



Grange Engineering LLC

New Gloucester, Maine
Grange.Engineering.Me@gmail.com
207 712 6990

George Thebargue
Deer Creek Crossing
Final Approval Application- Comment Response

December 7, 2022

Town of Durham Planning Board,


In response to the peer reviews second round of comments, I have prepared the following letter and supporting documentation.

Thanks,

Charlie Burnham, P.E.
Project Engineer

Attachments:

A – DEP NRPA Permit
B – Plan Set



1. The plan view on sheet C-200 has the stream crossing culvert called out as 48", revise the size.

Note changed to say the 60" arch.

2. Sheet C-305 shows the stream crossing. We recommend that the detail be improved to show the size of the culvert footers and the top and bottom elevations of the footers. It is not clear if the cross section on this sheet is drawn to scale, (no scale provided). It is not clear what the effective cross-section of the new culvert will be as it appears that the top of the arch is set just about at the top of the existing stream banks, which may not be the intent. The culvert that is drawn in the section appears to be a metal "box" culvert shape rather than an "arch" shape. We have concerns that if more detail is not provided, it will be confusing at the time of construction on how to construct this culvert. The notes on this sheet could be confusing because they appear to be generic notes from the USACE General Permit. For example, notes 2.a, 2.b, and 5.2 do not apply to the arch-type culvert that is being installed for this project.

The details have been updated. The culvert could be boxed or arched as long as it spans 60".

3. Sheet C-200 calls out invert-in and invert-out elevations for the culvert, however, since the structure is an open bottom arch, the inverts will be the natural inverts of the stream channel.

Inverts have been removed.

4. The response to prior comment #31 states that General Note 4 on Sheet C-101 has been removed. General Note 4 still indicates that if side setbacks are cleared during the grading of the lots or road, the same number of trees that were removed will be replanted. Our question remains. How will the number of trees that are removed during construction be quantified so the correct number can be replanted. It would be more appropriate to restrict tree cutting in the side setbacks.

Note #4 has been removed this time.

5. Provide a rip rap spillway detail for the ponds.

A note has been added specifying the spillway details on C-303.

6. Response #14 states that separating the roadway runoff from the total runoff would not affect the peak flows. We still recommend that the ditch flows and capacities should be checked as noted in the original comment to verify the stability of the roadside ditches. We also recommend revising the HydroCAD stormwater calcs and culvert capacity calcs to account for the impervious runoff. We performed a quick check of the peak runoff from the roadway, (pavement and ditch), from the southerly side of the road from approximately Station 9+00 to 16+00. The calculated peak flows were 0.12 cfs for the 2 yr. storm, 0.43 cfs for the 10 yr. storm and 0.74 cfs for the 25 yr. storm at the cross culvert to the underdrained soil filter, which are close to your calculated peak flows from the entire site. As stated in the original comment, combining the roadway runoff with the large wooded HSG A areas artificially suppresses the peak flows from the roadway. Additionally, the ditch flows may collect runoff from the developed lots as well.

It is our opinion that the stormwater model as provided took an extremely conservative approach. Subcatchment lines were drawn along the edge of streams and the actual area draining to the Point of Analysis is so large that any changes to our site would have been negligible. We chose to analyze smaller areas and provide treatment in accordance with the sizing standards set forth by the DEP. Each Subcatchment was drawn in accordance with what areas are draining to our points of interest. It is our opinion that despite the difference in smaller storms, the 25-year storm as modeled had a greater peak runoff than the 0.74 mentioned above. Therefore, it is our opinion that the model provides appropriate stormwater quality and quantity treatment.

7. As noted previously, the subdivision plan shall be stamped by the surveyor and the engineer.

The recorded plan will be hand stamped by the engineer and surveyor.

8. As noted previously the transformer easements shall be added to the subdivision plan.

A note was added to the Subdivision Plat requiring that all transformers and public utilities be located inside the ROW. Utilities shown are for permitting purposes only. It is our understanding/experience that CMP will locate the transformers wherever they want them inside the ROW.

9. The use of erosion control blankets for slopes greater than 15% is recommended by the MDEP Maine Erosion and Sediment Control Best Management Practices manual for Designers and Engineers. An erosion control blanket shall be specified for slopes greater than 15% rather than the 3:1 proposed in your response.

Note has been updated.

10. As noted previously, Route 9 should be labelled on sheets C101, C102, C200.

"Hallowell Road" has been added to each plan.

11. Show the stream setbacks on plan sheet C303.

Stream setbacks have been added to C-303.

12. Response #44 states that an NRPA permit application has been submitted. It does not appear that the impact to the stream by the underdrained soil filter has been included in the NRPA application as an impact adjacent to a protected natural resource. The application shall be revised to include the underdrained soil filter impact within the stream setback.

NRPA application has been revised and a copy of the application is attached.

13. The loam and seed on the sloped banks of the underdrained soil filter shall be called out on Detail Sheet C303. A reference to the seeding plan in the erosion control notes should be added to the underdrained soil filter detail for seeding of the soil media.

C-303 has been updated.

14. Response #77 noted that a reference to the Town's Dry Hydrant Standard is on Sheet C-302. A reference to the standards was not found.

A note has been added to the C-302 requiring Fire Chief signoff on all Dry Hydrant materials/equipment prior to installation.

15. The comment to supply a typical house lot erosion control plan was not addressed in the response letter.

A page from the Maine DEP contractor's manual has been included which shows a typical house lot erosion control plan.

16. A MaineDOT entrance permit is pending. The permit shall be submitted to the Town upon receipt.

Still pending.

17. A ditch is required on the right side of the road from approximately 15+00 to 18+00 to direct uphill drainage including potential lots from draining into the road.

Spot grades have been added to show that there is depression along the northside of the road.

**DEPARTMENT OF ENVIRONMENTAL PROTECTION
PERMIT BY RULE NOTIFICATION FORM**

(For use with DEP Regulation, Natural Resources Protection Act - Permit by Rule Standards, Chapter 305)

APPLICANT INFORMATION (Owner)				AGENT INFORMATION (If Applying on Behalf of Owner)			
Name:	Jack Doughty			Name:	Charles Burnham		
Mailing Address:	231 Flying Point Road			Mailing Address:	241 Rowe Station Road		
Mailing Address:				Mailing Address:			
Town/State/Zip:	Freeport, Maine, 04032			Town/State/Zip:	New Gloucester, Maine, 04260		
Daytime Phone #:	(207) 809-9976	Ext:		Daytime Phone #:	(207) 712-6990	Ext:	
Email Address:	jacktdoughty@gmail.com			Email Address:	grange.engineering.me@gmail.com		
PROJECT INFORMATION							
Part of a larger project? (check 1):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	After the Fact? (check 1):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Project involves work below mean low water? (check 1):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Name of waterbody:	Dyer Brook
Project Town:	Durham		Town Email Address:	townplanner@durhammaine.gov		Map and Lot Number:	Map 7 Lot 32A
Brief Project Description:	13-Lot cluster subdivision. Site has been used for logging and there is an existing stream crossing just down stream from the proposed crossing.						
Project Location & Brief Directions to Site:	From portland take exit 22 in Freeport. Travel North on 136. Next left onto route 9 south. Existing dirt road on the right just after the elementary school.						

PERMIT BY RULE (PBR) SECTIONS (Check at least one): I am filing notice of my intent to carry out work that meets the requirements for Permit-by-Rule (PBR) under DEP Rules, [Chapter 305](#). I and my agent(s), if any, have read and will comply with all of the standards in the Sections checked below.

- | | | |
|--|--|---|
| <input checked="" type="checkbox"/> Sec. (2) Act. Adj. to Prot. Natural Res. | <input type="checkbox"/> Sec. (9) Utility Crossing | <input type="checkbox"/> Sec. (16) Coastal Sand Dune Projects |
| <input type="checkbox"/> Sec. (3) Intake Pipes | <input checked="" type="checkbox"/> Sec. (10) Stream Crossing | <input type="checkbox"/> Sec. (17) Transfer/Permit Extension |
| <input type="checkbox"/> Sec. (4) Replacement of Structures | <input type="checkbox"/> Sec. (11) State Transportation Facilities | <input type="checkbox"/> Sec. (18) Maintenance Dredging |
| <input type="checkbox"/> Sec. (6) Movement of Rocks or Veg. | <input type="checkbox"/> Sec. (12) Restoration of Natural Areas | <input type="checkbox"/> Sec. (19) Act. Near SVP Habitat |
| <input type="checkbox"/> Sec. (7) Outfall Pipes | <input type="checkbox"/> Sec. (13) F&W Creat./Water Qual. Improv. | <input type="checkbox"/> Sec. (20) Act. Near Waterfowl/Bird Habitat |
| <input type="checkbox"/> Sec. (8) Shoreline Stabilization | <input type="checkbox"/> Sec. (15) Public Boat Ramps | |

NOTE: Municipal permits also may be required. Contact your local code enforcement office for information. Federal permits may be required for stream crossings and for projects involving wetland fill. Contact the Army Corps of Engineers at the Maine Project Office for information.

NOTIFICATION FORMS CANNOT BE ACCEPTED WITHOUT THE NECESSARY ATTACHMENTS AND FEE

- Attach** all required submissions for the PBR Section(s) checked above. The required submissions for each PBR Section are outlined in Chapter 305 and may differ depending on the Section you are submitting under.
- Attach** a location map that clearly identifies the site (U.S.G.S. topo map, Maine Atlas & Gazetteer, or similar).
- Attach** Proof of Legal Name if applicant is a corporation, LLC, or other legal entity. Provide a copy of Secretary of State's registration information (available at <http://icrs.informe.org/nei-sos-icrs/ICRS?MainPage=x>). Individuals and municipalities are not required to provide any proof of identity.

FEE: Pay by credit card at the [Payment Portal](#). The Permit-by-Rule fee may be found here <https://www.maine.gov/dep/feeschedule.pdf> and is currently \$266.

- Attach** payment confirmation from the Payment Portal when filing this notification form.

Signature & Certification:

- I authorize staff of the Departments of Environmental Protection, Inland Fisheries & Wildlife, and Marine Resources to access the project site for the purpose of determining compliance with the rules.
- I understand that this PBR becomes effective 14 calendar days after receipt by the Department of this completed form, the required submissions, and fee, *unless the Department approves or denies the PBR prior to that date.*

By signing this Notification Form, I represent that the project meets all applicability requirements and standards in Chapter 305 rule and that the applicant has sufficient title, right, or interest in the property where the activity takes place.

Signature of Agent or Applicant (may be typed):	Charlie Burnham	Date:	12/05/2022
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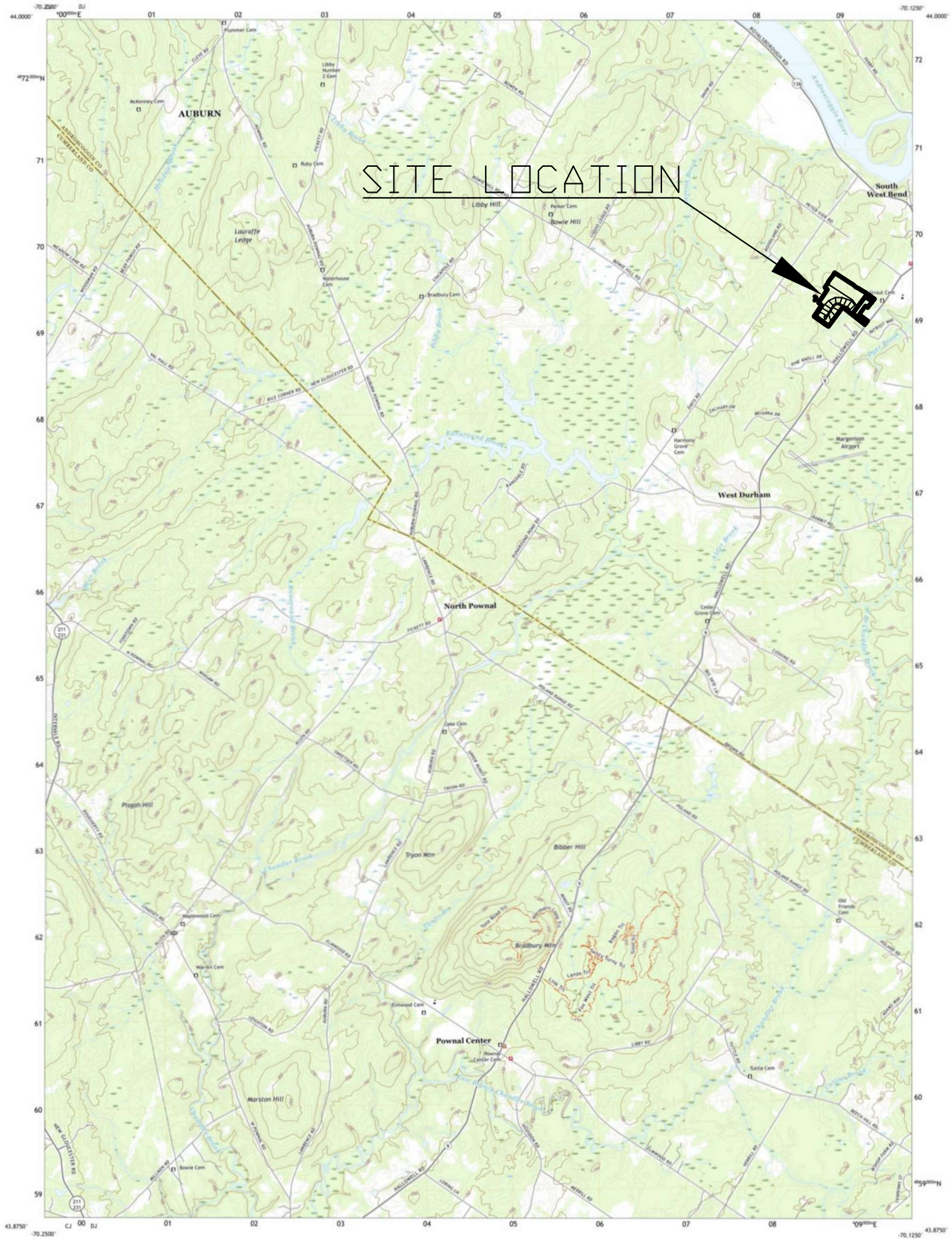
Keep a copy as a record of permit. Email this completed form with attachments to DEP at: DEP.PBRNotification@maine.gov. DEP will send a copy to the Town Office as evidence of DEP's receipt of notification. No further authorization will be issued by DEP after receipt of notice. A PBR is valid for two years, except Section 4, "Replacement of Structures," are valid for three years. **Work carried out in violation of the Natural Resources Protection Act or any provision in Chapter 305 is subject to enforcement.**

PROJECT NARRATIVE

The following application is for a stream crossing associated with a thirteen-lot subdivision off Hallowell Road. The stream is thirty inches wide at the proposed crossing location (See Photo 1). We are proposing a 60" spanning arch culvert . We have sized the stream to handle a 100 -year storm . The subcatchment feeding the proposed crossing is primarily wooded and highly draining soils.

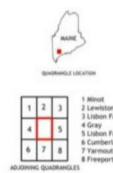
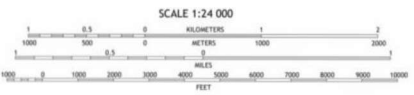
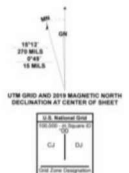
Attached to this application is a Site Location Figure (Attachment A), Site Photos (Attachment B), and culvert sizing calculations (Attachment C).

ATTACHMENT A



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid/Universal Transverse Mercator, Zone 18T
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.

Imagery: NADP, September 2018 - October 2018
Base: U.S. Census Bureau, 2019
Hydrography: National Hydrography Dataset, 2012 - 2019
Boundaries: Multiple sources; see metadata file 2018 - 2019
Wetlands: FWS National Wetlands Inventory 2001 - 2004



ROAD CLASSIFICATION

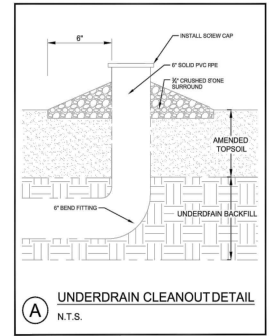
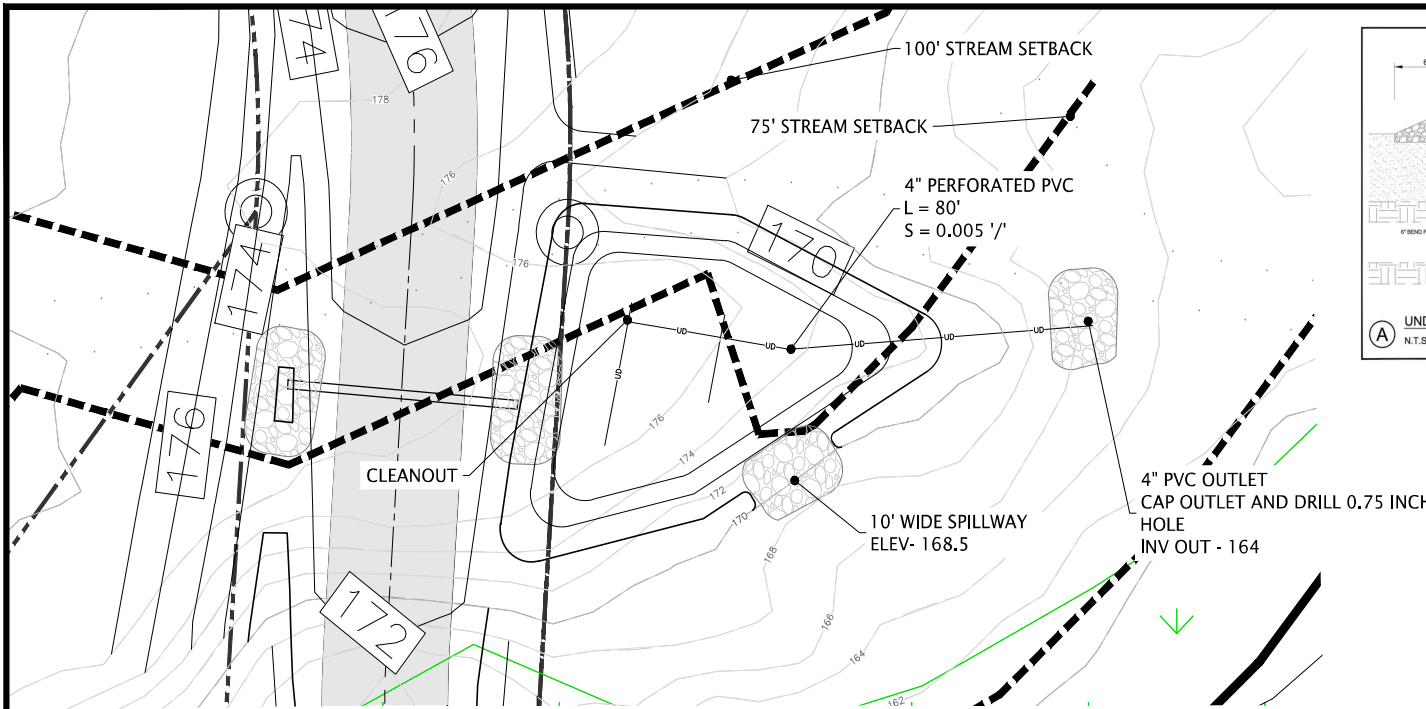
- Expressway
- Secondary Hwy
- Ramp
- Local Connector
- Local Road
- 4WD
- US Route
- State Route

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
This map was produced in conformance with the
National Geospatial Program US Topo Product Standard.

1	2	3
4	5	6
7	8	9

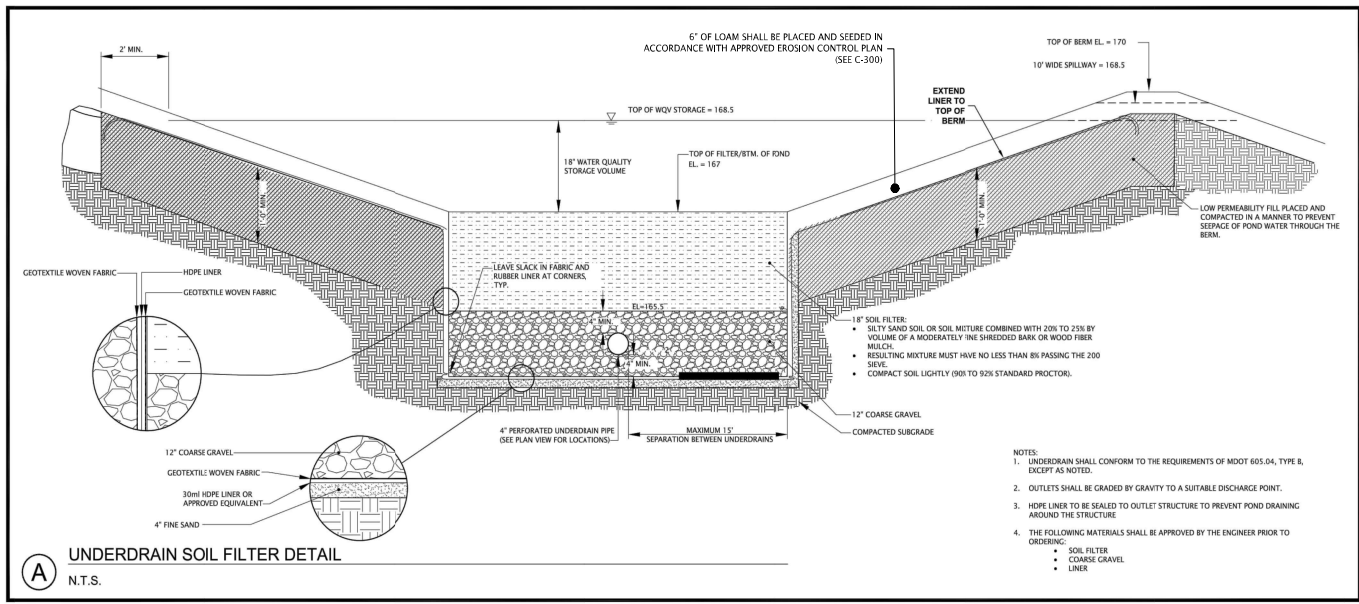
1 Millin
2 Lewiston
3 Libby Falls North
4 Gray
5 Libby Falls South
6 Cumberland Center
7 Farmstead
8 Freeport

NORTH POWNAL, ME
2021



EMERGENCY SPILLWAY NOTES:

1. 12" OF 6" D50 WILL BE PLACED ALONG THE EXTENTS OF THE SPILLWAY.
2. A NONWOVEN GEOTEXTILE FABRIC WILL BE INSTALLED 2' BEYOND THE RIPRAP AND KEYED IN UNDER 6" OF LOAM AND SEED.
3. RIPRAP WILL EXTEND 5 FEET DOWN GRADIENT BEYOND THE TOP OF THE SPILLWAY.



UNDERDRAINED SOIL FILTER NOTES:

1. UNDERDRAINED FILTER BASINS CONSTRUCTION SEQUENCE: THE SOIL FILTER MEDIA AND VEGETATION MUST NOT BE INSTALLED UNTIL THE AREA THAT DRAINS TO THE FILTER HAS BEEN PERMANENTLY STABILIZED WITH PAVEMENT OR OTHER STRUCTURE. 90% VEGETATION COVER OR OTHER PERMANENT STABILIZATION UNLESS THE RUNOFF FROM THE CONTRIBUTING DRAINAGE AREA IS DIVERTED AROUND THE FILTER. AFTER STABILIZATION IS COMPLETED, COMPACTION OF SOIL FILTER, FILTER SOIL MEDIA AND UNDERDRAIN BEDDING MATERIAL MUST BE COMPLETED TO BETWEEN 90% AND 92% STANDARD PROCTOR. THE BED SHOULD BE INSTALLED IN AT LEAST 2 LIFTS OF 9 INCHES TO PREVENT POCKETS OF LOOSE MEDIA. CONSTRUCTION OVERSIGHT INSPECTION BY A PROFESSIONAL ENGINEER WILL OCCUR AT A MINIMUM.
 - AFTER THE PRELIMINARY CONSTRUCTION OF THE FILTER GRABES AND ONCE THE UNDERDRAIN PIPES ARE INSTALLED BUT NOT BACKFILLED.
 - AFTER THE DRAINAGE LAYER IS CONSTRUCTED AND PRIOR TO THE INSTALLATION OF THE FILTER MEDIA.
 - AFTER THE FILTER MEDIA HAS BEEN INSTALLED AND SEEDED. BIO-RETENTION CELLS MUST BE STABILIZED PER THE PROVIDED PLANTING SCHEME AND DENSITY FOR THE CANOPY COVERAGE OF 30 AND 50%.
 - AFTER ONE YEAR TO INSPECT HEALTH OF THE VEGETATION AND MAKE CORRECTIONS, AND
 - ALL THE MATERIAL USED FOR THE CONSTRUCTION OF THE FILTER BASIN MUST BE CONFIRMED AS SUITABLE BY THE DESIGN ENGINEER. TESTING MUST BE DONE BY A CERTIFIED LABORATORY TO SHOW THAT THEY ARE PASSING OUR SPECIFICATIONS.
2. TESTING AND SUBMITTALS: THE CONTRACTOR SHALL IDENTIFY THE LOCATION OF THE SOURCE OF EACH COMPONENT OF THE FILTER MEDIA. ALL RESULTS OF FIELD AND LABORATORY TESTING SHALL BE SUBMITTED TO THE PROJECT ENGINEER FOR CONFIRMATION. THE CONTRACTOR SHALL:
 - SELECT SAMPLES FOR SAMPLING OF EACH TYPE OF MATERIAL TO BE BLENDED FOR THE MIXED FILTER 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.
 - PERFORM A SIEVE ANALYSIS CONFORMING TO ASTM C136 (STANDARD TEST METHOD FOR SIEVE ANALYSIS OF FINE AND COURSE AGGREGATES) 100% ON EACH TYPE OF THE SAMPLE MATERIAL. THE RESULTING SOIL FILTER MEDIA MIXTURE MUST HAVE 8% TO 12% BY WEIGHT PASSING THE #200 SIEVE, A CLAY CONTENT OF LESS THAN 2% (DETERMINED BY HYDROMETER GRAIN SIZE ANALYSIS) AND HAVE 10% DRY WEIGHT OF ORGANIC MATTER.
 - PERFORM A PERMEABILITY TEST ON THE SOIL FILTER MEDIA MIXTURE CONFORMING TO ASTM D2434 WITH THE MIXTURE COMPACTED TO 90-92% OF MAXIMUM DRY DENSITY BASED ON ASTM D698.
3. DEWATERING: A DEWATERING PLAN IS NEEDED TO ADDRESS EXCAVATION DEWATERING FOLLOWING HEAVY RAINFALL EVENTS OR WHERE THE EXCAVATION MAY INTERCEPT THE GROUNDWATER TABLE DURING CONSTRUCTION. THE COLLECTED WATER NEEDS TREATMENT AND A DISCHARGE POINT THAT WILL NOT CAUSE DOWNGRADIENT EROSION AND OFFSITE SEDIMENTATION OR WITHIN A RESOURCE. PLEASE FOLLOW THE DETAILS OF SUCH A PLAN.
4. BASIC STANDARDS: EROSION CONTROL MEASURES: MINIMUM EROSION CONTROL MEASURES WILL NEED TO BE IMPLEMENTED AND THE APPLICANT WILL BE RESPONSIBLE TO MAINTAIN ALL COMPONENTS OF THE EROSION CONTROL PLAN UNTIL THE SITE IS FULLY STABILIZED. HOWEVER, BASED ON SITE AND WEATHER CONDITIONS DURING CONSTRUCTION, ADDITIONAL EROSION CONTROL MEASURES MAY NEED TO BE IMPLEMENTED. 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. A CONSTRUCTION LOG MUST BE MAINTAINED FOR THE EROSION AND SEDIMENTATION CONTROL INSPECTIONS AND MAINTENANCE. THE MAINE EROSION AND SEDIMENT CONTROL HANDBOOK FOR CONSTRUCTION: BEST MANAGEMENT PRACTICES AS PUBLISHED IN 1991 BY THE CUMBERLAND COUNTY SOIL AND WATER CONSERVATION DISTRICT AND THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION HAS BEEN CHANGED TO THE "MAINE EROSION AND SEDIMENT CONTROL BMP'S" PUBLISHED BY THE MAINE DEP IN 2003. ALL REFERENCES SHOULD BE CHANGED TO THE NEW MANUAL. [HTTP://WWW.MAINE.GOV/DEP/BLW/DOD/STANDARDS/BMP/INDEX.HTM](http://www.maine.gov/dep/blw/dod/standards/bmp/index.htm)

CONSTRUCTION OVERSIGHT REQUIRED:

THE APPLICANT WILL RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER OR THIRD PARTY INSPECTOR TO INSPECT THE CONSTRUCTION AND STABILIZATION OF ALL STORMWATER MANAGEMENT STRUCTURES. IF NECESSARY, THE INSPECTING ENGINEER WILL INTERPRET THE PONDS CONSTRUCTION PLAN FOR THE CONTRACTOR. ONCE ALL STORMWATER MANAGEMENT STRUCTURES ARE CONSTRUCTED AND STABILIZED, THE INSPECTING ENGINEER WILL NOTIFY BOTH THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION AS WELL AS THE TOWN OF ARUNDEL IN WRITING WITHIN 30 DAYS TO STATE THAT THE POND HAS BEEN COMPLETED. ACCOMPANYING THE ENGINEER'S NOTIFICATION MUST BE A LOG OF THE ENGINEER'S INSPECTIONS DURING THE DATE OF EACH INSPECTION, THE TIME OF EACH INSPECTION, AND THE ITEMS INSPECTED ON EACH VISIT, AND INCLUDE ANY TESTING DATA OR SIEVE ANALYSIS DATA OF EVERY MINERAL SOIL AND SOIL MEDIA SPECIFIED IN THE PLANS AND USED ON SITE.

SUBMITTED FOR
FINAL PLAN
REVIEW

REV	DATE	DESCRIPTION	REVISIONS
1	11/22/2022	FINAL SUBMISSION RESPONSE	
2	10/17/2022	FINAL SUBMISSION	
3	6/22/2022	AMENDED PRELIMINARY SUBMISSION	
4	5/19/2022	PRELIMINARY SUBMISSION	
5	5/4/2022	SKETCH PLAN SUBMISSION	



**DEEPER CREEK CROSSING
DURHAM, MAINE**

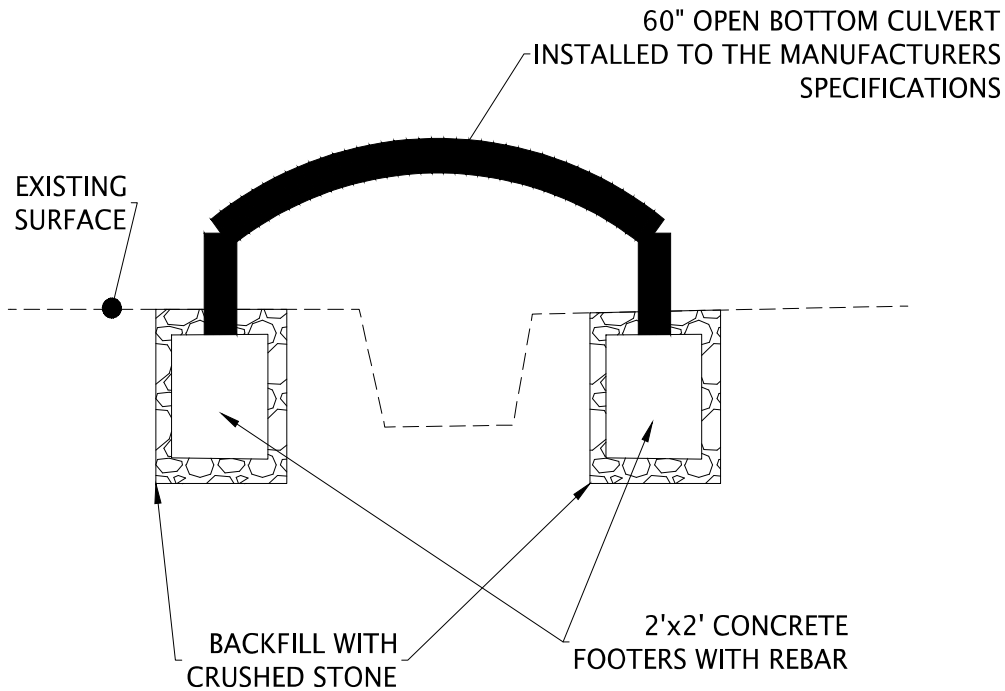
CIVIL DETAILS

3

Jack Doughty
231 Whiting Point Road
Freeport, Maine 04932

Grange Engineering LLC
241 Rowe Station Road
New Gloucester, ME 04260
Tel: 207.712.6990

DRAWN: CB	DATE: OCTOBER 19, 2022
DESIGNED: CB	SCALE:
CHECKED: CB	JOB NO. 1
FILE NAME:	
SHEET: C-303	



1. Span streams or size culverts or pipe arches such that they are wider than bankfull width (BFW). Spans are strongly preferred as they avoid or minimize disruption to the streambed, and avoid entire streambed reconstruction and maintenance inside the culvert or pipe arch (see 4, 5 & 7 below), which may be difficult in smaller structures. Footings and abutments for spans and scour protection should be landward of 1.2 times BFW. The width of culverts and arches at bankfull elevation should be ≥ 1.2 times BFW.
2. Embed pipe arch below the grade of the streambed. This is not required when ledge/bedrock prevents embedment, in which case spans are required. The following depths are recommended to prevent streambed washout, and ensure compliance and long-term success:
 - a. ≥ 2 feet for box culverts and pipe arches,
3. Match the culvert gradient (slope) with the stream channel profile.
4. Construct crossings with a natural bottom substrate within the structure matching the characteristics of the substrate in the natural stream channel and the banks (mobility, slope, stability, confinement, grain and rock size) at the time of construction and over time as the structure has had the opportunity to pass substantial high flow events.
5. Construct crossings with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows at the time of construction and over time. In order to provide appropriate water depths and

For the purposes of this GP, spans are bridges, three-sided box culverts, open-bottom culverts or arches that span the stream with footings landward of BFW. The use of bridge piers or similar supports does not prevent a structure from being considered as a span.

6. Banks on each side of the stream inside the crossing matching the horizontal profile of the existing stream and banks outside the crossing are recommended. This will allow terrestrial passage for wildlife and prevent flow from being focused to one side and scouring the bed, especially against the structure's sidewall which may undermine the footings in the case of spans. To prevent failure, all constructed banks should have a height to width ratio of no greater than 1:1.5 (vertical:horizontal) unless the stream is naturally incised. Tie these banks into the up and downstream banks and configure them to be stable during expected high flows
7. All

SUBMITTED FOR
FINAL PLAN
REVIEW

			DEER CREEK CROSSING DURHAM, MAINE STREAM CROSSING DETAILS	Grange Engineering LLC 241 Rowe Station Road New Gloucester, ME 04260 Tel: 207.712.6990
5 11/20/2022 FINAL SUBMISSION RESPONSE 4 10/17/2022 FINAL SUBMISSION 3 6/22/2022 AMENDED PRELIMINARY SUBMISSION 2 5/19/2022 PRELIMINARY SUBMISSION 1 5/4/2022 SKETCH PLAN SUBMISSION	REV DATE DESCRIPTION REVISIONS		Jack Doughty 231 Spring Point Road Freeport, Maine 04032	DRAWN: CB DATE: OCTOBER 19, 2022 DESIGNED: CB SCALE: CHECKED: CB JOB NO. 1 FILE NAME: SHEET: C-305

ATTACHMENT B

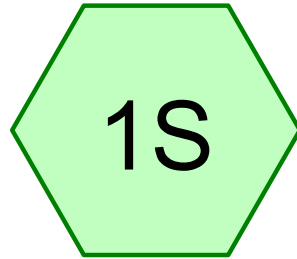


Photo 1- View of the proposed crossing location.

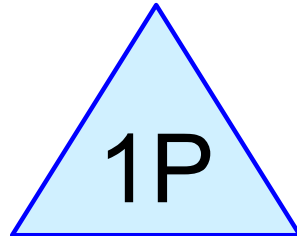
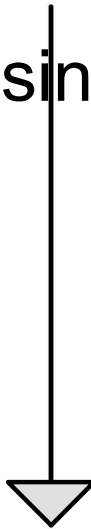


Photo 2- View of the bank opposite the crossing. Bank will be cut down slightly to minimize the fill/ footprint of the crossing.

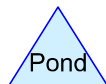
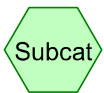
ATTACHMENT C



Crossing SC



Culvert



Crossing Model

Prepared by Full Version

HydroCAD® 10.00-24 s/n 08018 © 2018 HydroCAD Software Solutions LLC

Printed 5/16/2022

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
81.064	30	Woods, Good, HSG A (1S)
81.064	30	TOTAL AREA

Crossing Model

Prepared by Full Version

HydroCAD® 10.00-24 s/n 08018 © 2018 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.94"

Printed 5/16/2022

Page 3

Summary for Subcatchment 1S: Crossing SC

Runoff = 1.92 cfs @ 13.85 hrs, Volume= 1.306 af, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type II 24-hr 100-Year Rainfall=6.94"

Area (sf)	CN	Description
3,531,152	30	Woods, Good, HSG A
3,531,152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.0	100	0.0200	0.08		Sheet Flow, First 100 Feet Woods: Light underbrush n= 0.400 P2= 3.04"
18.3	936	0.0290	0.85		Shallow Concentrated Flow, Shallow Concentrated Woodland Kv= 5.0 fps
4.8	2,774	0.0210	9.73	116.72	Channel Flow, Stream Area= 12.0 sf Perim= 10.0' r= 1.20' n= 0.025 Earth, clean & winding
45.1	3,810	Total			

Summary for Pond 1P: Culvert

Inflow Area = 81.064 ac, 0.00% Impervious, Inflow Depth > 0.19" for 100-Year event
 Inflow = 1.92 cfs @ 13.85 hrs, Volume= 1.306 af
 Outflow = 1.91 cfs @ 14.04 hrs, Volume= 1.294 af, Atten= 1%, Lag= 11.2 min
 Primary = 1.91 cfs @ 14.04 hrs, Volume= 1.294 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
 Peak Elev= 162.33' @ 14.04 hrs Surf.Area= 5,036 sf Storage= 1,011 cf

Plug-Flow detention time= 8.6 min calculated for 1.288 af (99% of inflow)
 Center-of-Mass det. time= 5.0 min (1,071.1 - 1,066.1)

Volume	Invert	Avail.Storage	Storage Description
#1	162.00'	175,151 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.00	1,123	0	0
164.00	24,963	26,086	26,086
166.00	124,102	149,065	175,151

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	60.0" W x 36.0" H Arch Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 162.00' / 161.50' S= 0.0125 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 8.00 sf

Crossing Model

Type II 24-hr 100-Year Rainfall=6.94"

Prepared by Full Version

Printed 5/16/2022

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Page 4

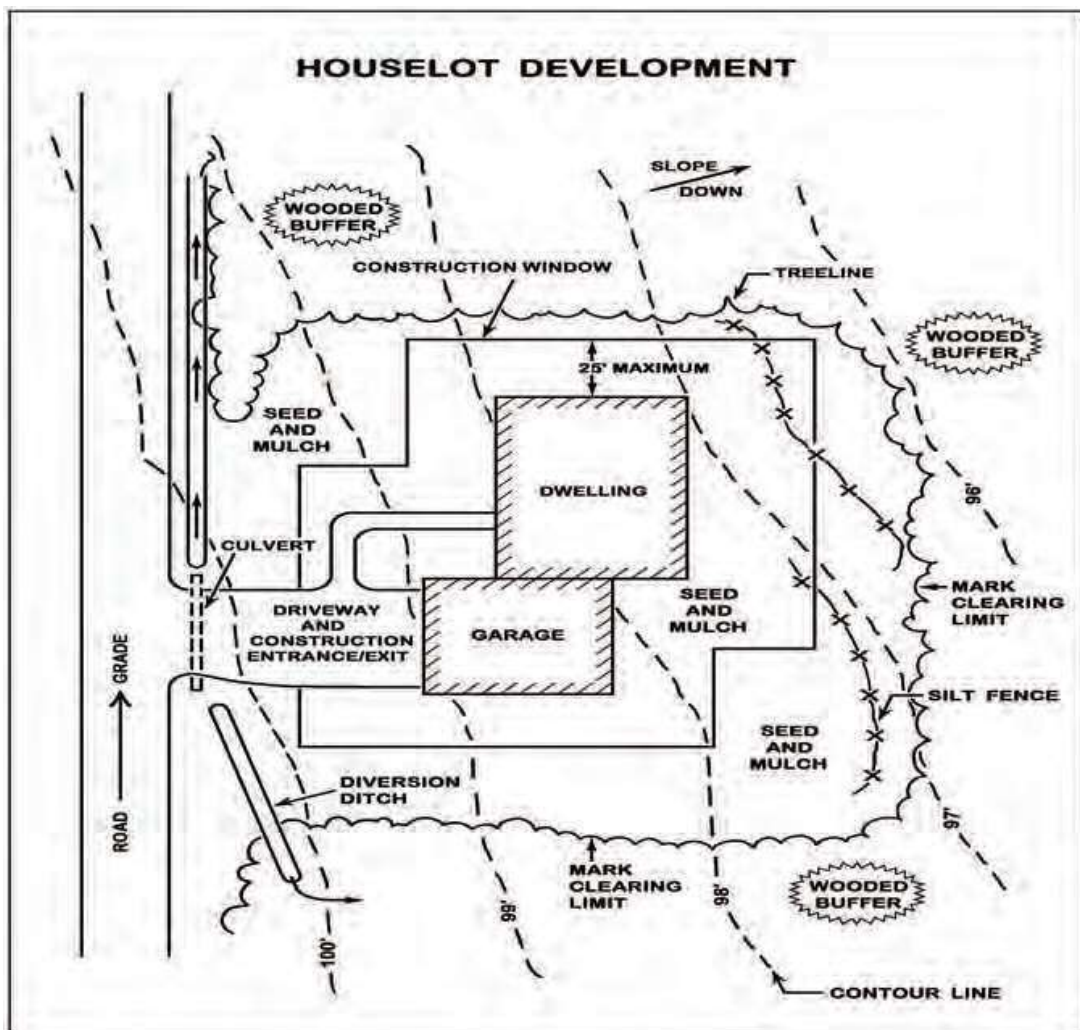
Primary OutFlow Max=1.91 cfs @ 14.04 hrs HW=162.33' (Free Discharge)

↑**1=Box Culvert** (Inlet Controls 1.91 cfs @ 1.45 fps)

The SIMPLE Erosion and Sediment Control Plan

Use this simple ESC plan for small sites (houselots)

- S** = Stabilize disturbed soils before moving on!
- I** = Install sediment barriers before construction!
- M** = Mulch daily!
- P** = Protect natural buffers!
- L** = Limit the area of soil disturbance!
- E** = Evaluate and repair all erosion controls and sediment measures!





NET DEVELOPMENT DENSITY CALCULATION:

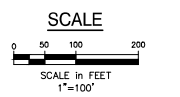
TOTAL PARCEL AREA	1,582,102 S.F.
AREAS UNSUITABLE IN NATURAL STATE:	
- WETLANDS/WATERCOURSES & FLOODPLAIN	115,161 S.F.
- STEEP SLOPES OVER 20%	25,136 S.F.
AREAS REMOVED FOR:	
- ACCESS ROADS/ROW'S	232,815 S.F.
- EASEMENTS*	
REMAINING LAND	1,179,000 S.F.
MINIMUM DWELLING UNIT AREA IN RURAL, RESIDENTIAL, AND AGRICULTURAL ZONE = 90,000 S.F.	
NET DEVELOPMENT DENSITY CALCULATION: 1,179,000/90,000 = 13.1 UNITS	
PROPOSED LOTS = 13 UNITS	

ZONING SUMMARY:

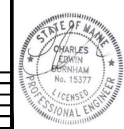
CURRENT USE: UNDEVELOPED		
PROPOSED USE: 13 LOT CLUSTERED SUBDIVISION		
ZONE: RURAL, RESIDENTIAL, AND AGRICULTURAL, RESOURCE PROTECTION AND AQUIFER PROTECTION OVERLAY		
APPLICABLE SPACE AND BULK REGULATIONS	MINIMUM	PROVIDED
LOT AREA	45,000 S.F.	> 45,000 S.F.
STREET FRONTAGE	150'	> 150'
CUL-DE-SAC FRONTAGE	N/A	N/A
LOT WIDTH	N/A	N/A
PRINCIPAL STRUCTURE:		
FRONT SETBACK	50 FT.	50 FT.
SIDE SETBACK	20 FT.	20 FT.
REAR SETBACK	20 FT.	20 FT.
OPEN SPACE	776,051 S.F. (66%)	784,025 S.F. (67%)
OPEN SPACE NOT WETLANDS	388,025 S.F. (33%)	598,351 S.F. (51%)

GENERAL NOTES:

1. WETLAND DELINEATION WAS PERFORMED BY ALEX FINANCIRE.
2. CONTOURS ARE FROM G.S.
3. EACH LOT WILL BE LIMITED TO 20,000 SQUARE FEET OF DEVELOPED AREA LAWN INCLUDED.
4. TRAIL CONSTRUCTION WILL BE LIMITED TO THE REMOVAL OF TREES SMALLER THAN 3 INCHES IN DIAMETER. ANY STREAM CROSSING WILL SPAN THE WIDTH OF THE STREAM BED BY A MINIMUM OF 3' ON EITHER SIDE OF THE STREAM.
5. NO DUG WELLS ARE PERMITTED ON ANY PART OF THE PROPERTY.
6. THERE IS A 100' SETBACK FROM ALL STREAMS ON THE PROPERTY.
7. ALL RESIDENTIAL STRUCTURES SHALL HAVE SPRINKLERS IN ACCORDANCE WITH THE MOST RECENT STATE FIRE CODES.
8. ANY STONE WALLS MOVED DURING THE CONSTRUCTION OF THE ROAD OR RESIDENTIAL LOTS WILL NEED TO BE RELOCATED ON SITE.
9. OPEN SPACE SHALL REMAIN VEGETATED.
10. FURTHER SUBDIVISION OF THE OPEN SPACE AND ITS USE FOR THAN NONCOMMERCIAL RECREATION, AGRICULTURE, OR CONSERVATION PURPOSES, EXCEPT FOR EASEMENTS FOR UNDERGROUND UTILITIES, SHALL BE PROHIBITED. STRUCTURES AND BUILDINGS ACCESSORY TO NON-COMMERCIAL RECREATIONAL OR CONSERVATION USES MAY BE ERRECTED ON COMMON LAND ONLY WITH PLANNING BOARD REVIEW AND APPROVAL.
11. ALL DEDICATED OPEN SPACE SHALL NOT BE USED FOR FUTURE BUILDING LOTS.
12. DURING STREET CONSTRUCTION, THE ENTIRE RIGHT OF WAY SHALL NOT BE CLEARED UNLESS CLEARING IS NECESSARY FOR UTILITIES, DRAINAGE OR OTHER INFRASTRUCTURE NECESSITIES BEYOND THE CLEAR ZONE. FOLLOWING STREET CONSTRUCTION, THE DEVELOPER OR CONTRACTOR SHALL CONDUCT A THOROUGH CLEAN-UP OF STUMPS AND OTHER DEBRIS FROM THE ENTIRE RIGHT OF WAY CREATED DURING THE STREET CONSTRUCTION PROCESS. IF ON-SITE DISPOSAL OF THE STUMPS AND DEBRIS IS PROPOSED, THE SITE SHALL BE NOTICED ON THE PLAN AND BE SUITABLY COVERED WITH FILL AND TOPSOIL, LIMED, FERTILIZED, AND SEEDED.
13. FORESTED BUFFERS WILL BE MARKED IN THE CENTER OF EACH LMTF AND PRINTED AT THE CORNERS. THE BUFFER WARNINGS WILL COMPLY WITH THE CURRENT MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION STANDARDS SET FORTH IN THEIR STORMWATER BMP MANUAL.
14. ALL DRIVEWAYS WILL HAVE A 15' HOPE CULVERT CENTERED IN THE DRAINAGE SWALE.
15. TRAIL SYSTEM WILL BE COMPLETED PRIOR TO ANY CERTIFICATE OF OCCUPANCY PERMITS BEING ISSUED.



NO.	DATE	DESCRIPTION	REVISIONS
1	11/22/2022	FINAL SUBMISSION RESPONSE	
2	01/17/2023	FINAL SUBMISSION	
3	02/20/2023	AMENDED PRELIMINARY SUBMISSION	
4	01/19/2022	PRELIMINARY SUBMISSION	
5	04/27/2022	SKETCH PLAN SUBMISSION	

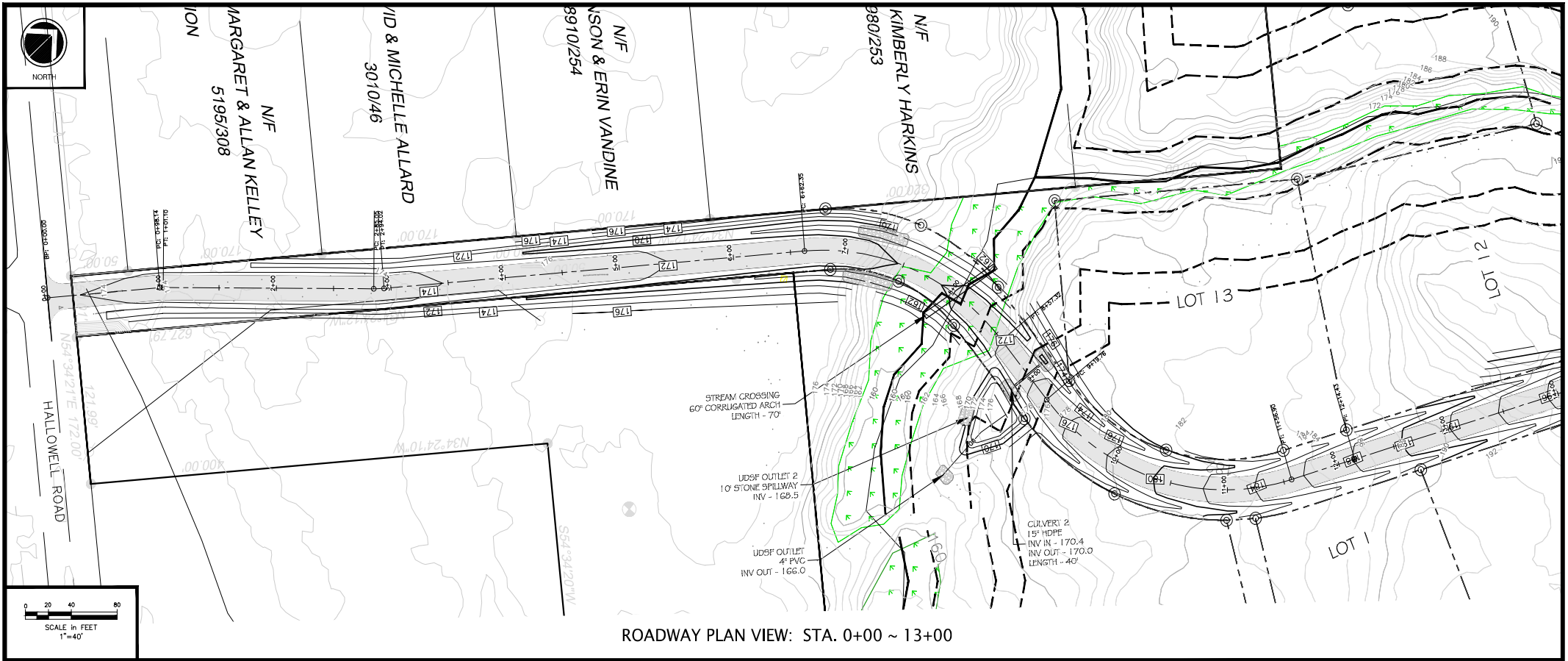


DEER CREEK CROSSING
MAP 7 LOT 32A
OVERALL SITE
LAYOUT PLAN

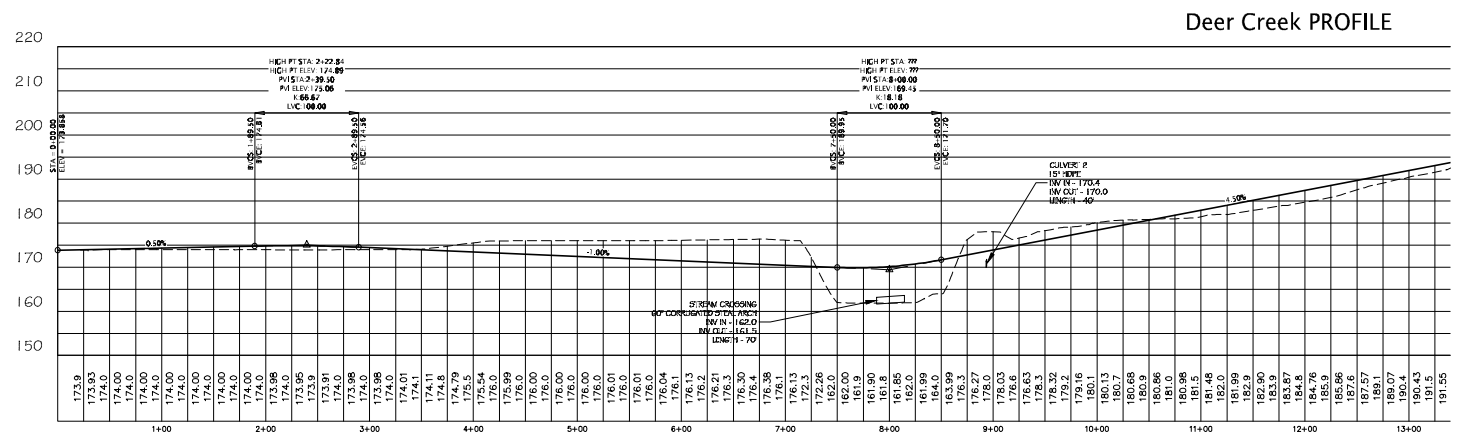
Jack Doughty
231 Spring Point Road
Freeport, Maine 04932

Grange Engineering LLC
241 Rowe Station Road
New Gloucester, ME 04260
Tel: 207.712.6990

DRAWN: CB DATE: OCTOBER 19, 2022
DESIGNED: CB SCALE: 1" = 100'
CHECKED: CB JOB NO. 1
FILE NAME:
SHEET: C-101



ROADWAY PLAN VIEW: STA. 0+00 ~ 13+00



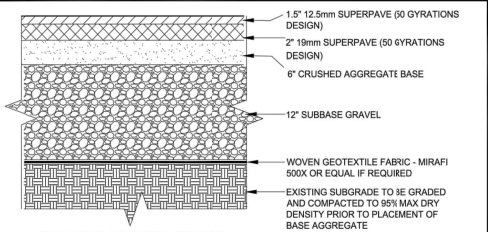
ROADWAY PROFILE VIEW: STA. 0+00 ~ 13+00

REV	DATE	DESCRIPTION	REVISIONS
5	11/22/2022	FINAL SUBMISSION RESPONSE	
4	10/17/2022	FINAL SUBMISSION	
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1	04/20/2021	SKETCH PLAN SUBMISSION	

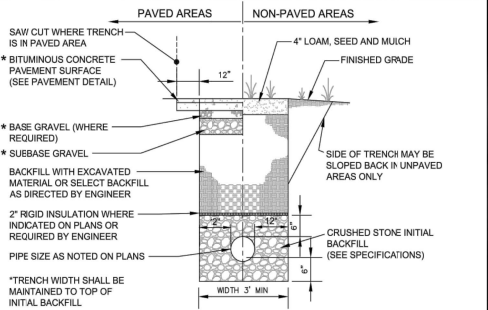


DEER CREEK CROSSING
DURHAM, MAINE
PLAN AND
PROFILE
Jack Doughty
231 Whiting Point Road
Freeport, Maine 04032

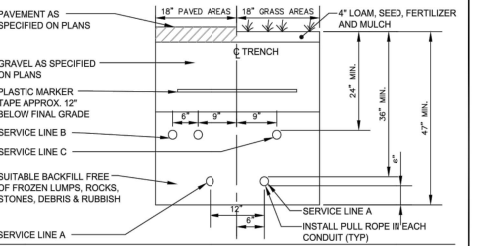
Grange Engineering LLC 241 Rowe Station Road New Gloucester, ME 04260 Tel: 207.712.6990	
DRAWN: CB	DATE: OCTOBER 19, 2022
DESIGNED: CB	SCALE:
CHECKED: CB	JOB NO. 1
FILE NAME:	
SHEET: C-200	



(A) NEW PAVEMENT DETAIL
N.T.S.

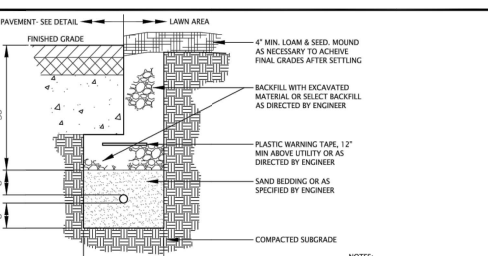


(B) TYPICAL SEWER AND STORM DRAIN TRENCH DETAIL
N.T.S.

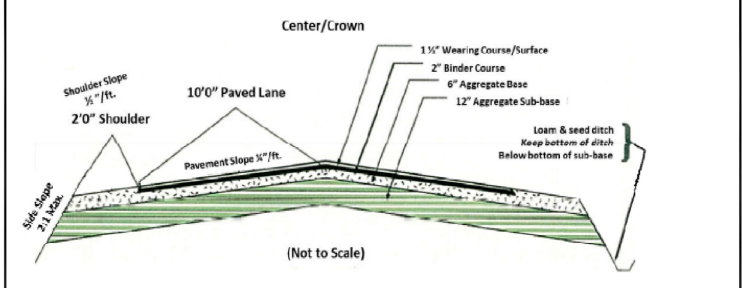


SERVICE	CONDUIT SIZE	CONDUIT TYPE	GRASS AREAS	PAVED AREAS	UTILITY	REMARKS
A	5"	SCHEDULE 40 PVC	RIGID GALVANIZED STEEL, ASTM A120		POWER	SEE NOTE 1
B	4"	SCHEDULE 40 PVC	RIGID GALVANIZED STEEL, ASTM A120		TELEPHONE	SEE NOTE 1
C	2"	SCHEDULE 40 PVC	RIGID GALVANIZED STEEL, ASTM A120		COMMUNICATION	

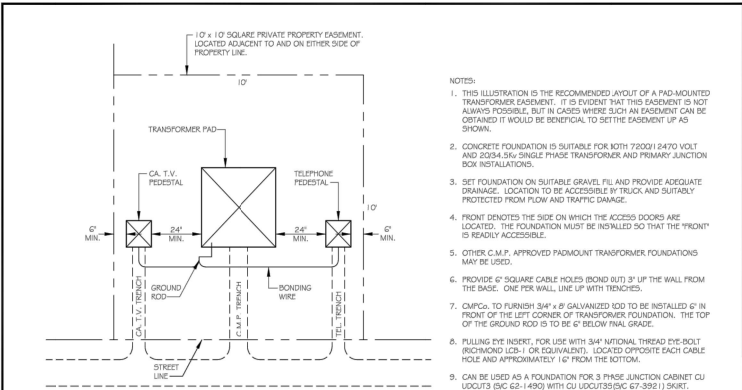
(C) COMBINED UTILITY TRENCH DETAIL
N.T.S.



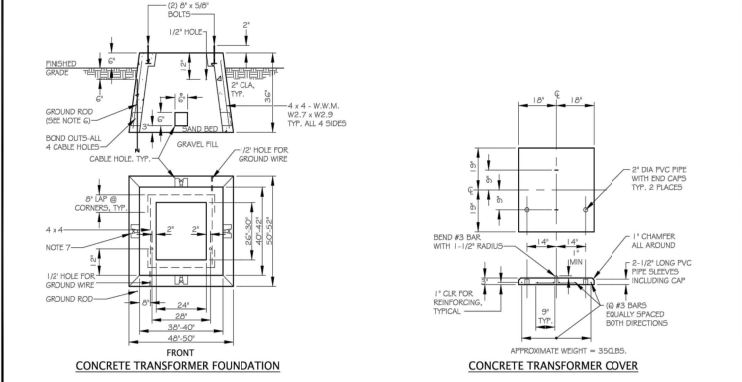
(D) ELECTRIC UTILITY TRENCH DETAIL
N.T.S.



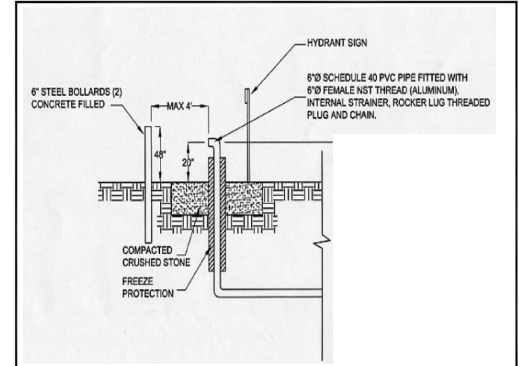
(E) TYPICAL ROADWAY SECTION
N.T.S.



(F) CENTRAL MAINE POWER TRANSFORMER PAD
NOT TO SCALE



(F) CENTRAL MAINE POWER TRANSFORMER PAD
NOT TO SCALE



(G) DRY HYDRANT DETAIL WITH BOLLARDS
N.T.S.

DRY HYDRANT NOTES:
THE DRY HYDRANT WILL BE CONSTRUCTED IN ACCORDANCE WITH THE TOWN STANDARDS AND ALL CONNECTIONS AND MATERIALS WILL BE APPROVED BY THE FIRE CHIEF PRIOR TO INSTALLATION.

- THIS DETAIL REFLECTS MINIMUM REQUIREMENTS, IN SITU SOIL CONDITIONS MAY REQUIRE ADDITIONAL MATERIALS AS DIRECTED BY PUBLIC WORKS DIRECTOR OR ENGINEER.
- CLEARING AND GRUBBING SHALL BE 6'-12" DEEP DEPENDING ON SOIL CONDITIONS AND EXTEND A MINIMUM OF THE ENTIRE WIDTH OF THE RIGHT OF WAY.
- ALL CONSTRUCTION SHALL MEET THE REQUIREMENTS RELATIVE TO THE APPLICABLE MOOT STANDARD SPECIFICATION FOR MATERIALS, PLACEMENT AND TESTING.
- BASE COURSE ASPHALT SHALL EXTEND UNDER SUIFORM CURB. SEE CURB DETAIL THIS SHEET.

AGGREGATE BASE

Sieve Designation	% By Weight Passing Square Mesh Sieves
2-inch	100%
1/2 inch	45-70%
1/4 inch	30-55%
No. 40	0-30%
No. 200	0-7%

*Aggregate for the base shall contain no particles of rock exceeding four (4") inches in any dimension.

AGGREGATE SUBBASE

Sieve Designation	% By Weight Passing Square Mesh Sieves
6-inch	100%
1/4 inch	25-70%
No. 40	0-30%
No. 200	0-7%

Gravel base shall be compacted over the full width and length of road bed including shoulders to a minimum of ninety-five (95%) percent of proctor density in accordance with American Society for Testing Materials Standard, ASTM D1556 and D1557.

SUBMITTED FOR FINAL PLAN REVIEW

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4	10/17/2022	FINAL SUBMISSION
3	02/22/2022	AMENDED PRELIMINARY SUBMISSION
2	07/02/2022	PRELIMINARY SUBMISSION
1	04/20/2022	SKETCH PLAN SUBMISSION



**DEER CREEK CROSSING
DURHAM, MAINE**

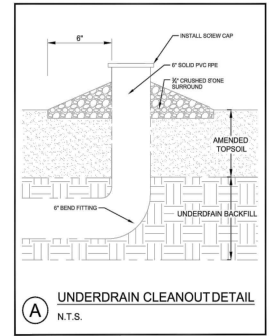
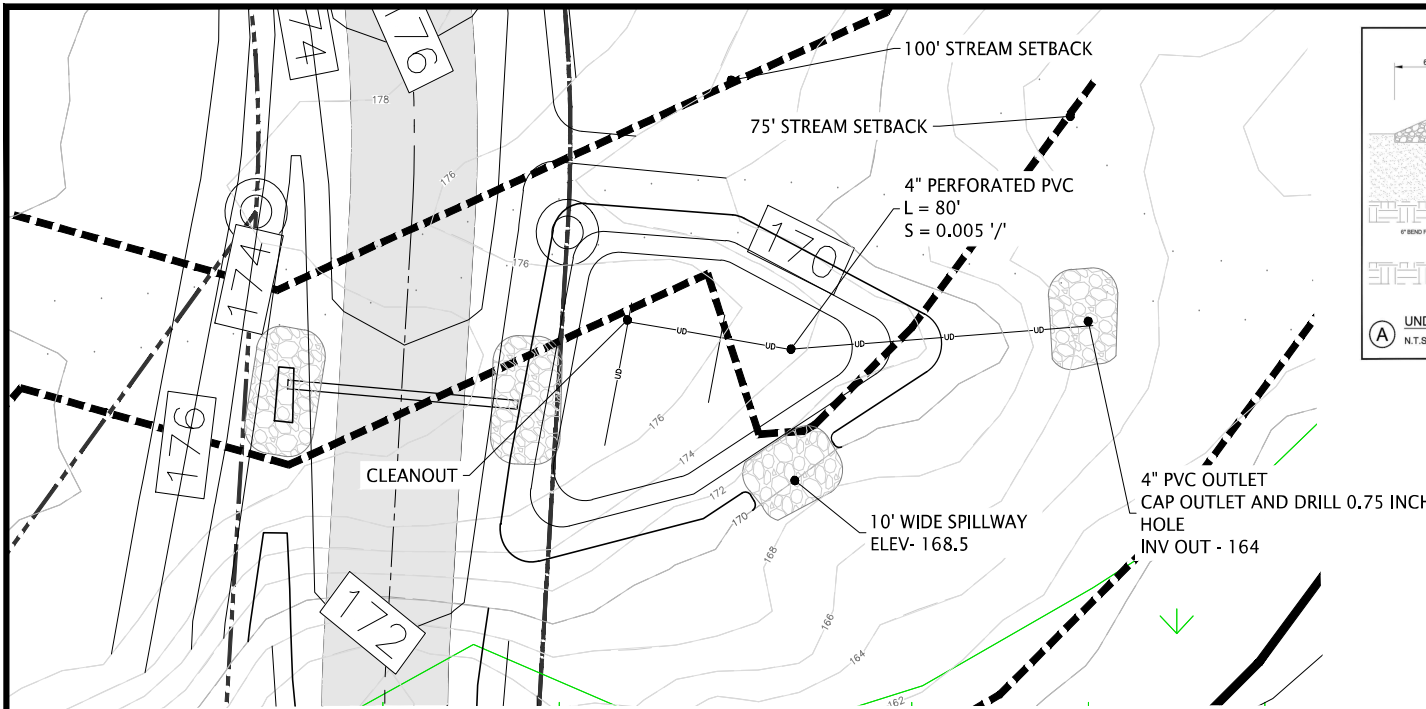
CIVIL DETAILS

2

Jack Doughty
231 Hymn Point Road
Freeport, Maine 04932

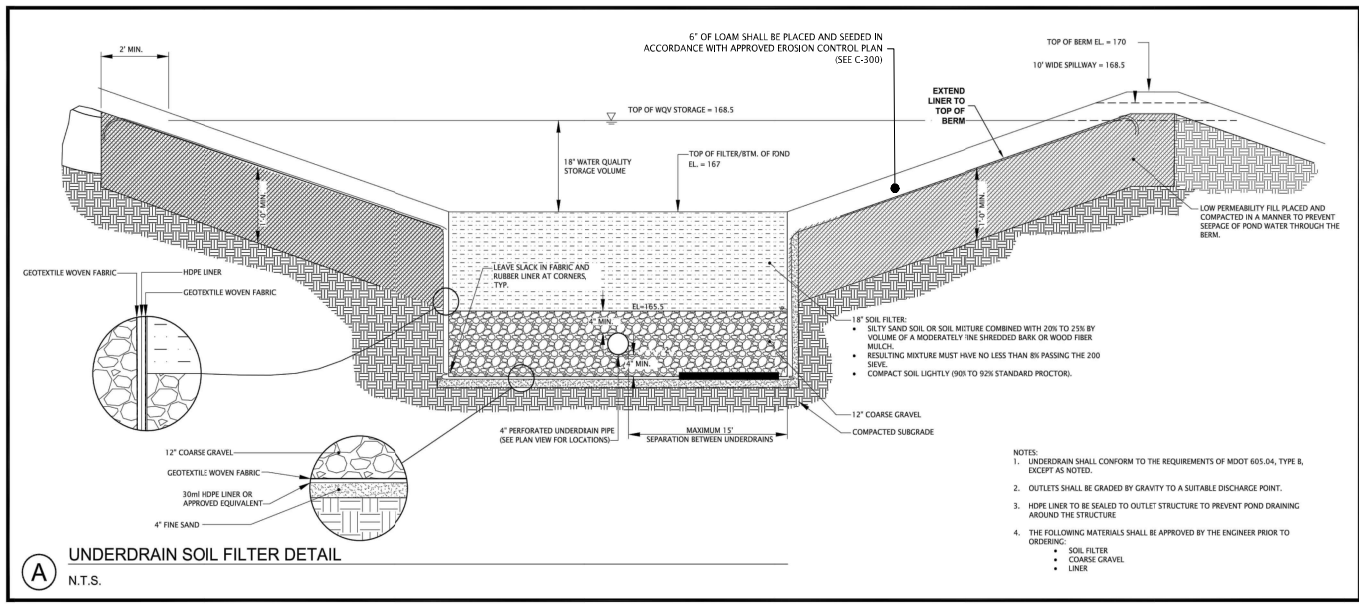
Grange Engineering LLC
241 Rowe Station Road
New Gloucester, ME 04260
Tel: 207.712.6990

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SHEET:	C-302		



EMERGENCY SPILLWAY NOTES:

1. 12" OF 6" D50 WILL BE PLACED ALONG THE EXTENTS OF THE SPILLWAY.
2. A NONWOVEN GEOTEXTILE FABRIC WILL BE INSTALLED 2' BEYOND THE RIPRAP AND KEYED IN UNDER 6" OF LOAM AND SEED.
3. RIPRAP WILL EXTEND 5 FEET DOWN GRADIENT BEYOND THE TOP OF THE SPILLWAY.



UNDERDRAINED SOIL FILTER NOTES:

1. UNDERDRAINED FILTER BASINS CONSTRUCTION SEQUENCE: THE SOIL FILTER MEDIA AND VEGETATION MUST NOT BE INSTALLED UNTIL THE AREA THAT DRAINS TO THE FILTER HAS BEEN PERMANENTLY STABILIZED WITH PAVEMENT OR OTHER STRUCTURE. 90% VEGETATION COVER OR OTHER PERMANENT STABILIZATION UNLESS THE RUNOFF FROM THE CONTRIBUTING DRAINAGE AREA IS DIVERTED AROUND THE FILTER. UNTIL STABILIZATION IS COMPLETED COMPACTION OF SOIL FILTER, FILTER SOIL MEDIA AND UNDERDRAIN BEDDING MATERIAL MUST BE COMPACTED TO BETWEEN 90% AND 92% STANDARD PROCTOR. THE BED SHOULD BE INSTALLED IN AT LEAST 2 LIFTS OF 9 INCHES TO PREVENT POCKETS OF LOOSE MEDIA. CONSTRUCTION OVERSIGHT INSPECTION BY A PROFESSIONAL ENGINEER WILL OCCUR AT A MINIMUM.
 - AFTER THE PRELIMINARY CONSTRUCTION OF THE FILTER GRABES AND ONCE THE UNDERDRAIN PIPES ARE INSTALLED BUT NOT BACKFILLED.
 - AFTER THE DRAINAGE LAYER IS CONSTRUCTED AND PRIOR TO THE INSTALLATION OF THE FILTER MEDIA.
 - AFTER THE FILTER MEDIA HAS BEEN INSTALLED AND SEEDED. BIO-RETENTION CELLS MUST BE STABILIZED PER THE PROVIDED PLANTING SCHEME AND DENSITY FOR THE CANOPY COVERAGE OF 30 AND 50%.
 - AFTER ONE YEAR TO INSPECT HEALTH OF THE VEGETATION AND MAKE CORRECTIONS, AND
 - ALL THE MATERIAL USED FOR THE CONSTRUCTION OF THE FILTER BASIN MUST BE CONFIRMED AS SUITABLE BY THE DESIGN ENGINEER. TESTING MUST BE DONE BY A CERTIFIED LABORATORY TO SHOW THAT THEY ARE PASSING OUR SPECIFICATIONS.
2. DEWATERING: A DEWATERING PLAN IS NEEDED TO ADDRESS EXCAVATION DE-WATERING FOLLOWING HEAVY RAINFALL EVENTS OR WHERE THE EXCAVATION MAY INTERCEPT THE GROUNDWATER TABLE DURING CONSTRUCTION. THE COLLECTED WATER NEEDS TREATMENT AND A DISCHARGE POINT THAT WILL NOT CAUSE DOWNGRADIENT EROSION AND OFFSITE SEDIMENTATION OR WITHIN A RESOURCE. PLEASE FOLLOW THE DETAILS OF SUCH A PLAN.
3. BASIC STANDARDS: EROSION CONTROL MEASURES: MINIMUM EROSION CONTROL MEASURES WILL NEED TO BE IMPLEMENTED AND THE APPLICANT WILL BE RESPONSIBLE TO MAINTAIN ALL COMPONENTS OF THE EROSION CONTROL PLAN UNTIL THE SITE IS FULLY STABILIZED. HOWEVER, BASED ON SITE AND WEATHER CONDITIONS DURING CONSTRUCTION, ADDITIONAL EROSION CONTROL MEASURES MAY NEED TO BE IMPLEMENTED. 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. A CONSTRUCTION LOG MUST BE MAINTAINED FOR THE EROSION AND SEDIMENTATION CONTROL INSPECTIONS AND MAINTENANCE. THE MAINE EROSION AND SEDIMENT CONTROL HANDBOOK FOR CONSTRUCTION: BEST MANAGEMENT PRACTICES AS PUBLISHED IN 1991 BY THE CUMBERLAND COUNTY SOIL AND WATER CONSERVATION DISTRICT AND THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION HAS BEEN CHANGED TO THE "MAINE EROSION AND SEDIMENT CONTROL BMP'S" PUBLISHED BY THE MAINE DEP IN 2003. ALL REFERENCES SHOULD BE CHANGED TO THE NEW MANUAL. [HTTP://WWW.MAINE.GOV/DEP/BLW/DOD/STANDARDS/ESC/BMP/INDEX.HTM](http://www.maine.gov/dep/blw/dod/standards/escbmp/index.htm)

CONSTRUCTION OVERSIGHT REQUIRED:

THE APPLICANT WILL RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER OR THIRD PARTY INSPECTOR TO INSPECT THE CONSTRUCTION AND STABILIZATION OF ALL STORMWATER MANAGEMENT STRUCTURES. IF NECESSARY, THE INSPECTING ENGINEER WILL INTERPRET THE PONDS CONSTRUCTION PLAN FOR THE CONTRACTOR. ONCE ALL STORMWATER MANAGEMENT STRUCTURES ARE CONSTRUCTED AND STABILIZED, THE INSPECTING ENGINEER WILL NOTIFY BOTH THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION AS WELL AS THE TOWN OF ARUNDEL IN WRITING WITHIN 30 DAYS TO STATE THAT THE POND HAS BEEN COMPLETED. ACCOMPANYING THE ENGINEER'S NOTIFICATION MUST BE A LOG OF THE ENGINEER'S INSPECTIONS DURING THE DATE OF EACH INSPECTION, THE TIME OF EACH INSPECTION, AND THE ITEMS INSPECTED ON EACH VISIT, AND INCLUDE ANY TESTING DATA OR SIEVE ANALYSIS DATA OF EVERY MINERAL SOIL AND SOIL MEDIA SPECIFIED IN THE PLANS AND USED ON SITE.

**SUBMITTED FOR
FINAL PLAN
REVIEW**

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2	01/17/2023	FINAL SUBMISSION	
3	02/22/2023	AMENDED PRELIMINARY SUBMISSION	
4	01/19/2022	PRELIMINARY SUBMISSION	
5	04/20/2022	SKETCH PLAN SUBMISSION	



**DEPER CREEK CROSSING
DURHAM, MAINE**

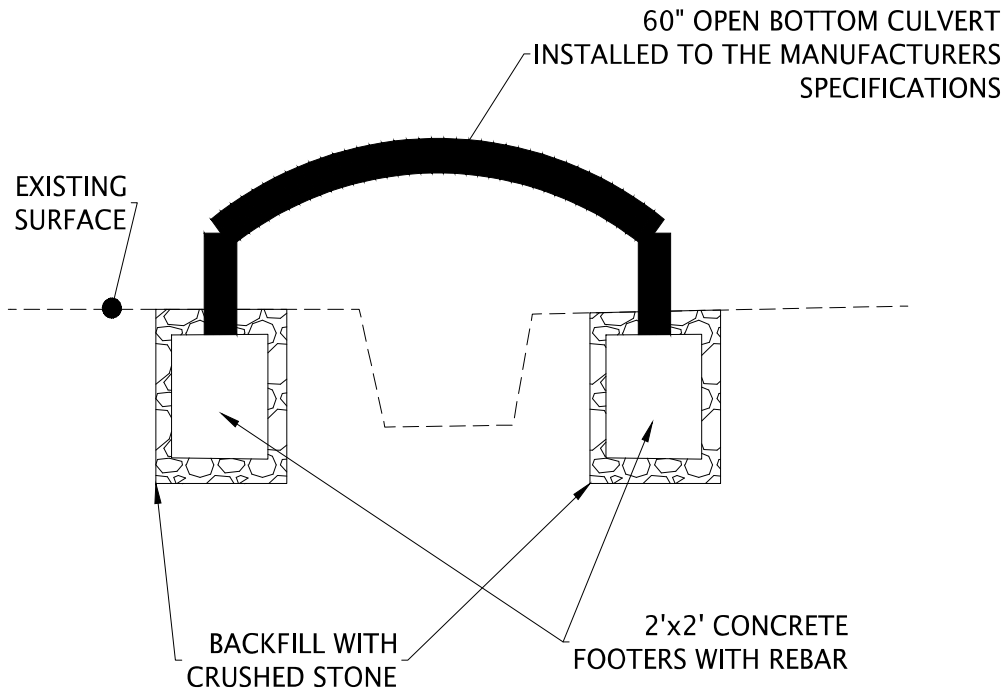
CIVIL DETAILS

3

Jack Doughty
231 Whiting Point Road
Freeport, Maine 04032

Grange Engineering LLC
241 Rowe Station Road
New Gloucester, ME 04260
Tel: 207.712.6990

DRAWN: CB	DATE: OCTOBER 19, 2022
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SHEET: C-303	



1. Span streams or size culverts or pipe arches such that they are wider than bankfull width (BFW). Spans are strongly preferred as they avoid or minimize disruption to the streambed, and avoid entire streambed reconstruction and maintenance inside the culvert or pipe arch (see 4, 5 & 7 below), which may be difficult in smaller structures. Footings and abutments for spans and scour protection should be landward of 1.2 times BFW. The width of culverts and arches at bankfull elevation should be ≥ 1.2 times BFW.
2. Embed pipe arch below the grade of the streambed. This is not required when ledge/bedrock prevents embedment, in which case spans are required. The following depths are recommended to prevent streambed washout, and ensure compliance and long-term success:
 - a. ≥ 2 feet for box culverts and pipe arches,
3. Match the culvert gradient (slope) with the stream channel profile.
4. Construct crossings with a natural bottom substrate within the structure matching the characteristics of the substrate in the natural stream channel and the banks (mobility, slope, stability, confinement, grain and rock size) at the time of construction and over time as the structure has had the opportunity to pass substantial high flow events.
5. Construct crossings with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows at the time of construction and over time. In order to provide appropriate water depths and

For the purposes of this GP, spans are bridges, three-sided box culverts, open-bottom culverts or arches that span the stream with footings landward of BFW. The use of bridge piers or similar supports does not prevent a structure from being considered as a span.

6. Banks on each side of the stream inside the crossing matching the horizontal profile of the existing stream and banks outside the crossing are recommended. This will allow terrestrial passage for wildlife and prevent flow from being focused to one side and scouring the bed, especially against the structure's sidewall which may undermine the footings in the case of spans. To prevent failure, all constructed banks should have a height to width ratio of no greater than 1:1.5 (vertical:horizontal) unless the stream is naturally incised. Tie these banks into the up and downstream banks and configure them to be stable during expected high flows
7. All

**SUBMITTED FOR
FINAL PLAN
REVIEW**

			DEER CREEK CROSSING DURHAM, MAINE STREAM CROSSING DETAILS	Grange Engineering LLC 241 Rowe Station Road New Gloucester, ME 04260 Tel: 207.712.6990
5	11/20/2022	FINAL SUBMISSION RESPONSE		DRAWN: CB DATE: OCTOBER 19, 2022
4	10/17/2022	FINAL SUBMISSION		DESIGNED: CB SCALE:
3	6/22/2022	AMENDED PRELIMINARY SUBMISSION		CHECKED: CB JOB NO. 1
2	5/19/2022	PRELIMINARY SUBMISSION		FILE NAME:
1	5/4/2022	SKETCH PLAN SUBMISSION		SHEET: C-305
REV	DATE	DESCRIPTION		
		REVISIONS		