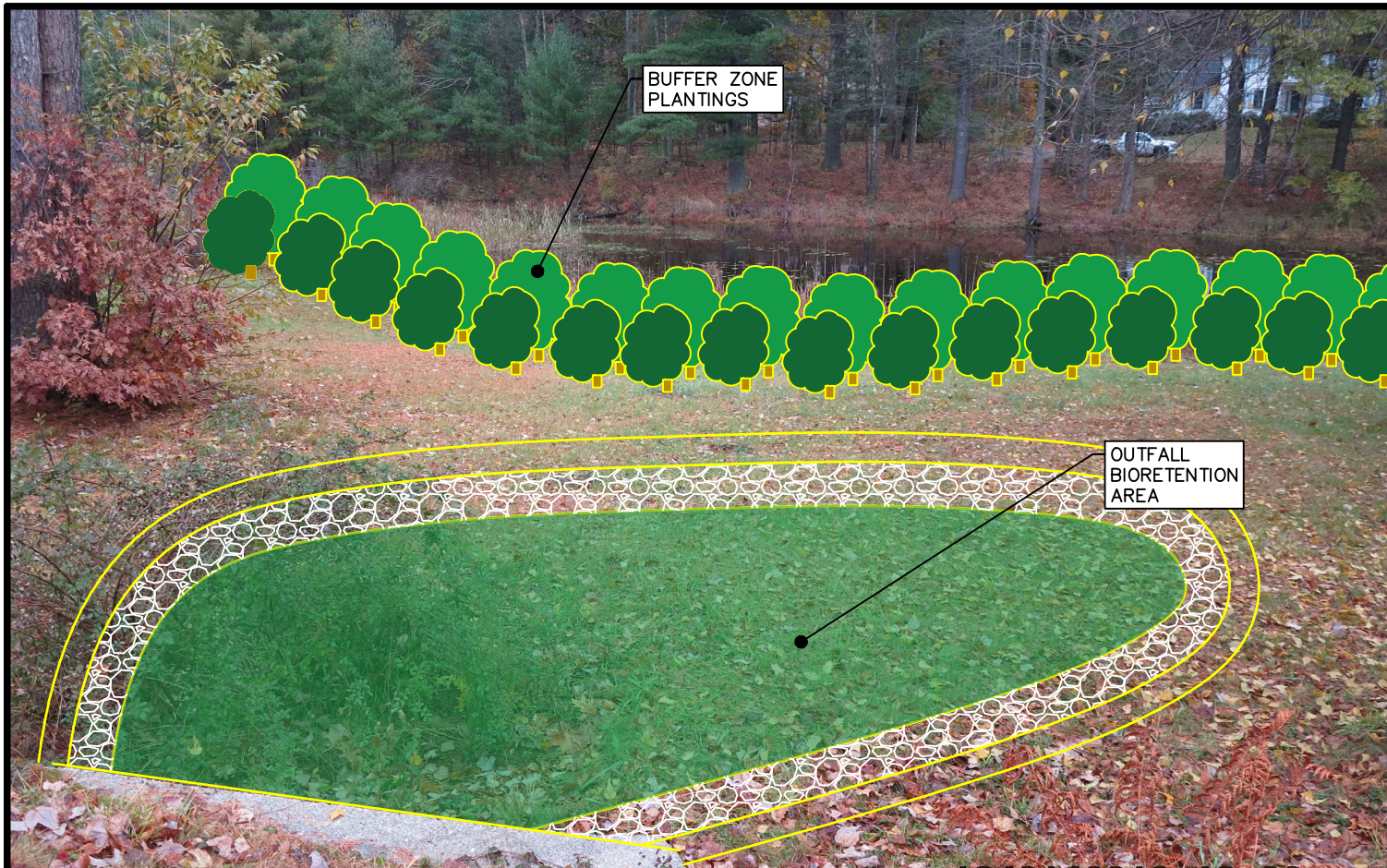
CEI recommends the following to improve the quality of the vegetated buffer to Witches Brook, thereby reducing pollutant loading to the Pennichuck water supply system:

- **Buffer Zone Plantings:** Reestablish buffer zone along the extents of the property bordering Witches Brook. This BMP will slow down stormwater sheet runoff, and capture any sediment and contaminants before they enter the brook. CEI will work with Pennichuck to reach out to the landowner to discuss potential options of implementing buffer improvements (including plant species selection and other design factors such as buffer width) under a future project, if desired.

See attached Sheet C-4 for the conceptual drawing of the aforementioned buffer zone improvements.



APPENDIX A:
CONCEPTUAL DESIGN SCHEMATICS



COMPREHENSIVE ENVIRONMENTAL
INCORPORATED

21 DEPOT ST.
MERRIMACK, NH 03054

CONCEPTUAL PLANS

POND AREA AT HANSOM DRIVE,

MERRIMACK, NH

PENNICHUCK WATER WORKS

Project No.: 131-62

Date: DECEMBER 2019

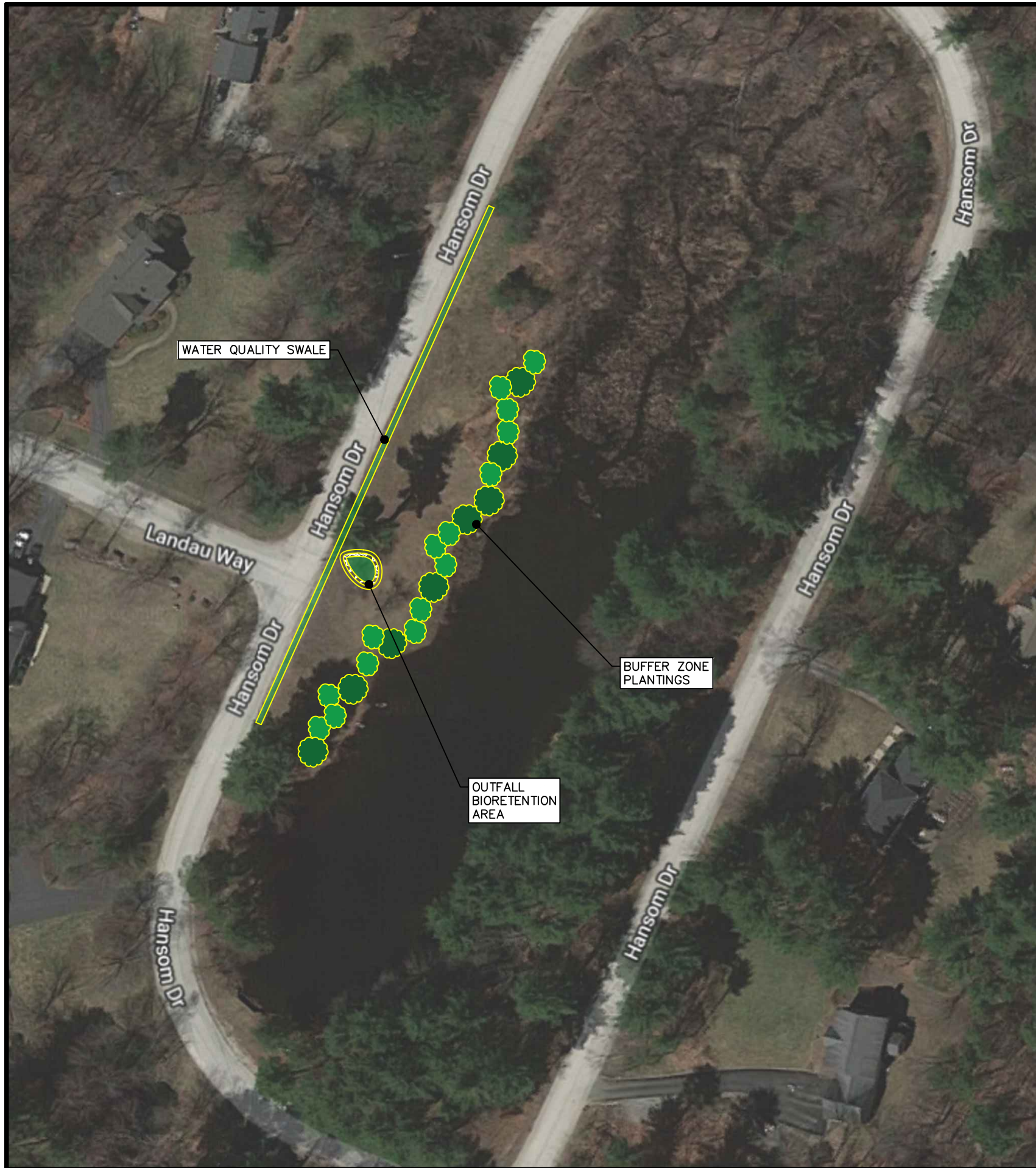
Drawn By: PD

Checked By: RH

Scale: N.T.S.

Sheet No.:

C-1A



COMPREHENSIVE ENVIRONMENTAL
INCORPORATED

21 DEPOT ST.
MERRIMACK, NH 03054

CONCEPTUAL PLANS

POND AREA AT HANSOM DRIVE,
MERRIMACK, NH
PENNICHUCK WATER WORKS

Project No.: 131-62
Date: DECEMBER 2019
Drawn By: PD
Checked By: RH
Scale: N.T.S.

Sheet No.:

C-1B



COMPREHENSIVE ENVIRONMENTAL INCORPORATED 21 DEPOT ST. MERRIMACK, NH 03054	
CONCEPTUAL PLANS VACANT LOT AT NORTHERN BOULEVARD, AMHERST, NH PENNICHUCK WATER WORKS	
Project No.: 131-62 Date: DECEMBER 2019 Drawn By: PD Checked By: RH Scale: N.T.S.	Sheet No.: C-2



COMPREHENSIVE ENVIRONMENTAL
INCORPORATED
21 DEPOT ST.
MERRIMACK, NH 03054

CONCEPTUAL PLANS
JUNKYARD AT WITCHES SPRING ROAD,
HOLLIS, NH
PENNICHUCK WATER WORKS

Project No.: 131-62
Date: DECEMBER 2019
Drawn By: PD
Checked By: RH
Scale: N.T.S.

Sheet No.:
C-3



COMPREHENSIVE ENVIRONMENTAL
INCORPORATED
21 DEPOT ST.
MERRIMACK, NH 03054

CONCEPTUAL PLANS
OPEN LAND ADJACENT TO FARM,
WITCHES SPRING ROAD, HOLLIS, NH
PENNICHUCK WATER WORKS

Project No.: 131-62
Date: DECEMBER 2019
Drawn By: PD
Checked By: RH
Scale: N.T.S.

Sheet No.:

C-4