APPENDIX 4:
PERMIT APPLICATIONS

Tighe&Bond

Chinook Solar Project
Fitzwilliam, New Hampshire

Alteration of Terrain Permit Application

Prepared For:

Chinook Solar, LLC
NextEra Energy Resources, LLC
700 Universe Boulevard
Juno Beach, FL 33408

October 2, 2019

Tighe&Bond
Engineers | Environmental Specialists

October 2, 2019

Bethann McCarthy, PE
State of New Hampshire
Department of Environmental Services
Alteration of Terrain Bureau
29 Hazen Drive, PO Box 95
Concord, New Hampshire 03302-0095

Re: **Chinook Solar Project**
Fitzwilliam, New Hampshire

Dear Bethann,

Tighe & Bond, Inc. is pleased to provide the following information, on behalf of the Chinook Solar, LLC in support of an Alteration of Terrain Application for the above referenced project:

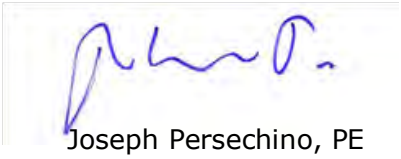
- Alteration of Terrain Application (loose)
- Check in the amount of $35,750 payable to "Treasurer, State of NH"
- Alteration fo Terrain Application Package dated October 2, 2019
- Site Plans dated October 2, 2019
- Hydrological Plans dated October 2, 2019
- Phasing Plans Dated October 2, 2019

The project includes the construction of a 30 megawatt (MW) alternating-current (AC) solar photovoltaic ground-mounted solar array in the Town of Fitzwilliam. The proposed project will result in approximately 157 acres of disturbance plus an additional 5 acres of temporary laydown and will include access roads, stormwater basins, electrical equipment, solar modules, and an electrical substation. Construction is anticipated to commence in the winter of 2021 and be completed in the fall of 2021. This application is being submitted in conjunction with a Site Evaluation Committee (SEC) filing.

If you have any questions or need additional information, please feel free to contact me at 603-433-8818 or jmpersechino@tighebond.com.

Very truly yours,

TIGHE & BOND, INC.



Joseph Persechino, PE
Senior Project Manager

Enclosures

Cc: Chinook Solar, LLC (email copy)

J:\N\N0758 NextEra\N-0758-017 Chinook\Report_Evaluation\Applications\20190926_AoT\Word Docs\00.0_Cover Letter.docx

ALTERATION OF TERRAIN PERMIT APPLICATION

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Water Division/ Alteration of Terrain Bureau/ Land Resources Management

Check the Status of your Application: www.des.nh.gov/onestop

RSA/ Rule: RSA 485-A:17, Env-Wq 1500

Administrative Use Only	Administrative Use Only	Administrative Use Only	File Number:
			Check No.
			Amount:
			Initials:

1. APPLICANT INFORMATION (INTENDED PERMIT HOLDER)		
Applicant Name: Chinook Solar, LLC	Contact Name: Heath Barefoot	
Email: heath.barefoot@nexteraenergy.com	Daytime Telephone: 561-304-6078	
Mailing Address: 700 Universe Boulevard		
Town/City: Juno Beach	State: FL	Zip Code: 33408
2. APPLICANT'S AGENT INFORMATION If none, check here: ☒		
Business Name:	Contact Name:	
Email:	Daytime Telephone:	
Address:		
Town/City:	State:	Zip Code:
3. PROPERTY OWNER INFORMATION (IF DIFFERENT FROM APPLICANT)		
Applicant Name: SEE ATTACHED FORM & DRAWING	Contact Name:	
Email:	Daytime Telephone:	
Mailing Address:		
Town/City:	State:	Zip Code:
4. PROPERTY OWNER'S AGENT INFORMATION If none, check here: ☒		
Business Name:	Contact Name:	
Email:	Daytime Telephone:	
Address:		
Town/City:	State:	Zip Code:
5. CONSULTANT INFORMATION If none, check here: ☐		
Engineering Firm: Tighe & Bond, Inc.	Contact Name: Joseph Persechino	
Email: jmpersechino@tighebond.com	Daytime Telephone: (603) 433-8818	
Address: 177 Corporate Drive		
Town/City: Portsmouth	State: NH	Zip Code: 03801

6. PROJECT TYPE

☐ Excavation Only ☐ Residential ☐ Commercial ☐ Golf Course ☐ School ☐ Municipal
☐ Agricultural ☐ Land Conversion ☒ Other: Site Developmen

7. PROJECT LOCATION INFORMATION

Project Name: Chinook Solar Project

Street/Road Address: Fullam Hill Road

Town/City: Fitzwilliam	County: Cheshire

Tax Map: SEE FORM	Block:	Lot Number:	Unit:

Location Coordinates: 42.766578,-072.10150 ☒ Latitude/Longitude ☐ UTM ☐ State Plane

Post-development, will the proposed project withdraw from or directly discharge to any of the following? If yes, identify the purpose.

1. Stream or Wetland Purpose:	☒ Yes ☐ No	☐ Withdrawal	☒ Discharge
2. Man-made pond created by impounding a stream or wetland Purpose:	☐ Yes ☒ No	☐ Withdrawal	☐ Discharge
3. Unlined pond dug into the water table Purpose:	☐ Yes ☒ No	☐ Withdrawal	☐ Discharge

Post-development, will the proposed project discharge to:

- A surface water impaired for phosphorus and/or nitrogen? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen**
- A Class A surface water or Outstanding Resource Water? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen**
- A lake or pond not covered previously? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus in the lake or pond**

Is the project a High Load area? ☐ Yes ☒ No
If yes, specify the type of high load land use or activity: _____

Is the project within a Water Supply Intake Protection Area (WSIPA)? ☐ Yes ☒ No
Is the project within a Groundwater Protection Area (GPA)? ☐ Yes ☒ No
Will the well setbacks identified in Env-Wq 1508.02 be met? ☐ Yes ☒ No

Note: Guidance document titled "*Using NHDES's OneStop WebGIS to Locate Protection Areas*" is available online. For more details on the restrictions in these areas, read Chapter 3.1 in Volume 2 of the NH Stormwater Manual.

Is any part of the property within the 100-year floodplain? ☒ Yes ☐ No
If yes: Cut volume: 0 cubic feet within the 100-year floodplain
Fill volume: 0 cubic feet within the 100-year floodplain

☐ Project **IS** within **¼ mile of a designated river** Name of River:
☒ Project is **NOT** within ¼ mile of a designated river

☐ Project **IS** within **a Coastal/Great Bay Region community - include info required by Env-Wq 1503.08(l) if applicable**
☒ Project is **NOT** within a Coastal/Great Bay Region community

8. BRIEF PROJECT DESCRIPTION (PLEASE DO NOT REPLY "SEE ATTACHED")

The Chinook Solar Project will consist of solar modules, skid-mounted transformers and inverters, above ground and below ground utility lines, a substation and utility switchyard and other necessary infrastructure (e.g. access roads and security fencing) as required by code. There will be no new transmission lines other than collector system lines.

9. IF APPLICABLE, DESCRIBE ANY WORK STARTED PRIOR TO RECEIVING PERMIT

N/A

10. ADDITIONAL REQUIRED INFORMATION

A. Date a copy of the application was sent to the municipality as required by Env-Wq 1503.05(e)[1]: This AoT has been submitted as part of a SEC filing and 4 hard copies have been submitted to the Town of Fitzwillam as part of the SEC requirements.

B. Date a copy of the application was sent to the local river advisory committee if required by Env-Wq 1503.05(e)[2]: N/A/ .
(Attach proof of delivery)

C. Type of plan required: ☐ Land Conversion ☒ Detailed Development ☐ Excavation, Grading & Reclamation ☐ Steep Slope

D. Additional plans required: ☒ Stormwater Drainage & Hydrologic Soil Groups ☐ Source Control ☐ Chloride Management

E. Total area of disturbance: 7,043,355 square feet

F. Additional impervious cover as a result of the project: 5,480 square feet (use the "-" symbol to indicate a net reduction in impervious coverage).
Total final impervious cover: 5,480 square feet

G. Total undisturbed cover: 1,733,141 square feet

H. Number of lots proposed: 0

I. Total length of roadway: 13,024 linear feet

J. Name(s) of receiving water(s): Scotts Brook

K. Identify all other NHDES permits required for the project, and for each indicate whether an application has been filed and is pending, or if the required approval has been issued provide the permit number, registration date, or approval letter number, as applicable.

Type of Approval	Application Filed?	Status	
		Pending	If Issued:
1. Water Supply Approval	☐ Yes ☐ No ☒ N/A	☐	Permit number:
2. Wetlands Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
3. Shoreland Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
4. UIC Registration	☐ Yes ☐ No ☒ N/A	☐	Registration date:
5. Large/Small Community Well Approval	☐ Yes ☐ No ☒ N/A	☐	Approval letter date:
6. Large Groundwater Withdrawal Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
7. Other:	☐ Yes ☐ No	☐	Permit number:

L. List all species identified by the Natural Heritage Bureau as threatened or endangered or of concern: None

M. Using NHDES's Web GIS OneStop program (www2.des.state.nh.us/gis/onestop/), with the Surface Water Impairment layer turned on, list the impairments identified for each receiving water. If no pollutants are listed, enter "N/A." N/A

N. Did the applicant/applicant's agent have a pre-application meeting with AOT staff? ☒ Yes ☐ No
If yes, name of staff member: Bethann McCarthy

O. Will blasting of bedrock be required? ☒ Yes ☐ No If yes, estimated quantity of blast rock: _____ cubic yards
If yes, standard blasting BMP notes must be placed on the plans, available at:
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-10-12.pdf

NOTE: If greater than 5,000 cubic yards of blast rock will be generated, a groundwater monitoring program must be developed and submitted to NHDES. Contact AOT staff for additional detail.

11. CHECK ALL APPLICATION ATTACHMENTS THAT APPLY (SUBMIT WITH APPLICATION IN ORDER LISTED)

[1] Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the governing body of each municipality in which the project is proposed.

[2] Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the Local River Advisory Committee, if the project is within ¼ mile of a designated river.

LOOSE:

- ☒ Signed application form: des.nh.gov/organization/divisions/water/aot/index.htm (with attached proof(s) of delivery)
- ☒ Check for the application fee: des.nh.gov/organization/divisions/water/aot/fees.htm
- ☒ Color copy of a USGS map with the property boundaries outlined (1" = 2,000' scale)
- ☒ If Applicant is not the property owner, proof that the applicant will have a legal right to undertake the project on the property if a permit is issued to the applicant.

BIND IN A REPORT IN THE FOLLOWING ORDER:

- ☒ Copy of the signed application form & application checklist (des.nh.gov/organization/divisions/water/aot/index.htm)
- ☒ Copy of the check
- ☒ Copy of the USGS map with the property boundaries outlined (1" = 2,000' scale)
- ☒ Narrative of the project with a summary table of the peak discharge rate for the off-site discharge points
- ☒ Web GIS printout with the "Surface Water Impairments" layer turned on - http://www4.des.state.nh.us/onestopdatamapper/onestopmapper.aspx
- ☒ Web GIS printouts with the AOT screening layers turned on - http://www4.des.state.nh.us/onestopdatamapper/onestopmapper.aspx
- ☒ NHB letter using DataCheck Tool – www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/
- ☒ The Web Soil Survey Map with project's watershed outlined – websoilsurvey.nrcs.usda.gov
- ☒ Aerial photograph (1" = 2,000' scale with the site boundaries outlined)
- ☒ Photographs representative of the site
- ☐ Groundwater Recharge Volume calculations (one worksheet for each permit application): des.nh.gov/organization/divisions/water/aot/documents/bmp_worksh.xls
- ☐ BMP worksheets (one worksheet for each treatment system): des.nh.gov/organization/divisions/water/aot/documents/bmp_worksh.xls
- ☒ Drainage analysis, stamped by a professional engineer (see Application Checklist for details)
- ☒ Riprap apron or other energy dissipation or stability calculations
- ☒ Site Specific Soil Survey report, stamped and with a certification note prepared by the soil scientist that the survey was done in accordance with the Site Specific Soil Mapping standards, *Site-Specific Soil Mapping Standards for NH & VT, SSSNNE Special Publication No. 3*.
- ☐ Infiltration Feasibility Report (example online) [Env-Wq 1503.08(f)(3)]
- ☐ Registration and Notification Form for Storm Water Infiltration to Groundwater (UIC Registration-for underground systems only, including drywells and trenches): (http://des.nh.gov/organization/divisions/water/dwgb/dwspp/gw_discharge)
- ☒ Inspection and maintenance manual with, if applicable, long term maintenance agreements [Env-Wq 1503.08(g)]
- ☐ Source control plan

PLANS:

- ☒ One set of design plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details)
- ☒ Pre & post-development color coded soil plans on 11" x 17" (see Application Checklist for details)
- ☒ Pre & post-development drainage area plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details)

100-YEAR FLOODPLAIN REPORT:

- ☐ All information required in Env-Wq 1503.09, submitted as a separate report.

ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

- ☐ See Checklist for Details

☒ **REVIEW APPLICATION FOR COMPLETENESS & CONFIRM INFORMATION LISTED ON THE APPLICATION IS INCLUDED WITH SUBMITTAL.**

12. REQUIRED SIGNATURES

JD By initialing here, I acknowledge that I am required by Env-Wq 1503.20(e) to submit a copy of all approved documents to the department in PDF format on a CD within one week after permit approval.

By signing below, I certify that:

- The information contained in or otherwise submitted with this application is true, complete, and not misleading to the best of my knowledge and belief;
- I understand that the submission of false, incomplete, or misleading information constitutes grounds for the department to deny the application, revoke any permit that is granted based on the information, and/or refer the matter to the board of professional engineers established by RSA 310-A:3 if I am a professional engineer; and
- I understand that I am subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641.

☒ **APPLICANT** ☐ **APPLICANT'S AGENT**:

Signature: _____ Date: 10/02/2019

Name (print or type): John DiDonato Title: Vice President

☐ PROPERTY OWNER ☒ PROPERTY OWNER'S AGENT:

Signature: _____ Date: 10/02/2019

Name (print or type): John DiDonato Title: Vice President

ATTACHMENT A:
ALTERATION OF TERRAIN PERMIT APPLICATION CHECKLIST

Check the box to indicate the item has been provided or provide an explanation why the item does not apply.

DESIGN PLANS

☒ Plans printed on 34 - 36" by 22 - 24" white paper

☒ PE stamp

☒ Wetland delineation

☒ Temporary erosion control measures

☒ Treatment for all stormwater runoff from impervious surfaces such as roadways (including gravel roadways), parking areas, and non-residential roof runoff. Guidance on treatment BMPs can be found in Volume 2, Chapter 4 of the NH Stormwater Management Manual.

☒ Pre-existing 2-foot contours

☒ Proposed 2-foot contours

☒ Drainage easements protecting the drainage/treatment structures

☒ Compliance with the Wetlands Bureau, RSA 482- A http://des.nh.gov/organization/divisions/water/wetlands/index.htm. Note that artificial detention in wetlands is not allowed.

☐ Compliance with the Comprehensive Shoreland Protection Act, RSA 483-B. http://des.nh.gov/organization/divisions/water/wetlands/cspa

☐ Benches. Benching is needed if you have more than 20 feet change in elevation on a 2:1 slope, 30 feet change in elevation on a 3:1 slope, 40 feet change in elevation on a 4:1 slope.

☐ Check to see if any proposed ponds need state Dam permits. http://des.nh.gov/organization/divisions/water/dam/documents/damdef.pdf

DETAILS

☒ Typical roadway x-section

☒ Detention basin with inverts noted on the outlet structure

☒ Stone berm level spreader

☒ Outlet protection – riprap aprons

☒ A general installation detail for an erosion control blanket

☒ Silt fences or mulch berm

☒ Storm drain inlet protection. Note that since hay bales must be embedded 4 inches into the ground, they are not to be used on hard surfaces such as pavement.

☐ Hay bale barriers

☒ Stone check dams

☒ Gravel construction exit

☒ Temporary sediment trap

☒ The treatment BMP's proposed

☐ Any innovative BMP's proposed

CONSTRUCTION SEQUENCE/EROSION CONTROL

☒ Note that the project is to be managed in a manner that meets the requirements and intent of RSA 430:53 and Chapter Agr 3800 relative to invasive species.

☒ Note that perimeter controls shall be installed prior to earth moving operations.

☒ Note that temporary water diversion (swales, basins, etc) must be used as necessary until areas are stabilized.

☒ Note that ponds and swales shall be installed early on in the construction sequence (before rough grading the site).

☒ Note that all ditches and swales shall be stabilized prior to directing runoff to them.

☒ Note that all roadways and parking lots shall be stabilized within 72 hours of achieving finished grade.

☒ Note that all cut and fill slopes shall be seeded/loamed within 72 hours of achieving finished grade

☒ Note that all erosion controls shall be inspected weekly AND after every half-inch of rainfall.

☒ Note the limits on the open area allowed, see Env-Wq 1505.02 for detailed information.

Example note: The smallest practical area shall be disturbed during construction, but in no case shall exceed 5 acres at any one time before disturbed areas are stabilized.

☒ Note the definition of the word “stable”

Example note: An area shall be considered stable if one of the following has occurred:

- Base course gravels have been installed in areas to be paved.
- A minimum of 85 percent vegetated growth has been established.
- A minimum of 3 inches of non-erosive material such stone or riprap has been installed.
- Or, erosion control blankets have been properly installed.

☒ Note the limit of time an area may be exposed
Example note: All areas shall be stabilized within 45 days of initial disturbance.

☒ Provide temporary and permanent seeding specifications. (Reed canary grass is listed in the Green Book; however, this is a problematic species according to the Wetlands Bureau and therefore should not be specified)

☒ Provide winter construction notes that meet or exceed our standards.

Standard Winter Notes:

- All proposed vegetated areas that do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The installation of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
- After October 15, incomplete road or parking surfaces, where work has stopped for the winter season, shall be protected with a minimum of 3 inches of crushed gravel per NHDOT item 304.3.

☒ Note at the end of the construction sequence that “Lot disturbance, other than that shown on the approved plans, shall not commence until after the roadway has the base course to design elevation and the associated drainage is complete and stable.” – This note is applicable to single/duplex family subdivisions, when lot development is not part of the permit.

DRAINAGE ANALYSES

Please double-side 8 ½” x 11” sheets where possible but, **do not** reduce the text such that more than one page fits on one side.

☒ PE stamp

☒ Rainfall amount obtained from the Northeast Regional Climate Center- http://precip.eas.cornell.edu/. Include extreme precipitation table as obtained from the above referenced website.

☒ Drainage analyses, in the following order:

- Pre-development analysis: Drainage diagram.
- Pre-development analysis: Area Listing and Soil Listing.
- Pre-development analysis: Node listing 1-year (if applicable), 2-year, 10-year and 50-year.
- Pre-development analysis: Full summary of the 10-year storm.
- Post-development analysis: Drainage diagram.
- Post-development analysis: Area Listing and Soil Listing.
- Post-development analysis: Node listing for the 2-year, 10-year and 50-year.
- Post-development analysis: Full summary of the 10-year storm.

☒ Review the Area Listing and Soil Listing reports

- Hydrologic soil groups (HSG) match the HSGs on the soil maps provided.
- There is the same or less HSG A soil area after development (check for each HSG).
- There is the same or less “woods” cover in the post-development.
- Undeveloped land was assumed to be in “good” condition.
- The amount of impervious cover in the analyses is correct.

Note: A good check is to subtract the total impervious area used in the pre analysis from the total impervious area used in the post-analysis. For residential projects without demolition occurring, a good check is to take this change in impervious area, subtract out the roadway and divide the remaining by the number of houses/units proposed. Do these numbers make sense?

☒ Check the storage input used to model the ponds.

☒ Check to see if the artificial berms pass the 50-year storm, i.e., make sure the constructed berms on ponds are not overtopped.

☒ Check the outlet structure proposed and make sure it matches that modeled.

☒ Check to see if the total areas in the pre and post analyses are same.

☒ Confirm the correct NRCS storm type was modeled (Coos, Carroll & Grafton counties are Type II, all others Type III).

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PRE- AND POST-DEVELOPMENT DRAINAGE AREA PLANS

☒ Plans printed on 34 - 36” by 22 - 24” on white paper.

☒ Submit these plans separate from the soil plans.

☒ A north arrow.

☒ A scale.

☒ Labeled subcatchments, reaches and ponds.

☒ Tc lines.

☒ A clear delineation of the subcatchment boundaries.

☒ Roadway station numbers.

☒ Culverts and other conveyance structures.

PRE AND POST-DEVELOPMENT COLOR-CODED SOIL PLANS

☒ 11” x 17”sheets suitable, as long as it is readable.

☒ Submit these plans separate from the drainage area plans.

☒ A north arrow.

☒ A scale.

☒ Name of the soil scientist who performed the survey and date the soil survey took place.

☒ 2-foot contours (5-foot contours if application is for a gravel pit) as well as other surveyed features.

☒ Delineation of the soil boundaries and wetland boundaries.

☒ Delineation of the subcatchment boundaries.

☒ Soil series symbols (e.g., 26).

☒ A key or legend which identifies each soil series symbol and its associated soil series name (e.g., 26 = Windsor).

☒ The hydrologic soil group color coding (A = Green, B = yellow, C= orange, D=red, Water=blue, & Impervious = gray).

Please note that excavation projects (e.g., gravel pits) have similar requirements to that above, however the following are common exceptions/additions:

☐ Drainage report is not needed if site does not have off-site flow.

☐ 5 foot contours allowed rather than 2 foot.

☐ No PE stamp needed on the plans.

☐ Add a note to the plans that the applicant must submit to the Department of Environmental Services a written update of the project and revised plans documenting the project status every five years from the date of the Alteration of Terrain permit.

☐ Add reclamation notes.

See NRCS publication titled: *Vegetating New Hampshire Sand and Gravel Pits* for a good resource, it is posted online at: http://des.nh.gov/organization/divisions/water/aot/categories/publications.

ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

☐ If project will discharge stormwater to a surface water impaired for phosphorus and/or nitrogen, include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen.

☐ If project will discharge stormwater to a Class A surface water or Outstanding Resource Water, include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen.

☐ If project will discharge stormwater to a lake or pond not covered previously, include information to demonstrate that project will not cause net increase in phosphorus in the lake or pond.

☐ If project is within a Coastal/Great Bay Region community, include info required by Env-Wq 1503.08(l) if applicable.

THIS CHECK IS VOID WITHOUT A GREEN BACKGROUND AND AN ARTIFICIAL WATERMARK ON THE BACK - HOLD AT AN ANGLE TO VIEW

WARNING: Original document has a reflective watermark on reverse side. Hold at an angle to view.

64-1278
611

Chinook Solar LLC
700 Universe Blvd
Juno Beach, FL 33408

BANK OF AMERICA, NA

Check Date: **09/26/2019**

Check No. **5000000029**

THIRTY-FIVE THOUSAND SEVEN HUNDRED FIFTY DOLLARS

$35,750.00

Void after 180 days

PAY TO THE ORDER OF

TREASURER STATE OF NEW HAMPSHIRE
DEPARTMENT OF HEALTH AND HUMAN SERV
C/O RADIOLOGICAL HEALTH SECTION
29 HAZEN DRIVE
CONCORD NH 03301-6504

Chinook Solar LLC

SIGNATURE HAS A COLORED BACKGROUND • BORDER CONTAINS MICROPRINTING

Form 617-G

Job No. 555948

⑈5000000029⑈ ⑆061112788⑆ 335 998 1423⑈

Chinook Solar LLC (6391 000007)
Vendor Name: TREASURER STATE OF NEW HAMPSHIRE

Check Date : 09/26/2019
Check Number: 5000000029

Invoice Number	Invoice Date	Document Header Text	SAP Document	Gross Amount	Discount	Net Amount
CHINOOK SOLAR#2	09/23/2019	APPLICATION&TERRAIN CHINOOK SOLAR APPL- SEPT 2019	1900000069	35,750.00	0.00	35,750.00
		Check Total.....				**$35,750.00**

Land Owners

Map 8 Lot 24
Donna L. Hill
35 Crane Road
Fitzwilliam, NH 03447
Book 1748 Page 307

Map 12 Lot 3
Jonas Damon Realty Company
102 Damon Road
Fitzwilliam, NH 03447
Book 404 Page 387

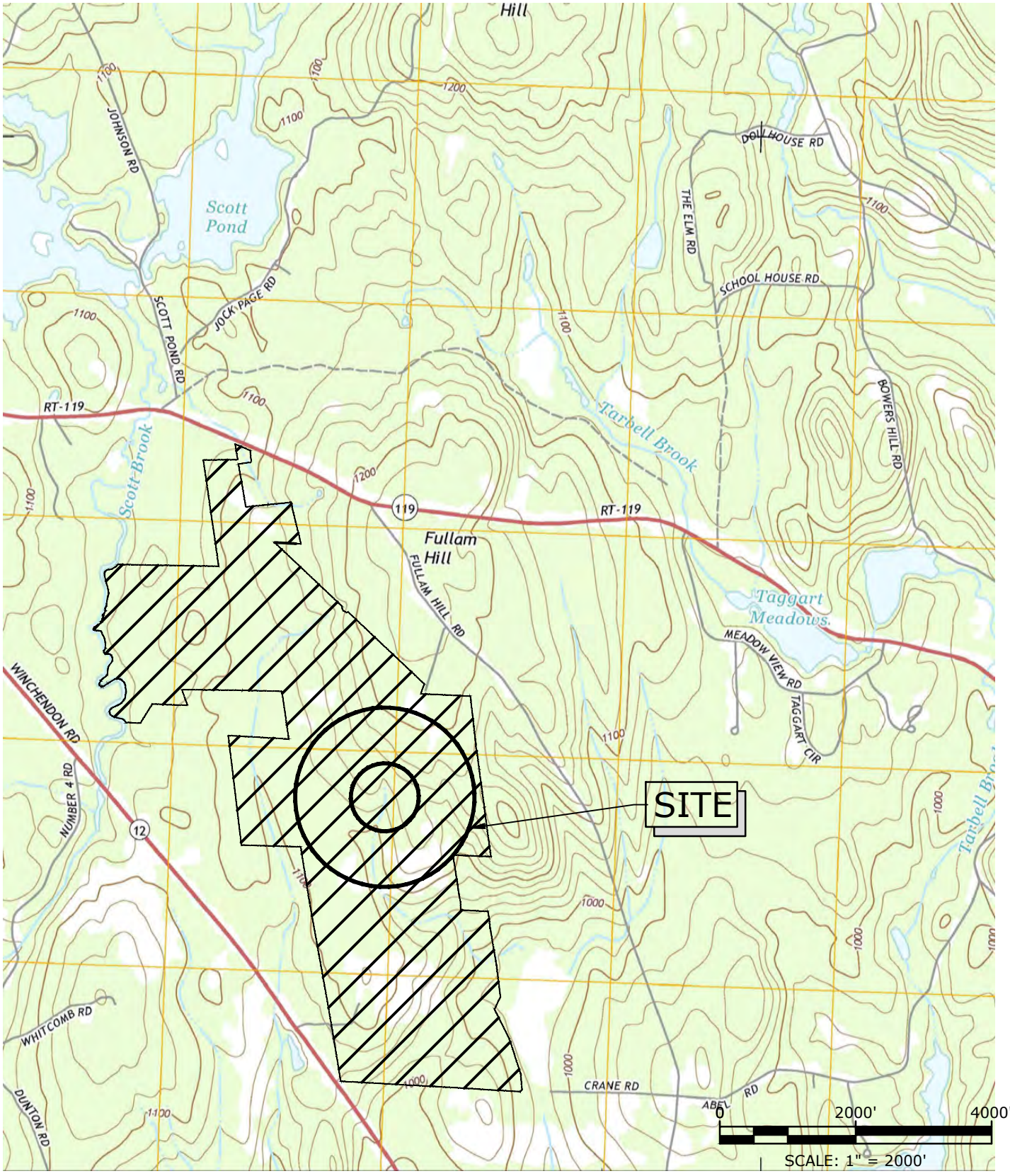
Map 12 Lot 4
Edward J & Carmen Vanblarcom
113 Hadley Road
Jaffrey, NH 03452
Book 2280 Page 918

Map 12 Lot 5
David A. & Mary L. Rich
16 Jackson Street
Ayer, MA 01432
Book 2530 Page 228

Mat 12 Lot 6
David A. & Mary L. Rich
16 Jackson Street
Ayer, MA 01432
Book 2530 Page 228

Map 12 Lot 50
David A. & Mary L. Rich
16 Jackson Street
Ayer, MA 01432
Book 2530 Page 228

Map 12 Lot 29
John J. Fedier JR
310 Route 119
Fitzwilliam, NH 03447
Book 1728 Page 715



APRIL 2019

Chinook Solar Project

Fullam Hill Road
Fitzwillam, New Hampshire

NORTH

1" = 2000'

FIGURE 1

SITE LOCATION MAP

Based on USGS Topographic Map for Monadnock Mountain, NH
Circles indicate 500-foot and 1/4-mile radii

Tighe&Bond
Engineers | Environmental Specialists

May 20, 2019-5:19pm Plotted By: EDoremus
Tighe & Bond, Inc. \\tighebond.com\data\Data\Projects\N\N0758 NextEra\N-0758-017 Chinook\Drawings_Figures\AutoCAD\CHINOOK SITE I\Sheet\N0758-017_CS.dwg

Titebond

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Tighe&Bond

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Copy of Check

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Section 3 NRCS Soil Survey Map

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Section 7 Rip-Rap Calculations

Section 8 Long Term Operation & Maintenance Plan

APPENDICES

Tighe&Bond

SECTION 1

Section 1
Narrative

This drainage analysis was prepared to assess the pre-and post-development stormwater runoff rates and watershed management for the proposed Chinook Solar Project. The project is a planned 30 megawatt (MW) alternating current (AC) solar energy generation facility consisting of photovoltaic modules and associated civil and electrical infrastructure. Chinook Solar is a wholly-owned subsidiary of NextEra Energy Resources, LLC (NEER). NEER's parent company, NextEra Energy, Inc. (NextEra).

The proposed project is located in a sparsely settled rural area within the rural zoning district in the eastern portion of Fitzwilliam, New Hampshire. The location of the proposed project is south of NH State Route 119, east of NH State Route 12, and west of Fullam Hill Road. The project is located on seven privately owned parcels owned by five landowners, and project parcels are either under purchase or lease options with Chinook Solar. The project parcels comprise a total of approximately 579 acres, and 513 acres are under control by the applicant.

Directly east of the Project and west of Fullam Hill Road is a transmission corridor containing two 115-kV electric transmission lines, both owned by National Grid. Chinook Solar proposes to interconnect the Project to the utility grid by building a substation to interconnect to the 115-kV transmission line. The proposed access to the Project is via an existing access road located off Fullam Hill Road.

The Chinook Solar Project will consist of solar modules, skid-mounted transformers and inverters, above ground and below ground utility lines, a Project substation and utility switchyard, and other necessary infrastructure (e.g. access roads and security fencing) as required by code. There will be no new transmission lines other than collector system lines. The final Project footprint area will be approximately 157 acres, which includes clearing, fencing, etc. Construction is anticipated to commence in the spring of 2021 and be completed in the fall of 2021.

Directly south of the project area, and on a parcel that is under control by the applicant (Parcel Map 8, Lot 24), is the proposed temporary laydown area for the project. A temporary access road will be constructed to the project area to allow for access materials to be transported to the project. The proposed laydown area is currently vegetated with grass and will be restored to its preconstruction condition after the project is completed. Erosion controls will be installed and maintained around the temporary construction laydown area when it is being used. The proposed layout area is relatively flat and significant clearing is not required.

During the design of the project, the project team coordinated with NHDES Alteration of Terrain staff on numerous occasions. The project has been designed to meet the *New Hampshire Department of Environmental Services, Alteration of Terrain Bureau Stormwater Design Guidance – Large Scale Solar Arrays (Jan 2019)*. The design process included a full site-specific soil map (SSSM) and a hydrologic analysis of the development area.

1.1 On-Site Soil Description

The site has varying topography that is sloped in all directions, however, within the Project area, topography generally trends to the west and south towards Scott Brook or to the southeast towards Sip Pond and Millers River. The high point of the site is approximately 1,226 feet along Fullam Road and a low point elevation of approximately 980' in the southeast portion of the project area.

A site-specific soil map (SSSM) and a report was completed by Gove Environmental Services, Inc. and has been included in Appendix B of this report. Based on the SSSM the soils on site consist primarily of Monadnock, and Berkshire, Becket and Marlow soils. These soils have either moderate or low infiltration rates and have been modeled using hydrologic soil group B or C respectively.

1.2 Pre- and Post-Development Flow Comparison

The pre-development and post-development watershed areas have been analyzed at three distinct points of analysis (PA1, PA2, and PA3). Point of analysis 1 (PA1) is located at Scotts Brook, point of analysis 2 (PA2) is located at the wetland adjacent to Sip Pond and point of analysis 3 (PA3) is located at the wetland adjacent to Crane Road. The temporary laydown area was not included in the pre and post development flow comparison because no changes in grades or permanent use are proposed.

The peak discharge rates at the three points of analysis were determined by analyzing Type III 24-hour storm events. The rainfall data for these storm events was obtained from the data published by the Northeast Regional Climate Center at Cornell University. The rainfall data has been included in Appendix A of this report.

Table 1.0 - Comparison of Pre and Post Development Flows

Pre-Development Condition	2-Year Storm (cfs)	10-Year Storm (cfs)	50-Year Storm (cfs)
PA1	9.65	24.34	50.20
PA2	11.23	33.11	73.67
PA3	10.51	36.30	88.55
Post-Development Condition	2-Year Storm (cfs)	10-Year Storm (cfs)	50-Year Storm (cfs)
PA1	4.91	19.65	31.15
PA2	5.22	28.18	46.34
PA3	8.62	30.51	78.84

1.3 Best Management Practices

Soil erosion and sediment control measures have been designed to meet the *New Hampshire Department of Environmental Services, Alteration of Terrain Bureau Stormwater Design Guidance – Large Scale Solar Arrays (Jan 2019)* and with guidance from the *NH Stormwater Manual, Volume 3: Erosion and Sediment Controls During Construction.*

The intent of the design is to minimize erosion and sedimentation during construction, stabilize and protect the site from erosion after construction is complete and maintain stormwater quality from the site. Best Management Practices for this project include:

- Temporary erosion and sediment control practices to be implemented during construction include stabilized construction exits, sedimentation barriers, mulching and temporary seeding, check dams and level spreaders, erosion control matting and sedimentation basins. Temporary erosion controls such as silt sock and silt fence will be installed around the perimeter of the temporary laydown area.

- The project will be phased into 10-acre sections during construction. Each phase will be stabilized either temporarily or permanently prior to moving on to the next section. Multiple disconnected 10-acre sections within the project development area are proposed to be developed concurrently, in accordance with the proposed phasing plan, and as discussed with the NHDES AoT review staff. A schematic level phasing plan has been developed as part of the AoT and these figures are included in Appendix D.

- Permanent best management practices (BMPs) to be implemented prior to the completion of construction include level spreaders, detention basins, and vegetated buffers as outlined in the *New Hampshire Department of Environmental Services, Alteration of Terrain Bureau Stormwater Design Guidance – Large Scale Solar Arrays (Jan 2019).* Appendix F of this application includes a Best Management Practices Figure that identifies how stormwater runoff from each area of the site is being treated.

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SECTION 2

Section 2
Exhibits & Letters

2.1 Web GIS Printout - Surface Water Impairments

(See following pages)

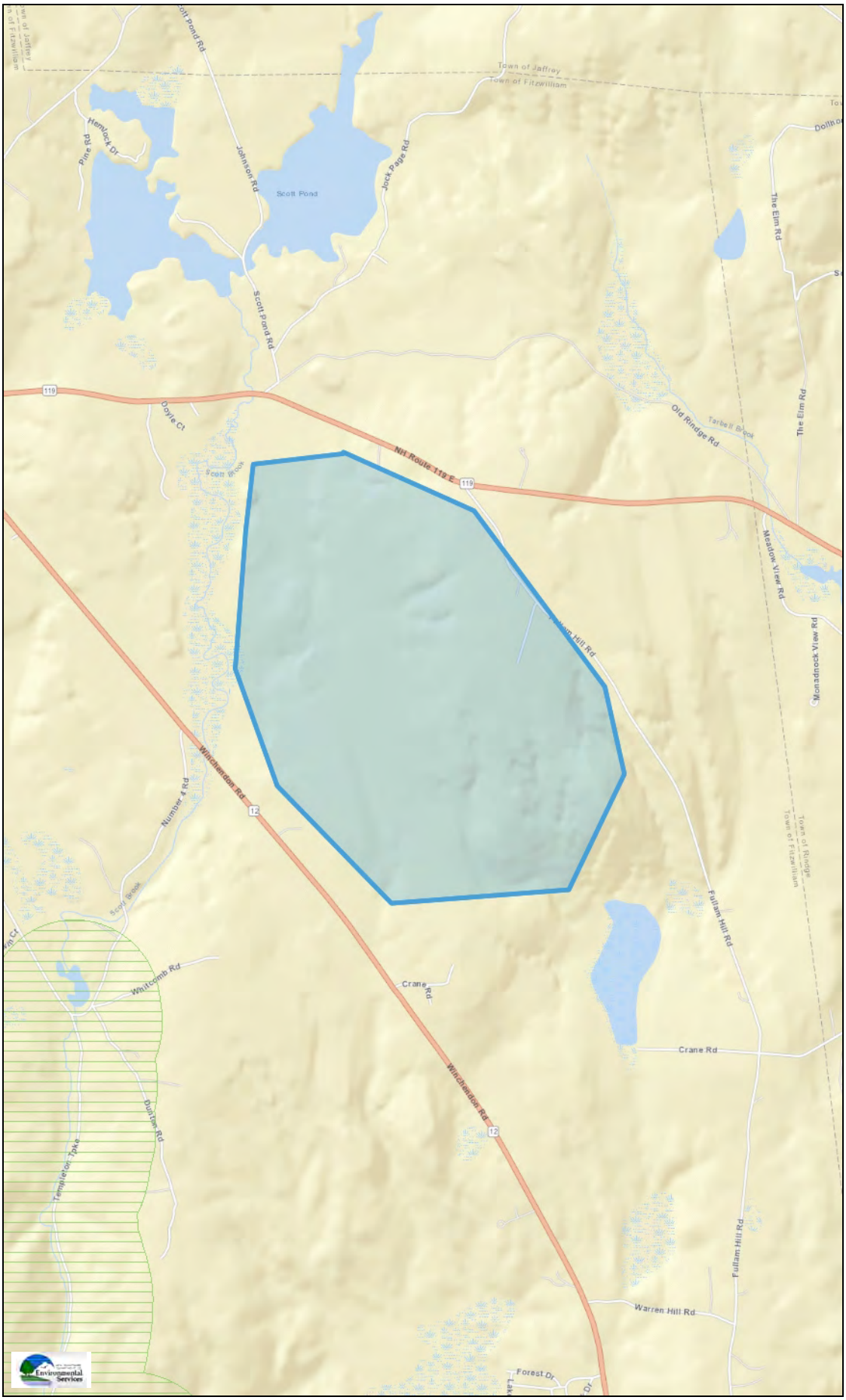
2.2 Web GIS Printout - AoT Screening Layers

(See following pages)

2.3 New Hampshire Natural Heritage Bureau Letter

(See following pages)

Surface Water Impairment



Legend

- Public Water Supply Wells
- Surface Waters with Impairm 2016 with Quarter Mile Buffe

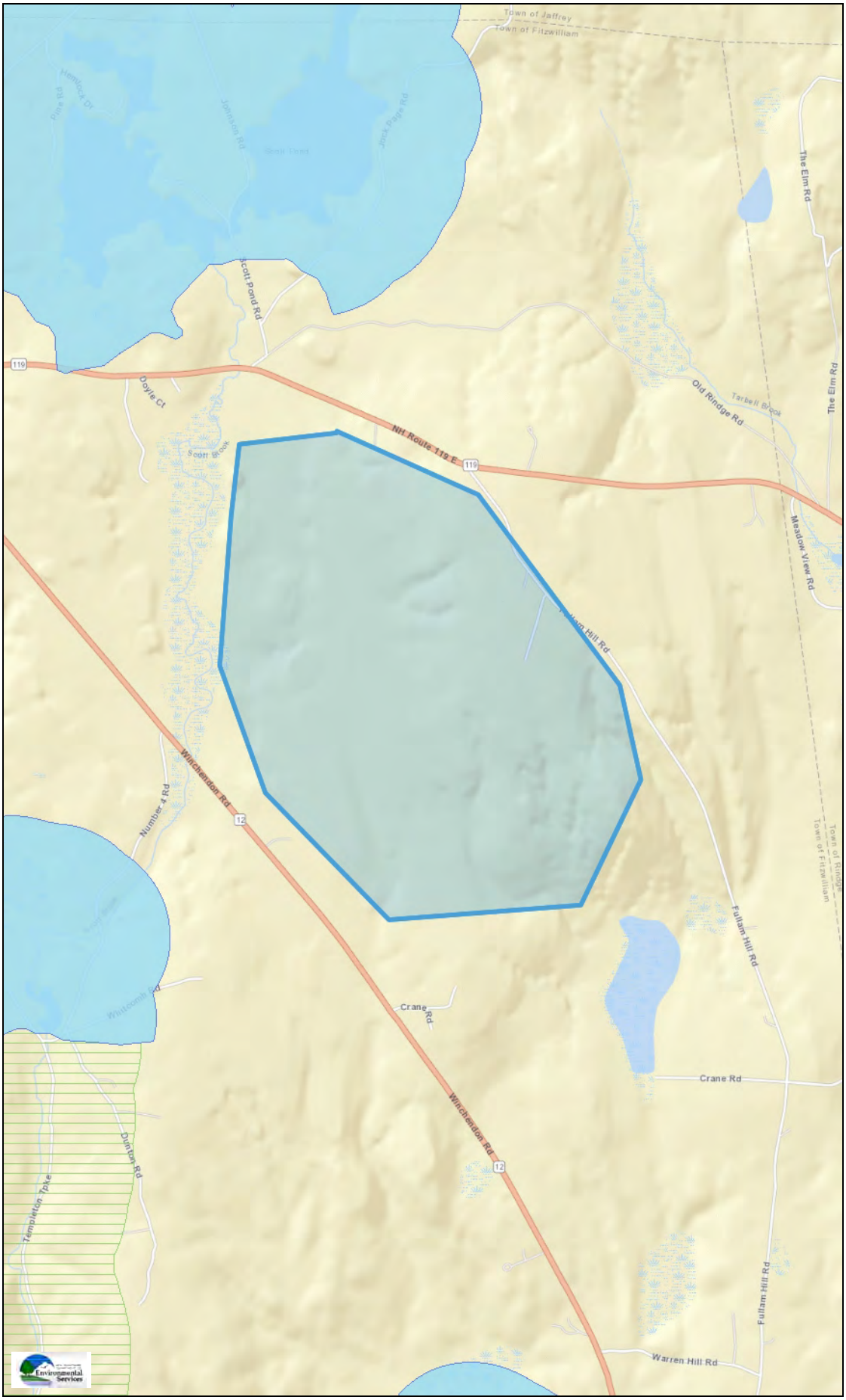
Map Scale

1: 25,977

Map Generated: 4/22/2019

Notes

AoT Screening Layers



Legend

- Coastal and Great Bay Regi Communities
- Designated Rivers Quarterm Buffer
- Public Water Supply Wells
- Groundwater Classification / GA1
- Groundwater Classification / GA2
- Water Supply Intake Protect Areas
- Wellhead Protection Areas
- Lakes with a Quarter Mile Bu
- All Features
- All Lakes, with a Quarter Mil Buffer
- Outstanding Resource Wate Watersheds
- Surface Waters with Impairn 2016 with Quarter Mile Buffe
- Watersheds with Chloride Impairments 2016

Map Scale

1: 24,000

Map Generated: 4/22/2019

Notes

CONFIDENTIAL – NH Dept. of Environmental Services review

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

To: Tracy Sudhalter, TRC Environmental
670 North Commercial Street
Manchester, NH 03101

From: Amy Lamb, NH Natural Heritage Bureau
Date: 3/5/2019 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB19-0727 Town: Fitzwilliam Location: Tax Maps: Multiple
Description: Proposed Solar Development. Previous NHB request NHB17-3211
cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: Please continue to coordinate with the NH Fish & Game Department.

Vertebrate species	**State[1]**	**Federal**	**Notes**
Blanding's Turtle (*Emydoidea blandingii*)	E	--	Contact the NH Fish & Game Dept (see below).
Wood Turtle (*Glyptemys insculpta*)	SC	--	Contact the NH Fish & Game Dept (see below).

[1]Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

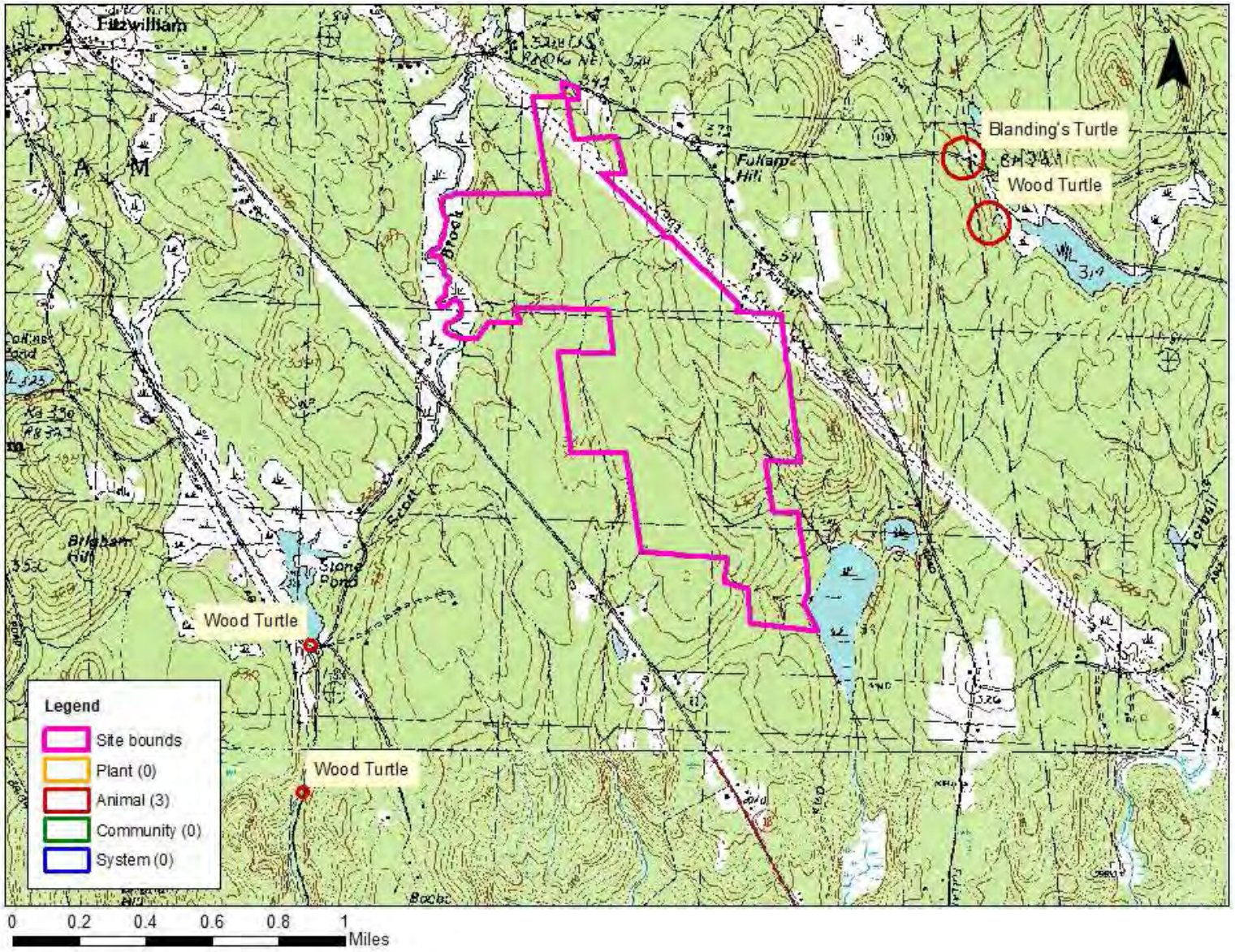
A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord, NH 03301

CONFIDENTIAL – NH Dept. of Environmental Services review

NHB19-0727



New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2012: Area 13031: 1 adult observed.
General Area: 2012: Area 13031: Roadside.
General Comments:
Management Comments:

Location

Survey Site Name: Fullam Hill
Managed By:

County: Cheshire
Town(s): Fitzwilliam
Size: 7.7 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2012: Area 13031: Rte. 119 at the Rindge/Fitzwilliam town line.

Dates documented

First reported: 2012-09-22 Last reported: 2012-09-22

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Rare or uncommon
State:	Special Concern	State:	Rare or uncommon

Description at this Location

Conservation Rank: Good quality, condition and landscape context ('B' on a scale of A-D).
Comments on Rank:

Detailed Description: 2008: Area 11534: 1 adult female seen. Pyramidal scutes, orange throat and limbs on underside. Area 11535: 1 adult seen.
General Area: 2008: Area 11534: Found near the Snow Moles Bridge crossing Priest Brook and the railroad bed in a flooded marsh along the river. Area 11535: Intersection of #4 Road and Templeton Turnpike.
General Comments:
Management Comments:

Location

Survey Site Name: Stone Pond, south of
Managed By:

County: Cheshire
Town(s): Fitzwilliam
Size: .9 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2008: Area 11534: Snowmoles Bridge over Scott Brook. Area 11535: Intersection of #4 Road and Templeton Turnpike.

Dates documented

First reported: 2008-04-12 Last reported: 2008-06-09

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Rare or uncommon
State:	Special Concern	State:	Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2009: Area 12381: 1 observed.
General Area: 2009: Area 12381: Roadside.
General Comments:
Management Comments:

Location

Survey Site Name: Fullam Hill
Managed By:

County: Cheshire
Town(s): Rindge
Size: 7.7 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2009: Area 12381: 159 Meadow View Road, Rindge.

Dates documented

First reported: 2009-07-29 Last reported: 2009-07-29

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

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SECTION 3

Section 3
NRCS Soil Survey Map

(See following pages)


72° 7' 33" W
72° 5' 12" W
735100
735600
736100
736600
737100
737600
738100
42° 47' 16" N
42° 45' 0" N
4741200
4740700
4740200
4739700
4739200
4738700
4738200
4737700
4737200
197 365C 60C 143B 495 60B 60C 395 214 347B 613B 559C 347B 60C 60C 347B 169B 60D 169B 73D 295 56C 559B 143C 169B 559B 347B 143C 214 169B 57C 56B 558B 60B 169B 295 57B 60B 143C 143B 57B 77B 558B 73B 77D 559C 647B 559B 559B 57B 57D 79B 77B 559B 143B 647B 60D 60B 169B 57C 56B 56C 77B 143C 395 647B 57D 56C 559C 395 495 295 169B 365C 169B 57B 57D 57B 77C 647B 60B 60C 77E 169B 79B 495 60C 77B 77E 77D 57B 295 365C 169B 495 495 143B 347B 559B 60B 559B 647B 57B 771C 295 60B 56B 77E 298 395 365C 559B 57D 169B 559B 57C 559B 347B 365C 347B 60B 647B 495 197 647B 771C 647B 143B 56B 169B 197 12
Map Scale: 1:20,600 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 300 600 1200 1800
Feet
0 1000 2000 4000 6000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

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 1:20,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Cheshire County, New Hampshire
Survey Area Data: Version 21, Sep 7, 2018

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

Date(s) aerial images were photographed: Apr 9, 2011—May 12, 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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
56B	Becket fine sandy loam, 3 to 8 percent slopes	61.8	3.5%
56C	Becket fine sandy loam, 8 to 15 percent slopes	17.4	1.0%
57B	Becket fine sandy loam, 0 to 8 percent slopes, very stony	82.3	4.7%
57C	Becket fine sandy loam, 8 to 15 percent slopes, very stony	40.9	2.3%
57D	Becket fine sandy loam, 15 to 25 percent slopes, very stony	59.3	3.4%
60B	Tunbridge-Berkshire complex, 0 to 8 percent slopes, very stony	84.0	4.8%
60C	Tunbridge-Berkshire complex, 8 to 15 percent slopes, very stony	45.0	2.6%
60D	Tunbridge-Berkshire complex, 15 to 25 percent slopes, very stony	16.3	0.9%
73B	Berkshire fine sandy loam, 0 to 8 percent slopes, very stony	6.3	0.4%
73D	Berkshire fine sandy loam, 15 to 25 percent slopes, very stony	9.9	0.6%
77B	Marlow fine sandy loam, 0 to 8 percent slopes, very stony	110.3	6.3%
77C	Marlow fine sandy loam, 8 to 15 percent slopes, very stony	26.3	1.5%
77D	Marlow fine sandy loam, 15 to 25 percent slopes, very stony	43.0	2.4%
77E	Marlow fine sandy loam, 25 to 50 percent slopes, very stony	21.2	1.2%
79B	Peru fine sandy loam, 0 to 8 percent slopes, very stony	30.6	1.7%
143B	Monadnock fine sandy loam, 0 to 8 percent slopes, very stony	43.4	2.5%
143C	Monadnock fine sandy loam, 8 to 15 percent slopes, very stony	48.1	2.7%
169B	Sunapee fine sandy loam, 0 to 8 percent slopes, very stony	115.3	6.6%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
197	Borohemists, ponded	4.2	0.2%
214	Naumburg loamy fine sand	10.8	0.6%
295	Greenwood mucky peat	148.3	8.4%
298	Pits, gravel	3.0	0.2%
347B	Lyme and Moosilauke soils, 0 to 5 percent slopes, very stony	51.6	2.9%
365C	Monadnock and Berkshire soils, 8 to 15 percent slopes, extremely stony	27.1	1.5%
395	Chocorua mucky peat	25.6	1.5%
495	Ossipee mucky peat	79.4	4.5%
558B	Skerry fine sandy loam, 3 to 8 percent slopes	48.9	2.8%
559B	Skerry fine sandy loam, 0 to 8 percent slopes, very stony	204.4	11.6%
559C	Skerry fine sandy loam, 8 to 15 percent slopes, very stony	49.4	2.8%
613B	Croghan loamy fine sand, 0 to 5 percent slopes	8.5	0.5%
647B	Pillsbury fine sandy loam, 0 to 8 percent slopes, very stony	190.9	10.9%
771C	Monadnock and Berkshire soils, 8 to 15 percent slopes, extremely bouldery	42.9	2.4%
Totals for Area of Interest		**1,756.3**	**100.0%**

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SECTION 4

Section 4
Aerial & Site Photographs

(See following pages)

Photo 1: Looking northwest near Crane Road at existing project area via drone

Photo 2: Looking northwest at existing project area via drone. Note active forest harvesting.

Photo 3: Looking southeast at existing project area via drone. Note active forest harvesting.

Photo 4: Looking north at existing project area via drone. Note active forest harvesting.

FIGURE 1
SITE OVERVIEW

LEGEND

Limit of Work

LOCUS MAP

N

0 1,000 2,000

Feet

1:24,000

NOTES

1. Orthophotography courtesy of GRANIT (2015).

Chinook Solar Project
Fitzwilliam, New Hampshire

August 2019

Tighe&Bond
Engineers | Environmental Specialists

V:\Projects\N\N0758\ChinookSolar\ChinookSolar_FitzwilliamNH_LOW_24k.mxd, [Exported By: kjw, 8/28/2019, 4:15:31 PM]

N-0758

Photo 1: Looking northwest near Crane Road at existing project area via drone

Photo 2: Looking northwest at existing project area via drone

Photo 3: Looking southeast at existing project area via drone

Photo 4: Looking north at existing project area via drone

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SECTION 5

Section 5
Best Management Practices (BMPs)

The Chinook Solar Project has been designed in designed to meet the *New Hampshire Department of Environmental Services, Alteration of Terrain Bureau Stormwater Design Guidance – Large Scale Solar Arrays (Jan 2019)* and with guidance from the *NH Stormwater Manual, Volume 3: Erosion and Sediment Controls During Construction*.

The project design includes various Best Management Practices (BMPs) based on the *NH Stormwater Manual, Volume 3: Erosion and Sediment Controls During Construction* as well as the *New Hampshire Department of Environmental Services, Alteration of Terrain Bureau Stormwater Design Guidance – Large Scale Solar Arrays (Jan 2019).* Below is an outline of the proposed BMPs. A BMP Figure is included in Appendix F that identifies how stormwater runoff from each area of the site is being treated.

- Temporary erosion and sediment control practices to be implemented during construction include: stabilized construction exits, silt socks and/or silt fence and erosion control berms, mulching and temporary seeding, check dams and level spreaders, and erosion control matting.
- The project will include multiple temporary sedimentation basins which were designed to treat the first inch of runoff in newly graded conditions. These basins have also been designed to be utilized as permanent detention basins post-construction and maintain a minimum of one-foot of freeboard in the 50-year storm.
- The ground cover under and around the array will consist of meadow grasses that will be mowed twice per year.
- A vegetated buffer of various widths with a minimum distance of 75’ to wetlands areas will be maintained.
- On slopes greater than 5 percent, when the drip edges align perpendicular to the contours, and flow paths are greater than 100’, at grade level spreaders will be installed to reduce the potential for concentrated flows.

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SECTION 6

Section 6
Drainage Analysis

6.1 Calculation Methods

The design storms analyzed in this study are the 2-year, 10-year, and 50-year 24-hour duration storm events. The stormwater modeling system, HydroCAD 10.00-20 was utilized to predict the peak runoff rates from these storm events. A Type III storm pattern was used in the model.

The time of concentration was computed using the TR-55 Method, which provides a means of determining the time for an entire watershed to contribute runoff to a specific location via sheet flows, shallow concentrated flow and channel flow. Runoff curve numbers were calculated by estimating the coverage areas and then summing the curve number for the coverage area as a percent of the entire watershed.

References:

1. HydroCAD Stormwater Modeling System, by HydroCAD Software Solutions LLC, Chocorua, New Hampshire.

2. New Hampshire Department of Environmental Services, Alteration of Terrain Bureau Stormwater Design Guidance – Large Scale Solar Arrays (Jan 2019).

3. New Hampshire Stormwater Management Manual, Volume 2, Post-Construction Best Management Practices Selection and Design, December 2008.

6.2 Pre-Development Conditions

In order to analyze the pre-development condition, the site has been divided into three watershed areas modeled at three points of analysis. These points of analysis and watersheds are depicted on the plan entitled "Pre-Development Watershed Plan", Sheet C.700. Individual pre-development watershed plans, sheets C.701-714, are also included for clarity.

Each of the points of analysis and their contributing watershed areas are described below.

Point of Analysis (PA1)

PRE-1.0 is the third smallest sub-catchment area and encompasses the northern portions of the project area and is comprised of mostly of actively managed forests and brush. Runoff from this sub-catchment travels west via overland flow before entering Scotts Brook.

Point of Analysis (PA2)

PRE-2.0 and PRE-2.1 are the second largest and smallest sub-catchment areas, respectively. They encompass areas in the middle of the project and a small area in the

southwest side of the development area. These areas are comprised of mostly of actively managed forests and brush. Runoff from these sub-catchments travels west via overland flow before entering the wetland adjacent to Sip Pond.

Point of Analysis (PA3)

PRE-3.0 and PRE-3.1 are the largest and second smallest sub-catchment areas, respectively. They encompass most of the southern portion of the project. These areas are comprised of mostly of actively managed forests and brush. Runoff from these sub-catchments travels southeast via overland flow before entering the wetland adjacent to Crane Road.

Temporary Laydown Area

The temporary laydown area was not included in the pre-development flow comparison because no changes in grades or permanent uses are proposed.

6.2.1 Pre-Development Calculations

(See following pages)

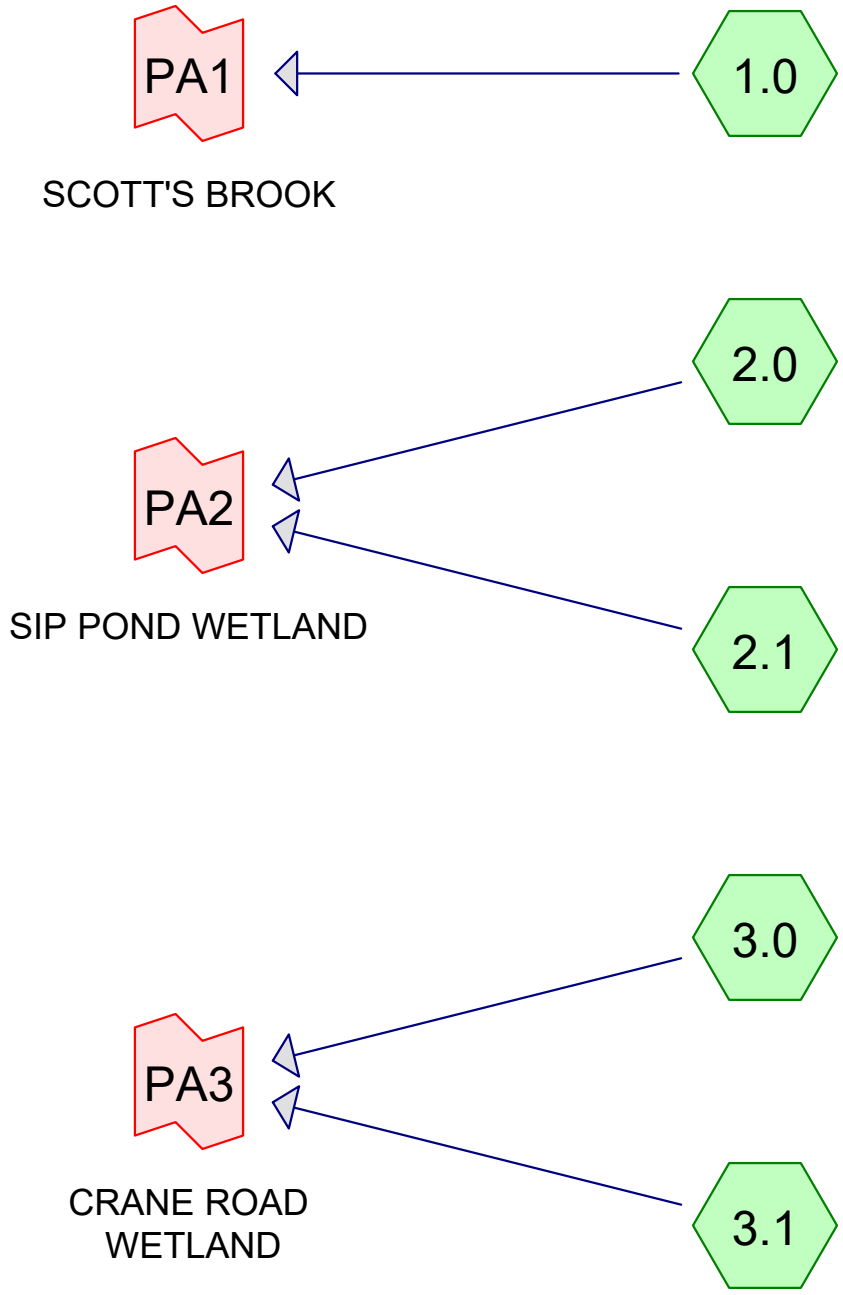
6.2.2 Pre-Development Watershed Plans

(Bound Separately)

6.2.3 Pre-Development Soil Color Plan

(See plan at end of Section 6.2)

PRE DEVELOPMENT



Subcat Reach Pond Link

Routing Diagram for N-0758-017_PRE
Prepared by Tighe & Bond, Printed 9/26/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.334	96	Gravel surface, HSG B (2.0, 3.0)
0.284	96	Gravel surface, HSG C (2.0, 3.0)
44.740	55	Woods, Good, HSG B (2.0, 3.0, 3.1)
82.394	70	Woods, Good, HSG C (1.0, 2.0, 2.1, 3.0, 3.1)
0.089	77	Woods, Good, HSG D (2.0, 3.0)
11.829	58	Woods/grass comb., Good, HSG B (2.0, 3.0, 3.1)
18.094	72	Woods/grass comb., Good, HSG C (1.0, 2.0, 3.0, 3.1)
0.177	79	Woods/grass comb., Good, HSG D (2.0, 3.0)

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
56.902	HSG B	2.0, 3.0, 3.1
100.772	HSG C	1.0, 2.0, 2.1, 3.0, 3.1
0.265	HSG D	2.0, 3.0
0.000	Other	

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.0: Runoff Area=963,629 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=854' Tc=18.2 min CN=70 Runoff=9.65 cfs 1.176 af

Subcatchment2.0: Runoff Area=1,204,083 sf 0.00% Impervious Runoff Depth=0.44"
Flow Length=1,155' Tc=17.6 min CN=65 Runoff=7.12 cfs 1.022 af

Subcatchment2.1: Runoff Area=416,565 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=589' Tc=19.0 min CN=70 Runoff=4.12 cfs 0.508 af

Subcatchment3.0: Runoff Area=3,622,132 sf 0.00% Impervious Runoff Depth=0.38"
Flow Length=3,769' Tc=66.9 min CN=63 Runoff=8.94 cfs 2.604 af

Subcatchment3.1: Runoff Area=673,414 sf 0.00% Impervious Runoff Depth=0.41"
Flow Length=4,286' Tc=82.5 min CN=64 Runoff=1.67 cfs 0.527 af

Link PA1: SCOTT'S BROOK Inflow=9.65 cfs 1.176 af
Primary=9.65 cfs 1.176 af

Link PA2: SIP POND WETLAND Inflow=11.23 cfs 1.530 af
Primary=11.23 cfs 1.530 af

Link PA3: CRANE ROAD WETLAND Inflow=10.51 cfs 3.131 af
Primary=10.51 cfs 3.131 af

Total Runoff Area = 157.939 ac Runoff Volume = 5.837 af Average Runoff Depth = 0.44"
100.00% Pervious = 157.939 ac 0.00% Impervious = 0.000 ac

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.0: Runoff Area=963,629 sf 0.00% Impervious Runoff Depth=1.44"
Flow Length=854' Tc=18.2 min CN=70 Runoff=24.34 cfs 2.650 af

Subcatchment2.0: Runoff Area=1,204,083 sf 0.00% Impervious Runoff Depth=1.12"
Flow Length=1,155' Tc=17.6 min CN=65 Runoff=22.70 cfs 2.586 af

Subcatchment2.1: Runoff Area=416,565 sf 0.00% Impervious Runoff Depth=1.44"
Flow Length=589' Tc=19.0 min CN=70 Runoff=10.41 cfs 1.146 af

Subcatchment3.0: Runoff Area=3,622,132 sf 0.00% Impervious Runoff Depth=1.01"
Flow Length=3,769' Tc=66.9 min CN=63 Runoff=31.17 cfs 6.972 af

Subcatchment3.1: Runoff Area=673,414 sf 0.00% Impervious Runoff Depth=1.06"
Flow Length=4,286' Tc=82.5 min CN=64 Runoff=5.44 cfs 1.370 af

Link PA1: SCOTT'S BROOK Inflow=24.34 cfs 2.650 af
Primary=24.34 cfs 2.650 af

Link PA2: SIP POND WETLAND Inflow=33.11 cfs 3.731 af
Primary=33.11 cfs 3.731 af

Link PA3: CRANE ROAD WETLAND Inflow=36.30 cfs 8.342 af
Primary=36.30 cfs 8.342 af

Total Runoff Area = 157.939 ac Runoff Volume = 14.724 af Average Runoff Depth = 1.12"
100.00% Pervious = 157.939 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1.0:

Time of concentration includes travel time outside of catchment area.

Runoff = 24.34 cfs @ 12.28 hrs, Volume= 2.650 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
749,140	70	Woods, Good, HSG C
214,489	72	Woods/grass comb., Good, HSG C
963,629	70	Weighted Average
963,629		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	25	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
1.4	75	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	63	0.0158	0.88		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.2	691	0.0622	1.25		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.2	854	Total			

Summary for Subcatchment 2.0:

Time of concentration includes travel time outside of catchment area.

Runoff = 22.70 cfs @ 12.29 hrs, Volume= 2.586 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
154,573	58	Woods/grass comb., Good, HSG B
323,260	55	Woods, Good, HSG B
10,965	96	Gravel surface, HSG B
318,390	72	Woods/grass comb., Good, HSG C
387,636	70	Woods, Good, HSG C
495	96	Gravel surface, HSG C
6,948	79	Woods/grass comb., Good, HSG D
1,816	77	Woods, Good, HSG D
1,204,083	65	Weighted Average
1,204,083		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	25	0.0500	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
4.6	468	0.1154	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.4	387	0.0724	1.88		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	275	0.0436	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.6	1,155	Total			

Summary for Subcatchment 2.1:

Time of concentration includes travel time outside of catchment area.

Runoff = 10.41 cfs @ 12.30 hrs, Volume= 1.146 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
416,565	70	Woods, Good, HSG C
416,565		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	25	0.0180	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
8.9	368	0.0190	0.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.3	196	0.0816	1.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.0	589	Total			

Summary for Subcatchment 3.0:

Time of concentration includes travel time outside of catchment area.

Runoff = 31.17 cfs @ 13.01 hrs, Volume= 6.972 af, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
318,373	58	Woods/grass comb., Good, HSG B
1,383,762	55	Woods, Good, HSG B
3,567	96	Gravel surface, HSG B
218,885	72	Woods/grass comb., Good, HSG C
1,682,885	70	Woods, Good, HSG C
11,870	96	Gravel surface, HSG C
748	79	Woods/grass comb., Good, HSG D
2,042	77	Woods, Good, HSG D
3,622,132	63	Weighted Average
3,622,132		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	25	0.0350	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
60.9	3,744	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	3,769	Total			

Summary for Subcatchment 3.1:

Time of concentration includes travel time outside of catchment area.

Runoff = 5.44 cfs @ 13.23 hrs, Volume= 1.370 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
42,306	58	Woods/grass comb., Good, HSG B
241,844	55	Woods, Good, HSG B
36,417	72	Woods/grass comb., Good, HSG C
352,847	70	Woods, Good, HSG C
673,414	64	Weighted Average
673,414		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0620	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.86"
1.2	144	0.0810	1.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
77.5	4,092	0.0310	0.88		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
82.5	4,286	Total			

Summary for Link PA1: SCOTT'S BROOK

Inflow Area = 22.122 ac, 0.00% Impervious, Inflow Depth = 1.44" for 10YR event
Inflow = 24.34 cfs @ 12.28 hrs, Volume= 2.650 af
Primary = 24.34 cfs @ 12.28 hrs, Volume= 2.650 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Summary for Link PA2: SIP POND WETLAND

Inflow Area = 37.205 ac, 0.00% Impervious, Inflow Depth = 1.20" for 10YR event
Inflow = 33.11 cfs @ 12.29 hrs, Volume= 3.731 af
Primary = 33.11 cfs @ 12.29 hrs, Volume= 3.731 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Summary for Link PA3: CRANE ROAD WETLAND

Inflow Area = 98.612 ac, 0.00% Impervious, Inflow Depth = 1.02" for 10YR event
Inflow = 36.30 cfs @ 13.04 hrs, Volume= 8.342 af
Primary = 36.30 cfs @ 13.04 hrs, Volume= 8.342 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.0: Runoff Area=963,629 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=854' Tc=18.2 min CN=70 Runoff=50.20 cfs 5.274 af

Subcatchment2.0: Runoff Area=1,204,083 sf 0.00% Impervious Runoff Depth=2.40"
Flow Length=1,155' Tc=17.6 min CN=65 Runoff=52.24 cfs 5.534 af

Subcatchment2.1: Runoff Area=416,565 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=589' Tc=19.0 min CN=70 Runoff=21.47 cfs 2.280 af

Subcatchment3.0: Runoff Area=3,622,132 sf 0.00% Impervious Runoff Depth=2.23"
Flow Length=3,769' Tc=66.9 min CN=63 Runoff=76.38 cfs 15.421 af

Subcatchment3.1: Runoff Area=673,414 sf 0.00% Impervious Runoff Depth=2.31"
Flow Length=4,286' Tc=82.5 min CN=64 Runoff=13.00 cfs 2.980 af

Link PA1: SCOTT'S BROOK Inflow=50.20 cfs 5.274 af
Primary=50.20 cfs 5.274 af

Link PA2: SIP POND WETLAND Inflow=73.67 cfs 7.814 af
Primary=73.67 cfs 7.814 af

Link PA3: CRANE ROAD WETLAND Inflow=88.55 cfs 18.402 af
Primary=88.55 cfs 18.402 af

Total Runoff Area = 157.939 ac Runoff Volume = 31.489 af Average Runoff Depth = 2.39"
100.00% Pervious = 157.939 ac 0.00% Impervious = 0.000 ac

SITE SPECIFIC SOIL SURVEY HYDROLOGIC SOIL GROUP (HSG) LEGEND

SYMBOL	SOIL TYPE, SLOPE RATING	HSG
56	BECKET (3 TO 8% AND 8 TO 15%)	C
57	BECKET, VERY STONY (3 TO 8%, 8 TO 15% AND 15 TO 25%)	C
60	TURNBRIDGE-BERKSHIRE COMPLEX (0 TO 8%)	C
73	BERKSHIRE (0 TO 8%, 8 TO 15% AND 15 TO 25%)	B
76	MARLOW (3 TO 8%, 8 TO 15%, 15 TO 25% AND 25 TO 50%)	C
77	MARLOW, VERY STONY (0 TO 8%, 8 TO 15% AND 15 TO 25%)	B
143	MONADNOCK (0 TO 8%, 8 TO 15%, 15 TO 25%, 25 TO 50% AND 50%+)	B
168	SUNAPEE (3 TO 8%, 8 TO 15% AND 15 TO 25%)	B
559	SKERRY (3 TO 8%, 8 TO 15% AND 15 TO 25%)	C

NOTES:

1. SSSS PREPARED BY LUKE HURLEY, GES INC., DATED 05/04/2018.

LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

DRAINAGE NOTES:

1. AREAS OUTSIDE OF THE LIMIT OF CLEARING WERE NOT ANALYZED. THESE AREAS ARE ASSUMED TO HAVE NO CHANGE FROM PRE TO POST DEVELOPMENT.

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICI A No. 08580 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

SCALE IN FEET
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Chinook Solar, LLC

Fitzwilliam, NH

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PRE-DEVELOPMENT WATERSHED KEY PLAN

SCALE: AS SHOWN

C.700

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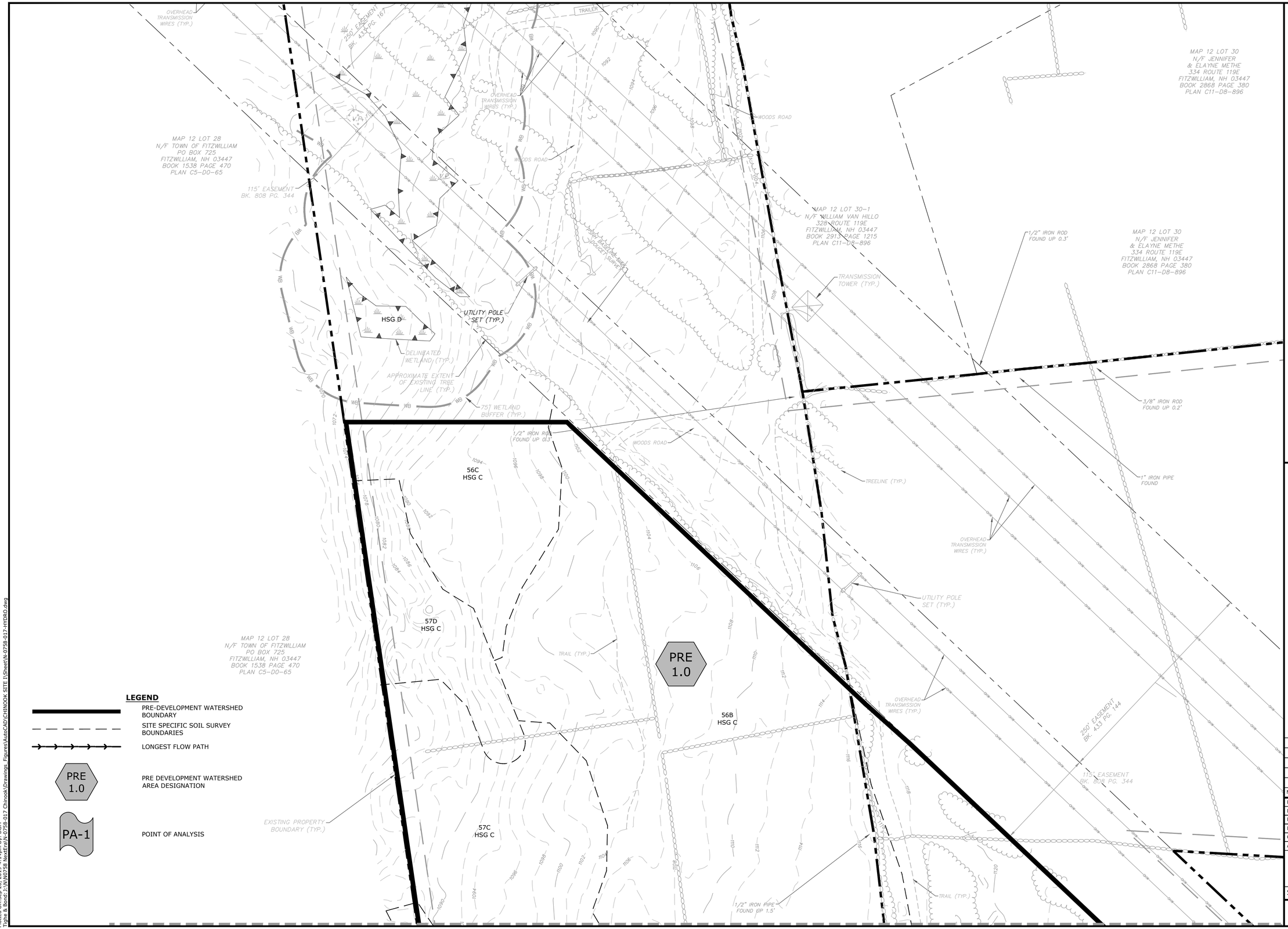

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.701

LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

PRE 1.0

PA-1

57D HSG C

57B HSG C

57C HSG C

HSG D

559B HSG C

3/4" IRON PIPE FOUND UP 0.6'

1/2" IRON PIPE FOUND UP 1.5'

UTILITY POLE SET (TYP.)

WOODED

TRAIL (TYP.)

75' WETLAND BUFFER (TYP.)

DELINEATED WETLAND (TYP.)

MATCH TO SHEET C.703

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NEXTera ENERGY

BRADLEE MEDICA No. 08580 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.702

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1" IRON PIPE
FOUND UP 1.0'
N88°50'51"W
3.07' TO CORNER

3/4" IRON PIPE
FOUND UP 2.0'

1" IRON PIPE
FOUND UP 4.0'

OVERHEAD
TRANSMISSION
WIRES (TYP.)

DRILL
HOLE(S)
FOUND

1" IRON PIPE
FOUND UP 1.0'

PRE
1.0

57B
HSG C

559B
HSG C

TRAIL (TYP.)

MATCH TO SHEET C.702

MATCH TO SHEET C.704

LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

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NEXTera ENERGY

BRADLEE MEDICA "A" No. 08.89 LICENSED PROFESSIONAL ENGINEER - STATE OF NEW HAMPSHIRE

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER - STATE OF NEW HAMPSHIRE

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.703

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MATCH TO SHEET C.703

MATCH TO SHEET C.706

MATCH TO SHEET C.705

LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

PRE 2.0

PRE 2.0

PRE 2.0

559B HSG C

168C HSG B

559D HSG C

HSG D

559C HSG C

168D HSG B

559D INTERMITTENT STREAM (0'-3' WIDE)

TRAIL (TYP.)

OVERHEAD TRANSMISSION (TYP.)

1" IRON PIPE FOUND UP 0.4'

1-1/2" IRON PIPE FOUND UP 4.0'

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STATE OF NEW HAMPSHIRE - BRADLEE MEDICA A No. 08389 - LICENSED PROFESSIONAL ENGINEER

STATE OF NEW HAMPSHIRE - JOSEPH M. PERSECHINO No. 12388 - LICENSED PROFESSIONAL ENGINEER

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.704

LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

1" IRON PIPE FOUND LEANING WEST

IRON PIPE FOUND

MAP 12 LOT 53
N/F ROBERT E. VIGEANT
94 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 1417 PAGE 877
PLAN 53-99

MAP 12 LOT 53-1
N/F ROBERT E. VIGEANT
94 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 1577 PAGE 733
PLAN 53-99

OVERHEAD TRANSMISSION WIRES (TYP.)

"OLD ROAD" UNKNOWN OWNER AND STATUS

1/2" IRON PIPE FOUND UP 1.5'

250' EASEMENT BK. 437 PG. 195

HSG D

559B
HSG C

MATCH TO SHEET C.704

MATCH TO SHEET C.707

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICA No. 08359 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

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Fitzwilliam, NH

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.705

MATCH TO SHEET C.704

HSG D

PRE 2.0

559B HSG C

HSG D

168D HSG B

BARBED WIRE FENCE REMNANTS

168C HSG B

168C HSG B

559B HSG C

168C HSG B

559B HSG C

168D HSG D

HSG D

TRAIL (TYP.)

1-1/2" IRON PIPE FOUND UP 4.0"

HSG D

168B HSG B

559B HSG C

TRAIL (TYP.)

HSG D

MATCH TO SHEET C.708

MATCH TO SHEET C.707

LEGEND

PRE-DEVELOPMENT WATERSHED BOUNDARY

LONGEST FLOW PATH

PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION

PA-1 — POINT OF ANALYSIS

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICA A No. 08380 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

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GRAPHIC SCALE

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Chinook Solar, LLC

Fitzwilliam, NH

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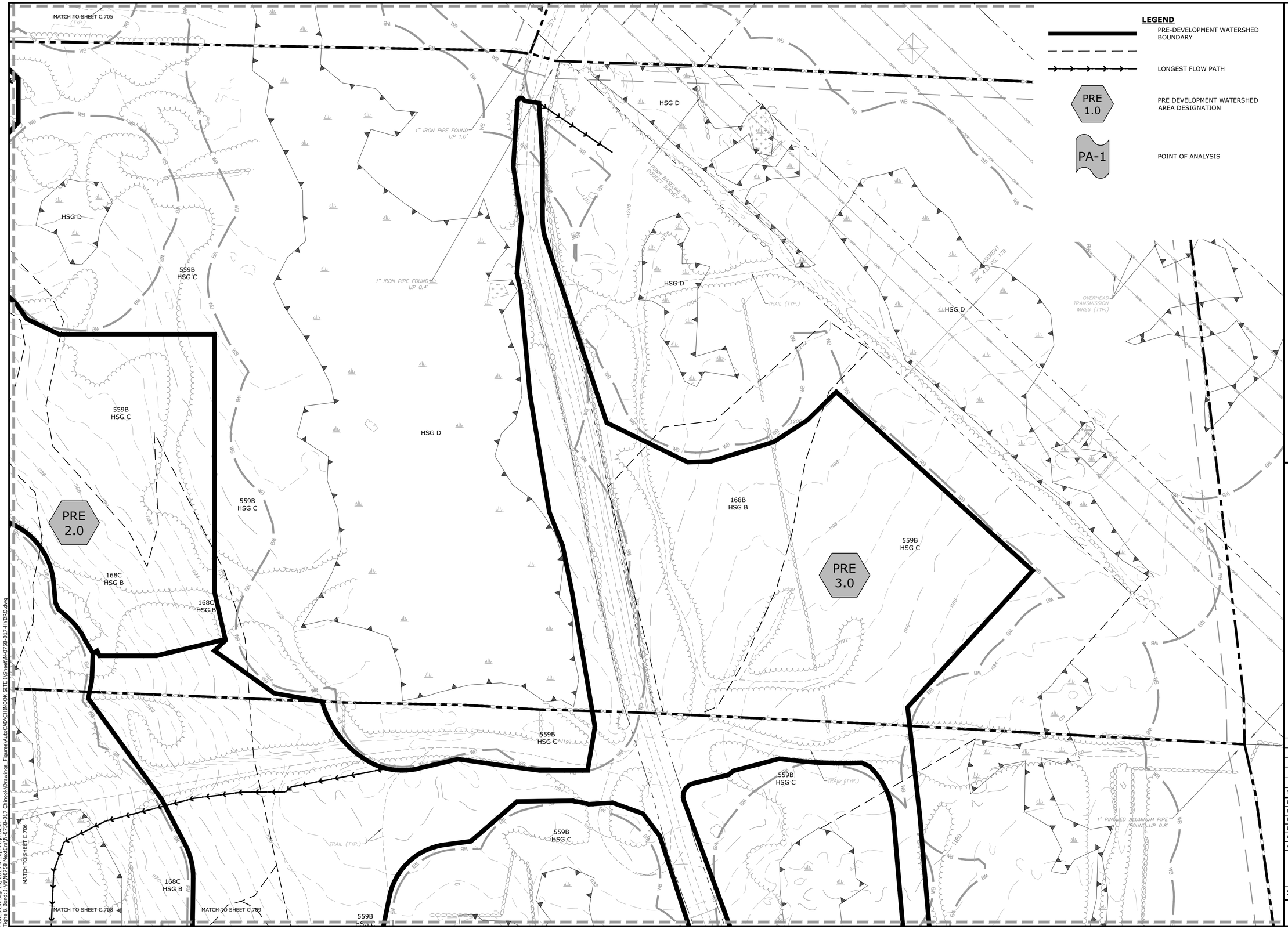
PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.706



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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICI A No. 08389 – LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 – LICENSED PROFESSIONAL ENGINEER – 10/2/19

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.707

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MATCH TO SHEET C.706

MATCH TO SHEET C.707

PRE 3.1

PRE 3.1

559B
HSG C

559B
HSG C

559B
HSG C

559C
HSG C

559B
HSG C

168C
HSG B

168B
HSG B

168B
HSG B

168C
HSG B

168C
HSG B

168C
HSG B

HSG D

HSG D

HSG D

HSG D

HSG D

TRAIL (TYP.)

TRAIL (TYP.)

TRAIL (TYP.)

TRAIL (TYP.)

WB

BM

LEGEND

PRE-DEVELOPMENT WATERSHED BOUNDARY

LONGEST FLOW PATH

PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION

PA-1 — POINT OF ANALYSIS

MATCH TO SHEET C.709

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICA A No. 08389 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

SCALE IN FEET
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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.708

MATCH TO SHEET C.707

MATCH TO SHEET C.708

MATCH TO SHEET C.711

168D
HSG B

559B
HSG C

559C
HSG C

559C
HSG C

559D
HSG C

60B
HSG C

60B
HSG C

60D
HSG C

77B
HSG B

77C
HSG B

77C
HSG B

77D
HSG B

77B
HSG B

77C
HSG B

77C
HSG B

77D
HSG B

PRE
3.0

PRE
3.0

PRE
1.0

TRAIL (TYP.)

STREAM
(TYP.)

LEGEND

PRE-DEVELOPMENT WATERSHED BOUNDARY

LONGEST FLOW PATH

PRE DEVELOPMENT WATERSHED AREA DESIGNATION

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.709

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MATCH TO SHEET C.708

1-1/2" IRON (PIPE FOUND 1.5' UP

TRAIL (TYP.)

HSG D

60B
HSG C

56B
HSG C

168C
HSG B

168D
HSG B

PRE
3.0

STREAM (TYP.)

BOULDER (TYP.)

60D
HSG
C

MATCH TO SHEET C.712

MATCH TO SHEET C.711

LEGEND

PRE-DEVELOPMENT WATERSHED BOUNDARY

LONGEST FLOW PATH

PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION

PA-1 — POINT OF ANALYSIS

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NEXTera ENERGY

BRADLEE MEDICA
No. 08389
LICENSED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO
No. 12388
LICENSED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE
10/2/19

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
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CHECKED:	JMP
APPROVED:	BLM

PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.710

MATCH TO SHEET C.709

60D HSG C

60C HSG C

60B HSG C

77C HSG B

77D HSG B

60D HSG C

60B HSG C

60B HSG C

TRAIL (TYP.)

60B HSG C

LEDGE (TYP.)

60D HSG C

PRE 3.0

168C HSG B

60B HSG C

60C HSG C

60D HSG C

168C HSG B

60C HSG C

60D HSG C

168C HSG B

MATCH TO SHEET C.710

MATCH TO SHEET C.713

STREAM (TYP.)

WB

1150 1148 1146 1144 1142 1140 1138 1136 1134 1132 1130 1128 1126 1124 1122 1120 1118 1116 1114 1112 1110 1108 1106 1104 1102 1100 1098 1096 1094 1092 1090 1088 1086 1084 1082 1080 1078 1076 1074 1072 1070 1068 1066 1064 1062 1060

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LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

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BRADLEE MECCA A No. 08.89 LICENSED PROFESSIONAL ENGINEER - STATE OF NEW HAMPSHIRE

JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER - STATE OF NEW HAMPSHIRE

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.711

MATCH TO SHEET C.710

MATCH TO SHEET C.713

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NEXTera ENERGY

BRADLEE MEDICA No. 08380 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

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SCALE IN FEET
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DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.712

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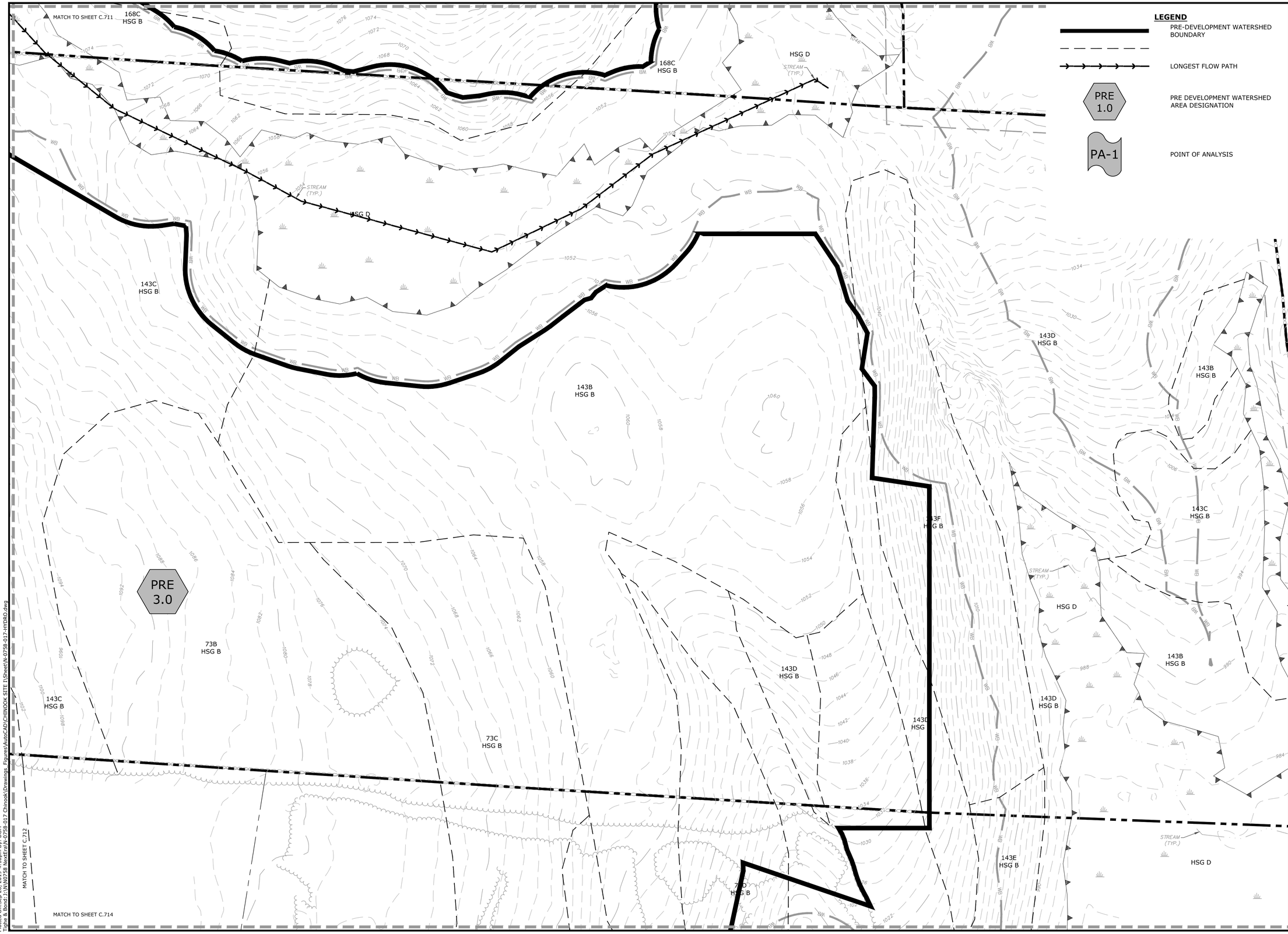

LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

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STATE OF NEW HAMPSHIRE – BRADLEE MEDICI A No. 08389 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

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PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.713

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MATCH TO SHEET C.713

PRE 3.0

73B HSG B

73D HSG B

143C HSG B

143D HSG B

HSG D

HSG D

HSG D

HSG D

HISTORICAL LOCATION OF CRANE ROAD AND/OR OLD COUNTY ROAD

LEGEND

PRE-DEVELOPMENT WATERSHED BOUNDARY

LONGEST FLOW PATH

PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION

PA-1 — POINT OF ANALYSIS

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STATE OF NEW HAMPSHIRE – BRADLEE MEDICA A No. 08380 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

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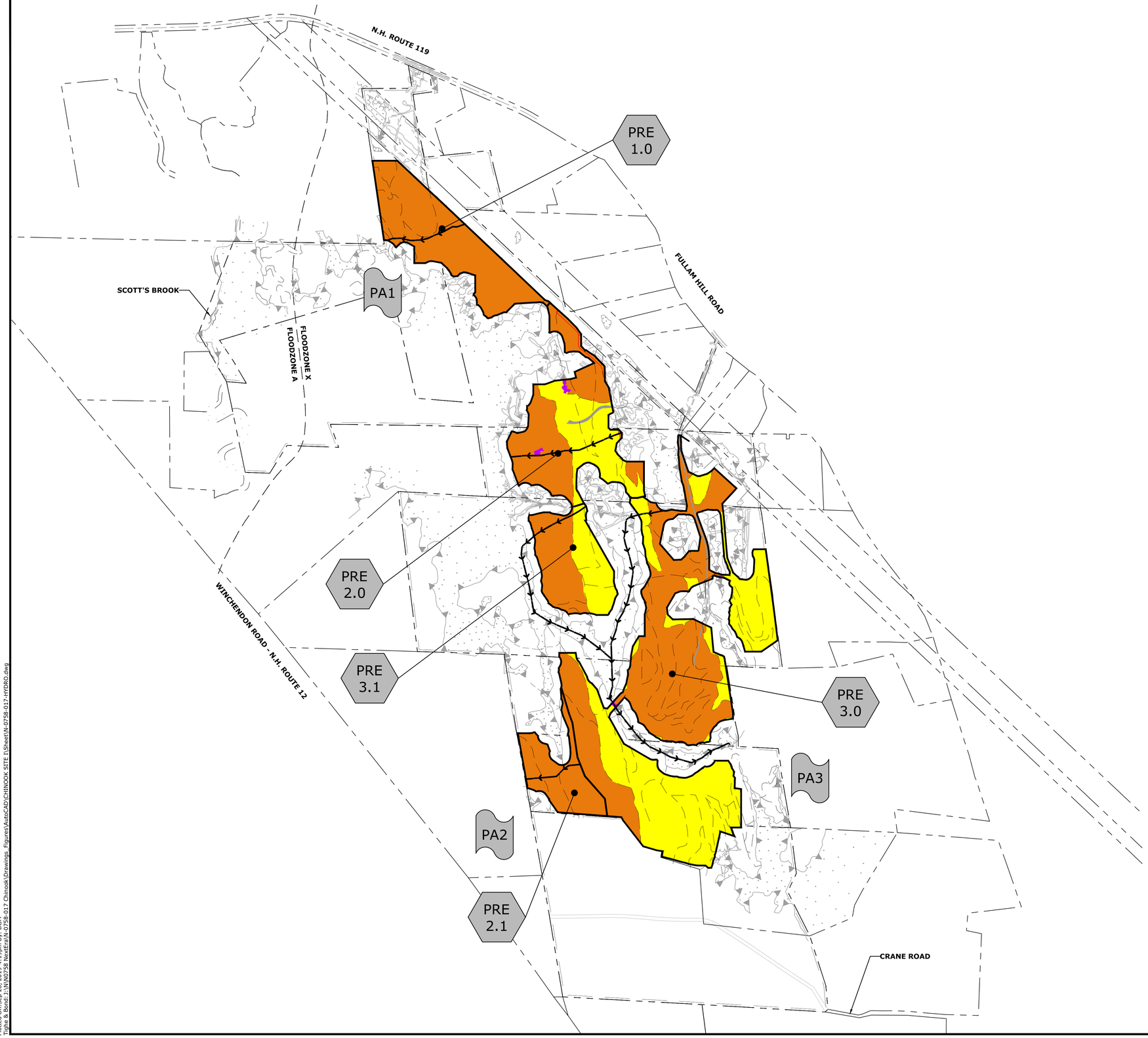
PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.714



LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PA-1 — POINT OF ANALYSIS

DRAINAGE NOTES:
1. AREAS OUTSIDE OF THE LIMIT OF CLEARING WERE NOT ANALYZED. THESE AREAS ARE ASSUMED TO HAVE NO CHANGE FROM PRE TO POST DEVELOPMENT.

SITE SPECIFIC SOIL SURVEY HYDROLOGIC SOIL GROUP RATING

- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP C
- IMPERVIOUS AREA
- WETLANDS (HYDROLOGIC SOIL GROUP D)

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICI A No. 08380 LICENSED PROFESSIONAL ENGINEER – 10/2/19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

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PRE-DEVELOPMENT WATERSHED COLOR PLAN

SCALE: AS SHOWN

C.715

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6.3 Post-Development Conditions

In order to analyze the post-development condition, the site has been divided into 14 watershed areas modeled at three points of analysis. These points of analysis and watersheds are depicted on the plan entitled "Post-Development Watershed Plan", Sheet C.800. Individual post-development watershed plans, sheets C.801-814, are also included for clarity.

Each of the points of analysis and their contributing watershed areas are described below.

Point of Analysis (PA1)

POST-1.0 through POST-1.4 are located towards the northern portions of the project area and are comprised of mostly of vegetated meadow and gravel access roads. Runoff from these sub-catchments travels west via overland flow before discharging to Scotts Brook.

- Runoff from POST-1.0 travels via overland flow before discharging to Scotts Brook
- Runoff from POST-1.1 runs via overland flow and conveyed by a grass and stoned lined swale to POST POND A before discharging to Scotts Brook
- Runoff from POST-1.2 runs via overland flow and conveyed by a grass lined swale to POST POND B before discharging to Scotts Brook
- Runoff from POST-1.3 runs via overland flow and conveyed by a grass lined swale to POST POND C before discharging to Scotts Brook
- Runoff from POST-1.4 runs via overland flow and conveyed by a grass lined swale to POST POND B before discharging to Scotts Brook

Point of Analysis (PA2)

POST-2.0 through POST-2.8 are located in the middle of the project and a small area in the southwest side of the development area and are comprised of mostly vegetated meadow and gravel access roads. Runoff from these sub-catchments travels west via overland flow before entering the wetland adjacent to Sip Pond.

- Runoff from POST-2.0 runs via overland flow before discharging to a wetland near Sip Pond
- Runoff from POST-2.1 runs via overland flow to POST POND D before discharging to a wetland near Sip Pond
- Runoff from POST-2.2 runs via overland flow and conveyed by a grass lined swale to POST POND E before discharging to a wetland near Sip Pond
- Runoff from POST-2.3 runs via overland flow before discharging to a wetland near Sip Pond
- Runoff from POST-2.4 runs via overland flow before discharging to a wetland near Sip Pond
- Runoff from POST-2.5 runs via overland and pipe flow before discharging to a wetland near Sip Pond
- Runoff from POST-2.6 runs via overland flow before discharging to a wetland near Sip Pond
- Runoff from POST-2.7 runs via overland flow and conveyed by a grass lined swale to POST POND K before discharging to a wetland near Sip Pond

- Runoff from POST-2.8 runs via overland flow before discharging to a wetland near Sip Pond

Point of Analysis (PA3)

POST-3.0. through POST 3.17 are located in the southern portion of the project area and are comprised of mostly vegetated meadow and gravel access roads. Runoff from these sub-catchments travels Southeast via overland flow before entering the wetland adjacent to Crane Road.

- Runoff from POST-3.0 runs via overland flow and conveyed by a grass lined swale to POST POND F before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.1 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.2 runs via overland flow and conveyed by a grass and stone lined swale to POST POND G before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.3 runs via overland flow and conveyed by a grass lined swale to POST POND H before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.4 runs via overland flow and conveyed by a grass lined swale to POST POND I before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.5 runs via overland flow and conveyed by a grass lined swale to POST POND J before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.6 runs via overland and pipe flow and conveyed by a grass and stone lined swale to POST POND L before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.7 runs via overland and pipe flow and conveyed by a grass lined swale to POST POND M before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.8 runs via overland flow and conveyed by a grass lined swale to POST POND M before discharging to a wetland adjacent to Crane Road
- Runoff from POST-3.9 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.10 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.11 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.12 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.13 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.14 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.15 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.16 runs via overland flow before flowing to a wetland adjacent to Crane Road
- Runoff from POST-3.17 runs via overland and pipe flow before flowing to a wetland adjacent to Crane Road

Temporary Layout Area

The temporary laydown area was not included in the post-development flow comparison because no changes in grades or permanent uses are proposed.

6.3.1 Post-Development Calculations

(See following pages)

6.3.2 Post-Development Watershed Plans

(Bound Separately)

6.3.3 Post-Development Soil Color Plan

(See plan at end of Section 6.3)

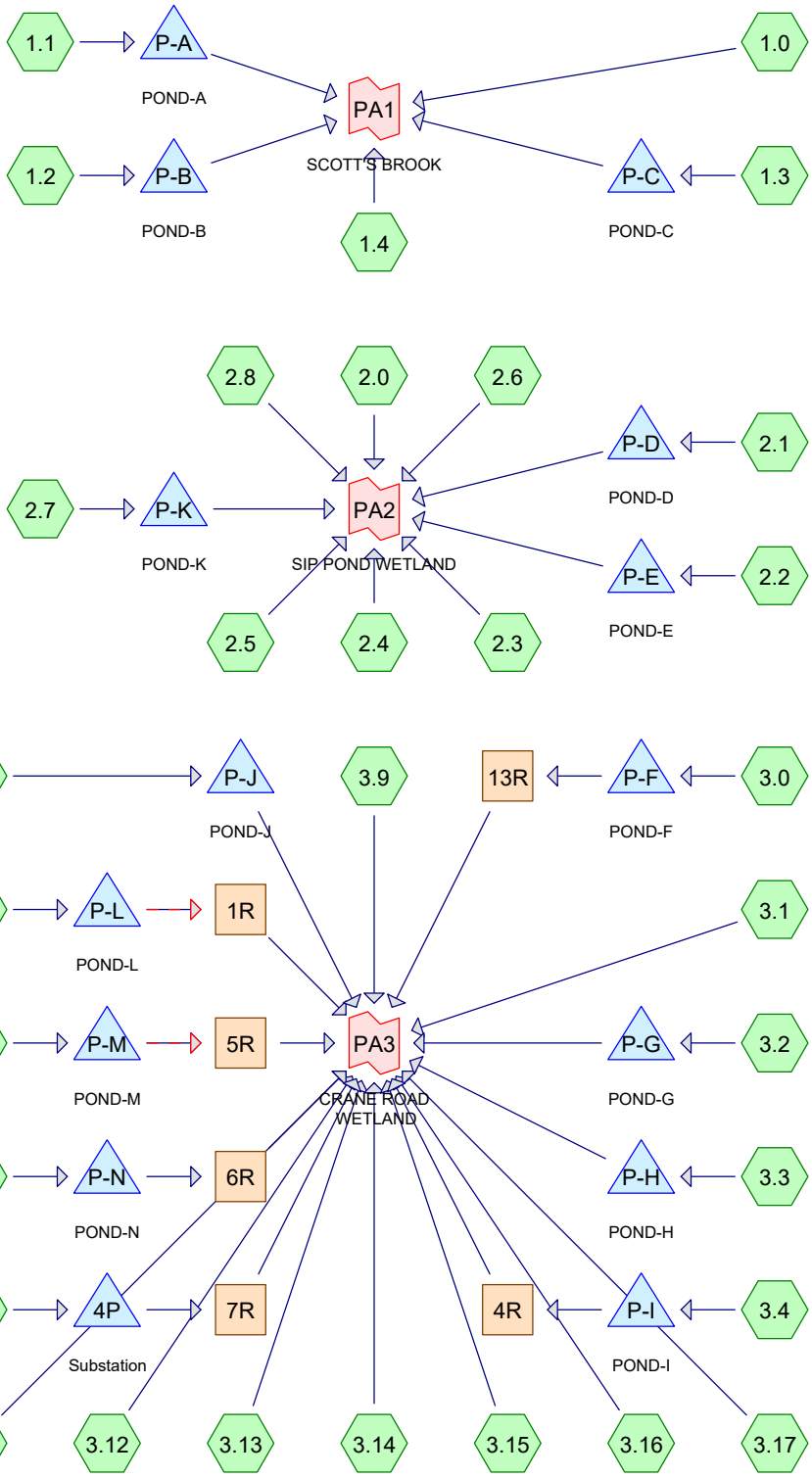
6.4 Peak Rate Comparisons

The following table summarizes and compares the pre- and post-development peak runoff rates for the 2-year, 10-year and 50-year storm events at each point of analysis. The HydroCAD calculations in section 6.2.1 and 6.3.1 fully document these computations.

Table 2.0 - Comparison of Pre and Post Development Flows

Point of Analysis	Pre/**Post** 2-Year Storm (cfs)	Pre/**Post** 10-Year Storm (cfs)	Pre/**Post** 50-Year Storm (cfs)
PA1	9.65/**4.91**	24.34/**19.65**	50.20/**31.15**
PA2	11.23/**5.22**	33.11/**28.18**	73.67/**46.34**
PA3	10.51/**8.62**	36.30/**30.51**	88.55/**78.84**

POST DEVELOPMENT



Subcat Reach Pond Link

Routing Diagram for N-0758-017_POST
Prepared by Tighe & Bond, Printed 9/26/2019

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,206	73	Brush, Good, HSG D (3.12, 3.13, 3.15, 3.9)
44,159	96	Gravel roads, HSG C (1.1, 1.2, 1.3, 2.0, 2.5)
132,787	96	Gravel surface, HSG B (2.1, 2.2, 2.5, 3.0, 3.10, 3.11, 3.13, 3.14, 3.15, 3.17, 3.3, 3.6, 3.7, 3.9)
119,332	96	Gravel surface, HSG C (2.1, 3.10, 3.13, 3.14, 3.15, 3.17, 3.4, 3.8)
60	60	Gravel surface, HSG D (3.12)
520	96	Gravel surface, HSG D (3.13, 3.9)
2,318,101	58	Meadow, non-grazed, HSG B (2.1, 2.2, 2.3, 2.5, 3.0, 3.1, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9)
4,191,539	71	Meadow, non-grazed, HSG C (1.0, 1.1, 1.2, 1.3, 1.4, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.0, 3.1, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.2, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9)
29,721	55	Woods, Good, HSG B (2.1, 3.5)
32,635	70	Woods, Good, HSG C (1.0, 2.1, 2.2, 3.5)
1,815	77	Woods, Good, HSG D (2.1, 2.2)
6,948	79	Woods/grass comb., Good, HSG D (2.1, 2.2)

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
2,480,609	HSG B	2.1, 2.2, 2.3, 2.5, 3.0, 3.1, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9
4,387,665	HSG C	1.0, 1.1, 1.2, 1.3, 1.4, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.0, 3.1, 3.10, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.2, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9
11,549	HSG D	2.1, 2.2, 3.12, 3.13, 3.15, 3.9
0	Other	

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.0: Runoff Area=157,015 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=450' Tc=7.7 min CN=71 Runoff=2.22 cfs 8,913 cf

Subcatchment1.1: Runoff Area=283,669 sf 0.00% Impervious Runoff Depth=0.73"
Flow Length=913' Tc=9.5 min CN=72 Runoff=3.98 cfs 17,164 cf

Subcatchment1.2: Runoff Area=280,660 sf 0.00% Impervious Runoff Depth=0.73"
Flow Length=686' Tc=5.8 min CN=72 Runoff=4.66 cfs 16,982 cf

Subcatchment1.3: Runoff Area=223,129 sf 0.00% Impervious Runoff Depth=0.73"
Flow Length=508' Tc=5.8 min CN=72 Runoff=3.70 cfs 13,501 cf

Subcatchment1.4: Runoff Area=21,977 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=2,653' Tc=43.4 min CN=71 Runoff=0.17 cfs 1,248 cf

Subcatchment2.0: Runoff Area=118,990 sf 0.00% Impervious Runoff Depth=0.77"
Flow Length=857' Tc=13.2 min CN=73 Runoff=1.74 cfs 7,661 cf

Subcatchment2.1: Runoff Area=335,900 sf 0.00% Impervious Runoff Depth=0.44"
Flow Length=913' Tc=11.2 min CN=65 Runoff=2.29 cfs 12,416 cf

Subcatchment2.2: Runoff Area=485,355 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=1,025' Tc=8.6 min CN=68 Runoff=4.74 cfs 22,479 cf

Subcatchment2.3: Runoff Area=15,945 sf 0.00% Impervious Runoff Depth=0.68"
Tc=5.0 min CN=71 Runoff=0.25 cfs 905 cf

Subcatchment2.4: Runoff Area=22,331 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=255' Tc=8.3 min CN=71 Runoff=0.31 cfs 1,268 cf

Subcatchment2.5: Runoff Area=253,783 sf 0.00% Impervious Runoff Depth=0.44"
Flow Length=1,299' Tc=19.9 min CN=65 Runoff=1.42 cfs 9,381 cf

Subcatchment2.6: Runoff Area=24,694 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=52' Slope=0.0385 '/' Tc=6.3 min CN=71 Runoff=0.37 cfs 1,402 cf

Subcatchment2.7: Runoff Area=369,396 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=560' Tc=19.2 min CN=71 Runoff=3.98 cfs 20,970 cf

Subcatchment2.8: Runoff Area=37,054 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=78' Slope=0.0800 '/' Tc=5.0 min CN=71 Runoff=0.57 cfs 2,103 cf

Subcatchment3.0: Runoff Area=576,271 sf 0.00% Impervious Runoff Depth=0.52"
Flow Length=1,165' Tc=15.3 min CN=67 Runoff=4.43 cfs 24,825 cf

Subcatchment3.1: Runoff Area=47,963 sf 0.00% Impervious Runoff Depth=0.38"
Flow Length=3,323' Tc=80.1 min CN=63 Runoff=0.11 cfs 1,502 cf

Subcatchment3.10: Runoff Area=87,933 sf 0.00% Impervious Runoff Depth=2.41"
Tc=5.0 min CN=96 Runoff=4.99 cfs 17,692 cf

Subcatchment3.11: Runoff Area=125,123 sf 0.00% Impervious Runoff Depth=0.31"
Flow Length=494' Tc=13.9 min CN=61 Runoff=0.43 cfs 3,269 cf

Subcatchment3.12: Runoff Area=60,346 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=1,489' Tc=29.5 min CN=70 Runoff=0.50 cfs 3,208 cf

Subcatchment3.13: Runoff Area=103,667 sf 0.00% Impervious Runoff Depth=0.82"
Flow Length=3,829' Tc=70.4 min CN=74 Runoff=0.74 cfs 7,090 cf

Subcatchment3.14: Runoff Area=185,149 sf 0.00% Impervious Runoff Depth=0.60"
Flow Length=3,669' Tc=61.0 min CN=69 Runoff=0.95 cfs 9,197 cf

Subcatchment3.15: Runoff Area=250,791 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=2,611' Tc=45.0 min CN=71 Runoff=1.85 cfs 14,237 cf

Subcatchment3.16: Runoff Area=28,988 sf 0.00% Impervious Runoff Depth=0.31"
Flow Length=1,969' Tc=36.9 min CN=61 Runoff=0.07 cfs 757 cf

Subcatchment3.17: Runoff Area=135,315 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=4,039' Tc=67.5 min CN=70 Runoff=0.72 cfs 7,193 cf

Subcatchment3.2: Runoff Area=109,220 sf 0.00% Impervious Runoff Depth=0.60"
Flow Length=310' Tc=5.5 min CN=69 Runoff=1.40 cfs 5,425 cf

Subcatchment3.3: Runoff Area=292,966 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=710' Tc=13.3 min CN=58 Runoff=0.60 cfs 5,623 cf

Subcatchment3.4: Runoff Area=569,403 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=1,051' Tc=19.5 min CN=70 Runoff=5.59 cfs 30,268 cf

Subcatchment3.5: Runoff Area=601,189 sf 0.00% Impervious Runoff Depth=0.26"
Flow Length=1,679' Tc=20.8 min CN=59 Runoff=1.35 cfs 12,861 cf

Subcatchment3.6: Runoff Area=385,597 sf 0.00% Impervious Runoff Depth=0.41"
Flow Length=812' Tc=11.7 min CN=64 Runoff=2.26 cfs 13,142 cf

Subcatchment3.7: Runoff Area=130,552 sf 0.00% Impervious Runoff Depth=0.26"
Flow Length=842' Tc=10.8 min CN=59 Runoff=0.33 cfs 2,793 cf

Subcatchment3.8: Runoff Area=271,365 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=864' Tc=17.9 min CN=71 Runoff=2.98 cfs 15,405 cf

Subcatchment3.9: Runoff Area=288,087 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=2,553' Tc=57.5 min CN=68 Runoff=1.39 cfs 13,343 cf

Reach 1R: Avg. Flow Depth=0.03' Max Vel=0.23 fps Inflow=1.11 cfs 13,139 cf
n=0.100 L=816.0' S=0.0263 '/' Capacity=73.52 cfs Outflow=0.65 cfs 13,137 cf

Reach 4R: Avg. Flow Depth=0.04' Max Vel=0.31 fps Inflow=1.07 cfs 29,789 cf
n=0.100 L=207.0' S=0.0386 '/' Capacity=38.01 cfs Outflow=1.07 cfs 29,765 cf

Reach 5R: Avg. Flow Depth=0.01' Max Vel=0.10 fps Inflow=0.11 cfs 2,788 cf
n=0.100 L=578.0' S=0.0241 '/' Capacity=4.81 cfs Outflow=0.09 cfs 2,775 cf

Reach 6R: Avg. Flow Depth=0.02' Max Vel=0.18 fps Inflow=0.33 cfs 15,091 cf
n=0.100 L=1,815.0' S=0.0320 '/' Capacity=17.59 cfs Outflow=0.30 cfs 14,739 cf

Reach 7R: Avg. Flow Depth=0.07' Max Vel=0.19 fps Inflow=4.58 cfs 17,692 cf
n=0.100 L=1,189.7' S=0.0067 '/' Capacity=2.54 cfs Outflow=1.27 cfs 17,527 cf

Reach 13R: Avg. Flow Depth=0.03' Max Vel=0.20 fps Inflow=0.68 cfs 24,398 cf
n=0.100 L=2,520.0' S=0.0222 '/' Capacity=67.46 cfs Outflow=0.54 cfs 23,717 cf

Pond 4P: Substation Peak Elev=1,189.53' Storage=887 cf Inflow=4.99 cfs 17,692 cf
Outflow=4.58 cfs 17,692 cf

Pond P-A: POND-A Peak Elev=1,081.94' Storage=6,108 cf Inflow=3.98 cfs 17,164 cf
Outflow=1.03 cfs 17,142 cf

Pond P-B: POND-B Peak Elev=1,110.50' Storage=11,052 cf Inflow=4.66 cfs 16,982 cf
Outflow=2.27 cfs 23,132 cf

Pond P-C: POND-C Peak Elev=1,120.74' Storage=10,714 cf Inflow=3.70 cfs 13,501 cf
Outflow=1.16 cfs 13,488 cf

Pond P-D: POND-D Peak Elev=1,126.71' Storage=8,407 cf Inflow=2.29 cfs 12,416 cf
Outflow=0.91 cfs 12,408 cf

Pond P-E: POND-E Peak Elev=1,114.30' Storage=17,347 cf Inflow=4.74 cfs 22,479 cf
Outflow=1.07 cfs 22,393 cf

Pond P-F: POND-F Peak Elev=1,103.27' Storage=14,604 cf Inflow=4.43 cfs 24,825 cf
Outflow=0.68 cfs 24,398 cf

Pond P-G: POND-G Peak Elev=1,102.75' Storage=6,138 cf Inflow=1.40 cfs 5,425 cf
Outflow=0.16 cfs 5,210 cf

Pond P-H: POND-H Peak Elev=1,136.78' Storage=3,365 cf Inflow=0.60 cfs 5,623 cf
Outflow=0.20 cfs 5,557 cf

Pond P-I: POND-I Peak Elev=1,059.67' Storage=16,398 cf Inflow=5.59 cfs 30,268 cf
Outflow=1.07 cfs 29,789 cf

Pond P-J: POND-J Peak Elev=1,025.42' Storage=5,197 cf Inflow=1.35 cfs 12,861 cf
Outflow=0.36 cfs 12,807 cf

Pond P-K: POND-K Peak Elev=1,095.17' Storage=11,026 cf Inflow=3.98 cfs 20,970 cf
Outflow=1.86 cfs 20,682 cf

Pond P-L: POND-L Peak Elev=1,066.99' Storage=4,344 cf Inflow=2.26 cfs 13,142 cf
Outflow=1.11 cfs 13,139 cf

Pond P-M: POND-M Peak Elev=1,056.60' Storage=3,087 cf Inflow=0.33 cfs 2,793 cf
Outflow=0.11 cfs 2,788 cf

Pond P-N: POND-N Peak Elev=1,105.29' Storage=11,022 cf Inflow=2.98 cfs 15,405 cf
Outflow=0.33 cfs 15,091 cf

Link PA1: SCOTT'S BROOK Inflow=4.91 cfs 63,923 cf
Primary=4.91 cfs 63,923 cf

Link PA2: SIP POND WETLAND Inflow=5.22 cfs 78,203 cf
Primary=5.22 cfs 78,203 cf

Link PA3: CRANE ROAD WETLAND Inflow=8.62 cfs 185,031 cf
Primary=8.62 cfs 185,031 cf

Total Runoff Area = 6,879,823 sf Runoff Volume = 324,226 cf Average Runoff Depth = 0.57"
100.00% Pervious = 6,879,823 sf 0.00% Impervious = 0 sf

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.0: Runoff Area=157,015 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=450' Tc=7.7 min CN=71 Runoff=5.49 cfs 19,688 cf

Subcatchment1.1: Runoff Area=283,669 sf 0.00% Impervious Runoff Depth=1.57"
Flow Length=913' Tc=9.5 min CN=72 Runoff=9.67 cfs 37,191 cf

Subcatchment1.2: Runoff Area=280,660 sf 0.00% Impervious Runoff Depth=1.57"
Flow Length=686' Tc=5.8 min CN=72 Runoff=10.95 cfs 36,796 cf

Subcatchment1.3: Runoff Area=223,129 sf 0.00% Impervious Runoff Depth=1.57"
Flow Length=508' Tc=5.8 min CN=72 Runoff=8.71 cfs 29,254 cf

Subcatchment1.4: Runoff Area=21,977 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=2,653' Tc=43.4 min CN=71 Runoff=0.40 cfs 2,756 cf

Subcatchment2.0: Runoff Area=118,990 sf 0.00% Impervious Runoff Depth=1.64"
Flow Length=857' Tc=13.2 min CN=73 Runoff=3.97 cfs 16,294 cf

Subcatchment2.1: Runoff Area=335,900 sf 0.00% Impervious Runoff Depth=1.12"
Flow Length=913' Tc=11.2 min CN=65 Runoff=7.34 cfs 31,422 cf

Subcatchment2.2: Runoff Area=485,355 sf 0.00% Impervious Runoff Depth=1.31"
Flow Length=1,025' Tc=8.6 min CN=68 Runoff=13.77 cfs 52,880 cf

Subcatchment2.3: Runoff Area=15,945 sf 0.00% Impervious Runoff Depth=1.50"
Tc=5.0 min CN=71 Runoff=0.60 cfs 1,999 cf

Subcatchment2.4: Runoff Area=22,331 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=255' Tc=8.3 min CN=71 Runoff=0.76 cfs 2,800 cf

Subcatchment2.5: Runoff Area=253,783 sf 0.00% Impervious Runoff Depth=1.12"
Flow Length=1,299' Tc=19.9 min CN=65 Runoff=4.63 cfs 23,740 cf

Subcatchment2.6: Runoff Area=24,694 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=52' Slope=0.0385 '/' Tc=6.3 min CN=71 Runoff=0.91 cfs 3,096 cf

Subcatchment2.7: Runoff Area=369,396 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=560' Tc=19.2 min CN=71 Runoff=9.70 cfs 46,319 cf

Subcatchment2.8: Runoff Area=37,054 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=78' Slope=0.0800 '/' Tc=5.0 min CN=71 Runoff=1.38 cfs 4,646 cf

Subcatchment3.0: Runoff Area=576,271 sf 0.00% Impervious Runoff Depth=1.24"
Flow Length=1,165' Tc=15.3 min CN=67 Runoff=13.21 cfs 59,760 cf

Subcatchment3.1: Runoff Area=47,963 sf 0.00% Impervious Runoff Depth=1.01"
Flow Length=3,323' Tc=80.1 min CN=63 Runoff=0.37 cfs 4,021 cf

Subcatchment3.10: Runoff Area=87,933 sf 0.00% Impervious Runoff Depth=3.70"
Tc=5.0 min CN=96 Runoff=7.46 cfs 27,103 cf

Subcatchment3.11: Runoff Area=125,123 sf 0.00% Impervious Runoff Depth=0.90"
Flow Length=494' Tc=13.9 min CN=61 Runoff=1.92 cfs 9,333 cf

Subcatchment3.12: Runoff Area=60,346 sf 0.00% Impervious Runoff Depth=1.44"
Flow Length=1,489' Tc=29.5 min CN=70 Runoff=1.27 cfs 7,229 cf

Subcatchment3.13: Runoff Area=103,667 sf 0.00% Impervious Runoff Depth=1.71"
Flow Length=3,829' Tc=70.4 min CN=74 Runoff=1.66 cfs 14,813 cf

Subcatchment3.14: Runoff Area=185,149 sf 0.00% Impervious Runoff Depth=1.37"
Flow Length=3,669' Tc=61.0 min CN=69 Runoff=2.50 cfs 21,165 cf

Subcatchment3.15: Runoff Area=250,791 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=2,611' Tc=45.0 min CN=71 Runoff=4.51 cfs 31,447 cf

Subcatchment3.16: Runoff Area=28,988 sf 0.00% Impervious Runoff Depth=0.90"
Flow Length=1,969' Tc=36.9 min CN=61 Runoff=0.30 cfs 2,162 cf

Subcatchment3.17: Runoff Area=135,315 sf 0.00% Impervious Runoff Depth=1.44"
Flow Length=4,039' Tc=67.5 min CN=70 Runoff=1.81 cfs 16,210 cf

Subcatchment3.2: Runoff Area=109,220 sf 0.00% Impervious Runoff Depth=1.37"
Flow Length=310' Tc=5.5 min CN=69 Runoff=3.66 cfs 12,485 cf

Subcatchment3.3: Runoff Area=292,966 sf 0.00% Impervious Runoff Depth=0.74"
Flow Length=710' Tc=13.3 min CN=58 Runoff=3.43 cfs 18,037 cf

Subcatchment3.4: Runoff Area=569,403 sf 0.00% Impervious Runoff Depth=1.44"
Flow Length=1,051' Tc=19.5 min CN=70 Runoff=14.12 cfs 68,212 cf

Subcatchment3.5: Runoff Area=601,189 sf 0.00% Impervious Runoff Depth=0.79"
Flow Length=1,679' Tc=20.8 min CN=59 Runoff=6.56 cfs 39,555 cf

Subcatchment3.6: Runoff Area=385,597 sf 0.00% Impervious Runoff Depth=1.06"
Flow Length=812' Tc=11.7 min CN=64 Runoff=7.82 cfs 34,178 cf

Subcatchment3.7: Runoff Area=130,552 sf 0.00% Impervious Runoff Depth=0.79"
Flow Length=842' Tc=10.8 min CN=59 Runoff=1.78 cfs 8,590 cf

Subcatchment3.8: Runoff Area=271,365 sf 0.00% Impervious Runoff Depth=1.50"
Flow Length=864' Tc=17.9 min CN=71 Runoff=7.25 cfs 34,027 cf

Subcatchment3.9: Runoff Area=288,087 sf 0.00% Impervious Runoff Depth=1.31"
Flow Length=2,553' Tc=57.5 min CN=68 Runoff=3.80 cfs 31,387 cf

Reach 1R: Avg. Flow Depth=0.07' Max Vel=0.42 fps Inflow=5.49 cfs 34,175 cf
n=0.100 L=816.0' S=0.0263 '/' Capacity=73.52 cfs Outflow=3.01 cfs 34,172 cf

Reach 4R: Avg. Flow Depth=0.12' Max Vel=0.68 fps Inflow=7.79 cfs 67,681 cf
n=0.100 L=207.0' S=0.0386 '/' Capacity=38.01 cfs Outflow=7.66 cfs 67,651 cf

Reach 5R: Avg. Flow Depth=0.02' Max Vel=0.19 fps Inflow=0.71 cfs 8,584 cf
n=0.100 L=578.0' S=0.0241 '/' Capacity=4.81 cfs Outflow=0.46 cfs 8,569 cf

Reach 6R: Avg. Flow Depth=0.02' Max Vel=0.22 fps Inflow=0.55 cfs 33,573 cf
n=0.100 L=1,815.0' S=0.0320 '/' Capacity=17.59 cfs Outflow=0.53 cfs 33,017 cf

Reach 7R: Avg. Flow Depth=0.09' Max Vel=0.24 fps Inflow=6.95 cfs 27,103 cf
n=0.100 L=1,189.7' S=0.0067 '/' Capacity=2.54 cfs Outflow=2.21 cfs 26,931 cf

Reach 13R: Avg. Flow Depth=0.04' Max Vel=0.28 fps Inflow=1.28 cfs 59,245 cf
n=0.100 L=2,520.0' S=0.0222 '/' Capacity=67.46 cfs Outflow=1.17 cfs 58,309 cf

Pond 4P: Substation Peak Elev=1,189.53' Storage=1,171 cf Inflow=7.46 cfs 27,103 cf
Outflow=6.95 cfs 27,103 cf

Pond P-A: POND-A Peak Elev=1,082.67' Storage=9,848 cf Inflow=9.67 cfs 37,191 cf
Outflow=8.79 cfs 37,168 cf

Pond P-B: POND-B Peak Elev=1,110.82' Storage=14,951 cf Inflow=10.95 cfs 36,796 cf
Outflow=4.37 cfs 42,945 cf

Pond P-C: POND-C Peak Elev=1,121.01' Storage=14,988 cf Inflow=8.71 cfs 29,254 cf
Outflow=3.33 cfs 29,239 cf

Pond P-D: POND-D Peak Elev=1,127.04' Storage=12,718 cf Inflow=7.34 cfs 31,422 cf
Outflow=3.71 cfs 31,413 cf

Pond P-E: POND-E Peak Elev=1,114.76' Storage=28,136 cf Inflow=13.77 cfs 52,880 cf
Outflow=3.41 cfs 52,786 cf

Pond P-F: POND-F Peak Elev=1,104.57' Storage=34,067 cf Inflow=13.21 cfs 59,760 cf
Outflow=1.28 cfs 59,245 cf

Pond P-G: POND-G Peak Elev=1,103.06' Storage=8,971 cf Inflow=3.66 cfs 12,485 cf
Outflow=0.52 cfs 12,257 cf

Pond P-H: POND-H Peak Elev=1,137.52' Storage=7,084 cf Inflow=3.43 cfs 18,037 cf
Outflow=0.83 cfs 17,968 cf

Pond P-I: POND-I Peak Elev=1,060.33' Storage=24,210 cf Inflow=14.12 cfs 68,212 cf
Outflow=7.79 cfs 67,681 cf

Pond P-J: POND-J Peak Elev=1,027.92' Storage=19,794 cf Inflow=6.56 cfs 39,555 cf
Outflow=0.76 cfs 39,483 cf

Pond P-K: POND-K Peak Elev=1,095.24' Storage=11,814 cf Inflow=9.70 cfs 46,319 cf
Outflow=12.39 cfs 46,016 cf

Pond P-L: POND-L Peak Elev=1,067.64' Storage=7,958 cf Inflow=7.82 cfs 34,178 cf
Outflow=5.49 cfs 34,175 cf

Pond P-M: POND-M Peak Elev=1,056.86' Storage=4,493 cf Inflow=1.78 cfs 8,590 cf
Outflow=0.71 cfs 8,584 cf

Pond P-N: POND-N Peak Elev=1,106.37' Storage=22,919 cf Inflow=7.25 cfs 34,027 cf
Outflow=0.55 cfs 33,573 cf

Link PA1: SCOTT'S BROOK Inflow=19.65 cfs 131,796 cf
Primary=19.65 cfs 131,796 cf

Link PA2: SIP POND WETLAND Inflow=28.18 cfs 182,792 cf
Primary=28.18 cfs 182,792 cf

Link PA3: CRANE ROAD WETLAND Inflow=30.51 cfs 436,126 cf
Primary=30.51 cfs 436,126 cf

Total Runoff Area = 6,879,823 sf Runoff Volume = 748,599 cf Average Runoff Depth = 1.31"
100.00% Pervious = 6,879,823 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1.0:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 5.49 cfs @ 12.12 hrs, Volume= 19,688 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
156,159	71	Meadow, non-grazed, HSG C
856	70	Woods, Good, HSG C
157,015	71	Weighted Average
157,015		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.1200	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
3.5	400	0.0750	1.92		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	450	Total			

Summary for Subcatchment 1.1:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 9.67 cfs @ 12.15 hrs, Volume= 37,191 cf, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

	Area (sf)	CN	Description
	271,641	71	Meadow, non-grazed, HSG C
*	12,028	96	Gravel roads, HSG C
	283,669	72	Weighted Average
	283,669		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0110	0.74		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.86"
8.7	797	0.0477	1.53		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	96	0.0625	3.75		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
9.5	913	Total			

Summary for Subcatchment 1.2:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 10.95 cfs @ 12.11 hrs, Volume= 36,796 cf, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

	Area (sf)	CN	Description
*	273,304	71	Meadow, non-grazed, HSG C
*	7,356	96	Gravel roads, HSG C
	280,660	72	Weighted Average
	280,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	27	0.0380	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.86"
4.7	390	0.0385	1.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	269	0.0166	5.94	178.23	**Channel Flow, Swale** Area= 30.0 sf Perim= 33.4' r= 0.90' n= 0.030
5.8	686	Total			

Summary for Subcatchment 1.3:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 8.71 cfs @ 12.11 hrs, Volume= 29,254 cf, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

	Area (sf)	CN	Description
*	213,075	71	Meadow, non-grazed, HSG C
*	10,054	96	Gravel roads, HSG C
	223,129	72	Weighted Average
	223,129		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	27	0.0380	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.86"
5.5	481	0.0437	1.46		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.8	508	Total			

Summary for Subcatchment 1.4:

Runoff = 0.40 cfs @ 12.64 hrs, Volume= 2,756 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
21,977	71	Meadow, non-grazed, HSG C
21,977		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
33.7	2,603	0.0338	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
43.4	2,653	Total			

Summary for Subcatchment 2.0:

Runoff = 3.97 cfs @ 12.21 hrs, Volume= 16,294 cf, Depth= 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

	Area (sf)	CN	Description
	108,233	71	Meadow, non-grazed, HSG C
*	10,757	96	Gravel roads, HSG C
	118,990	73	Weighted Average
	118,990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
1.4	217	0.1382	2.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.8	590	0.0847	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	857	Total			

Summary for Subcatchment 2.1:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 7.34 cfs @ 12.20 hrs, Volume= 31,422 cf, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
136,929	58	Meadow, non-grazed, HSG B
1,214	96	Gravel surface, HSG B
24,738	55	Woods, Good, HSG B
147,084	71	Meadow, non-grazed, HSG C
3,878	96	Gravel surface, HSG C
17,278	70	Woods, Good, HSG C
3,242	79	Woods/grass comb., Good, HSG D
1,537	77	Woods, Good, HSG D
335,900	65	Weighted Average
335,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.1000	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
4.5	633	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	230	0.0150	1.84		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
11.2	913	Total			

Summary for Subcatchment 2.2:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 13.77 cfs @ 12.14 hrs, Volume= 52,880 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
146,196	58	Meadow, non-grazed, HSG B
313,948	71	Meadow, non-grazed, HSG C
3,706	79	Woods/grass comb., Good, HSG D
11,821	70	Woods, Good, HSG C
278	77	Woods, Good, HSG D
9,406	96	Gravel surface, HSG B
485,355	68	Weighted Average
485,355		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	55	0.0400	1.52		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.86"
8.0	970	0.0825	2.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.6	1,025	Total			

Summary for Subcatchment 2.3:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.60 cfs @ 12.10 hrs, Volume= 1,999 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
412	58	Meadow, non-grazed, HSG B
15,533	71	Meadow, non-grazed, HSG C
15,945	71	Weighted Average
15,945		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2.4:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.76 cfs @ 12.13 hrs, Volume= 2,800 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
22,331	71	Meadow, non-grazed, HSG C
22,331		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	25	0.0450	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
2.9	230	0.0355	1.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.3	255	Total			

Summary for Subcatchment 2.5:

Runoff = 4.63 cfs @ 12.32 hrs, Volume= 23,740 cf, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

	Area (sf)	CN	Description
	155,894	58	Meadow, non-grazed, HSG B
	13,402	96	Gravel surface, HSG B
	80,523	71	Meadow, non-grazed, HSG C
*	3,964	96	Gravel roads, HSG C
	253,783	65	Weighted Average
	253,783		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0700	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
3.1	400	0.0943	2.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	270	0.0519	1.14		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	156	0.0770	1.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.2	423	0.0520	1.14		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	1,299	Total			

Summary for Subcatchment 2.6:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.91 cfs @ 12.11 hrs, Volume= 3,096 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
24,694	71	Meadow, non-grazed, HSG C
24,694		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	25	0.0385	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.5	27	0.0385	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.3	52	Total			

Summary for Subcatchment 2.7:

Runoff = 9.70 cfs @ 12.30 hrs, Volume= 46,319 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
369,396	71	Meadow, non-grazed, HSG C
369,396		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
1.0	50	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.2	217	0.0138	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.3	243	0.0617	1.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.2	560	Total			

Summary for Subcatchment 2.8:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.38 cfs @ 12.10 hrs, Volume= 4,646 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
37,054	71	Meadow, non-grazed, HSG C
37,054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	25	0.0800	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.86"
0.6	53	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.9	78	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment 3.0:

Runoff = 13.21 cfs @ 12.24 hrs, Volume= 59,760 cf, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
223,886	58	Meadow, non-grazed, HSG B
331,713	71	Meadow, non-grazed, HSG C
20,672	96	Gravel surface, HSG B
576,271	67	Weighted Average
576,271		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
4.3	452	0.0620	1.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	663	0.0150	1.84		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.3	1,165	Total			

Summary for Subcatchment 3.1:

Runoff = 0.37 cfs @ 13.20 hrs, Volume= 4,021 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
29,060	58	Meadow, non-grazed, HSG B
18,903	71	Meadow, non-grazed, HSG C
47,963	63	Weighted Average
47,963		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	25	0.0800	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
77.2	3,298	0.0203	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
80.1	3,323	Total			

Summary for Subcatchment 3.10:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 7.46 cfs @ 12.08 hrs, Volume= 27,103 cf, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
26,630	96	Gravel surface, HSG B
61,303	96	Gravel surface, HSG C
87,933	96	Weighted Average
87,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 3.11:

Runoff = 1.92 cfs @ 12.24 hrs, Volume= 9,333 cf, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
113,697	58	Meadow, non-grazed, HSG B
11,426	96	Gravel surface, HSG B
125,123	61	Weighted Average
125,123		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0700	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
1.5	143	0.0525	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.1	301	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.9	494	Total			

Summary for Subcatchment 3.12:

Runoff = 1.27 cfs @ 12.45 hrs, Volume= 7,229 cf, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

	Area (sf)	CN	Description
	5,811	58	Meadow, non-grazed, HSG B
	54,112	71	Meadow, non-grazed, HSG C
	363	73	Brush, Good, HSG D
*	60	60	Gravel surface, HSG D
	60,346	70	Weighted Average
	60,346		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
0.1	21	0.1905	3.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
24.4	1,418	0.0374	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.5	1,489	Total			

Summary for Subcatchment 3.13:

Runoff = 1.66 cfs @ 12.98 hrs, Volume= 14,813 cf, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
29,325	58	Meadow, non-grazed, HSG B
45,019	71	Meadow, non-grazed, HSG C
380	73	Brush, Good, HSG D
11,511	96	Gravel surface, HSG B
17,236	96	Gravel surface, HSG C
196	96	Gravel surface, HSG D
103,667	74	Weighted Average
103,667		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.1300	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
0.4	65	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.9	3,714	0.0353	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
70.4	3,829	Total			

Summary for Subcatchment 3.14:

Runoff = 2.50 cfs @ 12.88 hrs, Volume= 21,165 cf, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
36,082	58	Meadow, non-grazed, HSG B
147,261	71	Meadow, non-grazed, HSG C
98	96	Gravel surface, HSG B
1,708	96	Gravel surface, HSG C
185,149	69	Weighted Average
185,149		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
1.4	154	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	632	0.0665	3.87		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.5	128	0.0050	4.20	7.43	**Pipe Channel, CMP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	38	0.0263	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
49.2	2,667	0.0326	0.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
61.0	3,669	Total			

Summary for Subcatchment 3.15:

Runoff = 4.51 cfs @ 12.66 hrs, Volume= 31,447 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
64,525	58	Meadow, non-grazed, HSG B
155,499	71	Meadow, non-grazed, HSG C
748	73	Brush, Good, HSG D
12,824	96	Gravel surface, HSG B
17,195	96	Gravel surface, HSG C
250,791	71	Weighted Average
250,791		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	25	0.0600	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.86"
36.6	2,586	0.0555	1.18		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
45.0	2,611	Total			

Summary for Subcatchment 3.16:

Runoff = 0.30 cfs @ 12.60 hrs, Volume= 2,162 cf, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
22,913	58	Meadow, non-grazed, HSG B
6,075	71	Meadow, non-grazed, HSG C
28,988	61	Weighted Average
28,988		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	25	0.0700	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.86"
29.0	1,944	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.9	1,969	Total			

Summary for Subcatchment 3.17:

Runoff = 1.81 cfs @ 12.97 hrs, Volume= 16,210 cf, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
38,834	58	Meadow, non-grazed, HSG B
79,709	71	Meadow, non-grazed, HSG C
4,751	96	Gravel surface, HSG B
12,021	96	Gravel surface, HSG C
135,315	70	Weighted Average
135,315		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0600	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.86"
0.9	90	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.8	372	0.0510	3.39		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
61.0	3,527	0.0372	0.96		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.5	4,039	Total			

Summary for Subcatchment 3.2:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.66 cfs @ 12.10 hrs, Volume= 12,485 cf, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
12,866	58	Meadow, non-grazed, HSG B
96,354	71	Meadow, non-grazed, HSG C
109,220	69	Weighted Average
109,220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.1400	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
1.5	260	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.5	310	Total			

Summary for Subcatchment 3.3:

Runoff = 3.43 cfs @ 12.24 hrs, Volume= 18,037 cf, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
292,335	58	Meadow, non-grazed, HSG B
631	96	Gravel surface, HSG B
292,966	58	Weighted Average
292,966		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
6.7	660	0.0550	1.64		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.3	710	Total			

Summary for Subcatchment 3.4:

Runoff = 14.12 cfs @ 12.30 hrs, Volume= 68,212 cf, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
30,743	58	Meadow, non-grazed, HSG B
537,628	71	Meadow, non-grazed, HSG C
1,032	96	Gravel surface, HSG C
569,403	70	Weighted Average
569,403		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0090	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
6.0	773	0.0931	2.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	228	0.0263	2.43		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.5	1,051	Total			

Summary for Subcatchment 3.5:

Runoff = 6.56 cfs @ 12.37 hrs, Volume= 39,555 cf, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
525,700	58	Meadow, non-grazed, HSG B
67,826	71	Meadow, non-grazed, HSG C
4,983	55	Woods, Good, HSG B
2,680	70	Woods, Good, HSG C
601,189	59	Weighted Average
601,189		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
12.6	1,246	0.0550	1.64		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	383	0.0366	2.87		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
20.8	1,679	Total			

Summary for Subcatchment 3.6:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 7.82 cfs @ 12.21 hrs, Volume= 34,178 cf, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
219,278	58	Meadow, non-grazed, HSG B
158,916	71	Meadow, non-grazed, HSG C
7,403	96	Gravel surface, HSG B
385,597	64	Weighted Average
385,597		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
4.4	502	0.0750	1.92		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	222	0.0450	3.18		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.0	25	0.0500	13.91	17.07	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.1	13	0.0050	3.72	4.57	**Pipe Channel, HDPE_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
11.7	812	Total			

Summary for Subcatchment 3.7:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.78 cfs @ 12.21 hrs, Volume= 8,590 cf, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
124,455	58	Meadow, non-grazed, HSG B
4,769	71	Meadow, non-grazed, HSG C
1,328	96	Gravel surface, HSG B
130,552	59	Weighted Average
130,552		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.1000	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
6.2	755	0.0850	2.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	37	0.0500	13.91	17.07	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
10.8	842	Total			

Summary for Subcatchment 3.8:

Runoff = 7.25 cfs @ 12.28 hrs, Volume= 34,027 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
18,469	58	Meadow, non-grazed, HSG B
247,937	71	Meadow, non-grazed, HSG C
4,959	96	Gravel surface, HSG C
271,365	71	Weighted Average
271,365		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
5.3	491	0.0478	1.53		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	145	0.0345	2.79		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.3	178	0.0200	8.80	10.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
17.9	864	Total			

Summary for Subcatchment 3.9:

Runoff = 3.80 cfs @ 12.84 hrs, Volume= 31,387 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10YR Rainfall=4.16"

Area (sf)	CN	Description
90,691	58	Meadow, non-grazed, HSG B
184,866	71	Meadow, non-grazed, HSG C
715	73	Brush, Good, HSG D
11,491	96	Gravel surface, HSG B
324	96	Gravel surface, HSG D
288,087	68	Weighted Average
288,087		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.86"
5.5	402	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
43.3	2,101	0.0262	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
57.5	2,553	Total			

Summary for Reach 1R:

Inflow Area = 385,597 sf, 0.00% Impervious, Inflow Depth = 1.06" for 10YR event
Inflow = 5.49 cfs @ 12.41 hrs, Volume= 34,175 cf
Outflow = 3.01 cfs @ 12.78 hrs, Volume= 34,172 cf, Atten= 45%, Lag= 21.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 32.1 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 108.6 min

Peak Storage= 5,801 cf @ 12.78 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 0.50' Flow Area= 50.0 sf, Capacity= 73.52 cfs

Custom cross-section, Length= 816.0' Slope= 0.0263 '/'
Constant n= 0.100 Heavy timber, flow below branches
Inlet Invert= 1,065.50', Outlet Invert= 1,044.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.50	0.00
5.00	0.00	0.50
100.00	0.00	0.50
105.00	0.50	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	95.0	0	0.00
0.50	50.0	105.0	40,800	73.52

Summary for Reach 4R:

Inflow Area = 569,403 sf, 0.00% Impervious, Inflow Depth > 1.43" for 10YR event
Inflow = 7.79 cfs @ 12.63 hrs, Volume= 67,681 cf
Outflow = 7.66 cfs @ 12.70 hrs, Volume= 67,651 cf, Atten= 2%, Lag= 4.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Max. Velocity= 0.68 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 19.5 min

Peak Storage= 2,318 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 0.30' Flow Area= 30.0 sf, Capacity= 38.01 cfs

Custom cross-section, Length= 207.0' Slope= 0.0386 '/'
Constant n= 0.100 Heavy timber, flow below branches
Inlet Invert= 1,052.00', Outlet Invert= 1,044.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.30	0.00
5.00	0.00	0.30
100.00	0.00	0.30
105.00	0.30	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	95.0	0	0.00
0.30	30.0	105.0	6,210	38.01

Summary for Reach 5R:

Inflow Area = 130,552 sf, 0.00% Impervious, Inflow Depth > 0.79" for 10YR event
Inflow = 0.71 cfs @ 12.62 hrs, Volume= 8,584 cf
Outflow = 0.46 cfs @ 13.40 hrs, Volume= 8,569 cf, Atten= 34%, Lag= 46.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Max. Velocity= 0.19 fps, Min. Travel Time= 49.5 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 147.5 min

Peak Storage= 1,381 cf @ 13.40 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 0.10' Flow Area= 10.0 sf, Capacity= 4.81 cfs

Custom cross-section, Length= 578.0' Slope= 0.0241 '/'
Constant n= 0.100 Heavy timber, flow below branches
Inlet Invert= 1,054.00', Outlet Invert= 1,040.09'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.10	0.00
5.00	0.00	0.10
100.00	0.00	0.10
105.00	0.10	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	95.0	0	0.00
0.10	10.0	105.0	5,780	4.81

Summary for Reach 6R:

Inflow Area = 271,365 sf, 0.00% Impervious, Inflow Depth > 1.48" for 10YR event
Inflow = 0.55 cfs @ 15.72 hrs, Volume= 33,573 cf
Outflow = 0.53 cfs @ 18.71 hrs, Volume= 33,017 cf, Atten= 4%, Lag= 179.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Max. Velocity= 0.22 fps, Min. Travel Time= 135.3 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 202.7 min

Peak Storage= 4,262 cf @ 18.71 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 0.20' Flow Area= 20.0 sf, Capacity= 17.59 cfs

Custom cross-section, Length= 1,815.0' Slope= 0.0320 '/'
Constant n= 0.100 Heavy timber, flow below branches
Inlet Invert= 1,102.00', Outlet Invert= 1,044.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.20	0.00
5.00	0.00	0.20
100.00	0.00	0.20
105.00	0.20	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	95.0	0	0.00
0.20	20.0	105.0	36,300	17.59

Summary for Reach 7R:

[55] Hint: Peak inflow is 274% of Manning's capacity

Inflow Area = 87,933 sf, 0.00% Impervious, Inflow Depth = 3.70" for 10YR event
Inflow = 6.95 cfs @ 12.11 hrs, Volume= 27,103 cf
Outflow = 2.21 cfs @ 12.46 hrs, Volume= 26,931 cf, Atten= 68%, Lag= 20.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Max. Velocity= 0.24 fps, Min. Travel Time= 82.3 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 329.6 min

Peak Storage= 10,911 cf @ 12.46 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.10' Flow Area= 10.0 sf, Capacity= 2.54 cfs

Custom cross-section, Length= 1,189.7' Slope= 0.0067 '/'
Constant n= 0.100 Heavy timber, flow below branches
Inlet Invert= 1,052.00', Outlet Invert= 1,044.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.10	0.00
5.00	0.00	0.10
100.00	0.00	0.10
105.00	0.10	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	95.0	0	0.00
0.10	10.0	105.0	11,897	2.54

Summary for Reach 13R:

Inflow Area = 576,271 sf, 0.00% Impervious, Inflow Depth > 1.23" for 10YR event
Inflow = 1.28 cfs @ 14.94 hrs, Volume= 59,245 cf
Outflow = 1.17 cfs @ 18.33 hrs, Volume= 58,309 cf, Atten= 9%, Lag= 203.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Max. Velocity= 0.28 fps, Min. Travel Time= 152.1 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 259.0 min

Peak Storage= 10,636 cf @ 18.33 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.50' Flow Area= 50.0 sf, Capacity= 67.46 cfs

Custom cross-section, Length= 2,520.0' Slope= 0.0222 '/'
Constant n= 0.100 Heavy timber, flow below branches
Inlet Invert= 1,099.90', Outlet Invert= 1,044.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.50	0.00
5.00	0.00	0.50
100.00	0.00	0.50
105.00	0.50	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	95.0	0	0.00
0.50	50.0	105.0	126,000	67.46

Summary for Pond 4P: Substation

Inflow Area = 87,933 sf, 0.00% Impervious, Inflow Depth = 3.70" for 10YR event
Inflow = 7.46 cfs @ 12.08 hrs, Volume= 27,103 cf
Outflow = 6.95 cfs @ 12.11 hrs, Volume= 27,103 cf, Atten= 7%, Lag= 1.6 min
Primary = 6.95 cfs @ 12.11 hrs, Volume= 27,103 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Peak Elev= 1,189.53' @ 12.11 hrs Surf.Area= 87,933 sf Storage= 1,171 cf

Plug-Flow detention time= 7.7 min calculated for 27,103 cf (100% of inflow)
Center-of-Mass det. time= 6.3 min (772.3 - 766.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,189.50'	11,607 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 29,018 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,189.50	87,933	0	0
1,189.83	87,933	29,018	29,018

Device	Routing	Invert	Outlet Devices
#1	Primary	1,189.50'	**460.0' 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=6.76 cfs @ 12.11 hrs HW=1,189.53' TW=1,052.07' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 6.76 cfs @ 0.45 fps)

Summary for Pond P-A: POND-A

Inflow Area = 283,669 sf, 0.00% Impervious, Inflow Depth = 1.57" for 10YR event
Inflow = 9.67 cfs @ 12.15 hrs, Volume= 37,191 cf
Outflow = 8.79 cfs @ 12.33 hrs, Volume= 37,168 cf, Atten= 9%, Lag= 11.0 min
Primary = 8.79 cfs @ 12.33 hrs, Volume= 37,168 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,080.50' Surf.Area= 2,515 sf Storage= 1,115 cf
Peak Elev= 1,082.67' @ 12.31 hrs Surf.Area= 5,698 sf Storage= 9,848 cf (8,733 cf above start)
Flood Elev= 1,084.75' Surf.Area= 10,038 sf Storage= 23,540 cf (22,425 cf above start)

Plug-Flow detention time= 88.7 min calculated for 35,978 cf (97% of inflow)
Center-of-Mass det. time= 65.7 min (921.4 - 855.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,080.00'	23,540 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,080.00	1,955	373.0	0	0	1,955
1,082.00	4,618	496.0	6,385	6,385	10,505
1,084.00	8,162	616.0	12,613	18,998	21,182
1,084.50	10,038	635.0	4,542	23,540	23,099

Device	Routing	Invert	Outlet Devices
#1	Primary	1,080.00'	**15.0" Round Culvert** L= 21.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,080.00' / 1,079.75' S= 0.0119 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,082.50'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,080.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=8.38 cfs @ 12.33 hrs HW=1,082.64' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 8.38 cfs @ 6.83 fps)
└─**2=HAALA** (Passes < 20.57 cfs potential flow)
└─**3=Orifice/Grate** (Passes < 1.30 cfs potential flow)

Summary for Pond P-B: POND-B

Inflow Area = 280,660 sf, 0.00% Impervious, Inflow Depth = 1.57" for 10YR event
Inflow = 10.95 cfs @ 12.11 hrs, Volume= 36,796 cf
Outflow = 4.37 cfs @ 12.40 hrs, Volume= 42,945 cf, Atten= 60%, Lag= 17.6 min
Primary = 4.37 cfs @ 12.40 hrs, Volume= 42,945 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,110.50' Surf.Area= 11,967 sf Storage= 11,052 cf
Peak Elev= 1,110.82' @ 12.40 hrs Surf.Area= 12,564 sf Storage= 14,951 cf (3,898 cf above start)
Flood Elev= 1,112.75' Surf.Area= 16,913 sf Storage= 39,123 cf (28,071 cf above start)

Plug-Flow detention time= 146.3 min calculated for 31,893 cf (87% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,109.50'	39,123 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,109.50	10,141	560.0	0	0	10,141
1,110.00	11,057	593.0	5,298	5,298	13,183
1,112.00	14,913	657.0	25,874	31,172	19,670
1,112.50	16,913	676.0	7,951	39,123	21,713

Device	Routing	Invert	Outlet Devices
#1	Primary	1,108.00'	**12.0" Round Culvert** L= 19.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,108.00' / 1,107.80' S= 0.0105 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

#2	Device 1	1,110.00'	**24.0" W x 8.0" H Vert. ORIFICE** C= 0.600
#3	Device 1	1,111.25'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.37 cfs @ 12.40 hrs HW=1,110.82' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.37 cfs of 5.76 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 4.37 cfs @ 3.28 fps)
  └─**3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-C: POND-C

Inflow Area = 223,129 sf, 0.00% Impervious, Inflow Depth = 1.57" for 10YR event
Inflow = 8.71 cfs @ 12.11 hrs, Volume= 29,254 cf
Outflow = 3.33 cfs @ 12.41 hrs, Volume= 29,239 cf, Atten= 62%, Lag= 18.5 min
Primary = 3.33 cfs @ 12.41 hrs, Volume= 29,239 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,120.50' Surf.Area= 14,751 sf Storage= 7,024 cf
Peak Elev= 1,121.01' @ 12.41 hrs Surf.Area= 16,255 sf Storage= 14,988 cf (7,964 cf above start)
Flood Elev= 1,122.75' Surf.Area= 22,561 sf Storage= 42,985 cf (35,961 cf above start)

Plug-Flow detention time= 206.3 min calculated for 22,169 cf (76% of inflow)
Center-of-Mass det. time= 61.8 min (914.1 - 852.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,120.00'	42,985 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,120.00	13,357	755.0	0	0	13,357
1,122.00	19,346	1,062.0	32,519	32,519	57,784
1,122.50	22,561	1,081.0	10,466	42,985	61,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,120.00'	**18.0" Round Culvert** L= 9.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,120.00' / 1,119.90' S= 0.0111 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,120.50'	**36.0" W x 12.0" H Vert. ORIFICE** C= 0.600
#3	Device 1	1,122.00'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.32 cfs @ 12.41 hrs HW=1,121.01' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.32 cfs @ 3.70 fps)
  ├─**2=ORIFICE** (Passes 3.32 cfs of 3.54 cfs potential flow)
  └─**3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-D: POND-D

Inflow Area = 335,900 sf, 0.00% Impervious, Inflow Depth = 1.12" for 10YR event
Inflow = 7.34 cfs @ 12.20 hrs, Volume= 31,422 cf
Outflow = 3.71 cfs @ 12.50 hrs, Volume= 31,413 cf, Atten= 49%, Lag= 18.3 min
Primary = 3.71 cfs @ 12.50 hrs, Volume= 31,413 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,126.50' Surf.Area= 12,224 sf Storage= 5,816 cf
Peak Elev= 1,127.04' @ 12.50 hrs Surf.Area= 13,548 sf Storage= 12,718 cf (6,902 cf above start)
Flood Elev= 1,128.75' Surf.Area= 18,840 sf Storage= 35,721 cf (29,904 cf above start)

Plug-Flow detention time= 169.0 min calculated for 25,544 cf (81% of inflow)
Center-of-Mass det. time= 49.6 min (927.6 - 878.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,126.00'	35,721 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,126.00	11,050	602.0	0	0	11,050
1,128.00	16,102	907.0	26,994	26,994	47,706
1,128.50	18,840	917.0	8,727	35,721	49,228

Device	Routing	Invert	Outlet Devices
#1	Primary	1,123.00'	**12.0" Round Culvert** L= 22.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,123.00' / 1,122.75' S= 0.0114 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	1,126.50'	**36.0" W x 6.0" H Vert. ORIFICE** C= 0.600
#3	Device 1	1,127.50'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.71 cfs @ 12.50 hrs HW=1,127.04' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.71 cfs of 7.11 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 3.71 cfs @ 2.47 fps)
  └─**3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-E: POND-E

Inflow Area = 485,355 sf, 0.00% Impervious, Inflow Depth = 1.31" for 10YR event
Inflow = 13.77 cfs @ 12.14 hrs, Volume= 52,880 cf
Outflow = 3.41 cfs @ 12.64 hrs, Volume= 52,786 cf, Atten= 75%, Lag= 30.0 min
Primary = 3.41 cfs @ 12.64 hrs, Volume= 52,786 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,114.00' Surf.Area= 21,903 sf Storage= 10,574 cf
Peak Elev= 1,114.76' @ 12.64 hrs Surf.Area= 24,211 sf Storage= 28,136 cf (17,562 cf above start)
Flood Elev= 1,116.75' Surf.Area= 31,451 sf Storage= 75,459 cf (64,886 cf above start)

Plug-Flow detention time= 244.0 min calculated for 42,213 cf (80% of inflow)

Center-of-Mass det. time= 106.0 min (972.4 - 866.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,113.50'	75,459 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,113.50	20,401	1,000.0	0	0	20,401
1,114.00	21,903	1,007.0	10,574	10,574	21,626
1,116.00	28,208	1,072.0	49,978	60,552	32,579
1,116.50	31,451	1,090.0	14,907	75,459	35,723

Device	Routing	Invert	Outlet Devices
#1	Primary	1,113.00'	**12.0" Round Culvert** L= 13.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,113.00' / 1,112.80' S= 0.0154 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	1,114.00'	**24.0" W x 6.0" H Vert. ORIFICE** C= 0.600
#3	Device 1	1,115.00'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.40 cfs @ 12.64 hrs HW=1,114.76' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 3.40 cfs of 4.24 cfs potential flow)
  - **2=ORIFICE** (Orifice Controls 3.40 cfs @ 3.40 fps)
  - **3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-F: POND-F

Inflow Area = 576,271 sf, 0.00% Impervious, Inflow Depth = 1.24" for 10YR event
Inflow = 13.21 cfs @ 12.24 hrs, Volume= 59,760 cf
Outflow = 1.28 cfs @ 14.94 hrs, Volume= 59,245 cf, Atten= 90%, Lag= 162.3 min
Primary = 1.28 cfs @ 14.94 hrs, Volume= 59,245 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,102.50' Surf.Area= 11,107 sf Storage= 5,245 cf
Peak Elev= 1,104.57' @ 14.94 hrs Surf.Area= 16,997 sf Storage= 34,067 cf (28,822 cf above start)
Flood Elev= 1,106.50' Surf.Area= 25,264 sf Storage= 73,625 cf (68,380 cf above start)

Plug-Flow detention time= 394.3 min calculated for 54,000 cf (90% of inflow)
Center-of-Mass det. time= 306.2 min (1,181.8 - 875.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,102.00'	73,625 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,102.00	9,884	862.0	0	0	9,884
1,104.00	15,206	904.0	24,900	24,900	16,045
1,106.00	21,934	1,101.0	36,935	61,835	47,541
1,106.50	25,264	1,120.0	11,790	73,625	50,944

Device	Routing	Invert	Outlet Devices
#1	Primary	1,102.00'	**18.0" Round Culvert** L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,102.00' / 1,101.90' S= 0.0056 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,102.50'	**6.0" Vert. ORIFICE** C= 0.600
#3	Device 1	1,105.25'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.28 cfs @ 14.94 hrs HW=1,104.57' TW=1,099.94' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.28 cfs of 11.34 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 1.28 cfs @ 6.49 fps)
  └─**3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-G: POND-G

Inflow Area = 109,220 sf, 0.00% Impervious, Inflow Depth = 1.37" for 10YR event
Inflow = 3.66 cfs @ 12.10 hrs, Volume= 12,485 cf
Outflow = 0.52 cfs @ 12.88 hrs, Volume= 12,257 cf, Atten= 86%, Lag= 46.7 min
Primary = 0.52 cfs @ 12.88 hrs, Volume= 12,257 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,102.50' Surf.Area= 8,438 sf Storage= 4,002 cf
Peak Elev= 1,103.06' @ 12.88 hrs Surf.Area= 9,447 sf Storage= 8,971 cf (4,969 cf above start)
Flood Elev= 1,104.75' Surf.Area= 13,260 sf Storage= 24,878 cf (20,876 cf above start)

Plug-Flow detention time= 423.9 min calculated for 8,255 cf (66% of inflow)
Center-of-Mass det. time= 188.3 min (1,048.9 - 860.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,102.00'	24,878 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,102.00	7,579	483.0	0	0	7,579
1,104.00	11,291	647.0	18,747	18,747	22,370
1,104.50	13,260	666.0	6,131	24,878	24,382

Device	Routing	Invert	Outlet Devices
#1	Primary	1,101.00'	**12.0" Round Culvert** L= 5.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,101.00' / 1,100.85' S= 0.0300 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	1,102.50'	**6.0" Vert. ORIFICE** C= 0.600
#3	Device 1	1,103.50'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.52 cfs @ 12.88 hrs HW=1,103.06' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.52 cfs of 4.72 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 0.52 cfs @ 2.66 fps)
  └─**3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-H: POND-H

Inflow Area = 292,966 sf, 0.00% Impervious, Inflow Depth = 0.74" for 10YR event
Inflow = 3.43 cfs @ 12.24 hrs, Volume= 18,037 cf
Outflow = 0.83 cfs @ 13.04 hrs, Volume= 17,968 cf, Atten= 76%, Lag= 48.0 min
Primary = 0.83 cfs @ 13.04 hrs, Volume= 17,968 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,136.50' Surf.Area= 4,432 sf Storage= 2,106 cf
Peak Elev= 1,137.52' @ 13.04 hrs Surf.Area= 5,392 sf Storage= 7,084 cf (4,979 cf above start)
Flood Elev= 1,140.50' Surf.Area= 9,141 sf Storage= 27,925 cf (25,819 cf above start)

Plug-Flow detention time= 189.2 min calculated for 15,863 cf (88% of inflow)
Center-of-Mass det. time= 99.3 min (1,004.9 - 905.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,136.00'	27,925 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,136.00	3,994	296.0	0	0	3,994
1,138.00	5,883	334.0	9,816	9,816	6,001
1,140.00	7,998	371.0	13,827	23,643	8,193
1,140.50	9,141	390.0	4,282	27,925	9,359

Device	Routing	Invert	Outlet Devices
#1	Primary	1,135.00'	**18.0" Round Culvert** L= 23.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,135.00' / 1,134.50' S= 0.0217 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,136.50'	**6.0" Vert. ORIFICE** C= 0.600
#3	Device 1	1,139.50'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.83 cfs @ 13.04 hrs HW=1,137.51' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.83 cfs of 11.30 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 0.83 cfs @ 4.21 fps)
  └─**3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-I: POND-I

Inflow Area = 569,403 sf, 0.00% Impervious, Inflow Depth = 1.44" for 10YR event
Inflow = 14.12 cfs @ 12.30 hrs, Volume= 68,212 cf
Outflow = 7.79 cfs @ 12.63 hrs, Volume= 67,681 cf, Atten= 45%, Lag= 19.9 min
Primary = 7.79 cfs @ 12.63 hrs, Volume= 67,681 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,058.50' Surf.Area= 9,292 sf Storage= 4,451 cf
Peak Elev= 1,060.33' @ 12.63 hrs Surf.Area= 12,364 sf Storage= 24,210 cf (19,758 cf above start)
Flood Elev= 1,062.75' Surf.Area= 17,193 sf Storage= 55,459 cf (51,008 cf above start)

Plug-Flow detention time= 229.4 min calculated for 63,230 cf (93% of inflow)
Center-of-Mass det. time= 170.3 min (1,041.0 - 870.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,058.00'	55,459 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,058.00	8,518	531.0	0	0	8,518
1,060.00	11,817	569.0	20,245	20,245	12,022
1,062.00	15,344	607.0	27,084	47,330	15,767
1,062.50	17,193	625.0	8,130	55,459	17,558

Device	Routing	Invert	Outlet Devices
#1	Primary	1,057.50'	**15.0" Round Culvert** L= 22.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,057.50' / 1,057.25' S= 0.0114 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,058.50'	**4.0" Vert. ORIFICE** C= 0.600
#3	Device 1	1,059.50'	**36.0" W x 12.0" H Vert. ORIFICE** C= 0.600
#4	Device 1	1,061.00'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.69 cfs @ 12.63 hrs HW=1,060.32' TW=1,052.11' (Dynamic Tailwater)
└─**1=Culvert** (Passes 7.69 cfs of 8.75 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 0.54 cfs @ 6.19 fps)
  ├─**3=ORIFICE** (Orifice Controls 7.15 cfs @ 2.91 fps)
  └─**4=HAALA** (Controls 0.00 cfs)

Summary for Pond P-J: POND-J

Inflow Area = 601,189 sf, 0.00% Impervious, Inflow Depth = 0.79" for 10YR event
Inflow = 6.56 cfs @ 12.37 hrs, Volume= 39,555 cf
Outflow = 0.76 cfs @ 15.93 hrs, Volume= 39,483 cf, Atten= 88%, Lag= 213.4 min
Primary = 0.76 cfs @ 15.93 hrs, Volume= 39,483 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,024.50' Surf.Area= 3,471 sf Storage= 1,633 cf
Peak Elev= 1,027.92' @ 15.93 hrs Surf.Area= 7,725 sf Storage= 19,794 cf (18,161 cf above start)
Flood Elev= 1,028.50' Surf.Area= 9,495 sf Storage= 24,745 cf (23,113 cf above start)

Plug-Flow detention time= 354.2 min calculated for 37,850 cf (96% of inflow)
Center-of-Mass det. time= 311.0 min (1,219.4 - 908.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,024.00'	24,745 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,024.00	3,065	277.0	0	0	3,065
1,026.00	4,839	314.0	7,837	7,837	4,903
1,028.00	7,859	536.0	12,577	20,413	19,943
1,028.50	9,495	555.0	4,332	24,745	21,615

Device	Routing	Invert	Outlet Devices
#1	Primary	1,023.00'	**24.0" Round Culvert** L= 21.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,023.00' / 1,022.70' S= 0.0143 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	1,024.50'	**4.0" Vert. ORIFICE** C= 0.600
#3	Device 1	1,028.00'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.76 cfs @ 15.93 hrs HW=1,027.92' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.76 cfs of 26.43 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 0.76 cfs @ 8.69 fps)
  └─**3=HAALA** (Controls 0.00 cfs)

Summary for Pond P-K: POND-K

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 369,396 sf, 0.00% Impervious, Inflow Depth = 1.50" for 10YR event
Inflow = 9.70 cfs @ 12.30 hrs, Volume= 46,319 cf
Outflow = 12.39 cfs @ 12.32 hrs, Volume= 46,016 cf, Atten= 0%, Lag= 1.5 min
Primary = 12.39 cfs @ 12.32 hrs, Volume= 46,016 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,094.50' Surf.Area= 9,191 sf Storage= 4,287 cf
Peak Elev= 1,095.24' @ 12.33 hrs Surf.Area= 11,159 sf Storage= 11,814 cf (7,527 cf above start)
Flood Elev= 1,096.75' Surf.Area= 16,354 sf Storage= 28,530 cf (24,244 cf above start)

Plug-Flow detention time= 174.7 min calculated for 41,729 cf (90% of inflow)
Center-of-Mass det. time= 101.6 min (969.2 - 867.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,094.00'	28,530 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,094.00	7,971	710.0	0	0	7,971
1,096.00	13,372	985.0	21,111	21,111	45,103
1,096.50	16,354	1,004.0	7,419	28,530	48,151

Device	Routing	Invert	Outlet Devices
#1	Primary	1,092.50'	**18.0" Round Culvert** L= 12.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,092.50' / 1,092.30' S= 0.0167 '/' Cc= 0.900

n= 0.013, Flow Area= 1.77 sf
#2 Device 1 1,094.50' **6.0" Vert. ORIFICE** C= 0.600
#3 Device 1 1,095.15' **4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=10.96 cfs @ 12.32 hrs HW=1,095.23' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 10.96 cfs of 11.97 cfs potential flow)
└**2=ORIFICE** (Orifice Controls 0.66 cfs @ 3.34 fps)
└**3=HAALA** (Weir Controls 10.30 cfs @ 0.93 fps)

Summary for Pond P-L: POND-L

Inflow Area = 385,597 sf, 0.00% Impervious, Inflow Depth = 1.06" for 10YR event
Inflow = 7.82 cfs @ 12.21 hrs, Volume= 34,178 cf
Outflow = 5.49 cfs @ 12.41 hrs, Volume= 34,175 cf, Atten= 30%, Lag= 12.5 min
Primary = 5.49 cfs @ 12.41 hrs, Volume= 34,175 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,066.50' Surf.Area= 4,405 sf Storage= 2,042 cf
Peak Elev= 1,067.64' @ 12.42 hrs Surf.Area= 6,033 sf Storage= 7,958 cf (5,916 cf above start)
Flood Elev= 1,069.50' Surf.Area= 9,158 sf Storage= 21,907 cf (19,865 cf above start)

Plug-Flow detention time= 78.6 min calculated for 32,066 cf (94% of inflow)
Center-of-Mass det. time= 36.2 min (917.9 - 881.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,066.00'	21,907 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,066.00	3,771	348.0	0	0	3,771
1,068.00	6,604	495.0	10,244	10,244	13,668
1,069.00	8,117	514.0	7,348	17,591	15,275
1,069.50	9,158	527.0	4,316	21,907	16,383

Device	Routing	Invert	Outlet Devices
#1	Primary	1,066.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 1.00 1.00 3.00
			Width (feet) 1.00 1.00 10.00 10.00

Primary OutFlow Max=5.38 cfs @ 12.41 hrs HW=1,067.63' TW=1,065.55' (Dynamic Tailwater)
└**1=Custom Weir/Orifice** (Weir Controls 5.38 cfs @ 2.31 fps)

Summary for Pond P-M: POND-M

Inflow Area = 130,552 sf, 0.00% Impervious, Inflow Depth = 0.79" for 10YR event
Inflow = 1.78 cfs @ 12.21 hrs, Volume= 8,590 cf
Outflow = 0.71 cfs @ 12.62 hrs, Volume= 8,584 cf, Atten= 60%, Lag= 24.6 min
Primary = 0.71 cfs @ 12.62 hrs, Volume= 8,584 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Starting Elev= 1,056.50' Surf.Area= 5,283 sf Storage= 2,530 cf
Peak Elev= 1,056.86' @ 12.62 hrs Surf.Area= 5,617 sf Storage= 4,493 cf (1,964 cf above start)
Flood Elev= 1,058.50' Surf.Area= 7,384 sf Storage= 15,052 cf (12,522 cf above start)

Plug-Flow detention time= 265.0 min calculated for 6,054 cf (70% of inflow)
Center-of-Mass det. time= 69.9 min (969.0 - 899.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,056.00'	15,052 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,056.00	4,838	298.0	0	0	4,838
1,058.00	6,737	336.0	11,523	11,523	6,857
1,058.50	7,384	346.0	3,529	15,052	7,426

Device	Routing	Invert	Outlet Devices
#1	Primary	1,056.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 0.50 2.00 Width (feet) 1.00 1.00 10.00 10.00

Primary OutFlow Max=0.70 cfs @ 12.62 hrs HW=1,056.86' TW=1,054.01' (Dynamic Tailwater)
↑—**1=Custom Weir/Orifice** (Weir Controls 0.70 cfs @ 1.96 fps)

Summary for Pond P-N: POND-N

Inflow Area = 271,365 sf, 0.00% Impervious, Inflow Depth = 1.50" for 10YR event
Inflow = 7.25 cfs @ 12.28 hrs, Volume= 34,027 cf
Outflow = 0.55 cfs @ 15.72 hrs, Volume= 33,573 cf, Atten= 92%, Lag= 206.4 min
Primary = 0.55 cfs @ 15.72 hrs, Volume= 33,573 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Starting Elev= 1,104.50' Surf.Area= 8,241 sf Storage= 3,888 cf
Peak Elev= 1,106.37' @ 15.72 hrs Surf.Area= 12,259 sf Storage= 22,919 cf (19,031 cf above start)
Flood Elev= 1,108.50' Surf.Area= 18,615 sf Storage= 55,194 cf (51,307 cf above start)

Plug-Flow detention time= 578.0 min calculated for 29,686 cf (87% of inflow)
Center-of-Mass det. time= 449.8 min (1,316.2 - 866.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,104.00'	55,194 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,104.00	7,319	560.0	0	0	7,319
1,106.00	11,333	707.0	18,506	18,506	22,194
1,108.00	16,703	950.0	27,863	46,369	54,279
1,108.50	18,615	962.0	8,825	55,194	56,166

Device	Routing	Invert	Outlet Devices
#1	Primary	1,102.10'	**15.0" Round Culvert** L= 16.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,102.10' / 1,102.00' S= 0.0062 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,104.50'	**4.0" Vert. ORIFICE** C= 0.600
#3	Device 1	1,106.50'	**7.0" Vert. ORIFICE** C= 0.600
#4	Device 1	1,108.00'	**4.0" x 4.0" Horiz. HAALA X 104.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.55 cfs @ 15.72 hrs HW=1,106.37' TW=1,102.02' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.55 cfs of 11.29 cfs potential flow)
  ├─**2=ORIFICE** (Orifice Controls 0.55 cfs @ 6.29 fps)
  ├─**3=ORIFICE** (Controls 0.00 cfs)
  └─**4=HAALA** (Controls 0.00 cfs)

Summary for Link PA1: SCOTT'S BROOK

Inflow Area = 966,450 sf, 0.00% Impervious, Inflow Depth = 1.64" for 10YR event
Inflow = 19.65 cfs @ 12.32 hrs, Volume= 131,796 cf
Primary = 19.65 cfs @ 12.32 hrs, Volume= 131,796 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Summary for Link PA2: SIP POND WETLAND

Inflow Area = 1,663,448 sf, 0.00% Impervious, Inflow Depth > 1.32" for 10YR event
Inflow = 28.18 cfs @ 12.32 hrs, Volume= 182,792 cf
Primary = 28.18 cfs @ 12.32 hrs, Volume= 182,792 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Summary for Link PA3: CRANE ROAD WETLAND

Inflow Area = 4,249,925 sf, 0.00% Impervious, Inflow Depth > 1.23" for 10YR event
Inflow = 30.51 cfs @ 12.74 hrs, Volume= 436,126 cf
Primary = 30.51 cfs @ 12.74 hrs, Volume= 436,126 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1.0: Runoff Area=157,015 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=450' Tc=7.7 min CN=71 Runoff=11.15 cfs 38,668 cf

Subcatchment1.1: Runoff Area=283,669 sf 0.00% Impervious Runoff Depth=3.05"
Flow Length=913' Tc=9.5 min CN=72 Runoff=19.34 cfs 72,113 cf

Subcatchment1.2: Runoff Area=280,660 sf 0.00% Impervious Runoff Depth=3.05"
Flow Length=686' Tc=5.8 min CN=72 Runoff=21.68 cfs 71,348 cf

Subcatchment1.3: Runoff Area=223,129 sf 0.00% Impervious Runoff Depth=3.05"
Flow Length=508' Tc=5.8 min CN=72 Runoff=17.24 cfs 56,723 cf

Subcatchment1.4: Runoff Area=21,977 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=2,653' Tc=43.4 min CN=71 Runoff=0.82 cfs 5,412 cf

Subcatchment2.0: Runoff Area=118,990 sf 0.00% Impervious Runoff Depth=3.15"
Flow Length=857' Tc=13.2 min CN=73 Runoff=7.76 cfs 31,203 cf

Subcatchment2.1: Runoff Area=335,900 sf 0.00% Impervious Runoff Depth=2.40"
Flow Length=913' Tc=11.2 min CN=65 Runoff=16.79 cfs 67,246 cf

Subcatchment2.2: Runoff Area=485,355 sf 0.00% Impervious Runoff Depth=2.67"
Flow Length=1,025' Tc=8.6 min CN=68 Runoff=29.82 cfs 108,181 cf

Subcatchment2.3: Runoff Area=15,945 sf 0.00% Impervious Runoff Depth=2.96"
Tc=5.0 min CN=71 Runoff=1.20 cfs 3,927 cf

Subcatchment2.4: Runoff Area=22,331 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=255' Tc=8.3 min CN=71 Runoff=1.55 cfs 5,499 cf

Subcatchment2.5: Runoff Area=253,783 sf 0.00% Impervious Runoff Depth=2.40"
Flow Length=1,299' Tc=19.9 min CN=65 Runoff=10.66 cfs 50,806 cf

Subcatchment2.6: Runoff Area=24,694 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=52' Slope=0.0385 '/' Tc=6.3 min CN=71 Runoff=1.83 cfs 6,081 cf

Subcatchment2.7: Runoff Area=369,396 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=560' Tc=19.2 min CN=71 Runoff=19.65 cfs 90,972 cf

Subcatchment2.8: Runoff Area=37,054 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=78' Slope=0.0800 '/' Tc=5.0 min CN=71 Runoff=2.78 cfs 9,125 cf

Subcatchment3.0: Runoff Area=576,271 sf 0.00% Impervious Runoff Depth=2.58"
Flow Length=1,165' Tc=15.3 min CN=67 Runoff=29.15 cfs 124,042 cf

Subcatchment3.1: Runoff Area=47,963 sf 0.00% Impervious Runoff Depth=2.23"
Flow Length=3,323' Tc=80.1 min CN=63 Runoff=0.90 cfs 8,895 cf

Subcatchment3.10: Runoff Area=87,933 sf 0.00% Impervious Runoff Depth=5.60"
Tc=5.0 min CN=96 Runoff=11.04 cfs 41,014 cf

Subcatchment3.11: Runoff Area=125,123 sf 0.00% Impervious Runoff Depth=2.05"
Flow Length=494' Tc=13.9 min CN=61 Runoff=5.03 cfs 21,401 cf

Subcatchment3.12: Runoff Area=60,346 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=1,489' Tc=29.5 min CN=70 Runoff=2.62 cfs 14,387 cf

Subcatchment3.13: Runoff Area=103,667 sf 0.00% Impervious Runoff Depth=3.24"
Flow Length=3,829' Tc=70.4 min CN=74 Runoff=3.21 cfs 28,023 cf

Subcatchment3.14: Runoff Area=185,149 sf 0.00% Impervious Runoff Depth=2.77"
Flow Length=3,669' Tc=61.0 min CN=69 Runoff=5.30 cfs 42,697 cf

Subcatchment3.15: Runoff Area=250,791 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=2,611' Tc=45.0 min CN=71 Runoff=9.16 cfs 61,763 cf

Subcatchment3.16: Runoff Area=28,988 sf 0.00% Impervious Runoff Depth=2.05"
Flow Length=1,969' Tc=36.9 min CN=61 Runoff=0.78 cfs 4,958 cf

Subcatchment3.17: Runoff Area=135,315 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=4,039' Tc=67.5 min CN=70 Runoff=3.76 cfs 32,260 cf

Subcatchment3.2: Runoff Area=109,220 sf 0.00% Impervious Runoff Depth=2.77"
Flow Length=310' Tc=5.5 min CN=69 Runoff=7.65 cfs 25,187 cf

Subcatchment3.3: Runoff Area=292,966 sf 0.00% Impervious Runoff Depth=1.80"
Flow Length=710' Tc=13.3 min CN=58 Runoff=10.18 cfs 43,959 cf

Subcatchment3.4: Runoff Area=569,403 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=1,051' Tc=19.5 min CN=70 Runoff=29.13 cfs 135,748 cf

Subcatchment3.5: Runoff Area=601,189 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=1,679' Tc=20.8 min CN=59 Runoff=18.73 cfs 94,362 cf

Subcatchment3.6: Runoff Area=385,597 sf 0.00% Impervious Runoff Depth=2.31"
Flow Length=812' Tc=11.7 min CN=64 Runoff=18.41 cfs 74,338 cf

Subcatchment3.7: Runoff Area=130,552 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=842' Tc=10.8 min CN=59 Runoff=4.95 cfs 20,491 cf

Subcatchment3.8: Runoff Area=271,365 sf 0.00% Impervious Runoff Depth=2.96"
Flow Length=864' Tc=17.9 min CN=71 Runoff=14.69 cfs 66,829 cf

Subcatchment3.9: Runoff Area=288,087 sf 0.00% Impervious Runoff Depth=2.67"
Flow Length=2,553' Tc=57.5 min CN=68 Runoff=8.21 cfs 64,212 cf

Reach 1R: Avg. Flow Depth=0.16' Max Vel=0.71 fps Inflow=17.53 cfs 74,334 cf
n=0.100 L=816.0' S=0.0263 '/' Capacity=73.52 cfs Outflow=11.22 cfs 74,331 cf

Reach 4R: Avg. Flow Depth=0.15' Max Vel=0.80 fps Inflow=11.56 cfs 135,202 cf
n=0.100 L=207.0' S=0.0386 '/' Capacity=38.01 cfs Outflow=11.55 cfs 135,170 cf

Reach 5R: Avg. Flow Depth=0.06' Max Vel=0.35 fps Inflow=3.95 cfs 20,485 cf
n=0.100 L=578.0' S=0.0241 '/' Capacity=4.81 cfs Outflow=2.12 cfs 20,470 cf

Reach 6R: Avg. Flow Depth=0.05' Max Vel=0.35 fps Inflow=1.78 cfs 66,235 cf
n=0.100 L=1,815.0' S=0.0320 '/' Capacity=17.59 cfs Outflow=1.60 cfs 65,474 cf

Reach 7R: Avg. Flow Depth=0.13' Max Vel=0.29 fps Inflow=10.43 cfs 41,014 cf
n=0.100 L=1,189.7' S=0.0067 '/' Capacity=2.54 cfs Outflow=3.65 cfs 40,835 cf

Reach 13R: Avg. Flow Depth=0.09' Max Vel=0.45 fps Inflow=14.03 cfs 123,412 cf
n=0.100 L=2,520.0' S=0.0222 '/' Capacity=67.46 cfs Outflow=3.95 cfs 122,201 cf

Pond 4P: Substation Peak Elev=1,189.54' Storage=1,534 cf Inflow=11.04 cfs 41,014 cf
Outflow=10.43 cfs 41,014 cf

Pond P-A: POND-A Peak Elev=1,083.75' Storage=17,042 cf Inflow=19.34 cfs 72,113 cf
Outflow=10.45 cfs 72,089 cf

Pond P-B: POND-B Peak Elev=1,111.65' Storage=26,137 cf Inflow=21.68 cfs 71,348 cf
Outflow=6.72 cfs 77,496 cf

Pond P-C: POND-C Peak Elev=1,121.50' Storage=23,256 cf Inflow=17.24 cfs 56,723 cf
Outflow=6.16 cfs 56,708 cf

Pond P-D: POND-D Peak Elev=1,127.69' Storage=22,081 cf Inflow=16.79 cfs 67,246 cf
Outflow=7.74 cfs 67,237 cf

Pond P-E: POND-E Peak Elev=1,115.70' Storage=52,135 cf Inflow=29.82 cfs 108,181 cf
Outflow=5.60 cfs 108,082 cf

Pond P-F: POND-F Peak Elev=1,105.47' Storage=50,705 cf Inflow=29.15 cfs 124,042 cf
Outflow=14.03 cfs 123,412 cf

Pond P-G: POND-G Peak Elev=1,103.54' Storage=13,716 cf Inflow=7.65 cfs 25,187 cf
Outflow=3.79 cfs 24,948 cf

Pond P-H: POND-H Peak Elev=1,139.39' Storage=18,972 cf Inflow=10.18 cfs 43,959 cf
Outflow=1.54 cfs 43,888 cf

Pond P-I: POND-I Peak Elev=1,061.95' Storage=46,638 cf Inflow=29.13 cfs 135,748 cf
Outflow=11.56 cfs 135,202 cf

Pond P-J: POND-J Peak Elev=1,028.11' Storage=21,326 cf Inflow=18.73 cfs 94,362 cf
Outflow=18.10 cfs 94,276 cf

Pond P-K: POND-K Peak Elev=1,095.74' Storage=17,753 cf Inflow=19.65 cfs 90,972 cf
Outflow=13.43 cfs 90,652 cf

Pond P-L: POND-L Peak Elev=1,068.03' Storage=10,459 cf Inflow=18.41 cfs 74,338 cf
Outflow=17.53 cfs 74,334 cf

Pond P-M: POND-M Peak Elev=1,057.17' Storage=6,306 cf Inflow=4.95 cfs 20,491 cf
Outflow=3.95 cfs 20,485 cf

Pond P-N: POND-N Peak Elev=1,107.48' Storage=38,121 cf Inflow=14.69 cfs 66,829 cf
Outflow=1.78 cfs 66,235 cf

Link PA1: SCOTT'S BROOK Inflow=31.15 cfs 250,374 cf
Primary=31.15 cfs 250,374 cf

Link PA2: SIP POND WETLAND Inflow=46.34 cfs 372,613 cf
Primary=46.34 cfs 372,613 cf

Link PA3: CRANE ROAD WETLAND Inflow=78.84 cfs 900,187 cf
Primary=78.84 cfs 900,187 cf

Total Runoff Area = 6,879,823 sf Runoff Volume = 1,521,871 cf Average Runoff Depth = 2.65"
100.00% Pervious = 6,879,823 sf 0.00% Impervious = 0 sf

SITE SPECIFIC SOIL SURVEY HYDROLOGIC SOIL GROUP (HSG) LEGEND		
SYMBOL	SOIL TYPE, SLOPE RATING	HSG
56	BECKET (3 TO 8% AND 8 TO 15%)	C
57	BECKET, VERY STONY (3 TO 8%, 8 TO 15% AND 15 TO 25%)	C
60	TURNBRIDGE-BERKSHIRE COMPLEX (0 TO 8%)	C
73	BERKSHIRE (0 TO 8%, 8 TO 15% AND 15 TO 25%)	B
76	MARLOW (3 TO 8%, 8 TO 15%, 15 TO 25% AND 25 TO 50%)	C
77	MARLOW, VERY STONY (0 TO 8%, 8 TO 15% AND 15 TO 25%)	B
143	MONADNOCK (0 TO 8%, 8 TO 15%, 15 TO 25%, 25 TO 50% AND 50%+)	B
168	SUNAPEE (3 TO 8%, 8 TO 15% AND 15 TO 25%)	B
559	SKERRY (3 TO 8%, 8 TO 15% AND 15 TO 25%)	C

NOTES:

1. SSSS PREPARED BY LUKE HURLEY, GES INC., DATED 05/04/2018.

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

N.H. ROUTE 119

SCOTT'S BROOK

FLOODZONE X

FLOODZONE A

FULLAM HILL ROAD

WINCHENDON ROAD - N.H. ROUTE 12

CRANE ROAD

C.801 C.802 C.803 C.804 C.805 C.806 C.807 C.808 C.809 C.810 C.811 C.812 C.813 C.814

POST 1.0 POST 1.1 POST 1.2 POST 1.3 POST 1.4 POST 2.0 POST 2.1 POST 2.2 POST 2.3 POST 2.4 POST 2.5 POST 2.6 POST 2.7 POST 2.8 POST 3.0 POST 3.1 POST 3.2 POST 3.3 POST 3.4 POST 3.5 POST 3.6 POST 3.7 POST 3.8 POST 3.9 POST 3.10 POST 3.11 POST 3.12 POST 3.15 POST 3.16 POST 3.17

PA1 PA2 PA3

POST POND A POST POND B POST POND C POST POND D POST POND E POST POND F POST POND G POST POND H POST POND 4P POST POND WLD

N

SCALE IN FEET
0 500' 1000'
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NEXTera ENERGY

BRADLEE MEZICA A. No. 08.80 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

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Chinook Solar, LLC

Fitzwilliam, NH

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PROJECT NO:	N0758-019
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POST-DEVELOPMENT WATERSHED KEY PLAN

SCALE: AS SHOWN

C.800

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BRADLEE MEDICA No. 08389 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10/2/19

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POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.801

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

POST 1.0

POST POND B

POST 1.2

POST 1.0

PA1

57D HSG C

57B HSG C

57C HSG C

57B HSG C

559B HSG C

57D HSG C

HSG D

HSG D

CONST. OCS-B RIM=1111.25 INV OUT=1108.00 SW

19 LF 12" HDPE @ 1.05%

CONST. FES-B INV OUT=1107.80 NE

MATCH TO SHEET C.803

N

SCALE IN FEET 0 50' 100'

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POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.802

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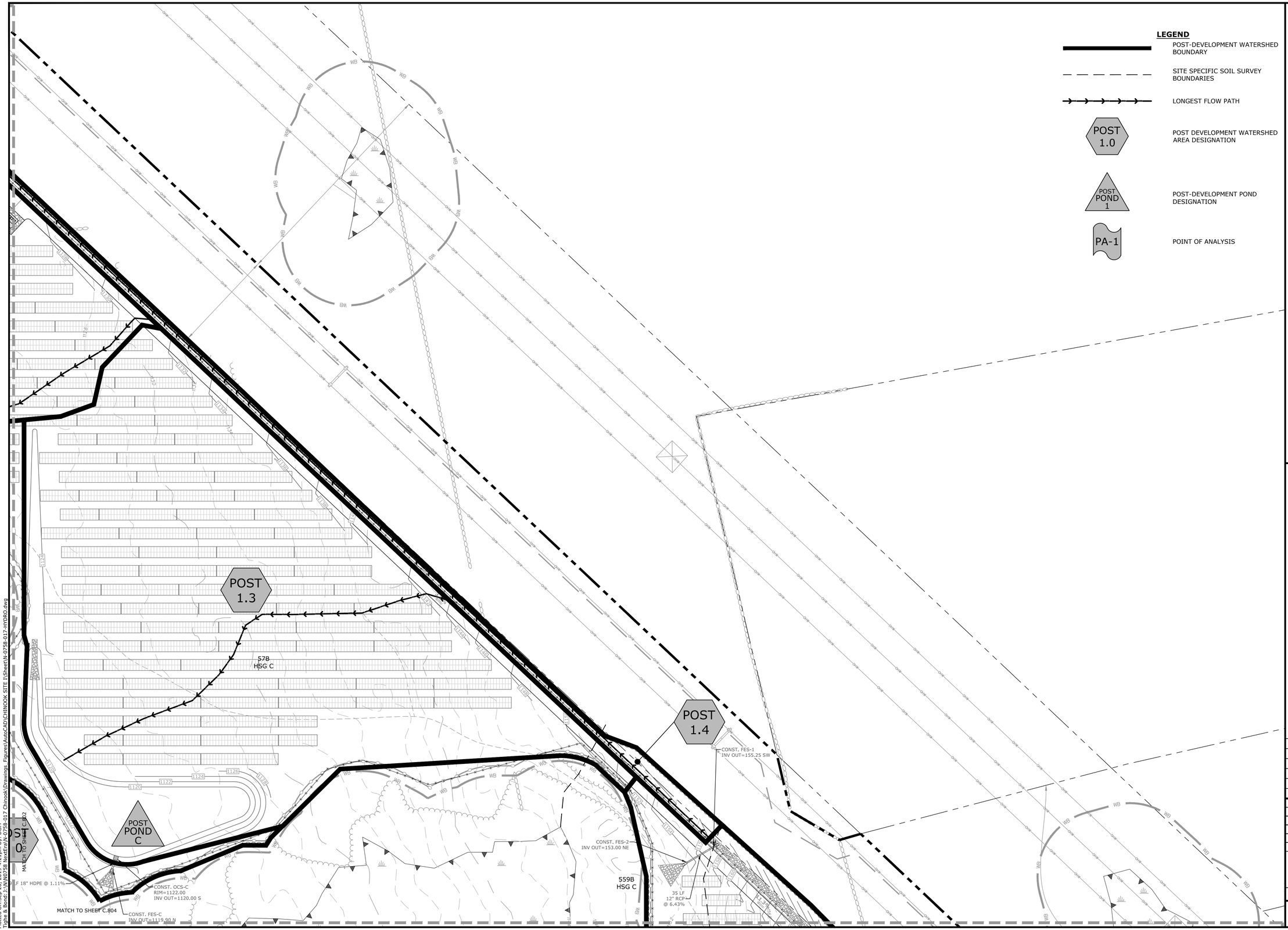

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

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POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.803

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MATCH TO SHEET C.803

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
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- PA-1 — POINT OF ANALYSIS

POST 2.0

POST 2.1

POST 2.3

POST POND D

17 LF 12" RCP @ 5.88%

CONST. FES-3
INV OUT=1184.00 W

CONST. FES-4
INV OUT=1183.00 E

CONST. OCS-D
RIM=1127.50
INV OUT=1123.00 W

22 LF 12" HDPE @ 1.14%

CONST. FES-D
INV OUT=1122.75 E

559B HSG C

559C HSG C

559D HSG C

168C HSG B

168D HSG B

HSG D

MATCH TO SHEET C.806

MATCH TO SHEET C.805

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICI A No. 0[illegible] – LICENSED PROFESSIONAL ENGINEER

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 – LICENSED PROFESSIONAL ENGINEER

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GRAPHIC SCALE

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Chinook Solar, LLC

Fitzwilliam, NH

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POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.804

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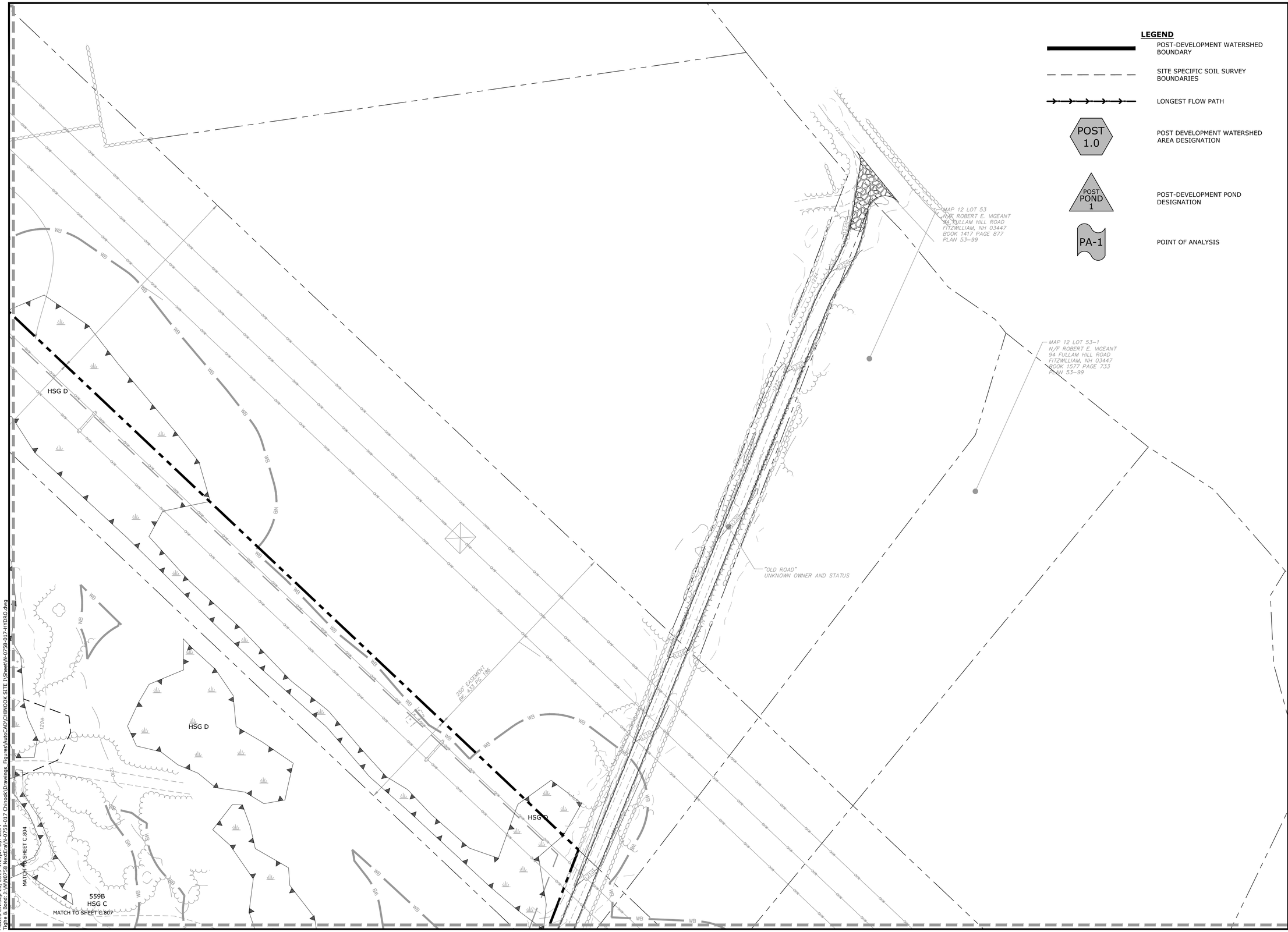

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
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Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

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MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.805

Last Saved: 9/26/2019
Plotted: Oct 02, 2019 - 4:21pm By: DGM
Tighe & Bond J:\N\N0758 NextEra\N-0758-017 Chinook\Drawings, Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-HYDRO.dwg

MATCH TO SHEET C.804

HSG D

168D
HSG B

POST
2.5

POST
2.2

168C
HSG B

559B
HSG C

HSG D

168C
HSG B

CONST. FES-8
INV OUT=1176.00 SW

9.5%

3.0%

10%

46 LF 15" RCP @ 3.26%

CONST. FES-6
INV OUT=1174.50 NE

168C
HSG B

POST
POND
E

13 LF 12" HDPE @ 1.54%

CONST. FES-E
INV OUT=1112.80 E

CONST. OCS-E
RIM=1115.00
INV OUT=1113.00 W

559B
HSG C

POST
2.4

CONST. FES-8
INV OUT=1187.50 NE

HSG D

22 LF 12" RCP @ 2.27%

CONST. FES-9
INV OUT=1143.00 SW

CONST. FES-10
INV OUT=1142.50 NE

HSG D

4.85%

CONST. FES-12
INV OUT=1146.45 E

24 LF 12" RCP @ 1.04%

CONST. FES-11
INV OUT=1146.70 W

168B
HSG B

559B

HSG D

POST
2.5

POST
3.0

MATCH TO SHEET C.807

808

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

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Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEDICI A
No. 0[illegible]
LICENSED
PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12388
LICENSED
PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
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CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.806

Last Saved: 9/26/2019
Plotted On: Sep 26, 2019-4:22pm By: DGM

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

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Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
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0 1 INCH
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MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.807

MATCH TO SHEET C.806

MATCH TO SHEET C.807

POST 2.5

POST 3.0

POST 3.1

POST POND F

559B
HSG C

168C
HSG B

168B
HSG B

HSG D

559C
HSG C

CONST. OCS-F
RIM=1105.25
INV OUT=1101.90 S

18 LF 18" HDPE @ 0.56%

CONST. FES-F
INV OUT=1101.90 N

68 LF 18"

CONST. FE
INV OUT=11

18 LF 15" RCP @ 1

MATCH TO SHEET C.809

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

Last Saved: 9/26/2019
Plotted: Oct 02, 2019 - 4:23pm By: DGM
Xrefs: C:\Users\dgm\Tighe & Bond\J:\N\N0758 NextEra\N-0758-017 Chinook\Drawings, Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-HYDRO.dwg

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

BRADLEE MEDICA
No. 08380
LICENSED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO
No. 12388
LICENSED PROFESSIONAL ENGINEER
STATE OF NEW HAMPSHIRE
10/2/19

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
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0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.808

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

BRADLEE MECCA A. No. 08.89 — STATE OF NEW HAMPSHIRE — LICENSED PROFESSIONAL ENGINEER

JOSEPH M. PERSECHINO No. 12388 — STATE OF NEW HAMPSHIRE — LICENSED PROFESSIONAL ENGINEER

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 — 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

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DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.809

Last Saved: 9/26/2019
Plotted: 10/02/2019 10:4:23pm By: DGM
Tighe & Bond:J:\NW\N0758 NextEra\N-0758-017 Chinook\Drawings Figures\AutoCAD\CHINOOK SITE 1\SheetN-0758-017-HYDRO.dwg

MATCH TO SHEET C.808

HSG D

60B
HSG C

56B
HSG C

168C
HSG B

168D
HSG B

POST
3.13

POST
3.9

POST
2.6

CONST. FES-25
INV OUT=1113.00 W

159 LF 15" HDPE @ 5.66%

CONST. FES-26
INV OUT=1104.00 E

CONST. OCS-N
RIM=1108.00
INV OUT=1102.10 SW

16 LF 15" HDPE @ 0.62%

CONST. FES-N
INV OUT=1102.00 NE

STREAM
(TYP.)

60D
HSG C

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

MATCH TO SHEET C.812

MATCH TO SHEET C.811

Last Saved: 9/26/2019
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NEXTera ENERGY

BRADLEE MEDICI A No. 08380 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
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CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.810

MATCH TO SHEET C.809

POST 3.8

POST 3.2

POST POND G

POST POND H

POST 3.3

POST 3.13

POST 3.4

POST 3.12

60D HSG C

60C HSG C

60B HSG C

77C HSG B

77D HSG B

168C HSG B

60D HSG C

STREAM (TYP.)

CONST. OCS-G
RIM=1103.50
INV OUT=1101.00 E

5 LF 12" HDPE @ 3.00%

CONST. FES-G
INV OUT=1100.85 W

CONST. OCS-H
RIM=1137.97
OUT=1135.00 SE

23 LF 18" HDPE @ 2.17%

CONST. FES-H
INV OUT=1134.50 NW

23 LF 15" HDPE @ 1.48%

MATCH TO SHEET C.810

MATCH TO SHEET C.813

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

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NEXTera ENERGY

BRADLEE MEDICI A No. 08580 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10/2/19

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
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MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
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CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.811

Last Saved: 9/26/2019
Plotted: Thursday, October 03, 2019 9:14:24am By: DGM
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MATCH TO SHEET C.810

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS
- PA2

POST 2.8
POST POND K
POST 2.7
POST 3.6
POST 3.5
POST 1.0
POST POND 1
PA-1
PA2

CONST. OCS-K
RIM=1095.15
INV OUT=1093.50 SW

CONST. FES-K
INV OUT=1093.40 NE

CONST. FES-27
INV OUT=1078.00 E

60B
HSG C

559C
HSG C

57B
HSG C

168B
HSG B

168D
HSG B

MATCH TO SHEET C.813

Last Saved: 9/26/2019
Plotted On: 9/27/2019 4:25pm By: DGM
Tighe & Bond: J:\W\W0758 NextEra\W-0758-017 Chinook\Drawings_Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-HYDRO.dwg

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

BRADLEE MEDICI A. No. 08580 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10/2/19

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.812

MATCH TO SHEET C.811

MATCH TO SHEET C.812

MATCH TO SHEET C.814

POST 3.4

POST POND I

POST POND L

POST POND M

POST 3.11

POST 3.7

POST 3.5

PA3

168C HSG B

143C HSG B

143B HSG B

143D HSG B

143E HSG B

73C HSG B

HSG D

STREAM (TYP.)

26 LF 15" RCP @ 5.00%

CONST. PDMH1
RIM=1080.00
INV IN=1076.70 W
INV OUT=1067.85 E

37 LF 15" HDPE @ 5.00%

CONST. FES-28
INV OUT=1066.00 W

CONST. FES-30
INV OUT=1068.00 S

54 LF 15" RCP @ 0.74%

CONST. FES-32
INV OUT=1056.00 S

28 LF 12" RCP @ 0.54%

CONST. FES-31
INV OUT=1056.15 N

CONST. FES-29
INV OUT=1068.40 N

CONST. FES-1
INV OUT=1057.25 NW

CONST. OCS-I
RIM=1061.00
INV OUT=1057.50 SE

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

BRADLEE MEDICI A No. 08389 LICENSED PROFESSIONAL ENGINEER - STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER - STATE OF NEW HAMPSHIRE
10/2/19

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
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0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.813

Last Saved: 9/26/2019
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MATCH TO SHEET C.813

POST POND J

POST 3.5

73B
HSG B

73D
HSG B

143C
HSG B

143D
HSG B

21 LF 24" HDPE @ 1.43%

CONST. OCS-J
RIM=1027.49
INV OUT=1023.00 SE

CONST. FES-1
INV OUT=1022.70 NW

HSG D

LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

BRADLEE MEDICA TA — No. 08380 — LICENSED PROFESSIONAL ENGINEER — STATE OF NEW HAMPSHIRE

JOSEPH M. PERSECHINO — No. 12388 — LICENSED PROFESSIONAL ENGINEER — STATE OF NEW HAMPSHIRE

N

SCALE IN FEET
0 50' 100'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 — 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C.814

Last Saved: 9/26/2019
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LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- SITE SPECIFIC SOIL SURVEY BOUNDARIES
- LONGEST FLOW PATH
- POST 1.0 — POST DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS

SITE SPECIFIC SOIL SURVEY HYDROLOGIC SOIL GROUP RATING

- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP C
- IMPERVIOUS AREA
- WETLANDS (HYDROLOGIC SOIL GROUP D)

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZCUA No. 08380 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

SCALE IN FEET
0 500' 1000'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-HYDRO.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

POST-DEVELOPMENT WATERSHED COLOR PLAN

SCALE: AS SHOWN

C.815

Last Saved: 9/26/2019
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Tighe&Bond

SECTION 7

Section 7
Rip-Rap Calculations

(See following pages)

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron A

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	9.24	cfs
Do (ft.)	1.25	ft
T_w (ft.)	0.50	ft

Output:		
Width of Apron (W1)	4	ft.
Width of Apron (W2)	24	ft.
Length of Apron (L_a)	21	ft.
Median Diameter	0.58	ft.
Riprap min. depth	1.30	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron B

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	6.02	cfs
Do (ft.)	1.00	ft
T_w (ft.)	0.40	ft

Output:		
Width of Apron (W1)	3	ft.
Width of Apron (W2)	21	ft.
Length of Apron (L_a)	18	ft.
Median Diameter	0.52	ft.
Riprap min. depth	1.16	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron C

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	4.77	cfs
Do (ft.)	1.50	ft
T_w (ft.)	0.60	ft

Output:		
Width of Apron (W1)	5	ft.
Width of Apron (W2)	20	ft.
Length of Apron (L_a)	15	ft.
Median Diameter	0.50	ft.
Riprap min. depth	1.13	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron D

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	5.66	cfs
Do (ft.)	1.00	ft
T_w (ft.)	0.40	ft

Output:		
Width of Apron (W1)	3	ft.
Width of Apron (W2)	20	ft.
Length of Apron (L_a)	17	ft.
Median Diameter	0.50	ft.
Riprap min. depth	1.13	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron E

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	5.59	cfs
Do (ft.)	1.00	ft
T_w (ft.)	0.40	ft

Output:		
Width of Apron (W1)	3	ft.
Width of Apron (W2)	20	ft.
Length of Apron (L_a)	17	ft.
Median Diameter	0.50	ft.
Riprap min. depth	1.13	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron F

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	4.24	cfs
Do (ft.)	1.50	ft
T_w (ft.)	0.60	ft

Output:		
Width of Apron (W1)	5	ft.
Width of Apron (W2)	19	ft.
Length of Apron (L_a)	15	ft.
Median Diameter	0.50	ft.
Riprap min. depth	1.13	ft.

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Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron G

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	0.75	cfs
Do (ft.)	1.00	ft
T_w (ft.)	0.40	ft

Output:		
Width of Apron (W1)	3	ft.
Width of Apron (W2)	11	ft.
Length of Apron (L_a)	8	ft.
Median Diameter	0.50	ft.
Riprap min. depth	1.13	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron H

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	1.23	cfs
Do (ft.)	1.50	ft
T_w (ft.)	0.60	ft

Output:		
Width of Apron (W1)	5	ft.
Width of Apron (W2)	16	ft.
Length of Apron (L_a)	12	ft.
Median Diameter	0.50	ft.
Riprap min. depth	1.13	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron I

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	12.22	cfs
Do (ft.)	1.25	ft
T_w (ft.)	0.50	ft

Output:		
Width of Apron (W1)	4	ft.
Width of Apron (W2)	28	ft.
Length of Apron (L_a)	24	ft.
Median Diameter	0.83	ft.
Riprap min. depth	1.86	ft.

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Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron J

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	8.84	cfs
Do (ft.)	2.00	ft
T_w (ft.)	0.80	ft

Output:		
Width of Apron (W1)	6	ft.
Width of Apron (W2)	26	ft.
Length of Apron (L_a)	20	ft.
Median Diameter	0.50	ft.
Riprap min. depth	1.13	ft.

Tighe&Bond
Engineers | Environmental Specialists

Project:	Chinook
Location:	Fitzwilliam, NH
T&B #:	N-0758-017
Calculations By:	NSC
Checked By:	JMP
Date:	9/26/2019

APRON DESIGN

Terms: Rip-Rap Apron K

length of apron (ft.)	L_a	
discharge from pipe (cfs)	Q	(25 YR STORM EVENT)
pipe dia. or channel width (ft.)	Do	
tailwater depth (ft.)	T_w	
width of apron (at outlet)(ft)	W1	
width of apron (downstream)(ft)	W2	
median stone diameter (ft.)	d_{50}	

Equations Used:

Length of Apron (L_a)

when Tw < .5*Do $L_a = \frac{1.8(Q)}{Do^{(3/2)}} + 7Do$

when Tw >= .5*Do $L_a = \frac{3(Q)}{Do^{(3/2)}} + 7Do$

Width of Apron (W1)

$W1 = 3Do$

Width of Apron (W2)

when Tw < .5*Do $W2 = 3Do + La$

when Tw >= .5*Do $W2 = 3Do + 0.4La$

Median Diameter $d_{50} = \frac{0.02 * Q^{(1.3)}}{(Tw * Do)}$

Input:		
Q (cfs)	12.43	cfs
Do (ft.)	1.50	ft
T_w (ft.)	0.60	ft

Output:		
Width of Apron (W1)	5	ft.
Width of Apron (W2)	27	ft.
Length of Apron (L_a)	23	ft.
Median Diameter	0.59	ft.
Riprap min. depth	1.32	ft.

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SECTION 8

Section 8
Long Term Operation & Maintenance Plan

It is the intent of this Operation and Maintenance Plan to identify the areas of this site that need routine maintenance for the continued operation of the stormwater system designed for the project.

8.1 Contact/Responsible Party

Chinook Solar, LLC
ATTN: (To Be Determined)
70 Universe Boulevard
Juno Beach, FL 33408

(Note: The contact information for the Contact/Responsible Party shall be kept current. If ownership changes, the Operation and Maintenance Plan must be transferred to the new party).

8.2 Maintenance Items

Maintenance of the following items shall be recorded:

- Litter/debris removal
- Landscaping/repair of vegetation
- Access road maintenance
- Removal of sediment after construction and general long-term detention basin maintenance

The following maintenance items and schedule represent the minimum action required. Periodic site inspections shall be conducted, and all measures must be maintained in effective operating condition. The following items shall be observed during site inspection and maintenance:

- Inspect vegetated areas, particularly slopes and embankments for areas of erosion/settlement. Replant and restore as required.
- Inspect detention basins, including, inlets and outlet control structures, for sediment buildup and remove as required.
- Inspect site for trash and debris and remove as required.

8.3 Overall Site Operation & Maintenance Schedule

Overall Site Operation and Maintenance Schedule		
Maintenance Item	**Frequency of Maintenance**	**Operation**
Litter/Debris Removal	-Twice per year	-Inspected and maintained as required -Remove litter and debris
Detention Basins	-Twice per year	-Inspected and maintained as required -Basins be mowed and maintained in healthy condition -Embankments to be mowed and inspected for erosion/settlement -To be cleaned of trash/debris -Basins to be cleaned of solids
Rip Rap Aprons/Spillways	-Twice per year	-Inspected and cleaned as required -Trash and debris to be removed -Any required maintenance shall be addressed
Drainage and Outlet Control Structures	-Twice per year	-Inspected and cleaned as required -Outlet structures to be cleaned of sediment and oils.
Landscaping and tree removal as needed	-Twice per year	-Inspect and remove trees and brush as required

8.3.1 Disposal Requirements

Disposal of debris, trash, sediment and other waste material will be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.

8.3.2 Annual Updates and Log Requirements

The Owner and/or Contact/Responsible Party shall review this Operation and Maintenance Plan once per year for its effectiveness and adjust the plan and deed as necessary.

A log of all preventative and corrective measures for the stormwater system shall be kept on-site and be made available upon request by any public entity with administrative, health environmental or safety authority over the site.

Stormwater Management Report						
Project Name		**Chinook Solar Project**				
BMP Description	**Date of Inspection**	**Inspector**	**BMP Installed and Operating Properly?**	**Cleaning / Corrective Action Needed**	**Date of Cleaning / Repair**	**Performed By**
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			

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APPENDIX A

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	72.111 degrees West
Latitude	42.773 degrees North
Elevation	0 feet
Date/Time	Wed, 08 May 2019 09:33:26 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.44	0.55	0.72	0.90	1.12	**1yr**	0.77	1.03	1.28	1.59	1.96	2.42	2.69	**1yr**	2.15	2.59	3.00	3.64	4.26	**1yr**
2yr	0.34	0.53	0.66	0.87	1.09	1.36	**2yr**	0.94	1.23	1.56	1.92	2.35	2.87	3.23	**2yr**	2.54	3.11	3.61	4.32	4.94	**2yr**
5yr	0.41	0.63	0.80	1.06	1.36	1.71	**5yr**	1.18	1.54	1.97	2.42	2.94	3.56	4.07	**5yr**	3.15	3.91	4.53	5.35	6.05	**5yr**
10yr	0.46	0.72	0.91	1.24	1.61	2.04	**10yr**	1.39	1.82	2.35	2.88	3.48	4.18	4.84	**10yr**	3.70	4.65	5.37	6.28	7.06	**10yr**
25yr	0.54	0.86	1.10	1.51	2.00	2.55	**25yr**	1.73	2.28	2.94	3.61	4.35	5.19	6.09	**25yr**	4.59	5.85	6.73	7.78	8.67	**25yr**
50yr	0.61	0.98	1.25	1.76	2.37	3.04	**50yr**	2.04	2.70	3.52	4.30	5.16	6.11	7.25	**50yr**	5.41	6.97	7.99	9.14	10.12	**50yr**
100yr	0.70	1.13	1.45	2.06	2.80	3.61	**100yr**	2.42	3.19	4.18	5.10	6.11	7.21	8.63	**100yr**	6.38	8.30	9.49	10.76	11.82	**100yr**
200yr	0.79	1.29	1.67	2.40	3.31	4.30	**200yr**	2.86	3.79	4.98	6.07	7.24	8.49	10.29	**200yr**	7.52	9.90	11.27	12.66	13.82	**200yr**
500yr	0.95	1.56	2.03	2.95	4.14	5.39	**500yr**	3.57	4.74	6.26	7.62	9.05	10.57	13.00	**500yr**	9.36	12.50	14.17	15.71	16.99	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.35	0.42	0.57	0.70	0.91	**1yr**	0.61	0.89	1.08	1.40	1.73	2.09	2.36	**1yr**	1.85	2.27	2.33	3.36	3.67	**1yr**
2yr	0.33	0.52	0.64	0.86	1.06	1.21	**2yr**	0.92	1.18	1.37	1.76	2.24	2.81	3.16	**2yr**	2.49	3.04	3.52	4.21	4.82	**2yr**
5yr	0.37	0.58	0.72	0.98	1.25	1.44	**5yr**	1.08	1.41	1.62	2.07	2.61	3.34	3.80	**5yr**	2.95	3.66	4.24	4.98	5.67	**5yr**
10yr	0.41	0.64	0.79	1.10	1.42	1.63	**10yr**	1.23	1.60	1.83	2.33	2.92	3.80	4.38	**10yr**	3.36	4.21	4.86	5.64	6.40	**10yr**

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
25yr	0.47	0.71	0.89	1.27	1.66	1.93	**25yr**	1.44	1.89	2.14	2.71	3.37	4.50	5.28	**25yr**	3.98	5.08	5.86	6.66	7.53	**25yr**
50yr	0.51	0.78	0.97	1.40	1.88	2.20	**50yr**	1.62	2.16	2.42	3.03	3.76	5.12	6.09	**50yr**	4.53	5.85	6.73	7.56	8.52	**50yr**
100yr	0.57	0.85	1.07	1.55	2.12	2.50	**100yr**	1.83	2.45	2.73	3.38	4.19	5.80	7.03	**100yr**	5.13	6.76	7.74	8.59	9.65	**100yr**
200yr	0.62	0.94	1.19	1.72	2.39	2.85	**200yr**	2.07	2.79	3.09	3.76	4.69	6.58	8.15	**200yr**	5.82	7.84	8.92	9.75	10.93	**200yr**
500yr	0.72	1.06	1.37	1.99	2.83	3.38	**500yr**	2.44	3.30	3.62	4.36	5.42	7.79	9.92	**500yr**	6.89	9.53	10.77	11.53	12.90	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.32	0.49	0.60	0.81	1.00	1.18	**1yr**	0.86	1.15	1.30	1.63	2.09	2.63	2.92	**1yr**	2.33	2.81	3.21	3.88	4.55	**1yr**
2yr	0.36	0.55	0.68	0.92	1.14	1.30	**2yr**	0.98	1.27	1.46	1.89	2.39	2.96	3.34	**2yr**	2.62	3.21	3.73	4.47	5.08	**2yr**
5yr	0.44	0.67	0.84	1.15	1.46	1.70	**5yr**	1.26	1.66	1.90	2.39	2.99	3.78	4.35	**5yr**	3.35	4.18	4.87	5.71	6.47	**5yr**
10yr	0.52	0.79	0.98	1.38	1.78	2.09	**10yr**	1.53	2.04	2.30	2.90	3.58	4.58	5.32	**10yr**	4.05	5.12	5.96	6.90	7.77	**10yr**
25yr	0.65	0.99	1.23	1.75	2.31	2.75	**25yr**	1.99	2.69	2.99	3.73	4.52	5.89	6.95	**25yr**	5.21	6.69	7.82	8.89	9.90	**25yr**
50yr	0.77	1.17	1.46	2.10	2.82	3.38	**50yr**	2.44	3.31	3.64	4.51	5.41	7.15	8.50	**50yr**	6.32	8.17	9.59	10.76	11.90	**50yr**
100yr	0.92	1.39	1.74	2.51	3.44	4.17	**100yr**	2.97	4.07	4.43	5.47	6.46	8.66	10.39	**100yr**	7.66	9.99	11.76	13.02	14.31	**100yr**
200yr	1.09	1.64	2.08	3.01	4.20	5.14	**200yr**	3.62	5.02	5.40	6.63	7.74	10.50	12.71	**200yr**	9.29	12.22	14.43	15.80	17.21	**200yr**
500yr	1.39	2.06	2.65	3.85	5.48	6.77	**500yr**	4.73	6.62	7.03	8.59	9.80	13.58	16.58	**500yr**	12.02	15.95	18.91	20.36	21.98	**500yr**

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APPENDIX B

SOIL SURVEY REPORT
Tighe and Bond Engineers
Chinook, Fitzwilliam, NH

1. MAPPING STANDARDS

Site-Specific Soil Mapping Standards for New Hampshire and Vermont. SSSNNE Special Publication No. 3, Version 5.0, December 2017. This map product is within the technical standards of the National Cooperative Soil Survey. It is a special product, intended for the site specific soil survey. It was produced by a professional soil scientist and is not a product of the USDA Natural Resource Conservation Service.

2. DATE SOIL MAP PRODUCED

Field work was performed during the spring of 2018, with the soil map compilation completed on December 21, 2018.

3. GEOGRAPHIC LOCATION AND SIZE OF SITE

The area of the soil map was approximately 120 acres. The parcel is composed of a combination of natural covered woodland, as well as a large percentage of recently logged areas. The parcel generally slopes from the Northeast to the south west on the eastern portion and from the southwest to the north east on the western portion. These two sides slope down to a large wetland system. Several connected and isolated wetland systems occur on site. The site has some areas of rock outcrops throughout, along the far north western side and the southern portion with areas interspersed throughout the site. Wetland areas were not delineated nor mapped by GES Inc. as part of the project.

4. PURPOSE OF THE SOIL MAP

The preparation of this map was requested by Tighe and Bond Engineers. The purpose was to meet the requirements of the NH Alteration of Terrain.

5. SOIL IDENTIFICATION LEGEND

SYMBOL	SOIL TAXONOMIC NAME	Hydrologic Soil Group
143	Monadnock	B
168	Sunapee	B
73	Berkshire Very Stony	B
56	Becket	C
57	Becket Very Stony	C
559	Skerry	C
60	Tunbridge Berkshire Complex	C
76	Marlow	C
77	Marlow Very Stony	C

8 Continental Dr Bldg 2 Unit H, Exeter, NH 03833-7526
Ph (603) 778 0644 / *Fax* (603) 778 0654
info@gesinc.biz
www.gesinc.biz

SOIL MAP UNIT DESCRIPTIONS

143 The Monadnock series consists of very deep, well drained soils that formed in loamy over sandy melt-out till on hills and mountains in glaciated uplands. Estimated saturated hydraulic conductivity is moderately high or high in the mineral solum and high or very high in the substratum. ESHWT were found below 40" and had a typical profile in the higher areas and on hillsides on the site of loam over sand on the southern portion of the site.

168 The Sunapee series consists of very deep, moderately well drained soils formed in loamy melt-out till on hills and mountains in glaciated uplands. On site they are typically located on the upper reaches of the uplands in the southern portion as well as on some of the toe slopes in the central portion. These soils had ESHWT between 15-40", with textures of loose till and loamy.

73 The Berkshire series consists of very deep, well drained soils formed in loamy melt-out till on hills and mountains in glaciated uplands. On site these are found in the far southern end of the site in the higher reaches with areas of exposed rock. Soil profile consists of Loose till over fine sand. ESHWT is below 40".

56/57 The Becket series consists of very deep, well drained soils that formed in a loamy mantle overlying dense, sandy till on drumlins and glaciated uplands. They are moderately deep to a densic contact. On site they are typically located on the upper reaches of the uplands in the southern portion as well as on some of the toe slopes in the central portion. These soils had ESHWT below 40", with firm, platy sandy textures in the A/B layers and gravelly sand in the C.

559 The Skerry series consists of very deep, moderately well drained soils that formed in a loamy mantle overlying dense, sandy till on drumlins and glaciated uplands. They are moderately deep to a densic contact. On site these soils are found primarily along the toe slopes, but are also sporadically located in some of the higher reaches along hillsides. ESHWT is found between 15-40" and textures range from firm, platy sandy till over loam.

60 The Tunbridge-Berkshire complex is composed of moderately deep, well drained soils on glaciated uplands. They formed in loamy supraglacial till (Tunbridge). And very deep, well drained soils formed in loamy melt-out till on hills and mountains in glaciated uplands (Berkshire). As a complex, these soils occur in such a manner that they are difficult to break out in separate units. These occur in the higher reaches typically on the southern portion of the site. ESHWT is below 40".

76/77 The Marlow series consists of well drained soils that formed in loamy lodgment till on hills and mountains in glaciated uplands. They are moderately deep to a dense substratum and very deep to bedrock. These soils on site are located

primarily I the far eastern portion, with ESHWT below 40". The have a typical profile of firm platy loamy till over fine sandy loam.

6. RESPONSIBLE SOIL SCIENTIST

Luke D. Hurley, C.S.S. #0095

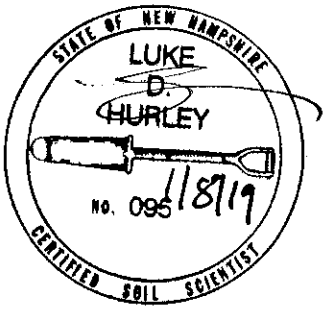
7. OTHER DISTINGUISHING FEATURES OF SITE
No distinguishing features were noted.

8. MAXIMUM SIZE OF LIMITING INCLUSIONS

No Inclusions were mapped.

9. SPECIAL FEATURE SYMBOLS

No special feature symbols were used.



LEGEND

SITE SPECIFIC SOIL SURVEY BOUNDARIES

SITE SPECIFIC SOIL SURVEY HYDROLOGIC SOIL GROUP (HSG) LEGEND

SYMBOL	SOIL TYPE, SLOPE RATING	HSG
56	BECKET (3 TO 8% AND 8 TO 15%)	C
57	BECKET, VERY STONY (3 TO 8%, 8 TO 15% AND 15 TO 25%)	C
60	TURNBRIDGE-BERKSHIRE COMPLEX (0 TO 8%)	C
73	BERKSHIRE (0 TO 8%, 8 TO 15% AND 15 TO 25%)	B
76	MARLOW (3 TO 8%, 8 TO 15%, 15 TO 25% AND 25 TO 50%)	C
77	MARLOW, VERY STONY (0 TO 8%, 8 TO 15% AND 15 TO 25%)	B
143	MONADNOCK (0 TO 8%, 8 TO 15%, 15 TO 25%, 25 TO 50% AND 50%+)	B
168	SUNAPEE (3 TO 8%, 8 TO 15% AND 15 TO 25%)	B
559	SKERRY (3 TO 8%, 8 TO 15% AND 15 TO 25%)	C

NOTES:

1. SSSS PREPARED BY LUKE HURLEY, GES INC., DATED 05/04/2018.
2. SITE-SPECIFIC SOIL MAPPING STANDARDS FOR NEW HAMPSHIRE AND VERMONT. SSSNNE SPECIAL PUBLICATION NO. 3, VERSION 5.0, DECEMBER 2017. THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PRODUCT, INTENDED FOR THE SUBMISSION TO NH DES ALTERATION OF TERRAIN. IT WAS PRODUCED BY A PROFESSIONAL SOIL SCIENTIST AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCE CONSERVATION SERVICE.

FULLAM HILL ROAD

FLOODZONE A

FLOODZONE X

MAP 12 LOT 29
JOHN J. FEBIER, JR
310 ROUTE 119
FITZWILLIAM, NH 03447
BOOK 1728 PAGE 715
3,050,383 Sq.Ft.
70.027 Ac.±
(AREA TO THE BROOK)

MAP 12 LOT 50
DAVID A. & MARY L. RICH
16 JACKSON STREET
AYER, MA 01432
BOOK 2511 PAGE 331
5,701,971 Sq.Ft.
130.899 Ac.±
(AREA TO THE BROOK)

MAP 12 LOT 6
DAVID A. & MARY L. RICH
16 JACKSON STREET
AYER, MA 01432
BOOK 2530 PAGE 228
2,014,499 Sq.Ft.
46.247 Ac.±

MAP 12 LOT 5
DAVID A. & MARY L. RICH
16 JACKSON STREET
AYER, MA 01432
BOOK 2530 PAGE 228
5,844,523 Sq.Ft.
134.172 Ac.±

MATCH TO SHEET 2 OF 2

Tighe&Bond
www.tighebond.com

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
LUKE D. HURLEY
No. 095
1/23/19
CERTIFIED SOIL SCIENTIST

N

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Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

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SITE SPECIFIC SOIL SURVEY

SCALE: AS SHOWN

1 OF 2

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LEGEND

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE
LUKE D. HURLEY
89. 065
1/23/19
CERTIFIED SOIL SCIENTIST

N

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Chinook Solar, LLC

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SITE SPECIFIC SOIL SURVEY

SCALE: AS SHOWN

1 OF 2

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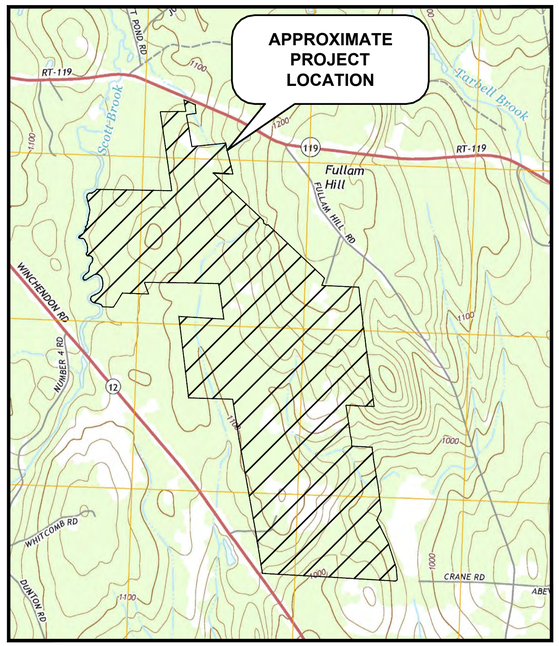
Tighe&Bond

APPENDIX C

CHINOOK SOLAR PROJECT
SITE PLANS
FITZWILLIAM, NH

OCTOBER 2, 2019

SHEET NO.	SHEET TITLE	LAST REVISED
-	COVER SHEET	9/18/2019
C.101	NOTES & LEGEND SHEET	9/18/2019
C.200	OVERALL EXISTING CONDITIONS PLAN	9/18/2019
C.201 - C.210	EXISTING CONDITIONS AND DEMOLITION PLANS	9/18/2019
C.300	OVERALL SITE PLAN	9/18/2019
C.301 - C.310	SITE PLANS	9/18/2019
C.501	EROSION CONTROL NOTES & DETAILS SHEET	9/18/2019
C.502 - C.504	CIVIL DETAILS SHEET	9/18/2019



SCALE: 1" = 1,500'

PREPARED BY:
Tighe&Bond
Engineers | Environmental Specialists

CIVIL ENGINEER
TIGHE & BOND, INC.
177 CORPORATE DRIVE
PORTSMOUTH, NH 03801

NEXTera ENERGY

DEVELOPER
NEXTERA ENERGY RESOURCES, LLC
700 UNIVERSE BOULEVARD,
JUNO BEACH, FL 33408

ENVIRONMENTAL CONSULTANT
TRC COMPAINES, INC.
6 ASHLEY DRIVE,
SCARBOROUGH, ME 04074

PERMIT DRAWINGS - NOT FOR CONSTRUCTION

COMPLETE SET 28 SHEETS

EXISTING CONDITIONS PLAN NOTES:

1. "EXISTING CONDITIONS PLAN" PREPARED BY MHF DESIGN CONSULTANTS DATED JUNE 29, 2018.
2. EXISTING CONDITIONS ARE BASED ON A FIELD SURVEY BY MHF DESIGN CONSULTANTS, PERFORMED BETWEEN JANUARY 2018 AND JUNE 2018.
3. WETLAND RESOURCE INFORMATION WAS PROVIDED ELECTRONICALLY TO TIGHE & BOND, INC. BY TRC SOLUTIONS, INC. ON DECEMBER 18, 2018 AND UPDATED ON JUNE 17, 2019.
4. APPROXIMATE 100 YEAR FLOODPLAIN ELEVATIONS WERE PROVIDED FROM FEMA FIRM MAP #33005C0465E, EFFECTIVE DATE MAY 23, 2006.
5. BORING LOCATIONS PROVIDED BY TERRACON ON APRIL 19, 2019

GENERAL NOTES:

1. THE LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE AND THE LOCATIONS ARE NOT GUARANTEED BY THE OWNER OR THE ENGINEER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES, ANTICIPATE CONFLICTS, REPAIR EXISTING UTILITIES AND RELOCATE EXISTING UTILITIES REQUIRED TO COMPLETE THE WORK.
2. COORDINATE ALL WORK WITHIN PUBLIC RIGHT OF WAYS WITH THE TOWN OF FITZWILLIAM.
3. THE CONTRACTOR SHALL EMPLOY A NEW HAMPSHIRE LICENSED LAND SURVEYOR TO DETERMINE ALL LINES AND GRADES.
4. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UTILITIES. CALL DIG SAFE AT LEAST 72 HOURS PRIOR TO THE COMMENCEMENT OF ANY DEMOLITION/CONSTRUCTION ACTIVITIES.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH AND COMPLY WITH THE CONDITIONS OF ALL OF THE PERMIT APPROVALS.
6. THE CONTRACTOR SHALL OBTAIN AND PAY FOR AND COMPLY WITH ADDITIONAL PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK AND ARRANGE FOR AND PAY FOR NECESSARY INSPECTIONS AND APPROVALS FROM THE AUTHORITIES HAVING JURISDICTION.
7. THE CONTRACTOR SHALL PHASE DEMOLITION AND CONSTRUCTION AS REQUIRED TO PROVIDE CONTINUOUS SERVICE TO EXISTING BUSINESSES AND HOMES THROUGHOUT THE CONSTRUCTION PERIOD. TEMPORARY SERVICES, IF REQUIRED, SHALL COMPLY WITH ALL FEDERAL, STATE, LOCAL AND UTILITY COMPANY STANDARDS. CONTRACTOR SHALL PROVIDE DETAILED CONSTRUCTION SCHEDULE TO OWNER PRIOR TO ANY DEMOLITION/CONSTRUCTION ACTIVITIES AND SHALL COORDINATE TEMPORARY SERVICES TO ABUTTERS WITH THE UTILITY COMPANY AND AFFECTED ABUTTER.
8. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE TOWN OF FITZWILLIAM HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS AND WITH THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION.
9. CONTRACTOR TO SUBMIT AS-BUILT DRAWING SETS ON REPRODUCIBLE MYLARS AND IN DIGITAL FORMAT (.DWG FILE) ON DISK TO THE OWNER AND ENGINEER UPON COMPLETION OF THE PROJECT. AS-BUILTS SHALL BE PREPARED AND CERTIFIED BY A NEW HAMPSHIRE LICENSED LAND SURVEYOR.

DEMOLITION NOTES:

1. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF ANY CLEARING OR DEMOLITION ACTIVITIES. REFER TO DETAILED PROJECT PHASING PLAN PREPARED BY TIGHE & BOND, INC. FOR ADDITIONAL DETAILS.
2. ALL MATERIALS SCHEDULED TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR UNLESS OTHERWISE SPECIFIED. THE CONTRACTOR SHALL DISPOSE OF ALL MATERIALS OFF-SITE IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS, ORDINANCES AND CODES.
3. COORDINATE REMOVAL, RELOCATION, DISPOSAL OR SALVAGE OF UTILITIES WITH THE OWNER AND APPROPRIATE UTILITY COMPANY.
4. ANY EXISTING WORK OR PROPERTY DAMAGED OR DISRUPTED BY CONSTRUCTION/ DEMOLITION ACTIVITIES SHALL BE REPLACED OR REPAIRED TO MATCH ORIGINAL EXISTING CONDITIONS BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
5. REMOVE TREES AND BRUSH AS REQUIRED FOR COMPLETION OF WORK. CONTRACTOR SHALL GRUB AND REMOVE ALL STUMPS WITHIN LIMITS OF WORK AND DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS.
6. CONTRACTOR SHALL PROTECT ALL PROPERTY MONUMENTATION THROUGHOUT DEMOLITION AND CONSTRUCTION OPERATIONS. SHOULD ANY MONUMENTATION BE DISTURBED BY THE CONTRACTOR, THE CONTRACTOR SHALL EMPLOY A NEW HAMPSHIRE LICENSED SURVEYOR TO REPLACE DISTURBED MONUMENTS.

GRADING AND DRAINAGE NOTES:

1. COMPACTION REQUIREMENTS:

BELOW PAVED OR CONCRETE AREAS	95%
TRENCH BEDDING MATERIAL AND SAND BLANKET BACKFILL	95%
BELOW LOAM AND SEED AREAS	90%

* ALL PERCENTAGES OF COMPACTION SHALL BE OF THE MAXIMUM DRY DENSITY AT THE OPTIMUM MOISTURE CONTENT AS DETERMINED AND CONTROLLED IN ACCORDANCE WITH ASTM D-1557, METHOD C FIELD DENSITY TESTS SHALL BE MADE IN ACCORDANCE WITH ASTM D-1556 OR ASTM-2922.

2. ALL DISTURBED AREAS NOT TO BE PAVED OR OTHERWISE TREATED SHALL RECEIVE 4" LOAM, SEED FERTILIZER AND MULCH.
3. ALL STORM DRAIN CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE NHDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION.

EROSION CONTROL NOTES:

1. SEE SHEET C-501.

UTILITY NOTES:

1. COORDINATE ALL UTILITY WORK WITH APPROPRIATE UTILITY COMPANY.
2. ALL ELECTRICAL MATERIAL WORKMANSHIP SHALL CONFORM TO THE NATIONAL ELECTRIC CODE, LATEST EDITION, AND ALL APPLICABLE STATE AND LOCAL CODES.
3. THE EXACT LOCATION OF NEW UTILITY SERVICES AND CONNECTIONS SHALL BE COORDINATED WITH THE ELECTRICAL DRAWINGS PREPARED BY OTHERS AND THE APPLICABLE UTILITY COMPANIES.
4. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL MANHOLES, BOXES, FITTINGS, CONNECTORS, COVER PLATES, AND OTHER MISCELLANEOUS ITEMS NOT NECESSARILY DETAILED ON THESE DRAWINGS TO RENDER INSTALLATION OF UTILITIES COMPLETE AND OPERATIONAL.

LEGEND:

- PROPERTY BOUNDARY
- LIMIT OF EXISTING RIGHT OF WAY
- PROPOSED LIMIT OF WORK
- PROPOSED SILT SOCK OR EROSION CONTROL BERM
- PROPOSED TEMPORARY SILT SOCK
- YARD SETBACK (LOCAL, TOWN OF FITZWILLIAM)
- LIMIT OF EXISTING TREE LINE
- LIMIT OF TREE LINE TO BE REMOVED
- PROPOSED LIMIT OF TREE LINE
- PROPOSED CLEARING
- 2000 — EXISTING 2' CONTOURS
- 1100 — PROPOSED 2' CONTOURS
- LIMIT OF DELINEATED WETLAND
- 75' STREAM & WETLAND BUFFER (LOCAL, TOWN OF FITZWILLIAM)
- STREAM CENTERLINE
- RIVER
- EXISTING STONE WALL
- EXISTING STONE WALL TO BE REMOVED
- OHW — OVERHEAD WIRES
- PE PE PE — PROPOSED UNDERGROUND ELECTRICAL CONDUIT
- EXISTING TRAIL
- PROPOSED GUARDRAIL
- PROPOSED CHAIN LINK FENCE
- PROPOSED 2X26 SOLAR MODULE RACK
- PROPOSED 2X13 SOLAR MODULE RACK
- PROPOSED INVERTER AND CONCRETE EQUIPMENT PAD
- EXISTING WETLAND
- SURVEY BASELINE DISK
- EXISTING IRON PIPE OR IRON ROD
- EXISTING UTILITY POLE
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE
- B-1 — EXISTING APPROXIMATE SUBSURFACE BORING LOCATION

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

BRADLEE MEZICA No. 02.99 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10/2/19

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Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

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NOTES & LEGEND SHEET

SCALE: AS SHOWN

C.101

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZCA No. 02.99 – LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12288 – LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

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Fitzwilliam, NH

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OVERALL EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.200

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UTILITY POLE SET (TYP.)

DELINEATED WETLAND (TYP.)

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

75' WETLAND BUFFER (TYP.)

WOODS ROAD

TREELINE (TYP.)

OVERHEAD TRANSMISSION WIRES (TYP.)

UTILITY POLE SET (TYP.)

MAP 12 LOT 34
N/F RANDOLPH BURT
129 BEAN HILL ROAD
RINDGE, NH 03461
BOOK 2927 PAGE 922

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

B-1

TRAIL (TYP.)

MAP 12 LOT 28
N/F TOWN OF FITZWILLIAM
PO BOX 725
FITZWILLIAM, NH 03447
BOOK 1538 PAGE 470
PLAN C5-D0-65

STONE WALL (TBR) (TYP.)

OVERHEAD TRANSMISSION WIRES (TYP.)

250' EASEMENT BK. 433 PG. 144

115' EASEMENT BK. 808 PG. 344

TRANSMISSION TOWER (TYP.)

EXISTING PROPERTY BOUNDARY (TYP.)

STONE WALL TO REMAIN (TYP.)

CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

TRAIL (TYP.)

UTILITY POLE SET (TYP.)

TREE LINE (TBR) (TYP.)

MAP 12 LOT 28
N/F TOWN OF FITZWILLIAM
PO BOX 725
FITZWILLIAM, NH 03447
BOOK 1538 PAGE 470
PLAN C5-D0-65

WOODED

STONE WALL (TBR) (TYP.)

TRAIL (TYP.)

250' EASEMENT BK. 433 PG. 186

DELINEATED WETLAND (TYP.)

75' WETLAND BUFFER (TYP.)

TRAIL (TYP.)

115' EASEMENT BK. 799 PG. 375

UTILITY POLE SET (TYP.)

OVERHEAD

MATCH LINE - C.201

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STATE OF NEW HAMPSHIRE
BRADLEE MEZICK A
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10-2-2019

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
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PROFESSIONAL ENGINEER
10/2/19

N

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0 60' 120'
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Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

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EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.201

MATCH LINE - C.202

TRANSMISSION WIRES (TYP.)

TRANSMISSION TOWER (TYP.)

APPROXIMATE EXISTING OVERHEAD WIRES (TYP.)

CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

75' WETLAND BUFFER (TYP.)

TRAIL (TYP.)

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

OVERHEAD TRANSMISSION WIRES (TYP.)

DELINEATED WETLAND (TYP.)

STONE WALL (TBR) (TYP.)

TREE LINE (TBR) (TYP.)

EXISTING RIGHT OF WAY (TYP.)

UTILITY POLE SET (TYP.)

N/F NEW ENGLAND POWER CONSTRUCTION COMPANY BOOK 433 PAGE 156

SELECTIVE CLEARING AS NEEDED WITHIN 75' WETLAND BUFFER

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

PROPOSED STREAM CROSSING (SEE SHEET C.303)

EPHEMERAL STREAM APPROX. 0'-3' WIDE

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

MAP 12 LOT 50
DAVID A. & MARY L. RICH
16 JACKSON STREET
AYER, MA 01432
BOOK 2511 PAGE 331
5,701,971 Sq.Ft.
130.899 Ac.±
(AREA TO THE BROOK)

115' EASEME... BK. 798, PG. ...

B-2

MATCH LINE - C.202

Last Saved: 9/26/2019
Plotted: October 26, 2019 - 4:43pm By: DGM
Tighe & Bond: J:\N\N0758 NextEra\N-07758-017 Chinook\Drawings_Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-SITE.dwg

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZZETTA No. 02... LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12... LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.202

MATCH LINE - C.203

TRAIL (TYP.)

CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

TRAIL (TYP.)

WOODS ROAD (TYP.)

B-3

WOODS ROAD (TYP.)

75' WETLAND BUFFER (TYP.)

OVERHEAD TRANSMISSION WIRES (TYP.)

EXISTING PROPERTY BOUNDARY (TYP.)

115' EASEMENT BK. 808 PG. 344

WOODS ROAD (TYP.)

B-4

BARBED WIRE FENCE REMNANTS

TREE LINE (TBR) (TYP.)

MAP 12 LOT 6
DAVID A. & MARY
16 JACKSON STRE
AYER, MA 0143
BOOK 2530 PAGE
2,014,499 Sq.
46.247 Ac.±

75' WETLAND BUFFER (TYP.)

DELINEATED WETLAND (TYP.)

DELINEATED WETLAND (TYP.)

75' WETLAND BUFFER (TYP.)

TREE LINE (TBR) (TYP.)

33' WIDE RIGHT OF WAY F
BENEFIT OF MAP 12 LOT
MAP 12 LOT 6 AS RESERVE
BOOK 2530 PAGE

75' WETLAND BUFFER (TYP.)

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

STONE WALL (TBR) (TYP.)

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

TRAIL (TYP.)

TRAIL (TYP.)

DELINEATED WETLAND (TYP.)

TRAIL (TYP.)

MATCH LINE - C.203

MATCH LINE - C.203

Last Saved: 9/26/2019
Plotted: 10/2/2019 8:04:43pm By: DGM
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Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02.39
LICENSED
PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED
PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.203

MATCH LINE - SEE INSET RIGHT

MAP 12 LOT 53-1
N/F ROBERT E. VIGEANT
94 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 1577 PAGE 733
PLAN 53-99

MAP 12 LOT 53-2
N/F MARK & PAMELA J. METHE
PO BOX 145
FITZWILLIAM, NH 03447
BOOK 1577 PAGE 733
PLAN 53-99

MAP 12 LOT 54-1
N/F PETER W. &
ROBERTA T. LETOURNEAU
59 GODDARD ROAD
RINDGE, NH 03461
BOOK 2797 PAGE 509
PLAN C13-D7-31

UTILITY POLE (TYP.)

APPROXIMATE EXISTING OVERHEAD WIRES (TYP.)

DRAIN CULVERT

OVERHEAD TRANSMISSION WIRES (TYP.)

75' WETLAND BUFFER (TYP.)

LIMIT OF WORK (TYP.)

TRANSMISSION TOWER (TYP.)

UTILITY POLE SET (TYP.)

8" RICH FEET 32 28 228

MATCH LINE - C.204

GRAVEL ROAD

TRAIL (TYP.)

250' EASEMENT BK. 824 PG. 178

75' WETLAND BUFFER (TYP.)

OVERHEAD TRANSMISSION WIRES (TYP.)

DELINEATED WETLAND (TYP.)

115' EASEMENT BK. 824 PG. 571

TREE LINE (TBR) (TYP.)

UTILITY POLE SET (TYP.)

FOR & IN 228

DELINEATED WETLAND (TYP.)

B-7

B-6

STONE WALL (TBR) (TYP.)

OVERHEAD TRANSMISSION WIRES (TYP.)

UTILITY POLE SET (TYP.)

TRAIL (TYP.)

MATCH LINE - C.206

MAP 12 LOT 50-2
N/F WENDY L. MISEK
68 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 1656 PAGE 501
PLAN 16-67C

MAP 12 LOT 50-1
N/F EARL F. &
MICHAEL J. HAMMOND
88 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 1600 PAGE 469
PLAN 16-67C

FULLAM HILL ROAD (PUBLIC - VARIABLE WIDTH)

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

GRAVEL

CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE/EXIT

EXISTING PROPERTY BOUNDARY (TYP.)

MAP 12 LOT 53
N/F ROBERT E. VIGEANT
94 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 1417 PAGE 877
PLAN 53-99

33' WIDE RIGHT OF WAY FOR BENEFIT OF MAP 12 LOT 5 & MAP 12 LOT 6 AS RESERVED IN BOOK 2530 PAGE 228

MAP 12 LOT 53-
N/F ROBERT E. VIGE
94 FULLAM HILL RO
FITZWILLIAM, NH 03
BOOK 1577 PAGE
PLAN 53-99

"OLD ROAD" UNKNOWN OWNER AND STATUS

MATCH LINE - SEE LEFT

INSET

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE - BRADLEE MEDICI A. No. 08539 - LICENSED PROFESSIONAL ENGINEER

STATE OF NEW HAMPSHIRE - JOSEPH M. PERSECHINO No. 12388 - LICENSED PROFESSIONAL ENGINEER

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.204

Last Saved: 9/26/2019
Plotted: Oct 02, 2019 - 9:44am By: DGM
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MATCH LINE - C.205

B-5

75' WETLAND BUFFER (TYP.)

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

TRAIL (TYP.)

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

TREE LINE (TBR) (TYP.)

STONE WALL (TBR) (TYP.)

MAP 12 LOT 5
DAVID A. & MARY L. RICH
16 JACKSON STREET
AYER, MA 01432
BOOK 7830 PAGE 228
5,844,523 Sq.Ft.
134.172 Ac.±

MATCH LINE - C.205

MATCH LINE - C.205
MATCH LINE - C.207

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.205

Last Saved: 9/26/2019
Plotted: 02 Oct 2019 - 9:04:44am By: DGM
Tighe & Bond: J:\NN\N0758 NextEra\N-0758-017 Chinook\Drawings_Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-SITE.dwg

MATCH LINE - C.206

TRAIL (TYP.)

DELINEATED WETLAND (TYP.)

33' WIDE RIGHT OF WAY FOR BENEFIT OF MAP 12 LOT 5 & MAP 12 LOT 6 AS RESERVED IN BOOK 2530 PAGE 228

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

TRAIL (TYP.)

TRAIL (TYP.)

75' WETLAND BUFFER (TYP.)

B-8

TRAIL (TYP.)

33' WIDE RIGHT OF WAY FOR BENEFIT OF MAP 12 LOT 5 AS RESERVED IN BOOK 2530 PAGE 228

EXISTING RIGHT OF WAY

TRAIL (TYP.)

MATCH LINE - C.204

MAP 12 LOT 59
N/F ROBERT & PRISCILLA BORDEN
REVOCABLE TRUST
199 FULLAM HILL ROAD
BOOK 2970 PAGE 169

EXISTING PROPERTY BOUNDARY (TYP.)

DELINEATED WETLAND (TYP.)

STREAM (TYP.)

DELINEATED WETLAND (TYP.)

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

75' WETLAND BUFFER (TYP.)

33' WIDE RIGHT OF WAY FOR BENEFIT OF MAP 12 LOT 5 & MAP 12 LOT 6 AS RESERVED IN BOOK 2530 PAGE 228

GRAVEL ROAD

75' WETLAND BUFFER (TYP.)

TRAIL (TYP.)

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

MATCH LINE - C.206
MATCH LINE - C.207

MATCH LINE - C.206
MATCH LINE - C.208

DELINEATED WETLAND (TYP.)

STREAM (TYP.)

TRAIL (TYP.)

MATCH LINE - C.206

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02.39
LICENSED
PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED
PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.206

Last Saved: 9/26/2019
Last Plotted: 10/2/2019 04:45pm By: DGM
Tighe & Bond:J:\W\N0758 NextEra\N-0758-017 Chinook\Drawings, Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-SITE.dwg

MATCH LINE - C.205
MATCH LINE - C.207
MATCH LINE - C.206
MATCH LINE - C.207
MATCH LINE - C.207
MATCH LINE - C.209

75' WETLAND BUFFER (TYP.)
TRAIL (TYP.)
MAP 12 LOT 4
EDWARD J. & CARMEN VANBLARCOM
113 HANLEY ROAD
JAFFREY, NH 03452
BOOK 2280 PAGE 918
1,772,150 SQ.FT.
40.683 Ac.±
BARBED WIRE FENCE REMNANTS
EXISTING PROPERTY BOUNDARY (TYP.)
STONE WALL (TBR) (TYP.)
B-9
CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)
BOULDER (TYP.)
STREAM (TYP.)
PROPOSED STREAM/ WETLAND CROSSING
CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.207

Last Saved: 9/26/2019
Plotted: Oct 02, 2019 - 4:45pm By: DGM
Tighe & Bond J:\W\N0758 NextEra\N-0758-017 Chinook\Drawings_Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-SITE.dwg

MATCH LINE - C.206
MATCH LINE - C.208

DELINEATED WETLAND (TYP.)

STREAM (TYP.)

75' WETLAND BUFFER (TYP.)

STONE WALL (TBR) (TYP.)

TREE LINE (TBR) (TYP.)

TRAIL (TYP.)

LEDGE (TYP.)

CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

EXISTING PROPERTY BOUNDARY (TYP.)

MAP 12 LOT 59
N/F ROBERT & PRISCILLA BORDEN REVOCABLE TRUST
199 FULLAM HILL ROAD
BOOK 2970 PAGE 169

MAP 12 LOT 60
N/F RYAN F. BALL
264 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 3005 PAGE 385

MATCH LINE - C.208
MATCH LINE - C.210

STREAM (TYP.)

DELINEATED WETLAND (TYP.)

Last Saved: 9/26/2019
Plotted: Oct 02, 2019 - 4:45pm By: DGM
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Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02...
LICENSED PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.208

MATCH LINE - C.207
MATCH LINE - C.209

EXISTING PROPERTY BOUNDARY (TYP.)

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

MAP 12 LOT 2
N/F WALTER F. & NANCY L. DESMOND
PO BOX 889
WESTMINSTER, MA 01473
BOOK 1144 PAGE 266
PLAN 10-81

75' WETLAND BUFFER

DELINEATED WETLAND (TYP.)

TRAIL (TYP.)

TRAIL (TYP.)

FOUR-WIRE PASTURE FENCE

FOUR-WIRE PASTURE FENCE

B-10

CONST. SILT SOCK ON SLOPES GREATER THAN 5%. SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

APPROXIMATE EXTENT OF EXISTING TREE LINE (TYP.)

MAP 12 LOT 2
N/F WALTER F. & NANCY L. DESMOND
PO BOX 889
WESTMINSTER, MA 01473
BOOK 1144 PAGE 266
PLAN 10-81

Tighe&Bond
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NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZCUA
No. 02.99
LICENSED
PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED
PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
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FILE:	N-0758-017-SITE.dwg
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CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.209

Last Saved: 9/26/2019
Plotted: Thursday, October 03, 2019 4:46pm By: DGM
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MATCH LINE - C.208

MATCH LINE - C.210

MATCH LINE - C.210

STREAM (TYP.)

DELINEATED WETLAND (TYP.)

MAP 12 LOT 3
JONAS DAMON REALTY COMPANY
422 DAMON ROAD
FITZWILLIAM, NH 03447
BOOK 404 PAGE 387
2,075,071 Sq.Ft.
47.637± ac

CONST. SILT SOCK OR EROSION CONTROL BERM TO LIMITS SHOWN (TYP.)

75' WETLAND BUFFER (TYP.)

CONST. SILT SOCK ON SLOPES GREATER THAN 5%, SPACE EVERY 200' (MAX.) RUNNING PARALLEL WITH CONTOURS. CONTRACTOR MAY ADJUST LOCATIONS BASED ON ACTUAL CONDITIONS IN FIELD DURING CONSTRUCTION. (TYP.)

TREE LINE (TBR) (TYP.)

STONE WALL (TBR) (TYP.)

B-11

TRAIL (TYP.)

75' WETLAND BUFFER (TYP.)

STREAM (TYP.)

DELINEATED WETLAND (TYP.)

MAP 12 LOT 60
N/F RYAN F. BALL
264 FULLAM HILL ROAD
FITZWILLIAM, NH 03447
BOOK 3005 PAGE 385

EXISTING PROPERTY BOUNDARY (TYP.)

STREAM (TYP.)

75' WETLAND BUFFER

Last Saved: 9/26/2019
Plotted: Oct 03, 2019 9:46pm By: DGM
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Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02.39
LICENSED PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

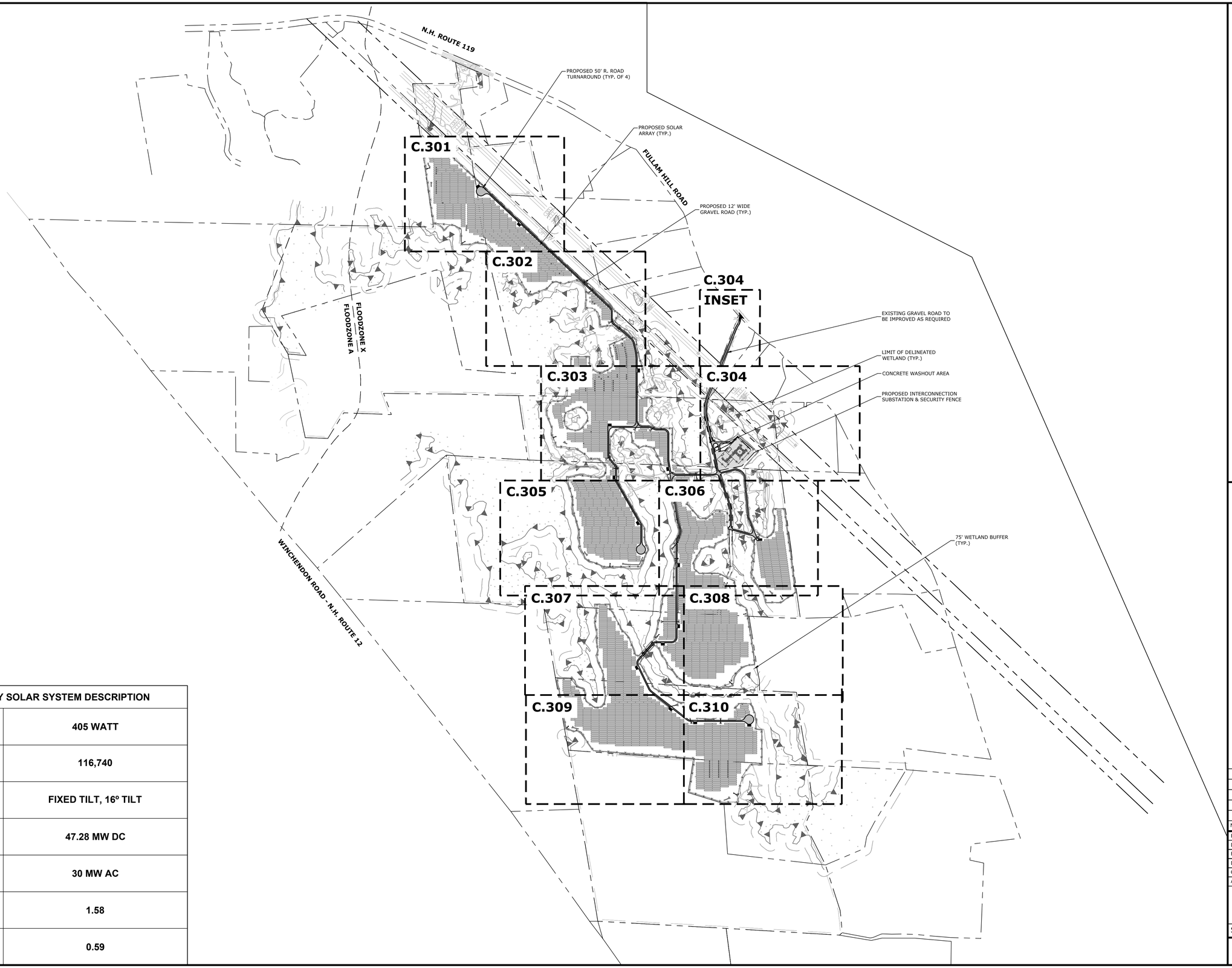
MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: AS SHOWN

C.210



PRELIMINARY SOLAR SYSTEM DESCRIPTION	
MODULE SIZE	405 WATT
QUANTITY	116,740
MODULE RACKING	FIXED TILT, 16° TILT
SYSTEM SIZE (DC)	47.28 MW DC
SYSTEM SIZE (AC)	30 MW AC
DC/AC RATIO	1.58
GCR	0.59

Last Saved: 9/26/2019
Printed: Oct 02, 2019 - 9:46pm By: DGM
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Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02.39
LICENSED PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 500' 1000'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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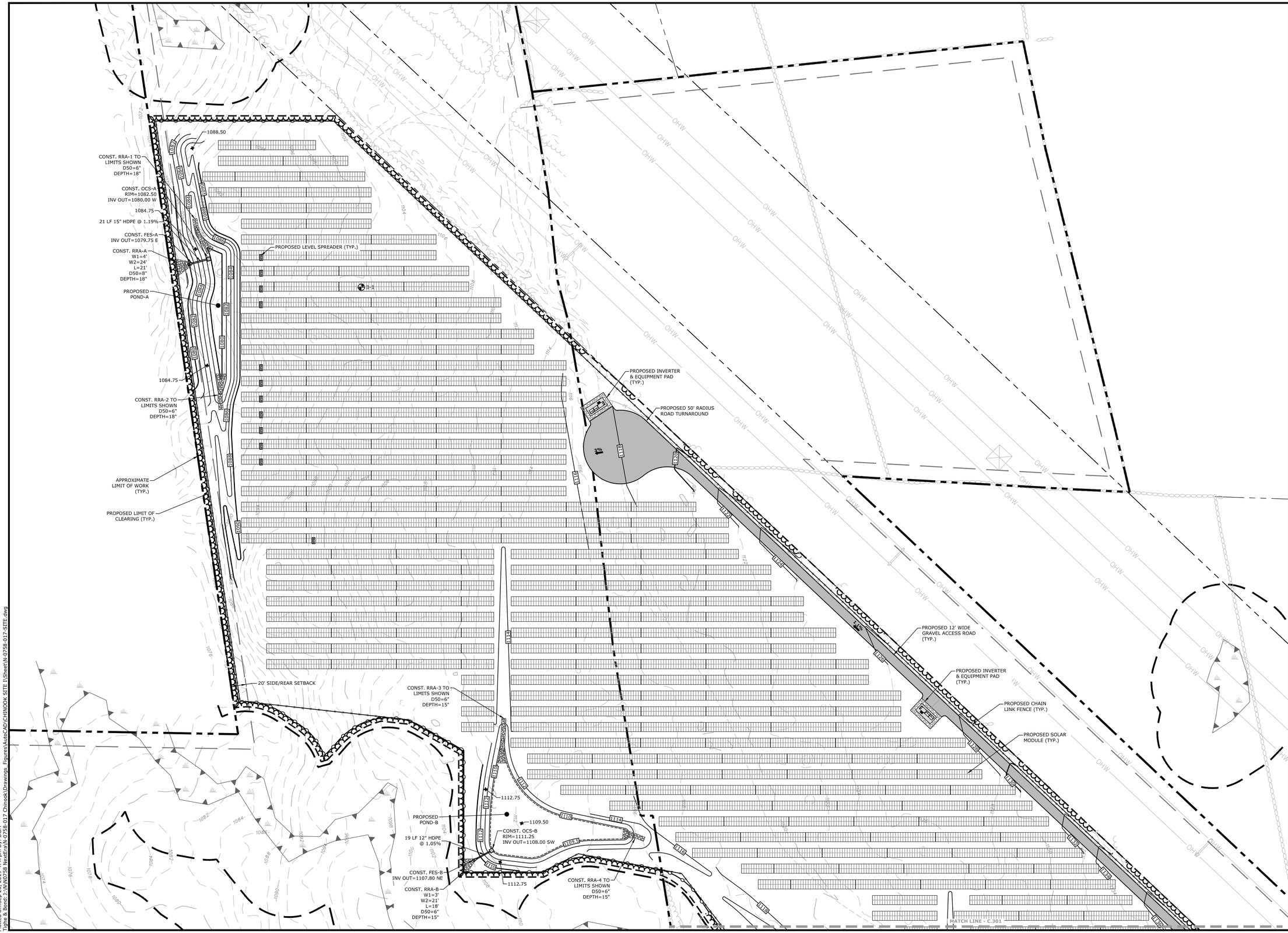
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

OVERALL SITE PLAN

SCALE: AS SHOWN

C.300



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Plotted: 10/02/2019 - 4:47pm By: DGM
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Tighe&Bond
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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZZETTA No. 02[illegible] LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
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MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

SITE PLAN

SCALE: AS SHOWN

C.301

MATCH LINE - C.302

PROPOSED SOLAR MODULE (TYP.)

PROPOSED LEVEL SPREADER (TYP.)

PROPOSED CHAIN LINK FENCE (TYP.)

CONST. RRA-5 TO LIMITS SHOWN D50=6" DEPTH=15"

PROPOSED LIMIT OF CLEARING (TYP.)

1122.50

PROPOSED 12' WIDE GRAVEL ACCESS ROAD (TYP.)

CONST. FES-1 INV OUT=155.25 SW

20' SIDE/REAR SETBACK

APPROXIMATE LIMIT OF WORK (TYP.)

CONST. RRA-6 TO LIMITS SHOWN D50=8", DEPTH=18"

1120.00

1122.50

PROPOSED POND-C

CONST. FES-2 INV OUT=153.00 NE

CONST. RRA-7 W1=5', W2=28' L=24', D50=8" DEPTH=18"

9 LF 18" HDPE @ 1.11%

CONST. OCS-C RIM=1122.00 INV OUT=1120.00 S

CONST. RRA-C W1=5' W2=20' L=15' D50=6" DEPTH=15"

CONST. FES-C INV OUT=1119.90 N

35 LF 12" RCP @ 6.43%

PROPOSED LIMIT OF CLEARING

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.) D50=8", DEPTH=18"

APPROXIMATE LIMIT OF WORK (TYP.)

17 LF 12" RCP @ 5.88%

CONST. RRA-8 TO LIMITS SHOWN D50=8" DEPTH=18"

CONST. FES-3 INV OUT=1184.00 W

CONST. RRA-9 W1=5' W2=28' L=24' D50=8" DEPTH=18"

PROPOSED 16' SWING GATE (TYP.)

PROPOSED 3'HX6'W PRECAST BOX CULVERT L=20', S=0.025 INV.IN=±1186.00 INV.OUT=±1183.00 (SEE DETAIL)

1189.00

CONST. FES-4 INV OUT=1183.00 E

PROPOSED 2:1 SLOPE WITH PERMANENT SLOPE STABILIZATION (TYP.)

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.) D50=8", DEPTH=18"

1188.80

PROPOSED GUARDRAIL (TYP.)

PROPOSED 16' SWING GATE (TYP.)

PROPOSED LEVEL SPREADER (TYP.)

PROPOSED LIMIT OF CLEARING (TYP.)

1128.75

APPROXIMATE LIMIT OF WORK (TYP.)

MATCH LINE - C.302

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZZETTA No. 02.39 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

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Chinook Solar, LLC

Fitzwilliam, NH

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APPROVED:	BLM

SITE PLAN

SCALE: AS SHOWN

C.302

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MATCH LINE - C.303

APPROXIMATE LIMIT OF WORK (TYP.)

PROPOSED LIMIT OF CLEARING (TYP.)

CONST. OCS-D
RIM=1127.50
INV OUT=1123.00 W

22 LF 12" HDPE @ 1.14%

CONST. RRA-D
W1=3'
W2=20'
L=17'
D50=6"
DEPTH=15"

CONST. FES-D
INV OUT=1122.75 E

PROPOSED POND-D

1128.75

1126.00

PROPOSED LEVEL SPREADER (TYP.)

1116.75

1116.75

PROPOSED POND-E

1113.50

13 LF 12" HDPE @ 1.54%

CONST. FES-E
INV OUT=1112.80 E

CONST. OCS-E
RIM=1115.00
INV OUT=1113.00 W

CONST. RRA-E
W1=3'
W2=20'
L=17'
D50=6"
DEPTH=15"

1116.75

CONST. RRA-14
TO LIMITS SHOWN
D50=8"
DEPTH=18"

B-3

B-4

20' SIDE/REAR SETBACK

PROPOSED SOLAR MODULE (TYP.)

CONST. RRA-10 TO LIMITS SHOWN
D50=8", DEPTH=18"

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.)
D50=8", DEPTH=18"

24 LF 12" RCP @ 2.08%

CONST. FES-7
INV OUT=1188.00 SW

CONST. RRA-12
TO LIMITS SHOWN
D50=8"
DEPTH=18"

CONST. FES-5
INV OUT=1176.00 SW

9.5%

3.0%

10%

1178.80

PROPOSED LIMIT OF CLEARING (TYP.)

PROPOSED 12' WIDE GRAVEL ACCESS ROAD (TYP.)

46 LF 15" RCP @ 3.26%

CONST. FES-6
INV OUT=1174.50 NE

CONST. RRA-11
W1=5'
W2=28'
L=24'
D50=8"
DEPTH=18"

CONST. RRA-13
W1=5'
W2=28'
L=24'
D50=8"
DEPTH=18"

CONST. FES-8
INV OUT=1187.50 NE

22 LF 12" RCP @ 2.27%

CONST. FES-9
INV OUT=1143.00 SW

CONST. RRA-15
TO LIMITS SHOWN
D50=8"
DEPTH=18"

CONST. FES-10
INV OUT=1142.50 NE

PROPOSED CHAIN LINK FENCE (TYP.)

40 LF 15" RCP @ 4.38%

CONST. FES-16
INV OUT=1178.00 W

CONST. RRA-22
TO LIMITS SHOWN
D50=6"
DEPTH=18"

CONST. RRA-25
W1=5'
W2=34'
L=28'
D50=12"
DEPTH=24"

CONST. RRA-24 TO LIMITS SHOWN
D50=12"
DEPTH=24"

CONST. FES-18
INV OUT=1188.00 S

44 LF
15" RCP
@ 3.18%

CONST. RRA-16
W1=5'
W2=28'
L=24'
D50=8"
DEPTH=18"

CONST. FES-12
INV OUT=1146.45 E

24 LF 12" RCP @ 1.04%

CONST. FES-11
INV OUT=1146.70 W

CONST. RRA-17 TO LIMITS SHOWN
D50=6"
DEPTH=18"

CONST. RRA-18
W1=5'
W2=25'
L=21'
D50=6"
DEPTH=18"

1148

PROPOSED INVERTER & EQUIPMENT PAD (TYP.)

CONST. RRA-23
W1=4'
W2=20'
L=17'
D50=6"
DEPTH=18"

CONST. FES-17
INV OUT=1176.25 E

CONST. FES-19
INV OUT=1186.60 N

MATCH LINE - C.303

MATCH LINE - C.303

MATCH LINE - C.303

39 LF

INV

INV

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICK A
No. 02.39
LICENSED
PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED
PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
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Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

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APPROVED:	BLM

SITE PLAN

SCALE: AS SHOWN

C.303

MATCH LINE - SEE INSET RIGHT

APPROXIMATE LIMIT OF WORK (TYP.)

20' SIDE/REAR SETBACK

GRAVEL ACCESS ROAD (IMPROVE AS NEEDED)

CONST. FES-13
INV OUT=1200.30 W

CONST. RRA-19 TO LIMITS SHOWN
D50=6"
DEPTH=18"

PROPOSED SUBSTATION ACCESS

CONST. PCB-2
RIM=1193.75
INV IN=1190.60 SW
INV OUT=1190.50 NE

122 LF 12" RCP @ 0.53%

CONST. PCB-3
RIM=1193.50
INV IN=1189.85 SW
INV OUT=1189.75 SE

194 LF 12" HDPE @ 1.16%

151 LF 12" RCP @ 0.50%

39 LF 15" RCP @ 1.79%

CONST. FES-14
INV OUT=1199.60 E

CONST. RRA-20
W1=4'
W2=13'
L=9'
D50=6"
DEPTH=18"

CONST. PCB-1
RIM=1195.20
INV OUT=1191.35 NE

PROPOSED 16' SWING GATE

PROPOSED PEDESTRIAN GATE

PROPOSED 20' SWING GATE

16.00'

200.00'

25' (MIN.)

1194.25

1194.35

1194.45

113.54'

PROPOSED 20' SWING GATE

PROPOSED PEDESTRIAN GATE

CONST. FES-15
INV OUT=1187.50 NW

CONST. RRA-21
W1=5'
W2=28'
L=24'
D50=8"
DEPTH=18"

1195.70

1196.25

250'

258'

PROPOSED LIMIT OF CLEARING (TYP.)

PROPOSED INTERCONNECTION SUBSTATION & SECURITY FENCE
(SEE DRAWINGS BY MSE ENGINEERING, LCC DATED 9/16/2019)

B-6

MATCH LINE - C.304

MATCH LINE - C.303

MATCH LINE - C.304

MATCH LINE - SEE LEFT

PALMER HILL ROAD
(PUBLIC - VARIABLE WIDTH)

CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE/EXIT

APPROXIMATE LIMIT OF WORK (TYP.)

GRAVEL ACCESS ROAD
(IMPROVE AS NEEDED)

MATCH LINE - SEE LEFT

INSET

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02.99
LICENSED PROFESSIONAL ENGINEER
10-29-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED PROFESSIONAL ENGINEER
10/29/19

N

SCALE IN FEET
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GRAPHIC SCALE

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Fitzwilliam, NH

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SITE PLAN

SCALE: AS SHOWN

C.304

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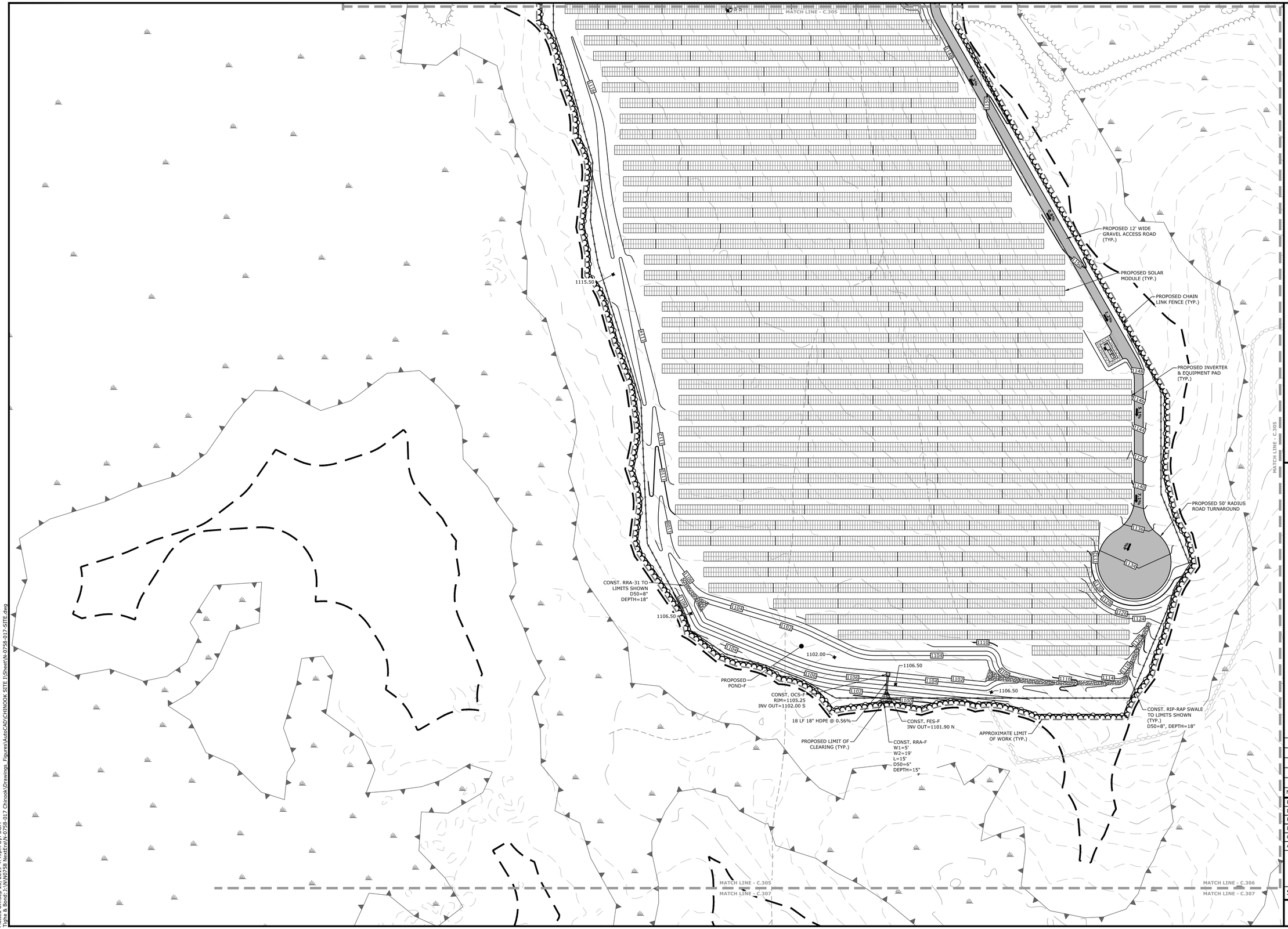

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZZETTA No. 02.39 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

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SITE PLAN

SCALE: AS SHOWN

C.305

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MATCH LINE - C.306

MATCH LINE - C.306

MATCH LINE - C.306

PROPOSED LIMIT OF CLEARING (TYP.)

APPROXIMATE LIMIT OF WORK (TYP.)

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.) D50=8", DEPTH=18"

B-8

CONST. PCB-4 (DOUBLE) RIM=1136.00 INV OUT=1131.80 SW

60 LF 18" HDPE @ 0.50%

CONST. PCB-5 RIM=1139.70 INV IN=1131.50 NE INV OUT=1134.40 SW

68 LF 18" HDPE @ 0.59%

CONST. FES-20 INV OUT=1134.00 NE

CONST. RRA-28 W1=5' W2=27' L=23' D50=8" DEPTH=18"

CONST. FES-24 INV OUT=1132.40 E

CONST. RRA-30 W1=4' W2=17' L=13' D50=8" DEPTH=18"

18 LF 15" RCP @ 3.33%

PROPOSED LIMIT OF CLEARING (TYP.)

CONST. RRA-29 TO LIMITS SHOWN D50=8" DEPTH=18"

CONST. FES-23 INV OUT=1133.00 W

1120.50

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.) D50=8", DEPTH=18"

1108.50

PROPOSED 20' SWING GATE (TYP.)

CONST. FES-22 INV OUT=1156.50 NE (TYP.)

CONST. RRA-27 W1=5' W2=34' L=28' D50=12" DEPTH=24"

1156.25

20' SIDE/REAR SETBACK

PROPOSED SOLAR MODULE (TYP.)

PROPOSED CHAIN LINK FENCE (TYP.)

PROPOSED LIMIT OF CLEARING

APPROXIMATE LIMIT OF WORK (TYP.)

20' SIDE/REAR SETBACK

PROPOSED 12' WIDE GRAVEL ACCESS ROAD (TYP.)

PROPOSED 20' SWING GATE (TYP.)

41 LF 15" RCP @ 1.22%

CONST. FES-21 INV OUT=1157.00 SW

CONST. RRA-26 TO LIMITS SHOWN D50=12" DEPTH=24"

MATCH LINE - C.306

MATCH LINE - C.308

CONST. RRA-32 TO LIMITS SHOWN D50=8" DEPTH=18"

PROPOSED POND-H

1136.00

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE - BRADLEE MEZZETTA No. 02.39 LICENSED PROFESSIONAL ENGINEER - 10-2-19

STATE OF NEW HAMPSHIRE - JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER - 10/2/19

N

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SITE PLAN

SCALE: AS SHOWN

C.306

MATCH LINE - C.305
MATCH LINE - C.307

MATCH LINE - C.306
MATCH LINE - C.307

PROPOSED SOLAR MODULE (TYP.)

PROPOSED CHAIN LINK FENCE (TYP.)

PROPOSED LIMIT OF CLEARING (TYP.)

APPROXIMATE LIMIT OF WORK (TYP.)

20' SIDE/REAR SETBACK

B-6

1096.75

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.) D50=8", DEPTH=18"

1108.50

CONST. FES-25 INV OUT=1113.00 W

159 LF 15" HDPE @ 5.66%

CONST. FES-26 INV OUT=1104.00 E

1108.50

CONST. RRA-34 W1=5' W2=25' L=20' D50=8" DEPTH=18"

CONST. RRA-33 TO LIMITS SH

PROPOSED POND-N

PROPOSED INVERTER & EQUIPMENT PAD (TYP.)

CONST. OCS-N RIM=1108.00 INV OUT=1102.10 SW

16 LF 15" HDPE @ 0.62%

1104.00

CONST. FES-N INV OUT=1102.00 NE

1108.50

CONST. RRA-N TO LIMITS SHOWN D50=6" DEPTH=18"

PROPOSED 16' SWING GATE (TYP.)

PROPOSED GUARDRAIL (TYP.)

PROPOSED 2:1 SLOPE WITH PERMANENT SLOPE STABILIZATION (TYP.)

PROPOSED PRECAST BRIDGE (SEE DETAIL)

PROPOSED 16' SWING GATE (TYP.)

PROPOSED INVERTER & EQUIPMENT PAD (TYP.)

PROPOSED 12' WIDE GRAVEL ACCESS ROAD (TYP.)

PROPOSED 12' WIDE GRAVEL ACCESS ROAD (TYP.)

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.) D50=8", DEPTH=18"

PROPOSED LIMIT OF CLEARING (TYP.)

26 LF 15" RCP @ 5.00%

CONST. PDMH1 RIM=1080.00 INV IN=1076.70 W INV OUT=1067.85 E

37 LF 15" HDPE @ 5.00%

CONST. FES-28 INV OUT=1066.00 W

CONST. RRA-37 W1=5', W2=25'

MATCH LINE - C.307
MATCH LINE - C.309

MATCH LINE - C.307
MATCH LINE - C.306

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NEXTera ENERGY

BRADLEE MEZICA No. 02.99 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10/2/19

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Chinook Solar, LLC

Fitzwilliam, NH

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APPROVED:	BLM

SITE PLAN

SCALE: AS SHOWN

C.307

CONST. RIP-RAP SWALE TO LIMITS SHOWN (TYP.) D50=8", DEPTH=18"

MATCH LINE - C.306
MATCH LINE - C.308

CONST. RRA-32 TO LIMITS SHOWN D50=8" DEPTH=18"

STREAM (TYP.)

PROPOSED POND-H

1140.50

1136.00

1140.50

23 LF 18" HDPE @ 2.17%

CONST. FES-H
INV OUT=1134.50 NW

CONST. OCS-H
RIM=1137.97
INV OUT=1135.00 SE

CONST. RRA-H
W1=5'
W2=16'
L=12'
D50=6"
DEPTH=15"

20' SIDE/REAR SETBACK

PROPOSED LEVEL SPREADER (TYP.)

1104.75

1104.75

PROPOSED POND-G

CONST. OCS-G
RIM=1103.50
INV OUT=1101.00 E

1102.00

5 LF 12" HDPE @ 3.00%

CONST. RRA-G
W1=3'
W2=11'
L=8'
D50=6"
DEPTH=15"

CONST. FES-G
INV OUT=1100.85 W

1104.75

T. RRA-33 TO LIMITS SHOWN, D50=6", DEPTH=18"

PROPOSED SOLAR MODULE (TYP.)

PROPOSED CHAIN LINK FENCE (TYP.)

MATCH LINE - C.308

APPROXIMATE LIMIT OF WORK (TYP.)

PROPOSED LIMIT OF CLEARING (TYP.)

1062.75

PROPOSED POND-I

22 LF 15" HDPE @ 1.14%

1058.00

CONST. RRA-I
W1=5'
W2=28'
L=24'
D50=10"
DEPTH=24"

CONST. FES-I
INV OUT=1057.25 NW

CONST. OCS-I
RIM=1061.00
INV OUT=1057.50 SE

1062.75

STREAM (TYP.)

STREAM (TYP.)

MATCH LINE - C.308
MATCH LINE - C.310

APPROXIMATE LIMIT

20' SIDE/REAR SETBACK

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02.39
LICENSED
PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED
PROFESSIONAL ENGINEER
10/2/19

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Chinook Solar, LLC

Fitzwilliam, NH

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APPROVED:	BLM

SITE PLAN

SCALE: AS SHOWN

C.308

MATCH LINE - C.307
MATCH LINE - C.309

1096.75
1096.75
PROPOSED POND-K
CONST. OCS-K
RIM=1095.15
INV OUT=1093.50 SW
9 LF 18" HDPE @ 1.11%
CONST. FES-K
INV OUT=1093.40 NE
1094.00
1096.75
CONST. RRA-K
W1=5'
W2=27'
L=23'
D50=8"
DEPTH=18"
CONST. RRA-35 TO
LIMITS SHOWN
D50=6"
DEPTH=18"
20' SIDE/REAR SETBACK
PROPOSED SOLAR
MODULE (TYP.)
PROPOSED CHAIN LINK
FENCE (TYP.)
APPROXIMATE LIMIT OF
WORK (TYP.)
PROPOSED LIMIT OF
CLEARING (TYP.)
PROPOSED LIMIT OF
CLEARING (TYP.)
26 LF 15" RCP @ 5.00%
CONST. PDMH1
RIM=1080.00
INV IN=1076.70 W
INV OUT=1067.85 E
37 LF 15" HDPE @ 5.00%
CONST. FES-28
INV OUT=1066.00 W
CONST. RRA-37
W1=5', W2=25'
L=20', D50=8"
DEPTH=18"
1069.50
PROPOSED POND-L
CONST. OCS-L
(SEE DETAIL)
STREAM
(TYP.)
CONST. FES-27
INV OUT=1078.00 E
CONST. RRA-36 TO LIMITS
SHOWN
D50=6"
DEPTH=18"
1066.50
1069.50
CONST. RRA-39 TO LIMITS SHOWN
D50=6"
DEPTH=18"
CONST. FES-30
INV OUT=1068.00 S
54 LF 15" RCP @ 0.74%
PROPOSED INVERTER &
EQUIPMENT PAD (TYP.)
CONST. FES-29
INV OUT=1068.40 N
CONST. RRA-38 TO LIMITS SHOWN, D50=6
B-10
MATCH LINE - C.310
MATCH LINE - C.310

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-SITE.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

SITE PLAN

SCALE: AS SHOWN

C.309

Last Saved: 9/26/2019
Plotted: Oct 02, 2019 - 4:50pm By: DGM
Tighe & Bond J:\NW\N0758 NextEra\N-0758-017 Chinook\Drawings_Figures\AutoCAD\CHINOOK SITE 1\Sheet\N-0758-017-SITE.dwg

DEPTH=18"
SED LIMIT OF
ING (TYP.)
26 LF 15" RCP @ 5.00%
CONST. PDMH1
RIM=1080.00
INV IN=1076.70 W
INV OUT=1067.85 E
37 LF 15" HDPE @ 5.00%
CONST. FES-28
INV OUT=1066.00 W
CONST. RRA-37
W1=5', W2=25'
L=20', D50=8"
DEPTH=18"
1069.50
PROPOSED POND-L
CONST. OCS-L
(SEE DETAIL)
1066.50
1069.50
CONST. RRA-39 TO LIMITS SHOWN
D50=6"
DEPTH=18"
CONST. FES-30
INV OUT=1068.00 S
54 LF 15" RCP @ 0.74%
PROPOSED INVERTER &
EQUIPMENT PAD (TYP.)
CONST. FES-29
INV OUT=1068.40 N
CONST. RRA-38 TO LIMITS SHOWN, D50=6", DEPTH=18"
STREAM
(TYP.)
1062.75
CONST. OCS-I
RIM=1061.00
INV OUT=1057.50 SE
MATCH LINE - C.308
MATCH LINE - C.310
PROPOSED LIMIT OF
CLEARING (TYP.)
APPROXIMATE LIMIT
OF WORK (TYP.)
CONST. OCS-M
(SEE DETAIL)
PROPOSED POND-M
1058.50
CONST. RRA-40 TO LIMITS SHOWN
D50=6"
DEPTH=18"
CONST. FES-32
INV OUT=1056.00 S
28 LF 12" RCP @ 0.54%
CONST. FES-31
INV OUT=1056.15 N
1056.50
1056.00
CONST. RRA-39 TO LIMITS SHOWN, D50=6", DEPTH=18"
20' SIDE/REAR SETBACK
PROPOSED 50' RADIUS
ROAD TURNAROUND
PROPOSED INVERTER &
EQUIPMENT PAD (TYP.)
PROPOSED CHAIN
LINK FENCE (TYP.)
STREAM
(TYP.)
MATCH LINE - C.308
MATCH LINE - C.310
PROPOSED SOLAR
MODULE (TYP.)
PROPOSED LEVEL SPREADER (TYP.)
APPROXIMATE LIMIT
OF WORK (TYP.)
PROPOSED LIMIT OF
CLEARING (TYP.)
STREAM
(TYP.)
B1
PROPOSED
POND-J
1028.50
21 LF 24" HDPE @ 1.43%
CONST. RRA-J
W1=6'
W2=26'
L=20'
D50=6"
DEPTH=15"
CONST. OCS-J
RIM=1027.49
INV OUT=1023.00 SE
CONST. FES-J
INV OUT=1022.70 NW
1062
1058
1072

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZICA
No. 02...9
LICENSED
PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12288
LICENSED
PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 60' 120'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
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DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

SITE PLAN

SCALE: AS SHOWN

C.310

Last Saved: 9/26/2019
Plotted: Oct 02, 2019 - 10:19:4-51pm By: DGM
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GENERAL PROJECT INFORMATION

PROJECT OWNER: CHINOOK SOLAR, LLC
C/O NEXTERA ENERGY RESOURCES, LLC
700 UNIVERSE BOULEVARD
JUNO BEACH, FLORIDA 33408
PROJECT NAME: CHINOOK SOLAR PROJECT
PROJECT ADDRESS: FULLAM HILL ROAD
FITZWILLIAM, NEW HAMPSHIRE 03447

PROJECT DESCRIPTION

THE PROJECT CONSISTS OF SOLAR ENERGY SYSTEM DEVELOPMENT. THE WORK IS ANTICIPATED TO START IN SPRING OF 2020, AND BE COMPLETED BY WINTER OF 2021.

DISTURBED AREA

THE TOTAL AREA TO BE DISTURBED IS APPROXIMATELY +/-157 ACRES.

NAME OF RECEIVING WATERS

THE STORMWATER RUNOFF FROM THE SITE WILL BE DISCHARGED VIA OVERLAND FLOW TO SCOTT BROOK OR SIP POND AND MILLER RIVER.

CONSTRUCTION SEQUENCE OF MAJOR ACTIVITIES:

1. CONSTRUCT TEMPORARY SEDIMENT AND EROSION CONTROL FACILITIES. REFER TO DETAILED PROJECT PHASING PLAN PREPARED BY TIGHE & BOND, INC. FOR ADDITIONAL DETAILS.
2. EROSION AND SEDIMENT MEASURES SHALL BE INSTALLED PRIOR TO ANY TREE CLEARING OR EARTH MOVING OPERATIONS THAT WILL INFLUENCE STORMWATER RUNOFF.
3. CUT AND CLEAR TREES.
4. CLEAR AND DISPOSE OF DEBRIS. STUMP GRINDINGS MAY BE USED FOR EROSION CONTROL BERMS IN COMBINATION WITH SILT FENCE. THE USE OF THESE TYPES OF BERMS IS PREFERRED TO ENHANCE THE EROSION CONTROL BARRIERS ADJACENT TO WETLANDS.
5. CONSTRUCT TEMPORARY CULVERTS AND DIVERSION CHANNELS AS REQUIRED.
6. GRADE AND GRAVEL ROADWAYS - ALL ROADS SHALL BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
7. CONSTRUCT SOLAR ARRAY, FENCING, AND EQUIPMENT PADS.
8. BEGIN PERMANENT AND TEMPORARY SEEDING AND MULCHING. ALL CUT AND FILL SLOPES SHALL BE SEEDED AND MULCHED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
9. DAILY, OR AS REQUIRED, CONSTRUCT TEMPORARY BERMS, DRAINS, DITCHES, PERIMETER EROSION CONTROL MEASURES, SEDIMENT TRAPS, ETC., MULCH AND SEED AS REQUIRED.
10. INSPECT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES.
11. COMPLETE PERMANENT SEEDING.
12. REMOVE TRAPPED SEDIMENTS FROM EROSION CONTROL BARRIERS AS APPROPRIATE AND THEN REMOVE TEMPORARY EROSION CONTROL MEASURES.

SPECIAL CONSTRUCTION NOTES:

1. THE CONSTRUCTION SEQUENCE SHALL LIMIT THE DURATION AND AREA OF DISTURBANCE.
2. THE PROJECT IS TO BE MANAGED IN A MANNER THAT MEETS THE REQUIREMENTS AND INTENT OF NHDES REGULATIONS

EROSION CONTROL NOTES:

1. ALL EROSION CONTROL MEASURES AND PRACTICES SHALL CONFORM TO THE "NH DES STORMWATER MANUAL VOLUME 2 AND NHDES SOLAR GUIDANCE.
2. PRIOR TO ANY WORK OR SOIL DISTURBANCE, CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR EROSION CONTROL MEASURES.
3. CONTRACTOR SHALL INSTALL TEMPORARY EROSION CONTROL BARRIERS, INCLUDING SILT FENCES, MULCH BERMS, AND SILT SOCKS AS SHOWN IN THESE DRAWINGS AS THE FIRST ORDER OF WORK.
4. PERIMETER CONTROLS INCLUDING SILT FENCES, MULCH BERM, AND/OR SILT SOCKS SHALL BE MAINTAINED FOR THE DURATION OF THE PROJECT UNTIL ALL AREAS HAVE BEEN STABILIZED.
5. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL TEMPORARY EROSION CONTROL DEVICES UPON COMPLETION OF CONSTRUCTION.
6. ALL DISTURBED AREAS NOT OTHERWISE BEING TREATED SHALL RECEIVE 4" LOAM, SEED AND FERTILIZER.
7. INSPECT ALL INLET PROTECTION AND PERIMETER CONTROLS WEEKLY AND AFTER EACH RAIN 0STORM OF 0.25 INCH OR GREATER. REPAIR/MODIFY PROTECTION AS NECESSARY TO MAXIMIZE EFFICIENCY OF FILTER. REPLACE ALL FILTERS WHEN SEDIMENT IS 1/3 THE FILTER HEIGHT.
8. CONSTRUCT EROSION CONTROL BLANKETS ON ALL SLOPES STEEPER THAN 3:1.

STABILIZATION:

1. AN AREA SHALL BE CONSIDERED STABLE WHEN ONE OF THE FOLLOWING HAS OCCURRED:
   A. BASE COURSE GRAVELS HAVE BEEN INSTALLED IN GRAVEL ROAD AREAS;
   B. A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
   C. A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIPRAP HAS BEEN INSTALLED;
   D. EROSION CONTROL BLANKETS HAVE BEEN PROPERLY INSTALLED.
2. WINTER STABILIZATION PRACTICES:
   A. ALL PROPOSED VEGETATED AREAS THAT DO NOT EXHIBIT A MINIMUM OF 85 PERCENT VEGETATIVE GROWTH BY OCTOBER 15, OR WHICH ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED BY SEEDING AND INSTALLING EROSION CONTROL BLANKETS ON SLOPES GREATER THAN 3:1, AND SEEDING AND PLACING 3 TO 4 TONS OF MULCH PER ACRE, SECURED WITH ANCHORED NETTING, ELSEWHERE. THE INSTALLATION OF EROSION CONTROL BLANKETS OR MULCH AND NETTING SHALL NOT OCCUR OVER ACCUMULATED SNOW OR ON FROZEN GROUND AND SHALL BE COMPLETED IN ADVANCE OF SNOW OR SPRING MELT EVENTS;
   B. ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85 PERCENT VEGETATIVE GROWTH BY OCTOBER 15, OR WHICH ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED TEMPORARILY WITH STONE OR EROSION CONTROL BLANKETS APPROPRIATE FOR THE DESIGN FLOW CONDITIONS;
   C. AFTER NOVEMBER 15, INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE WINTER SEASON, SHALL BE PROTECTED WITH A MINIMUM OF 3 INCHES OF CRUSHED GRAVEL, OR IF CONSTRUCTION IS TO CONTINUE THROUGH THE WINTER SEASON BE CLEARED OF ANY ACCUMULATED SNOW AFTER EACH STORM EVENT;
3. STABILIZATION SHALL BE INITIATED ON ALL LOAM STOCKPILES, AND DISTURBED AREAS, WHERE CONSTRUCTION ACTIVITY SHALL NOT OCCUR FOR MORE THAN TWENTY-ONE (21) CALENDAR DAYS BY THE FOURTEENTH (14TH) DAY AFTER CONSTRUCTION ACTIVITY HAS PERMANENTLY OR TEMPORARILY CEASED IN THAT AREA. STABILIZATION MEASURES TO BE USED INCLUDE:
   A. TEMPORARY SEEDING;
   B. MULCHING.
4. WHEN CONSTRUCTION ACTIVITY PERMANENTLY OR TEMPORARILY CEASES WITHIN 100 FEET OF NEARBY SURFACE WATERS OR DELINEATED WETLANDS, THE AREA SHALL BE STABILIZED WITHIN SEVEN (7) DAYS OR PRIOR TO A RAIN EVENT. ONCE CONSTRUCTION ACTIVITY CEASES PERMANENTLY IN AN THESE AREAS, SILT FENCES, MULCH BERMS, HAY BALE BARRIERS AND ANY EARTH/DIKES SHALL BE REMOVED ONCE PERMANENT MEASURES ARE ESTABLISHED.
5. DURING CONSTRUCTION, RUNOFF SHALL BE DIVERTED AROUND THE SITE WITH EARTH DIKES, PIPING OR STABILIZED CHANNELS WHERE POSSIBLE. SHEET RUNOFF FROM THE SITE SHALL BE FILTERED THROUGH SILT FENCES, MULCH BERMS, OR SILT SOCKS.
6. THE SITE SHALL BE STABILIZED FOR THE WINTER BY NOVEMBER 15.

DUST CONTROL:

1. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTROL DUST THROUGHOUT THE CONSTRUCTION PERIOD.
2. DUST CONTROL METHODS SHALL INCLUDE, BUT BE NOT LIMITED TO SPRINKLING WATER ON EXPOSED AREAS, COVERING LOADED DUMP TRUCKS LEAVING THE SITE, AND TEMPORARY MULCHING.
3. DUST CONTROL MEASURES SHALL BE UTILIZED SO AS TO PREVENT THE MIGRATION OF DUST FROM THE SITE TO ABUTTING AREAS.

STOCKPILES:

1. LOCATE STOCKPILES A MINIMUM OF 50 FEET AWAY FROM CATCH BASINS, SWALES, CULVERTS, DELINEATED WETLANDS, AND VERNAL POOLS.
2. ALL STOCKPILES SHOULD BE SURROUNDED WITH TEMPORARY EROSION CONTROL MEASURES PRIOR TO THE ONSET OF PRECIPITATION.
3. PERIMETER BARRIERS SHOULD BE MAINTAINED AT ALL TIMES, AND ADJUSTED AS NEEDED TO ACCOMMODATE THE DELIVERY AND REMOVAL OF MATERIALS FROM THE STOCKPILE. THE INTEGRITY OF THE BARRIER SHOULD BE INSPECTED AT THE END OF EACH WORKING DAY.
4. PROTECT ALL STOCKPILES FROM STORMWATER RUN-OFF USING TEMPORARY EROSION CONTROL MEASURES SUCH AS BERMS, SILT SOCK, OR OTHER APPROVED PRACTICE TO PREVENT MIGRATION OF MATERIAL BEYOND THE IMMEDIATE CONFINES OF THE STOCKPILES.

OFF SITE VEHICLE TRACKING:

1. THE CONTRACTOR SHALL CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO ANY EXCAVATION ACTIVITIES.

CONCRETE WASHOUT AREA:

1. THE CONCRETE DELIVERY TRUCKS SHALL, WHENEVER POSSIBLE, USE WASHOUT FACILITIES AT THEIR OWN PLANT OR DISPATCH FACILITY;
2. IF IT IS NECESSARY, SITE CONTRACTOR SHALL DESIGNATE SPECIFIC WASHOUT AREAS AND DESIGN FACILITIES TO HANDLE ANTICIPATED WASHOUT WATER;
3. CONTRACTOR SHALL LOCATE WASHOUT AREAS AT LEAST 150 FEET AWAY FROM STORM DRAINS, SWALES AND SURFACE WATERS OR DELINEATED WETLANDS & VERNAL POOLS;
4. INSPECT WASHOUT FACILITIES DAILY TO DETECT LEAKS OR TEARS AND TO IDENTIFY WHEN MATERIALS NEED TO BE REMOVED.

EROSION CONTROL OBSERVATIONS AND MAINTENANCE PRACTICES

THE CONTRACTOR SHALL PREPARE A STORMWATER POLLUTION PREVENTION PLAN (SWPPP). THE CONTRACTOR SHALL BE FAMILIAR WITH THE SWPPP AND KEEP AN UPDATED COPY OF THE SWPPP ONSITE AT ALL TIMES.

THE FOLLOWING REPRESENTS THE GENERAL OBSERVATION AND REPORTING PRACTICES THAT SHALL BE FOLLOWED AS PART OF THIS PROJECT:

1. OBSERVATIONS OF THE PROJECT FOR COMPLIANCE WITH THE SWPPP SHALL BE MADE BY THE CONTRACTOR AT LEAST ONCE A WEEK OR WITHIN 24 HOURS OF A STORM 0.25 INCHES OR GREATER;
2. AN OBSERVATION REPORT SHALL BE MADE AFTER EACH OBSERVATION AND DISTRIBUTED TO THE ENGINEER, THE OWNER, AND THE CONTRACTOR;
3. A REPRESENTATIVE OF THE SITE CONTRACTOR, SHALL BE RESPONSIBLE FOR MAINTENANCE AND REPAIR ACTIVITIES;
4. IF A REPAIR IS NECESSARY, IT SHALL BE INITIATED WITHIN 24 HOURS OF REPORT.

VEGETATION

1. TEMPORARY GRASS COVER
   A. SEEDBED PREPARATION:
      1. APPLY FERTILIZER AT THE RATE OF 600 POUNDS PER ACRE OF 10-10-10. APPLY LIMESTONE (EQUIVALENT TO 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF THREE (3) TONS PER ACRE.
   B. SEEDING
      1. UTILIZE ANNUAL RYE GRASS AT A RATE OF 40 LBS/ACRE.
      2. WHERE THE SOIL HAS BEEN COMPACTED BY CONSTRUCTION OPERATIONS, LOOSEN SOIL TO A DEPTH OF TWO (2) INCHES BEFORE APPLYING FERTILIZER, LIME AND SEED.
      3. APPLY SEED UNIFORMLY BY HAND, CYCLONE SEEDER, OR HYDROSEEDER (SLURRY INCLUDING SEED AND FERTILIZER). HYDROSEEDINGS, WHICH INCLUDE MULCH,MAY BE LEFT ON SOIL SURFACE. SEEDING RATES MUST BE INCREASED 10% WHEN HYDROSEEDING.
   C. MAINTENANCE
2. TEMPORARY SEEDING SHALL BE PERIODICALLY INSPECTED. AT A MINIMUM, 95% OF THE SOIL SURFACE SHOULD BE COVERED BY VEGETATION. IF ANY EVIDENCE OF EROSION OR SEDIMENTATION IS APPARENT, REPAIRS SHALL BE MADE AND OTHER TEMPORARY MEASURES USED IN THE INTERIM (MULCH, FILTER BARRIERS, CHECK DAMS, ETC.).
3. VEGETATIVE PRACTICE
   A. FOR PERMANENT MEASURES AND PLANTINGS.
      1. LIMESTONE SHALL BE THOROUGHLY INCORPORATED INTO THE LOAM LAYER AT A RATE OF THREE (3) TONS PER ACRE IN ORDER TO PROVIDE A PH VALUE OF 5.5 TO 6.5.
      2. FERTILIZER SHALL BE SPREAD ON THE TOP LAYER OF LOAM AND WORKED INTO THE SURFACE. FERTILIZER APPLICATION RATE SHALL BE 800 POUNDS PER ACRE OF 10-20-20 FERTILIZER.
      3. SOIL CONDITIONERS AND FERTILIZER SHALL BE APPLIED AT THE RECOMMENDED RATES AND SHALL BE THOROUGHLY WORKED INTO THE LOAM. LOAM SHALL BE RAKED UNTIL THE SURFACE IS FINELY PULVERIZED, SMOOTH AND EVEN, AND THEN COMPACTED TO AN EVEN SURFACE CONFORMING TO THE REQUIRED LINES AND GRADES WITH APPROVED ROLLERS WEIGHING BETWEEN 4-1/2 POUNDS AND 5-1/2 POUNDS PER INCH OF WIDTH.
      4. SEED SHALL BE SOWN AT THE RATE SHOWN BELOW. SOWING SHALL BE DONE ON A CALM, DRY DAY, PREFERABLY BY MACHINE, BUT IF BY HAND, ONLY BY EXPERIENCED WORKMEN. IMMEDIATELY BEFORE SEEDING, THE SOIL SHALL BE LIGHTLY RAKED. ONE HALF THE SEED SHALL BE SOWN IN ONE DIRECTION AND THE OTHER HALF AT RIGHT ANGLES TO THE ORIGINAL DIRECTION. IT SHALL BE LIGHTLY RAKED INTO THE SOIL TO A DEPTH NOT OVER 1/4 INCH AND ROLLED WITH A HAND ROLLER WEIGHING NOT OVER 100 POUNDS PER LINEAR FOOT OF WIDTH.
      5. HAY MULCH SHALL BE APPLIED IMMEDIATELY AFTER SEEDING AS INDICATED ABOVE.
      6. THE SURFACE SHALL BE WATERED AND KEPT MOIST WITH A FINE SPRAY AS REQUIRED, WITHOUT WASHING AWAY THE SOIL, UNTIL THE GRASS IS WELL ESTABLISHED. ANY AREAS WHICH ARE NOT SATISFACTORILY COVERED WITH GRASS SHALL BE RESEEDED, AND ALL NOXIOUS WEEDS REMOVED.
      7. THE CONTRACTOR SHALL PROTECT AND MAINTAIN THE SEEDED AREAS UNTIL ACCEPTED.
      8. A SEED MIXTURE CONTAINING THE FOLLOWING SEED REQUIREMENTS SHALL BE APPLIED AT THE INDICATED RATE:

NORTHEASTERN WILDFLOWER MIX*	9 LBS/ACRE
SHEEP FESCUE	25 LBS/ACRE

*NORTHEASTERN WILDFLOWER MIX BY ALLEN, STERLING & LOTHROP IN FALMOUTH, MAINE OR EQUAL.

IN NO CASE SHALL THE WEED CONTENT EXCEED ONE (1) PERCENT BY WEIGHT. ALL SEED SHALL COMPLY WITH STATE AND FEDERAL SEED LAWS. SEEDING SHALL BE DONE NO LATER THAN SEPTEMBER 15. IN NO CASE SHALL SEEDING TAKE PLACE OVER SNOW.

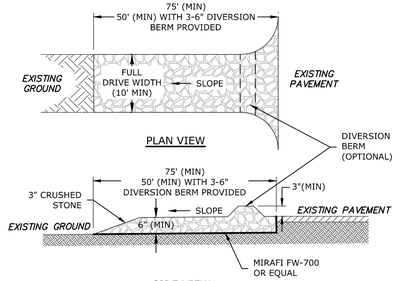
4. DORMANT SEEDING (SEPTEMBER 15 TO FIRST SNOWFALL)
   A. FOLLOW PERMANENT MEASURES SLOPE, LIME, FERTILIZER AND GRADING REQUIREMENTS. APPLY SEED MIXTURE AT TWICE THE INDICATED RATE. APPLY MULCH AS INDICATED FOR PERMANENT MEASURES.

ALLOWABLE NON-STORMWATER DISCHARGES

1. DISCHARGES FROM FIRE-FIGHTING ACTIVITIES
2. FIRE HYDRANT FLUSHINGS
3. WATERS USED TO WASH VEHICLES WHERE DETERGENTS ARE NOT USED
4. WATER USED TO CONTROL DUST
5. POTABLE WATER INCLUDING UNCONTAMINATED WATER LINE FLUSHINGS
6. ROUTINE EXTERNAL EQUIPMENT WASH DOWN -NO DETERGENTS
7. UNCONTAMINATED AIR CONDITIONING/COMPRESSOR CONDENSATE
8. UNCONTAMINATED GROUND WATER OR SPRING WATER
9. FOUNDATION OR FOOTING DRAINS -NOT CONTAMINATED
10. UNCONTAMINATED EXCAVATION DEWATERING
11. LANDSCAPE IRRIGATION

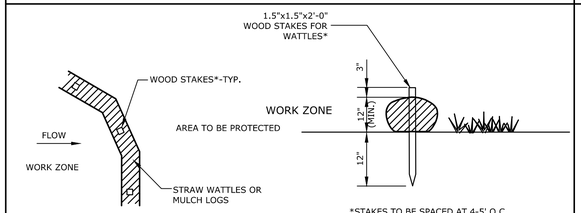
SPILL PREVENTION

1. CONTRACTOR SHALL BE FAMILIAR WITH SPILL PREVENTION MEASURES REQUIRED BY LOCAL, STATE AND FEDERAL AGENCIES. AT A MINIMUM, CONTRACTOR SHALL FOLLOW THE BEST MANAGEMENT SPILL PREVENTION PRACTICES OUTLINED BELOW.
2. THE FOLLOWING ARE THE MATERIAL MANAGEMENT PRACTICES THAT SHALL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURE OF MATERIALS AND SUBSTANCES DURING CONSTRUCTION TO STORMWATER RUNOFF:
   A. GOOD HOUSEKEEPING
      THE FOLLOWING GOOD HOUSEKEEPING PRACTICES SHALL BE FOLLOWED ON SITE DURING THE CONSTRUCTION PROJECT:
      1. ONLY SUFFICIENT AMOUNTS OF PRODUCTS TO DO THE JOB SHALL BE STORED ON SITE.
      2. ALL MATERIALS STORED ON SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER IN THEIR PROPER (ORIGINAL IF POSSIBLE) CONTAINERS AND, IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE.
      3. MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL SHALL BE FOLLOWED.
      4. THE SITE SUPERINTENDENT SHALL INSPECT DAILY TO ENSURE PROPER USE AND DISPOSAL OF MATERIALS.
      5. SUBSTANCES SHALL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER.
      6. WHENEVER POSSIBLE ALL OF A PRODUCT SHALL BE USED UP BEFORE DISPOSING OF THE CONTAINER.
   B. HAZARDOUS PRODUCTS
      THE FOLLOWING PRACTICES SHALL BE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS:
      1. PRODUCTS SHALL BE KEPT IN THEIR ORIGINAL CONTAINERS UNLESS THEY ARE NOT RESEALABLE.
      2. ORIGINAL LABELS AND MATERIAL SAFETY DATA SHALL BE RETAINED FOR IMPORTANT PRODUCT INFORMATION.
      3. SURPLUS PRODUCT THAT MUST BE DISPOSED OF SHALL BE DISCARDED ACCORDING TO THE MANUFACTURER'S RECOMMENDED METHODS OF DISPOSAL.
   C. PRODUCT SPECIFICATION PRACTICES
      THE FOLLOWING PRODUCT SPECIFIC PRACTICES SHALL BE FOLLOWED ON SITE:
      1. PETROLEUM PRODUCTS
         a. ALL ON SITE VEHICLES SHALL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTIVE MAINTENANCE TO REDUCE LEAKAGE.
         b. PETROLEUM PRODUCTS SHALL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. ANY ASPHALT BASED SUBSTANCES USED ON SITE SHALL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
      2. FERTILIZERS:
         a. FERTILIZERS USED SHALL BE APPLIED ONLY IN THE MINIMUM AMOUNTS DIRECTED BY THE SPECIFICATIONS.
         b. ONCE APPLIED FERTILIZER SHALL BE WORKED INTO THE SOIL TO LIMIT EXPOSURE TO STORMWATER.
         c. STORAGE SHALL BE IN A COVERED SHED OR ENCLOSED TRAILERS. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER SHALL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO AVOID SPILLS.
      3. PAINTS:
         a. ALL CONTAINERS SHALL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE.
         b. EXCESS PAINT SHALL BE DISPOSED OF PROPERLY ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR STATE AND LOCAL REGULATIONS.
   D. SPILL CONTROL PRACTICES
      IN ADDITION TO GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES DISCUSSED IN THE PREVIOUS SECTION, THE FOLLOWING PRACTICES SHALL BE FOLLOWED FOR SPILL PREVENTION AND CLEANUP:
      1. MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP SHALL BE CLEARLY POSTED AND SITE PERSONNEL SHALL BE MADE AWARE OF THE PROCEDURES AND THE LOCATION OF THE INFORMATION AND CLEANUP SUPPLIES.
      2. MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEANUP SHALL BE KEPT IN THE MATERIAL STORAGE AREA ON SITE. EQUIPMENT AND MATERIALS SHALL INCLUDE BUT NOT BE LIMITED TO BROOMS, DUSTPANS, MOPS, RAGS, GLOVES, GOGGLES, KITTY LITTER, SAND, SAWDUST AND PLASTIC OR METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE.
      3. ALL SPILLS SHALL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY.
      4. THE SPILL AREA SHALL BE KEPT WELL VENTILATED AND PERSONNEL SHALL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH A HAZARDOUS SUBSTANCE.
      5. SPILLS OF TOXIC OR HAZARDOUS MATERIAL SHALL BE REPORTED TO THE APPROPRIATE LOCAL, STATE OR FEDERAL AGENCIES AS REQUIRED.
      6. THE SITE SUPERINTENDENT RESPONSIBLE FOR DAY-TO-DAY SITE OPERATIONS SHALL BE THE SPILL PREVENTION AND CLEANUP COORDINATOR.
   E. VEHICLE FUELING AND MAINTENANCE PRACTICE:
      1. CONTRACTOR SHALL MAKE AN EFFORT TO PERFORM EQUIPMENT/VEHICLE FUELING AND MAINTENANCE AT AN OFF-SITE FACILITY.
      2. CONTRACTOR SHALL PROVIDE AN ON-SITE FUELING AND MAINTENANCE AREA THAT IS CLEAN AND DRY.
      3. IF POSSIBLE THE CONTRACTOR SHALL KEEP AREA COVERED.
      4. CONTRACTOR SHALL KEEP A SPILL KIT AT THE FUELING AND MAINTENANCE AREA.
      5. CONTRACTOR SHALL VEHICLES SHALL BE INSPECTED REGULARLY FOR LEAKS AND DAMAGE.
      6. CONTRACTOR SHALL USE DRIP PANS, DRIP CLOTHS, OR ABSORBENT PADS WHEN REPLACING SPENT FLUID.



NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OF SEDIMENT FROM THE SITE. WHEN WASHING IS REQUIRED, IT SHALL BE DONE SO RUNOFF DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING STORM DRAINS, DITCHES, OR WATERWAYS

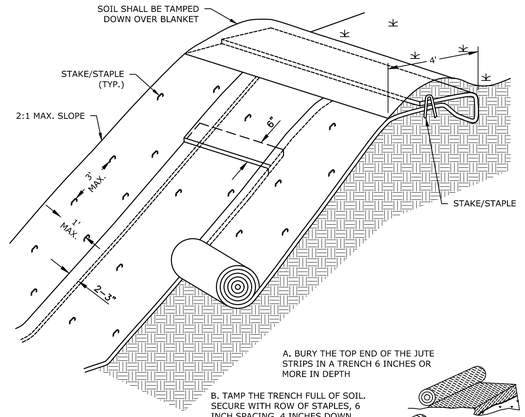
STABILIZED CONSTRUCTION EXIT
NO SCALE



NOTES:
1. SILT SOCK TO BE ORANGE IN COLOR.

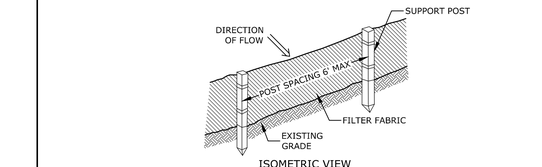
*STAKES TO BE SPACED AT 4-5' O.C. STAGGER STAKES BETWEEN STRAW WATTLES AND SILT FENCE

SILT SOCK
NO SCALE



NOTES:
1. EROSION CONTROL BLANKET SHALL BE INSTALLED VERTICALLY DOWNSLOPE.
2. STAKES/STAPLES SHALL BE PLACED NO MORE THAN 3 FT. APART VERTICALLY, AND 1 FT. APART HORIZONTALLY.
3. SLOPE SURFACE SHALL BE FREE OF STICKS, ROCKS, AND OTHER OBSTRUCTIONS.
4. BLANKETS SHALL BE ROLLED OUT LOOSELY WITH 3-4 STAPLES PER SQUARE YARD TO MAINTAIN DIRECT SOIL CONTACT. DO NOT STRETCH THE BLANKETS.

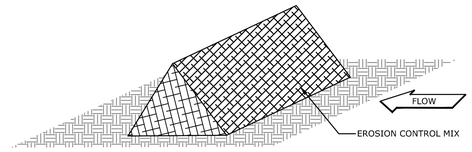
TYPICAL EROSION CONTROL BLANKET
NO SCALE



NOTE SILT FENCE LOCATION PER CROSS SECTION VIEW

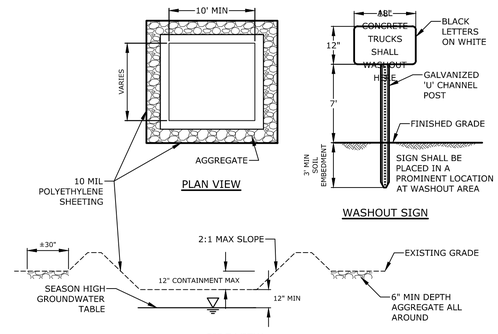
NOTES:
1. SILT FENCE SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
2. ADJOINING SECTIONS OF THE FENCE SHALL BE OVERLAPPED BY 6 INCHES, FOLDED AND STAPLED TO A SUPPORT POST.
3. SILT FENCE TO BE ORANGE IN COLOR.

SILT FENCE
NO SCALE



NOTES:
1. SEE SILT FENCE DETAIL FOR INSTALLATION DETAIL
2. EROSION CONTROL MIX MATERIAL TO BE FREE OF INVASIVE SPECIES SEED OR MATTER. DO NOT PLACE EROSION CONTROL MIX BERMS IN WETLANDS BEYOND THE LIMIT OF WORK. MIX MAY CONSIST OF STUMP GRINDINGS AND/OR MULCH.
3. EROSION CONTROL MIX MATERIAL MAY BE COVERED WITH CRUSHED STONE TO IMPROVE STABILITY.
4. SILT FENCE AND EROSION CONTROL BERM COMBINATION MAY BE SUBSTITUTED FOR SILT SOCK.

EROSION CONTROL BERM
NO SCALE



NOTES:
1. CONTAINMENT SHALL BE STRUCTURALLY SOUND AND LEAK FREE AND CONTAIN ALL LIQUID WASTES.
2. CONTAINMENT DEVICES MUST BE OF SUFFICIENT QUANTITY TO COMPLETELY CONTAIN THE LIQUID WASTES GENERATED.
3. WASHOUT SHALL BE CLEANED OR NEW FACILITIES CONSTRUCTED AND READY TO USE ONCE WASHOUT IS 75% FULL.
4. WASHOUT AREAS SHALL BE INSTALLED IN A LOCATION EASILY ACCESSIBLE BY CONCRETE TRUCKS
5. ONE OR MORE AREAS MAY BE INSTALLED ON THE CONSTRUCTION SITE AND MAY BE RELOCATED AS CONSTRUCTION PROGRESSES.
6. AT LEAST WEEKLY, REMOVE ACCUMULATION OF SAND AND AGGREGATE AND DISPOSE OF PROPERLY.

CONCRETE WASHOUT AREA
NO SCALE

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Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZA A. – No. 02.99 – LICENSED PROFESSIONAL ENGINEER – 10-2-2019

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO – No. 12288 – LICENSED PROFESSIONAL ENGINEER – 10/2/19

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

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DATE:	10/2/2019
FILE:	N0758-017_DTLS.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

EROSION CONTROL DETAILS & NOTES

SCALE: AS SHOWN

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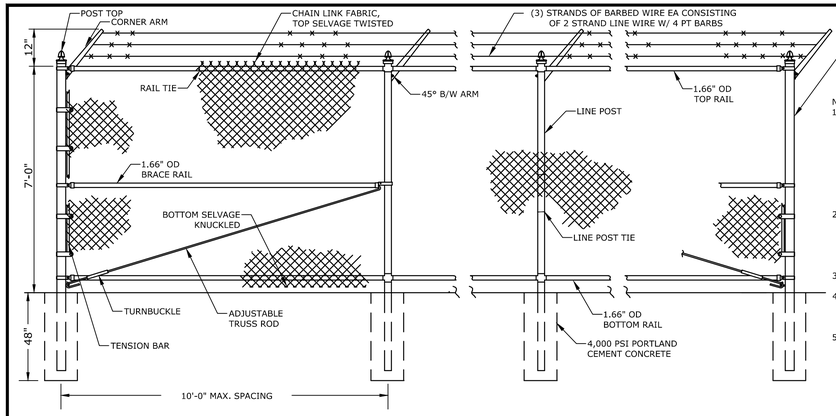
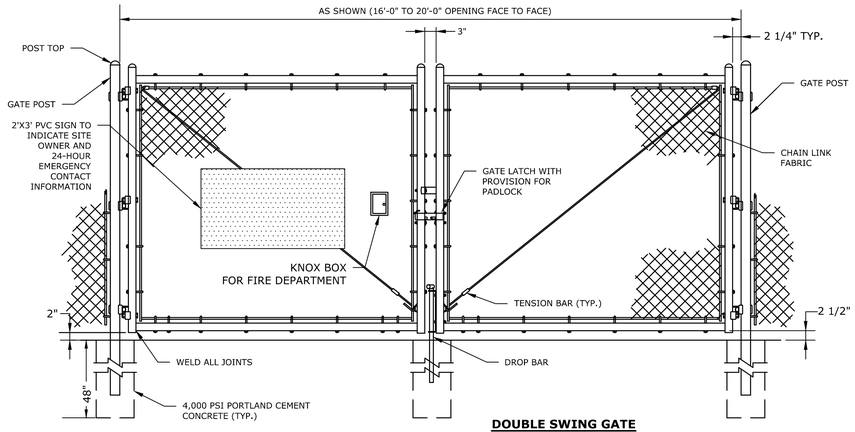
Last Saved: 9/26/2019
Plotted: 10/02/2019 @ 3:57pm By: DGM
Tighe & Bond: J:\WK0758 NextEraN-0758-017 Chinook\Drawings_Figures\AutoCAD\CHINOOK SITE 1\Sheet\N0758-017_DTLS.dwg



NOTES:
1. UNLESS OTHERWISE NOTED ON THE SITE PLANS, ALL CHAIN LINK FENCING COMPONENTS SHALL HAVE A HOT DIPPED GALVANIZED FINISH. ANY CHIPS IN THE GALVANIZED FINISH DUE SITE INSTALLATION SHOULD BE MINIMIZED AND REPAIRED WITH INDUSTRIAL GRADE PAINT ON GALVANIZED PAINT. ALL CUT ENDS ARE TO BE FINISHED WITH INDUSTRIAL GRADE PAINT ON GALVANIZED FINISH.
2. CHAIN LINK FABRIC SHALL BE MADE OF 9 GAUGE STEEL WIRE, 2" MESH SIZE, AND HOT DIPPED GALVANIZED PRIOR TO WEAVING. ONE EDGE OF THE FABRIC SHALL BE FINISHED WITH A SELVAGE TWIST AND THE OTHER WITH A SELVAGE KNUCKLE.
3. ALL POSTS SHALL BE PLUMB IN ALL DIRECTIONS.
4. LINE & TERMINAL POSTS, BRACE TUBES, TOP RAILS, BOTTOM RAILS, & GATE POSTS SHALL ALL BE SCHEDULE 40 PIPE. REFERENCED DIAMETER IS NOMINAL.
5. FOOTING WIDTH TO BE (4)X POST WIDTH.

SUBSTATION CHAIN LINK FENCE
NO SCALE



NOTES:
1. UNLESS OTHERWISE NOTED ON THE SITE PLANS, ALL CHAIN LINK FENCING COMPONENTS SHALL HAVE A HOT DIPPED GALVANIZED FINISH. ANY CHIPS IN THE GALVANIZED FINISH DUE SITE INSTALLATION SHOULD BE MINIMIZED AND REPAIRED WITH INDUSTRIAL GRADE PAINT ON GALVANIZED PAINT. ALL CUT ENDS ARE TO BE FINISHED WITH INDUSTRIAL GRADE PAINT ON GALVANIZED FINISH.
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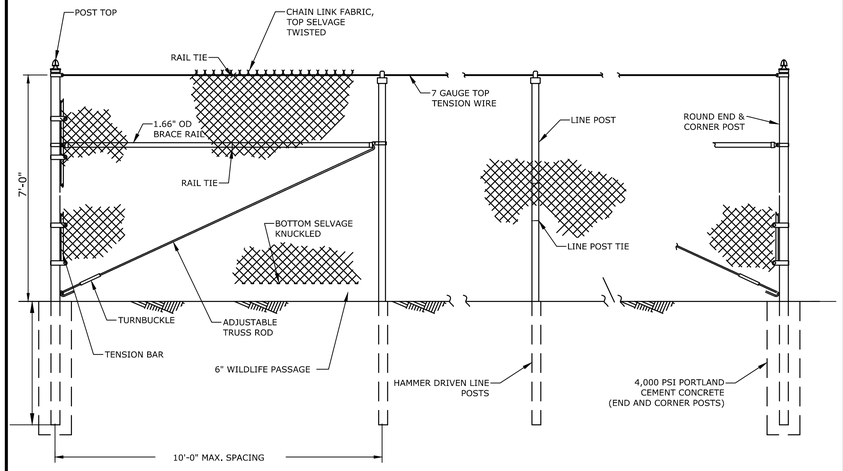
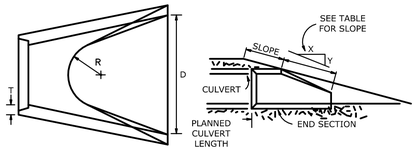
3. ALL POSTS SHALL BE PLUMB IN ALL DIRECTIONS.
4. LINE & TERMINAL POSTS, BRACE TUBES, TOP RAILS, BOTTOM RAILS, & GATE POSTS SHALL ALL BE SCHEDULE 40 PIPE. REFERENCED DIAMETER IS NOMINAL.
5. FOOTING WIDTH TO BE (4)X POST WIDTH

DOUBLE SWING GATE
NO SCALE

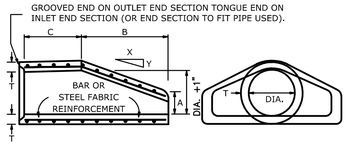


NOTES:
1. UNLESS OTHERWISE NOTED ON THE SITE PLANS, ALL CHAIN LINK FENCING COMPONENTS SHALL HAVE A HOT DIPPED GALVANIZED FINISH. ANY CHIPS IN THE GALVANIZED FINISH DUE SITE INSTALLATION SHOULD BE MINIMIZED AND REPAIRED WITH INDUSTRIAL GRADE PAINT ON GALVANIZED PAINT. ALL CUT ENDS ARE TO BE FINISHED WITH INDUSTRIAL GRADE PAINT ON GALVANIZED FINISH.
2. CHAIN LINK FABRIC SHALL BE MADE OF 9 GAUGE STEEL WIRE, 2" MESH SIZE, AND HOT DIPPED GALVANIZED PRIOR TO WEAVING. ONE EDGE OF THE FABRIC SHALL BE FINISHED WITH A SELVAGE TWIST AND THE OTHER WITH A SELVAGE KNUCKLE.
3. ALL POSTS SHALL BE PLUMB IN ALL DIRECTIONS.
4. LINE POSTS MAY BE HAMMER DRIVEN. IF HAMMER DRIVEN, POST END MUST BE CUT TO FINAL HEIGHT AFTER DRIVING IS COMPLETE. CUT END IS TO BE CUT SQUARE AND FREE OF BENDS, MUSHROOMING, AND BURRS. CUT END TO BE TREATED AS PER NOTE #1.
5. LINE & TERMINAL POSTS, BRACE TUBES, TOP RAILS, & GATE POSTS SHALL ALL BE SCHEDULE 40 PIPE. REFERENCED DIAMETER IS NOMINAL.
6. FOOTING WIDTH TO BE (4)X POST WIDTH

CHAIN LINK FENCE
NO SCALE



PLAN SLOPE DETAIL

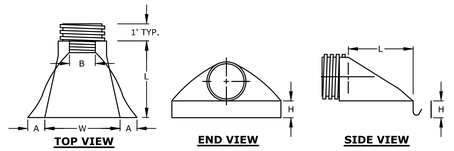


LONGITUDINAL SECTION END VIEW

PIPE DIA.	APPROX. SLOPE X to Y	A	B	C	D	R	T
12"	3 TO 1	4"	24"	48#"	24"	9"	2"
15"	3 TO 1	6"	27"	46"	30"	11"	2,"
18"	3 TO 1	9"	27"	46"	36"	12"	2"
24"	3 TO 1	9"	43"	30"	48"	14"	3"
30"	3 TO 1	12"	54"	19#"	60"	15"	3"
36"	3 TO 1	15"	63"	33"	72"	20"	4"
42"	3 TO 1	21"	63"	33"	78"	22"	4"
48"	3 TO 1	24"	72"	24"	84"	22"	5"

NOTES:
1. DESIGN OF END SECTION SHALL CONFORM TO STANDARD REINFORCED CONCRETE PIPE.

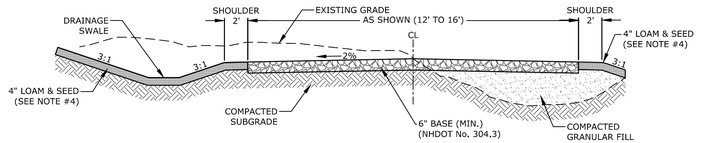
REINFORCED CONCRETE END SECTION
NO SCALE



TOP VIEW END VIEW SIDE VIEW

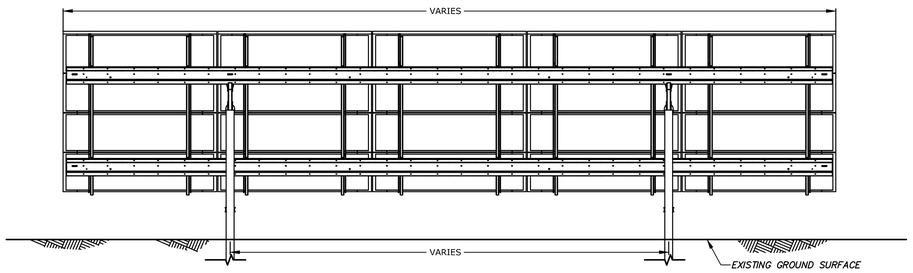
PIPE Ø	DIMENSION (INCHES)					
	PART NO.	A(1±)	B MAX	H(1±)	L(1/2±)	W(2±)
12" & 15"	1210 NP	6.5	10	6.5	25	29
18"	1810 NP	7.5	15	6.5	32	35
24"	2410 NP	7.5	18	6.5	36	45
36"	3610 NP	10.5	NA	7.0	53	68

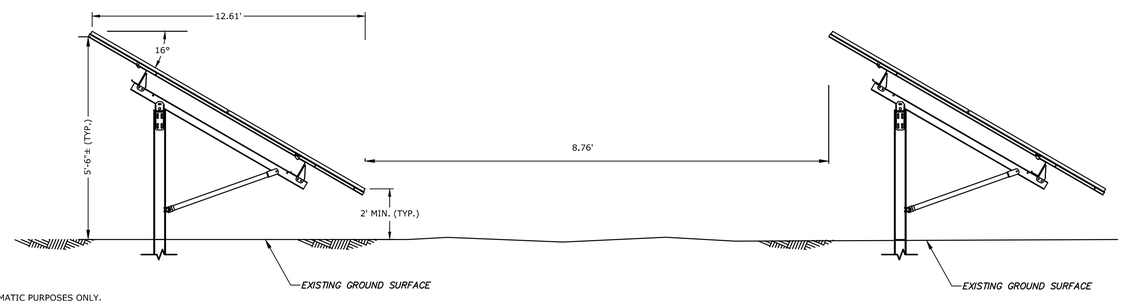
HDPE END SECTION DIMENSIONS
NO SCALE



NOTES:
1. SEE SITE PLAN FOR ROAD WIDTH AND LOCATION.
2. SEE GRADING, DRAINAGE & EROSION CONTROL PLAN FOR ROAD SLOPES AND CROSS-SLOPES.
3. ADDITIONAL SUBBASE MATERIAL AND GEOTEXTILE MAY BE REQUIRED AS NEEDED DEPENDING ON SITE CONDITIONS. ROADWAY TO BE GRADED/AMENDED THROUGHOUT CONSTRUCTION TO ENSURE ROADWAY REMAINS PASSABLE.
4. ON SITE TOPSOIL MAY BE SUBSTITUTED FOR LOAM PENDING ENGINEERS APPROVAL.

GRAVEL ROAD CROSS SECTION
NO SCALE





NOTES:
1. THIS DETAIL IS FOR SCHEMATIC PURPOSES ONLY.
2. FINAL PANEL LAYOUT, RACKING DESIGN, AND PILE DESIGN TO BE DETERMINED PRIOR TO CONSTRUCTION.
3. SOLAR RACKING AND PILE DESIGN PER MANUFACTURERS PLANS.

SOLAR RACKING SYSTEM (TYP.)
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZICA A No. 02.39 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER – 10/2/19

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Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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DATE:	10/2/2019
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Last Saved: 9/26/2019
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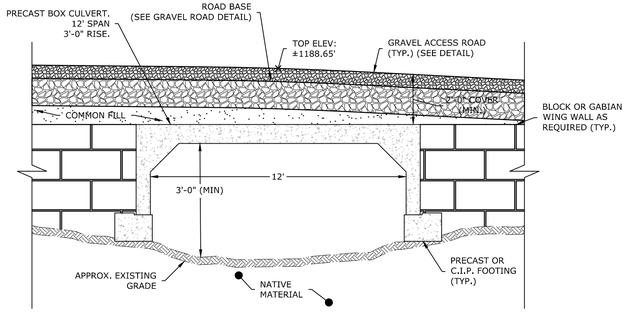


CULVERT NOTES

1. THE DESIGN OF THE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION SHALL BE IN ACCORDANCE WITH THE "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" 17TH EDITION, ADOPTED BY THE AMERICAN ASSOCIATION OF STATE TRANSPORTATION OFFICIALS (AASHTO), 2002, THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AS SPECIFIED BY THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION (NHDOT), AND THE MANUFACTURER'S SPECIFICATIONS.
2. THE STRUCTURE SHALL BE DESIGNED AND CONSTRUCTED TO WITHSTAND AASHTO HS-20-44 LOADING.
3. THE DESIGN OF THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. THE DESIGN AND SUBMITTAL SHALL INCLUDE THE FOLLOWING REQUIREMENTS:
   A. THE DESIGN SHALL INCLUDE DETAILED COMPUTATIONS AND ALL DETAILS, DIMENSIONS, QUANTITIES AND CROSS SECTIONS NECESSARY TO CONSTRUCT THE STRUCTURE.
   B. THE DESIGN SHALL CONFORM TO ALL OF THE REQUIREMENTS NOTED ABOVE. IN THE EVENT THAT TWO OR MORE SPECIFICATIONS APPLY TO THE WORK, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN.
   C. THE DESIGN DRAWINGS SHALL BE ON 22"X34" PLANS WITH THE PROJECT NAME, NUMBER AND DESIGN FIRM NOTED.
   D. THE DESIGN SHALL INCLUDE ALL BEDDING, BACKFILL AND INSTALLATION PROCEDURES.
   E. THE DESIGN SHALL INCLUDE A SCOUR ANALYSIS AS PART OF THE FOUNDATION DESIGN.
   F. ALL PLANS AND COMPUTATIONS SHALL BE PREPARED, STAMPED AND SIGNED BY A NEW HAMPSHIRE LICENSED PROFESSIONAL ENGINEER.
4. THE DESIGN ENGINEER FOR THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION SHALL PERFORM SUFFICIENT INSPECTIONS DURING CONSTRUCTION TO CERTIFY THAT THE INSTALLATION IS IN ACCORDANCE WITH THE DESIGN DRAWINGS AND SPECIFICATIONS.

TEMPORARY WATER CONTROL AND DEWATERING NOTES

1. THE CONTRACTOR SHALL PROVIDE, OPERATE AND MAINTAIN ADEQUATE PUMPING, DIVERSION AND DRAINAGE FACILITIES TO MAINTAIN THE EXCAVATED AREA SUFFICIENTLY DRY FROM GROUNDWATER AND/OR SURFACE RUNOFF SO AS NOT TO ADVERSELY AFFECT CONSTRUCTION PROCEDURES NOR CAUSE EXCESSIVE DISTURBANCE OF UNDERLYING OR SURROUNDING NATURAL GROUND.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS REQUIRED FOR DEWATERING ACTIVITIES AND TAKE ACTIONS NECESSARY TO ENSURE THAT DEWATERING DISCHARGES COMPLY WITH PERMITS APPLICABLE TO THE PROJECT. THE CONTRACTOR SHALL DISPOSE OF WATER FROM THE TRENCHES AND EXCAVATIONS IN SUCH A MANNER AS TO AVOID PUBLIC NUISANCE, INJURY TO PUBLIC HEALTH OR THE ENVIRONMENT, DAMAGE TO PUBLIC OR PRIVATE PROPERTY, OR DAMAGE TO THE WORK COMPLETED OR IN PROGRESS.
3. THE CONTRACTOR SHALL BRACE OR OTHERWISE PROTECT PIPELINES AND STRUCTURES NOT STABLE AGAINST UPLIFT DURING CONSTRUCTION.
4. THE CONTRACTOR SHALL NOT EXCAVATE UNTIL THE DEWATERING SYSTEM IS OPERATIONAL AND THE EXCAVATION MAY PROCEED WITHOUT DISTURBANCE TO THE FINAL SUBGRADE OR SURROUNDING AREAS.
5. THE CONTRACTOR SHALL CONTINUE DEWATERING UNINTERRUPTED UNTIL THE STRUCTURES, PIPES AND APPURTENANCES TO BE INSTALLED HAVE BEEN COMPLETED SUCH THAT THEY WILL NOT FLOAT OR BE OTHERWISE DAMAGED BY AN INCREASE IN GROUNDWATER ELEVATION.
6. DEWATERING DISCHARGE:
   A. INSTALL SAND AND GRAVEL, OR CRUSHED STONE, FILTERS IN CONJUNCTION WITH SUMPS, WELL POINTS, AND/OR DEEPWELLS TO PREVENT THE MIGRATION OF FINES FROM THE EXISTING SOIL DURING THE DEWATERING OPERATION.
   B. WATER PUMPED FROM EXCAVATIONS MUST BE PASSED THROUGH A SILT FILTER BAG OR OTHER SUCH BEST MANAGEMENT PRACTICE (BMP) FEATURE PRIOR TO BEING DISCHARGE BACK TO A SURFACE WATER BODY.
   C. DO NOT DISCHARGE WATER INTO ANY SANITARY SEWER SYSTEM.
   D. ALL DEWATERING DISCHARGES SHALL BE OUTSIDE OF ANY WETLAND SYSTEMS.
   E. FOLLOWING TREATMENT IN AN APPROPRIATE BMP, WATER PUMPED FROM EXCAVATION SHOULD GENERALLY DISCHARGED ON THE DOWNSTREAM SIDE OF THE WORK AREA.
   F. THE DISCHARGE AREA FOR THE PUMP OR SIPHON OUTLET MUST BE PROPERLY PROTECTED TO PREVENT EROSION BY HIGH VELOCITY FLOW.
   G. DISCHARGE FLOW VELOCITY FROM PUMPS OR SIPHONS OVER UNPROTECTED, VEGETATED GROUND MUST NOT EXCEED A MAXIMUM OF 1 FOOT PER SECOND. DISCHARGE FLOW VELOCITY FROM PUMPS OR SIPHONS WITHIN THE UNPROTECTED NATURAL STREAM CHANNEL SHALL NOT EXCEED A MAXIMUM OF 3 FEET PER SECOND. IN THE EVENT EROSION RESULTS FROM VELOCITIES OF THE MAGNITUDES, THE CONTRACTOR SHALL TAKE STEPS TO MITIGATE THE EROSION OR SHALL REDUCE DISCHARGE FLOW VELOCITY.
7. THE CONTRACTOR SHALL INSTALL TEMPORARY COFFERDAMS, IF REQUIRED, OUTSIDE THE LIMITS OF THE STREAM. NO IN-STREAM WORK SHALL OCCUR. THE EXACT CONSTRUCTION DETAILS OF THE COFFERDAM SHALL BE DETERMINED BY THE CONTRACTOR PERFORMING THE WORK.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY WATER CONTROL, SURFACE WATER AND GROUNDWATER, NECESSARY TO EXECUTE AND COMPLETE THE WORK, SUBJECT TO THE RESTRICTIONS CONTAINED IN THE PROJECT PERMITS.
9. ALL TEMPORARY WATER CONTROL MEASURES SHALL BE IMPLEMENTED IN CONJUNCTION WITH APPROPRIATE SEDIMENT AND EROSION CONTROL MEASURES SO AS TO MITIGATE TO THE GREATEST EXTENT POSSIBLE RELEASE OF SEDIMENT INTO WATER BODIES AND POTENTIAL EROSION OF SOIL.
10. PUMPS OR GENERATORS WHICH UTILIZE LIQUID FUEL MUST BE PLACED WITHIN AN IMPERMEABLE SECONDARY CONTAINMENT AREA WITH SUFFICIENT CAPACITY TO CONTAIN THE FULL VOLUME OF THE FUEL TANK.
11. PUMP OR SIPHON INTAKES SHALL BE PLACED SUCH THAT SEDIMENT AND DEBRIS ENTRAINMENT IS MINIMIZED.
12. THE COFFERDAM SHALL NOT BE CONSTRUCTED ON UNCONTAINED FILL (SOIL, ROCK, OR ANY OTHER LOOSE MATERIAL). THESE TYPES OF COFFERDAMS ARE SPECIFICALLY DISALLOWED FOR ENVIRONMENTAL PROTECTION REASONS.
13.

CONSTRUCTION SEQUENCE FOR STREAM CROSSINGS

1. IF PRACTICAL, ALL STREAM CROSSING WORK SHALL OCCUR DURING DRY CONDITIONS
2. INSTALL ALL EROSION AND SEDIMENT CONTROL BARRIERS AS FIRST ORDER OF WORK.
3. CONSTRUCT ANY REQUIRED COFFERDAMS AND/OR DEWATERING PRACTICES REQUIRED FOR THE CONSTRUCTION OF THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION.
4. CONSTRUCT THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION AND REMOVE ANY COFFERDAMS AND/OR DEWATERING MEASURES.
5. CONSTRUCT THE FINAL GRADING ABOVE AND ADJACENT TO THE WETLANDS CROSSING OR LOW POINT.
6. WHEN THE AREA IS COMPLETELY STABILIZED, REMOVE THE EROSION AND SEDIMENT CONTROL BARRIERS.

BOX CULVERT DETAIL
NOT TO SCALE

CULVERT NOTES

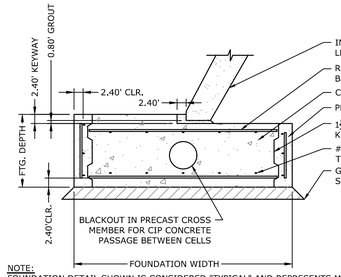
1. THE DESIGN OF THE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION SHALL BE IN ACCORDANCE WITH THE "STANDARD SPECIFCATIONS FOR HIGHWAY BRIDGES" 17TH EDITION, ADOPTED BY THE AMERICAN ASSOCIATION OF STATE TRANSPORTATION OFFICIALS (AASHTO), 2002, THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AS SPECIFIED BY THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION (NHDOT), AND THE MANUFACTURER'S SPECIFICATIONS.
2. THE STRUCTURE SHALL BE DESIGNED AND CONSTRUCTED TO WITHSTAND AASHTO HS-20-44 LOADING.
3. THE DESIGN OF THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. THE DESIGN AND SUBMITTAL SHALL INCLUDE THE FOLLOWING REQUIREMENTS:
   A. THE DESIGN SHALL INCLUDE DETAILED COMPUTATIONS AND ALL DETAILS, DIMENSIONS, QUANTITIES AND CROSS SECTIONS NECESSARY TO CONSTRUCT THE STRUCTURE.
   B. THE DESIGN SHALL CONFORM TO ALL OF THE REQUIREMENTS NOTED ABOVE. IN THE EVENT THAT TWO OR MORE SPECIFICATIONS APPLY TO THE WORK, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN.
   C. THE DESIGN DRAWINGS SHALL BE ON 22"X34" PLANS WITH THE PROJECT NAME, NUMBER AND DESIGN FIRM NOTED.
   D. THE DESIGN SHALL INCLUDE ALL BEDDING, BACKFILL AND INSTALLATION PROCEDURES.
   E. THE DESIGN SHALL INCLUDE A SCOUR ANALYSIS AS PART OF THE FOUNDATION DESIGN.
   F. ALL PLANS AND COMPUTATIONS SHALL BE PREPARED, STAMPED AND SIGNED BY A NEW HAMPSHIRE LICENSED PROFESSIONAL ENGINEER.
4. THE DESIGN ENGINEER FOR THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION SHALL PERFORM SUFFICIENT INSPECTIONS DURING CONSTRUCTION TO CERTIFY THAT THE INSTALLATION IS IN ACCORDANCE WITH THE DESIGN DRAWINGS AND SPECIFICATIONS.

TEMPORARY WATER CONTROL AND DEWATERING NOTES

1. THE CONTRACTOR SHALL PROVIDE, OPERATE AND MAINTAIN ADEQUATE PUMPING, DIVERSION AND DRAINAGE FACILITIES TO MAINTAIN THE EXCAVATED AREA SUFFICIENTLY DRY FROM GROUNDWATER AND/OR SURFACE RUNOFF SO AS NOT TO ADVERSELY AFFECT CONSTRUCTION PROCEDURES NOR CAUSE EXCESSIVE DISTURBANCE OF UNDERLYING OR SURROUNDING NATURAL GROUND.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS REQUIRED FOR DEWATERING ACTIVITIES AND TAKE ACTIONS NECESSARY TO ENSURE THAT DEWATERING DISCHARGES COMPLY WITH PERMITS APPLICABLE TO THE PROJECT. THE CONTRACTOR SHALL DISPOSE OF WATER FROM THE TRENCHES AND EXCAVATIONS IN SUCH A MANNER AS TO AVOID PUBLIC NUISANCE, INJURY TO PUBLIC HEALTH OR THE ENVIRONMENT, DAMAGE TO PUBLIC OR PRIVATE PROPERTY, OR DAMAGE TO THE WORK COMPLETED OR IN PROGRESS.
3. THE CONTRACTOR SHALL BRACE OR OTHERWISE PROTECT PIPELINES AND STRUCTURES NOT STABLE AGAINST UPLIFT DURING CONSTRUCTION.
4. THE CONTRACTOR SHALL NOT EXCAVATE UNTIL THE DEWATERING SYSTEM IS OPERATIONAL AND THE EXCAVATION MAY PROCEED WITHOUT DISTURBANCE TO THE FINAL SUBGRADE OR SURROUNDING AREAS.
5. THE CONTRACTOR SHALL CONTINUE DEWATERING UNINTERRUPTED UNTIL THE STRUCTURES, PIPES AND APPURTENANCES TO BE INSTALLED HAVE BEEN COMPLETED SUCH THAT THEY WILL NOT FLOAT OR BE OTHERWISE DAMAGED BY AN INCREASE IN GROUNDWATER ELEVATION.
6. DEWATERING DISCHARGE:
   A. INSTALL SAND AND GRAVEL, OR CRUSHED STONE, FILTERS IN CONJUNCTION WITH SUMPS, WELL POINTS, AND/OR DEEPWELLS TO PREVENT THE MIGRATION OF FINES FROM THE EXISTING SOIL DURING THE DEWATERING OPERATION.
   B. WATER PUMPED FROM EXCAVATIONS MUST BE PASSED THROUGH A SILT FILTER BAG OR OTHER SUCH BEST MANAGEMENT PRACTICE (BMP) FEATURE PRIOR TO BEING DISCHARGE BACK TO A SURFACE WATER BODY.
   C. DO NOT DISCHARGE WATER INTO ANY SANITARY SEWER SYSTEM.
   D. ALL DEWATERING DISCHARGES SHALL BE OUTSIDE OF ANY WETLAND SYSTEMS.
   E. FOLLOWING TREATMENT IN AN APPROPRIATE BMP, WATER PUMPED FROM EXCAVATION SHOULD GENERALLY DISCHARGED ON THE DOWNSTREAM SIDE OF THE WORK AREA.
   F. THE DISCHARGE AREA FOR THE PUMP OR SIPHON OUTLET MUST BE PROPERLY PROTECTED TO PREVENT EROSION BY HIGH VELOCITY FLOW.
   G. DISCHARGE FLOW VELOCITY FROM PUMPS OR SIPHONS OVER UNPROTECTED, VEGETATED GROUND MUST NOT EXCEED A MAXIMUM OF 1 FOOT PER SECOND. DISCHARGE FLOW VELOCITY FROM PUMPS OR SIPHONS WITHIN THE UNPROTECTED NATURAL STREAM CHANNEL SHALL NOT EXCEED A MAXIMUM OF 3 FEET PER SECOND. IN THE EVENT EROSION RESULTS FROM VELOCITIES OF THE MAGNITUDES, THE CONTRACTOR SHALL TAKE STEPS TO MITIGATE THE EROSION OR SHALL REDUCE DISCHARGE FLOW VELOCITY.
7. THE CONTRACTOR SHALL INSTALL TEMPORARY COFFERDAMS, IF REQUIRED, OUTSIDE THE LIMITS OF THE STREAM. NO IN-STREAM WORK SHALL OCCUR. THE EXACT CONSTRUCTION DETAILS OF THE COFFERDAM SHALL BE DETERMINED BY THE CONTRACTOR PERFORMING THE WORK.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY WATER CONTROL, SURFACE WATER AND GROUNDWATER, NECESSARY TO EXECUTE AND COMPLETE THE WORK, SUBJECT TO THE RESTRICTIONS CONTAINED IN THE PROJECT PERMITS.
9. ALL TEMPORARY WATER CONTROL MEASURES SHALL BE IMPLEMENTED IN CONJUNCTION WITH APPROPRIATE SEDIMENT AND EROSION CONTROL MEASURES SO AS TO MITIGATE TO THE GREATEST EXTENT POSSIBLE RELEASE OF SEDIMENT INTO WATER BODIES AND POTENTIAL EROSION OF SOIL.
10. PUMPS OR GENERATORS WHICH UTILIZE LIQUID FUEL MUST BE PLACED WITHIN AN IMPERMEABLE SECONDARY CONTAINMENT AREA WITH SUFFICIENT CAPACITY TO CONTAIN THE FULL VOLUME OF THE FUEL TANK.
11. PUMP OR SIPHON INTAKES SHALL BE PLACED SUCH THAT SEDIMENT AND DEBRIS ENTRAINMENT IS MINIMIZED.
12. THE COFFERDAM SHALL NOT BE CONSTRUCTED ON UNCONTAINED FILL (SOIL, ROCK, OR ANY OTHER LOOSE MATERIAL). THESE TYPES OF COFFERDAMS ARE SPECIFICALLY DISALLOWED FOR ENVIRONMENTAL PROTECTION REASONS.

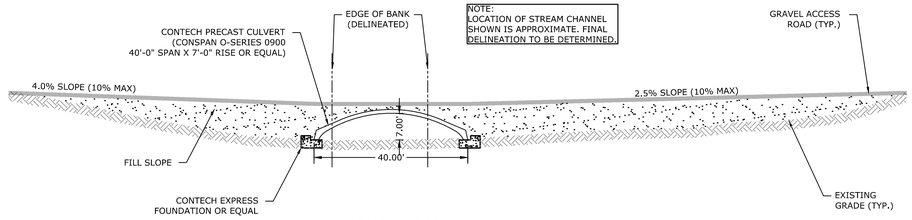
CONSTRUCTION SEQUENCE FOR WETLAND CROSSINGS

1. IF PRACTICAL, ALL WETLAND CROSSING WORK SHALL OCCUR DURING DRY CONDITIONS.
2. INSTALL ALL EROSION AND SEDIMENT CONTROL BARRIERS AS FIRST ORDER OF WORK.
3. CONSTRUCT ANY REQUIRED COFFERDAMS AND/OR DEWATERING PRACTICES REQUIRED FOR THE CONSTRUCTION OF THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION.
4. CONSTRUCT THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION AND REMOVE ANY COFFERDAMS AND/OR DEWATERING MEASURES.
5. CONSTRUCT THE FINAL GRADING ABOVE AND ADJACENT TO THE WETLANDS CROSSING OR LOW POINT.
6. WHEN THE AREA IS COMPLETELY STABILIZED, REMOVE THE EROSION AND SEDIMENT CONTROL BARRIERS.



NOTE:
FOUNDATION DETAIL SHOWN IS CONSIDERED "TYPICAL" AND REPRESENTS MINIMUM DIMENSIONS. FINAL DESIGN SHALL BE COMPLETED BY CULVERT DESIGNER PRIOR TO CONSTRUCTION, AND STAMPED BY A NEW HAMPSHIRE LICENSED PROFESSIONAL ENGINEER.

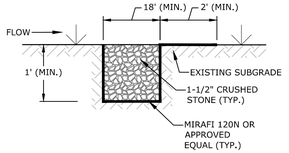
FOUNDATION DETAIL



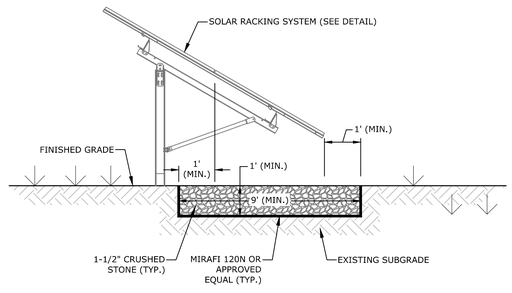
PRECAST BRIDGE

PRECAST BRIDGE
NO SCALE

NOTES:
1. CONSTRUCT AT GRADE LEVEL SPREADER ON ZERO PERCENT GRADE TO INSURE UNIFORM SPREADING OF RUNOFF (CONVERTING CHANNEL FLOW TO SHEET FLOW).
2. AT GRADE LEVEL SPREADER SHALL BE CONSTRUCTED ON UNDISTURBED SOIL (NOT ON FILL).
3. STORM RUNOFF CONVERTED TO SHEET FLOW SHALL OUTLET ONTO STABILIZED AREAS. WATER SHALL NOT BE RECONCENTRATED IMMEDIATELY BELOW THE POINT OF DISCHARGE.

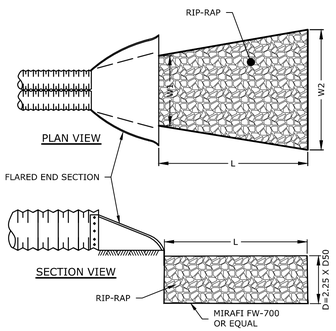


PROFILE VIEW



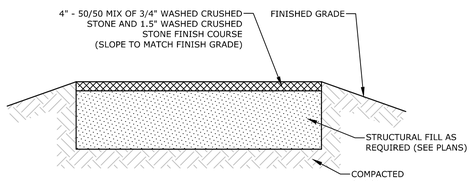
SECTION VIEW

AT GRADE LEVEL SPREADER
NO SCALE



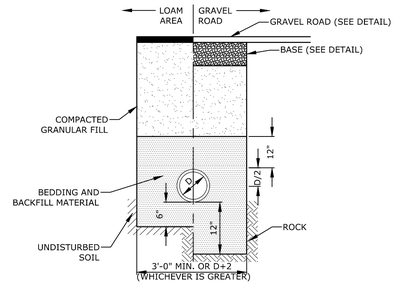
NOTES:
1. STONE SIZE AND MAT DIMENSIONS DETAILED ON PLANS.
2. STONE SHALL CONSIST OF SUB-ANGULAR FIELD STONE OR ROUGH UNHEWN QUARRY STONE OF APPROXIMATELY RECTANGULAR SHAPE. FLAT OR ROUND ROCKS ARE NOT ACCEPTABLE. THE STONE SHALL BE HARD AND OF SUCH QUALITY THAT IT WILL NOT DISINTEGRATE ON EXPOSURE TO WATER OR WEATHERING, BE CHEMICALLY STABLE AND IT SHALL BE SUITABLE IN ALL OTHER RESPECTS FOR THE PURPOSE INTENDED. THE BULK SPECIFIC GRAVITY (SATURATED SURFACE-DRY BASIS) OF THE INDIVIDUAL STONES SHALL BE AT LEAST 2.5.
3. THE STONE SHALL BE COMPOSED OF A WELL-GRADED MIXTURE DOWN TO THE ONE-INCH SIZE PARTICLE SUCH THAT 50 PERCENT OF THE MIXTURE BY WEIGHT SHALL BE LARGER THAN THE D50 SIZE SPECIFIED. A WELL-GRADED MIXTURE IS DEFINED AS A MIXTURE COMPOSED PRIMARILY OF THE LARGER STONE SIZE BUT WITH A SUFFICIENT MIXTURE OF OTHER SIZES TO FILL THE PROGRESSIVELY SMALLER VOIDS BETWEEN THE STONES. THE DIAMETER OF THE LARGEST STONE SIZE IN SUCH A MIXTURE SHALL BE 1.5 TIMES THE D50 SIZE.

RIP-RAP APRON
NO SCALE



NOTES:
1. SEE SITE PLAN FOR SUBSTATION DIMENSIONS
2. SEE GRADING, DRAINAGE AND EROSION CONTROL PLAN FOR SLOPE AND CROSS-SLOPE.
3. CONTRACTOR TO VERIFY MINIMUM 18" OF SEPARATION FROM SEASONAL GROUNDWATER LEVEL TO BOTTOM OF 18" GRAVEL FILL LAYER

SUBSTATION AREA SECTION
NO SCALE



NOTE:
1. CRUSHED STONE AND BACKFILL FOR FULL WIDTH OF THE TRENCH FROM 6" BELOW PIPE IN EARTH AND 12" BELOW PIPE IN ROCK UP TO 12" ABOVE TOP OF PIPE.

DRAINAGE TRENCH
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

BRADLEE MEZICK No. 02.99 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10-2-19

JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE
10/2/19

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

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DATE:	10/2/2019
FILE:	N0758-017_DTLS.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

CIVIL DETAILS SHEET

SCALE: AS SHOWN

C.503

Last Saved: 9/26/2019
Plotted: 10/02/2019 2:57pm By: DGM
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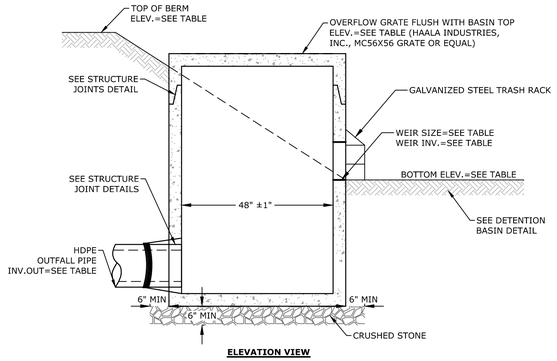
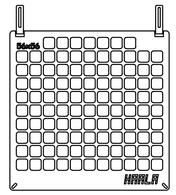


ELEVATION VIEW



TOP GRATE

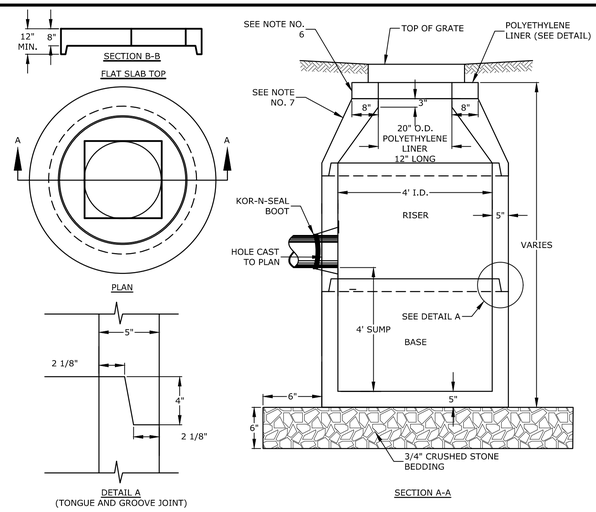
NOTES:
1. GRATE SHALL BE HAALA MICHIE CORP. 56X56
2. GRATE TO BE CONSTRUCTED OF ⅜" THICK GALVANIZED PLATE.
3. GRATE TO BE SECURED TO CONCRETE STRUCTURE.

BASIN & OUTLET STRUCTURE TABLE

POND NAME	TOP OF BERM ELEV. (FT.)	BOTTOM OF POND ELEV. (FT.)	OUTLET STRUCTURE	OCS RIM ELEV. (FT.)	ORIFICE #1 SIZE (IN.) (WIDTH X HEIGHT OR DIA.)	ORIFICE #1 INVERT (FT.)	ORIFICE #2 SIZE (IN.) (WIDTH X HEIGHT OR DIA.)	ORIFICE #2 INVERT (FT.)	OUTFALL PIPE SIZE (IN.)	OUTFALL PIPE INVERT (FT.)
POND-A	1084.75	1080.00	OCS-A	1082.50	6 DIA.	1080.50	-	-	15.00	1080.00
POND-B	1112.75	1109.50	OCS-B	1111.25	24W X 8H	1110.00	-	-	12.00	1108.00
POND-C	1122.75	1120.00	OCS-C	1122.00	36W X 12H	1120.50	-	-	18.00	1120.00
POND-D	1128.75	1126.00	OCS-D	1127.50	36W X 6H	1126.50	-	-	12.00	1123.00
POND-E	1116.75	1113.50	OCS-E	1115.00	24W X 6H	1114.00	-	-	12.00	1113.00
POND-F	1106.50	1102.00	OCS-F	1105.25	6 DIA.	1102.50	-	-	18.00	1102.00
POND-G	1104.75	1102.00	OCS-G	1103.50	6 DIA.	1102.50	-	-	12.00	1101.00
POND-H	1140.50	1136.00	OCS-H	1139.50	6 DIA.	1136.50	-	-	18.00	1135.00
POND-I	1062.75	1058.00	OCS-I	1061.00	4 DIA.	1058.50	36W X 12H	1059.50	15.00	1057.50
POND-J	1028.50	1024.00	OCS-J	1028.00	4 DIA.	1024.50	-	-	24.00	1023.00
POND-K	1096.75	1094.00	OCS-K	1095.15	6 DIA.	1094.50	-	-	18.00	1092.50
POND-N	1108.50	1104.00	OCS-N	1108.00	4 DIA.	1104.50	7 DIA.	1106.50	15.00	1102.10

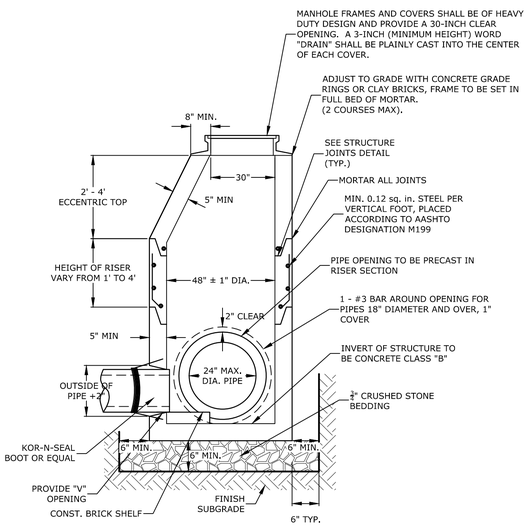
NOTES:
1. ALL SECTIONS SHALL BE 4,000 PSI CONCRETE (TYPE II CEMENT).
2. CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQUARE INCHES PER LINEAR FOOT IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER OF THE THIRD WALL.
3. THE TONGUE OR THE GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQUARE INCHES PER LINEAR FOOT.
4. THE STRUCTURES SHALL BE DESIGNED FOR H20 LOADING.
5. ALL JOINTS ON THE STRUCTURE AND PIPING SHALL BE WATERTIGHT.

PROPOSED OUTLET STRUCTURES
NO SCALE



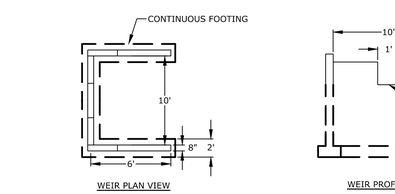
NOTES:
1. ALL SECTIONS SHALL BE CONCRETE CLASS AA(4000 psi).
2. CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQ.IN. PER LINEAR FT. IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER THIRD OF THE WALL.
3. THE TONGUE AND GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQ. IN. PER LINEAR FT.
4. RISERS OF 1', 2', 3' & 4' CAN BE USED TO REACH DESIRED DEPTH.
5. THE STRUCTURES SHALL BE DESIGNED FOR H20 LOADING.
6. FITTING FRAME TO GRADE MAY BE DONE WITH PREFABRICATED ADJUSTMENT RINGS OR CLAY BRICKS (2 COURSES MAX.).
7. CONE SECTIONS MAY BE EITHER CONCENTRIC OR ECCENTRIC, OR FLAT SLAB TOPS MAY BE USED WHERE PIPE WOULD OTHERWISE ENTER INTO THE CONE SECTION OF THE STRUCTURE AND WHERE PERMITTED.
8. PIPE ELEVATIONS SHOWN ON PLANS SHALL BE FIELD VERIFIED PRIOR TO PRECASTING.
9. OUTSIDE EDGES OF PIPES SHALL PROJECT NO MORE THAN 3" BEYOND INSIDE WALL OF STRUCTURE.
10. PRECAST SECTIONS SHALL HAVE A TONGUE AND GROOVE JOINT 4" HIGH AT AN 11° ANGLE CENTERED IN THE WIDTH OF THE WALL AND SHALL BE ASSEMBLED USING AN APPROVED FLEXIBLE SEALANT IN JOINTS.
11. THE TONGUE AND GROOVE JOINT SHALL BE SEALED WITH ONE STRIP OF BUTYL RUBBER SEALANT.
12. "ELIMINATOR" OIL/WATER SEPARATOR SHALL BE INSTALLED TIGHT TO INSIDE OF CATCHBASIN.

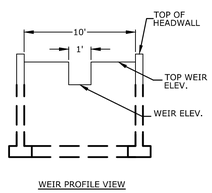
4' DIAMETER CATCHBASIN
NO SCALE

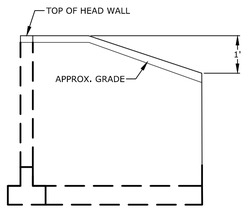


NOTES:
1. ALL SECTIONS SHALL BE 4,000 PSI CONCRETE.
2. CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQUARE INCHES PER LINEAR FOOT IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER THIRD OF THE WALL.
3. THE TONGUE AND THE GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQUARE INCHES PER LINEAR FOOT.
4. THE STRUCTURES SHALL BE DESIGNED FOR H20 LOADING.
5. CONSTRUCT CRUSHED STONE BEDDING AND BACKFILL UNDER (6" MINIMUM THICKNESS)
6. THE TONGUE AND GROOVE JOINT SHALL BE SEALED WITH ONE STRIP OF BUTYL RUBBER SEALANT.
7. PIPE ELEVATIONS SHOWN ON PLANS SHALL BE FIELD VERIFIED PRIOR TO PRECASTING.
8. OUTSIDE EDGES OF PIPES SHALL PROJECT NO MORE THAN 3" BEYOND INSIDE WALL OF STRUCTURE.
9. PRECAST SECTIONS SHALL HAVE A TONGUE AND GROOVE JOINT 4" HIGH AT AN 11° ANGLE CENTERED IN THE WIDTH OF THE WALL AND SHALL BE ASSEMBLED USING AN APPROVED FLEXIBLE SEALANT IN JOINTS.
10. ALL STRUCTURES WITH MULTIPLE PIPES SHALL HAVE A MINIMUM OF 12" OF INSIDE SURFACE BETWEEN HOLES, NO MORE THAN 75% OF A HORIZONTAL CROSS SECTION SHALL BE HOLES, AND THERE SHALL BE NO HOLES CLOSER THAN 3" TO JOINTS.

4' DIAMETER DRAIN MANHOLE
NO SCALE





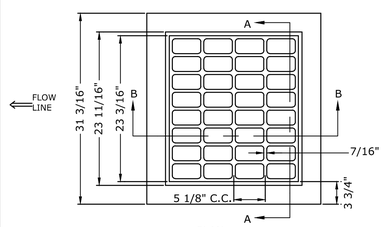


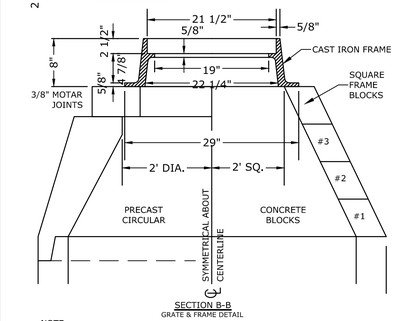
BASIN & OUTLET STRUCTURE TABLE

POND NAME	TOP OF BERM ELEV. (FT.)	BOTTOM OF POND ELEV. (FT.)	OUTLET STRUCTURE	WEIR ELEVATION	TOP WEIR ELEVATION	TOP OF HEADWALL
POND-L	1069.50	1066.00	OCS-L	1066.50	1067.50	1069.50
POND-M	1058.50	1056.00	OCS-M	1056.50	1057.50	1058.50

NOTE:
1. CONTRACTOR SHALL SUBMIT FINAL STRUCTURAL DESIGN TO THE ENGINEER WITH ALL CALCULATIONS AND PLANS. STRUCTURAL DESIGN TO BE COMPLETED AND STAMPED BY A MASSACHUSETTS LICENSED STRUCTURAL ENGINEER. DESIGN ENGINEER SHALL INSPECT WALL DURING CONSTRUCTION AND CERTIFY THAT IT HAS BEEN INSTALLED IN ACCORDANCE WITH APPROVED PLANS AND SPECIFICATIONS. AN AS-BUILT PLAN SHOWING THE STRUCTURE LOCATION AND DIMENSIONS SHALL BE SUBMITTED TO THE CITY UPON COMPLETION.

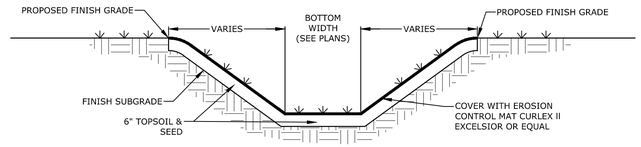
PROPOSED OUTLET STRUCTURES OCS-L & OCS-M
NO SCALE





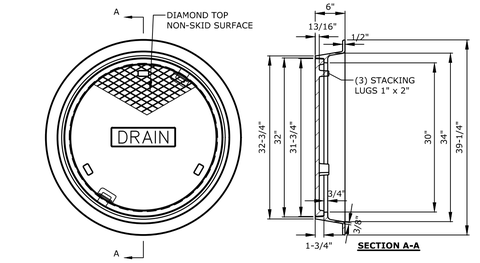
NOTE:
1. GRATE TO BE CAST IRON (NHDOT TYPE B ALTERNATE 1)
2. FRAME AND GRATE TO BE MANUFACTURED IN THE USA

CATCH BASIN FRAME & GRATE
NO SCALE



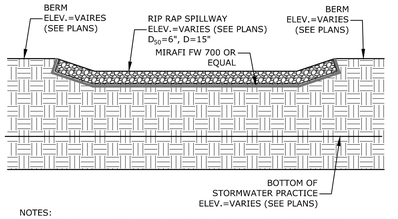
NOTES:
1. THE FOUNDATION AREA OF THE WATERWAY SHALL BE CLEARED AND GRUBBED OF ALL TREES, BRUSH, STUMPS, AND OTHER OBJECTIONABLE MATERIAL. MATERIALS REMOVED SHALL BE DISPOSED OF SO THEY WILL NOT INTERFERE WITH THE CONSTRUCTION OR PROPER FUNCTIONING OF THE WATERWAY.
2. THE WATERWAY SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE AND CROSS-SECTION AS REQUIRED TO MEET THE DESIGN CRITERIA. THE WATERWAY SHALL BE FREE OF IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
3. EARTH FILLS REQUIRED TO MEET SUBGRADE REQUIREMENTS BECAUSE OF OVER EXCAVATION OR TOPOGRAPHY SHALL BE COMPACTED TO THE SAME DENSITY AS THE SURROUNDING SOIL TO PREVENT UNEQUAL SETTLEMENT THAT COULD CAUSE DAMAGE TO THE COMPLETED WATERWAY. EARTH REMOVED AND NOT NEEDED IN CONSTRUCTION SHALL BE SPREAD OR DISPOSED OF SO IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE WATERWAY.
4. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER AS TO MINIMIZE EROSION AND AIR AND WATER POLLUTION. ALL APPROPRIATE STATE AND LOCAL LAWS AND REGULATIONS SHALL BE COMPLIED WITH FOR INSTALLATION.
5. VEGETATION SHALL BE ESTABLISHED IN THE SWALE PRIOR TO ALLOWING STORMWATER RUNOFF TO FLOW THROUGH THE SWALE.
6. MAINTENANCE OF THE VEGETATION IN THE GRASSED WATERWAY IS EXTREMELY IMPORTANT IN ORDER TO PREVENT RILLING, EROSION, AND FAILURE OF THE WATERWAY. MOWING SHOULD BE DONE FREQUENTLY ENOUGH TO CONTROL ENCROACHMENT OF WEEDS AND WOODY VEGETATION AND TO KEEP THE GRASSES IN A VIGOROUS CONDITION. THE VEGETATION SHOULD NOT BE MOWED TOO CLOSELY SO AS TO REDUCE THE EROSION RESISTANCE IN THE WATERWAY.
7. THE WATERWAY SHOULD BE INSPECTED PERIODICALLY AND AFTER EVERY MAJOR STORM TO DETERMINE THE CONDITION OF THE WATERWAY. RILLS AND DAMAGED AREAS SHOULD BE PROMPTLY REPAIRED AND REVEGETATED AS NECESSARY TO PREVENT FURTHER DETERIORATION.
8. PERIODIC APPLICATIONS OF LIME AND FERTILIZER MAY BE NEEDED TO MAINTAIN VIGOROUS GROWTH.

GRASSED LINED SWALE
NO SCALE



NOTES:
1. ALL DIMENSIONS ARE NOMINAL.
2. FRAMES USING NARROWER DIMENSIONS FOR THICKNESS ARE ALLOWED PROVIDED:
   2.A. THE FRAMES MEET OR EXCEED THE SPECIFIED LOAD RATING.
   2.B. THE INTERIOR PERIMETER (SEAT AREA) DIMENSIONS OF THE FRAMES REMAIN THE SAME TO ALLOW CONTINUED USE OF EXISTING GRATES/COVERS AS THE EXISTING FRAMES ALLOW, WITHOUT SHIMS OR OTHER MODIFICATIONS OR ACCOMMODATIONS.
   2.C. ALL OTHER PERTINENT REQUIREMENTS OF THE SPECIFICATIONS ARE MET.
3. LABEL TYPE OF MANHOLE WITH 3" HIGH LETTERS IN HE CENTER OF THE COVER.

DRAIN MANHOLE AND COVER
NO SCALE



NOTES:
1. SEE GRADING & DRAINAGE PLAN(S) FOR LOCATION(S) AND DIMENSIONS.

RIP-RAP SPILLWAY
NO SCALE

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZICA A. No. 02.99 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12288 LICENSED PROFESSIONAL ENGINEER – 10/2/19

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 — 1 INCH
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MARK	DATE	DESCRIPTION

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DATE:	10/2/2019
FILE:	N0758-017_DTLS.dwg
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CHECKED:	JMP
APPROVED:	BLM

CIVIL DETAILS SHEET

SCALE: AS SHOWN

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Plotted: Oct 02, 2019 - 3:58pm By: DGM
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Tighe&Bond

APPENDIX D

DESIGN INTENT

THE INTENT OF THIS PLAN IS TO SHOW THE MAXIMUM ALLOWABLE OPEN AREA FOR THE PROJECT DURING CONSTRUCTION. THE CONTRACTOR SHALL PHASE CONSTRUCTION SO THAT NO MORE THAN 10 ACRES CAN BE OPEN AT ANY ONE TIME FOR EACH INDIVIDUAL AREA (UP TO 50 ACRES TOTAL FOR THE SITE) AS SHOWN ON THE ATTACHED PLAN. EACH INDIVIDUAL PHASE MUST BE FULLY STABILIZED EITHER TEMPORARILY OR PERMANENTLY BEFORE MOVING TO THE NEXT PHASE. THE PHASE LIMITES SHOW ARE APPROXIMATE AND MAY VARY DURING CONSTRUCTION.

SEQUENCE OF CONSTRUCTION FOR EACH PHASE

1. MARK LIMIT OF CLEARING AND LIMITS OF BUFFER AREAS.
2. INSTALL CONSTRUCTION ENTRANCE/EXIT.
3. CUT TREES ABOVE THE GROUND. RETAIN STUMPS IN PLACE.
4. INSTALL PERIMETER CONTROLS TO ESTABLISH PHASE AREA IN ACCORDANCE WITH SITE PLAN, ALTERATION OF TERRAIN PERMIT, AND STORMWATER POLLUTION PREVENTION PLAN (SWPPP).
5. CONSTRUCT ROADS, SWALES, AND DETENTION/SEDIMENTATION BASINS.
6. GRUB AND GRADE AREA AS REQUIRED.
7. INSTALL TEMPORARY OR PERMANENT STABILIZATION MEASURES SUCH AS EROSION CONTROL BLANKETS, LEVEL SPREADERS, CHECK DAMS, SEED AND MULCH, STUMP GRINDINGS, ETC, PRIOR TO MOVING TO NEXT PHASE.
8. INSTALL RACKING, MODULES, AND CONDUIT. THIS MAY BE CONSTRUCTED AFTER AREA IS TEMPORARILY STABILIZED WHILE WORK ON AN ADJACENT PHASE BEGINS.
9. INSTALL PERMANENT EROSION CONTROL MEASURES AND ESTABLISH VEGETATION. MAINTAIN AND RESEED AREAS AS REQUIRED.

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEDICA No. 08.80 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

SCALE IN FEET
0 200' 400'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING 0 1 INCH IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	10/2/2019
FILE:	N-0758-017-PHASING.dwg
DRAWN BY:	EGD/NSC
CHECKED:	JMP
APPROVED:	BLM

OVERALL PHASING PLAN

SCALE: AS SHOWN

Last Saved: 9/26/2019
Plotted On: 9/26/2019 3:23pm By: DGM
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NEXTera ENERGY

N

SCALE IN FEET
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GRAPHIC SCALE

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Fitzwilliam, NH

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DATE:	10/2/2019
FILE:	N-0758-017-PHASING.dwg
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CHECKED:	JMP
APPROVED:	BLM

PHASE AREA SUB PLAN

SCALE: AS SHOWN

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Plotted On:Sep 26, 2019-3:23pm By: DGM
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DESIGN INTENT

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6. GRUB AND GRADE AREA AS REQUIRED.
7. INSTALL TEMPORARY OR PERMANENT STABILIZATION MEASURES SUCH AS EROSION CONTROL BLANKETS, LEVEL SPREADERS, CHECK DAMS, SEED AND MULCH, STUMP GRINDINGS, ETC, PRIOR TO MOVING TO NEXT PHASE.
8. INSTALL RACKING, MODULES, AND CONDUIT. THIS MAY BE CONSTRUCTED AFTER AREA IS TEMPORARILY STABILIZED WHILE WORK ON AN ADJACENT PHASE BEGINS.
9. INSTALL PERMANENT EROSION CONTROL MEASURES AND ESTABLISH VEGETATION. MAINTAIN AND RESEED AREAS AS REQUIRED.

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZICA No. 08380 – LICENSED PROFESSIONAL ENGINEER

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 – LICENSED PROFESSIONAL ENGINEER

N

SCALE IN FEET
0 200' 400'
GRAPHIC SCALE

PERMIT DRAWINGS
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Chinook Solar, LLC

Fitzwilliam, NH

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DATE:	10/2/2019
FILE:	N-0758-017-PHASING.dwg
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APPROVED:	BLM

PHASE AREA SUB PLAN

SCALE: AS SHOWN

3 OF 3

Last Saved: 9/26/2019
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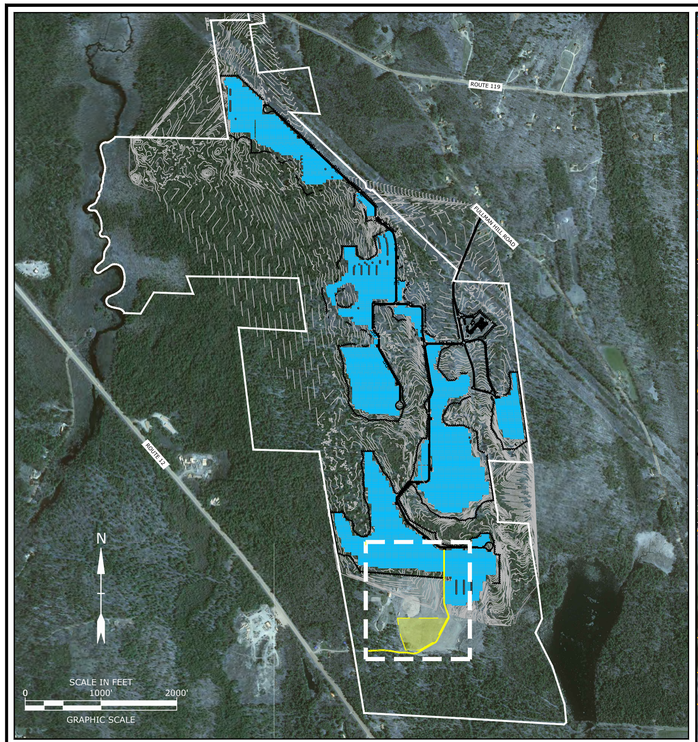
Tighe&Bond

APPENDIX E



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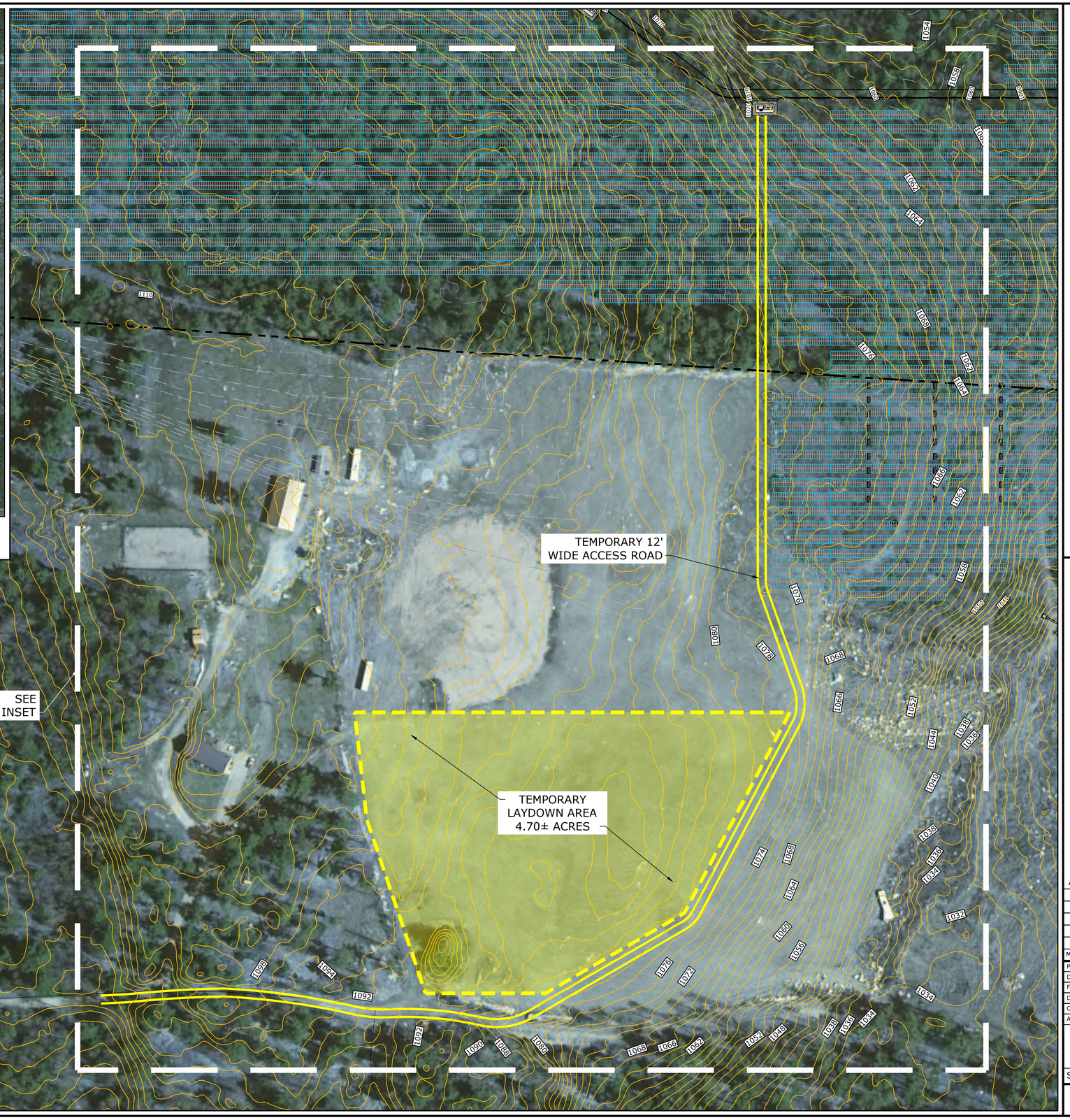

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NEXTera ENERGY

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Chinook Solar, LLC

Fitzwilliam, NH

August 14, 2019

MARK	DATE	DESCRIPTION

PROJECT NO:	N0758-019
DATE:	9/26/2019
FILE:	N-0758-017_LAYDOWN.dwg
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CHECKED:	JMP
APPROVED:	BLM

TEMPORARY LAYDOWN AND ACCESS ROAD PLAN

SCALE: AS SHOWN

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Plotted: 9/19/2019 10:21am By: DGM
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Tighe&Bond

APPENDIX F

LEGEND

- TEMPORARY SEDIMENTATION/DETENTION BASIN AND SWALES
- TEMPORARY SEDIMENTATION/DETENTION WATERSHED
- 75' VEGETATIVE BUFFER
- VEGETATIVE WATERSHED
- LEVEL SPREADER
- TEMPORARY EROSION CONTROL BARRIER

MATCH TO SHEET 2 OF 2

Tighe&Bond
Engineers | Environmental Specialists

NEXTera ENERGY

STATE OF NEW HAMPSHIRE
BRADLEE MEZCUA
No. 023[illegible]
LICENSED PROFESSIONAL ENGINEER
10-2-19

STATE OF NEW HAMPSHIRE
JOSEPH M. PERSECHINO
No. 12388
LICENSED PROFESSIONAL ENGINEER
10/2/19

N

SCALE IN FEET
0 200' 400'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

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FILE:	N-0758-017-BMP.dwg
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APPROVED:	BLM

BMP COLOR PLAN

SCALE: AS SHOWN

1 OF 2

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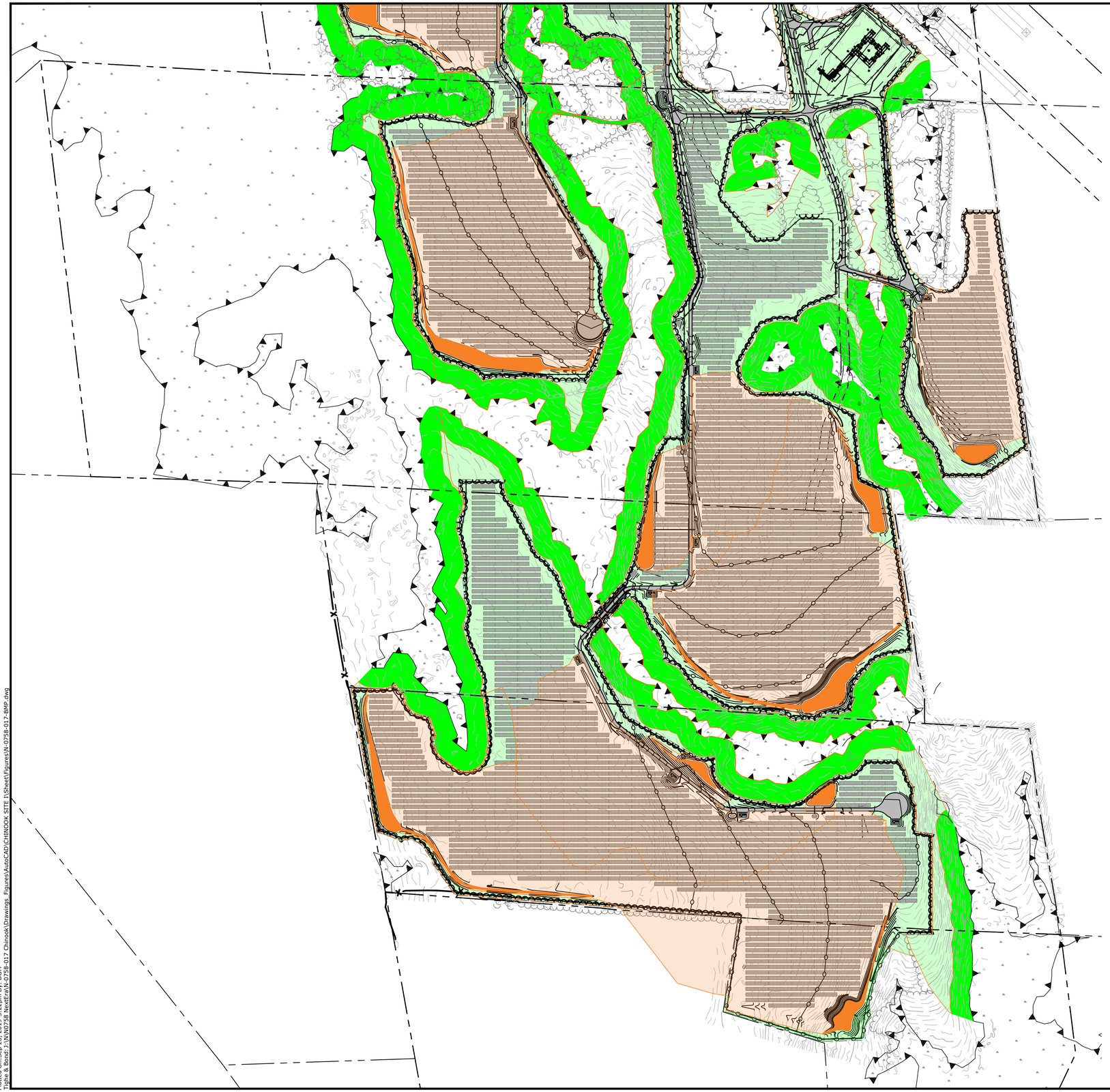

LEGEND

- TEMPORARY SEDIMENTATION/DETENTION BASIN AND SWALES
- TEMPORARY SEDIMENTATION/DETENTION WATERSHED
- 75' VEGETATIVE BUFFER
- VEGETATIVE WATERSHED
- LEVEL SPREADER
- TEMPORARY EROSION CONTROL BARRIER

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NEXTera ENERGY

STATE OF NEW HAMPSHIRE – BRADLEE MEZICA No. 08380 LICENSED PROFESSIONAL ENGINEER – 10-2-19

STATE OF NEW HAMPSHIRE – JOSEPH M. PERSECHINO No. 12388 LICENSED PROFESSIONAL ENGINEER – 10/2/19

N

SCALE IN FEET
0 200' 400'
GRAPHIC SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION

Chinook Solar Project

Chinook Solar, LLC

Fitzwilliam, NH

VERIFY SCALE
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DATE:	10/2/2019
FILE:	N-0758-017-BMP.dwg
DRAWN BY:	EGD/NSC
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APPROVED:	BLM

BMP COLOR PLAN

SCALE: AS SHOWN

2 OF 2

Last Saved: 9/26/2019
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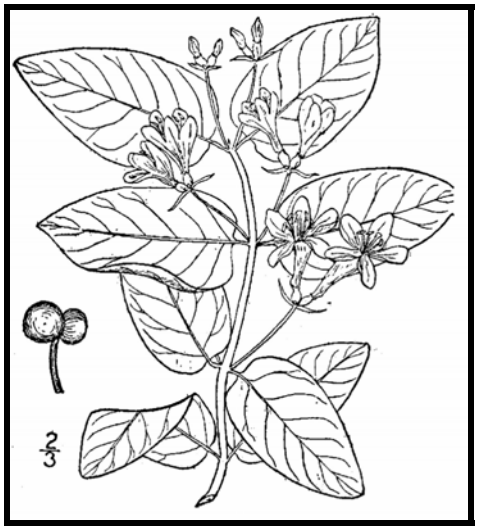
APPENDIX G

UNIVERSITY of NEW HAMPSHIRE COOPERATIVE EXTENSION

Methods for Disposing Non-Native Invasive Plants

Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle
Lonicera tatarica
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

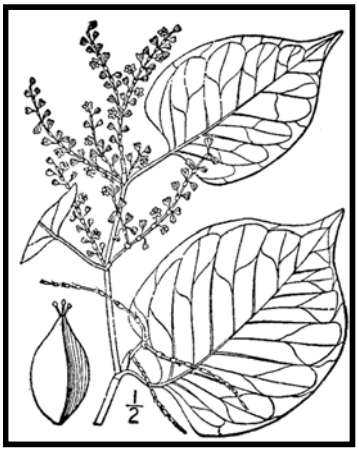
Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag "head first" at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can't be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn't be burned as the seeds may disperse by the hot air created by the fire.



Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don't reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn't used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don't compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.

Be diligent looking for seedlings for *years* in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

<table>
<tr><th>Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">Norway maple
(Acer platanoides)
European barberry
(Berberis vulgaris)
Japanese barberry
(Berberis thunbergii)
autumn olive
(Elaeagnus umbellata)
burning bush
(Euonymus alatus)
Morrow's honeysuckle
(Lonicera morrowii)
Tatarian honeysuckle
(Lonicera tatarica)
showy bush honeysuckle
(Lonicera x bella)
common buckthorn
(Rhamnus cathartica)
glossy buckthorn
(Frangula alnus)</td><td rowspan="2">Fruit and Seeds
  </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Use as firewood.
▪ Make a brush pile.
▪ Chip.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip once all fruit has dropped from branches.
▪ Leave resulting chips on site and monitor.</td></tr>
<tr><td rowspan="2">oriental bittersweet
(Celastrus orbiculatus)
multiflora rose
(Rosa multiflora)</td><td rowspan="2">Fruits, Seeds, Plant Fragments
  </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Make a brush pile.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.</td></tr>
</table>

<table>
<tr><th>Non-Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">garlic mustard
(Alliaria petiolata)
spotted knapweed
(Centaurea maculosa)
▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling.
black swallow-wort
(Cynanchum nigrum)
▪ May cause skin rash. Wear gloves and long sleeves when handling.
pale swallow-wort
(Cynanchum rossicum)
giant hogweed
(Heracleum mantegazzianum)
▪ Can cause major skin rash. Wear gloves and long sleeves when handling.
dame’s rocket
(Hesperis matronalis)
perennial pepperweed
(Lepidium latifolium)
purple loosestrife
(Lythrum salicaria)
Japanese stilt grass
(Microstegium vimineum)
mile-a-minute weed
(Polygonum perfoliatum)</td><td rowspan="2">Fruits and Seeds
  </td><td>Prior to flowering
Depends on scale of infestation
Small infestation
▪ Pull or cut plant and leave on site with roots exposed.

Large infestation
▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting).
▪ Monitor. Remove any re-sprouting material.</td></tr>
<tr><td>During and following flowering
Do nothing until the following year or remove flowering heads and bag and let rot.

Small infestation
▪ Pull or cut plant and leave on site with roots exposed.

Large infestation
▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting).
▪ Monitor. Remove any re-sprouting material.</td></tr>
<tr><td>common reed
(Phragmites australis)
Japanese knotweed
(Polygonum cuspidatum)
Bohemian knotweed
(Polygonum x bohemicum)</td><td>Fruits, Seeds, Plant Fragments
Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn’t materially influence disposal activities.</td><td>Small infestation
▪ Bag all plant material and let rot.
▪ Never pile and use resulting material as compost.
▪ Burn.

Large infestation
▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile.
▪ Monitor and remove any sprouting material.
▪ Pile, let dry, and burn.</td></tr>
</table>

January 2010

Managing Invasive Plants
Methods of Control

by Christopher Mattrick

They're out there. The problem of invasive plants is as close as your own backyard.

Maybe a favorite dogwood tree is struggling in the clutches of an Oriental bittersweet vine. Clawlike canes of multiflora rose are scratching at the side of your house. That handsome burning bush you planted few years ago has become a whole clump in practically no time … but what happened to the azalea that used to grow right next to it?

If you think controlling or managing invasive plants on your property is a daunting task, you're not alone. Though this topic is getting lots of attention from federal, state, and local government agencies, as well as the media, the basic question for most homeowners is simply, "How do I get rid of the invasive plants in my own landscape?" Fortunately, the best place to begin to tackle this complex issue is in our own backyards and on local conservation lands. We hope the information provided here will help you take back your yard. We won't kid you—there's some work involved, but the payoff in beauty, wildlife habitat, and peace of mind makes it all worthwhile.

PLAN OF ATTACK

Three broad categories cover most invasive plant control: mechanical, chemical, and biological. Mechanical control means physically removing plants from the environment through cutting or pulling. Chemical control uses herbicides to kill plants and inhibit regrowth. Techniques and chemicals used will vary depending on the species. Biological controls use plant diseases or insect predators, typically from the targeted species' home range. Several techniques may be effective in controlling a single species, but there is usually one preferred method—the one that is most resource efficient with minimal impact on non-target species and the environment.

Spraying chemicals to control invasive plants.

MECHANICAL CONTROL METHODS

Mechanical treatments are usually the first ones to look at when evaluating an invasive plant removal project. These procedures do not require special licensing or introduce chemicals into the environment. They do require permits in some situations, such as wetland zones. [See sidebar on page 23.] Mechanical removal is highly labor intensive and creates a significant amount of site disturbance, which can lead to rapid reinvasion if not handled properly.

Pulling and digging

Many herbaceous plants and some woody species (up to about one inch in diameter), if present in limited quantities, can be pulled out or dug up. It's important to remove as much of the root system as possible; even a small portion can restart the infestation. Pull plants by hand or use a digging fork, as shovels can shear off portions of the root system, allowing for regrowth. To remove larger woody stems (up to about three inches in diameter), use a Weed Wrench™, Root Jack, or Root Talon. These tools, available from several manufacturers, are designed to remove the aboveground portion of the plant as well as the entire root system. It's easiest to undertake this type of control in the spring or early summer when soils are moist and plants come out more easily.

Using tools to remove woody stems.

Volunteers hand pulling invasive plants.

Suffocation

Try suffocating small seedlings and herbaceous plants. Place double or triple layers of thick UV-stabilized plastic sheeting, either clear or black (personally I like clear), over the infestation and secure the plastic with stakes or weights. Make sure the plastic extends at least five feet past the edge of infestation on all sides. Leave the plastic in place for at least two years. This technique will kill everything beneath the plastic—invasive and non-invasive plants alike. Once the plastic is removed, sow a cover crop such as annual rye to prevent new invasions.

Cutting or mowing

This technique is best suited for locations you can visit and treat often. To be effective, you will need to mow or cut infested areas three or four times a year for up to five years. The goal is to interrupt the plant's ability to photosynthesize by removing as much leafy material as possible. Cut the plants at ground level and remove all resulting debris from the site. With this treatment, the infestation may actually appear to get worse at first, so you will need to be as persistent as the invasive plants themselves. Each time you cut the plants back, the root system gets slightly larger, but must also rely on its energy reserves to push up new growth. Eventually, you will exhaust these reserves and the plants will die. This may take many years, so you have to remain committed to this process once you start; otherwise the treatment can backfire, making the problem worse.

CHEMICAL CONTROL METHODS

Herbicides are among the most effective and resource-efficient tools to treat invasive species. Most of the commonly known invasive plants can be treated using only two herbicides—glyphosate (the active ingredient in Roundup™ and Rodeo™) and triclopyr (the active ingredient in Brush-B-Gone™ and Garlon™). Glyphosate is non-selective, meaning it kills everything it contacts. Triclopyr is selective and does not injure monocots (grasses, orchids, lilies, etc.). Please read labels and follow directions precisely for both environmental and personal safety. These are relatively benign herbicides, but improperly used they can still cause both short- and long-term health and environmental problems. Special aquatic formulations are required when working in wetland zones. You are required to have a state-issued pesticide applicator license when applying these chemicals on land you do not own. To learn more about the pesticide regulations in your state, visit or call your state's pesticide control division, usually part of the state's Department of Agriculture. In wetland areas, additional permits are usually required by the Wetlands Protection Act. [See sidebar on page 23.]

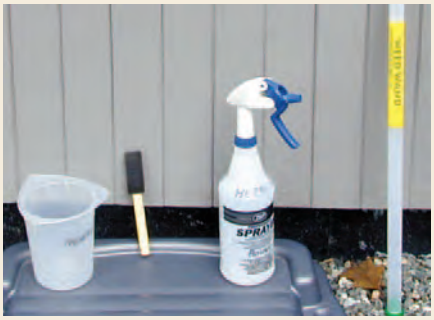
Foliar applications

When problems are on a small scale, this type of treatment is usually applied with a backpack sprayer or even a small handheld spray bottle. It is an excellent way to treat large monocultures of herbaceous plants, or to spot-treat individual plants that are difficult to remove mechanically, such as goutweed, swallowwort, or purple loosestrife. It is also an effective treatment for some woody species, such as Japanese barberry, multiflora rose, Japanese honeysuckle, and Oriental bittersweet that grow in dense masses or large numbers over many acres. The herbicide mixture should contain no more than five percent of the active ingredient, but it is important to follow the instructions on the product label. This treatment is most effective when the plants are actively growing, ideally when they are flowering or beginning to form fruit. It has been shown that plants are often more susceptible to this type of treatment if the existing stems are cut off and the regrowth is treated. This is especially true for Japanese knotweed. The target plants should be thoroughly wetted with the herbicide on a day when there is no rain in the forecast for the next 24 to 48 hours.

Cut stem treatments

There are several different types of cut stem treatments, but here we will review only the one most commonly used. All treatments of this type require a higher concentration of the active ingredient than is used in foliar applications. A 25 to 35 percent solution of the active ingredient should be used for cut stem treatments, but read and follow all label instructions. In most cases, the appropriate herbicide is glyphosate, except for Oriental bittersweet, on which triclopyr should be used. This treatment can be used on all woody stems, as well as phragmites and Japanese knotweed.

For woody stems, treatments are most effective when applied in the late summer and autumn—between late August and November. Stems should be cut close to the ground, but not so close that you will lose track of them. Apply herbicide directly to the cut surface as soon as possible after cutting. Delaying the application will reduce the effectiveness of the treatment. The herbicide can be applied with a sponge, paintbrush, or spray bottle.



Cut stem treatment tools.

For phragmites and Japanese knotweed, treatment is the same, but the timing and equipment are different. Plants should be treated anytime from mid-July through September, but the hottest, most humid days of the summer are best for this method. Cut the stems halfway between two leaf nodes at a comfortable height. Inject (or squirt) herbicide into the exposed hollow stem. All stems in an infestation should be treated. A wash bottle is the most effective application tool, but you can also use an eyedropper, spray bottle, or one of the recently developed high-tech injection systems.

It is helpful to mix a dye in with the herbicide solution. The dye will stain the treated surface and mark the areas that have been treated, preventing unnecessary reapplication. You can buy a specially formulated herbicide dye, or use food coloring or laundry dye.

There is not enough space in this article to describe all the possible ways to control invasive plants. You can find other treatments, along with more details on the above-described methods, and species-specific recommendations on The Nature Conservancy Web site (tncweeds.ucdavis.edu). An upcoming posting on the Invasive Plant Atlas of New England (www.ipane.org) and the New England Wild Flower Society (www.newfs.org) Web sites will also provide further details.

Hollow stem injection tools.

Biological controls—still on the horizon

Biological controls are moving into the forefront of control methodology, but currently the only widely available and applied biocontrol relates to purple loosestrife. More information on purple loosestrife and other biological control projects can be found at www.invasiveplants.net.

DISPOSAL OF INVASIVE PLANTS

Proper disposal of removed invasive plant material is critical to the control process. Leftover plant material can cause new infestations or reinfest the existing project area. There are many appropriate ways to dispose of invasive plant debris. I've listed them here in order of preference.

1. **Burn it**—Make a brush pile and burn the material following local safety regulations and restrictions, or haul it to your town's landfill and place it in their burn pile.

2. **Pile it**—Make a pile of the woody debris. This technique will provide shelter for wildlife as well.

3. **Compost it**—Place all your herbaceous invasive plant debris in a pile and process as compost. Watch the pile closely for resprouts and remove as necessary. Do not use the resulting compost in your garden. The pile is for invasive plants only.

Injecting herbicide into the hollow stem of phragmites.

4. **Dry it/cook it**—Place woody debris out on your driveway or any asphalt surface and let it dry out for a month. Place herbaceous material in a doubled-up black trash bag and let it cook in the sun for one month. At the end of the month, the material should be non-viable and you can dump it or dispose of it with the trash. The method assumes there is no viable seed mixed in with the removed material.

Care should be taken in the disposal of all invasive plants, but several species need extra attention. These are the ones that have the ability to sprout vigorously from plant fragments and should ideally be burned or dried prior to disposal: Oriental bittersweet, multiflora rose, Japanese honeysuckle, phragmites, and Japanese knotweed.

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Controlling Invasive Plants in Wetlands

Special concerns; special precautions

Control of invasive plants in or around wetlands or bodies of water requires a unique set of considerations. Removal projects in wetland zones can be legal and effective if handled appropriately. In many cases, herbicides may be the least disruptive tools with which to remove invasive plants. You will need a state-issued pesticide license to apply herbicide on someone else's property, but all projects in wetland or aquatic systems fall under the jurisdiction of the Wetlands Protection Act and therefore require a permit. ***Yes, even hand-pulling that colony of glossy buckthorn plants from your own swampland requires a permit.*** Getting a permit for legal removal is fairly painless if you plan your project carefully.

1. Investigate and understand the required permits and learn how to obtain them. The entity charged with the enforcement of the Wetlands Protection Act varies from state to state. For more information in your state, contact:

   ME: Department of Environmental Protection
   www.state.me.us/dep/blwq/docstand/nrpapage.htm

   NH: Department of Environmental Services
   www.des.state.nh.us/wetlands/

   VT: Department of Environmental Conservation
   www.anr.state.vt.us/dec/waterq/permits/htm/pm_cud.htm

   MA: Consult your local town conservation commission

   RI: Department of Environmental Management
   www.dem.ri.gov/programs/benviron/water/permits/fresh/index.htm

   CT: Consult your local town Inland Wetland and Conservation Commission

2. Consult an individual or organization with experience in this area. Firsthand experience in conducting projects in wetland zones and navigating the permitting process is priceless. Most states have wetland scientist societies whose members are experienced in working in wetlands and navigating the regulations affecting them. A simple Web search will reveal the contact point for these societies. Additionally, most environmental consulting firms and some nonprofit organizations have skills in this area.

3. Develop a well-written and thorough project plan. You are more likely to be successful in obtaining a permit for your project if you submit a project plan along with your permit application. The plan should include the reasons for the project, your objectives in completing the project, how you plan to reach those objectives, and how you will monitor the outcome.

4. Ensure that the herbicides you plan to use are approved for aquatic use. Experts consider most herbicides harmful to water quality or aquatic organisms, but rate some formulations as safe for aquatic use. Do the research and select an approved herbicide, and then closely follow the instructions on the label.

5. If you are unsure—research, study, and most of all, ask for help. Follow the rules. The damage caused to aquatic systems by the use of an inappropriate herbicide or the misapplication of an appropriate herbicide not only damages the environment, but also may reduce public support for safe, well-planned projects.