CENTRAL MAINE POWER

January 25, 2019

Mr. James R. Beyer
Maine Department of Environmental Protection
Division of Land Resources Regulation
106 Hogan Road
Bangor, ME 04401

RE: Response to December 21, 2018 MDEP Technical Review Memorandum
New England Clean Energy Connect Project, L-27625-26-A-N

Dear Mr. Beyer:

Central Maine Power Company (CMP) is pleased to provide this response to the Maine Department of Environmental Protection (MDEP) December 21, 2018 technical review memorandum (Attachment A) associated with the Site Location of Development Act and Natural Resources Protection Act permit applications and supplemental materials submitted by CMP, for the New England Clean Energy Connect (NECEC) project. The memorandum makes reference to:

- CMP's July 2018 Stormwater Submittals to the Department in response to Kerem Gungor technical review memorandum dated January 2018;
- A summarized Review of The Applicant's Submittals dated 6/29/18; and
- Reviews and comments to CMP's Stormwater Management standards.

Eleven new comments require edits and/or supporting material to the Stormwater Management submissions included with the application, within three different standards:

- Basic Standards Submissions
- General Standards Submission
- Flooding Standards Submission

Each of these eleven comments are discussed below within the corresponding standard.

A. Basic Standards

MDEP Comment #1:

Please amend "Section 14. Basic Standards" of the application with the following and submit the full-text of the amended section for review:

a. Page 14-2: Insert the "order of construction operations" response given in the second page of the response letter dated 6/29/18 where appropriate,
b. Create a separate subsection (i.e. Subsection 14.2) titled "Best Management Practices for Segment 1 Higher Erosion Risk Areas" which includes the following:

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i. Response #2 (page 2 of the response letter) including Segment 1: Areas with higher erosion risk table,
ii. Each week, erosion and sedimentation control (ESC) inspection and maintenance log to be kept by the ESC crew shall be reviewed by the third-party inspectors who shall report their findings to the Department per Chapter 500 Appendix B(1)(c),
iii. Prior to the construction, CMP shall provide a construction plan including the construction timetable, access roads to be used in the construction, contractor, ESC crew, environmental inspector and third-party inspector information – long stretches of high risk areas (e.g. 11.4-mile section between structures 3006-199 & 3006-258) may need multiple inspectors- for the Department's review and approval,
iv. CMP shall provide a plan showing the project's progress (disturbed, stabilized areas) to the Department monthly during the construction,

c. Exhibit 14-1: "Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects" (Revised 6/29/2018)

CMP Response:

CMP has revised "Section 14. Basic Standards" to reflect the requested changes. See Attachment B for the full text of the amended section.

MDEP Comment #2:

In response to the discussions held between the applicant's representative and the Department staff (see Mr. Mirabile's letter dated 8/13/18, page 10), the applicant has proposed an alternative cross-section for the southeasterly cut slope, which is shown in 1076-003-005 Sheet 1 of 6. I strongly recommend the applicant to use the alternative cross-section which will reduce the disturbed area and minimize the erosion and sedimentation risk during the construction. An upgradient flow diversion structure can be necessary during the construction of the slope.

CMP Response:

CMP will use the alternative cross-section as proposed and will use an upgradient flow diversion structure during the construction of the slope, if determined to be necessary by the MDEP's third party inspector or CMP's environmental inspector.

MDEP Comment #3:

Environmentally sound management of the HDD fluid is a prerequisite to prevent the unauthorized discharges and sedimentation into the protected natural resources. The applicant has provided Exhibit 14-1 *"Inadvertent Fluid Release Prevention, Monitoring, and Contingency Plan"* to satisfy this requirement. The document mostly lists several criteria/requirements to be met by the HDD contractor who will prepare the site-specific inadvertent fluid release plan. Should the project be approved, I recommend the Department Order to include the following special conditions:

a. No less than three months before the tentative HDD start date, the applicant shall submit a site-specific inadvertent fluid release prevention, monitoring, and contingency plan satisfying all the criteria given in Exhibit 14-1 of the application for the Department's review and approval,

b. The applicant shall retain the services of a Department-approved third-party inspector to oversee the HDD,
c. An on-site pre-construction meeting shall be held with the attendance of the Department-approved third-party inspector, the representatives of the Department, applicant, and HDD contractor.

CMP Response:

CMP accepts these recommended special conditions for the proposed HDD crossing beneath the Kennebec River.

MDEP Comment #4:

Stormwater source control best management practices must be used to prevent unauthorized discharges due to the drilling fluid recirculation and processing. I recommend:

a. Covering drilling fluid pits (i.e. mud pits mentioned in page 3, Section 1.4) especially during no-work period,
b. Using a high-efficiency, high-rate manufactured device to separate the cuttings from the drilling fluid instead of a low-rate gravity separation basin which may be exposed to weather and require a larger footprint,
c. Using dumpsters for the temporary storage of the cuttings and covering the dumpsters during no-work period,

Plans, technical details and specifications of the drilling fluid processing/recycling system which ensures zero drilling fluid discharge must be provided concurrently with the "Inadvertent Fluid Release Prevention, Monitoring, and Contingency Plan" (see Comment #4) for the Department's review and approval.

CMP Response:

CMP will use the best management practices described in Comment #4 and will provide plans, technical details, and specifications of the drilling fluid processing/recycling system concurrently with the "Inadvertent Fluid Release, Prevention, Monitoring, and Contingency Plan.

B. General Standards

a. Kennebec River Crossing

MDEP Comment #5:

Please provide treatment summary tables for each termination station in the post-development plan sheets (*315641 SW-2* & *315641 SW-4*).

CMP Response:

Treatment summary tables have been added for each termination station. Please refer to sheets 315641 SW-2 Rev 0.0C and 315641 SW-4 Rev 0.0C (Attachment C).

MDEP Comment #6:

Termination Station Access Roads:

a. New impervious area associated with the *West Forks* access road, shown in *C-4* plan sheet, is approximately half an acre. Total impervious area treated by the meadow buffer is given as 15 x (65+368) = 6,495 sf in the buffer/level spreader sizing table. Using *C-4* plan sheet, I calculated the minimum linear impervious area requiring treatment to be *ca.* 22,000 sf. Please review the level lip spreader sizing and revise if necessary. Also, please delineate the treatment area of the buffer in the post-development watershed plan (*315641 SW-2*).
b. Land cover of the *Moxie Gore* vegetated buffer is given as meadow in the sizing calculations. The buffer area appears to be forested in *C-3* plan sheet. Please review.
c. Please clarify the new *Moxie Gore* access road grading in *C-3* plan sheet. Will the road be sloped towards the swales within the landscaped island?
d. The proposed buffer lengths shown in *C-3* and *C-4* plan sheets apparently provide flow paths exceeding 150 ft, which is the value used in the sizing. Review the buffer delineations and revise the plan sheets if necessary.

CMP Response:

a. The drawing bar scale shown on C-4 is incorrect. The drawing scale is 1 inch = 50 feet and the bar scale is 1 inch = 100 feet. The bar scale has been revised to match the correct drawing scale (1 inch = 50 feet). The error in scale accounts for the difference in the reviewer's calculated impervious area. Please note, the West Forks access road is defined as the permanent access road from the existing logging road to the termination station. The main segment is 380 linear feet and the smaller segment is 81 linear feet. Using a 15 foot-wide road, the impervious area to be treated is 6,915 square feet. Also note, the temporary access road that extends to the receiving platform from the termination station is not considered in the treatment calculation.
a. The treatment area on sheet 315641 – SW-2 Rev 0.0C is labeled and has been bolded for clarity (Attachment C).
b. Buffer sizing calculations have been updated to reflect a forested buffer type. Please see revised buffer sizing calculations (Attachment D).
c. The Moxie Gore access road will be sloped towards the swales within the landscaped island per section D on sheet 315641 C-5 Rev 0.0C, previously provided.

d. The buffer length on sheet 315641 C-3 (B-2) is measured on the south side of the buffer which is 150 feet in length. It appears somewhat longer on the north side as the bottom of the buffer is squared off along the downstream contour. The buffer length on sheet 315641 C-4 (B-1) is correct. The bar scale on the drawing is incorrect. The drawing scale should be 1 inch = 50 feet. A revised sheet 315641 C-4 Rev 0.0C is included in the resubmittal package. (Attachment C)

MDEP Comment #7:

Termination Stations: As shown in *C-5* plan sheet, the termination stations will be mostly constructed on fill. Northern section of the proposed *West Forks* station will be in cut *Tunbridge* soil which has 24-36" deep bedrock as shown in the soil test pit logs. Therefore, seasonally high water table interference is not anticipated for the termination station yards.

a. Please confirm that the concrete slabs and similar truly impervious surfaces (curve number = 98) within the termination station yards will not exceed 0.01 ac as given in the post-development HydroCAD models (Subcatchments *1SA* and *2SA*). If the areas of these surfaces have been revised and increased since the latest submission, please demonstrate that the substation yard will provide minimum one-inch storage for the runoff from the truly impervious surfaces.

CMP Response:

The foundation areas are based on the equipment shown on the general arrangement plans for both termination stations. These sketches and calculations are included in the resubmittal package. The total impervious areas for the equipment foundations within each termination station footprint is just under 0.01 acre.

b. Merrill Road Converter Substation – Gravel Wetlands

MDEP Comment #8:

Please provide 1":20' or larger scale plan views of the proposed gravel wetlands that:

a. Show location of the lateral underdrains in each cell,
b. Show location and number of the perforated riser pipes in each cell. Please note that a riser must be provided for every 10 linear ft of the inlet lateral underdrains per Maine Stormwater BMP Manual Chapter 7.4,
c. Revise the berms separating the cells. They must extend perpendicular to the flow direction without interruption and include a stable spillway. In the current plan views of the gravel wetlands (e.g. *1076-003-004 Sheet 1 of 2*), the berms appear to have a sizeable opening in the middle, which may prevent the intended ponding in the upgradient cell.
d. Provide detailed grading and keynotes for *Gravel Wetland #1* forebay to ensure that the entire runoff enters the first/upgradient cell at a defined, stabilized (e.g. riprap spillway) entry point,
e. Have *Gravel Wetland #2* with only one forebay instead of two forebays. The gravel wetland design specifications call for one defined inlet which maximizes the longitudinal runoff travel path within the gravel wetland and ensures that

both cells are sequentially used for the water quality volume treatment. Hence, the forebay by Sta 10+00 can remain and the other forebay can be removed. The runoff from the Sta 8+00 and Sta 10+00 section can be directed to the remaining forebay by installing a curb or another flow diversion structure.

CMP Response:

Plan views for each of the two gravel wetlands have been provided, at 1" = 20' scale, on new drawing 1076-003-002 SH 6 of 6 (Attachment E). In particular:

- The locations of the lateral underdrains in each cell are depicted;
- The locations and number of the perforated riser pipes in each cell are depicted;
- The berms separating the cells have been revised to extend perpendicular to the flow direction without interruption; and
- The grading in the vicinity of Gravel Wetland #1 has been detailed to ensure that the entire runoff enters the forebay, then on to the first/upgradient cell.

The grading in the vicinity of Gravel Wetland #2 has been revised so that the entire runoff enters one forebay. The forebay by Sta 10+00 remains and the other forebay has been removed. The runoff from the access road between Sta 8+00 and Sta 10+00 is directed to the forebay by a concrete curb.

MDEP Comment #9:

"Gravel Wetland Cross Section Construction Details" & "Gravel Wetland Outlet Control Structure" in 1076-003-002 (Sheet 5 of 6):

a. The riprap emergency spillway elevations are lower than the outlet control structure (OCS) grate elevations. Please lower the OCS grate elevations to the "top of wetland soil elevation + 1.5 ft",
b. Clarify the locations of the lateral underdrains in both cells and provide the pipe specifications in the gravel wetland cross sectional details.

CMP Response:

The locations of the lateral underdrains in both cells and the pipe specifications in the gravel wetland cross sectional details are provided in 1076-003-002 (Stormwater Treatment Plan Sheet 5 of 6). See Attachment E.

C. Flooding Standard

a. Termination Stations & Their Access Roads at the Kennebec River Crossing:

The applicant has submitted pre- and post-development hydrologic models for the drainage areas of the proposed stations. One subcatchment was used for each station in the pre-development models. The proposed termination station yards were modeled as separate subcatchments in the post-development models.

MDEP Comment #10:
Please demonstrate that the proposed 18" corrugated metal pipe culvert, shown in *C-3* plan sheet, can handle the 10-yr, 24-h peak flow.

CMP Response:
The 18-inch diameter CMP culverts are adequately sized to convey peak flow from the 10-year, 24-hour storm event. Please refer to the culvert sizing calculations included in Attachment D.

b. Merrill Road Converter Substation
The modeled area was expanded westerly due to the reorientation of the proposed access road as shown in *1076-003-002* pre- and post-development stormwater plans. The proposed wetlands, grassed underdrained soil filter, and stormwater conveyance structures were modeled using a revised post-development model. The applicant has demonstrated that the five proposed culverts can handle the 25-yr, 24-h peak flows.

MDEP Comment #11:
Please provide a routing diagram for the post-development model, the peak flow outputs for the outfalls A and C.

CMP Response:
A routing diagram for the post-development model has been provided in the stormwater management report, within Appendix C – Stormwater Calculations. The routing diagram can be found after the stormwater plans and before the stormwater model output.

If you have any questions regarding these responses, please give me a call at (207) 629-9717 or email gerry.mirabile@cmpco.com.

Sincerely,

Gerry J. Mirabile
Manager – Environmental Projects
Environmental Permitting
AVANGRID Networks, Inc.

Enclosures

cc: MDEP Service List; LUPC Service List
File: New England Clean Energy Connect

ATTACHMENT A

MDEP Technical Review Memorandum – December 2018

TECHNICAL REVIEW MEMORANDUM

Bureau of Land Resources

TO: **Jim Beyer, Project Manager – Bureau of Land Resources**
FROM: **Kerem Gungor, Environmental Engineer-- Bureau of Land Resources**
RE: **Central Maine Power Company, New England Clean Energy Connect, L-27625-26-A-N**
DATE: **December 21, 2018**

I have reviewed the submittals delivered to the Department in response to my technical review memorandum dated January, 2018 on the proposed *New England Clean Energy Connect (NECEC)* project.

APPLICANT: CMP
DEP#: L-27625-26-A-N
Primary Contact for the Applicant: Gerry Mirabile
Project description: NECEC which mainly includes transmission line construction and improvements, substation improvements, one new converter station and one new substation construction.
Resultant impervious area[1]: 13.25 ac
Resultant developed area[2]: 20.18 ac
Standards applicable to the project: Basic, flooding, general, phosphorus, discharge to wetlands, and redistribution of stormwater discharges.

A. STORMWATER SUBMITTALS

The electronic submittals, portable document files (PDFs), in response to my technical review memorandum dated January, 2018 were received by the Department in July, 2018 and are accessible from https://www.maine.gov/dep/ftp/projects/necec/response-comments/Response%20to%20Storm%20Water%20Memo/ :

- Response MDEP 1-18 Tech Rev Memo 6-29-2018.pdf: 383-page document that includes the entire response submittals:
  - Response letter dated 6/29/18, signed by *Gerry J. Mirabile*, CMP Environmental Projects Manager.
  - Attachment A. MDEP Technical Review Memorandum – January 2018.
  - Attachment B. Exhibit 4-1. Environmental Guidelines for Construction and Maintenance Activities on Transmission Lines and Substation Projects (Revised).

[1] Proposed transmission line work and existing substation improvements will not create jurisdictional impervious area. Therefore, the given resultant impervious area figure is the total figure for the two new substations and two new underground transmission termination stations: 3.90 ac for Fickett Road substation; 7.15 ac (substation pad) + 0.96 ac (access road) for Merrill Road substation; 0.61 ac for Moxie Gore station; 0.63 ac for West Forks station.

[2] Proposed transmission line work and existing substation improvements will not create jurisdictional developed area. Therefore, the given resultant developed area figure is the total figure for the two new substations and two new underground transmission termination stations: 10.71 ac (substation pad) + 2.71 ac (access road) for Merrill Road substation; 4.87 ac (total) for Fickett Road substation; 0.86 ac for Moxie Gore station; 1.03 ac for West Forks station.

- Attachment C. Typical Figure: Erosion and Sedimentation Controls for Structure Installation in High Risk Areas.
- Attachment D. Fickett Road Substation Stormwater Plan Revisions.
- Attachment E. Merrill Road Converter Station Stormwater Plan Revisions.

I also reviewed the following geotechnical engineering reports as they are pertinent to my technical review. The pdfs are accessible from https://www.maine.gov/dep/ftp/projects/necec/response-comments/:

- 17-1017 Geotech Report.pdf: 51-page document.
  - Explorations and Geotechnical Engineering Services Report (for) Proposed Converter Station Merrill Road Lewiston, Maine. Dated 5/11/18, prepared by *S.W. Cole Engineering Inc.*, signed and sealed by *Paul F. Kohler, P.E.*

- Fickett Road SS Geotech Report 6-19-2018.pdf: 56-page document.
  - Explorations and Geotechnical Engineering Services Report (for) Proposed Substation Fickett Road Pownal, Maine. Dated 6/19/18, prepared by *S.W. Cole Engineering Inc.*, signed and sealed by *Paul F. Kohler, P.E.*

After the receipt of the above submittals, the applicant revised Merrill Rd Converter Substation design and subsequently provided the following electronic documents to the Department (Hardcopies of the submittals were received by the Department on 8/17/18). The PDFs are accessible from https://www.maine.gov/dep/ftp/projects/necec/response-comments/2018-08-14%20Responses%20to%20Comments/ :

- 2018-08-13 NECEC Supplemental Application Materials Submittal - Final.pdf: 24-page document.
  - Cover letter dated 8/13/18 and signed by *Gerry J. Mirabile*. Please note that Item #7 (page 4) and page 10 of the letter are directly related to the stormwater management.

- 2018-08-14 Attachment H - NECEC Revised Merrill Road Converter Station Stormwater Management Plan.pdf: 198-page document including the following plan sheets:
  - 1076-003-001. General Site Plan Existing Conditions Sh 1 of 2. Revised 7/12/18.
  - 1076-003-001. General Site Plan Proposed Conditions Sh 2 of 2. Revised 7/12/18.
  - 1076-003-002. Grading Plan Sh 1 of 5. Revised 7/12/18.
  - 1076-003-002. Stormwater Treatment Plan Sh 2 of 5. Revised 8/9/18.
  - 1076-003-002. Pre-development Stormwater Plan Sh 3 of 5. Revised 8/9/18.
  - 1076-003-002. Post-development Stormwater Plan Sh 4 of 5. Revised 8/9/18.
  - 1076-003-002. Stormwater Treatment Plan Sh 5 of 5. Revised 8/9/18.
  - 1076-003-003. Erosion and Sediment Control Plan 1 Sh 1 of 2. Revised 7/12/18.
  - 1076-003-003. Erosion and Sediment Control Plan 2 Sh 2 of 2. Revised 7/12/18.
  - 1076-003-004. Road Plan and Profile 1 Sh 1 of 2. Revised 7/12/18.
  - 1076-003-004. Road Plan and Profile 2 Sh 2 of 2. Revised 7/12/18.
  - 1076-003-005. Site Details 1 Sh 1 of 6. Revised 8/9/18.
  - 1076-003-005. Site Details Sh 5 of 6. Dated 5/29/18.
  - 1076-003-005. Site Details Sh 6 of 6. Revised 8/9/18.

    The plan sheets above were signed and sealed by *Kenneth R. Volock, P.E.*

- 2018-08-14 Attachment I - NECEC Revised Fickett Road Substation Stormwater Management Drawings.pdf: 129-page document including the following plan sheets:
    - 1077-003-003. Stormwater Treatment Plan Sh 1 of 3. Dated 5/29/18.
    - 1077-003-003. Post-development Stormwater Plan. Sh 3 of 3. Dated 5/29/18.
    - 1077-003-005. Site Details 4 Sh 4 of 5. Dated 5/29/18.
    - 1077-003-005. Site Details 5 Sh 5 of 5. Dated 5/29/18.

      The plan sheets above were signed and sealed by *Kenneth R. Volock, P.E.*

The applicant provided the following amendment dated 10/19/18 to the Site Location of Development Act (SLODA) permit application, which is accessible online from https://www.maine.gov/dep/ftp/projects/necec/applications/hdd-amend/ . The amendment is about the horizontal directional drill (HDD) proposed for the Upper Kennebec River crossing:

- NECEC Kennebec River HDD Site Law Application Amendment_10.19.18.pdf: 250-page document. Relevant sections used in my technical review are:
    - Section 1. Development Description.
    - Section 4. Technical Ability.
    - Section 11. Soils.
        - Exhibit 11-1. Class B High Intensity Soil Surveys.
            - Class B High Intensity Soil Survey for Central Maine Power Company Electrical Substation Moxie Gore, ME by *Robert Vile Soil Consulting Inc.* dated 10/16/18.
                - Four soil test pit logs sealed by *Robert Vile, C.S.S.*
                - Class B High Intensity Soil Survey Map. Central Maine Power Company Corridor Moxie Gore, Somerset County, Maine. Dated 10/16/18, signed and sealed by *Robert Vile, C.S.S.*
            - Class B High Intensity Soil Survey for Central Maine Power Company Electrical Substation West Forks Plantation, ME by *Robert Vile Soil Consulting Inc.* dated 10/16/18.
                - Six soil test pit logs sealed by *Robert Vile, C.S.S.*
                - Class B High Intensity Soil Survey Map. Central Maine Power Company Corridor West Forks, Somerset County, Maine. Dated 10/16/18, signed and sealed by *Robert Vile, C.S.S.*
        - Exhibit 11-2. Geotechnical Feasibility Review Memorandum dated 10/17/18 by *Wade A. Narin van Court, Ph.D., P.E.*
    - Section 12. Stormwater Management.
        - Exhibit 12-1. Stormwater Plans.
            - Stormwater Management Report (Dated October, 2018) by *TRC*
                - Plan sheets:
                    - G-1. Cover Sheet & Drawing Index. Unsealed.
                    - G-2. General Notes, Legend & Vicinity Map.
                    - C-1. HDD Crossing (Sta 0+00 to 20+50) Plan & Profile.
                    - C-2. HDD Crossing (Sta 20+50 to 36+00) Plan & Profile.
                    - C-3. Grading & Restoration Plan Moxie Gore.
                    - C-4. Grading & Restoration Plan West Forks.
                    - C-5. Cross-sections & HDD Details 1.
                    - C-6. Cross-sections & HDD Details 2.
                    - C-7. Erosion Control Notes & Details 1.

- C-8. Erosion Control Notes & Details 2.
- SW-1. Pre-development Watershed Plan (West Forks Station).
- SW-2. Post-development Watershed Plan (West Forks Station).
- SW-3. Pre-development Watershed Plan (Moxie Gore Station).
- SW-4. Post-development Watershed Plan (Moxie Gore Station).

The above plan sheets were dated 10/5/18, signed and sealed by *Ricky A. Young, P.E.* on Oct. 19 or Oct. 18, 2018 unless stated otherwise.

B. REVIEW OF THE APPLICANT'S SUBMITTALS

Central Maine Power Company (CMP) provided itemized responses in the letter dated 6/29/18 and signed by *Gerry J. Mirabile* to the itemized comments stated in my technical review memorandum dated January, 2018. Significant amendments made to NECEC project are summarized below:

- "Environmental Guidelines for Construction and Maintenance Activities on Transmission Lines and Substation Projects" document has been amended with (a) water bar, sediment basin/trap, and flow diversion berm typical drawings, (b) directions for diverting upgradient runoff traversing the right-of-way (ROW), (c) directions for the use of additional erosion sedimentation control (ESC) measures in low points receiving runoff from steep ROW.

- The applicant provided a table showing the sections of *Segment 1* with higher erosion risk (i.e. the table titled *Segment 1: Areas with high erosion risk* in the response letter). The high erosion risk areas were determined using geospatial analysis with the soil erodibility and slope criteria. High erosion risk sections stretching more than one mile are given in the descending order below:

Structure Number		Linear distance (miles)	Approximate Location
From	To		
3006-199	3006-258	11.4	Three Slide Mountain to Smart Mountain
3006-175	3006-197	3.8	South of Number 5 Mountain
3006-271	3006-287	3.3	North of Van Dyke Mountain to US & Canada Border
3006-104	3006-119	2.8	Coburn Mountain
3006-77	3006-84	1.3	South of Johnson Mountain
3006-87	3006-93	1.1	West of Johnson Mountain
3006-53	3006-60	1.1	Little Wilson Hill Pond and Tobey Pond

Total linear distance of the higher erosion risk sections is 31.2 miles, which constitutes approximately 58% of the 53.5-mile long *Segment 1*. Please see Comment #1 below under Section C.A.

The applicant has revised the access road orientation for the proposed *Merrill Road* converter substation and proposed two gravel wetland stormwater measures to treat the road runoff.

CMP has revised the proposed Kennebec River crossing: an underground cable conduit will be installed using horizontal directional drilling (HDD) technique instead of the overhead transmission line originally

proposed. Approximate linear length of the underground cable conduit, hereafter HDD line, will be 3,000 ft as shown in *C-1* and *C-2* plan sheets. Typical cross-section of the HDD bore is shown in *C-5* plan sheet: 36" steel casing containing several conduits in a 48" borehole. Proposed length of the HDD line which will be under the Kennebec River is approximately 320 ft and the HDD line will be 55 to 75 ft deep from the bottom of the river bed. Remaining section of the HDD line will be under steep, wooded embankments of the river. Two temporary HDD platforms will be built on each side of the river: 125'x150' (East bank of the river, Moxie Gore) and 100'x150' (West bank of the river, West Forks). From the exit/entry points of HDD line, the underground transmission lines will be connected via trenches (see the detail in *C-5* plan sheet for the trenching) to the permanent 135'x135' termination stations on each side of the river. The temporary platform and termination station in Moxie Gore and West Forks can be seen in *C-3* and *C-4* and plan sheets, respectively. After the construction, the temporary platforms and their gravel access roads will be revegetated and restored to the pre-existing condition (see *Restoration Note* in *C-3* and *C-4* plan sheets). The erosion and sedimentation control (ESC) plan submissions are:

- ***Location plan.*** Sediment barrier locations shown in *C-3* and *C-4* plan sheets.
- ***Erosion and sedimentation control notes.*** *C-8* plan sheet.
- ***Construction and installation details.*** *C-7* and *C-8* plan sheets.

C. STORMWATER MANAGEMENT

I have eleven comments requiring the applicant's response:

A. Basic Standards

Note: *As always, the applicant's erosion control plan is a good starting point for providing protection during construction. However, based on site and weather conditions during construction, additional erosion and sediment control measures may necessary to stop soil from leaving the site. In addition, other measures may be necessary for winter construction. All areas of instability and erosion must be repaired immediately during construction and need to be maintained until the site is fully stabilized or vegetation is established. Approval of this plan does not allow unauthorized discharges from the site.*

1. Please amend "*Section 14. Basic Standards"* of the application with the following and submit the full-text of the amended section for review:
    - **a.** Page 14-2: Insert the "order of construction operations" response given in the second page of the response letter dated 6/29/18 where appropriate,
    - **b.** Create a separate subsection (i.e. Subsection 14.2) titled *"Best Management Practices for Segment 1 Higher Erosion Risk Areas"* which includes the following:
        - **i.** Response #2 (page 2 of the response letter) including *Segment 1: Areas with higher erosion risk* table,
        - **ii.** Each week, erosion and sedimentation control (ESC) inspection and maintenance log to be kept by the ESC crew shall be reviewed by the third-party inspectors who shall report their findings to the Department per Chapter 500 Appendix B(1)(c),
        - **iii.** Prior to the construction, CMP shall provide a construction plan including the construction timetable, access roads to be used in the construction, contractor, ESC crew, environmental inspector and third-party inspector information – long stretches of high risk areas (e.g. 11.4-mile section between structures 3006-199 & 3006-258) may need multiple inspectors- for the Department's review and approval,

iv. CMP shall provide a plan showing the project's progress (disturbed, stabilized areas) to the Department monthly during the construction,

c. Exhibit 14-1: *"Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects"* (Revised 6/29/2018)

2. In response to the discussions held between the applicant's representative and the Department staff (see *Mr. Mirabile*'s letter dated 8/13/18, page 10), the applicant has proposed an alternative cross-section for the southeasterly cut slope, which is shown in *1076-003-005 Sh 1 of 6*. I strongly recommend the applicant to use the alternative cross-section which will reduce the disturbed area and minimize the erosion and sedimentation risk during the construction. An upgradient flow diversion structure can be necessary during the construction of the slope.

Following comments are for the HDD crossing and termination stations:

3. Environmentally sound management of the HDD fluid is a prerequisite to prevent the unauthorized discharges and sedimentation into the protected natural resources. The applicant has provided Exhibit 14-1 *"Inadvertent Fluid Release Prevention, Monitoring, and Contingency Plan"* to satisfy this requirement. The document mostly lists several criteria/requirements to be met by the HDD contractor who will prepare the site-specific inadvertent fluid release plan. Should the project be approved, I recommend the Department Order to include the following special conditions:

a. No less than three months before the tentative HDD start date, the applicant shall submit a site-specific inadvertent fluid release prevention, monitoring, and contingency plan satisfying all the criteria given in Exhibit 14-1 of the application for the Department's review and approval,

b. The applicant shall retain the services of a Department-approved third-party inspector to oversee the HDD,

c. An on-site pre-construction meeting shall be held with the attendance of the Department-approved third-party inspector, the representatives of the Department, applicant, and HDD contractor.

4. Stormwater source control best management practices must be used to prevent unauthorized discharges due to the drilling fluid recirculation and processing. I recommend:

a. Covering drilling fluid pits (i.e. mud pits mentioned in page 3, Section 1.4) especially during no-work period,

b. Using a high-efficiency, high-rate manufactured device to separate the cuttings from the drilling fluid instead of a low-rate gravity separation basin which may be exposed to weather and require a larger footprint,

c. Using dumpsters for the temporary storage of the cuttings and covering the dumpsters during no-work period,

Plans, technical details and specifications of the drilling fluid processing/recycling system which ensures zero drilling fluid discharge must be provided concurrently with the "*Inadvertent Fluid Release Prevention, Monitoring, and Contingency Plan"* (see Comment #4) for the Department's review and approval.

B. General Standards

a. Kennebec River Crossing

The applicant will be disturbing approximately 2.5 and 2.3 ac of land for the proposed *West Forks* and *Moxie Gore* stations, respectively. After the restoration of the areas temporarily disturbed for HDD, approximately one ac of developed area will be created at the *West Forks* station; post-construction developed area associated with the *Moxie Gore* station will be approximately 0.86 ac.

The applicant proposes to treat the developed area excluding the station yards using vegetated stormwater buffers. The station yards are considered as self-treating surfaces per the Department's letter dated 6/5/2008.

5. Please provide treatment summary tables for each termination station in the post-development plan sheets (*315641 SW-2* & *315641 SW-4*).

6. Termination Station Access Roads:

- **a.** New impervious area associated with the *West Forks* access road, shown in *C-4* plan sheet, is approximately half an acre. Total impervious area treated by the meadow buffer is given as 15 x (65+368) = 6,495 sf in the buffer/level spreader sizing table. Using *C-4* plan sheet, I calculated the minimum linear impervious area requiring treatment to be *ca.* 22,000 sf. Please review the level lip spreader sizing and revise if necessary. Also, please delineate the treatment area of the buffer in the post-development watershed plan (*315641 SW-2*).
- **b.** Land cover of the *Moxie Gore* vegetated buffer is given as meadow in the sizing calculations. The buffer area appears to be forested in *C-3* plan sheet. Please review.
- **c.** Please clarify the new *Moxie Gore* access road grading in *C-3* plan sheet. Will the road be sloped towards the swales within the landscaped island?
- **d.** The proposed buffer lengths shown in *C-3* and *C-4* plan sheets apparently provide flow paths exceeding 150 ft, which is the value used in the sizing. Review the buffer delineations and revise the plan sheets if necessary.

7. Termination Stations: As shown in *C-5* plan sheet, the termination stations will be mostly constructed on fill. Northern section of the proposed *West Forks* station will be in cut *Tunbridge* soil which has 24-36" deep bedrock as shown in the soil test pit logs. Therefore, seasonally high water table interference is not anticipated for the termination station yards.

- **a.** Please confirm that the concrete slabs and similar truly impervious surfaces (curve number = 98) within the termination station yards will not exceed 0.01 ac as given in the post-development HydroCAD models (Subcatchments *1SA* and *2SA*). If the areas of these surfaces have been revised and increased since the latest submission, please demonstrate that the substation yard will provide minimum one-inch storage for the runoff from the truly impervious surfaces.

b. Merrill Road Converter Substation
The substation yard impervious and developed area figures have remained unchanged after the project revisions. The revised access road will result in 2.71 ac of developed area 0.96 ac of which will be impervious.

The applicant proposes to treat the linear portion of the project (i.e. access road) using two gravel wetlands as shown in *1076-003-004 Sh 1 of 2*. The proposed gravel wetlands were reviewed to determine their compliance with the design guidelines given in Maine Stormwater BMP Manual Chapter 7.4 (See Comments 8 & 9 below). The applicant proposes to use permeable road base (a.k.a. rock sandwich) to maintain the wetland connectivity between Sta 3+75 and Sta 8+00 as shown in *1076-003-044 Sh 1 of 2*; the permeable road base section of the access road is exempt from the standards per Chapter 500 Section 4(C)(5)(e). The applicant will treat 78.7 and 54.9% of the linear impervious and developed area -including the exempted crossing area-, respectively; therefore, the proposed treatment level for the linear development is well above the minimum requirements set forth in Chapter 500 Section 4(C)(5)(c).

The applicant has not made any significant revision which would affect the stormwater treatment system of the non-linear development. The proposed self-treating substation yard and grassed underdrained soil filter (GUSF) will treat 99.33 and 83.75% of the resultant non-linear impervious and developed area, respectively.

The applicant has revised the substation yard plans to incorporate a groundwater collection system so that seasonally high water table does not interfere with the stormwater detention and drainage (see *1076-003-002 Sh 1 of 5* & *Sh 2 of 5*).

<u>Gravel Wetlands:</u>

8. Please provide 1″:20′ or larger scale plan views of the proposed gravel wetlands that:
- **a.** Show location of the lateral underdrains in each cell,
- **b.** Show location and number of the perforated riser pipes in each cell. Please note that a riser must be provided for every 10 linear ft of the inlet lateral underdrains per Maine Stormwater BMP Manual Chapter 7.4,
- **c.** Revise the berms separating the cells. They must extend perpendicular to the flow direction without interruption and include a stable spillway. In the current plan views of the gravel wetlands (e.g. *1076-003-004 Sh 1 of 2*), the berms appear to have a sizeable opening in the middle, which may prevent the intended ponding in the upgradient cell.
- **d.** Provide detailed grading and keynotes for *Gravel Wetland #1* forebay to ensure that the entire runoff enters the first/upgradient cell at a defined, stabilized (e.g. riprap spillway) entry point,
- **e.** Have *Gravel Wetland #2* with only one forebay instead of two forebays. The gravel wetland design specifications call for one defined inlet which maximizes the longitudinal runoff travel path within the gravel wetland and ensures that both cells are sequentially used for the water quality volume treatment. Hence, the forebay by Sta 10+00 can remain and the other forebay can be removed. The runoff from the Sta 8+00 and Sta 10+00 section can be directed to the remaining forebay by installing a curb or another flow diversion structure.

9. "Gravel Wetland Cross Section Construction Details" & "Gravel Wetland Outlet Control Structure" in 1076-003-002 (Sh 5 of 5):
    a. The riprap emergency spillway elevations are lower than the outlet control structure (OCS) grate elevations. Please lower the OCS grate elevations to the "top of wetland soil elevation + 1.5 ft",
    b. Clarify the locations of the lateral underdrains in both cells and provide the pipe specifications in the gravel wetland cross sectional details.

C. Flooding Standard

a. Termination Stations & Their Access Roads at the Kennebec River Crossing:

The applicant has submitted pre- and post-development hydrologic models for the drainage areas of the proposed stations. One subcatchment was used for each station in the pre-development models. The proposed termination station yards were modeled as separate subcatchments in the post-development models.

Comment:

10. Please demonstrate that the proposed 18" corrugated metal pipe culvert, shown in *C-3* plan sheet, can handle the 10-yr, 24-h peak flow.

b. Merrill Road Converter Substation

The modeled area was expanded westerly due to the reorientation of the proposed access road as shown in *1076-003-002* pre- and post-development stormwater plans. The proposed wetlands, grassed underdrained soil filter, and stormwater conveyance structures were modeled using a revised post-development model. The applicant has demonstrated that the five proposed culverts can handle the 25-yr, 24-h peak flows.

Comments:

11. Please provide a routing diagram for the post-development model, the peak flow outputs for the outfalls A and C.

D. Discharge to Wetlands Standard

a. Merrill Road Converter Substation

The proposed gravel wetland treatment measures have outfalls that will discharge into the forested wetlands as shown in *1076-003-004 Sh 1 of 2*. Since the 2-yr, 24-h storm's runoff will be retained by the constructed wetlands and the outflow will be controlled by the 7/8" orifices shown in *1076-003-002 Sh 5 of 5*, the outfalls' peak flows will be *de minimis* (i.e. 0.02 cfs as reported in the post-development model). The project will not increase the mean storage depth of the downgradient forested wetlands; hence, it complies with Chapter 500 Section 4(I).

E. Phosphorus Standard

a. Fickett Road Substation

The applicant has made the necessary revisions in response to my technical review memorandum dated January, 2018. The revised project phosphorus budget (PPB) and the post-treatment project phosphorus export (post-PPE) are 0.51 and 0.45 lb/yr, respectively. The post-PPE is smaller than the PPB. The revised project complies with Chapter 500 Section 4(D).

F. Redistribution of Stormwater Discharges

a. Merrill Road Converter Substation

The applicant eliminated *LS-1* level spreader associated with *Underdrain Soil Filter #2*, which has been replaced by the gravel wetlands. The level spreaders *LS-2* thru *LS-4* remain unchanged. The revised project complies with Chapter 500 Section 4(H).

ATTACHMENT B

Section 14. Basic Standards (Revised January 16, 2019)

14.0 BASIC STANDARDS SUBMISSIONS

14.1 Introduction

Basic Standards Submissions under MDEP Site Law process focus on details associated with appropriate erosion and sedimentation plan development and implementation. CMP has developed a standard manual, "Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects" ("Environmental Guidelines"), which it uses as a routine part of all transmission and substation Projects, located in **Exhibit 14-1**. This manual contains effective and proven erosion and sedimentation control requirements, standards, and methods that will be used to protect soil and water resources during construction of the various NECEC Project components. The manual is largely based on, and has been developed to be consistent with, the MDEP Maine Erosion and Sediment Control Best Management Practices ("BMPs") dated March 2014, MDEP's Erosion and Sediment Control Law (38 M.R.S. § 420-C), MDEP's Chapter 500 (38 M.R.S. §420-D), and Maine Forest Service ("MFS") Slash Law (12 M.R.S. § 9333), and contains specific BMPs appropriate for electric transmission line and substation construction. This manual has been a component of several prior CMP transmission line and substation applications that have been reviewed and approved by MDEP.

The primary goals of erosion and sedimentation control ("ESC") plans are minimizing soil movement and loss, preserving the integrity of environmentally sensitive areas, and maintaining existing water quality. The guide provided in **Exhibit 14-1** provides CMP personnel, their representatives, and contractors with a single, cohesive set of erosion control specifications for the NECEC Project. This guide is designed to provide specifications for the installation and implementation of soil ESC measures while allowing adequate flexibility for application of the most appropriate measures based on site-specific conditions. All bid packages and contracts for work performed on the NECEC Project will include these specific guidelines to ensure the work is completed in an environmentally sensitive manner. CMP personnel and their representatives will ensure that the procedures contained in this manual are followed by regularly inspecting all work and requiring corrective action when necessary.

Implementation of the following objectives is required to achieve the goals of this plan:

1. Minimize the extent and duration of soil disturbance;
2. Protect exposed soil by diverting runoff to stabilized areas or vegetated filter strips;
3. Install temporary and permanent erosion control measures (including installation prior to any site disturbance, up to and including final site restoration); and
4. Establish an effective inspection and maintenance program.

The guide includes appendices that contain: definitions of scientific and technical terms; illustrations of proper and improper application of erosion and sedimentation control techniques as a basis for comparison; site-specific erosion and sedimentation control drawings; and other generic and specific references to ensure the proper and adequate implementation of ESC methods during construction activities. All scientific and technical terms used in this document are defined in the guide.

Throughout the successful completion of the MPRP, which was the largest construction project in Maine's history, taking five years to complete, CMP gained valuable experience in implementing effective ESC over large geographic areas containing varied terrain and challenging soil conditions.

CMP is committed to prioritizing the protection of natural resources during the NECEC Project. CMP makes this commitment and plans to implement the following components into the NECEC project as "lessons learned" from MPRP:

1. During the planning and contractor walk through stages, areas with high erodible soils (soils containing high clay/silt content and/or steep slopes) will be identified on project plans and flagged in the field. Once identified and in consultation with CMP's environmental inspectors and third-party inspectors additional measures will be taken to prevent potential erosion and sedimentation in these specific areas. Additional measures may include: use of additional erosion and sedimentation controls, additional use of matting, limiting areas of exposed soils, and/or timing activities to avoid adverse weather conditions.
2. CMP will require contractors be certified in "basic and advanced erosion control practices" by the DEP's nonpoint source training center prior to initiating work on NECEC. In addition, CMP will contractually communicate to the contractors, that the Department may cite all parties responsible for violations involving erosion and sedimentation.
3. CMP will change order of construction operations, as recommended by DEP stormwater engineer during 8/17/2017 application coordination meeting to establish Stormwater measures to assist in ESC during construction

Per the order of construction operations recommended by MDEP, CMP will adopt the recommendations from its environmental guidelines to establish sediment detention basins prior to full site development at proposed substations for use as temporary sediment traps. The use of sediment basins as temporary sediment traps will be discontinued when the site is determined to be stabilized by CMP environmental inspectors in consultation with MDEP and/or the MDEP third party inspector. All grade cuts, whether in a

transmission line ROW or a proposed substation site, will be temporarily or permanently stabilized within 48 hours of initial soil disturbance, or before any predicted storm event, whichever occurs first. To the extent practicable, CMP will limit the extent and duration of exposed soils during site development at proposed substations and during the construction of temporary access roads within transmission line corridors. The extent of soil disturbance at transmission line structure locations will be the minimum required to safely install the structures as defined in Figure 7-1 of the Natural Resources Protection Act application.

Similar to the MPRP, CMP intends to provide environmental training to all project personnel at the beginning of the NECEC Project and will continue to provide refresher trainings to contractors, particularly in the time period before the spring mud season. The trainings will focus on the following items specific to ESC:

1. environmental accountability;
2. proper construction planning;
3. the importance of erosion and sedimentation control;
4. management and minimization of exposed areas;
5. proper treatment of runoff;
6. recognizing ESC deficiencies and high-risk areas;
7. environmental communication between contractor personnel and environmental inspectors; and,
8. monitoring for poor weather conditions.

CMP recognizes, through its experience on the MPRP and other projects, the importance of communicating to its contractors that erosion controls often must be augmented with additional lines of sedimentation control (e.g., erosion control mulch backed by silt fence) to prevent turbid discharges from impacting protected natural resource areas. CMP will incorporate a program of identifying areas of environmental risk based on topography, soils, and other unusual construction conditions. Environmental inspectors will meet with contractor personnel and third-party inspectors to discuss these areas and to form a consensus on the appropriate erosion and sedimentation control approach. Additionally, areas identified as having a higher risk will be tracked by the environmental inspection team and will be subject to a higher frequency of inspection.

Specific erosion and sedimentation controls for each substation are provided under separate cover in the Stormwater Management Plans.

14.2 Best Management Practices for Segment 1 Higher Erosion Risk Areas

As requested by MDEP, Segment 1 has been evaluated using a GIS analysis of both soil types (soils classified as highly erodible or potentially highly erodible) and percent slope (>22%). Areas with higher erosion risk have been determined (see table below) and will be tracked closely during construction. However, site specific conditions may merit the addition of distinct locations to this list. All areas will be evaluated during preconstruction walkovers with the construction contractors and the MDEP third party inspectors. Any additional high-risk areas identified by CMP environmental compliance inspectors, MDEP third party inspectors, and/or construction management or contractor personnel, during the walkovers or during construction, will be added to the high-risk tracking table. Contractors will be required to have a dedicated erosion and sedimentation control crew in Segment 1 of the Project.

As stated in the application, CMP will inspect higher risk areas with greater frequency and will implement robust and effective environmental controls in these areas including the use of multiple structural erosion and sedimentation control devices in combination with water bars, diversions, and sediment traps, as needed. The extent and duration of exposed soils within high-risk areas will be limited to the maximum extent practicable.

Segment 1: Areas with higher erosion risk

Structure Number	
From	To
3006-11	3006-12
3006-17	3006-19
3006-21	3006-27
3006-28	3006-30
3006-40	3006-43
3006-47	3006-48
3006-50	3006-51
3006-53	3006-60
3006-65	3006-70
3006-74	3006-75
3006-77	3006-79
3006-80	3006-84
3006-87	3006-93
3006-96	3006-97
3006-104	3006-119
3006-130	3006-134
3006-144	3006-148

3006-154	3006-155
3006-167	3006-169
3006-175	3006-176
3006-177	3006-197
3006-199	3006-217
3006-218	3006-229
3006-230	3006-234
3006-235	3006-239
3006-240	3006-258
3006-263	3006-264
3006-266	3006-267
3006-271	3006-287

Each week, erosion and sedimentation control ("ESC") inspection and maintenance log to be kept by the ESC crew shall be reviewed by the third-party inspectors who shall report their findings to the Department per Chapter 500 Appendix B(1)(c).

Prior to the construction, CMP shall provide a construction plan including the construction timetable, access roads to be used in the construction, contractor, ESC crew, environmental inspector and third-party inspector information for the MDEP's review and approval. Long stretches of high-risk areas (e.g. 11.4-mile section between structures 3006-199 & 3006-258) may need multiple inspectors. CMP shall also provide a plan showing the project's progress (disturbed, stabilized areas) to the MDEP monthly during the construction.

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Exhibit 14-1: Environmental Guidelines for Construction and Maintenance Activities on Transmission Lines and Substation Projects

Environmental Guidelines For Construction and Maintenance Activities on Transmission Line And Substation Projects

Prepared for:

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DOCUMENT REVISION LOG

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-	All	Initial Release		1992
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-	Multiple	Update to correspond to DEP Guidelines	G. Mirabile	Dec 2007
-	3, 5	Update to correspond to DEP Guidelines	G. Mirabile	May 2011
1	All	Converted to ISO Controlled Document	G. Mirabile	Oct 2012
2	All	Changed Doc Type from SOP to Reference	R. Koster	Mar 2015
3	9 & Appendix A	Revised Section 9.2.5 and 9.2.7 (Restoration Methods), and Appendix A (Temporary Access Road definition)	G. Mirabile	August 2016
4	Various	Consistency with latest MDEP BMPs	G. Mirabile	June 2018

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CENTRAL MAINE POWER COMPANY

Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects

1.0 INTRODUCTION

These guidelines contain standards and methods used to protect soil and water resources during construction, reconstruction, and maintenance of transmission lines and substations. They are based on practical methods developed for construction in utility corridors and their use is enforced by both State of Maine and Federal regulatory agencies. The construction practices described in this manual are typically required by the regulatory agencies for all projects. These practices are commonly referred to as Best Management Practices (BMPs). Illustrations have been provided as part of this manual (Appendix D) which demonstrate both the proper and improper techniques used for the more common construction activities.

All contracts for work performed on Central Maine Power Company (CMP) transmission line rights-of-way and substation sites will include these specific guidelines to ensure the project is constructed in an environmentally conscious manner. CMP personnel or their designated representatives will ensure that the guidelines are followed by inspecting all work and prescribing corrective steps to be taken where necessary. While this manual takes into consideration legal requirements, project personnel are still responsible for compliance with all federal, state, and local requirements.

This guide uses a number of scientific and technical terms. Definitions of these terms are provided in Appendix A.

2.0 PLANNING AND DESIGN CONSIDERATIONS

Planning is an important practice that will reduce the risk of erosion on a construction site, saving both time and money for Central Maine Power Company and its contractors. An erosion control plan should be prepared during project planning and design phases. It will likely be required for any Maine Department of Environmental Protection and/or local permits.

The erosion control plan should consist of:

- A narrative.
- A map.
- Plan details.

The narrative should describe the proposed project, existing site conditions, adjacent land uses, and any natural resources or properties that might be affected by the project. Other important details to include are descriptions of critical areas, proposed construction start and end dates, construction sequence, and brief descriptions of erosion and sedimentation control measures,

inspections and maintenance programs, and other clearing or construction that has taken place on the site in the last five years.

The map should include pre-development site contours at a scale to identify runoff patterns (minimum 5-foot contour interval), final contours, limits of clearing and grading, existing buffers, critical areas, natural resources, erosion control measures, and other clearing or construction that has taken place on the site in the last five years.

The plan details should include drawing of the erosion control structures and measures, design criteria and calculations, seeding specifications, and inspection and maintenance notes.

Key considerations include resource identification, familiarizing all parties with the construction site and limitations, and construction sequence.

2.1 Resource Identification

Sensitive natural areas which will receive priority treatment include:

- Streams and rivers.
- Great ponds.
- Wetlands.
- Steep slopes.
- Unstable soil conditions.

Sensitive natural areas which may receive priority treatment, depending upon the specifics of the project, include:

- Stream, river, pond, and wetland buffers.
- Significant wildlife habitats.
- Habitat for rare species.
- Historic and prehistoric sites.

During the planning phase, all sensitive natural areas that require priority treatment will be identified. The method of avoiding or crossing the sensitive natural areas to minimize impacts will be identified and incorporated into the project plans. Project plans should be designed and drawn to provide contractors and inspectors with a comprehensive reference guide that include, but is not limited to, locations of sensitive natural areas, access, and abutter and landowner issues. If modifications to the plans need to be made in the field, a designated person shall make necessary changes and shall notify all necessary personnel promptly. Copies of these plans should be provided and explained to equipment operators to assure that construction practices meet the intent of avoiding or minimizing impacts to the identified sensitive natural areas. In addition to the plans, the proposed access ways and water/wetland crossing locations, as well as other environmentally sensitive areas where activities will be restricted or prohibited, will be flagged and/or have signs posted.

Prior to crossings or construction in or near any sensitive natural areas, a "walk-through" will be conducted. Attendees at the walk-through will include: 1) the contractor, 2) CMP and/or any designated representative, and may include 3) any assigned Third Party Inspector. The purpose of the walk-through is to establish the following objectives, **prior to any clearing or construction work**:

- Identify available or alternate points of access to the project site.
- Identify sensitive natural areas.
- Identify future "No-Access" areas.
- Review color designation for all flagging used.
- Establish the Communication Chain of Command (Contact Point).
- Identify and flag access/construction roads within the ROW and/or project area.
- Establish methods of access over water resource areas (mats, timber corduroy, frozen ground, tracked equipment).

In order to minimize impacts to sensitive natural areas, the above objectives will continually be evaluated throughout the construction process. Project superintendents, foremen, and inspectors should also monitor weather conditions and reports on an on-going basis. Knowledge of changing or anticipated wet weather will allow time to address erosion control needs. In this way, CMP and its contractors will be prepared to respond to changing environmental conditions (e.g., unusually wet or dry weather) and other unknowns that are inherent in the construction and maintenance of transmission lines.

2.2 "Walk-Through" Mechanics

2.2.1 Use of Flagging and Signs

Flagging will be conducted at the time of the walk-through in order to visually identify select features or construction methods to be used. Wetlands may be flagged earlier as part of project permitting. Signs may also be installed following the walk-through to direct construction to approved access routes and away from "no access" areas. The CMP flagging color-code is as follows:

- ***Glow-pink*** with the printed words "Wetland Delineation", "Wetland Boundary" or "Wetlands". This flagging denotes the edge of wetlands.
- ***Red*** with or without the printed words – "Do Not Cross". This flagging denotes a No-Access area where no equipment is allowed.
- ***Yellow*** – no printed words. This flagging denotes the location of an environmental measure such as a waterbar, hay bale barrier, or silt fence.
- ***Blue*** – no printed words. This flagging denotes approved travel ways. This is typically flagged on each side of the access-way to denote the designated travel lane for all access.
- ***Glow-pink with black stripes*** or otherwise printed with the words Buffer or Wetland Buffer. This denotes a setback from a water resource and should be treated the same as No-Access area.

2.2.2 Identification and Use of Existing Roads

Available logging, farm, or access roads, as well as other existing rights-of-way, will be utilized for access to and from transmission line rights-of-way with permission of the respective landowners. In order to minimize ground disturbance, existing roads within the right-of-way and wetland/stream crossing areas will be used whenever possible for travel during construction, unless a better route is agreed upon during the walk-through. The movement of equipment and materials within the transmission line right-of-way will be confined as much as possible to a single road or travel path.

For example, it may be better to construct new access roads in order to: (1) minimize the span of a wetland or stream crossing, or (2) avoid the more environmentally sensitive or "wetter" portions of a wetland or stream crossing.

In all cases, CMP and its contractors will attempt to avoid and minimize impacts to sensitive natural areas. As a result of this procedure, wetland and stream crossings, steep slopes, unstable soils, and other sensitive natural areas will be avoided and adverse impacts minimized whenever practicable.

2.3 Construction Sequencing

Although a "Project Plan" may be specific in identifying the *locations* of water resource areas (wetlands, streams, etc.), and the *methods* of access over water resource areas (crane mats, frozen ground, etc.) it should not dictate *when* construction activities should occur. It would be impractical to include day to day activities in the "Project Plan" such as, 'pole X will be installed on Y date'. However, including environmental considerations in the daily and weekly project planning is very important. Factors such as the project schedule and weather often determine where and when construction activities occur; environmental impacts should also be considered. Below are some guidelines:

- Work closely with the individual(s) in charge of environmental compliance to plan project activities.
- Construction activities that cause soil disturbance should not occur during or just prior to forecast heavy rain events.
- Coordinate access planning with all of the contractors on the project. Often temporary access roads are used by several different contractors and the construction and use of temporary access roads can cause significant soil disturbance. Minimize equipment and vehicle travel on temporary access ways.
- Stabilize/restore disturbed areas as soon as possible, preferably while equipment is on site. Additional trips with equipment can create more soil disturbance which will need to be stabilized. Often a site can and should be stabilized within hours of when the soil disturbance occurred.
- Use frozen conditions to your advantage. There may be instances where water resource areas can be crossed during frozen conditions in lieu of installing crane mats. Before using this technique consult with the project environmental inspector.

- Crane mats should be removed as soon as they are no longer needed and/or when conditions are favorable.

3.0 STANDARDS FOR CONSTRUCTION

3.1 Road Construction

The following five standards apply to the construction and/or upgrade of all roads, skid trails, yarding areas, or work pads whether temporary or permanent.

1. Where construction will be located near water resources, such that material or soil may be washed into them, these disturbances will be set back from the edge of the water resource to maximize the amount of undisturbed filtering area between the disturbed area and the resource. These "filter strips" will consist of an area of undisturbed vegetation between the edge of disturbed area and/or silt fence/hay bale barriers placed to intercept any sediment load in runoff water before it can enter the resource area. In order to maintain the integrity and effectiveness of filter strips, sediment barriers should be installed very early in the construction sequence, and they need to be monitored to make sure they are functional. Effective filter strip widths may vary from only a few feet in relatively well drained flat areas to as much as several hundred feet in steeper areas with more impermeable soils. In steep terrain, additional erosion and sedimentation control measures will be installed at the low point where the work area drains into the filter strip when exposed soils exist and the flow path may result in channelization of runoff. The minimum width of the buffer strip shall be 25 feet or in accordance with local CEO or DEP regulations. The width of the filter strip shall be increased proportionately for slopes longer than 150 feet or for higher sediment concentrations. **Table 1** below provides the recommended widths for the filter strips according to the slope of land between the edge of the resource and any exposed soil.

Table 1
Recommended Widths For Filter Strips Between Disturbed Areas And Water Resources

Slope of Land Between Disturbance and the Resource (Percent)	Width of Filter Strip* (Feet)
0	25
10	45
20	65
30	85
40	105
50	125
60	145
70	165
*Measured along surface of the ground	

2. Wherever possible, construction equipment will either avoid steep slopes or proceed across the slope in a safe manner to avoid excessive disturbance of vegetation and soils. Equipment will not travel straight up or down any slopes with a grade steeper than 10 percent, except where necessary due to safety concerns and/or terrain constraints.
3. Where access roads or construction areas are to be built across the slope, the area will be properly sloped, slanting away from the cut bank to the outside edge of the roadbed in order to facilitate road surface drainage.
4. Slopes of cut-and-fill banks will be no steeper than 1 horizontal to 1 vertical. If located within 100 feet of water resources, the slopes will be no steeper than 2 horizontal to 1 vertical.
5. Rivers, streams, and wetland areas will be crossed, where necessary, at right angles to the channel and/or at points of minimum impact. To insure that natural drainage patterns will not be altered or restricted as a result of construction activities, crossings will be designed and constructed according to specific standards outlined below.

3.2 Stream or Wetland Crossings

The following standards apply to all unavoidable stream, drainage way, or wetland crossings encountered while accessing the project site or on the project site itself.

3.2.1 Types of Crossings Used

The type of crossing used for access is dependent on: the purpose and use of the crossing, the nature of the resource being crossed, ground conditions present at the time of construction, and construction materials available. Some planning guidance is provided below. The appropriate means and location of the crossing will be determined at the time of the formal walk-through. It is important to consult with the project environmental inspector prior to installing any crossing.

- Permanent culverts and bridges will be used only where long-term, continued, and frequent access is required (such as substation access roads).
- Temporary crossings will be used at all other locations. Temporary bridges, culverts, or crane mats must be used to cross any streams, drainage ways, or wetland swales that contain: (1) flowing water, (2) standing water, (3) saturated soils, or (4) organic/mucky soils.
- The use of corduroy as crossing material will be limited to wetlands which are not anticipated to have flowing or standing water during the construction period.
- In certain cases, no crossing material will be required if the stream bottom or drainage way is dry and contains a gravel or solid rock bottom (a “ford”). Fords can only be used if they will cause no unreasonable sedimentation of the stream and no unreasonable alteration of the stream banks and bottom.
- All crossings should include water bars or broad based dips or turn outs on the access, appropriately spaced on each side of the crossing, to promote filter-strip treatment of runoff. Consult Table 4 on page 12 of this document for specific water diversion structure spacing standards.
- All temporary crossings must be stabilized within seven (7) days of its removal, unless specified otherwise.

3.3 Construction in Wetlands

Where structures are to be placed in wetlands, topsoil must be excavated first, and stockpiled separate from subsoil. Be sure that stockpile soils are placed in such a manner that they are readily replaced into the excavated area. Soils shall be replaced into the excavated area in the opposite order they were removed. Excavation and pole placement in wetland areas should be completed within the same day. After pole installation, topsoil must be restored to the original surface grade, except where mounding around a structure is necessary for structure stability.

4.0 INSTALLATION OF CROSSINGS

4.1 Bridges

Bridges are a preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other waterway crossing methods. Most bridges can be quickly removed and reused without significantly affecting the stream or its banks and without interfering with fish migration.

Materials
Access bridge construction typically entails the use of log stringers as construction materials.

Sizing
Table 2 below illustrates the log sizing requirements depending on the span and anticipated loads.

Table 2
Log Bridge Stringer Requirements

Span	Minimum Log Diameter* (80,000 lb. Load)	(40,000 lb. Load)
8 ft.	16 in.	12 in.
12 ft.	18 in.	14 in.
16 ft.	20 in.	16 in.

Wheel guards: 10” diameter
- Size of deck planks: 4” x 12” x 12’
* Assume 6 stringers at 24” centers

Positioning
The following is guidance for the positioning and installation for all permanent and temporary bridges:

- Access roads will cross streams at right angles to the channel at a location with firm banks and level approaches whenever possible.
- Bridge piers and abutments will be aligned parallel to the stream flow so that the original direction of stream flow is not altered.
- Piers and abutments will be imbedded in good foundation material. The grade of the bridge should coincide with that of the road wherever practicable.

For additional specifications on bridge construction, refer to section F-2 of the Maine Erosion and Sediment Control BMPs (see full citation in Appendix C).

4.2 Culverts

Materials
Permanent culverts will be either corrugated metal or plastic pipe. Temporary culverts will be corrugated metal, plastic pipe, or lumber ties. Chemically-treated wood will be not used.

Sizing
Permanent culverts will be sized to have a diameter of at least 3 times the cross-sectional area of the stream channel or will be designed to accommodate 25-year frequency flows. Multiple culverts may be used in place of one large culvert if they have the equivalent capacity of a larger one. A culvert sizing criteria table (3x Rule) produced by the MDEP can be found in Appendix G. However, it is recommended that an engineer be consulted when installing any permanent culvert.

Temporary culverts will also be sized to provide an opening at least 3 times the cross-sectional area of the stream channel and sized to accommodate a 25-year frequency storm flow. The stream channel cross-section will be determined at highest flows or will be approximated during periods of lower flows using the apparent natural high water marks remaining on the stream banks. For small intermittent streams, drainage ways or wetland crossings, the minimum sized culvert that may be used is 18 inches. Multiple culverts may be used in place of one larger culvert if they have the equivalent capacity of a larger one.

Positioning
The following is guidance for the positioning of all permanent and temporary culverts:

- Culverts should be placed to allow for the crossing to take place at right angles to the channel to assure that natural drainage patterns will not be altered.
- Culverts should be placed at the point of narrowest crossing and where firm banks and level approach slopes are available. Slopes should be no greater than 1.5 to 1.

Installation
The following is guidance for the installation of all permanent and temporary culverts:

- Culverts should be of sufficient length to allow both ends to extend at least one foot beyond the toe of any fill used to cover the culvert.
- Inlet and outlet armoring shall extend at least one pipe diameter beyond the upstream and downstream end of the culvert. See Table 3 below for outlet protection in erodible areas.
- Culverts should be bedded on firm ground. Supplemental use of geotextile with gravel can be used to create this firm base. Permanent culvert installation should include firm compaction of the foundation and the fill around the sides of the culvert. Compaction should be done in no more than 8-inch lifts.

- Both the inlet and outlet ends of the culverts will be set at or slightly below the natural stream bottom to allow passage of fish and other aquatic life at all levels of flow. At no point should either end of an installed culvert be positioned in the air out of the water.
- Multiple culverts must be offset in order to concentrate low flows into the culvert within the natural channel.
- When working in and around a perennial stream, temporary stream diversion may be necessary to avoid creating turbidity in the stream water. This type of work requires a permit from Maine DEP, and must be coordinated with the project environmental inspector.
- Fill used to bury the culvert will be compacted at least half-way up the side of the culvert for its full length in insure that flowing water will not undermine the culvert.
- Culverts will be covered with fill to a depth of at least one foot or one and a half times the culvert diameter, whichever is greater.
- Road fill at the upstream (headwall) and downstream (out-fall) ends of culverts will be armored with either rock rip rap or logs to protect the road fill from being eroded by the action of water or road traffic. This material will be installed up to the level of anticipated high water.
- In areas where the streambed appears highly erodible, the streambed at the outlet end of the culvert will be lined with riprap to prevent erosion and potential stream bed scour. Table 3 below indicates the distances away from the culvert to install such riprap.

Table 3
Culvert Size - Length of Rock Protection

Culvert Diameter (Inches)	Length of Rock Protection From Culvert (Feet)
12 – 20	7
21 – 24	9
30	11
36	13
42 – 48	18
54 – 60	24
66 – 78	32

Removal

Temporary culverts will be removed once their use is no longer necessary. The fill material can be redistributed and spread out on the nearby uplands at a distance sufficient to prevent its reentry into the resource. Silt fence/hay bales, seeding, and mulching may be necessary to stabilize this material. The banks and bottoms of the stream, drainage way, or wetland should be restored to original conditions. Exposed soils on the banks and within 100 feet of the crossing should be stabilized using seed and mulch. Some banks and steep slopes adjacent to streams may require stabilization with curlex or jute matting in combination with seed and mulch.

4.3 Mats (Crane or Swamp Mats)

CMP construction projects require that adequate mats are present at the project site prior to construction. A readily accessible source of mats should also be available in case construction conditions change and necessitate the need for more mats.

Materials

A number of different sized and constructed crane mats are typically available. CMP requires that the appropriate mats be used for the appropriate crossing. For example:

- Longer mats should be used for the longer crossing spans. This practice avoids the need to install additional mats within the crossing area in order to support the "span" mats.
- Mats should be in good condition to allow for their "clean" installation. Having mats in good condition prevents them from being dragged in versus them being carried in due to broken hitching cables, breaking apart on the job site, or becoming imbedded in mud due to their inability to support the required weight.
- Mats with partial/short timbers joined end to end should generally not be used to cross stream channels.

Installation

- Whenever possible, mats should be carried and not dragged. Dragging mats creates more soil disturbance which requires additional erosion control or final restoration work.
- At the crossing location, the ends of the crane mats should extend at least two feet onto firm banks or several feet into the upland edge of a wetland to assure a dry, firm approach onto the mats.
- At crossings which contain open or flowing water, the mats should be supported within the span using cross mats as abutments in order to prevent the impoundment of water or having water flow over the mats.
- At "dry" crossings where no water is present or anticipated during project construction, the mats may be placed directly onto the sensitive natural area in order to prevent excessive rutting, provided stream banks and bottoms are not altered.

Maintenance

Matted crossings should be continually monitored to assure their correct functioning. Mats which become covered with dirt should be kept clean and the material removed must be disposed of in an upland location. The material must not be scraped and shoveled into the water resource. Mats which become imbedded must be reset or layered to prevent mud from covering them or water passing over them.

Removal

Mats should not be removed until their use is absolutely no longer necessary. Specifically, all final restoration work should be completed prior to the mats being removed from the crossings. The planned removal of mats should be coordinated with CMP (or designated representative), the project environmental inspector, and any Third Party Inspector. As temporary structures, they should be removed within one year from the date of installation. All areas disturbed during ford removal shall be stabilized with seed and mulch.

4.4 Corduroy

Materials
Corduroy material will consist of de-limbed trees or logs. The logs must have a diameter greater than three inches at the small end and lengths greater than 18 feet. Shorter length material may be used only as described in the Installation section below.

Positioning
Corduroy should be placed perpendicular to the direction of travel. Corduroy should be placed at the point of narrowest crossing and where firm banks and level approach slopes are available.

Installation
The corduroy should be placed with the longer length pieces laid down first. The bed of corduroy should not only be placed within the low portions of the crossing but also for at least three feet up the sides of any upland side slopes in order to prevent rutting and sedimentation from the approaches to the crossing.

Once a thick base of corduroy has been laid, pieces shorter than 18 feet can be used to fill gaps and raise the elevation of the corduroy to provide for a more stable crossing.

Removal
Removal is the reverse of installation. Once the corduroy has been removed from the crossing, it may be moved off the right-of-way, burned, or chipped. The material may also be spread and distributed on the ROW over the nearby upland if in accordance with the Maine Slash Law (see Appendix E) and approved by a CMP representative. The banks of streams and drainage ways must be graded back to original conditions. Exposed soils on the banks and within 100 feet of the crossing must be stabilized using seed and mulch. Banks of drainage ways that are expected to receive high flows should be stabilized with seed and curlex or jute matting.

5.0 SURFACE WATER DIVERSION STRUCTURES (WATER BARS)

A number of above-ground structures or techniques are available to divert water out of travel ways and work areas in order to prevent subsequent runoff and erosion. The terminology and definitions for these techniques (i.e., broad-based dips, water bars, skid humps, water turnouts, and cross-drainage box culvert) vary, but the purpose of all is to redirect water moving down a slope into adjacent vegetated areas (filter strips). Any activities that involve land grading have the potential to cause sedimentation. Their use and installation needs to be carefully planned. Planning for these techniques must include timing, use of natural buffers (filter strips), mulching, and temporary and permanent seeding. Minimizing the area of soil exposed at one time is a key component of ensuring that surface water diversion structures function effectively. General standards for their construction are as follows.

Materials
Most of these structures are constructed by excavating or moving and shaping earth from within the access way or work area. The cross-drainage culvert structure typically uses logs or timber to form a box-like structure to catch water from travel ways or side ditches in order to direct it across the travel way and away from disturbed areas.

Positioning

These structures should be installed immediately above and along steep pitches in the road and below seepage areas on natural or cut banks; be sloped away from the travel surface and be sited to take advantage of existing vegetation for filtering. In some areas of exposed soils, the right-of-way might be sloped such that runoff traverses the disturbed area. In these areas, temporary water diversions should be deployed to divert the upgradient runoff away from the disturbed work area and towards a stable drainageway. The interval for installing these diversion structures depends on the slope of the road, as well as the nature of the road surface, soils, and wetness. Generally speaking, steeper slopes require shorter distances between diversion structures. The following table contains recommended distances between installed structures depending on slope.

Table 4
Recommended Distances Between Water Diversion Structures

Slope (Percent)	Spacing (Feet)
2	250
5	135
10	80
15	60
20	45
30	35

All of these structures should be sized in anticipation of greater flows resulting from snow melt, spring runoff, and storm rains.

Installation

These structures should be installed at 30-degrees angled down grade. The shape of the backside portion of the structure should have a reverse slope of about 3 percent. Use of a pop-level is recommended to ensure that drainage is away from the road. Structures should be constructed with rounded (not vertical) mounds and dips to allow for firm compaction and to allow re-vegetation.

In the case of the cross-drainage culvert, the minimum width of the open face of the culvert should be 18 inches. The travel surface should consist of at least 12 inches of gravel or soil over the culvert. The slope of the culvert should be a drop of at least 5 inches in every 10 feet of length to ensure proper drainage.

The inlet end of all structures should extend beyond the edge of the access road so that it fully intercepts water flows that may flow onto the access road. The outlet end of the structure should extend out enough to prevent water from flowing around and re-entering the road or work area.

The discharge ends of any of these diversion structures should outlet into a vegetated filter strip. Where heavy flows are encountered or anticipated, the outlet end of the structures should incorporate an apron of rock, gravel, or brush to reduce water velocities. If construction will

extend into fall and winter months, be sure to upgrade to meet winter standards all erosion control measures (e.g., increase amount of mulch, etc.), to protect the site from spring runoff.

Where the structure is within 100 feet of a stream or wetland, the incorporation of a small, excavated settling basin or ditch turnout to reduce the velocity of flows and the continued movement of sediment downslope should be considered. In addition, some type of sediment barrier (silt fencing or staked hay bales) will be installed at the outlet of the diversion structure, where vegetated filter strips are narrow or sparsely vegetated, in order to prevent sediment from eroding into water resources.

Maintenance

Due to repeated travel over these structures, maintenance is critical to their effective functioning. As the structure becomes flattened or rutted, it needs to be re-excavated or graded to ensure the interception and redirection of water runoff. The ends of any cross-drainage culverts should be maintained by clearing away any potential blockages.

Removal

After the completion of the construction project, removal of these structures is not a requirement, with the exception of the cross-drainage culvert. The structures can be left in place provided they have been suitably stabilized with seed and mulch. Any hay bale barriers or silt fence at the outlet end should be removed when the site has a healthy vegetative cover.

6.0 SEDIMENT BARRIERS (STRUCTURAL MEASURES)

6.1 Introduction

The use of properly installed erosion and sediment control barriers is a fundamental and critical component for preventing erosion at CMP construction projects. Erosion control barriers include silt fence, hay bales, and/or erosion control mix berms. In some cases, these barriers may be deemed unnecessary by CMP, its representatives, or a Third Party Inspector due to factors including slope and filter strip width within project boundaries. A typical CMP construction project will use a combination of barriers to effectively control erosion near water resources. Installation and diligent maintenance of these barriers serves the following purposes:

- Assures the environmental integrity of those upland and water resource areas not designated or permitted for disturbance. Specifically, it maintains the onsite vegetative community and water quality of the surface water within the watershed.
- Assures compliance with all applicable federal, state, and local environmental and land use regulations or permit conditions.

Generally, silt fence is the preferred barrier because: it traps a much higher percentage of suspended sediments than hay bales; it can be easier to install, obtain, and transport; and is less costly. In addition, the structural longevity of silt fence is 60 days or longer unlike straw or hay bales' longevity which is 60 days or less.

The standards and procedures outlined in this section of the manual are meant to address a majority of the situations encountered during transmission line and substation construction activities. For additional information on sediment and erosion control methods and techniques, or to address a particularly problematic situation, this manual should be used in conjunction with and supplemented by the Maine Erosion and Sediment Control BMPs. For other recommended references, see Appendix C.

6.2 Silt Fence

Materials

Silt fence is provided by a number of manufacturers and is generally a synthetic fabric pre-attached to wooden staking. The fabric should be pervious to water allowing a flow through rate of 0.3 gallon per square foot per minute. The fabric should contain stabilizers and ultraviolet ray inhibitors to allow it to sustain exposure of a minimum of 6 months. The height of the filter fabric should not exceed 4 feet in height.

Placement

Silt fence is to be utilized at the edge of any planned work area or area which will cause the disturbance of soil. It will be installed to intercept any sheet flow of water and detain sediment from entering water resources or leaving the project site. It should be installed prior to starting work. Given the expansiveness of CMP transmission line projects in particular, the amount of silt fence placement must be selective; however, it should still be used in amounts sufficient to meet potential changing conditions in a pro-active manner. After the primary stabilization measures (temporary and permanent) have been implemented, silt fence use is encouraged in the following selected locations, as appropriate:

- Around all substation project sites.
- Along all access roads or work areas that are within 100 feet of water resources.
- Along all access roads or work areas in upland settings that encounter seepage moving across slope.
- Around all stockpiled soils.

In general, the placement of silt fence is appropriate when:

- Serving a drainage area of no more than .25 acre per 100 feet of silt fence length.
- The maximum slope length behind the fence is 100 feet or less.
- The maximum gradient behind the fence is 50% or 2:1 horizontal/vertical.
- Where the filter strip is not of an adequate width (see Table 1).

Installation

The following installation guidelines are the minimum which should be implemented; however, appropriate changes to silt fence installation should be made as conditions change during the construction operation.

Silt fence will be placed an adequate distance (6-10 feet) beyond the toe of the slope (if there is sufficient room) to allow for sediment accumulation between the disturbed area and the down-

gradient water resources. If there is not sufficient room to place the silt fence an adequate distance beyond the toe of the slope, CMP, a representative of CMP, or the Third Party Inspector should be consulted. The barrier should be installed along the contour, within reason. The goal is to slow and pool the sediment-laden runoff to allow fine sediments to settle-out before the runoff enters the water resource. The ends of the barrier should be up-turned to maintain the pool volume.

A trench shall be excavated approximately 6 inches wide and 6 inches deep on the up-slope side of the silt fence alignment. The lower edge of the silt fence fabric should be entrenched for a distance of at least 4 inches up-slope and then back-filled. Should frozen or rocky ground conditions prevent the effective or practical use of trenching, materials such as bark/wood chips, wood fiber mulch, or a soil erosion control mixture can be used. This material is to be mounded on top of at least 4 inches of filter fabric which would otherwise be trenched.
Silt fence should be installed in a continuous roll to avoid the need of a joint between different pieces of fence. If joints are necessary, filter fabric shall be "spliced" together at a support post, securely sealed, and with a minimum of 6 inches of overlap. Splicing rolls of silt fence entails twisting end posts together, creating a continuous section of silt fence.

Support posts should be placed on the down-slope side or the side closest to or facing the water resource. The posts should be placed 6 feet apart (a maximum of 10 feet may be acceptable in some locations) and driven securely into the ground, typically about one foot deep. Silt fence usually has posts pre-attached.

Silt fence should not be installed in streams or drainage ways where concentrated water flow is present or concentrated flows are anticipated.

Maintenance
Once a week, or after rainstorms producing at least ½ inch of rainfall, whichever is more frequent, the contractor is responsible for inspecting all temporary erosion and sediment control barriers. Such inspection is necessary to assure that the barriers are functioning properly as well as identifying new areas requiring installation. A maintenance log should be kept of all erosion control changes, improvements, and maintenance performed.

If any barriers are not functioning properly, they will be repaired or replaced. A sediment control barrier is not functioning if:

1. Water is flowing around the sides or under the barrier.
2. Soil has built up behind the barrier to the point more than half-way up the fence.
3. There is excessive sag in the fence.
4. There is evidence of sedimentation such as gully erosion, slumping of banks, or the discoloration of water outside of the perimeter silt fence.

Corrective measures include removing accumulated sediment from behind the barrier, restaking, extending the ends of the fence, or installing another fence further upslope.

Removal
Installed silt fence will be removed once it is evident that the soils have become stabilized and the potential for erosion no longer exists. In most cases, the silt fence will not be removed until at least one growing season has past. Removal of silt fence should be coordinated with CMP or their designated representative.

Any ridges or mounds of soil or caught sediment remaining in place after the silt fence has been removed, must be leveled-off to conform to the existing grade. Any newly exposed soil that may erode must be seeded and mulched.
All removed silt fence must be properly disposed of off the project area.

6.3 Hay Bales

Placement
Like silt fence, hay bale barriers can be utilized at the edge of any planned work area or areas where soil disturbance has occurred or will occur. Barriers are installed to intercept sheet flow of water and detain sediment from entering water resources or leaving the project site. Given the expansiveness of CMP transmission line projects in particular, the amount of hay bale barrier placement must be selective, but still in amounts sufficient to meet potential changing conditions in a pro-active manner. Hay bale barriers will be used, as appropriate, in the following locations:

- Around all substation project sites.
- Along all access roads or work areas that are within 100 feet of a water resource area.
- Along all access roads or work areas in upland settings that encounter seepage moving across slope.
- Around all stockpiled soils.

In general, the placement of hay bales is appropriate when:

- Serving a drainage area of no more than .25 acre per 100 feet of barrier length.
- The maximum slope length behind the barrier is 100 feet or less.
- The maximum gradient behind the barrier of 50% or 2:1 horizontal/vertical.
- Where the filter strip is not of an adequate width (see Table 1).

Installation
The following installation guidelines are the minimum which should be implemented; however, appropriate changes to hay bale installation should be made as conditions change during the construction operation.

The barrier will be placed an adequate distance (6-10 feet) beyond the toe of the slope (if there is sufficient room) to allow for sediment accumulation between the disturbed area and the down-gradient sensitive areas. If there is not sufficient room to place the hay bales an adequate distance beyond the toe of the slope, CMP, a representative of CMP, the project environmental inspector, or the Third Party Inspector should be consulted. Within reason, the barrier should be installed along the contour. The goal is to slow and pool the sediment-laden runoff to allow fine

sediments to settle-out before the runoff enters the water resource. The ends of the barrier should be up-turned to maintain the pool volume.

A shallow trench shall be excavated the width of the bale and to a minimum depth of 4 inches in which to bed the bale. The excavated soils are then used to seal the lower inside (up-slope) edge of the barrier. The bales should be set tightly together and entrenched with the baling string oriented on the sides (i.e., not touching the ground) in order to prevent deterioration of the string.

Every bale should be staked using 2 stakes per bale. The stakes should be driven in at angles such that it binds and forces abutting hay bales together.
Gaps between bales shall be packed with loose hay to prevent water from escaping between the bales.

Hay bales will not be placed in streams where flow is present or anticipated.

Maintenance
Once a week, or after rainstorms producing at least ½ inch of rainfall, whichever is more frequent, the contractor is responsible for inspecting all temporary erosion and sediment control barriers. Such inspection is necessary to ensure the structures are functioning properly as well as identifying new areas requiring installation. A maintenance log should be kept of all erosion control changes, improvements, and maintenance performed.

If any barriers are not functioning properly, they must be repaired or replaced. A sediment barrier is not functioning if:

- Water is flowing around the sides or under the barrier.
- Soil has built up behind the barrier to the point more than half-way up the hay bale or where there is excessive lean to the barrier.
- There is evidence of sedimentation such as gully erosion, slumping of banks, or the discoloration of water outside of the hay bale barrier.

Corrective measures include removing accumulated sediment from behind the barrier, re-staking, extending the barrier at the ends, or installing another barrier further up-slope.

It is not recommended that straw or hay bales be used for periods greater than 60 days.

Removal
Installed hay bales will be removed once it is evident that the soils have become stabilized and the potential for erosion no longer exists. In most cases, the hay bale barrier will not be removed until at least a healthy growth of vegetation is established on the disturbed site. Removal of hay bale barriers should be coordinated with CMP or their designated representative.

Any ridges, mounds of soil, or caught sediment remaining in place after the hay bales have been removed, must be leveled-off to conform to the existing grade. Any newly exposed soil that may erode must be seeded and mulched.

All removed hay bales must be properly disposed of, or broken up and used as mulch on the bare soils near the barrier.

6.3.1 Problems With Straw or Hay Bale Barriers

There are several situations where straw or hay bale barriers may be ineffective or cause problems:

1. When improperly placed and installed (such as staking the bales directly to the ground with no soil seal or entrenchment), hay bales allow undercutting and end flow.
2. When used in streams and drainage ways, high water velocities and volumes destroy or impair their effectiveness.
3. When bales are not inspected and maintained adequately.
4. When hay bale barriers are removed before up-slope areas have been permanently stabilized.
5. When hay bale barriers have not been removed after they have served their usefulness.

6.4 Erosion Control Mix Berms

Composition

Erosion control mix berms are made up of shredded bark, stump grindings, and composted bark. It may be made on a project site if adequate materials are available, however its composition needs to be a well-graded mix of different particle sizes. Wood chips, bark chips, ground construction debris and processed wood cannot make up the organic component of the mix. Be sure to consult with the project environmental inspector regarding the suitability of any erosion control mix material proposed for use.

Installation

Erosion control mix berms are simply placed on the surface of the ground and do not require any soil disturbance. The berm should be located in a similar manner to other sediment control barriers along contour, downslope of disturbed soils. Also similar to other sediment barriers, they should not be placed in areas of concentrated runoff, below culvert outlets, around catch basins, or at the bottom of a large contributing subwatershed. At the toe of shallow slopes less than 20 feet long, at a minimum berms should be 12” high and a minimum of 2 feet wide at their base. For longer or steeper slopes, the berms should be wider to accommodate additional runoff. They are ideal for installation on frozen ground, on shallow to bedrock soils, outcrops of bedrock, and heavily rooted forested areas (i.e., those areas where other barriers are difficult to install).

Erosion control mix can also be placed in a synthetic “sock” to create a contained stable sediment barrier. This is especially useful in areas where trenching is not feasible, such as frozen ground, across pavement, or compacted gravel. When in a sock, erosion control mix can staked in an area of concentrated flow (i.e., ditch or swale) as the netting prevents movement of the mulch mixture.

Maintenance
As with other barriers, inspection should be performed after each rainfall or daily during prolonged periods of rain. Accumulations of sediment should be removed when they reach half the height of the barrier, and the berms can be reshaped and new material can be added as needed.

Removal
In most cases, erosion control mix berms do not need to be removed. They will continue to function as they decompose, become part of the soil on the site and will naturally revegetate. If synthetic socks are used, the erosion control mix can be emptied from the sock and the socks can be disposed of offsite.

6.5 Temporary Sediment Traps

Temporary sediment traps function to slow or temporarily detain runoff and allow sediment to settle out of the water column prior to runoff leaving a project site. Sediment traps generally consist of natural or manmade depressions. Sediment traps are not designed for high volume or high velocity flows.

Installation
Areas draining to sediment traps should be relatively small. Sediment traps are routinely installed at the discharge end of a water bar or upgradient water diversion to treat runoff. Natural depressions can be used or modified, and small basins can be excavated. Structural erosion control devices can be installed along the downslope perimeter of natural or excavated sediment traps to increase filtration of any runoff that overtops the trap. Sediment traps should discharge to vegetated buffer areas.

Sediment traps may also be constructed using structural erosion controls such as hay bale corrals lined with geotextile fabric. Care should be taken to prevent existing vegetation or obstructions from tearing the fabric and allowing the runoff to escape the fabric untreated.

Maintenance
When sediment has accumulated to 50% of the capacity of the trap it should be removed and placed in an upland area and stabilized in a manner to prevent its entry into protected natural resources. Similarly, non-functioning or damaged geotextile fabric must be removed, disposed of properly and replaced as needed.

Removal
Temporary sediment traps shall be removed, and areas shall be regraded to original contours and stabilized with permanent non-structural controls until fully re-vegetated. All structural controls used to construct temporary sediment traps must be removed and disposed of properly.

6.6 Temporary Sediment Basins

Permanent sediment basins, designed by a qualified engineer, can be used during construction for temporary storage of stormwater and settling of sediments. Sediment basins should be constructed and stabilized prior to the remainder of the site being disturbed. Flow patterns across the site should be directed towards the sediment basin for treatment.

Installation of the sediment basin shall be completed per the design on the engineer-stamped drawings. Following its use as a temporary sediment basin, all collected sediment must be removed and necessary repairs made to allow for the intended permanent function of the engineered design. Sediments removed from the basin must be placed in an upland area and stabilized in a manner to prevent its introduction into protected natural resources.

7.0 NONSTRUCTURAL EROSION CONTROL MEASURES

7.1 Nonstructural Measures Defined

Nonstructural measures are temporary or permanent methods used to cover exposed soil areas to prevent erosion from occurring. Their purpose is to cover whole areas of exposed soil to prevent initial erosion of soil from a construction site.

Examples of nonstructural measures include hay or straw mulch, erosion control mix, matting, or seeding.

7.2 Importance of Nonstructural Measures

Nonstructural measures are important because they provide both temporary and permanent protective cover to exposed soils. Generally, they provide the first line of protection against erosion, and can be the most effective means of preventing erosion. This protection is important because exposed soils are easily eroded by wind or water. Some soils such as silts can easily be removed from a construction site by rainwater. The impact of individual raindrops on exposed soils can loosen soil particles, and these particles can then be carried off the work site by runoff and deposited into water resources including streams, rivers, wetlands, ponds, and lakes. Silt particles don't settle out of water easily, and water siltation can pollute surface waters and harm aquatic creatures such as insects and fish. For example, brook trout, one of Maine's premier game fish species, requires clear, high quality water in order to survive. Silty water can reduce spawning habitat, irritate fish gills, lower oxygen content in water, and make fish susceptible to diseases.

Dry soil conditions and high winds can also cause siltation. When small particle soils such as silts become dry, they have a baby powder-like texture and can easily be swept away by winds. Nonstructural measures help prevent wind erosion because they hold moisture next to the soil, keep the soil from drying out due to wind exposure, and prevent winds from carrying away dry soil particles. Keep in mind, however, that proper construction sequencing is invaluable (See Section 2.3).

7.3 Placement of Nonstructural Measures

Nonstructural measures should be used whenever there is a possibility that exposed soils on a construction site could wash into adjacent sensitive water resources. Temporary nonstructural measures such as hay or straw mulch should be spread on exposed soils within 100-feet of water resources within 48 hours of initial soil disturbance, or before any predicted storm event. There are two types of nonstructural measures: temporary and permanent. Temporary measures are typically used during construction, while permanent measures are usually applied after construction is complete (i.e., restoration). Provided below are general discussions and explanations of the common nonstructural measures that are used on CMP construction sites.

7.3.1 Temporary Measures

- Hay or straw mulch (unanchored on slopes less than 8%, anchored on slopes greater than 8%) on exposed soil areas and soil stockpiles in the construction area.
- Temporary seeding covered by hay or straw mulch on soil stockpiles or areas of exposed soil next to sensitive resources that are not scheduled for final restoration for 30 days (this only applies between the dates of April 16 to October 31 of any given year). Temporary seeding is not required during the Winter Construction Season.
- Erosion control mix can be used as a stand-alone temporary mulch on slopes that are 2 horizontal to 1 vertical, or less, on frozen ground, in forested areas, or at the edge of gravel parking and areas under construction. It should be applied at a thickness of 4 to 6 inches.
- Rolled Erosion Control Products (RECP's) such as Curlex or Jute matting, can be used on areas of high wind exposure, steep slopes (steeper than 8% grade), unstable soils, and stream/river bank restoration areas. Matting is typically anchored (usually with large staples, as recommended by the manufacturer). Although this type of material is usually used during final restoration, it is considered a temporary measure because it generally deteriorates within two years.

Table 5
Temporary Seeding Rates and Dates

Seed	Lb./Ac	Seeding Depth	Recommended Seeding Dates	Remarks
Winter Rye	112(2.0 bu)	1-1.5 in.	8/15-10/1	Good for fall seeding. Select a hardy species, such as Aroostook Rye.
Oats	80 (2.5 bu)	1-1.5 in.	4/1-7/1 8/15-9/15	Best for spring seeding. Early fall seeding will die when winter weather moves in, but mulch will provide protection.
Annual Ryegrass	40	.25 in.	4/1-7/1	Grows quickly but is of short duration. Use where appearance is important. With mulch, seeding may be done throughout growing season.
Sudangrass Perennial	40 (1.0 bu) 40 (2.0 bu)	.5-1 in. .25 in.	5/15-8/15 8/15-9/15	Good growth during hot summer periods. Good cover, longer lasting than Annual Ryegrass. Mulching will allow seeding throughout growing season.

Temporary mulch with or without dormant seeding			10/1-4/1	Refer to TEMPORARY MULCHING BMP and/or PERMANENT VEGETATION BMP.

Proper application rates, location, and seasonal consideration are provided in Table 6 on page 23 of this manual.

7.3.2 Permanent Measures

Uplands

- Permanent grass and legume seeding covered by hay or straw mulch on all areas that have been restored to final grade (this seeding generally applies between the dates of April 16 to October 31 of any given year). This is required to establish permanent, perennial, vegetative cover on exposed soils. Permanent seeding is not required during the Winter Construction Season, although dormant seeding may be performed. (See Section 8.0 for details on winter construction.)
- Seeds covered by anchored (usually with large staples) Curlex or jute matting in areas of high wind exposure, on steep slopes (steeper than 8% grade), unstable soils, and stream/river bank restoration areas.
- The soil may need to be properly prepared before any seeds are placed on the ground. This preparation may include addition of fertilizer (only in designated upland areas not adjacent to, or near waterbodies or wetlands, if in doubt ask the environmental or construction inspector) in areas that have been tested, and are found to be deficient in plant nutrients.
- Erosion control mix can also be used as a permanent mulch to provide a buffer around disturbed areas. It can be left in place to decompose and naturalize. It will eventually support vegetation, which should be promoted. If vegetation is desired in the short-term, legumes and woody vegetation can be planted, which will create additional stability.

Wetlands

- Wetland areas are to be seeded only with resource agency approved wetland seed mixes. If it is decided that wetlands will not be seeded, disturbed wetland will be graded to original contours, mulched with straw, and allowed to revegetate naturally.

As with the Temporary Measures, refer to Table 6 on page 23 for proper application rates, locations, and seasonal considerations.

For permanent seeding mixtures, consult the approved plans/proposal for the project, the environmental inspector, or Appendix A of the Maine Erosion and Sediment Control BMPs.

8.0 WINTER CONSTRUCTION CONSIDERATIONS

If a project is actively being constructed between November 1 and April 15 of any given year, sediment and erosion control guidelines developed by the Maine Department of Environmental Protection for projects occurring during the winter months must be followed.

Proper construction sequencing (Section 2.3) can greatly minimize environmental impact during winter construction. When in doubt, contact the project construction manager or environmental inspector with any questions.

Table 6 on page 23 highlights some of the major differences between the winter construction guidelines and normal BMPs used during construction and for temporary stabilization. The table presents differences for temporary measures that should be used during construction, and permanent measures when construction is completely done.

Table 6
Nonstructural Erosion Control Measures (Seasonal Differences in Construction BMP Requirements)

Dates	General Construction April 16 through October 31 of every year	Winter Construction November 1 through April 15 of every year
Mulch on slopes less than 8%	Within 100-feet of sensitive water resources apply hay and/or straw mulch at a minimum of 70 lbs./1000 square feet of exposed soil (about 2 bales). Must be done within 7 days of initial soil disturbance and before storm forecasted events, unless specified otherwise.	Within 100-feet of sensitive water resources apply and maintain properly anchored hay and/or straw mulch at a minimum of 150 lbs./1000 square feet of exposed soil (about 5 bales) at all times. (double the April 16 – October 31 rate)
Mulch on slopes greater than 8%	Hay or straw mulch can be applied without being anchored, though specific site conditions may require use of anchoring.	Apply mulch as specified above. Properly anchor with Curlex, jute matting, or similar mulch netting on upland slopes exceeding 8% and within 100 feet of streams if no construction activities are anticipated for 7 or more days.
Area of exposed soils allowed at any one time	No restriction on area exposed, but contractor must attempt to minimize amount of exposed soil at any one time, especially next to water resources.	Not more than one (1) acre of exposed (not mulched or otherwise devoid of vegetative cover) soil.
Sediment barriers	A single line of sediment barriers including silt fence, hay bales, or wood waste filter berms must be installed between water resources and disturbed soils.	If soil is frozen, wood waste filter berms **or** 2 lines of sediment barriers (including hay bales and silt fence) must be placed between water resources and disturbed soils.
Temporary seeding in uplands	If required, apply at the rate specified by the supplier, CMP Environmental Department, or Environmental Inspector. Cover with mulch.	Not required, but if temporary seeding is desired, it must be applied at a rate 3 times higher than the General Construction Season, and covered with mulch.
Temporary seeding in wetlands	Wetlands are not to be seeded unless done so with an agency-approved seed mix. Annual Rye Grass is not acceptable and shall not be used. Disturbed wetland areas will be mulched exclusively with straw.	Wetlands are not to be seeded unless done so with an agency approved seed mix. Annual Rye Grass is not acceptable and shall not be used. Disturbed wetland areas will be mulched exclusively with straw.
Permanent seeding in uplands	Site must be seeded at rate specified by the supplier and covered with hay or straw mulch. If needed, the site can be limed and fertilized.	Not required before April 16, but if dormant seeding is desired, the site should receive an adequate cover of loam, if necessary, be seeded at a rate 3 times higher than the General Construction Season, and covered with mulch at a minimum of 150 lbs./1000 square feet.
Permanent seeding in wetlands	Do not apply permanent seed mixes to wetland areas unless they are specially designated wetland seed mixes approved by a resource agency.	Do not apply permanent seed mixes to wetland areas unless they are specially designated wetland seed mixes approved by a resource agency.
Temporary seedbed preparation	Apply limestone and fertilizer (uplands only) according to soil test data. If soil test is not possible, 10-10-10 fertilizer may be applied at a rate of 600 lbs./acre and limestone at 3 tons/acre.	Not required, but seedbed can be prepared according to General Construction requirements.

Dates	General Construction April 16 through October 31 of every year	Winter Construction November 1 through April 15 of every year
Permanent seedbed preparation	Apply limestone and fertilizer (uplands only) according to soil test data. If soil test is not possible, 10-20-20 fertilizer may be applied at a rate of 800 lbs./acre and limestone at 3 tons/acre.	Not required before April 16, but if dormant seeding is desired, the seedbed can be prepared according to the General Construction requirements.
Temporary slope stabilization	Same as winter construction season, but mulch does not need to be anchored.	Anchored hay or straw mulch on slopes greater than 8% and drainage ways with greater than 3% slope as necessary. Wood waste mix can be used on slopes in place of anchored hay or straw mulch.
Maintenance of erosion controls	Same as winter construction guidelines.	All erosion controls should be inspected periodically to ensure proper function. If any evidence of erosion or sedimentation is evident, repairs should be made to existing controls or other methods should be used.
Inspection and monitoring	Monitoring should be performed as needed until a new, healthy vegetative cover is attained on the site. This applies to both temporary and permanent seeding.	Monitoring should be performed as needed to ensure proper stabilization and re-vegetation (both temporary and permanent). Starting in the spring following completion of the project, inspections should be performed until new, healthy vegetative cover is attained.

9.0 SITE RESTORATION STANDARDS

Following completion of the construction work, the contractor will be responsible for conducting site restoration work. The following guidelines will apply to all activities, including temporary and permanent roads, stream/wetland crossings, staging and work areas, and substation sites.

9.1 Procedure

At the completion of project construction in an area or at the end of the construction, CMP or their designated representative, the contractor, and any Third Party Inspector will review the project's restoration needs and prioritize the areas. This prioritization should consider time of year, ground conditions, re-vegetation probabilities, and equipment availability. A restoration "walk-through" is strongly recommended.

In many cases a site can and should be restored within hours of when the soil disturbance occurred. Often getting the equipment to a site that needs to be restored only creates more disturbed area to restore. It is important to "restore as you go" to reduce the equipment travel on temporary access roads. It can be particularly difficult to restore an area that was disturbed during winter construction activities in the spring or summer.

Likely areas of restoration include, but are not limited to:

- Around substation construction areas.
- Around pole and anchor pole placement.
- All wetland, stream, or brook crossings, particularly the approaches and any stream banks.
- Drainage ways or ditches.
- All temporary or permanent constructed roads, yarding, and staging areas.
- Cut banks.
- Steep slopes (over 8%).

9.2 Methods for Restoration

There are several methods of restoration for different areas.

1. All soil that is excavated, mounded, or deposited during construction will be re-graded or removed from the site as directed by CMP. All re-grading and redistribution of soil will be done to match existing grade.
2. The banks and bottoms of brooks, streams, and rivers will be restored to natural conditions. In general, any material or structure used at temporary crossings will be removed, and the bank and bottoms restored to their original depth and contour.
3. On permanent access roads, stream culverts and bridges will be left intact and in good repair to remain available for maintenance operations and/or public access (woods roads, camp roads, etc.).
4. On those construction roads to be closed to future vehicle traffic (as determined by CMP), bridges, culverts, and other temporary crossing or water diversion structures will be removed and the banks and bottoms restored to original conditions.

5. Previously installed water bars may remain or new ones will be installed at locations designated by CMP or their designated representative. To prevent accelerated soil erosion, such water bars will be installed on all access and construction roads to be closed to vehicle traffic and on steep sections of permanent roads. Permanent water bars will be constructed to a sufficient height and width to divert the amount of water anticipated at each location as well as to provide some post-project permanence to the site. Water bars on long-term temporary access roads will be constructed in such a manner that they will remain effective and require minimal maintenance, and will be permanently seeded to ensure their long-term stability.
6. All areas severely rutted by construction equipment will be re-graded and permanently revegetated.
7. Upon completion of the project, all disturbed areas will be permanently revegetated or otherwise permanently stabilized. This includes the restoration of all areas disturbed by pole installation, temporary access roadways, permanent access roadways, substation construction, and resource crossings. Restoration is generally assumed to be a well-established vegetative cover. All cut and fill slopes must be revegetated, stabilized with riprap, or stabilized with erosion control mix, as appropriate to the slope conditions.
8. Liming, fertilizing, and seeding requirements for permanent re-vegetation will depend upon the soil type and drainage condition of the site. In the absence of soil tests, permanent seeding will generally be done in accordance with “Procedures for Permanent Seeding for Erosion Control” found in Table 6 on page 23.
9. The contractor will be responsible for the proper maintenance of all revegetated areas until the project has been completed and accepted. Where seed areas have become eroded or damaged by construction operations, the affected areas will be promptly re-graded, limed, fertilized, and re-seeded as originally required.
10. The contractor will perform all erosion control work to the complete satisfaction of Central Maine Power Company before the work is accepted. Central Maine Power Company will base acceptance of the erosion control and stabilization work on a final inspection.

APPENDIX A

DEFINITION OF TERMS

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DEFINITION OF TERMS

Adjacent to a natural resource: Within 75 feet of, or in a position to wash into, a water resource (river, stream, brook, pond, wetland, or tidal area).
Annual seed mix: Seed mixture largely made up of plants that only persist one growing season.
Brook: Essentially the same as a stream, a water course that has a defined channel, a gravel, sand, rock or clay base, and flows at least part of the year. It may be a dry channel part of the year.
Corduroy: Logs greater than 3 inches in diameter at the small end and at least 18 feet long that are placed perpendicular to travel direction, on approaches to and in wetlands for crossings. The purpose of the logs is to prevent rutting and preserve vegetation root integrity in and adjacent to wetland areas. May also be used on approaches to mats or bridge stream crossings.
Crossing: Any activity extending from one side to the opposite side of a sensitive natural resource whether under, through, or over that resource. Such activities include, but are not limited to, roads, fords, bridges, culverts, utility lines, water lines, sewer lines, and cables, as well as maintenance work on these crossings. Crossings should be done to minimize impact. For example, crossing at a right angle to the resource and finding the driest or narrowest spot is one method for minimizing impact.
Cross-sectional area: The cross-sectional area of a stream channel is determined by multiplying the stream channel width by the average stream channel depth. The stream channel width is the straight-line distance from the normal high water line on one side of the channel to the normal high water line on the opposite side of the channel. The average stream channel depth is the average of the vertical distances from a straight line between the normal high water marks of the stream channel to the bottom of the channel.
Culvert: A pipe or box structure of wood, metal, plastic, or concrete used to convey water.
Erosion: Movement of earthen material by water or wind.
Erosion control blanket (matting): Manufactured material made out of natural or synthetic fiber designed to control movement of earthen material when installed properly.
Erosion control mix: Erosion control mix consists primarily of organic materials such as shredded bark, wood chips, stump grindings, composted bark, or similar materials. Ground construction debris or reprocessed wood products are not acceptable for use in erosion control mix. It contains a well-graded mix of particle sizes and may contain rocks up to 4 inches in diameter. Properly manufactured mix will have organic matter content between 80 and 100 percent (dry weight), 100 percent of particles must pass a 6-inch screen, the organic portion needs to be fibrous and elongated, it may contain only small proportions of silts, clays, or fine sand, and its pH should be between 5.0 and 8.0. Its applications include erosion control berms and mulch.
Erosion control plans: Written guidelines specific to a project or activity, describing various techniques and methods to control erosion for specific construction activities.
Fill: Any earth, rock, gravel, sand, silt, clay, peat, or debris that is put into or upon, supplied to, or allowed to enter a water body or wetland. Material, other than structures, placed in or adjacent to a water body or wetland.

Filter strip: Undisturbed areas of ground consisting of natural vegetation and natural litter such as leaves, brush, and branches, located between a water resource and access road, skid road or trail, or other area of disturbed soil.
Ford: A permanent crossing of a stream utilizing an area of existing, non-erodible substrate of the stream, such as ledge or cobble, or by placing non-erodible material such as stone or geotextile on the stream bottom.
Geotextile, Non-woven: Synthetic material made of spun polypropylene fiber used to support wetland fill or stabilize soils.
Geotextile, Woven: Synthetic material of woven polypropylene used to stabilize soils and make sediment barriers (silt fence).
Great pond: An inland water body which in a natural state has a surface area in excess of 10 acres, and any inland water body which is artificially formed or increased which has a surface area in excess of 30 acres.
Intermittent watercourse: Water course that has water in it only part of the year. It is still considered a natural resource.
Mats: Pre-constructed, portable, timber platforms used to support equipment or travel in or over wetlands or water bodies.
Mulch: Temporary erosion control such as hay, bark, or some similar natural material utilized to stabilize disturbed soil.
Perennial seed mix: Seed mixture made up of seeds from plants that persist for several years.
Perennial watercourse: A river, stream, or brook depicted as a solid blue line on the most recent edition of a United States Geological Survey 7.5 minute series topographic map. Typically has water in it year round.
Permanent access road: Project access road that is not restored after project construction completion. Permanent access roads should be designed and constructed so they are not an erosion problem.
Permanent stabilization: Establishment of a permanent vegetative cover on exposed soils where perennial vegetation is needed for long-term protection.
Permanent vegetative cover: Perennial seed stock, including but not limited to grasses and legumes that persist for more than several growing seasons.
Protected Natural Resource: Coastal sand dune system, coastal wetlands, significant wildlife habitat, fragile mountain areas, freshwater wetlands, community public water system primary protection areas, great ponds or rivers, streams, or brooks. (From the Maine Natural Resources Protection Act, 38 M.R.S.A. Section 480-B., revised 2007).
Riprap: Heavy, irregular-shaped rocks that are fit into place, usually without mortar, on a slope in order to stabilize and prevent soil erosion.
Sediment barrier: Staked hay bales, silt fence, or similar materials placed in a manner to intercept silt and sediment laden water runoff.
Sedimentation: Deposition of earthen material in a water body or wetland.
Sensitive Natural Resource: Area that deserves special attention because it is significant wildlife habitat, fisheries habitat, or has other natural resource values. These areas may require the use of minimum impact construction techniques such as use of mats, leaving vegetation intact for buffers, special timing of construction, or other specific techniques.
Settling basin (sediment/catch basin): Excavated pit placed to intercept water running off disturbed soils or dirt road bed. Usually used only where filter strip is inadequate to protect a stream, pond, or wetland from silt and sediment.

Silt fence: Woven geotextile sediment barrier. Proper installation requires placement on-contour and keying the fabric in at ground level.
Steep slopes: Slopes in excess of eight (8) percent.
Stone check dam: A small, temporary dam constructed across a swale or drainage ditch. The purpose is to reduce the velocity of concentrated flows, reducing erosion and trapping sediment generated in the ditch.
Stream: Generally, a channel between defined banks with a gravel, sand, rock, or clay base that flows at least part of the year. It may be a dry channel part of the year. The Maine Natural Resources Protection Act contains a more detailed definition.
Structure: Anything built for the support, shelter, or enclosure of persons, animals, goods, or property of any kind, together with anything constructed or erected with a fixed location on or in the ground. Examples of structures include buildings, utility lines, and roads.
Temporary access road: A road constructed solely for project access which is restored to original grade upon project completion, if not sooner. All areas disturbed by access road construction and use will be stabilized, including road ditches, travel ways, and slopes back to vegetated conditions. In most cases, any roadway ditches associated with temporary access roads should be refilled to reestablish pre-development drainage conditions.
Temporary stabilization: Mulch, matting, or seed, or a combination thereof, utilized to stabilize soil. Soil stockpiles left in place longer than 14 days must have temporary stabilization.
Temporary vegetative cover: An annual seed mixture, typically annual rye and oats.
Topography: The contour and elevation of the surface of the ground.
Turn out: Water diversion that directs water out of a ditch or off a travel-way and into a vegetated buffer.
Upland edge: The area of uplands alongside a wetland, stream, or water body.
Wastes requiring special handling: Wastes generated from construction activity including engine oil, hydraulic oil, gear oil, diesel, gasoline, or coolants.
Water bar: Constructed bar across an access road or skid trail that directs surface water off the road or trail into a stable vegetated surface or filter strip. They are used as a temporary measure on active roads or when closing roads permanently to prevent erosion.
Water body: River, stream, brook, pond, wetland, or tidal area.
Water resource: River, stream, brook, pond, wetland, or tidal area.
Wetland: An area that is inundated or saturated by surface or groundwater at a frequency and for a duration sufficient to support, and which under normal circumstance do support, a prevalence of wetland vegetation typically adapted for life in saturated soils. The Maine Natural Resources Protection Act contains a more detailed definition.

APPENDIX B

CONSTRUCTION MATERIALS SOURCE LIST

APPENDIX B

CONSTRUCTION MATERIALS SOURCE LIST

The following list of vendors has been selected given the wide variety of construction materials they offer. The list is not meant to be all-inclusive or an indication of favored vendors.

W.H. Shurtleff Company (Culverts, Geotextiles)

One Runway Road
Suite 8
South Portland, Maine 04106-6169
1-800-633-6149
www.whshurtleff.com

A. H. Harris (Geotextiles, i.e. Curlex Excelsior Blankets)

22 Leighton Road
Augusta, Maine 04332
(207) 622-0821

585 Riverside Street
Portland, Maine 04103
(207) 775-5764

www.ahharris.com

North American Green (Erosion control materials)

Maine Distributor:
E.J. Prescott
P.O. Box 600
32 Prescott Street, Libby Hill Business Park
Gardiner, Maine 04345
(207) 582-1851
www.ejprescott.com

New England Organics (Erosion Control Mulch)

135 Presumpscot Street, Unit 1
Portland, ME 04103
1-800-933-6474
www.newenglandorganics.com

APPENDIX C

OTHER RECOMMENDED REFERENCE MANUALS

APPENDIX C

OTHER RECOMMENDED REFERENCE MANUALS

Maine Erosion and Sediment Control Best Management Practices (BMPs). Manual for Designers and Engineers. Bureau of Land Resources, Maine Department of Environmental Protection, Augusta, Maine. October 2016. http://www.maine.gov/dep/land/erosion/escbmps/esc_bmp_engineers.pdf

Maine Erosion and Sediment Control Practices Field Guide for Contractors. Bureau of Land Resources, Maine Department of Environmental Protection, Augusta, Maine. 2014. http://www.maine.gov/dep/land/erosion/escbmps/esc_bmp_field.pdf

Best Management Practices for Forestry: Protecting Maine's Water Quality. Maine Forest Service, Augusta, Maine. 2004. www.maine.gov/doc/mfs/pubs/bmp_manual.htm

Forest Transportation Systems: Roads and Structures Manual. Seven Islands Land Company, Bangor, Maine. Third Edition, 1999.

APPENDIX D

CONSTRUCTION TECHNIQUE ILLUSTRATIONS

CULVERT CROSSING

IMPROPER INSTALLATION

- **Culvert is undersized, allowing overflow to cross travel-way**
- **Insufficient cover thickness over culvert**
- **Outlet is not stable, leading to erosion**
- **Culvert outlet is set too high causing it to be impassable to fish and other aquatic organisms**

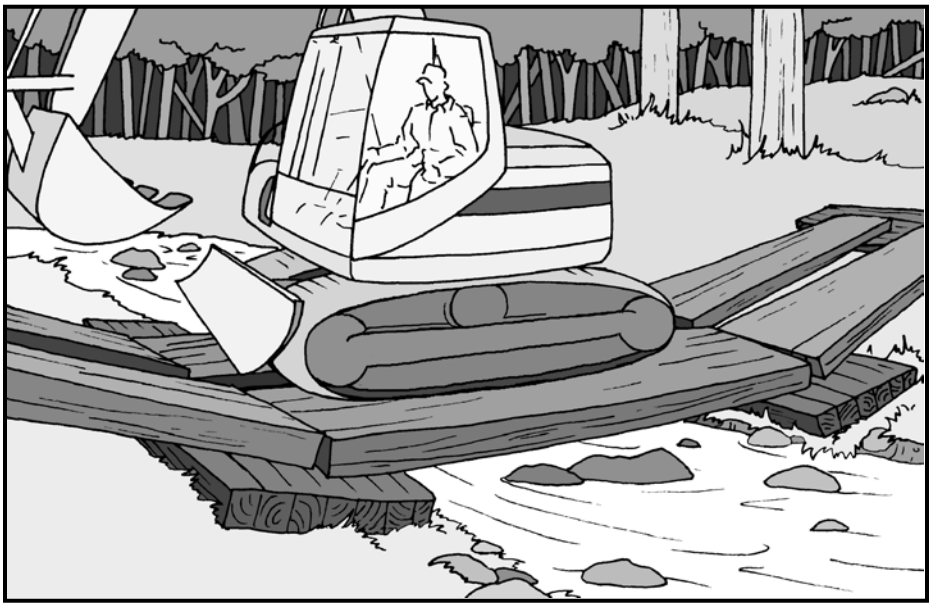
PROPER INSTALLATION

- **Culvert is adequately sized for flow**
- **Sufficient cover thickness over culvert**
- **Inlet and outlet are adequately supported by gravel and rock to protect and maintain stability**
- **Outlet is properly seated at or below stream bottom allowing aquatic organisms to access upstream**

CRANE MATS – WATERBODY CROSSING

IMPROPER INSTALLATION

- **Mats not long enough to keep equipment out of water and wetland soils**
- **Lacks cross supports which elevate travel mat**
- **Mats do not extend far enough to protect wetland soils from rutting**



PROPER INSTALLATION

- **Mats are elevated by cross-supports on stream banks, keeping them up out of water and out of wet soils**
- **Water flows under mats**
- **Mats extend over approaches to crossing protecting soils from rutting and eroding**
- **Equipment stays out of water and wetlands**

CRANE MATS – WETLAND CROSSING

IMPROPER INSTALLATION

- **Long axis of mats is not perpendicular to travel direction**
- **Mats are working down into wetland causing significant disturbance and picking up mud**
- **Mats do not extend beyond wetland edge to solid ground**

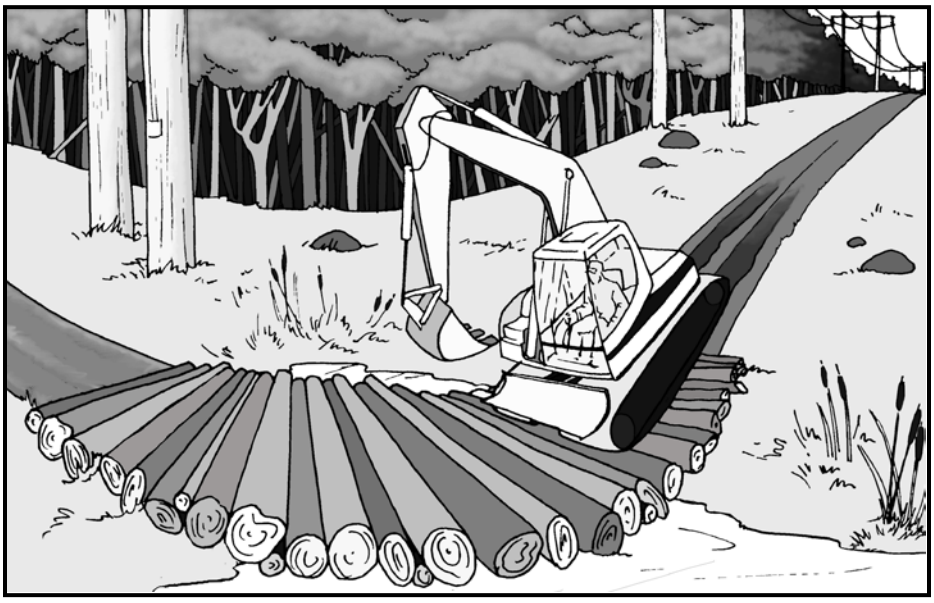
PROPER INSTALLATION

- **Correct orientation relative to travel direction**
- **Entire wetland is spanned, preventing rutting at ends of crossing**

CORDUROY CROSSING

IMPROPER INSTALLATION

- **Insufficient corduroy to support equipment**
- **Corduroy is sunken into wetland soil**
- **Approaches are steep, rutted, and are not protected with additional corduroy or slash**
- **Flow is interrupted, and water is soiled with mud and silt**



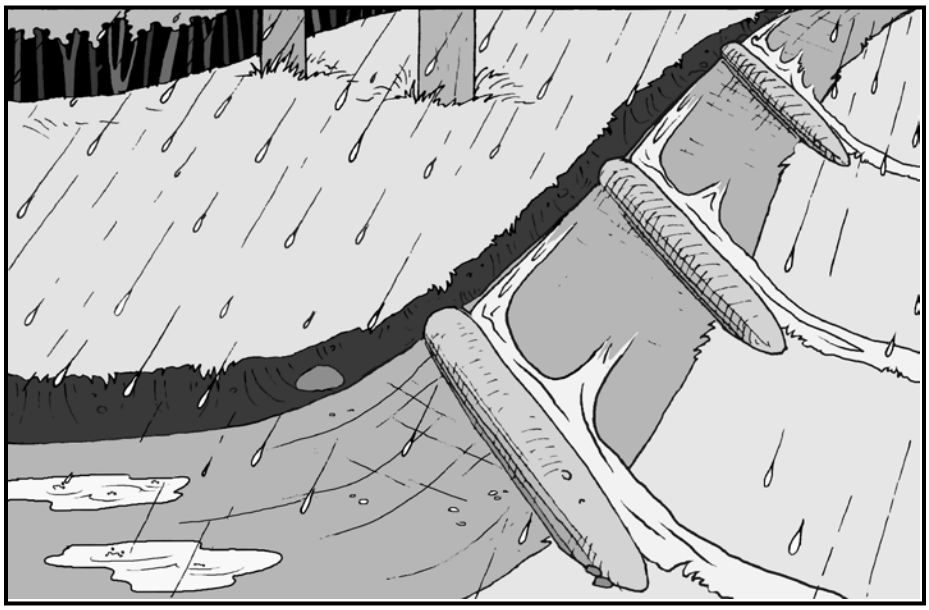
PROPER INSTALLATION

- **Adequate amount of layered corduroy to protect soil from rutting**
- **Approaches are protected from rutting by extension of corduroy beyond edges of crossing**
- **Flow is maintained and water is clear of mud and silt**

WATER BARS

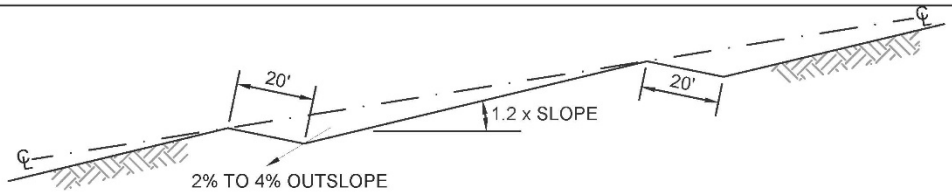
IMPROPER INSTALLATION

- **Flow directed to uphill side on upper bar**
- **Angle of lower bar is too shallow**
- **Lower bar does not extend far enough, allowing water to escape around ends**
- **Bars are not high enough, allowing water to flow over top, eroding them**

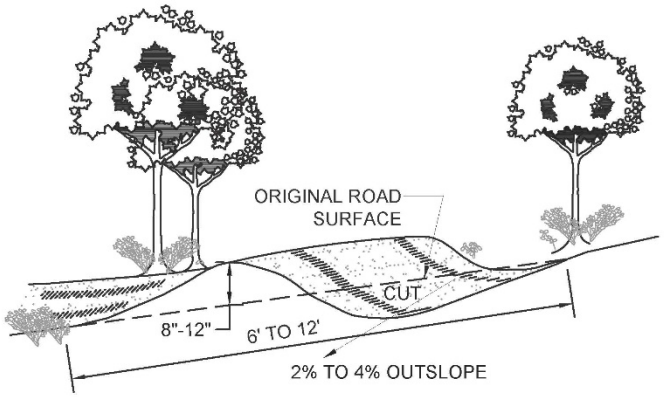


PROPER INSTALLATION

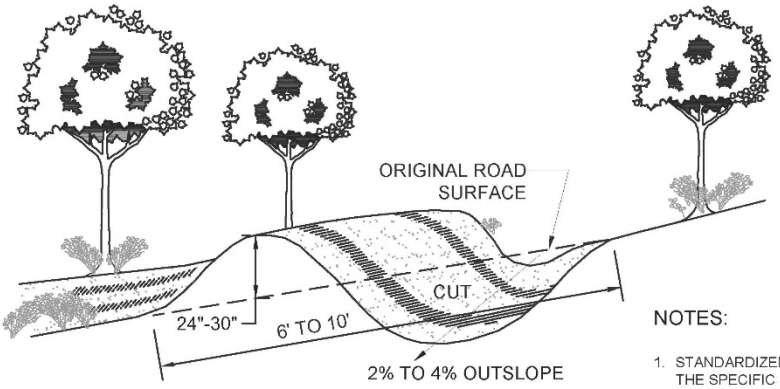
- **Bars are at moderate angles**
- **There are enough bars to divert all water flowing down road**
- **Bars are high enough to prevent water from flowing over them**
- **Bars extend beyond edges of road, preventing water from flowing around them**



BROAD BASE DIPS ON ROAD



SHALLOW WATER BAR



DEEP WATER BAR

NOTES:

1. STANDARDIZED DESIGNS MUST BE ADAPTED TO THE SPECIFIC SITE.
2. CONSTRUCT WATER BAR IN ACCORDANCE WITH MAINE EROSION AND SEDIMENT CONTROL PRACTICES FIELD GUIDE FOR CONTRACTORS, LATEST EDITION.

SCALE: N.T.S.

CENTRAL MAINE POWER

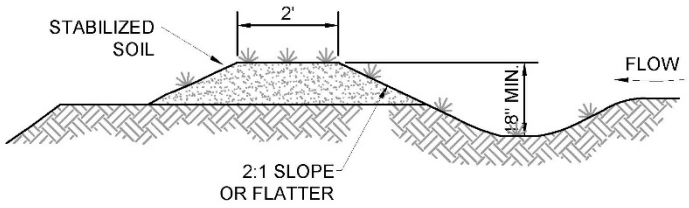
CENTRAL MAINE POWER COMPANY

TYPICAL WATER BAR DETAIL

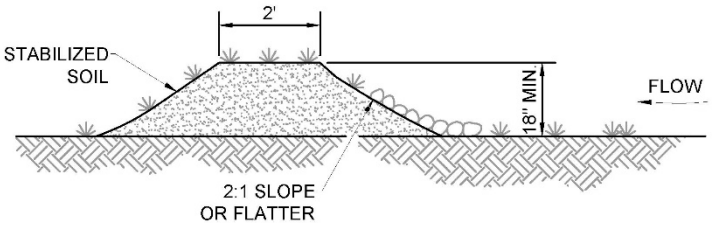
UPGRADIENT RUNOFF DIVERSION

NOTES:

1. ANGLE DIVERSION AWAY FROM SLOPE, WITH A 2-3% DOWNWARD GRADIENT.
2. DIVERSION SHALL DISCHARGE DIRECTLY TO EITHER A PLUNGE POOL, LEVEL SPREADER OR OTHER ENERGY DISSIPATER.
3. STABILIZE WITH MATERIAL THAT IS APPROPRIATE FOR THE SLOPE AND EXPECTED RUNOFF (EROSION CONTROL BLANKETS, GRAVEL OR RIPRAP).
4. CONSTRUCT DIVERSION IN ACCORDANCE WITH MAINE EROSION AND SEDIMENT CONTROL PRACTICES FIELD GUIDE FOR CONTRACTORS, LATEST EDITION.



DIVERSION WITH EXCAVATION
SCALE: N.T.S.



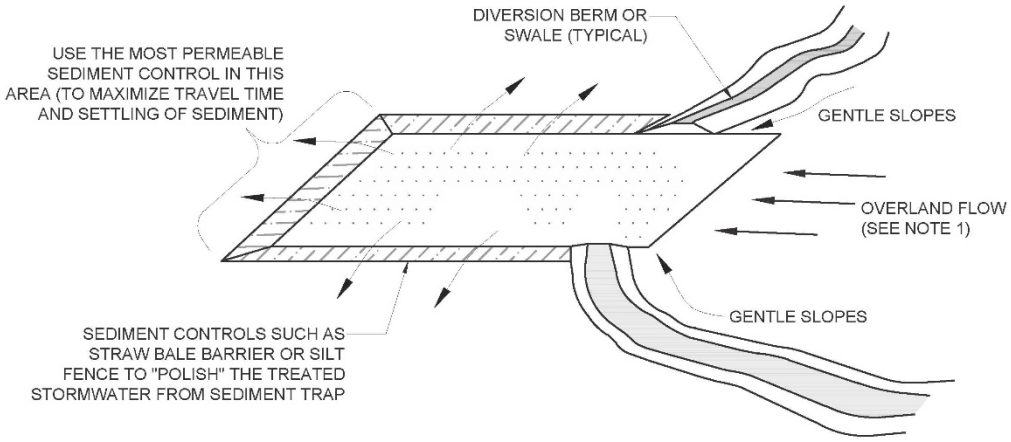
DIVERSION WITH FILL
SCALE: N.T.S.

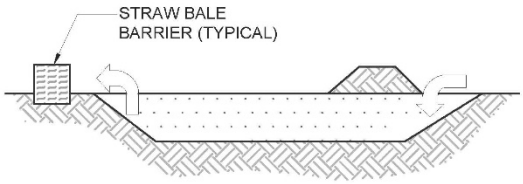
CENTRAL MAINE POWER

CENTRAL MAINE POWER COMPANY

TYPICAL UPGRADIENT RUNOFF DIVERSION DETAIL

TEMPORARY SEDIMENT TRAP





NOTES:

1. MAXIMUM AREA FOR OVERFLOW SEDIMENT TRAP IS USUALLY 1 ACRE. MUST HAVE GENTLE SLOPES (LESS THAN 2% GENERALLY) AND PREDOMINATELY OVERLAND SHEET FLOW.
2. MAXIMUM PERMANENT WET DEPTH IS 2 FEET. OVERFLOW SEDIMENT TRAPS MAY NOT BE EFFECTIVE FOR HIGH GROUNDWATER TABLE AND INFLOWS.
3. CONSTRUCT SEDIMENT TRAP IN ACCORDANCE WITH MAINE EROSION AND SEDIMENT CONTROL PRACTICES FIELD GUIDE FOR CONTRACTORS, LATEST EDITION.

SCALE: N.T.S.

CENTRAL MAINE POWER

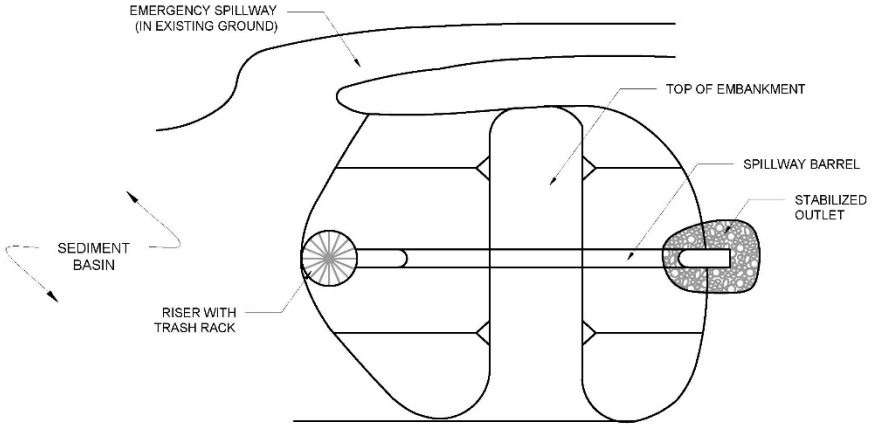
CENTRAL MAINE POWER COMPANY

TYPICAL SEDIMENT TRAP DETAIL

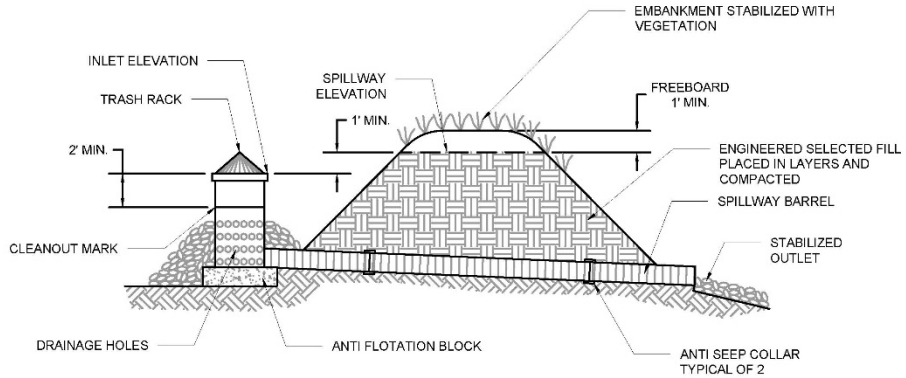
TEMPORARY SEDIMENT BASIN

NOTES:

1. THE BASIN'S LENGTH TO WIDTH RATIO SHALL BE 2:1 OR FLATTER.
2. BASIN SHALL BE LOCATED MORE THAN 100 FEET AWAY FROM ANY MAPPED OR DELINEATED NATURAL RESOURCE AND SHALL NOT DIRECTLY DISCHARGE TO A STREAM.
3. STABILIZE BASIN WITHIN 7 CALENDAR DAYS WITH RIPRAP, EROSION CONTROL MIX OR AN ANCHORED EROSION CONTROL BLANKET.
4. CONSTRUCT BASIN IN ACCORDANCE WITH MAINE EROSION AND SEDIMENT CONTROL PRACTICES FIELD GUIDE FOR CONTRACTORS, LATEST EDITION.



PLAN
SCALE: N.T.S.



SECTION
SCALE: N.T.S.

CENTRAL MAINE POWER COMPANY

TYPICAL SEDIMENT BASIN DETAIL

SEDIMENT BARRIER – HAY BALES

PROPER INSTALLATION

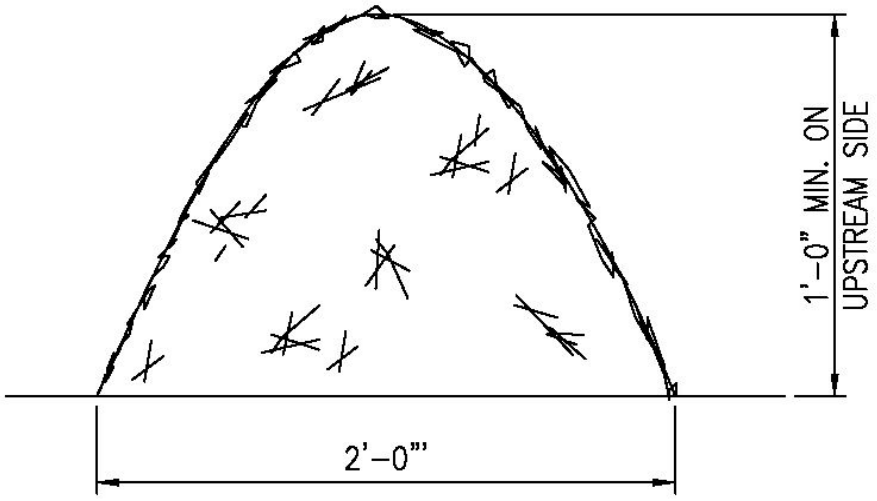
- **Dug trench to key bales into ground**
- **Stakes placed and driven in at angles to snug bales together**
- **Excess dirt used to cover openings and cracks**

SEDIMENT BARRIER – SILT FENCE

PROPER INSTALLATION

- **Dug trench to key material into ground**
- **Stakes are placed facing away from disturbed area**
- **Excess material on bottom is buried with excess dirt to prevent water from flowing under fence**

EROSION CONTROL MIX BERM DETAIL



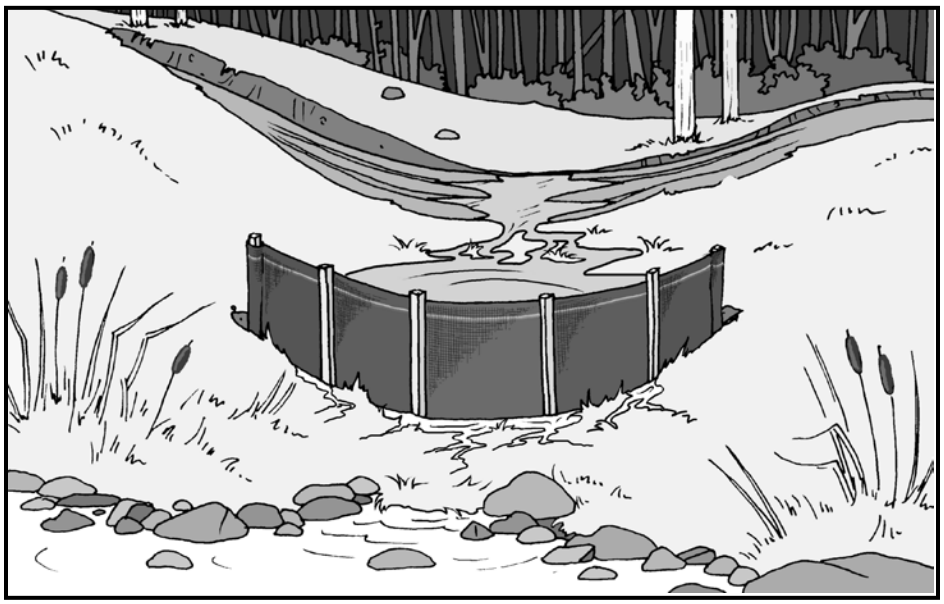
- Use erosion control mix berm in place of silt fence and/or hay bale sediment barriers
- Erosion control soil/bark mix shall consist of: shredded bark, stump grindings, composted bark or flume grit and fragmented wood generated from water-flume log handling systems. The mix shall conform to the following:

1. pH: 5.0 to 8.0
2. Screen Size: 6" – 100% passing
   ¾" – 70% to 85% passing
   Mix shall not contain large portions of silts, clays or fine sands
3. Organic material: 20% - 100% (dry weight basis)
   Organic portion must be fibrous and elongated
4. Soluble salts shall be <4.0 mmhos/cm

SEDIMENT BARRIER – SILT FENCE

IMPROPER INSTALLATION

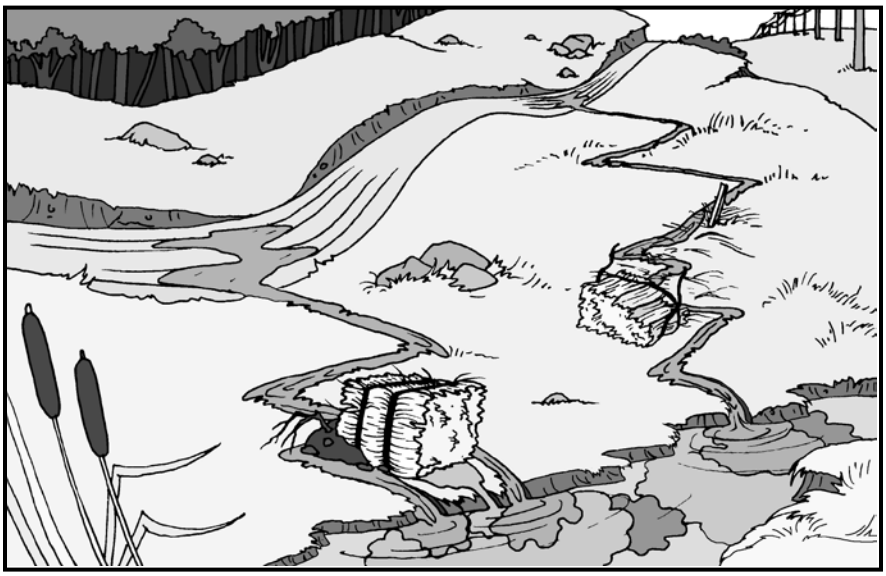
- **Fence located too far from road and too close to resource**
- **Stakes installed on wrong side of fence**
- **Needs maintenance (restaking, restapling, or even replacement)**
- **Placed in concentrated flow**



PROPER INSTALLATION

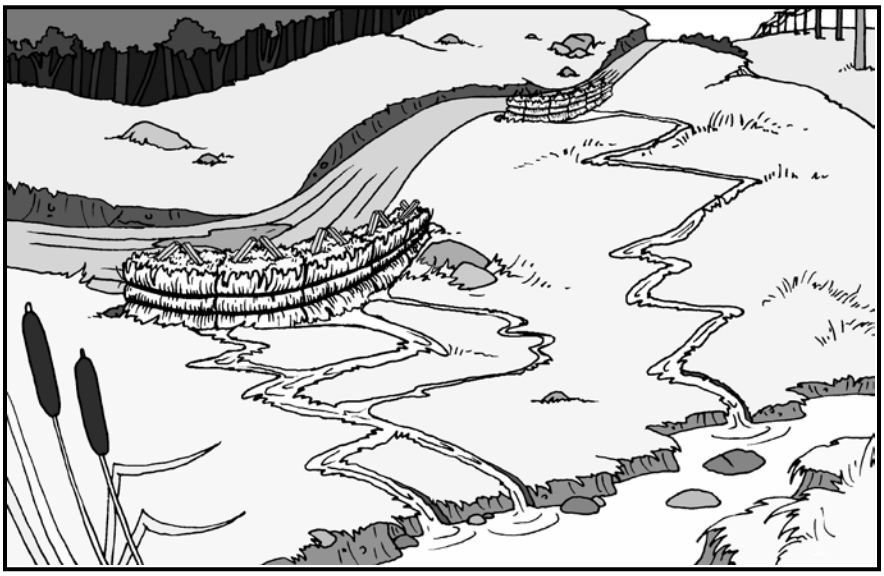
- **Adequate distance from road and resource allows road to capture and slow water, and allows silt fence to filter it before reaching resource**
- **Stakes placed on correct side; facing resource, while filter fabric faces disturbed area**
- **Adequate length; fence is long enough and turned uphill at ends to prevent water from escaping around edges**

SEDIMENT BARRIER – HAY BALES



IMPROPER INSTALLATION

- **Placed in concentrated flow**
- **Hay bales are not staked**
- **Not enough hay bales to adequately capture and slow flow**
- **Too far from source of runoff and sediment**
- **Improper orientation of bales; horizontal grass fibers do not provide adequate filtration, and strings on ground rot and bales to fall apart**



PROPER INSTALLATION

- **Staked properly; bales are secure and snug to one another**
- **Sufficient number of bales to slow flow and insure that no water escapes around edges**
- **Positioned close to disturbance, and far from resource to allow proper filtration**
- **Vertical orientation of grass fibers provides adequate filtration**
- **Placed along contour to capture sheet flow**

APPENDIX E

EROSION AND SEDIMENTATION CONTROL LAW* 38 M.R.S.A. § 420-C

APPENDIX E

EROSION AND SEDIMENTATION CONTROL LAW*

38 M.R.S.A. § 420-C

A person who conducts, or causes to be conducted, an activity that involves filling, displacing or exposing soil or other earthen materials shall take measures to prevent unreasonable erosion of soil or sediment beyond the project site or into a protected natural resource as defined in section 480-B. Erosion control measures must be in place before the activity begins. Measures must remain in place and functional until the site is permanently stabilized. Adequate and timely temporary and permanent stabilization measures must be taken and the site must be maintained to prevent unreasonable erosion and sedimentation.

This section applies to a project or any portion of a project located within and organized area of this State. This section does not apply to agriculture fields. Forest management activities, including associated road construction or maintenance, conducted in accordance with applicable standards of the Maine Land Use Regulation Commission, are deemed to comply with this section. This section may not be construed to limit a municipality's authority under home rule to adopt ordinances containing stricter standards than those contained in this section.

* The Erosion and Sedimentation Control Law is administered by the Maine Department of Environmental Protection (MDEP), Augusta, Maine. Please contact the MDEP with specific questions regarding this law.

APPENDIX F

MAINE SLASH LAW* 12 M.R.S.A. § 9333

APPENDIX F

MAINE SLASH LAW*

12 M.R.S.A § 9333

§9333. Disposal along railroad and utility lines

*1. **Stumpage owner**. A stumpage owner, operator, landowner or agent who cuts or causes or permits to be cut any forest growth on lands that are within or border the right-of-way of a railroad, a pipeline, or an electric power, telegraph, telephone or cable line may not place slash or allow it to remain on the ground within the right-of-way or within 25 feet of the nearer side of the right-of-way.*

*2. **Construction**. Slash accumulated by the construction and maintenance of a railroad, a highway, a pipeline or electric power, telegraph, telephone or cable line may not be left on the ground but must be hauled away, burned or chipped. Slash may not be left or place within the right-of-way or within 25 feet of the nearer side of the right-of-way. If a burning permit is denied or revoked under this chapter, the director may allow logs that are too large to be chipped to remain in the right-of-way until the director determines that their removal is economically feasible.*

*3. **Utility line maintenance**. Slash accumulated by the periodic maintenance of a pipeline or an electric power, telegraph, telephone or cable line may be disposed of in the following manner.*

- *A. Slash with a diameter of 3 inches or less may be left in piles on the ground within the maintained portion of the right-of-way. A pile may not be higher than 18 inches from the ground or longer than 50 feet and must be separated from other piles by a minimum of 25 feet in every direction. A buffer strip with a minimum width of 10% of the total width of the maintained right-of-way must be kept totally free of slash with a diameter of 3 inches or less.*
- *B. Slash with a diameter of more than 3 inches must be removed, chipped or limbed and placed on the ground surface. The pieces must be separated and may not be piled one piece over another. Slash of this size may be left within the maintained buffer strips.*
- *C. If a utility line right-of-way is adjacent to a road, slash that is 3 inches or less in diameter must be removed, burned or chipped. Slash with a diameter of more than 3 inches may be left on the ground within the right-of-way and must not be limbed and separated and may not be piled one piece over another. Usable timber products generated from the maintenance of a utility right-of-way may be piled within the right-of-way but must be removed within 30 days.*

* Note that this is an excerpt from the full text of the law. Please contact the Maine Forest Service, Augusta, Maine, for the full text of the law or with specific questions regarding the Slash Law.

APPENDIX G

CULVERT SIZES FOR STREAM CROSSINGS

(3X RULE)

CULVERT SIZES (ROUND) FOR STREAM CROSSINGS (3x RULE)

AVERAGE STREAM WIDTH

Take two measurements across the stream from bank to bank where you intend to place the culvert. Measurements should be taken at the normal high water line (NHWL). To find the NHWL during low flow periods look for water stains on rocks or a debris line along the bank. Add the first measurement to the second and divide this number by 2. This equals the average stream width.
Example: 36in. + 47 in. = 83in. 83÷2 = avg. stream width of 41.5 inches. (Round up to 42in.)

AVERAGE STREAM DEPTH

Take 3 measurements from the bottom of the stream to the NHWL.
Add the measurements together and divide this number by 3. This equals the avg. stream depth.
Example: 12in. + 16in. + 14in. = 42in. 42÷3 = average stream depth of 14 inches.

USING THE TABLE

Take the average width and depth figures and determine where they intersect on the table above.
*For example, for an average stream width of 42 inches (on the left side of the table), and an average stream depth of 14 inches (along the top of the table), the intersect shows a culvert diameter of 48 inches.

Average Stream Width		Average Stream Depth (Inches)														
Feet	Inches	2	4	6	8	10	12	**14***	16	18	20	22	24	26	28	30
1	12	12	15	18	21	21	24	30	30	30	30	36	36	36	36	42
1.5	18	12	18	21	24	30	30	36	36	36	42	42	42	42	48	48
2	24	15	21	24	30	30	36	36	42	42	48	48	48	54	54	54
2.5	30	15	21	30	30	36	42	42	48	48	48	54	54	60	60	60
3	36	18	24	30	36	42	42	48	48	54	54	60	60	60	66	66
3.5	**42***	18	30	36	36	42	48	**48**	54	54	60	60	66	66	72	72
4	48	21	30	36	42	48	48	54	54	60	66	66	66	72	72	78
4.5	54	21	30	36	42	48	54	54	60	66	66	72	72	78	78	84
5	60	21	30	42	48	48	54	60	66	66	72	72	78	78	84	84
5.5	66	24	36	42	48	54	60	60	66	72	72	78	78	84	84	90
6	72	24	36	42	48	54	60	66	66	72	78	78	84	90	90	96
6.0	78	24	36	42	54	60	60	66	72	78	78	84	90	90	96	96
7	84	30	36	48	54	60	66	72	72	78	84	84	90	96	96	102
7.5	90	30	42	48	54	60	66	72	78	84	84	90	96	96	102	102
8	96	30	42	48	54	66	66	72	78	84	90	90	96	102	102	108
8.5	102	30	42	48	60	66	72	78	84	84	90	96	102	102	108	108
9	108	30	42	54	60	66	72	78	84	90	96	96	102	108	108	114
9.5	114	30	42	54	60	66	72	78	84	90	96	102	102	108	114	114
10	120	30	48	54	66	72	78	84	90	96	96	102	108	114	114	120
10.5	126	36	48	54	66	72	78	84	90	96	102	108	108	114	120	120
11	132	36	48	60	66	72	78	84	90	96	102	108	114	114	120	126
11.5	138	36	48	60	66	78	84	90	96	102	108	108	114	120	126	126
12	144	36	48	60	66	78	84	90	96	102	108	114	120	120	126	132
12.5	150	36	48	60	72	78	84	90	96	102	108	114	120	126	132	132
13	156	36	54	60	72	78	90	96	102	108	114	114	120	126	132	138
13.5	162	36	54	66	72	84	90	96	102	108	114	120	126	132	132	138
14	168	36	54	66	72	84	90	96	102	108	114	120	126	132	138	144
14.5	174	36	54	66	78	84	90	96	108	114	120	126	126	132	138	144
15	180	42	54	66	78	84	96	102	108	114	120	126	132	138	144	144

ATTACHMENT C

315641-SW-2 Rev-0.0C

315641-SW-4 Rev-0.0C

315641-C-4 Rev-0.0C

SOILS LEGEND		
MAP UNIT SYMBOL	MAP UNIT NAME	HSG RATING
DEC	DANFORTH-ELLIOTTSVILLE ASSOCIATION, 3 TO 15 PERCENT SLOPES	B
MOB	MONARDA-BURNHAM COMPLEX, 0 TO 3 PERCENT SLOPES, VERY STONY	D
MTB	MONARDA-TELOS COMPLEX, 0 TO 8 PERCENT SLOPES, VERY STONY	D
MVE	MONSON-ELLIOTTSVILLE-KNOB LOCK COMPLEX, 30 TO 60 PERCENT SLOPES, VERY ROCKY	D

WEST FORKS POST-DEVELOPMENT LAND COVER COMPARISON SUMMARY (ACRES)			
COVER TYPE	CN	1S	1SA
ROOFS & FOUNDATIONS	98	0.00	0.01
STONE YARD SURFACE	55	0.00	0.47
GRAVEL ROAD, HSG B	96	0.15	0.00
BRUSH, HSG B	67	0.48	0.00
WOODS, HSG B	66	4.92	0.00
TOTAL AREA		5.55	0.48

LEGEND

- SUBCATCHMENTBOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- REACH
- 100' SF — SHEET FLOW
- 100' SCF — SHALLOW CONCENTRATED FLOW
- 100' CF — CHANNEL FLOW
- EL. 520.0± — SPOT ELEVATION
- 1R — REACH ID
- 1S — SUBCATCHMENT ID
- 1P — POND ID
- SP1 — STUDY POINT ID
- RIGHT OF WAY
- SOILS
- 100 — EXISTING CONTOUR
- 100 — PROPOSED CONTOUR
- TREELINE
- WETLAND

50 0 50 100 FT

SCALE: 1" = 50'

ISSUE FOR PERMITTING
NOT FOR CONSTRUCTION

INSTALL

NOTE

IMPERVIOUS AREA ASSOCIATED WITH EXISTING ROAD SECTIONS ARE NOT INCLUDED WITH PROPOSED TOTAL. UNTREATED SECTIONS OF EXISTING IMPERVIOUS AREA ARE NOT SUBJECTED TO CHAPTER 500 STANDARDS. TREATMENT OF EXISTING IMPERVIOUS AREA IS COUNTED AS A CREDIT TOWARD WATER QUALITY TREATMENT REQUIREMENTS.

NECEC - WEST FORKS - VEGETATED BUFFER SUMMARY

ROAD SECTION	BMP ID	SHEET NUMBER	LENGTH	WIDTH	BUFFER SLOPE (%)	BUFFER TYPE	BUFFER LENGTH (FT)	TOTAL IMP AREA (SF)	TREATED IMP AREA (SF)	BERM LENGTH (FT)	UNTREATED IMP AREA (SF)	HSG	NOTES
AR-RIGHT	B-1	315641 C-4 & SW-2	380	15	8%	DITCH TURNOUT: MEADOW	150	5700	5700	30	0	B	
AR-LEFT	B-1	315641 C-4 & SW-2	81	15	8%	DITCH TURNOUT: MEADOW	150	1215	1215	30	0	B	
											PERCENT TREATED		100%
							TOTAL IMPERVIOUS AREA REQUIRING TREATMENT		6,915	6,915		0		100%

PE STAMP
STATE OF MAINE
RICK A. YOUNG
No. 6422
LICENSED PROFESSIONAL ENGINEER
JAN. 16, 2019

AVANGRID ENGINEERING
CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION
Property of AVANGRID

CMP AVANGRID

REV	DESCRIPTION	DATE	BY	CK	APP
C	IFP - RESSIED FOR PERMITTING	01/16/2019	CMV	PGT	RY
B	IFP - ISSUED FOR PERMITTING	10/17/2018	CMV	PGT	SGL
A	IFR - ISSUE FOR REVIEW	10/05/2018	KAV	PGT	SGL

POST-DEVELOPMENT WATERSHED PLAN
WEST FORKS STATION

NECEC HVDC LINE — MOXIE GORE & WEST FORKS, ME

BY: PGT/TRC | SCALE: AS NOTED | FILE: 315641 Watershed.dwg
CK: PGT/TRC | NO.
APP: SGL/TRC | DATE: 10/05/2018

315641 SW-2 | REV 0-0 C

811 DigSafe MA·ME·NH·RI·VT

LOGO TRC
INFO TRC 249 WESTERN AVENUE AUGUSTA, ME 04330 207-621-7000
PROJECT NO.315641
ANSI D 1/16/2019

SOILS LEGEND		
MAP UNIT SYMBOL	MAP UNIT NAME	HSG RATING
DEC	DANFORTH-ELLIOTTSVILLE ASSOCIATION, 3 TO 15 PERCENT SLOPES	B
MOB	MONARDA-BURNHAM COMPLEX, 0 TO 3 PERCENT SLOPES, VERY STONY	D
MTB	MONARDA-TELOS COMPLEX, 0 TO 8 PERCENT SLOPES, VERY STONY	D
MVE	MONSON-ELLIOTTSVILLE-KNOB LOCK COMPLEX, 30 TO 60 PERCENT SLOPES, VERY ROCKY	D

MOXIE GORE POST-DEVELOPMENT LAND COVER COMPARISON SUMMARY (ACRES)			
COVER TYPE	HSG	2S	2SA
ROOFS & FOUNDATIONS	98	0.00	0.01
STONE YARD SURFACE	55	0.00	0.47
GRAVEL ROAD, HSG B	96	0.38	0.00
BRUSH, HSG B	67	0.83	0.00
WOODS, HSG B	66	10.71	0.00
TOTAL AREA		11.92	0.48

LEGEND

- SUBCATCHMENTBOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- REACH
- 100' SF — SHEET FLOW
- 100' SCF — SHALLOW CONCENTRATED FLOW
- 100' CF — CHANNEL FLOW
- EL. 520.0± — SPOT ELEVATION
- 1R — REACH ID
- 1S — SUBCATCHMENT ID
- 1P — POND ID
- SP1 — STUDY POINT ID
- RIGHT OF WAY
- SOILS
- 100 — EXISTING CONTOUR
- 100 — PROPOSED CONTOUR
- TREELINE
- WETLAND

NOTE
IMPERVIOUS AREA ASSOCIATED WITH EXISTING ROAD SECTIONS ARE NOT INCLUDED WITH PROPOSED TOTAL. UNTREATED SECTIONS OF EXISTING IMPERVIOUS AREA ARE NOT SUBJECTED TO CHAPTER 500 STANDARDS. TREATMENT OF EXISTING IMPERVIOUS AREA IS COUNTED AS A CREDIT TOWARD WATER QUALITY TREATMENT REQUIREMENTS.

NECEC - MOXIE GORE - VEGETATED BUFFER SUMMARY												
ROAD SECTION	BMP ID	SHEET NUMBER	LENGTH	WIDTH	BUFFER SLOPE (%)	BUFFER TYPE	BUFFER LENGTH (FT)	TOTAL IMP AREA (SF)	TREATED IMP AREA (SF)	BERM LENGTH (FT)	UNTREATED IMP AREA (SF)	HSG	NOTES
AR-RIGHT	B-2	315641 C-3 & SW-4	150	15	8%	DITCH TURNOUT: FORESTED	150	2250	2250	30	0	B	
AR-LEFT	B-2	315641 C-4 & SW-2	88	15	8%	DITCH TURNOUT: FORESTED	150	1320	1320	30	0	B	
											PERCENT TREATED		100%
							TOTAL IMPERVIOUS AREA REQUIRING TREATMENT		3,570	3,570		0		100%

REV	DESCRIPTION	DATE	BY	CK	APP
C	FP - REISSUED FOR PERMITTING	01/16/19	CMW	PGT	RY
B	FP - ISSUE FOR PERMITTING	10/17/2018	CMW	PGT	SGL
A	FR - ISSUE FOR REVIEW	10/05/2018	KAV	PGT	SGL

50 0 50 100 FT
SCALE: 1" = 50'

ISSUE FOR PERMITTING
NOT FOR CONSTRUCTION

INSTALL

PE STAMP
STATE OF MAINE
RICKY A. YOUNG
No. 5422
LICENSED PROFESSIONAL ENGINEER
8 AM 19, 2019

AVANGRID ENGINEERING
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CMP AVANGRID

POST-DEVELOPMENT WATERSHED PLAN
MOXIE GORE STATION

NECEC HVDC LINE — MOXIE GORE & WEST FORKS, ME

BY	PGT/TRC	SCALE: AS NOTED	FILE: 315641 Watershed.dwg
CK	PGT/TRC	NO.	REV
APP	SGL/TRC	315641 SW-4	0-OC
DATE	10/05/2018		

INFO
TRC
249 WESTERN AVENUE
AUGUSTA, MAINE 04330
207-621-7000

LOGO
TRC
PROJECT NO:315641

ANSI D 1/16/2019

ACCESS ROAD NOTE:
EXISTING LOGGING ROADS TO BE USED FOR SITE ACCESS (CAPITAL RD AND WILSON HILL ROAD AND SECONDARY ROAD). THESE ROADS ARE IN GOOD SHAPE WITH MINOR ROAD IMPROVEMENTS NEEDED.
REFERENCE:
CMP VEGETATION REMOVAL - ROADS AND CONSTRUCTION SITE REPORT

EXISTING 300' R.O.W.

LIMIT OF CLEARING (COORDINATE WITH TRANSMISSION LINE LIMIT OF CLEARING)

15' WIDE ACCESS ROAD

2:1 SIDE SLOPE TYP

PERMANENT CHECK DAM

16' WIDE DOUBLE LEAF GATE TYP. OF 2

947.60

947.60

BH-1

135'

WEST FORKS 135' x 135' TERMINATION STATION

37+32

37+00

-2.00%

135'

944.90

944.90

LEVEL SPREADER (LS-1)

(B-1)

UG ELECTRICAL VAULTS

TEMPORARY ACCESS ROAD TO RECEIVING PLATFORM

TEMPORARY GRADING 2:1 SIDE SLOPES - SEE RESTORATION NOTE

TEMPORARY 100' x 150' RECEIVING PLATFORM

UG ELECTRIC LINE

35+00

917.00

917.00

917.00

HDD LINE

BH-2

33+00

32+00

31+00

C-5

50 0 50 100 FT

SCALE: 1" = 50'

UTM 83 ZONE 19 US FT

SYMBOL LEGEND

SYMBOL	DESCRIPTION
	HDD LINE
UGE	UNDERGROUND ELECTRIC LINE
	TERMINATION STATION FENCE
	ACCESS ROAD
	UNDERGROUND ELECTRIC VAULT
	TEMPORARY WORK PLATFORM
	TEMPORARY ACCESS ROAD
	RIGHT OF WAY LINE
	WETLANDS
	YARD SURFACING
	EXISTING TREE LINE
	LIMIT OF CLEARING
SF	SILT FENCE
850	EXISTING CONTOUR
850	PROPOSED CONTOUR
850	TEMPORARY CONTOUR (SEE RESTORATION NOTE)
BH-0	PROPOSED BORE HOLE LOCATION

RESTORATION NOTE:

PRIOR TO INITIAL SITE GRADING, TOPSOIL WILL BE REMOVED STOCKPILED AND STABILIZED FOR THE DURATION OF CONSTRUCTION. UPON COMPLETION OF CONSTRUCTION THE SITE WILL BE GRADED TO APPROXIMATE PRECONSTRUCTION CONTOURS AND TOPSOIL WILL BE REPLACED. A CONSERVATION SEED MIX (APRIL 16-OCTOBER 31) WILL BE APPLIED AT A RATE SPECIFIED BY THE MANUFACTURER. AN ANNUAL SEED MIXTURE WILL BE APPLIED BASED ON 3X THE MANUFACTURER'S SPECIFIED RATE (NOV 1-APRIL 15). ALL EXPOSED SOIL AND SEEDED AREAS WILL BE COVERED WITH HAY MULCH. MULCH WILL BE APPLIED AT A RATE OF 2 BALES (APRIL 16-OCTOBER 31) AND 5 BALES (NOV 1-APRIL 15) PER 1,000 SQUARE FEET.

811 DigSafe MA-ME-NH-RI-VT

ISSUE FOR PERMITTING
NOT FOR CONSTRUCTION

INSTALL

REV	DESCRIPTION	DATE	BY	CK	APP
C	IFP - RE-ISSUED FOR PERMITTING	01-15-2019	DED	PGT	RY
B	IFP - ISSUED FOR PERMITTING	10/17/2018	DED	PGT	SGL
A	IFR - ISSUE FOR REVIEW	10/05/2018	KAV	PGT	SGL

PE STAMP
STATE OF MAINE
RICHARD YOUNG
No. 6424
LICENSED
PROFESSIONAL ENGINEER
JANUARY 16, 2019

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CMP AVANGRID

GRADING & RESTORATION PLAN
WEST FORKS

NECEC HDVC LINE — MOXIE GORE & WEST FORKS, ME

BY	DED/TRC	SCALE: AS NOTED	FILE: 315641 Base.dwg
CK	PGT/TRC	NO.	REV
APP	SGL/TRC	315641 C-4	0-0C
DATE	10/05/2018		

LOGO TRC PROJECT NO.315641

INFO
TRC
249 MEDICAL AVENUE
AUGUSTA, ME 04330
207-621-7000

ANSI D 1/15/2019

ATTACHMENT D

Level Spreader, Buffer Sizing and Culvert Sizing Calculations

CALCULATIONS

LEVEL SPREADER & BUFFER SIZING CALCULATIONS
CULVERT SIZING CALCULATIONS

PROJECT:	**CMP**	**Calculated By:**	PGT
	Kennebec HDD Termination Stations	**Checked By:**	PMM
TRC Proj:		**Date:**	October 17,2018
		Revised:	January 16, 2019

VEGETATED BUFFER AND STONED BERMED LEVEL SPREADER SIZING

Use of stone bermed level lip spreader in lieu of ditch turnout level spreaders.

Design Criteria:

Per BMP manual Volume III chapter 5.2.2 Buffer with Stone Bermed Level Lip Spreader
Reference Tables 5-4, 5-5 and 5-6

The given road section is: 15 ft wide gravel road
12 ft wide ditch section (3 ft bottom including side slopes)

Sub-Watershed 1S - West Forks Station

Vegetated Buffer B-1

Required Length of flow path through a meadow buffer (0-8% slope) = 150 ft
Provided is a 150 ft long meadow buffer. (average slope exceeds 8%)

Treatment for roadway		
Impervious areas		
15 x 81 =	1215	0.03 Ac
15 x 380 =	5700	0.13 Ac
Concrete foundations(per GA Plan)		0.01 Ac
Total Impervious Area		**0.17 Ac**
Pervious area		
12 x 164	1968	0.05 Ac
12 x 307 =	3684	0.08 Ac
Total Landscaped Area		**0.13 Ac**

Level Spreader LS-1

Using Hydrologic Soil group B Soils

Per acre of impervious area =	100 Ft
Per acre of Lawn area =	30 Ft
Length for Impervious area =	17 LF
Length for Lawn area =	4 LF
Total length required =	**21 LF**
Provided =	**30 LF**

Note: Buffer slope is 16% so additional length of level spreader is provided to compensate for the increased slope.

PROJECT:	**CMP**	**Calculated By:**	PGT
	Kennebec HDD Termination Stations	**Checked By:**	PMM
TRC Proj:		**Date:**	October 17,2018
		Revised:	January 16, 2019

Sub-Watershed 2S - Moxie Gore Station

Vegetated Buffer B-2

Required Length of flow path through a forested buffer (0-8% slope) = 150 ft
Provided is a 150 ft long forested buffer.

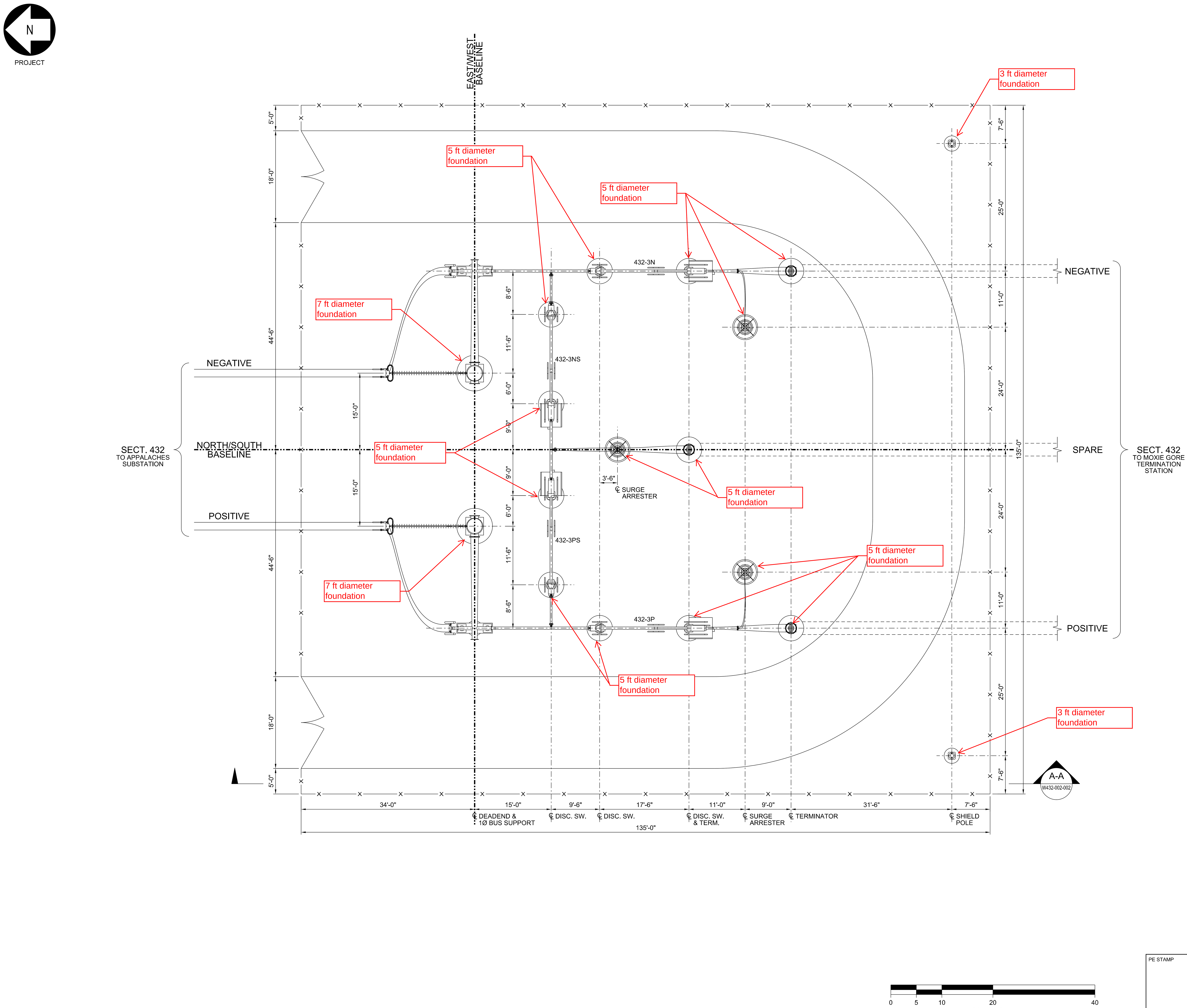
Treatment for roadway			
Impervious areas			
15 x 88 =	1320	0.03	Ac
15 x150 =	2250	0.05	Ac
Concrete foundations (per GA Plan)		0.01	Ac
Total Impervious Area		**0.09**	**Ac**
Pervious area			
12 x 65	780	0.02	
12 x 320 =	3840	0.09	Ac
Total Landscaped Area		**0.11**	**Ac**

Level Spreader LS-2

Using Hydrologic Soil group B Soils

Per acre of impervious area =	65	Ft
Per acre of Lawn area =	20	Ft
Length for Impervious area =	6	LF
Length for Lawn area =	2	LF
Total length required =	**8**	**LF**
Provided =	**30**	**LF**

Note: Runoff from transition station yard contributes to level spreader but no additional water quality treatment is needed.



FOUNDATION AREAS
(2) 7 FOOT DIAMETER FDN = 76.93 SF
(14) 5 FOOT DIAMETER FDN = 274.75 SF
(2) 3 FOOT DIAMETER FDN = 14.13 SF
TOTAL ------------------------------ 365.81 SF (0.008 ACRES)

PRELIMINARY
ISSUE FOR CLIENT REVIEW
NOT FOR CONSTRUCTION

REFERENCE DRAWINGS
W432-001-001 POWER ONE LINE DIAGRAM
W432-002-002 GENERAL ARRANGEMENT SECTIONS

INSTALL

REV	DESCRIPTION	DATE	BY	CK	APP
B	ISSUED FOR CONCEPTUAL REFERENCE	10/17/18	JMW/TRC	EJD/TRC	REF/TRC
A	IFR ISSUE FOR REVIEW	10/04/18	JMW/TRC	EJD/TRC	REF/TRC

TRC SOLUTIONS
249 WESTERN AVENUE
AUGUSTA, ME 04330
207-621-7000

TRC
PROJECT NO. 306390

ANSI D 10/3/18

PE STAMP

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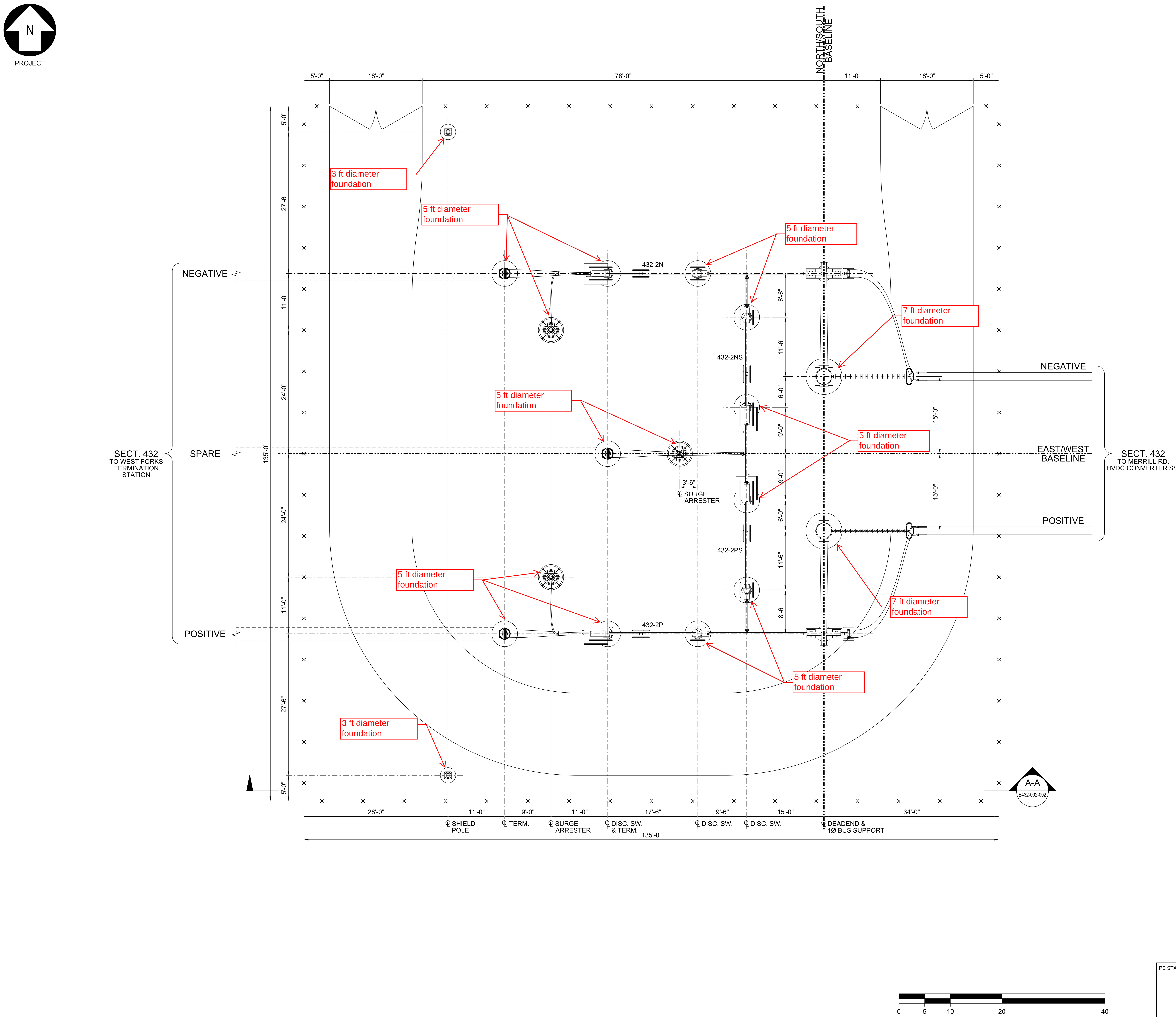
CMP AVANGRID

GENERAL ARRANGEMENT PLAN

WEST FORKS TERM. STA. WEST FORKS, ME

BY JMW/TRC SCALE: 1" = 10' FILE: W432-002-001.DGN
CK EJD/TRC NO.
APP REF/TRC
DATE 10/12/2018

W432-002-001 REV 0-0B



FOUNDATION AREAS
(2) 7 FOOT DIAMETER FDN = 76.93 SF
(14) 5 FOOT DIAMETER FDN = 274.75 SF
(2) 3 FOOT DIAMETER FDN = 14.13 SF
TOTAL -------------------------------- 365.81 SF (0.008 ACRES)

PRELIMINARY
ISSUE FOR CLIENT REVIEW
NOT FOR CONSTRUCTION

REFERENCE DRAWINGS
E432-001-001 POWER ONE LINE DIAGRAM
E432-002-002 GENERAL ARRANGEMENT SECTIONS

INSTALL

PE STAMP

AVANGRID ENGINEERING
CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION
Property of AVANGRID

CMP AVANGRID

REV	DESCRIPTION	DATE	BY	CK	APP

GENERAL ARRANGEMENT PLAN

MOXIE GORE TERM. STA. MOXIE GORE, ME

BY	JMW/TRC	SCALE: 1" = 10'	FILE: E432-002-001.DGN
CK	EJD/TRC	NO. E432-002-001	REV 0-0B
APP	REF/TRC		
DATE:	10/12/2018		

REV	DESCRIPTION	DATE	BY	CK	APP
B	ISSUED FOR CONCEPTUAL REFERENCE	10/17/18	JMW/TRC	EJD/TRC	REF/TRC
A	IFR ISSUE FOR REVIEW	10/04/18	JMW/TRC	EJD/TRC	REF/TRC

LOGO
TRC Results you can rely on
PROJECT NO: 306390
INFO
TRC SOLUTIONS
249 WESTERN AVENUE
AUGUSTA, ME 04330
207-621-7000

ANSI D 10/3/18

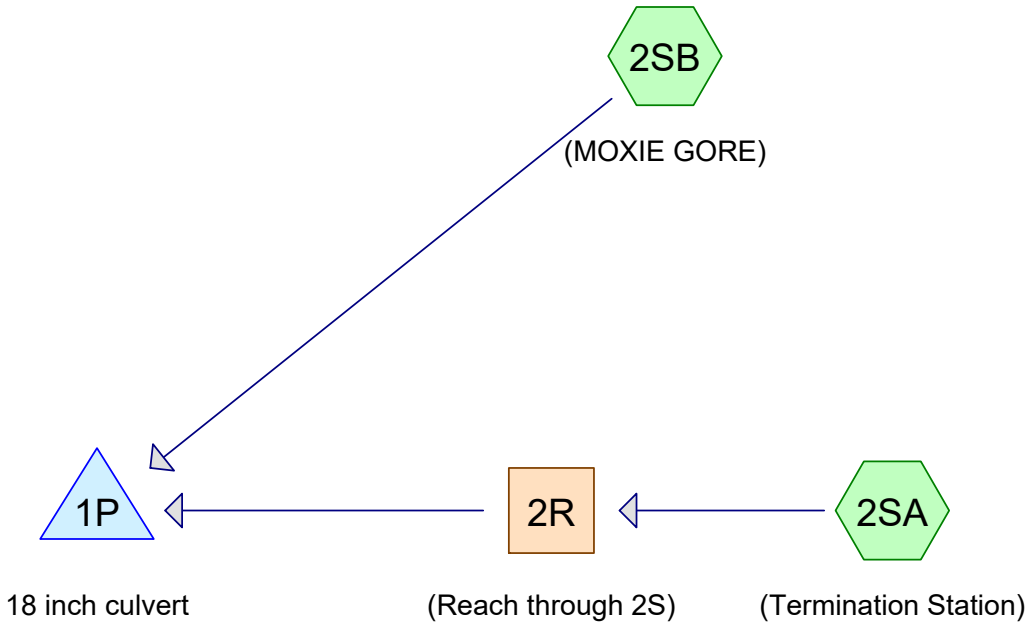
PROJECT:	**Kennebec River Gorge Transition Stations**	**Calculated By:**	PGT
	Moxie Gore	**Checked By:**	DTB
TRC Proj. No.:	**306390.0000.00000**	**Date:**	1/15/19
Subcatchment:	**CULVERT TC**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7		
SHEET FLOW									
Manning's No.	0.8								
Length, ft	150								
P2 , in	2.44								
Slope, ft/ft	0.0471								
T_t[1], hr	0.701								0.7007
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft		142							
Slope, ft/ft		0.025							
Velocity[2], ft/sec		2.5510884							
T_t[3], hr		0.015							0.0155
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft									
Slope, ft/ft									
Velocity[5], ft/sec									
T_t[3], hr									0.0000
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[12], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.716
Min	**42.97**

CULVERT SIZING MODEL



Subcat Reach Pond Link

Routing Diagram for 2019-01-14 Moxie Gore Culvert Model
Prepared by TRC, Printed 1/16/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.320	67	Brush, Poor, HSG B (2SB)
0.010	98	Foundations, HSG B (2SA)
0.090	96	Gravel surface, HSG B (2SB)
0.470	55	Substation Surface (2SA)
0.770	66	Woods, Poor, HSG B (2SB)
1.660	**65**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
1.190	HSG B	2SA, 2SB
0.000	HSG C	
0.000	HSG D	
0.470	Other	2SA
1.660		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.320	0.000	0.000	0.000	0.320	Brush, Poor	2SB
0.000	0.010	0.000	0.000	0.000	0.010	Foundations	2SA
0.000	0.090	0.000	0.000	0.000	0.090	Gravel surface	2SB
0.000	0.000	0.000	0.000	0.470	0.470	Substation Surface	2SA
0.000	0.770	0.000	0.000	0.000	0.770	Woods, Poor	2SB
0.000	**1.190**	**0.000**	**0.000**	**0.470**	**1.660**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	889.00	887.80	30.0	0.0400	0.025	18.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 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

Subcatchment 2SA: (Termination Station) Runoff Area=0.480 ac 2.08% Impervious Runoff Depth=0.49"
Tc=6.0 min CN=56 Runoff=0.32 cfs 0.020 af

Subcatchment 2SB: (MOXIE GORE) Runoff Area=1.180 ac 0.00% Impervious Runoff Depth=1.14"
Tc=43.0 min CN=69 Runoff=0.82 cfs 0.112 af

Reach 2R: (Reach through 2S) Avg. Flow Depth=0.09' Max Vel=1.61 fps Inflow=0.32 cfs 0.020 af
n=0.030 L=178.0' S=0.0309 '/' Capacity=25.27 cfs Outflow=0.31 cfs 0.020 af

Pond 1P: 18 inch culvert Peak Elev=889.47' Storage=10 cf Inflow=0.88 cfs 0.132 af
18.0" Round Culvert n=0.025 L=30.0' S=0.0400 '/' Outflow=0.88 cfs 0.132 af

Total Runoff Area = 1.660 ac Runoff Volume = 0.132 af Average Runoff Depth = 0.95"
99.40% Pervious = 1.650 ac 0.60% Impervious = 0.010 ac

Summary for Subcatchment 2SA: (Termination Station)

Runoff = 0.32 cfs @ 12.00 hrs, Volume= 0.020 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-Year Rainfall=3.80"

	Area (ac)	CN	Description
*	0.470	55	Substation Surface
*	0.010	98	Foundations, HSG B
	0.480	56	Weighted Average
	0.470		97.92% Pervious Area
	0.010		2.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes (Minimum)**

Summary for Subcatchment 2SB: (MOXIE GORE)

Runoff = 0.82 cfs @ 12.45 hrs, Volume= 0.112 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-Year Rainfall=3.80"

Area (ac)	CN	Description
0.770	66	Woods, Poor, HSG B
0.090	96	Gravel surface, HSG B
0.320	67	Brush, Poor, HSG B
1.180	69	Weighted Average
1.180		100.00% Pervious Area

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

Summary for Reach 2R: (Reach through 2S)

Inflow Area = 0.480 ac, 2.08% Impervious, Inflow Depth = 0.49" for 10-Year event
Inflow = 0.32 cfs @ 12.00 hrs, Volume= 0.020 af
Outflow = 0.31 cfs @ 12.02 hrs, Volume= 0.020 af, Atten= 5%, Lag= 1.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 5.7 min

Peak Storage= 34 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.27 cfs

2.00' x 1.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 178.0' Slope= 0.0309 '/'
Inlet Invert= 894.50', Outlet Invert= 889.00'

Summary for Pond 1P: 18 inch culvert

Inflow Area = 1.660 ac, 0.60% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 0.88 cfs @ 12.44 hrs, Volume= 0.132 af
Outflow = 0.88 cfs @ 12.44 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.2 min
Primary = 0.88 cfs @ 12.44 hrs, Volume= 0.132 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 889.47' @ 12.44 hrs Surf.Area= 36 sf Storage= 10 cf
Flood Elev= 892.00' Surf.Area= 364 sf Storage= 472 cf

Plug-Flow detention time= 0.6 min calculated for 0.132 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (901.9 - 901.6)

Volume	Invert	Avail.Storage	Storage Description
#1	889.00'	2,307 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
889.00	5	0	0
890.00	70	38	38
891.00	217	144	181
892.00	364	291	472
893.00	918	641	1,113
894.00	1,471	1,195	2,307

Device	Routing	Invert	Outlet Devices
#1	Primary	889.00'	**18.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 889.00' / 887.80' S= 0.0400 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.77 sf

Primary OutFlow Max=0.88 cfs @ 12.44 hrs HW=889.47' (Free Discharge)
1=Culvert (Inlet Controls 0.88 cfs @ 1.85 fps)

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 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

Subcatchment 2SA: (Termination Station) Runoff Area=0.480 ac 2.08% Impervious Runoff Depth=0.67"
Tc=6.0 min CN=56 Runoff=0.49 cfs 0.027 af

Subcatchment 2SB: (MOXIE GORE) Runoff Area=1.180 ac 0.00% Impervious Runoff Depth=1.42"
Tc=43.0 min CN=69 Runoff=1.05 cfs 0.139 af

Reach 2R: (Reach through 2S) Avg. Flow Depth=0.11' Max Vel=1.87 fps Inflow=0.49 cfs 0.027 af
n=0.030 L=178.0' S=0.0309 '/' Capacity=25.27 cfs Outflow=0.47 cfs 0.027 af

Pond 1P: 18 inch culvert Peak Elev=889.54' Storage=12 cf Inflow=1.13 cfs 0.166 af
18.0" Round Culvert n=0.025 L=30.0' S=0.0400 '/' Outflow=1.13 cfs 0.166 af

Total Runoff Area = 1.660 ac Runoff Volume = 0.166 af Average Runoff Depth = 1.20"
99.40% Pervious = 1.650 ac 0.60% Impervious = 0.010 ac

Summary for Subcatchment 2SA: (Termination Station)

Runoff = 0.49 cfs @ 11.99 hrs, Volume= 0.027 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-Year Rainfall=4.23"

	Area (ac)	CN	Description
*	0.470	55	Substation Surface
*	0.010	98	Foundations, HSG B
	0.480	56	Weighted Average
	0.470		97.92% Pervious Area
	0.010		2.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes (Minimum)**

Summary for Subcatchment 2SB: (MOXIE GORE)

Runoff = 1.05 cfs @ 12.44 hrs, Volume= 0.139 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-Year Rainfall=4.23"

Area (ac)	CN	Description
0.770	66	Woods, Poor, HSG B
0.090	96	Gravel surface, HSG B
0.320	67	Brush, Poor, HSG B
1.180	69	Weighted Average
1.180		100.00% Pervious Area

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

Summary for Reach 2R: (Reach through 2S)

Inflow Area = 0.480 ac, 2.08% Impervious, Inflow Depth = 0.67" for 25-Year event
Inflow = 0.49 cfs @ 11.99 hrs, Volume= 0.027 af
Outflow = 0.47 cfs @ 12.01 hrs, Volume= 0.027 af, Atten= 3%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.87 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 5.2 min

Peak Storage= 45 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.27 cfs

2.00' x 1.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 178.0' Slope= 0.0309 '/'
Inlet Invert= 894.50', Outlet Invert= 889.00'

Summary for Pond 1P: 18 inch culvert

Inflow Area = 1.660 ac, 0.60% Impervious, Inflow Depth = 1.20" for 25-Year event
Inflow = 1.13 cfs @ 12.43 hrs, Volume= 0.166 af
Outflow = 1.13 cfs @ 12.43 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.4 min
Primary = 1.13 cfs @ 12.43 hrs, Volume= 0.166 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 889.54' @ 12.43 hrs Surf.Area= 40 sf Storage= 12 cf
Flood Elev= 892.00' Surf.Area= 364 sf Storage= 472 cf

Plug-Flow detention time= 0.6 min calculated for 0.166 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (893.9 - 893.7)

Volume	Invert	Avail.Storage	Storage Description
#1	889.00'	2,307 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
889.00	5	0	0
890.00	70	38	38
891.00	217	144	181
892.00	364	291	472
893.00	918	641	1,113
894.00	1,471	1,195	2,307

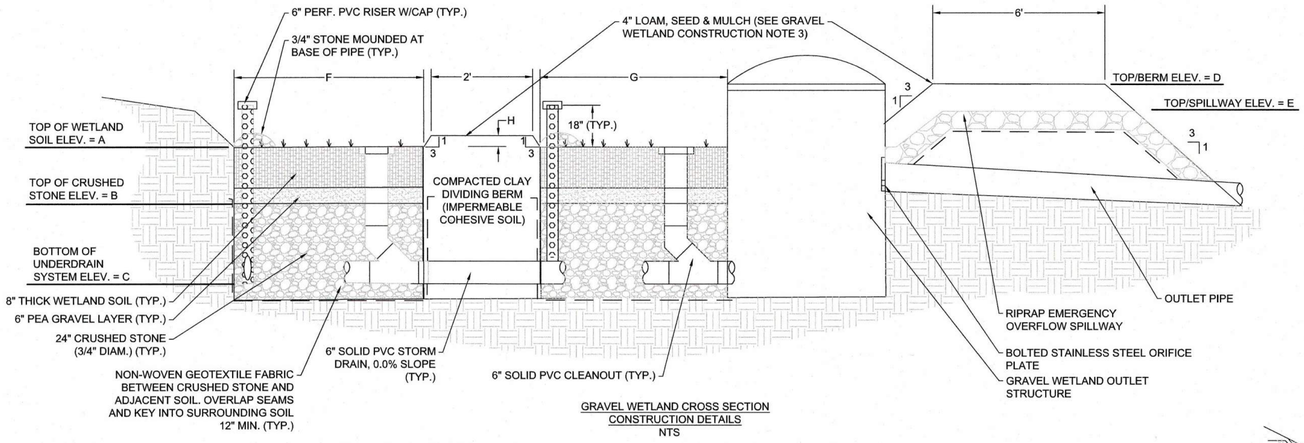
Device	Routing	Invert	Outlet Devices
#1	Primary	889.00'	**18.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 889.00' / 887.80' S= 0.0400 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.77 sf

Primary OutFlow Max=1.13 cfs @ 12.43 hrs HW=889.54' (Free Discharge)
1=Culvert (Inlet Controls 1.13 cfs @ 1.97 fps)

ATTACHMENT E

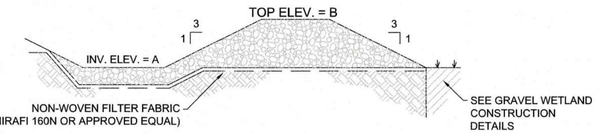
1076-003-002 Sheet 5

1076-003-002 Sheet 6



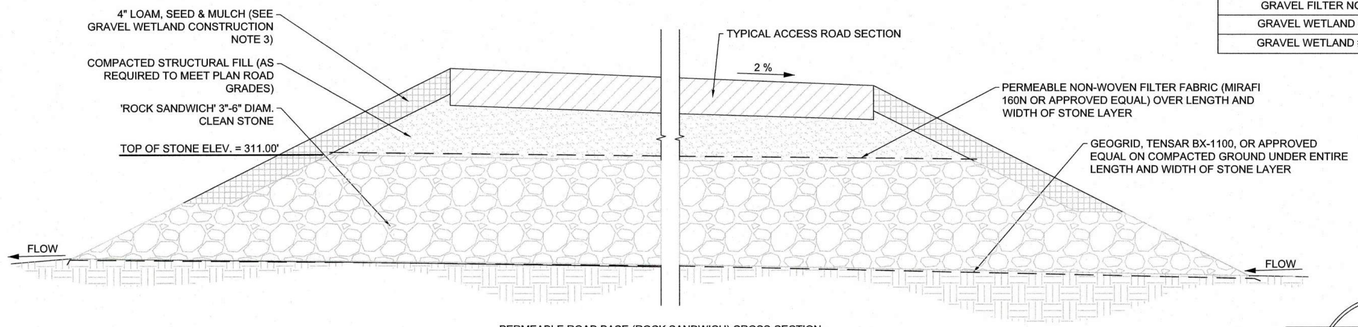
GRAVEL WETLAND CROSS SECTION
CONSTRUCTION DETAILS
NTS

GRAVEL WETLAND ELEVATIONS/GEOMETRY								
GRAVEL WETLAND NUMBER	A	B	C	D	E	F	G	H
GRAVEL WETLAND #1	308.77	307.60	305.60	312.00	310.70	62.00	38.00	7 "
GRAVEL WETLAND #2	308.77	307.60	305.60	312.00	310.80	35.50	40.00	7 "

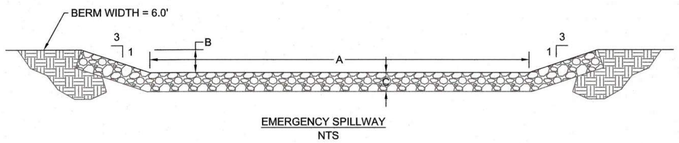


STONE FOREBAY
NTS

STONE FOREBAY ELEVATIONS		
GRAVEL FILTER NO.	A	B
GRAVEL WETLAND #1	310.0	310.5
GRAVEL WETLAND #2	310.0	310.5

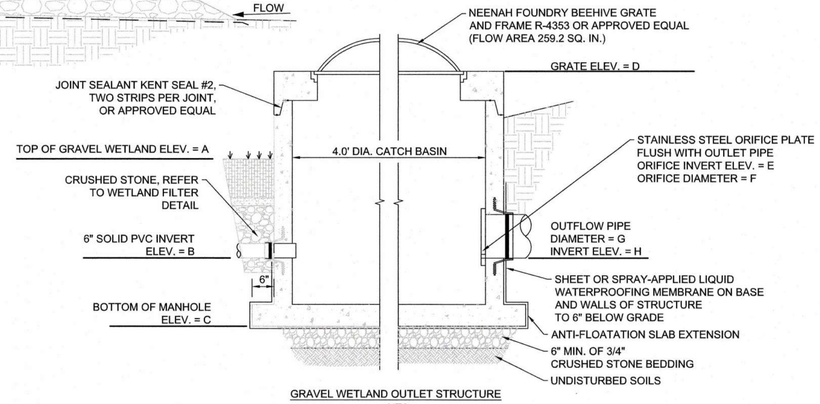


PERMEABLE ROAD BASE (ROCK SANDWICH) CROSS-SECTION
NTS



EMERGENCY SPILLWAY
NTS

EMERGENCY SPILLWAY GEOMETRY						
GRAVEL WETLAND NO.	A	B	C	D	RIP RAP D50	25-YR WATER ELEV.
GRAVEL WETLAND #1	10'	1.30'	18"	310.70	9"	310.72
GRAVEL WETLAND #2	10'	1.20'	12"	310.80	6"	310.80



GRAVEL WETLAND OUTLET STRUCTURE
NTS

GRAVEL WETLAND OUTLET STRUCTURE ELEVATIONS/GEOMETRY								
GRAVEL WETLAND NUMBER	A	B	C	D	E	F	G	H
GRAVEL WETLAND #1	308.77	305.60	304.60	310.27	308.10	7/8"	12.00	308.10
GRAVEL WETLAND #2	308.77	305.60	304.60	310.27	308.10	7/8"	12.00	308.10

GRAVEL WETLAND MATERIAL NOTES:

1. SOLID DRAIN PIPES SHALL BE 6" DIAMETER SCH. 40 PVC. ENDS OF UNDERDRAIN PIPING SHALL BE PLUGGED WITH PIPE FITTINGS. PIPE JOINTS SHALL BE FULLY GLUED.
2. PERFORATED UNDERDRAIN AND VERTICAL RISERS SHALL BE 6" DIAMETER PERFORATED SCH. 40 PVC. RISERS SHALL EXTEND TO 18".
3. COMPACT EMBANKMENT MATERIAL TO 93% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D1557.
4. SIDE SLOPES SHALL BE SEEDED USING "NEW ENGLAND CONSERVATION/WILDLIFE MIX" FROM NEW ENGLAND WETLAND PLANTS, INC.OF AMHERST, MA. OR APPROVED EQUAL (APPLICATION RATE 25# / ACRE).
5. WETLAND PLANTS:
   5.1. FERTILIZER SHALL NOT BE USED TO ESTABLISH VEGETATION.
   5.2. WETLAND PLANTS SHALL BE A MIX OF REEDS (JUNCUS EFFUSUS), CATTAILS (TYPHA LATIFILIA) AND BULRUSH (SCIRPUS)
6. RIPRAP SHALL HAVE D50 = 9" AND SHALL HAVE NON-WOVEN GEOTEXTILE BETWEEN THE RIPRAP AND SOIL LAYER
7. WETLAND MEDIA MATERIALS:
   7.1. WETLAND SOIL SHALL BE 8" THICK MANUFACTURED MIX OF COMPOST, SAND AND FINE SOILS WITH 15% MINIMUM ORGANIC MATTER, 15% SILT PASSING #200 SIEVE AND CLAY LESS THAN 2%. HYDRAULIC CONDUCTIVITY SHALL BE BETWEEN 0.1 AND 0.01 FT./DAY)
   7.2. PEA GRAVEL LAYER SHALL BE 6" THICK LAYER OF PEA GRAVEL.
   7.3. CRUSHED STONE LAYER SHALL BE 24" THICK LAYER OF ANGULAR 3/4" CRUSHED STONE. PIPE UNDERDRAINS SHALL HAVE A MINIMUM OF 2' OF GRAVEL COVER AND 6" OF BEDDING BELOW THE PIPE.

GRAVEL WETLAND CONSTRUCTION INSPECTION AND TESTING NOTES:

1. GRAVEL WETLAND CONSTRUCTION SHALL BE STARTED NO LATER THAN SEPTEMBER 1 OR EARLIER THAN JUNE 1 WITH SEEDING AND STABILIZATION OCCURRING BY SEPTEMBER 15TH
2. THE SUBAREA DRAINING TO THE WETLAND AND THE WETLAND VEGETATION MUST BE COMPLETELY ESTABLISHED AND STABILIZED BEFORE RUNOFF IS DIRECTED TO THE BASIN
3. CONSTRUCT THE GRAVEL WETLAND UNDER THE SUPERVISION OF THE DESIGN ENGINEER
4. MINIMUM INSPECTION REQUIREMENTS ARE AS FOLLOWS:
   4.1. INSPECTIONS BY THE DESIGN ENGINEER DURING CONSTRUCTION:
      4.1.1. AFTER PRELIMINARY CONSTRUCTION OF THE WETLAND GRADES AND ONCE THE UNDERDRAIN PIPES ARE INSTALLED BUT NOT BACKFILLED;
      4.1.2. AFTER THE CRUSHED STONE LAYER IS CONSTRUCTED AND PRIOR TO THE INSTALLATION OF THE PEA GRAVEL AND WETLAND SOIL LAYERS;
      4.1.3. AFTER THE WETLAND SOIL LAYER HAS BEEN INSTALLED AND PLANTED; AND
      4.1.4. AFTER EVERY MAJOR STORM EVENT IN THE FIRST YEAR FOLLOWING CONSTRUCTION AND EVERY SIX MONTHS FOLLOWING THE FIRST YEAR ONE TO INSPECT HEALTH OF THE VEGETATION AND MAKE CORRECTIONS
   4.2. POST CONSTRUCTION INSPECTIONS SHALL INCLUDE:
      4.2.1. CHECK FOR ESTABLISHMENT OF VEGETATION
      4.2.2. CHECK AND CLEAN RISERS IF STANDING WATER, DISCOLORED WATER OR ACCUMULATED SEDIMENTS ARE VISIBLE
      4.2.3. VERIFY THAT CELLS DRAIN WITHIN 24-48 HOURS
      4.2.4. CHECK FOR ACCUMULATED SEDIMENT. REMOVE SEDIMENT BEFORE ACCUMULATION DEPTH REACHES 4" OF SEDIMENT
      4.2.5. CHECK AND CLEAN ALL OUTLETS, INLETS AND SPILLWAYS
      4.2.6. INSPECT FOR AREAS OF EROSION AND MAKE REPAIRS
      4.2.7. REPLACE DEAD OR DECAYING WETLAND VEGETATION
      4.2.8. REMOVE FOREIGN PLANT SPECIES
   4.3. POST CONSTRUCTION INSPECTIONS DURING THE FIRST YEAR SHALL INCLUDE:
      4.3.1. INSPECT THAT THE SYSTEM DRAINS WITHIN 24-48 HOURS
      4.3.2. PLANT WATERING AND RE-VEGETATION REQUIREMENTS
      4.3.3. INSPECT FOR AREAS OF EROSION AND MAKE REPAIRS
      4.3.4. CHECK INLETS, OUTLETS AND RISERS AND REMOVE ACCUMULATED SEDIMENT AND DEBRIS
5. ALL MATERIAL USED FOR THE CONSTRUCTION OF THE GRAVEL WETLAND WILL BE APPROVED BY THE DESIGN ENGINEER, AFTER TESTS BY A CERTIFIED LABORATORY SHOW THAT THEY ARE PASSING MAINE DEP SPECIFICATIONS.
6. THE CONTRACTOR SHALL SUBMIT SAMPLES OF EACH TYPE OF MATERIAL TO BE USED FOR THE WETLAND SOIL MEDIA AND SAMPLES OF THE UNDERDRAIN BEDDING MATERIAL. SAMPLES MUST BE A COMPOSITE OF THREE DIFFERENT LOCATIONS (GRABS) FROM THE STOCKPILE OR PIT FACE. SAMPLE SIZE REQUIRED WILL BE DETERMINED BY THE TESTING LABORATORY.
7. THE CONTRACTOR SHALL PERFORM, OR HAVE PERFORMED, A SIEVE ANALYSIS CONFORMING TO ASTM C138 ON EACH TYPE OF THE SAMPLE MATERIAL. ALL MATERIALS SHALL HAVE A CLAY CONTENT OF LESS THAN 2% AS DETERMNED BY HYDROMETER GRAIN SIZE ANALYSIS.
8. THE CONTRACTOR SHALL PERFORM, OR HAVE PERFORMED, A PERMEABILITY TEST ON THE SOIL FILTER MEDIA MATERIALS CONFORMING TO ASTM D2434 WITH THE MIXTURE COMPACTED TO 90 - 92% OF MAXIMUM DRY DENSITY BASED ON ASTM D698.
9. THE CONTRACTOR SHALL PROVIDE SUBMITTALS FOR EACH COMPONENT OF THE GRAVEL WETLAND, IDENTIFYING THE SOURCE.

PERMEABLE ROAD BASE NOTES:

1. PRIOR TO PLACING THE GEOGRID BENEATH THE STONE LAYER, PERFORM A MINIMAL AMOUNT OF STRIPPING OF EXISTING VEGETATION, ONLY AS NEEDED, TO ALLOW FOR A REASONABLY FLAT GROUND SURFACE FOR THE GEOGRID PLACEMENT
2. DO NOT STUMP OR SIGNIFICANTLY GRUB WETLAND SURFACES. CUT TREES CLOSE TO THE GROUND LEAVING STUMPS IN PLACE.
3. MINIMIZE GROUND DISTURBANCE AND AVOID EXCAVATING DITCHES.
4. AFTER THE SITE HAS BEEN PREPARED PLACE THE GEOGRID OVER THE LENGTH OF THE ROADWAY WITH MINIMUM 18" OVERLAP AT THE JOINTS.
5. THE ROCK CORE SHALL BE, AT MINIMUM, A 12" THICK LAYER OF CLEAN 3"-6" DIAMETER STONE ON GEOGRID FOR THE ENTIRE ROADWAY LENGTH AND WIDTH.
6. PLACE THE PERMEABLE, NON-WOVEN FILTER FABRIC ON TOP OF THE ENTIRE LENGTH AND WIDTH OF THE ROCK LAYER. DO NOT COVER UP-GRADIENT AND DOWN-GRADIENT SIDES OF THE ROCK LAYER WITH FABRIC.
7. IF INADVERTENT SOIL DISTURBANCE HAS OCCURRED UP-GRADIENT OF THE ROCK SANDWICH, PLACE STONE ON THE DISTURBED SOIL THAT WILL PREVENT SOIL MIGRATION TO THE ENDS OF THE ROCK SANDWICH.
8. PLACE ADDITIONAL ROAD FILL TO ACHIEVE DESIGN GRADES.

ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION
01/16/19

REV.	DESCRIPTION	DATE	BY	CK	APP
A	ACCESS ROAD ALIGNMENT REVISIONS	07/12/18	TJG	KRV	
B	STORMWATER MANAGEMENT REVISIONS	08/09/18	TJG	KRV	
C	STORMWATER MANAGEMENT REVISIONS	01/15/19	AJW	KRV	

OWNER ENGINEER:
APPROVAL STAMP:
DRAWING PREPARED BY:
ACCEPTED BY OE:

PE Stamp
STATE OF MAINE
KENNETH J. VOLCKEN
No. 11062
LICENSED PROFESSIONAL ENGINEER
Rev. C

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CMP
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REV.	DATE	BY	DESCRIPTION	APP.

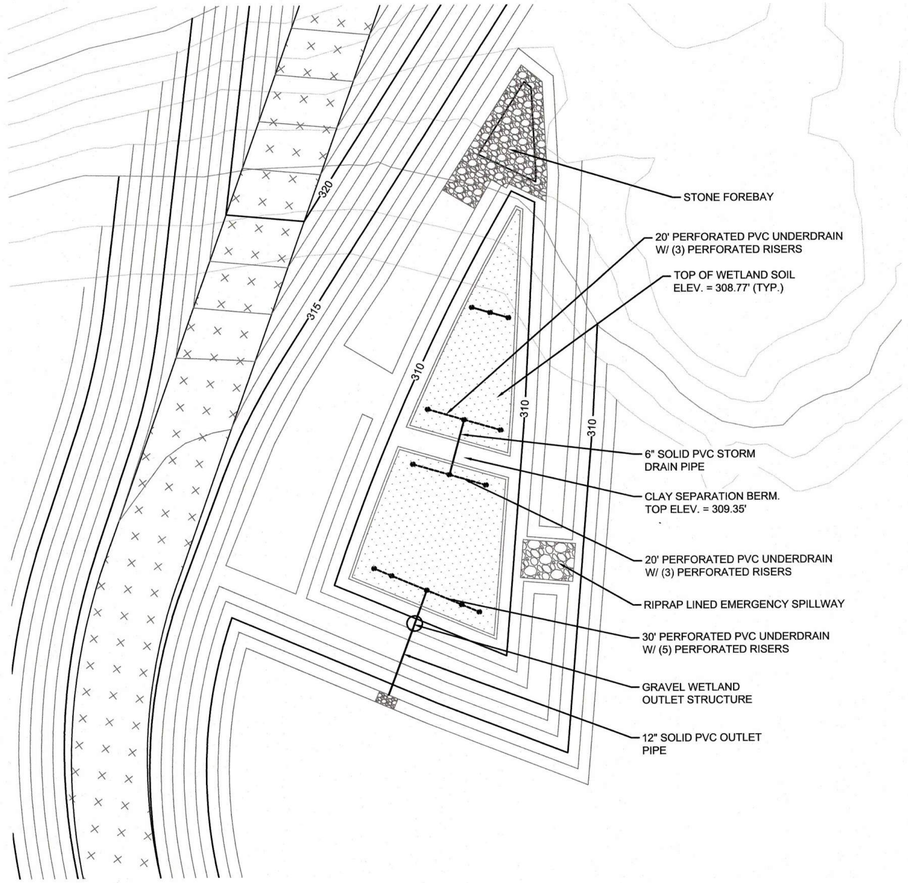
STORMWATER TREATMENT PLAN

SH 5 OF 6

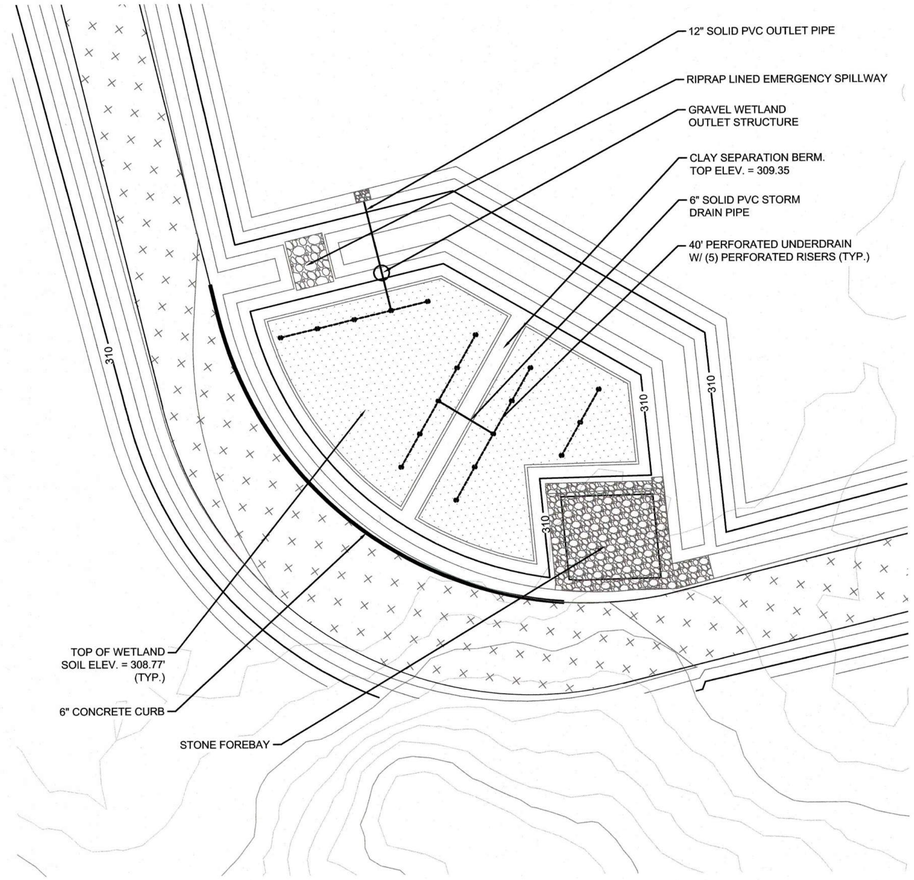
MERRILL ROAD/1076 LEWISTON, ME

DR.	TJG	SCALE: N/A	FILE: 1076-003-002SH002.DWG
CK.	KRV	NO.	REV.
APP.		1076-003-002	C
DATE			

ANSI D CADD Drawing, DO NOT REVISE MANUALLY.



GRAVEL WETLAND #1 PLAN
1"=20'



GRAVEL WETLAND #2 PLAN
1"=20'

LEGEND

- 750 — EX. MAJOR CONTOUR
- 744 — EX. MINOR CONTOUR
- 750 — PROP. MAJOR CONTOUR
- 744 — PROP. MINOR CONTOUR
- WETLAND SOIL
- FOREBAY/SPILLWAY RIPRAP (D50 = 9")
- PROPOSED ACCESS ROAD
- PERFORATED PVC RISER (PERFORATED SCH. 40 PVC)
- PERFORATED PVC STORM PIPE (PERFORATED SCH. 40 PVC)
- SOLID PVC STORM PIPE (SCH. 40 PVC)

NOTE: REFER TO SHEET 1076-003-002SH002 FOR ADDITIONAL MATERIAL SPECIFICATIONS.

20 0 20 40 FT
SCALE: 1" = 20'

ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION
01/16/19

REV.	DESCRIPTION	DATE	BY	CK	APP
A	STORMWATER MANAGEMENT REVISIONS	01/16/19	TJG	KRV	

OWNER ENGINEER:
APPROVAL STAMP:
DRAWING PREPARED BY:
ACCEPTED BY OE:

PE Stamp: STATE OF MAINE, KENNETH R. VOLOCK, No. 10052, LICENSED PROFESSIONAL ENGINEER, 01-16-2019

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REV.	DATE	BY	DESCRIPTION	APP.

POST-DEVELOPMENT STORMWATER PLAN
GRAVEL WETLAND PLAN

SH 6 OF 6

MERRILL ROAD/1076 — LEWISTON, ME

DR.	TJG	SCALE: 1" = 20'	FILE: 1076-003-002SH006.DWG
CK.	KRV	NO.	REV.
APP.		1076-003-002	A
DATE:			

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CADD Drawing, DO NOT REVISE MANUALLY.