Date	September 12, 2019
To	Town of Cumberland Planning Board
From	Carla Nixon, Town Planner
Subject	**Final Plan Review: 20 Lot Major Subdivision –Christmas Creek**

I. REQUEST/OVERVIEW:

The Applicant is Beta Zeta Properties. The Applicant is requesting Final Plan Review of a proposed 20 lot major subdivision. The lots will be served by public water and sewer and natural gas. The 50.58 acre parcel is located off Tuttle Road in the Rural Residential 1 zoning district as shown on Tax Assessor Map R4, Lot 10. Thomas Perkins, P.E., of Dirigo Architectural Engineering is the Applicant's representative.

II. PROJECT HISTORY:

Sketch Plan Review: 9/18/18 and 11/20/18

Site Walk: 11/3/18

Preliminary Plan Approval: February 19, 2019

Final Plan Review: August 20, 2019. Tabled.

III. DESCRIPTION:

Parcel size:	50.58 acres
Net Residential Density:	Allows for 20.11 lots.
Proposed number of lots:	20
Zoning:	Rural Residential 1
Development Type:	Clustered Subdivision Design
Min. Lot Size:	30,000 sf
Lot frontage:	100'
Setbacks:	Front: 50', Rear: 75', Side: 30' (combined = 75')
Water:	Public Water
Sewer:	Public Sewer (gravity drained)
Open Space:	14.96 acres (29.6 % of parcel)
Wetlands:	6.6 acres
Trails:	3'6" bark mulch trail. Easement to Town of Cumberland for trail connection from Tuttle Rd. to Val Halla.
Utilities:	Natural gas, underground electric, telephone, and cable from Tuttle Road.

Street Lighting:	None proposed.
Road:	26’ pavement width; 2’ gravel shoulder on one side and 4’ paved shoulder on other side. Road will be constructed to municipal standards for a Residential Access Road and proposed for public acceptance.
Sidewalks:	4’ paved shoulder on the westerly side of Vining Way.
Homeowners Association:	Draft Declaration of Protective Covenants and Common Easements are on file.
Right, Title and Interest:	Warranty Deed

Waivers Granted:

1. The requirement for a high intensity soil survey.
2. The requirement for a survey of trees over 10” in diameter.

Waivers Denied: None.

Outside Agency Approvals Required:

Agency	Type of Permit	Status
MDEP	Stormwater Permit/General Construction Permit	Condition of Approval
MDEP	SLODA	Condition of Approval
MDEP	NRPA Permit by Rule for stream crossing.	Condition of Approval
Army Corp of Engineers	General Permit	Intent to Permit on File
Maine Historic Preservation Commission		Letter on file
Maine Natural Areas Program	Rare & Exemplary Botanical Features. None documented.	Letter on file
Maine Inland Fisheries & Wildlife		Letter on file
Portland Water District		Letter on file

IV. REVIEW COMMENTS:

DEPARTMENT HEAD REVIEWS:

William Longley, CEO: No comments.

Police Chief Charles Rumsey: No concerns.

Fire Chief Small: After reviewing the application for this subdivision I have the following comments:

1) The locations of the fire hydrants must be identified.
2) It is recommended, ***but not required***, to have monitored fire alarm systems in each residence.
3) It is recommended, ***but not required***, to have fire department approved key boxes on each residence.

Peer Review Engineer: Dan Diffin, P.E., Sevee and Maher Engineers:

In reviewing this revised stormwater management report, it appears that the pre vs. post comparison has changed since the July 12th report. At the existing culvert crossing at Tuttle Road (combined flows), there is now an almost 9 cfs increase in peak flows during the 10-year storm, 9 cfs increase in the 25-year storm, and a 15 cfs increase in the 100-year storm. In the July report, these increases were less. With this increase in peak flows, SME recommends that additional modelling at the Tuttle Road culvert crossing be completed to demonstrate that ponding behind the culverts will not result in overtopping of the roadway.

Daniel P. Diffin, P.E., LEED AP BD+C

Hi Dan,

What are your thoughts about handling this as a condition of approval? How would you describe the condition?

Carla

Carla,

I expect that the calculations will be ok for the culvert at Tuttle Road, therefore, am comfortable with a Condition.

The Approval could be conditioned on final review and approval by the Town Engineer of the stormwater quantity calculations at the Tuttle Road culverts.

Dan

(Response from Project Engineer, Tom Perkins)

Good afternoon everyone -

Thanks for these comments. We just concluded a call with MDEP to wrap up four final comments they had. We have to make some callout changes to the subdivision plan to more clearly delineate the storm water buffers and to show the arrangement of the houses on the lots within the building windows. Also, they have asked us to raise the elevation of the pond by about 6" to provide more treatment.

Along with that, with regards to the pre and post development flows in Dans email below, they have asked us to provide a pre-development model that disregards the existing culverts as they are perched anyway. This and the minor adjustments to the pond should help with the flows. They also pointed out, based on their field visit and study of aerial photography, that the neighbors pond is effectively catching and keeping most of the water headed towards the Tuttle Road culverts, so ultimately they are not concerned and are comfortable with the flow rates presented.

We will send them updated plans over the next two days and will cc: you in the process. They will send us an email on Monday or Tuesday to confirm the permit is written and is in transit to Augusta for final review. Should the updated report still show some cause for concern with Tuttle road, we would welcome the opportunity to have that as a condition of approval that we can explore immediately after the planning board meeting to satisfy any concerns the Town has.

Thank you - Tom

Thomas W. Perkins, PE

President

Dirigo A/E

IV. FINAL MAJOR SUBDIVISION REVIEW:

PROPOSED FINDINGS OF FACT - Chapter 250 - Subdivision of Land

The purpose of these standards shall be to assure the comfort, convenience, safety, health and welfare of the people, to protect the environment and to promote the development of an economically sound and stable community. To this end, in approving subdivisions within the Town of Cumberland, Maine, the Board shall consider the following criteria and before granting approval shall determine that the proposed subdivision:

1. Pollution. The proposed subdivision will not result in undue water or air pollution. In making this determination, it shall at least consider:
   A. The elevation of the land above sea level and its relation to the flood plains;
   B. The nature of soils and subsoil and their ability to adequately support waste disposal;
   C. The slope of the land and its effect on effluents;
   D. The availability of streams for disposal of effluents; and
   E. The applicable state and local health and water resource rules and regulations;

   The 20 lot residential subdivision will be served by public water and sewer; it will not result in undue water or air pollution.

   Based on the information provided, the standards of this section have been met.

2. Sufficient Water. The proposed subdivision has sufficient water available for the reasonable foreseeable needs of the subdivision;

   The lots will be served by public water. A letter from the Portland Water District indicating capacity to serve is on file.

   Based on the information provided, the standards of this section have been met.

3. Municipal Water Supply. The proposed subdivision will not cause an unreasonable burden on an existing water supply, if one is to be used;

The subdivision will utilize public water. A letter from the Portland Water District indicating capacity to serve is on file.

Based on the information provided, the standards of this section have been met.

4. Erosion. The proposed subdivision will not cause unreasonable soil erosion or a reduction in the land's capacity to hold water so that a dangerous or unhealthy condition results;

The applicant has submitted an erosion and sedimentation control plan that has been reviewed and approved by the Town Engineer.

Based on the information provided, the standards of this section have been met.

5. Traffic. The proposed subdivision will not cause unreasonable highway or public road congestion or unsafe conditions with respect to the use of the highways or public roads existing or proposed;

The plans have been reviewed and approved by the Town Engineer.

Based on the information provided, the standards of this section have been met.

6. Sewage disposal. The proposed subdivision will provide for adequate sewage waste disposal and will not cause an unreasonable burden on municipal services, if they are utilized;

The project will utilize public sewer. A capacity to serve letter from the PWD is on file along with a letter from the Superintendent of Wastewater in Falmouth. Sewer user permits will be obtained from the Town Manager prior to the preconstruction conference. This is a condition of approval.

With the proposed condition of approval, the standards of this section have been met.

7. Municipal solid waste disposal. The proposed subdivision will not cause an unreasonable burden on the municipality's ability to dispose of solid waste, if municipal services are to be utilized;

Cumberland provides curbside trash collection and recycling through a contracted waste hauler. The addition of 20 new homes will not cause a burden on the municipality's ability to dispose of solid waste.

Based on the information provided, the standards of this section have been met.

8. Aesthetic, cultural and natural values. The proposed subdivision will not have an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites, significant wildlife habitat identified by the Department of inland Fisheries and Wildlife or the municipality, or rare and irreplaceable natural areas or any public rights for physical or visual access to the shoreline;

Letters are on file stating that the subdivision will not have an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites, significant wildlife habitat or rare and irreplaceable natural areas.

Based on the information provided, the standards of this section have been met.

9. Conformity with local ordinances and plans. The proposed subdivision conforms to a duly adopted subdivision regulation or ordinance, comprehensive plan, development plan or land use plan, if any. In making this determination, the municipal reviewing authority may interpret these ordinances and plans;

The plans have been reviewed and approved by the town planner, the town engineer and town department heads.

Based on the information provided, the standards of this section have been met.

10. Financial and technical capacity. The subdivider has adequate financial and technical capacity to meet the standards of this section;

Technical capacity is evidenced by the use of the following experts: a professional engineer, a licensed land surveyor, and a wetland scientist.

Financial capacity is evidence by a letter dated 12/27/18 from Katahdin Trust Company stating that the developer has the financial capability to finance the estimated costs of the project which is estimated to be $2,535,000.

Based on the information provided, the standards of this section have been met.

11. Surface waters; outstanding river segments. Whenever situated entirely or partially within the watershed of any pond or lake or within 250 feet of any wetland, great pond or river as defined in Title 38 chapter 3, subchapter I, article 2-B, the proposed subdivision will not adversely affect the quality of that body of water or unreasonably affect the shoreline of the body of water;

The proposed subdivision will not adversely affect the quality of the mapped wetland or unreasonably affect the shoreline of the stream on the parcel. The proposed stream crossing and wetland impacts will conform to, the requirements of the MDEP and ACOE. This is a condition of approval.

With the proposed condition of approval, the standards of this section have been met.

12. Ground water. The proposed subdivision will not alone, or in conjunction with, existing activities, adversely affect the quality or quantity of ground water;

The 20 lot residential subdivision which will be served by public water and sewer will not adversely affect the quality or quantity of ground water.

Based on the information provided, the standards of this section have been met.

13. Flood areas. Based on the Federal Emergency Management Agency's Flood Boundary and Floodway Maps and Flood Insurance Rate Maps, and information presented by the applicant whether the subdivision is in a flood-prone area. If the subdivision, or any part of it, is in such an area, the subdivider shall determine the 100-year flood elevation and flood hazard boundaries within the subdivision. The proposed subdivision plan must include a condition of plan approval requiring that principal structures in the subdivision will be constructed with their lowest floor, including the basement, at least one foot above the 100-year flood elevation;

The parcel is shown on FEMA Floodplain Map # 23005C0538F as being in Zone C (area of minimal flooding).

Based on the information provided, the standards of this section have been met.

14. Storm water. The proposed subdivision will provide for adequate storm water management;

A stormwater management plan was submitted as part of the application packet and has been reviewed and approved by the Town Engineer. A copy of the stormwater management report supporting the application was provided in the packet. A Stormwater Permit application has been submitted to MEDEP. Receipt of the MEDEP Stormwater Permit is a condition of approval.

With the proposed condition of approval, the standards of this section have been met.

15. Freshwater wetlands. All potential freshwater wetlands, as defined in 30-A M.R.S.A. §4401 (2-A), within the proposed subdivision have been identified on any maps submitted as part of the application, regardless of the size of these wetlands. Any mapping of freshwater wetlands may be done with the help of the local soil and water conservation district.

    All wetlands within the proposed subdivision were delineated by Sebago Technics and are outlined in the project plan set.
    Based on the information provided, the standards of this section have been met.

16. River, stream or brook... Any river, stream, or brook within or abutting the proposed subdivision has been identified on any map submitted as a part of the application. For purposes of this section, "river, stream or brook" has the same meaning as in Title 38, Section 480-B, Subsection 9. [Amended; Effective. 11/27/89]

    A perennial stream has been identified on the site. ACE has approved the subdivision plan.
    Based on the information provided, the standards of this section have been met.

V. STANDARD CONDITIONS OF APPROVAL

This approval is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted by the applicant. Any variation from the plans, proposals and supporting documents, except deminimus changes as so determined by the Town Planner which do not affect approval standards, is subject to review and approval of the Planning Board prior to implementation.

VI. LIMITATION OF APPROVAL

Construction of the improvements covered by any site plan approval must be substantially commenced within twelve (12) months of the date upon which the approval was granted. If construction has not been substantially commenced and substantially completed within the specified period, the approval shall be null and void. The applicant may request an extension of the approval deadline prior to expiration of the period. Such request must be in writing and must be made to the Planning Board. The Planning Board may grant up to two (2) 1 year extensions to the periods if the approved plan conforms to the ordinances in effect at the time the extension is granted and any and all federal and state approvals and permits are current.

VII. RECOMMENDED CONDITIONS FOR FINAL PLAN APPROVAL:

1. MDEP SLODA and NRPA wetland permits to be submitted prior to releasing the plat for recording at the Cumberland County Registry of Deeds.

2. A Schedule of Values and a performance guarantee in a form and amount acceptable to the Town Manager shall be provided prior to releasing the plat for recording at the Cumberland County Registry of Deeds.

3. The Applicant shall provide an escrow for 2% of the cost of the Schedule of Values to be used for inspection fees.

4. A blasting permit, if required, shall be obtained from the Code Enforcement Officer.

5. The Town Engineer to approve the final stormwater quantity calculations at the Tuttle Road culverts prior to releasing the plat for recording at the Cumberland County Registry of Deeds.

6. A preconstruction conference is required prior to the start of work.

7. Clearing limits shall be flagged and approved by the peer review engineer prior to the preconstruction conference.

8. The proposed stream crossing and wetland impacts will conform to, the requirements of the MDEP and ACOE.

9. The Applicant shall provide evidence of the reservation of the required number of sewer user permits from the Town Manager prior to the preconstruction conference.

10. The Applicant shall be responsible for the repair to Tuttle Road from any damage caused to new pavement by the installation of utilities.

11. The Applicant or the HOA (once in place) shall have a continuing obligation to maintain required plantings in a good and healthy condition. Any dead or diseased trees shall be removed and replaced with a plant of the same type, subject to the Town Planner's approval. No invasive species of plants are permitted.

12. The Home Owners Association documents, as reviewed and approved by the Town Attorney, shall be recorded at the Cumberland County Registry of Deeds prior to the preconstruction conference.

13. The subdivision lot deeds, referencing the HOA documents, shall be recorded at the Cumberland County Registry of Deeds.

Machias
Savings Bank

Experienced people. Exceptional service.

July 29, 2019

Johan N. Noren
Christopher J. Webster
Members
Beta Zeta Properties, LLC
9 Kimberly Circle
Brunswick, ME 04011-3816

Re: Loan Commitment

Dear Johan and Chris:

This letter, when properly signed and accepted, will constitute an agreement whereby, Machias Savings Bank, hereinafter called the Bank, agrees to make a loan, and Beta Zeta Properties, LLC, a Maine limited liability company, hereafter called the Borrower, agrees to borrow, subject to the following terms and conditions:

Borrower:	Beta Zeta Properties, LLC
Guarantor(s):	Johan N. Noren Christopher J. Webster *And any individual or entity owning 20% or more of Borrower
Loan Amount:	Two Million Sixty Thousand Dollars and 00/100 ($2,060,000.00)
Loan Purpose:	Funds used to complete the infrastructure for the Christmas Creek Subdivision and pay off a land loan to Katahdin Trust.
Interest Rate:	Four and ninety five hundredths (4.95%) percent, fixed. Interest is calculated on a 365/360-day basis. This is a simple interest loan.

Default Interest Rate:	Four percentage point (4.0%) greater than the interest rate applicable under the terms of the promissory note
Loan Term:	Eighteen (18) months
Repayment:	During the Construction Period, the Borrower will make monthly payments of interest only.
Prepayment Premium:	None
Late Charge:	10% of overdue payment if over ten (10) days late.
Fees:	A fee of $12,500.00. The fee is consideration for the underwriting services rendered in order to issue this commitment, supported by good, valuable, and adequate consideration. The fee is acknowledged to be earned upon acceptance of this commitment in principal.

General Conditions

1. Security. The loan is to be evidenced by a promissory note secured by:

A priority mortgage of land located at Lots 1-20 in the Christmas Creek Subdivision, Cumberland, Maine. Upon execution of this commitment letter, Borrower shall provide Bank with a legal description of said property.

The mortgage deed shall provide that the grantor shall not assign, transfer, or convey, or suffer or permit any encumbrance of the Borrower's interest in the collateral real estates without first having obtained the prior written consent of the Bank, its successors, or assigns.

All business assets and personal property of every kind and nature of the Borrower, wherever located and whether now owned or hereafter acquired, whether now existing or hereafter arising, including but not limited to all fixtures, goods, machinery, equipment, inventory, accounts, including accounts receivable, chattel paper, including electronic chattel paper, deposit accounts, including all certificates of deposit whether or not evidenced by an instrument, documents, letter of credit rights, commercial tort claims, securities and all other investment property, any other contract rights or rights to the payment of money, insurance claims and proceeds, general

intangibles, instruments, goods not otherwise described herein, and all cash and non-cash proceeds, including insurance proceeds, additions, accessions, substitutions or products to or for any of the foregoing Collateral now owned or hereafter acquired located at the above property.

2. Legal Services. The Bank's counsel may review all title documentation, title insurance binders or policies and title opinions. The Bank's counsel shall prepare all documents pertaining to this loan, on behalf of the Bank. All such documents, and any opinions required of the Borrower shall be in form and substance satisfactory to Lender's counsel. It is understood that whether or not the transaction herein contemplated is completed, the Borrower will pay all costs of the title examination, attorneys' fees, appraisal fees, survey costs, and all other incidental expenses.

3. Insurance. Insurance policies, insurance binders, or certificates of insurance providing for fire insurance with extended coverage, public liability insurance, flood insurance and workers' compensation insurance, if applicable, in such amounts as the Bank may require from time to time, and other such insurance coverage as the Bank may from time to time require, shall be in form, substance, amounts, and with companies acceptable to the Bank. The Borrower may select an agent or insurer through or by which the insurance that is required by the Bank is placed. The Borrower may choose an agent, broker or insurer whether or not that agent, broker or insurer is affiliated with the Bank. Your choice is subject to the approval of the Bank, which approval must be on a reasonable basis. Insurance policies shall have premiums prepaid by the Borrower, shall have proper mortgagee clauses attached to provide for any loss payable thereunder to be paid to the Bank as a loss payee, and shall provide that the policy may not be canceled without 10 days prior written notice to the Bank. Evidence of such coverage shall be deposited with the Bank throughout the life of the loan.

4. Title Insurance; Surveys. The Borrower may select an attorney to make a title examination. The Bank will require an executed title insurance binder (to be supplemented after closing by an executed policy of title insurance) from a title insurance company approved by the Bank, dated no more than five (5) days prior to closing, with premium paid and such endorsements as the Bank may require, securing the Bank in the total amount of the loan as the holder of a valid mortgage lien on the Borrower's fee simple interest in the property, free and clear of all liens, encumbrances, and exceptions other than those approved by the Bank. Borrower may elect to receive owner's coverage.

Bank may also require a current survey certified to Bank and the title insurer, made by a registered land surveyor in the State of Maine acceptable to Bank, containing a detailed legal description of the Property which coincides with that contained in the title policy, clearly setting forth bearings and dimensions and location of boundary lines as well as the dimensions and location of all component parcels comprising the subject real estate, improvements, streets, accesses, easements, encroachments and setbacks and containing such certifications as Bank may require. Bank may also require additional surveys at any time it deems necessary.

Borrower shall pay all costs related to the issuance of the title insurance commitment, policy, endorsements and any survey or inspection required by Bank.

5. Brokerage. No brokerage commission or compensation is to be paid by the Bank in connection with this loan, and, by acceptance hereof, the Borrower covenants to indemnify the Bank against any claim for a brokerage commission or compensation.

6. Borrower's and Guarantor's Representations. The Borrower and each of the Guarantors represents and warrants to the Bank as follows:

A. The Borrower and each of the Guarantors is fully authorized to execute this agreement and all other agreements and documents pertaining to the loan, and such execution will not violate any law, ordinance, regulation, bylaw, or articles of incorporation.

B. The financial condition of the Borrower and each of the Guarantors has not changed since the date of its loan application. All financial data submitted by Borrower and each of the Guarantors are true and correct.

C. All taxes, rates, and assessments, whether federal, state, or local, due from the Borrower and each of the Guarantors have been paid or accrued and appropriate tax returns have been filed.

D Neither the Borrower nor any company of which the Borrower, nor the Guarantors nor any company of which any Guarantor is or was a principal owner has been in receivership, been adjudicated as bankrupt or insolvent, made an assignment for the benefit of creditors, or been prosecuted in any criminal proceedings.

E. There is no litigation, eminent domain, or similar proceeding threatened or pending against Borrower, or any Guarantor, which may materially affect the value of the Collateral or the ability of Borrower or any Guarantor to perform its obligation hereunder.

F. There exists no event or circumstance which, with notice of lapse of time, or both, would constitute grounds for termination of this Commitment;

G. Borrower has, or prior to closing will have, a valid fee simple interest in and to the real and personal property constituting collateral for this loan, free and clear of all liens, charges, claims, options and other encumbrances, subject only to such liens, charges, claims, options and encumbrances as may be accepted in writing by Bank;

H. No consent, approval or other authorization is required with respect to this transaction from any person or under any document by which Borrower or any Guarantor is obligated or bound.

Borrower shall update the above representations and warranties and furnish at closing such additional information, representations and warranties for it or any other relevant party as Bank may request in connection with the Loan.

7. Set Off. The Borrower agrees that all cash or other property in possession of the Bank (including compensating balances or any deposits) will be collateral for the entire loan without further agreement unless otherwise specifically agreed in writing.

8. Incorporation Into Loan Documents. The Bank and the Borrower agree that this commitment shall survive the loan closing contemplated hereunder and that each and every one of the obligations and undertakings of the Borrower and any guarantor set forth in this commitment shall be continuing obligations and undertakings and shall not cease or terminate until the entire loan, together with all interest, fees and any other amounts which may accrue pursuant to this commitment or the loan documents executed pursuant hereto shall have been paid in full.

9. Environmental Compliance.

A. As a condition of this commitment, Borrower must complete the attached Environmental Risk Assessment Questionnaire and provide such supplemental information (including responses to a Supplemental Tank Questionnaire pertaining to storage tanks) as

Lender may deem necessary or proper.

B. If Lender determines, based upon a review of Borrower's responses to the Environmental Risk Assessment Questionnaire or any other information that Borrower supplies to Lender, that the Property may, or actually does, contain environmental hazards, Lender may, at its sole discretion, require an Environmental Site Assessment to be conducted by a reputable environmental engineer or consultant designated or approved by Lender. Such report shall indicate the absence from the premises of any and all environmental hazards, and shall otherwise be satisfactory in all respects to Lender. All analyses shall be at Borrower's expense.

C. Borrower represents and warrants to Lender that Borrower is in compliance with all laws and regulations governing hazardous waste, asbestos, and any other environmental matters that Lender and/or Lender's counsel deem to be appropriate. Borrower shall execute any and all documentation concerning environmental matters as Lender may request.

D. If the results of the Environmental Risk Assessment Questionnaire - or any site assessment or inquiry reveal that environmental problems exist, Lender reserves the right to determine, in its sole judgment, whether such problems pose sufficient credit risk that Lender desires to reconsider entering into a loan relationship with the Borrower.

E. If any further environmental analyses are required, Borrower authorizes Lender or its agents to directly discuss with any consultants retained by Borrower the results of those analyses. The decision by Lender to lend should not be construed as Lender's determination or implicit representation that Borrower's real property or mode of operation is free of actual or potential environmental problems.

F. Borrower shall not cause any environmental pollution from any of its business activities and shall, at all times, maintain compliance with all applicable federal, state and local environmental and land use laws and regulations, including, but not limited to, those provisions relating to fuel and chemical storage tanks.

G. Borrower shall promptly notify Bank of any change in environmental status from that previously supplied to Bank. Further, Borrower shall promptly notify Bank of the commencement of state, federal, or private environmental or land use investigation or enforcement proceeding or threat thereof.

H. Borrower and Guarantor agree to indemnify and hold Bank harmless from all liability or loss arising out of violations of all applicable environmental laws or regulations except insofar as the violation was direct and intentional result of independent action taken by Bank.

10. Other Conditions. This commitment is subject to the following other conditions:

A. Borrower shall execute such further documents to evidence or perfect the security of the loan transaction as contemplated by this commitment and provide such resolutions, representations, and attorney opinions as Bank and Bank's counsel shall deem necessary or advisable.

B. Borrower will maintain a comprehensive deposit relationship with the Bank for the duration of the loan.

C. Guarantors shall each provide an irrevocable unconditional personal payment guaranty.

D. Borrower agrees to provide Bank with copies of reviewed financial statements prepared by a CPA, CPA prepared Federal Income Tax Return, and an annual debt schedule satisfactory to the Bank within 120 days of its year-end annually.

E. Guarantors agree to provide Bank with their personal financial statements and copies of their CPA prepared Federal Income Tax Return satisfactory to the Bank within 120 days of year-end annually.

F. If not already required by the existing terms as stated herein the Bank may, at Bank's discretion, require Borrower and any related Entities to provide in-house prepared financial statements on a schedule to be determined by Bank.

G. Borrower's aggregate cash flow/debt service ratio must be maintained at a ratio of no less than 1.15 to 1. This cash flow coverage ratio shall be calculated as follows: (Net Profit After All Distributions and/or income taxes Plus Depreciation, Amortization, and Interest Expenses) Divided by Annual Debt Service. Bank may make adjustments for items identified as Extraordinary Items.

H. A satisfactory review of an appraisal of the real property security. The market value of the real property must give the Bank a loan to value as improved of 80% or less. Borrower agrees to pay for this appraisal. This agreement will be in effect for the duration of the loan.

I. Borrower agrees that the loan to cost will not exceed 80%.

J. The Bank's satisfactory review of the proposed plans, specifications, construction contract (if Borrower and contractor are different) and detailed construction estimates, with a minimum contingency of 10% allocated for potential cost overruns.

K. Bank shall hire an unrelated, qualified third party project inspector to conduct inspections upon request of construction advances. All advances will be handled by a third party monitoring service. Borrower shall be responsible for the cost of said inspections.

L. Borrower's legal counsel will provide to Bank written evidence that: (i) all required utilities are unconditionally available to the project site in sufficient capacity to serve the property; (ii) the real property upon which the improvements are to be constructed is finally and properly zoned for its contemplated use; and (iii) that all required licenses, permits and approvals of governmental authorities for the improvements and the intended use of the affected real property have been unconditionally and validly issued and obtained, are in full force and effect, and are not being challenged.

M. Construction of the project shall be conducted only by a general contractor. That contractor shall be bonded; however, the Bank may consider waiving the bond requirement upon receipt and review of a "bonding commitment letter specific to the project" and the General Management contract.

N. Borrower agrees that all construction disbursements will be made in accordance with Bank's construction agreement.

O. Borrower agrees that the title to the property will be updated monthly during construction. Borrower agrees to pay for the title updates.

P. Borrower agrees that 100% of the net proceeds from lot sales will be paid as a principal reduction on the note. Net proceeds are defined as the total sale price less any commissions and closing costs.

Q. This commitment letter supersedes and replaces our commitment letter of July 10, 2019 to the Borrower.

11. Bank not a Joint Venturer. Bank shall not be deemed to be a partner or joint venturer with Borrower or any other parties. Borrower will indemnify and hold Bank harmless from and against any and all liabilities, damages, claims, demands, costs, expenses and attorneys' fees resulting from such a construction of the relationship of the parties.

12. Enforcement against Bank. Borrower understands that, under Maine law, no promise, contract or agreement to lend money, extend credit, forbear from collection of a debt or make any other accommodation for the repayment of a debt for more than $250,000.00 may be enforced in court against the Bank unless the promise, contract or agreement is in writing and signed by the Bank. Accordingly, the Borrower cannot enforce any oral promise unless it is contained in a Loan Document signed by the Bank, nor can any change, forbearance, or other accommodation relating to the Loan, this Agreement or any other Loan Document be enforced, unless it is in writing signed by the Bank. Borrower also understands that all future promises, contracts or agreements of the Bank relating to any other transaction between Borrower and Bank cannot be enforced in court unless they are in writing signed by the Bank.

13. Waiver of Jury Trial. BANK AND BORROWER AGREE THAT NEITHER OF THEM NOR ANY ASSIGNEE OR SUCCESSOR SHALL (A) SEEK A JURY TRIAL IN ANY LAWSUIT, PROCEEDING, COUNTERCLAIM, OR ANY OTHER ACTION BASED UPON, OR ARISING OUT OF, THIS AGREEMENT, ANY RELATED INSTRUMENTS, OR THE DEALINGS OR THE RELATIONSHIP BETWEEN OR AMONG ANY OF THEM, OR (B) SEEK TO CONSOLIDATE ANY SUCH ACTION WITH ANY OTHER ACTION IN WHICH A JURY TRIAL CANNOT BE OR HAS NOT BEEN WAIVED. THE PROVISIONS OF THIS PARAGRAPH HAVE BEEN FULLY DISCUSSED BY THE BANK AND THE BORROWER, AND THESE PROVISIONS SHALL BE SUBJECT TO NO EXCEPTIONS. NEITHER THE BANK NOR THE BORROWER HAS AGREED WITH OR REPRESENTED TO THE OTHER THAT THE PROVISIONS OF THIS PARAGRAPH WILL NOT BE FULLY ENFORCED IN ALL

INSTANCES.

14. Closing. This commitment shall become null and void if the loan is not closed and initial disbursement made on or before 90 days from the date of acceptance unless said date is extended by the Bank at its sole option. The loan closing will be held at the office of the Bank or a place designated by the Bank.

15. Acceptance. This commitment is issued in response to the Borrower's request for a loan and in reliance upon the representations made herein and in the application. In consideration for the expenses incurred by the Bank in processing this loan, for its issuance of this commitment, and for the holding for disbursement, the Borrower agrees that upon acceptance of this commitment it shall become binding and that the loan will be closed in accordance with the provisions hereof.

16. Entire Agreement; Modification. This Agreement contains the entire agreement of the parties with respect to the subject matter herein and supersedes and cancels any and all prior negotiations and understandings between them regarding the same subject matter. This Agreement may not be altered or amended except in writing, signed by each party. Borrower may not take any action herein prohibited or omit to perform any act herein required to be performed by it, unless Borrower obtains Lender's prior written consent to each such action or omission to act. The terms of this Agreement are contractual in nature and not mere recitals.

17. Right to sell loan or portion thereof by Bank to a Third Party.

Sale of loan. Bank shall have the unrestricted right at any time or from time to time, and without Borrower's consent to assign all or any portion of its rights and obligations hereunder to any third party, (each, an "Assignee"), and Borrower agrees that it shall execute, or cause to be executed, such documents as Bank shall deem reasonably necessary to effect the foregoing. Upon the execution and delivery of the assignment documentation, such Assignee shall be a party to this Agreement and shall have all of the rights of Bank under any and all documents, instruments and agreements executed in connection herewith to the extent that such rights and obligations have been assigned by Bank and Bank shall be released from its obligations hereunder and thereunder to a corresponding extent. Bank may furnish any information in its possession from time to time to prospective Assignees concerning Borrower, the Guarantors and the tenants including but not limited to all financial records, as that term is defined by Title 9-B M.R.S. § 161 (e), as amended, and all reports, tax returns, documents and all other information of any type or nature. Provisions in this paragraph shall survive the closing of the loan.

Sale of a Portion of Loan. Bank shall have the unrestricted right at any time and from time to time, and without the consent of or notice to Borrower, to grant to any third party, including but not limited to, one or more banks or other financial institutions (each, a "Participant") participating interests in the Loan. Bank may furnish any information concerning Borrower, the Guarantors and the tenants including but not limited to all financial information and tax returns in its possession from time to time to any prospective Participants.

Whether or not the loans(s) contemplated by this Commitment Letter are consummated, the Borrower and all Guarantors, jointly and severally, agree to pay all out-of-pocket costs and expenses of the Bank

(a) in obtaining and receiving the advice of counsel as to the rights and duties of the Bank under this Commitment Letter; and

(b) in connection with

(i) preparing, executing and delivering this Commitment Letter and any amendment, waiver or consent relating to this Commitment Letter;

(ii) preserving rights under this Commitment Letter; and

(iii) enforcing any terms, provisions, or conditions contained in this Commitment Letter.

For the purposes of this section, out-of-pocket costs and expenses include, without limitation, the fees and disbursements of legal counsel for the Bank.

The provisions of this commitment cannot be waived or modified unless such waiver or modification is by a written agreement signed by the Bank and the Borrower. This commitment shall not be assignable by operation of law or otherwise.

This commitment may be terminated by Bank at any time prior to closing upon discovery by Bank of a material adverse change in or any misrepresentations or erroneous statements about the proposed project, if applicable, or in or about Borrower's position with respect to solvency, credit worthiness, ability to carry out the proposed project, government regulation, Borrower's representations herein, or any other substantial factor. In the event of such termination, Bank is entitled to collect and retain all commitment fees herein required of Borrower. Such termination shall become effective upon the mailing of notice of termination by Bank by certified first-class mail to Borrower at the address shown on this commitment.

This commitment shall not become effective unless it is accepted in writing by the Borrower and Guarantor on or before August 10, 2019. Such acceptance is to be made by signing and returning to the Bank the original of this commitment letter. Also, please complete the enclosed environmental risk assessment questionnaire.

Very truly yours,

MACHIAS SAVINGS BANK
By:

Shawn Leger
Vice President
Business Banking

SL/sac

Each person or entity signing below as Borrower and Guarantor hereby accepts this commitment and agrees to be bound by its terms and provisions.

BETA ZETA PROPERTIES, LLC, Borrower

Johan N. Noren — Date 8/2/19
Member

Christopher J. Webster — Date 08/01/19
Member

Johan N. Noren, Guarantor — Date 8/2/19

Christopher J. Webster, Guarantor — Date 08/01/19

The following information in this packet for the Christmas Creek Subdivision is the same as what was provided by the applicant and included in the Board's meeting packet for their 8-20-19 meeting.

Transmittal

To

Carla Nixon
Town Of Cumberland
290 Tuttle Rd
Cumberland, Maine 04021
P: (207) 829-5559

From

August 1, 2019

Thomas W. Perkins
President

Project

18-015 - BZP Cumberland Subdivision

Delivery Method

Reasons

☒ As requested
☒ For your review
☒ For your use

Comments

SUBJECT: Christmas Creek Subdivision - Updated Documents Package

Please find the following items attached in electronic format:

- MDOT Driveway Entrance Permit
- USACE Email intent to permit
- Portland Water District Ability to Serve
- Town of Falmouth Sewer District Ability to Serve
- Town of Cumberland Sewer Ability to Serve
- Town of Cumberland Assessor's email accepting street name
- Maine Historic Preservation acceptance of pre-historic archeological survey findings
- Maine Department of Inland Fisheries and Wildlife ecological survey and sampling findings
- Spring vernal pool survey findings (no vernal pools)
- High Intensity Soil Survey
- Final negotiated Trail Easement
- Cumberland Fire Department approval of dead end street
- Finalized drawings

Thanks, and please let me know if there are any other items you would like forwarded.

Dirigo Architectural Engineering | 7 Cobblestone Drive - Suite 2 | Turner, Maine 04282
p: 207.225.3040 | f: 207.433.1075

Maine Department of Transportation

Driveway/Entrance Permit

Janet T. Mills
Governor

Bruce A. Van Note
Commissioner

Permit Number: 26750 - **Entrance ID:** 1

OWNER

Name: **Beta Zeta Properties, LLC**
Address: **9 Kimberly Circle**
Brunswick, ME 04011
Telephone: **(207)415-5731**

Date Printed: **May 10, 2019**

LOCATION

Route: **C450N, Tuttle Road**
Municipality: **Cumberland**
County: **Cumberland**
Tax Map: **R04** Lot Number: **10**
Culvert Size: **inches**
Culvert Type: **N/R**
Culvert Length: **feet**
Date of Permit: **May 10, 2019**
Approved Entrance Width: **26 feet**

In accordance with rules promulgated under 23 M.R.S.A., Chapter 13, Subchapter I, Section 704, the Maine Department of Transportation (MaineDOT) approves a permit and grants permission to perform the necessary grading to construct, in accordance with sketch or attached plan, **an Entrance** to **Subdivision/Development** at a point **879** feet **East** from **Crossing Brook Road**, subject to the Chapter 299 Highway Driveway and Entrance Rules, standard conditions and special conditions (if any) listed below.

Conditions of Approval:

This Permittee acknowledges and agrees to comply with the Standard Conditions and Approval attached hereto and to any Specific Conditions of Approval shown here.

(G = GPS Location; W = Waiver; S = Special Condition)

G - THE ENTRANCE SHALL BE LOCATED AT GPS COORDINATES: 43.785900N, -70.237300W.

S - In the town of Cumberland on the northeasterly side of Tuttle Road, the centerline being approximately 879 feet southeasterly of the centerline of Crossing Brook Road and approximately 30 feet southeasterly of utility pole 84.

S - Water runoff from the site's access road shall be contained and directed away from the highway pavement. Should runoff related issues occur, it will be the Property Owner's responsibility to take corrective action at their expense.

S - The entrance shall be constructed in general conformity with a drawing titled "Enlarged Entrance Plan", sheet no. C2.1, drawn by Dirigo Architectural, revision 3, dated 4/30/2019.

Approved by: Anthony Fontenot Date: 5-10-2019

Thomas Perkins

From: Greenan, Colin M CIV (US) <Colin.M.Greenan@usace.army.mil>
Sent: Tuesday, June 25, 2019 3:31 PM
To: Thomas Perkins
Cc: Zachary Quinn
Subject: RE: Christmas Creek - Cumberland

Tom,
With this submittal, the Corps is prepared to authorize the project. We will begin drafting the permit next week.

Thank you

--
Colin M. Greenan
Maine Project Office
U.S. Army Corps of Engineers
442 Civic Center Drive, Suite 350
Augusta, Maine 04330

ph. (978) 318-8676

In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

-----Original Message-----
From: Thomas Perkins [mailto:tperkins@dirigoae.com]
Sent: Tuesday, June 25, 2019 3:08 PM
To: Greenan, Colin M CIV (US) <Colin.M.Greenan@usace.army.mil>
Cc: Zachary Quinn <zquinn@dirigoae.com>
Subject: [Non-DoD Source] Christmas Creek - Cumberland

Good afternoon, Colin -

I believe the only remaining item we have left to address from your plan review comments is the change of the culvert crossing from 2 EA, 48" DIA pipes to 1 EA, 96" DIA pipe. The attached drawing and table show this change.

Would you be able to issue us our permit based on this last piece of information?

Thanks - Tom

Thomas W. Perkins, PE (ME, NH, CT)

LEED AP, M.ASCE

President

o: 207.225.3040

d: 207.500.1057

c: 207.475.4958

f: 207.433.1075

Blockedwww.dirigoae.com <Blockedhttp://www.dirigoae.com/>

7 Cobblestone Drive

Suite 2

Turner, Maine 04282

<Blockedhttps://www.facebook.com/dirigoae> <Blockedhttps://www.linkedin.com/company/dirigo-architectural-engineering>

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO ATTENTION OF

MAINE GENERAL PERMIT (GP)
AUTHORIZATION LETTER AND SCREENING SUMMARY

JOHAN NOREN
C/O BETA ZETA PROPERTIES, LLC
9 KIMBERLY CIRCLE
BRUNSWICK, MAINE 04011

CORPS PERMIT # NAE-2019-00883
CORPS GP ID# 19-220
STATE ID# NRPA

DESCRIPTION OF WORK:
Place temporary and permanent fill below the ordinary high mark of an unnamed stream and in adjacent freshwater wetlands off 239 Tuttle Road at Cumberland, Maine in order to construct associated infrastructure for a 20 lot single family residence subdivision. The project will result in approximately 460 sf of permanent and 100 sf of temporary stream bed impact, and 400 sf of permanent wetland impact. This work is shown on the attached plans entitled "Beta Properties, LLC Christmas Creek Subdivision" in ten sheets dated "7/18/19".
See ADDITIONAL CONDITIONS attached.

LAT/LONG COORDINATES: 43.786789° N -70.234814° W **USGS QUAD:** YARMOUTH, ME

I. CORPS DETERMINATION:
Based on our review of the information you provided, we have determined that your project will have only minimal individual and cumulative impacts on waters and wetlands of the United States. **Your work is therefore authorized by the U.S. Army Corps of Engineers under the Federal Permit, the Maine General Permit (GP) which can be found at:** https://www.nae.usace.army.mil/Missions/Regulatory/State-General-Permits/ Accordingly, we do not plan to take any further action on this project.

You must perform the activity authorized herein in compliance with all the terms and conditions of the GP [including any attached Additional Conditions and any conditions placed on the State 401 Water Quality Certification including any required mitigation]. Please review the enclosed GP carefully, including the GP conditions beginning on page 5, to familiarize yourself with its contents. You are responsible for complying with all of the GP requirements; therefore you should be certain that whoever does the work fully understands all of the conditions. You may wish to discuss the conditions of this authorization with your contractor to ensure the contractor can accomplish the work in a manner that conforms to all requirements.

If you change the plans or construction methods for work within our jurisdiction, please contact us immediately to discuss modification of this authorization. This office must approve any changes before you undertake them.

Condition 37 of the GP (page 16) provides one year for completion of work that has commenced or is under contract to commence prior to the expiration of the GP on October 13, 2020. You will need to apply for reauthorization for any work within Corps jurisdiction that is not completed by October 13, 2021.

This authorization presumes the work shown on your plans noted above is in waters of the U.S. Should you desire to appeal our jurisdiction, please submit a request for an approved jurisdictional determination in writing to the undersigned.

No work may be started unless and until all other required local, State and Federal licenses and permits have been obtained. **This includes but is not limited to a Flood Hazard Development Permit issued by the town if necessary.**

II. STATE ACTIONS: PENDING [X], ISSUED [ ], DENIED [ ] DATE_____

APPLICATION TYPE: PBR:___, TIER 1:____, TIER 2:____, TIER 3: X, LURC:____ DMR LEASE:____ NA:____

III. FEDERAL ACTIONS:

JOINT PROCESSING MEETING: 4/12/19 LEVEL OF REVIEW: CATEGORY 1:_____ CATEGORY 2: X

AUTHORITY (Based on a review of plans and/or State/Federal applications): SEC 10_____, 404 X 10/404_____, 103_____

EXCLUSIONS: The exclusionary criteria identified in the general permit do not apply to this project.

FEDERAL RESOURCE AGENCY OBJECTIONS: EPA NO, USF&WS NO, NMFS NO

If you have any questions on this matter, please contact my staff at 978-318-8676 at our Augusta, Maine Project Office. In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

CGR

COLIN M. GREENAN
PROJECT MANAGER
MAINE PROJECT OFFICE

FRANK J. DEL GIUDICE
CHIEF, PERMITS & ENFORCEMENT BRANCH
REGULATORY DIVISION

7 AUG 2019
DATE

US Army Corps
of Engineers ®
New England District

PLEASE NOTE THE FOLLOWING ADDITIONAL CONDITIONS FOR DEPARTMENT OF THE ARMY GENERAL PERMIT NO. NAE-2019-00883

1. This authorization requires you to 1) notify us before beginning work so we may inspect the project, and 2) submit a Compliance Certification Form. You must complete and return the enclosed Work Start Notification Form to this office at least two weeks before the anticipated starting date. You must complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work. **These forms are attached after the plans.**

2. The permittee shall assure that a copy of this permit is at the work site whenever work is being performed and that all personnel performing work at the site of the work authorized by this permit are fully aware of the terms and conditions of the permit. This permit, including its drawings and any appendices and other attachments, shall be made a part of any and all contracts and sub-contracts for work which affects areas of Corps of Engineers' jurisdiction at the site of the work authorized by this permit. This shall be done by including the entire permit in the specifications for the work. If the permit is issued after construction specifications but before receipt of bids or quotes, the entire permit shall be included as an addendum to the specifications. The term "entire permit" includes permit amendments. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions of the entire permit, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps of Engineers jurisdiction.

3. Adequate sedimentation and erosion control devices, such as geotextile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize impacts during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices shall be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

4. All exposed soils resulting from the construction will be promptly seeded and mulched in order to achieve vegetative stabilization.

5. This permit authorizes impacts to only those areas of wetlands/waterway shown on the attached plans. No other filling, clearing or other disturbance in waters of the United States shall occur without the necessary authorization from the Corps.

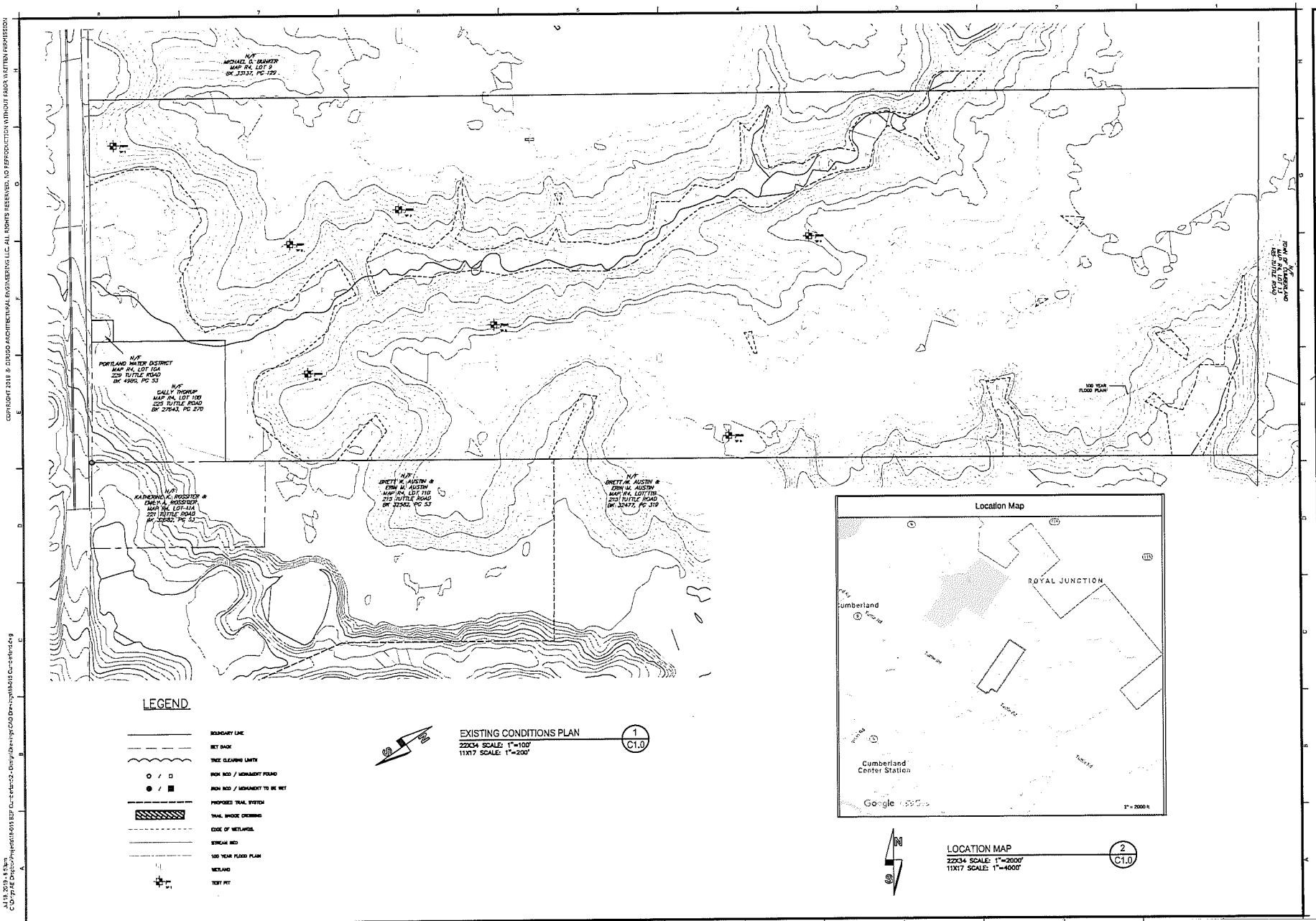
6. The buyers of lots 2, 4, 8, 10, 12 and 15 in this subdivision shall be provided a copy of this permit and plans showing buildable window areas. No filling, clearing or other disturbance in waters of the United States on these lots shall occur without the necessary authorization from the Corps.

7. All areas of temporary waterway fill shall be restored to their original contour and character upon completion of the project.

8. Stream crossing culverts shall be embedded at least 1 ft. for round pipe culverts. Riprap end treatments shall be placed at or below natural streambed elevations.

9. In-stream construction work shall be conducted between July 15th and September 30th in any year in order to minimize potential impacts to aquatic resources and local water quality. In-stream construction work shall also be conducted "in the dry" using cofferdams, temporary flume pipes, culverts, etc. and downstream flows shall be maintained during in-stream construction.

10. No tree cutting shall occur between June 1st and July 31st of any year and to the maximum extent practicable, tree cutting shall occur between October 16th and April 9th of any year in order to minimize potential impacts to federally threatened northern long-eared bats.



CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

THOMAS W. PERKINS
No. 12760
STATE OF MAINE
REGISTERED PROFESSIONAL ENGINEER

EXISTING CONDITIONS PLAN

REV.	DATE	DESCRIPTION
3	4/20/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS + FYI0 - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
DRAWN BY: JMO		CHECKED BY: TWP

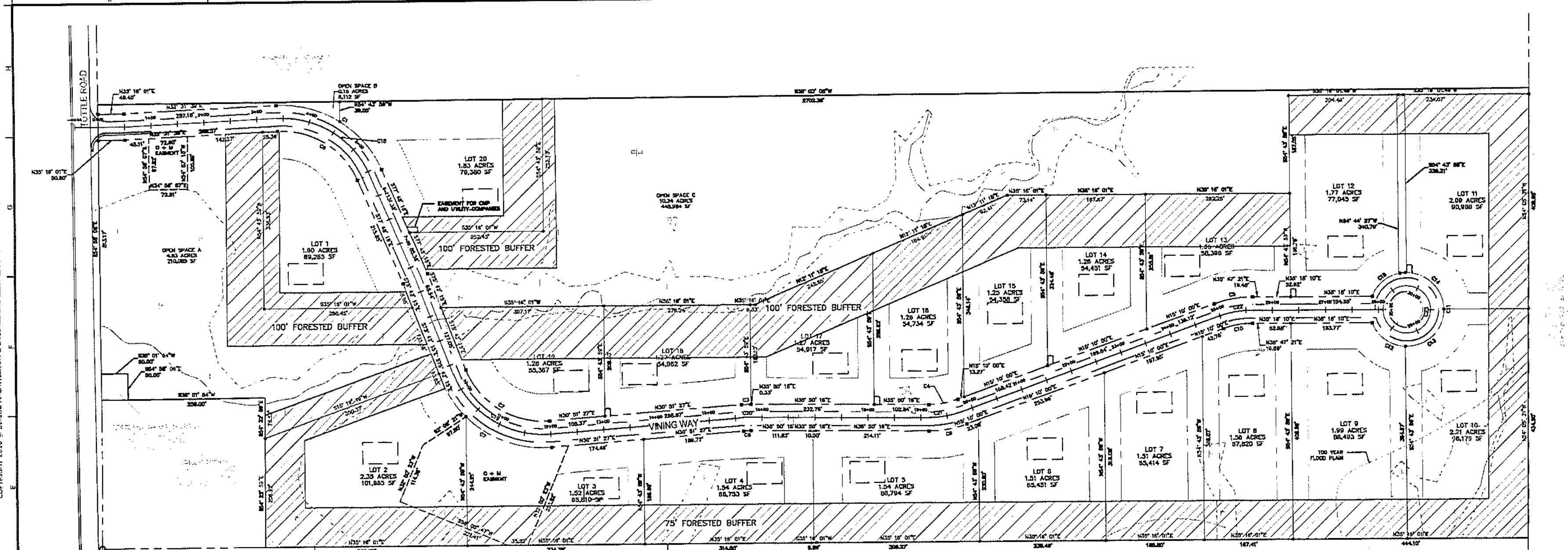
PH: (207) 225 - 3040
7 Cobblestone Way, Suite 2
Turner, ME 04282

DIRIGO ARCHITECTURAL
ENGINEERING • CONSTRUCTION MANAGEMENT
EM: tperkins@dirigoae.com W: www.dirigoae.com

DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C1.0

43.786789°N
-70.234814°W

Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 1 of 10
7/18/2019



GENERAL NOTES:

1. THE RECORD OWNER OF THE PARCEL IS BETA ZETA PROPERTIES, LLC - 9 KIMBERLY CIRCLE BRUNSWICK, MAINE - BY DEED DATED MAY 24, 2018 AND RECORDED AT THE CUMBERLAND COUNTY REGISTRY OF DEEDS (CCRD) IN BOOK 35013, PAGE 190.
2. THE PROPERTY IS SHOWN AS LOT 10 ON THE TOWN OF CUMBERLAND TAX MAP R4 AND IS LOCATED IN THE RURAL RESIDENTIAL 1 (RR1) DISTRICT.
3. TOTAL AREA OF PARCEL IS APPROXIMATELY 50.58 ACRES.
4. THE PROJECT AREA IS LOCATED WITHIN THE "RURAL RESIDENTIAL I (RR1)" ZONING DISTRICT. IT WILL BE SERVICED BY PUBLIC SEWER AND WATER.
   FOR CLUSTERED SUBDIVISION
   MINIMUM LOT SIZE: 30,000 SF
   MINIMUM FRONTAGE: 100 FT
   SETBACKS: FRONT:50 FT SIDE:30 FT REAR:75 FT
5. ROADWAY TYPE: RESIDENTIAL ACCESS > 50 VPD
   ROW WIDTH: 50 FT
   PAVEMENT WIDTH: 20 FT
   SHOULDERS: 2 FT (GRAVEL) & 4 FT PAVED SHOULDER (PEDESTRIAN LANE)
   SIDEWALK: N/A
   DESIGN SPEED: 25 MPH
6. BOUNDARY AND INFORMATION SHOWN HEREON IS BASED UPON A FIELD SURVEY PERFORMED BY SEBAGO TECHNICS, INC. IN AUGUST OF 2018.
7. PLAN REFERENCES:
   A. "MAINE STATE HIGHWAY COMMISSION RIGHT OF WAY MAP, STATE HIGHWAY, CUMBERLAND, CUMBERLAND COUNTY, STATE AID NO.3," S.H.C. FILE #5-3-289, DATED JUNE 1966 AND RECORDED AT THE CCRD IN PLAN BOOK 73, PAGE 34.
   B. "STANDARD BOUNDARY SURVEY OF DILLENBACK PARCEL, TUTTLE ROAD, CUMBERLAND MAINE, TOWN OF CUMBERLAND PURCHASE," PREPARED BY SQUAW BAY CORP. DATED MARCH 1994 AND RECORDED AT THE CCRD IN PLAN BOOK 194, PAGE 113.
   C. "STANDARD BOUNDARY SURVEY ON GREELY ROAD, CUMBERLAND, CUMBERLAND COUNTY, MAINE FOR THE TOWN OF CUMBERLAND, OWNER OF RECORD: GREGORY & KATHERINE FOWLER," PREPARED BY WALT DUNLAP, PLS, DATED SEPTEMBER 18, 1998 AND RECORDED AT THE CCRD IN PLAN BOOK 198, PAGE 334.
   D. "DIVISION OF PROPERTY, 223 TUTTLE ROAD, CUMBERLAND, MAINE, MADE FOR GREG VINING, MARCH 1, 2010 BY CULLENBERG LAND SURVEYING," RECORDED AT THE CCRD IN PLAN BOOK 210, PAGE 81.
   E. "TUTTLE ROAD LOT, CUMBERLAND, MAINE, STANDARD BOUNDARY SURVEY," PREPARED BY HARTY & HARTY PROFESSIONAL LAND SURVEYORS FOR WILLIAM R. GORMAN, DATED DECEMBER 1, 2010. UNRECORDED. PROJECT #10169.
   F. "PLAN OF A PRIVATE STREET ON TUTTLE ROAD IN CUMBERLAND, MAINE FOR OWNER OF RECORD: MICHAEL BUNKER," PREPARED BY WAYNE T. WOOD & CO. DATED MAY 2016, JOB #216074.
8. PLAN ORIENTATION IS GRID NORTH, MAINE STATE PLANE COORDINATE SYSTEM, WEST ZONE 1802-NAD83. ELEVATIONS DEPICTED HEREON ARE NAVD88, BASED ON DUAL FREQUENCY GPS OBSERVATIONS AND MAINE GIS.
9. THE LOCUS PROPERTY AS DEPICTED HEREON DOES FALL WITHIN A SPECIAL FLOOD HAZARD AREA AS DELINEATED ON THE FLOOD INSURANCE RATE MAP FOR CUMBERLAND, MAINE, CUMBERLAND COUNTY, COMMUNITY-PANEL NUMBER 2301620015B, HAVING AN EFFECTIVE DATE OF MAY 19, 1981. A PORTION OF THE LOCUS FALLS WITHIN AN AREA IDENTIFIED AS ZONE B, AREAS BETWEEN LIMITS OF 100-YEAR FLOOD AND 500-YEAR FLOOD. THE REMAINING PORTION OF THE LOCUS PROPERTY FALLS WITHIN AN AREA IDENTIFIED AS ZONE C, AREAS OF MINIMAL FLOODING.
10. A WETLAND DELINEATION WAS PERFORMED ON THIS PROJECT SITE IN JULY 2018 BY DAVID V. CHAPMAN, CERTIFIED SOIL SCIENTIST OF SEBAGO TECHNICS, INC. THIS DELINEATION CONFORMS TO THE STANDARDS AND METHODS OUTLINED IN THE 1987 WETLANDS DELINEATION MANUAL AND NORTHEAST REGIONAL SUPPLEMENT AUTHORED AND PUBLISHED BY THE U.S. ARMY CORPS OF ENGINEERS. ALL WETLAND FLAGS WERE LOCATED USING GLOBAL POSITIONING SYSTEMS (GPS) TECHNOLOGY CAPABLE OF DECIMETER ACCURACY. SEE "WETLAND DELINEATION, TUTTLE ROAD, CUMBERLAND" SOILS REPORT DATED JULY 23, 2018 AND PREPARED BY SEBAGO TECHNICS, INC. PROJECT #18280. WETLANDS ARE APPROXIMATE ONLY.
11. STREAMS SHOWN HEREON WERE INTERPOLATED FROM 2006 LIDAR DATA AND ARE APPROXIMATE ONLY.
12. DUE TO A LACK OF ORIGINAL MONUMENTS AND EVIDENCE OF PROPERTY LINE LOCATIONS, A BOUNDARY LINE AGREEMENT IS RECOMMENDED ALONG THE INDICATED LINE.

LEGEND

(line)	BOUNDARY LINE
(dashed line)	SET BACK
(scalloped line)	TREE CLEARING LIMITS
○ / □	IRON ROD / MONUMENT FOUND
● / ■	IRON ROD / MONUMENT TO BE SET
(line)	PROPOSED TRAIL SYSTEM
(hatched bar)	TRAIL BRIDGE CROSSING
(dashed line)	EDGE OF WETLANDS
(line)	STREAM BED
(dash-dot line)	100 YEAR FLOOD PLAIN
(symbol)	WETLAND

Curve Table: Vining Way

Curve #	Radius	Arc Length	Chord Bearing	Chord Length
C1	205.00	240.27	N67° 21' 40.75"E	234.19'
C2	155.00	198.67	N67° 34' 36.88"E	185.30'
C3	205.00	17.82	N33° 20' 51.23"E	17.81'
C4	155.00	58.82	N25° 30' 07.99"E	58.62'
C5	205.00	73.79	N25° 28' 40.79"E	73.39'
C6	155.00	188.47	N67° 21' 40.75"E	177.07'
C7	205.00	282.78	N67° 34' 36.88"E	245.14'
C8	155.00	13.47	N33° 20' 51.23"E	13.47'
C9	205.00	73.96	N25° 30' 07.99"E	73.56'
C10	155.00	55.79	N25° 28' 40.79"E	55.49'
C11	70.00	369.02	N54° 35' 56.77"W	49.70'
C18	180.00	218.87	N67° 21' 40.75"E	205.63'
C19	180.00	230.71	N67° 34' 35.88"E	215.24'
C20	180.00	15.65	N33° 20' 51.23"E	15.64'
C21	180.00	64.94	N25° 30' 07.99"E	64.59'
C22	180.00	64.79	N25° 28' 40.79"E	64.44'
C23	45.00	141.90	N35° 18' 10.09"E	90.00'

Curve Table

Curve #	Radius	Arc Length	Chord Bearing	Chord Length
C12	70.00	81.32	N71° 19' 34"E	76.83
C13	70.00	113.67	N8° 28' 07"W	101.81
C14	70.00	112.04	S79° 14' 08"W	100.46
C15	70.00	71.70	S4° 11' 50"E	68.60

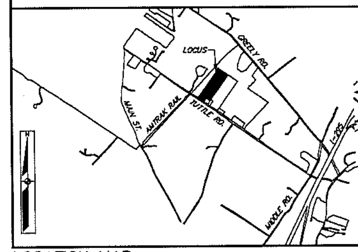
CLUSTERED Net Residential Density/Acreage	Square Feet	Acres	% of Parcel	Comments
Gross Area	2,203,371	50.58	100.0%	Measurement provided by licensed surveyor
- Roads/Parking	-	0.00	0.0%	Included in ROW/Easements
- Slope > 20%	-	0.00	0.0%	Steep slopes coincide with wetland delineation
- Wetlands	287,613	6.60	13.1%	Measurement provided by licensed surveyor
- 100-Yr Flood Areas	3,369	0.08	0.2%	Per FEMA Flood Plain Map
- ROW/Easements	160,717	3.69	7.3%	Total ROW including road and utility easements
- Resource Protection Districts	-	0.00	0.0%	Within wetland delineation
Net Area Available for Lots	1,751,672	40.21	79.5%	
Open Space Allotment	651,814	14.96	29.6%	Per attached subdivision plan, >25% MIN
Net Residential Density Limit	87,120	2.00		With public sewer and water
Maximum Number of Lots	20.11			

State of Maine, Cumberland ss
Registry of Deeds
Received ________ 20____
at ___h___m___M and recorded in
Plan Book ________ Page ____
Attest: ________
Register

0 200 400 Feet

APPROVED BY THE TOWN OF CUMBERLAND PLANNING BOARD

DATED:



LOCATION MAP N.T.S.

JIMMY C. COURBRON, PLS #2532

SURVEYOR'S STATEMENT

THIS SURVEY WAS PERFORMED UNDER MY DIRECT SUPERVISION AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT WAS DONE IN ACCORDANCE WITH CHAPTER 90, PART 1 (PROFESSIONAL STANDARDS OF PRACTICE) AND PART 2 (TECHNICAL STANDARDS OF PRACTICE) OF THE MAINE BOARD OF LICENSURE FOR PROFESSIONAL LAND SURVEYORS.

JIMMY C. COURBRON, PLS DATE

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE THOMAS W. PERKINS No. 11710 LICENSED PROFESSIONAL ENGINEER

SUBDIVISON PLAN

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - FWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
DRAWN BY: ZTQ		CHECKED BY: TWP

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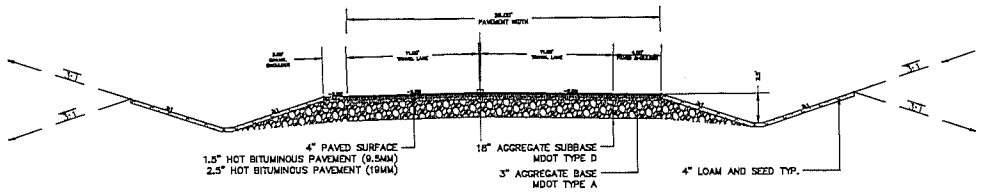
Suite 2
Turner, ME 04282

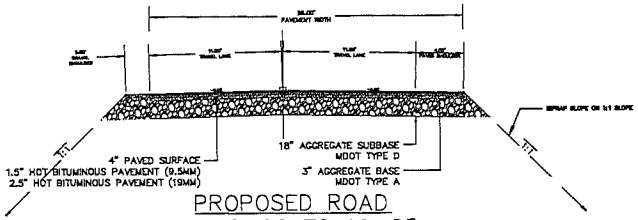
DIRIGO ARCHITECTURAL
ENGINEERING • CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C2.0

Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 2 of 10
7/18/2019

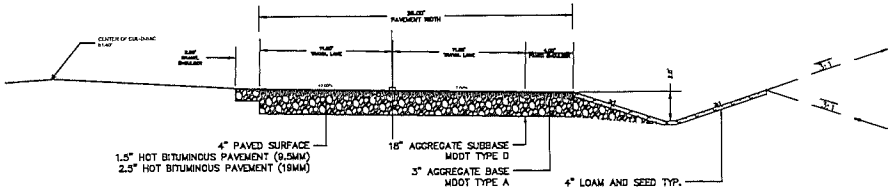


PROPOSED ROAD
STA. 1+00 TO 6+00
STA. 10+25 TO 27+90

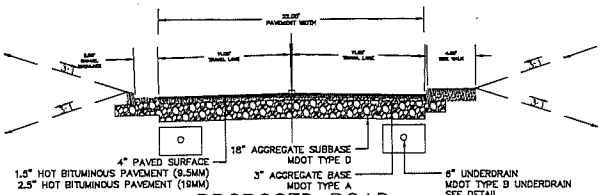


PROPOSED ROAD
STA. 6+00 TO 10+25

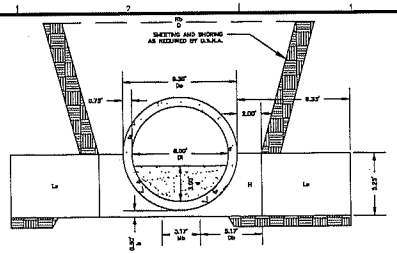
NOTE:
GUARDRAIL TO BE PROVIDED ALONG
1:1 SLOPE, SEE DETAIL 3/C2.1



PROPOSED ROAD
STA. 27+90 TO 30+80



PROPOSED ROAD
STA. 00+00 TO 1+00

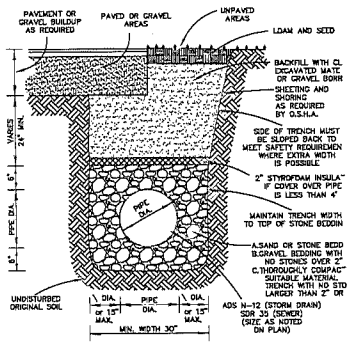


ITEM	DESCRIPTION	MATERIAL CATEGORY	COMPACTION REQUIREMENTS
Do	PIPE O.D.	REINF. CONC. PIPE	
Mb	MIDDLE BEDDING	I.	LOOSELY PLACED, UNCOMPACTED
O	OVERFILL	II.	95% MOD PROCTOR
Sb	STREAM BED FILL	IV.	NONE
Le	LOWER SIDE	III.	90% (DUV, FIRMNESS, MOD PROCTOR
H	HAUNCH	I.	95% MOD PROCTOR
Rb	ROAD BASE	SEE ROAD SECTION	SEE ROAD SECTIONS
Ob	OUTER BEDDING	I.	95% MOD PROCTOR

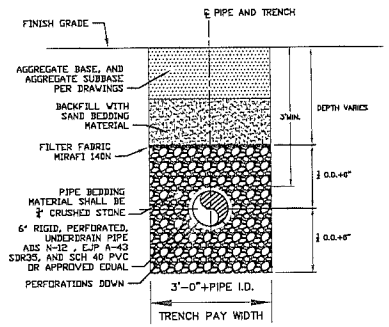
SOIL TYPES	MDOT SPEC
CAT I.	703.20 GRAVEL BORROW
CAT. II.	703.19 GRANULAR BORROW
CAT. III.	703.18 COMMON BORROW
CAT. IV.	ON-SITE MATERIAL

LOCATION	INVERT ELEV	STREAM BEDDING ELEV
5+60, 37.5' L ±	44.50	47.50
5+60, 37.5' R ±	44.00	47.00

STREAM CROSSING – PIPE SECTION
NOT TO SCALE



STORM DRAIN / SEWER TRENCH DETAIL
NOT TO SCALE



MDOT TYPE "B" UNDERDRAIN TRENCH DETAIL
NOT TO SCALE

CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

THOMAS W. PERKINS NO. 17760 STATE OF MAINE REGISTERED PROFESSIONAL ENGINEER

ROAD SECTIONS AND DETAILS

REV.	DATE	DESCRIPTION
3	4/3/2019	MOOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/1/2019	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MOOR SUBDIVISION FINAL PLAN SUBMISSION

DRAWN BY: ZNC CHECKED BY: TWP

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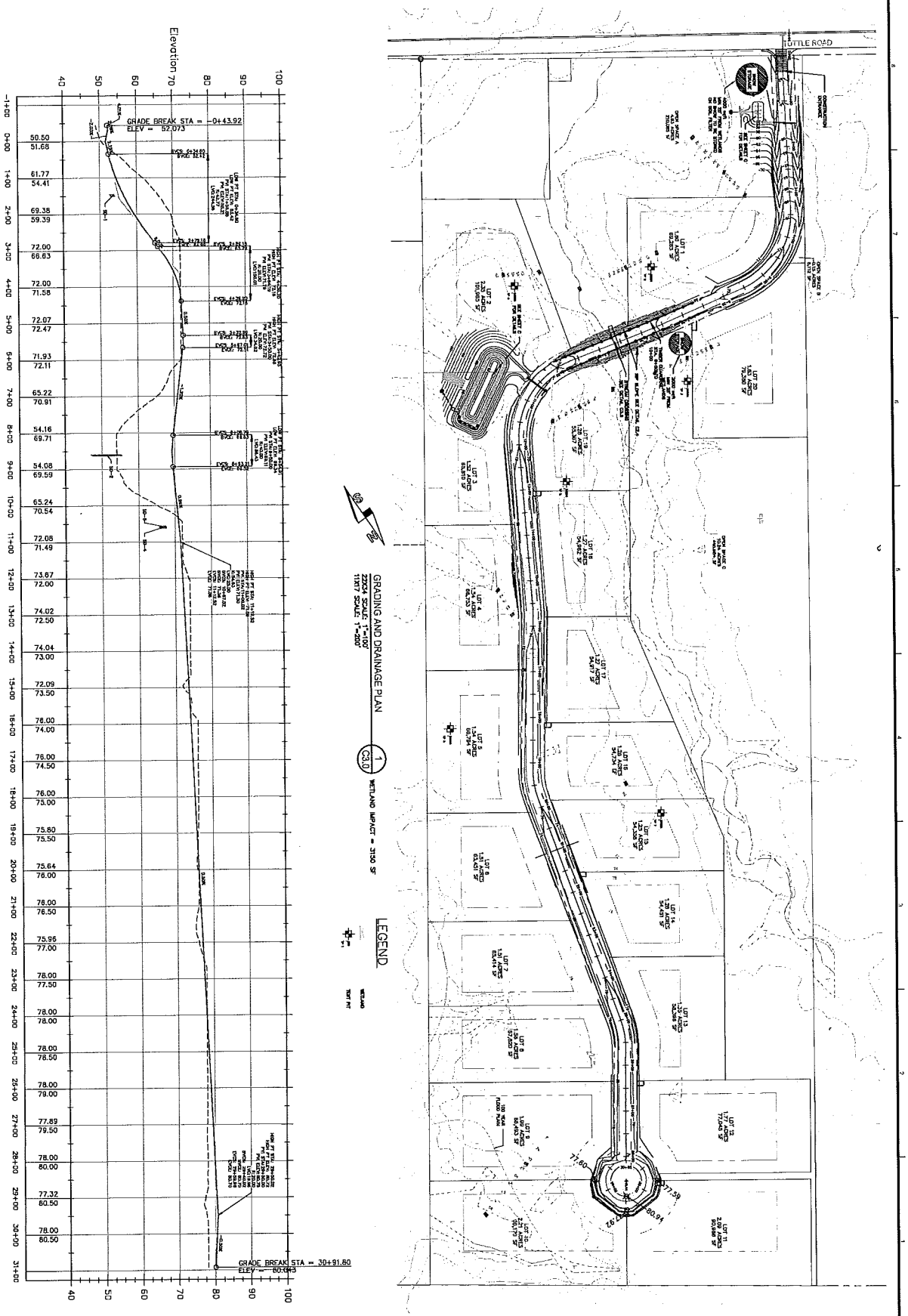
DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C3.5

Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 3 of 10
7/18/2019



SHEET NO.	C3.0
PROJECT NO. 18-015	
DATE: 7/18/2019	

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Turner, ME 04282

GRADING + DRAINAGE PLAN AND PROFILE

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - FWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

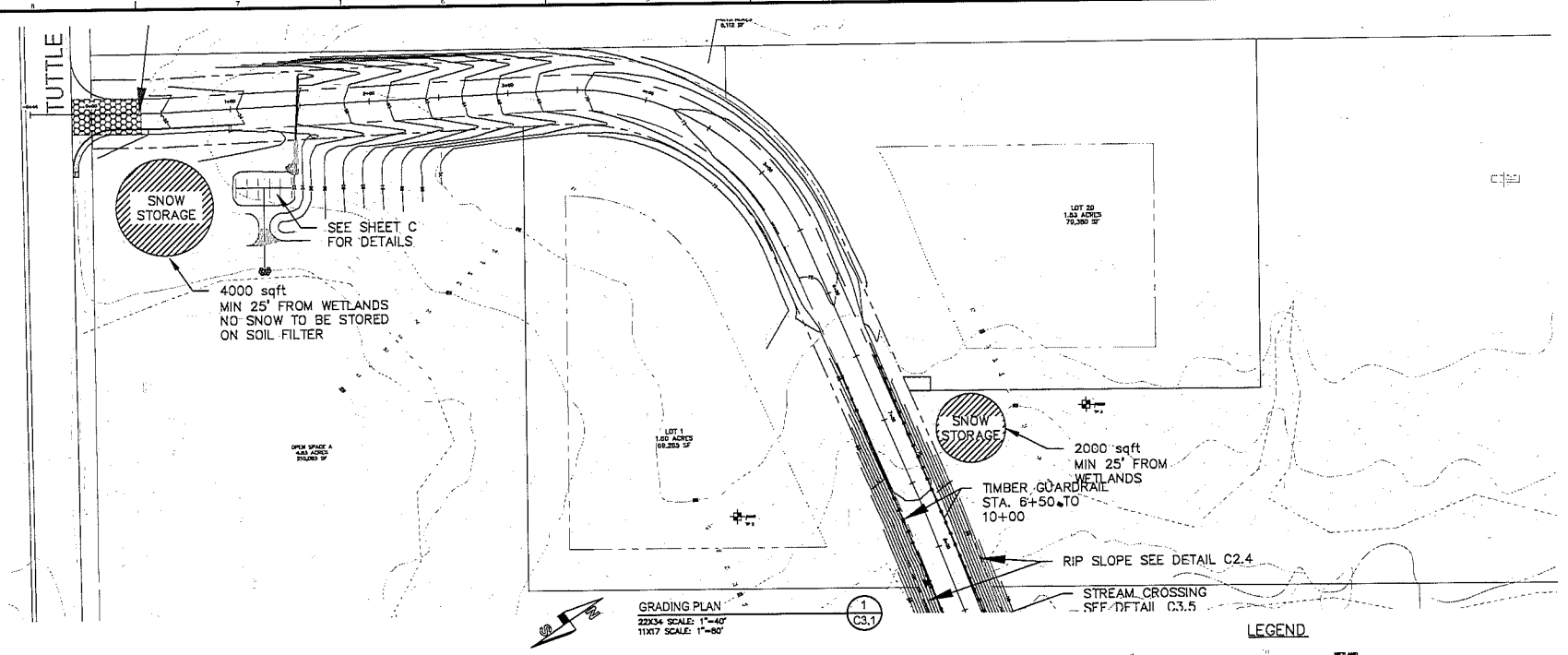
DRAWN BY: ZTQ | CHECKED BY: TWP

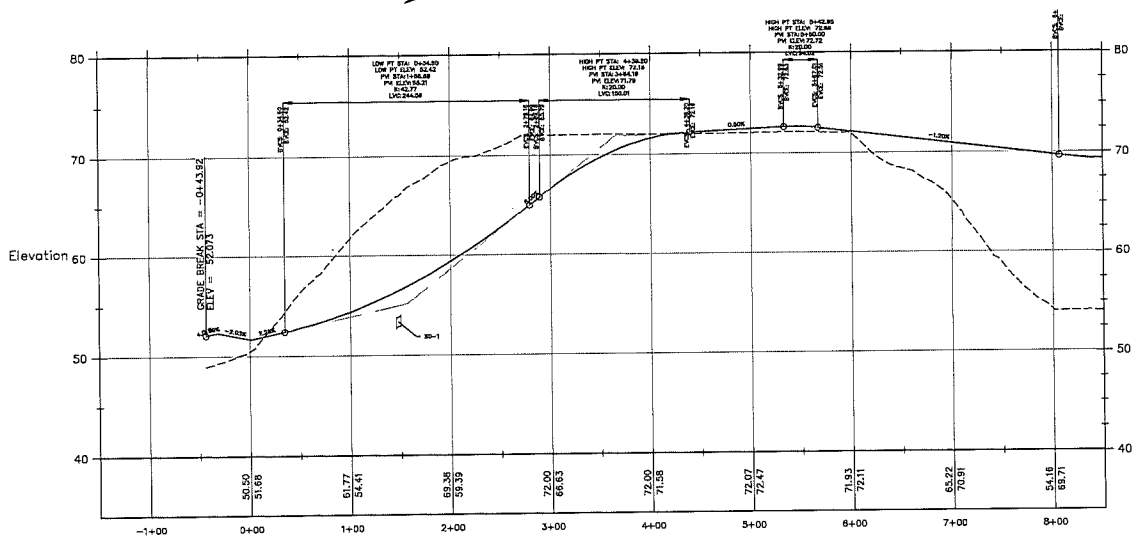
SIGNED COPY OF DRAWING ON FILE AT TOWN OFFICE

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 4 of 10
7/18/2019





CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

THOMAS W. PERKINS No. 11765 LICENSED PROFESSIONAL ENGINEER STATE OF MAINE

GRADING PLAN & PROFILE

REV.	DATE	DESCRIPTION
3	4/2019	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/2019	UTILITY DRAWINGS - FYDP - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

DRAWN BY: ZKO
CHECKED BY: TWP

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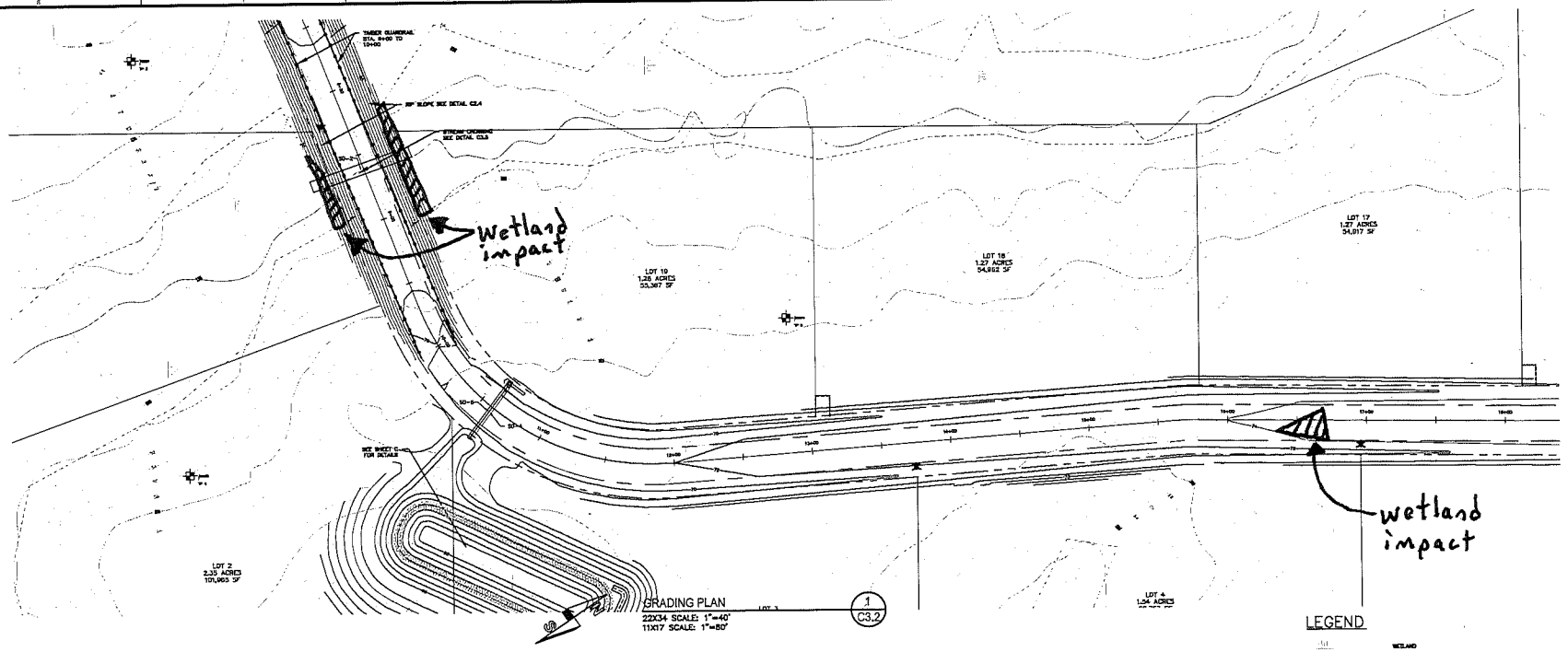
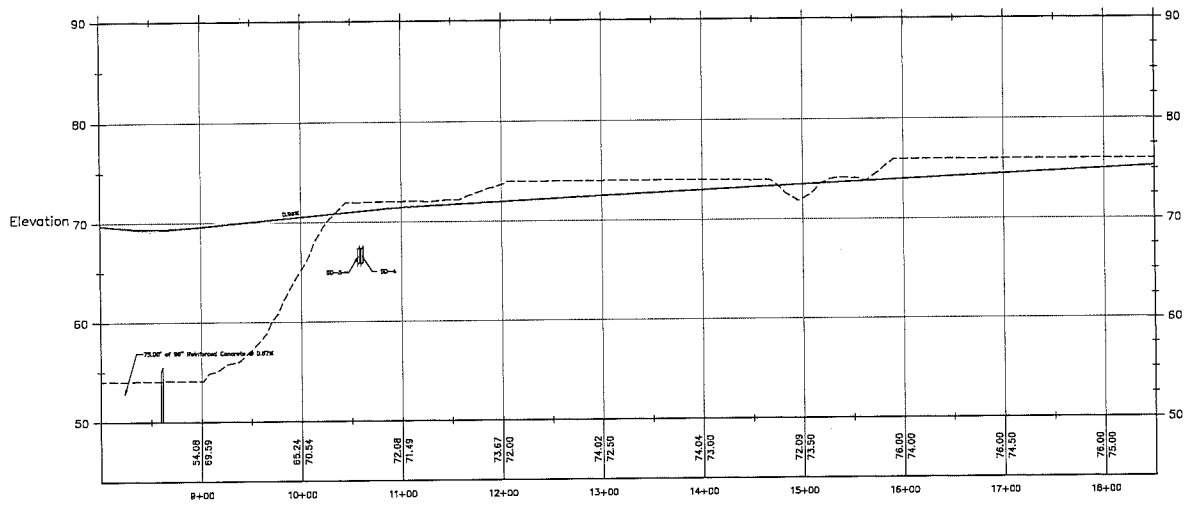
DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C3.1

Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 5 of 10
7/18/2019





CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

GRADING PLAN & PROFILE

REV.	DATE	DESCRIPTION
3	4/29/19	YARDA SUBDIVISION FINAL PLAN SUBMISSION
4	6/10/19	UTILITY REVISIONS - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

DESIGN BY: TJP CHECKED BY: TJP

PH: (207) 225 - 3040
7 Cobblestone Way, Suite 2
Turner, ME 04282

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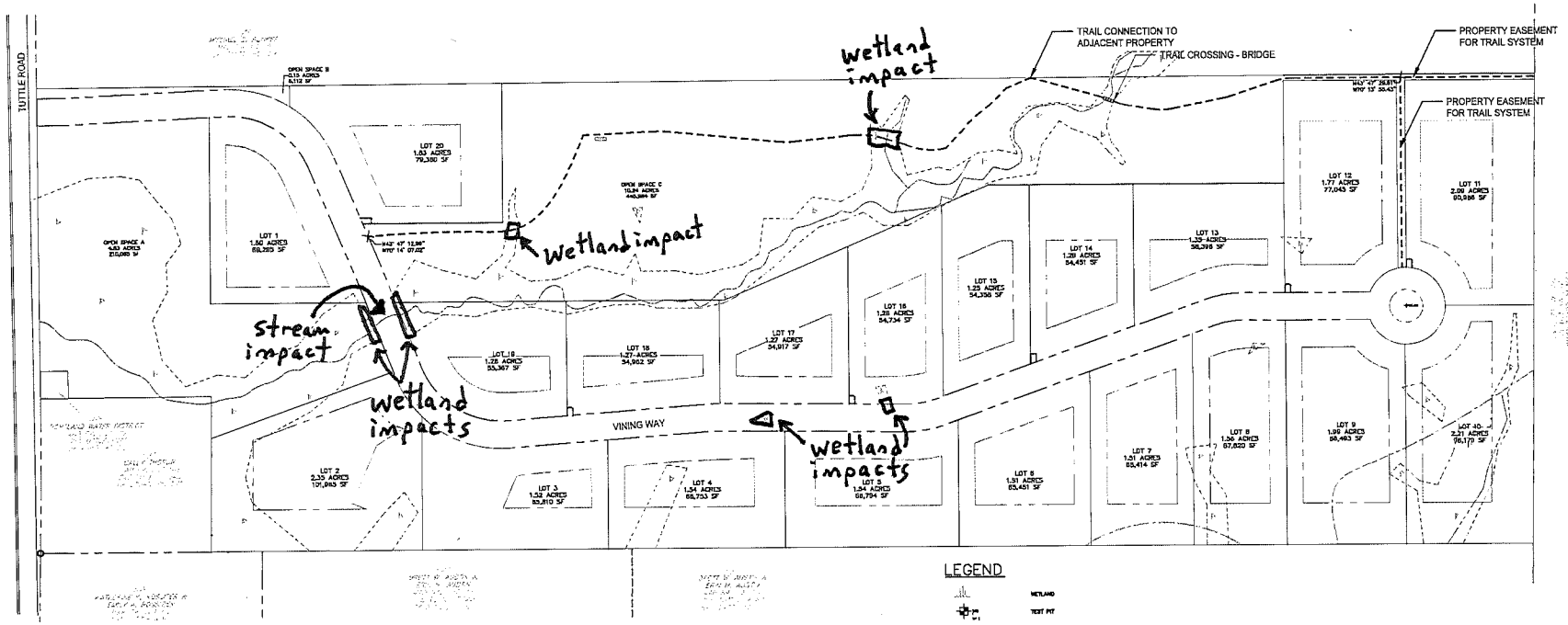
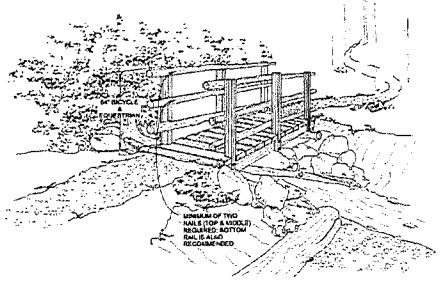
DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C3.2

Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 6 of 10
7/18/2019



TRAIL PLAN 1 C5.0
22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200'



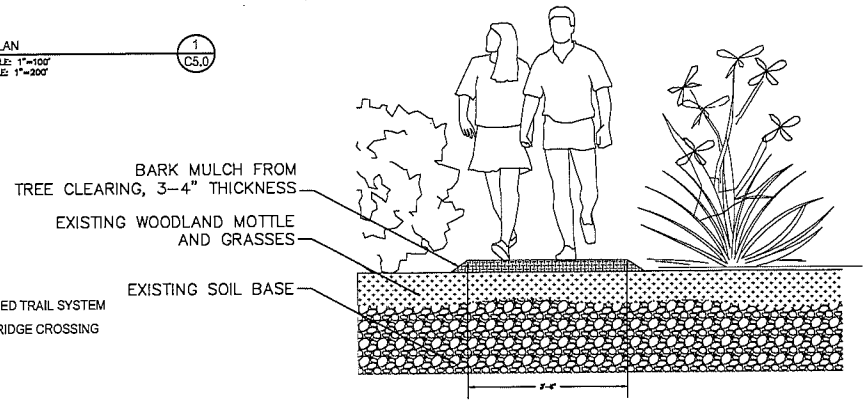
REMOTE LOCATION RAIL SYSTEM

AASHTO RURAL TRAIL BRIDGE DETAIL 2 C5.0
NTS

LEGEND

PROPOSED TRAIL SYSTEM

TRAIL BRIDGE CROSSING



TRAIL CONSTRUCTION 3 C5.0
NTS

CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

THOMAS W. PERKINS No. 12170 LICENSED PROFESSIONAL ENGINEER STATE OF MAINE

TRAIL PLAN

REV.	DATE	DESCRIPTION
3	4/20/19	PLANNING BOARD SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS + FHD - FINAL SUBMISSION
5	7/18/19	PLANNING BOARD SUBDIVISION FINAL PLAN SUBMISSION

DESIGNED BY: TWP DRAWN BY: TWP CHECKED BY: TWP

DIRIGO ARCHITECTURAL
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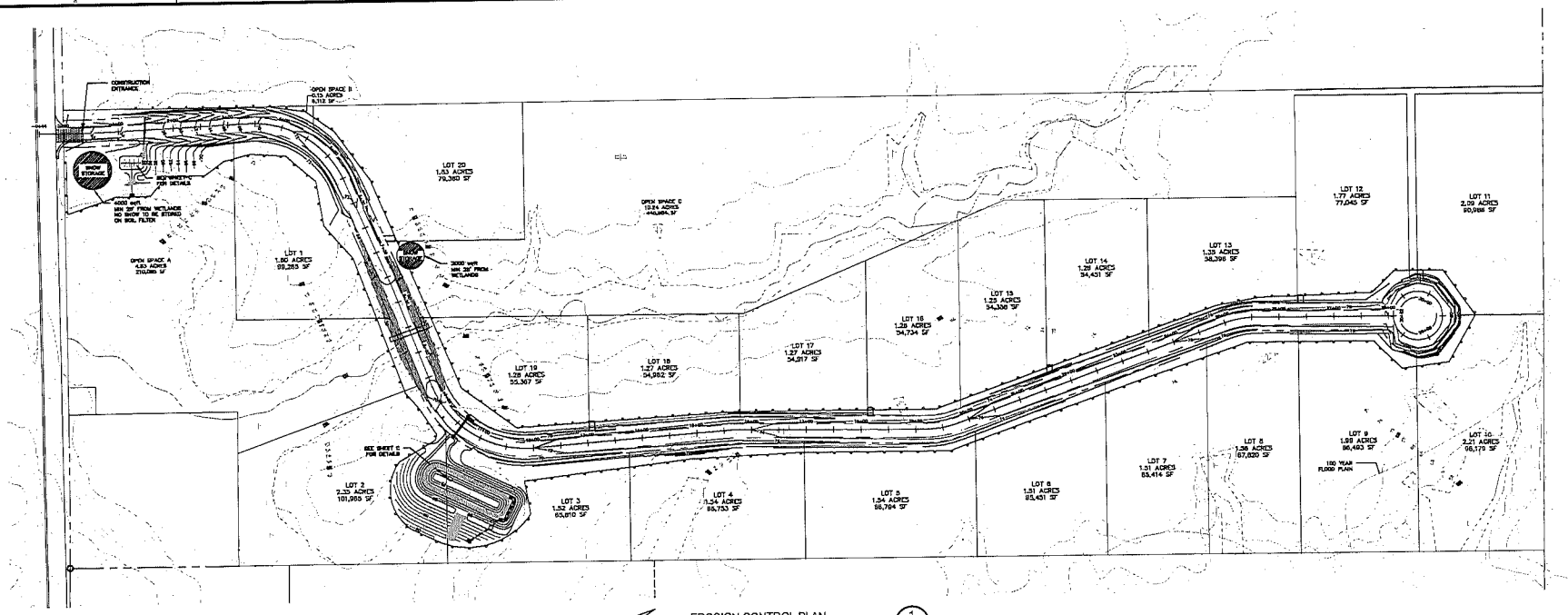
Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 7 of 10
7/18/2019

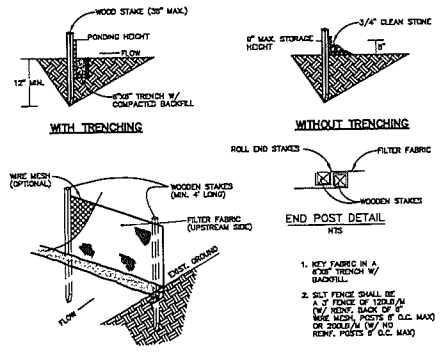


EROSION CONTROL PLAN (1 / C2.2)
22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200'

LEGEND

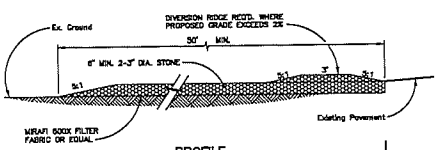
SILT FENCE / COMPOST SOCK

WETLANDS



1. KEY FABRIC IN A 6"X6" TRENCH W/ BACKFILL.
2. SILT FENCE SHALL BE A 3' FENCE OF 12OLB/M (W/ REINF. BACK OF 5' MAX MESH, POSTS 8' O.C. MAX) OR 200LB/M (W/ NO REINF. POSTS 6' O.C. MAX)

SILT FENCE DETAIL
N.T.S.

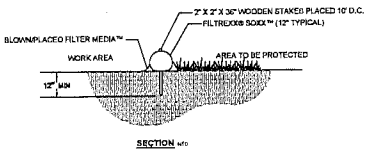


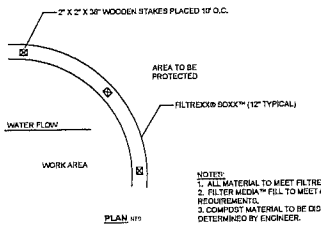
NOTES:
THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT OF WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT OF WAY.

WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

STABILIZED CONSTRUCTION ENTRANCE
NTS





NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

COMPOST SOCK FOR SEDIMENT CONTROL
NTS

CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

THOMAS W. PERKINS, #6475 — STATE OF MAINE — REGISTERED PROFESSIONAL ENGINEER

EROSION CONTROL PLAN

REV.	DATE	DESCRIPTION
3	4/10/19	MAJOR SUBDIVISION PLAN SUBMISSION
4	6/10/19	UTILITY DRAWINGS + FIRE - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

DRAWN BY: ZKQ
CHECKED BY: TWP

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Beta Zeta Properties, LLC
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NAE-2019-00883
Sheet 8 of 10
7/18/2019

Jul 18, 2019 - 6:54pm
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EROSION AND SEDIMENT CONTROL PLAN

THIS PLAN HAS BEEN DEVELOPED AS A STRATEGY TO CONTROL SOIL EROSION AND SEDIMENTATION DURING AND AFTER CONSTRUCTION. THIS PLAN IS BASED ON THE STANDARDS AND SPECIFICATIONS FOR EROSION PREVENTION IN DEVELOPING AREAS AS CONTAINED IN THE LATEST REVISION OF TO THE 2016 MAINE EROSION AND SEDIMENT CONTROL BMP'S MANUAL FOR DESIGNERS AND ENGINEERS, AND THE LATEST REVISION TO THE 2014 MAINE EROSION AND SEDIMENT CONTROL FIELD GUIDE FOR CONTRACTORS. SEE MANUALS FOR ADDITIONAL INFORMATION AND DETAILS.

THE PROPOSED LOCATIONS OF SILTATION AND EROSION CONTROL STRUCTURES ARE SHOWN ON THE SITE PLAN.

1. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE IN ACCORDANCE WITH THE "MAINE EROSION AND SEDIMENT CONTROL BMP'S", DEPARTMENT OF ENVIRONMENTAL PROTECTION, LATEST REVISION.
2. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION WILL BE LEFT IN AN UNTREATED OR UNVEGETATED CONDITION FOR A MINIMUM TIME. AREAS SHALL BE PERMANENTLY STABILIZED WITHIN 7 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 7 DAYS OF INITIAL DISTURBANCE OF THE SOIL. IF THE DISTURBANCE IS WITHIN 75 FEET OF A WETLAND OR WATERBODY, THE AREA SHALL BE STABILIZED WITHIN 2 DAYS OR PRIOR TO ANY STORM EVENT, WHICHEVER COMES FIRST.
3. EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRES OF THE SITE IS WITHOUT STABILIZATION AT ANY ONE TIME.
4. EXPOSED AREA SHOULD BE LIMITED TO THAT WHICH CAN BE MULCHED IN ONE DAY.
5. CONTINUATION OF EARTHWORK OPERATIONS OR ADDITIONAL AREAS SHALL NOT BEGIN UNTIL THE EXPOSED SOIL SURFACE ON THE AREA BEING WORKED HAS BEEN STABILIZED SUCH THAT NO MORE THAN ONE ACRE OF THE SITE IS WITHOUT EROSION CONTROL PROTECTION.
6. SEDIMENT BARRIERS (EROSION CONTROL MIX, STONE CHECK DAMS, STABILIZED CONSTRUCTION ENTRANCE, ETC.) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF THE CONTRIBUTING DRAINAGE AREA ABOVE THEM. THE CONTRACTOR SHALL MAINTAIN THE STABILIZED CONSTRUCTION ENTRANCE UNTIL ALL DISTURBED AREAS ARE STABILIZED.
7. INSTALL EROSION CONTROL MIX AT TOE OF SLOPES TO FILTER SILT FROM RUNOFF. SEE E.C. MIX DETAIL FOR PROPER INSTALLATION. EROSION CONTROL MIX WILL REMAIN IN PLACE PER NOTE #8. THE USE OF AN EROSION CONTROL MIX BERM IS PROHIBITED AT THE BASE OF SLOPES STEEPER THAN 8% OR WHERE THERE IS FLOWING WATER.
8. ALL EROSION CONTROL STRUCTURES WILL BE INSPECTED, REPLACED, AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY BEFORE AND FOLLOWING ANY SIGNIFICANT RAINFALL (ONE INCH OR MORE IN A 24-HOUR PERIOD) OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSURE. IF AN INSPECTION DETERMINES THAT A CORRECTIVE ACTION IS REQUIRED, THE ACTION OR REPAIR SHALL BE STARTED BY THE END OF THE NEXT WORKDAY AND COMPLETED WITHIN SEVEN DAYS OR BEFORE THE NEXT STORM EVENT. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT, THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE HALF THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE STABILIZED BY TURF. EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS OF PERMANENT STABILIZATION. PERMANENT STABILIZATION IS 90% GRASS CATCH IN VEGETATED AREAS.
9. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL BE STEEPER THAN ONE AND ONE HALF TO ONE (1.5 TO 1).
10. IF FINAL SEEDING OF THE DISTURBED AREAS IS NOT COMPLETED 45 DAYS PRIOR TO THE FIRST KILLING FROST, USE TEMPORARY MULCHING (DORMANT SEEDING MAY BE ATTEMPTED AS WELL) TO PROTECT THE SITE AND DELAY SEEDING UNTIL THE NEXT RECOMMENDED SEEDING PERIOD.
11. TEMPORARY SEEDING OF DISTURBED AREAS THAT HAVE NOT BEEN FINAL GRADED SHALL BE COMPLETED BY AUG. 15 OR 45 DAYS PRIOR TO THE FIRST KILLING FROST (OCT. 1) TO PROTECT FROM SPRING RUNOFF PROBLEMS.
12. DURING THE CONSTRUCTION PHASE, INTERCEPTED SEDIMENT WILL BE RETURNED TO THE SITE AND REGRADED ONTO OPEN AREAS. POST SEEDING SEDIMENT, IF ANY WILL BE DISPOSED OF IN AN ACCEPTABLE MANNER.
13. REVEGETATION MEASURES WILL COMMENCE UPON COMPLETION OF CONSTRUCTION EXCEPT AS NOTED ABOVE. ALL DISTURBED AREAS NOT OTHERWISE STABILIZED WILL BE GRADED, SMOOTHED, AND PREPARED FOR FINAL SEEDING AS FOLLOWS:
   a. FOUR INCHES OF LOAM WILL BE SPREAD OVER DISTURBED AREAS AND SMOOTHED TO A UNIFORM SURFACE.
   b. APPLY LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST. IF SOIL TESTING IS NOT FEASIBLE ON SMALL OR VARIABLE SITES, OR WHERE TIMING IS CRITICAL, FERTILIZER MAY BE APPLIED AT THE RATE OF 800 POUNDS PER ACRE OR 18.4 POUNDS PER 1,000 SQUARE FEET USING 10-20-20 (N-P2O5-K2O) OR EQUIVALENT. APPLY GROUND LIMESTONE (EQUIVALENT TO 50% CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS PER ACRE (138 LB PER 1,000 SQ. FT.).
   c. FOLLOWING SEED BED PREPARATION, DITCHES AND BACK SLOPES WILL BE SEEDED TO A MIXTURE OF 47% CREEPING RED FESCUE, 5% REDTOP, AND 48% TALL FESCUE. THE LAWN AREAS WILL BE SEEDED TO A PREMIUM TURF MIXTURE OF 44% KENTUCKY BLUEGRASS, 44% CREEPING RED FESCUE, AND 12% PERENNIAL RYEGRASS. SEEDING RATE IS 1.03 LBS PER 1000 SQ. FT. LAWN QUALITY SOD MAY BE SUBSTITUTED FOR SEED. SEED MIX SHALL CONTAIN 10% ANNUAL RYE GRASS.
   d. HAY MULCH AT THE RATE OF 70-90 LBS PER 1000 SQUARE FEET OR A HYDRO-APPLICATION OF ASPHALT, WOOD OR PAPER FIBER SHALL BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SUCH AS CURASOL OR AMS PLUS WILL BE USED ON HAY MULCH FOR WIND CONTROL.
14. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS ONCE THE SITE IS STABILIZED WITH 90% GRASS CATCH IN VEGETATED AREAS. TEMPORARY EROSION AND SEDIMENT CONTROL BLANKET SHALL BE USED IN ALL DITCHES AND SWALES AS SHOWN IN DETAILS.
15. WETLANDS WILL BE PROTECTED WITH EROSION CONTROL MIX OR SILT FENCE INSTALLED AT THE EDGE FOR THE WETLAND OR THE BOUNDARY OF WETLAND DISTURBANCE. ALL AREAS WITHIN 75 FEET OF A PROTECTED NATURAL RESOURCE MUST BE PROTECTED WITH A DOUBLE ROW OF SEDIMENT BARRIERS DURING WINTER CONSTRUCTION.
16. ALL STORMWATER WILL BE PREVENTED FROM RUNNING ONTO STOCKPILES. SEDIMENT BARRIERS WILL BE INSTALLED DOWNGRADIENT OF ALL STOCKPILES.
17. PERMANENT POST-CONSTRUCTION BMPS (VEGETATED SWALES, WET PONDS, ETC.) WILL NOT BE USED TO MANAGE FLOWS DURING CONSTRUCTION WITHOUT SPECIAL PROTECTION AND/OR RESTORATION.

MULCH AND MULCH ANCHORING

MULCH

LOCATION	MULCH	RATE (1000 S.F.)
PROTECTED AREA	STRAW OR HAY *	100 POUNDS
WINDY AREAS	SHREDDED OR CHOPPED CORNSTALKS	185-275 POUNDS
	STRAW OR HAY (ANCHORED) *	100 POUNDS
MODERATE TO HIGH VELOCITY AREAS OR STEEP SLOPES (GREATER THAN OR EQUAL TO 3:1)	JUTE MESH OR EXCELSIOR MAT	AS REQUIRED AS REQUIRED

(GREATER THAN OR EQUAL TO 3:1)

* A HYDRO-APPLICATION OF ASPHALT, WOOD, OR PAPER FIBER MAY BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SUCH AS CURASOL OR AMS PLUS SHALL BE USED ON HAY MULCH FOR WIND CONTROL.

MULCH ANCHORING

ANCHOR MULCH WITH PEG AND TWINE (1 SQ. YD./BLOCK); MULCH NETTING (AS PER MANUFACTURER); WOOD CELLULOSE FIBER (750 LBS/ACRE); USE OF A SERRATED STRAIGHT DISK. NETTING FOR SMALL AREAS AND ROAD DITCHES MAY BE PERMITTED.

Additional temporary seed mixtures (for periods less than 12 months).

Season	Seed	Rate
Summer (5/15 - 8/15)	Sudangrass Oats	40 lbs/acre 80 lbs/acre
Late Summer/Early Fall (8/15 - 9/15)	Perennial Ryegrass	40 lbs/acre
Fall (9/15 - 11/1)	Winter Rye	112 lbs/acre
Winter (11/1 - 4/1)	Mulch w/ Dormant Seed	80 lbs/acre*
Spring (4/1 - 7/1)	Oats Annual Ryegrass	80 lbs/acre 40 lbs/acre

*Seed Rate Only

EROSION CONTROL DURING CONSTRUCTION

WINTER CONSTRUCTION

1. WINTER CONSTRUCTION PERIOD: OCTOBER 1 THROUGH APRIL 15
2. OVERWINTER STABILIZATION OF DITCHES AND CHANNELS:
ALL STONE-LINED DITCHES AND CHANNELS MUST BE CONSTRUCTED AND STABILIZED BY NOVEMBER 15. ALL GRASS LINED DITCHES AND CHANNELS MUST BE CONSTRUCTED AND STABILIZED BY SEPTEMBER 1. IF A DITCH OR CHANNEL IS NOT GRASS-LINED BY SEPTEMBER 1, THEN ONE OF THE FOLLOWING ACTIONS MUST BE TAKEN TO STABILIZE THE DITCH FOR LATE FALL AND WINTER.
   A. INSTALL A SOD LINING IN THE DITCH:
   A DITCH MUST BE LINED WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES PINNING THE SOD ONTO THE SOIL WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL, AND ANCHORING SOD AT THE BASE OF THE DITCH WITH JUTE OR PLASTIC MESH TO PREVENT THE SOD FROM SLOUGHING DURING FLOW CONDITIONS. SEE THE PERMANENT VEGETATION BMP SECTION.
   B. INSTALL A STONE LINING IN THE DITCH:
   A DITCH MUST BE LINED WITH STONE RIPRAP BY NOVEMBER 15. A REGISTERED PROFESSIONAL ENGINEER MUST BE HIRED TO DETERMINE THE STONE SIZE AND LINING THICKNESS NEEDED TO WITHSTAND THE ANTICIPATED FLOW VELOCITIES AND FLOW DEPTHS WITHIN THE DITCH. IF NECESSARY, THE CONTRACTOR WILL REGRADE THE DITCH PRIOR TO PLACING THE STONE LINING SO TO PREVENT THE STONE LINING FROM REDUCING THE DITCH'S CROSS-SECTIONAL AREA.
3. OVERWINTER STABILIZATION OF DISTURBED SLOPES:
ALL STONE-COVERED SLOPES MUST BE CONSTRUCTED AND STABILIZED BY NOVEMBER 15. ALL SLOPES TO BE VEGETATED MUST BE SEEDED AND MULCHED BY SEPTEMBER 1. THE DEPARTMENT WILL CONSIDER ANY AREA HAVING A GRADE GREATER THAN 15% TO BE A SLOPE. IF A SLOPE TO BE VEGETATED IS NOT STABILIZED BY SEPTEMBER 1, THEN ONE OF THE FOLLOWING ACTIONS MUST BE TAKEN TO STABILIZE THE SLOPE FOR LATE FALL AND WINTER. STABILIZE THE SOIL WITH TEMPORARY VEGETATION AND EROSION CONTROL MATS. BY OCTOBER 1 THE DISTURBED SLOPE MUST BE SEEDED WITH WINTER RYE AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET AND THEN INSTALL EROSION CONTROL MATS OR ANCHORED MULCH OVER THE SEEDING. IF THE RYE FAILS TO GROW AT LEAST THREE INCHES OR FAILS TO COVER AT LEAST 75% OF THE SLOPE BY NOVEMBER 1, THEN THE CONTRACTOR WILL COVER THE SLOPE WITH A LAYER OF EROSION CONTROL MIX OR WITH STONE RIPRAP AS DESCRIBED IN THE FOLLOWING STANDARDS.
   A. STABILIZE THE SOIL WITH SOD:
   THE DISTURBED SLOPE MUST BE STABILIZED WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES THE CONTRACTOR PINNING THE SOD ONTO THE SLOPE WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, AND WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL. THE CONTRACTOR WILL NOT USE LATE SEASON SOD INSTALLATION TO STABILIZE SLOPES HAVING A GRADE GREATER THAN 33% (3H:1V) OR HAVING GROUNDWATER SEEPS ON THE SLOPE FACE.
   B. STABILIZE THE SOIL WITH EROSION CONTROL MIX:
   EROSION CONTROL MIX MUST BE PROPERLY INSTALLED BY NOVEMBER 15. THE CONTRACTOR WILL NOT USE EROSION CONTROL MIX TO STABILIZE SLOPES HAVING GREATER THAN 50% (2H:1V) OR HAVING GROUNDWATER SEEPS ON THE SLOPE FACE. SEE THE TEMPORARY MULCHING BMP SECTION.
   C. STABILIZE THE SOIL WITH STONE RIPRAP:
   PLACE A LAYER OF STONE RIPRAP ON THE SLOPE BY NOVEMBER 15. THE DEVELOPMENT'S OWNER WILL HIRE A REGISTERED PROFESSIONAL ENGINEER TO DETERMINE THE STONE SIZE NEEDED FOR STABILITY ON THE SLOPE AND TO DESIGN A FILTER LAYER FOR UNDERNEATH THE RIPRAP. SEE THE RIPRAP SLOPE STABILIZATION BMP SECTION.
4. OVERWINTER STABILIZATION OF DISTURBED SOILS:
BY SEPTEMBER 15, ALL DISTURBED SOILS ON AREAS HAVING A SLOPE LESS THAN 15% MUST BE SEEDED AND MULCHED. IF THE DISTURBED AREAS ARE NOT STABILIZED BY THIS DATE, THEN ONE OF THE FOLLOWING ACTIONS MUST BE TAKEN TO STABILIZE THE SOIL FOR LATE FALL AND WINTER.
   A. STABILIZE THE SOIL WITH TEMPORARY VEGETATION:
   BY OCTOBER 1, SEED THE DISTURBED SOIL WITH WINTER RYE AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET, LIGHTLY MULCH THE SEEDED SOIL WITH HAY OR STRAW AT 75 POUNDS PER 1000 SQUARE FEET, AND ANCHOR THE MULCH WITH PLASTIC NETTING. MONITOR GROWTH OF THE RYE OVER THE NEXT 30 DAYS. IF THE RYE FAILS TO GROW AT LEAST THREE INCHES OR FAILS TO COVER AT LEAST 75% OF THE DISTURBED SOILS BEFORE NOVEMBER 1, THEN MULCH THE AREA FOR OVER-WINTER PROTECTION AS DESCRIBED BELOW.
   B. STABILIZE THE SOIL WITH SOD:
   STABILIZE THE DISTURBED SOIL WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES PINNING THE SOD ONTO THE SOIL WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, AND WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL.
   C. STABILIZE THE SOIL WITH MULCH:
   BY NOVEMBER 15, MULCH THE DISTURBED SOIL BY SPREADING HAY OR STRAW AT A RATE OF AT LEAST 150 POUNDS PER 1000 SQUARE FEET ON THE AREA SO THAT NO SOIL IS VISIBLE THROUGH THE MULCH. IMMEDIATELY AFTER APPLYING THE MULCH, ANCHOR THE MULCH WITH PLASTIC NETTING TO PREVENT WIND FROM MOVING THE MULCH OFF THE DISTURBED SOIL.
5. MAINTENANCE:
IF AN INSPECTION DETERMINES THAT A CORRECTIVE ACTION IS REQUIRED, THE ACTION OR REPAIR SHALL BE STARTED BY THE END OF THE NEXT WORKDAY AND COMPLETED WITHIN SEVEN DAYS OR BEFORE THE NEXT STORM EVENT. MAINTENANCE MEASURES SHALL BE APPLIED AS NEEDED DURING THE ENTIRE CONSTRUCTION SEASON. ONCE A WEEK AND BEFORE AND AFTER EACH RAINFALL, SNOW STORM OR PERIOD OF THAWING AND RUNOFF, THE SITE CONTRACTOR SHALL PERFORM A VISUAL INSPECTION OF ALL INSTALLED EROSION CONTROL MEASURES AND PERFORM REPAIRS AS NEEDED TO INSURE THEIR CONTINUOUS FUNCTION. FOLLOWING THE TEMPORARY AND/OR FINAL SEEDING AND MULCHING, THE CONTRACTOR SHALL, IN THE SPRING, INSPECT AND REPAIR ANY DAMAGES AND/OR BARE SPOTS. AN ESTABLISHED VEGETATIVE COVER MEANS A MINIMUM OF 85 TO 90% OF AREAS VEGETATED WITH VIGOROUS GROWTH.

STABILIZATION SCHEDULE BEFORE WINTER:

SEPTEMBER 15	ALL DISTURBED AREAS MUST BE SEEDED AND MULCHED. ALL SLOPES MUST BE STABILIZED, SEEDED AND MULCHED. ALL GRASS LINED DITCHES AND CHANNELS MUST BE STABILIZED WITH MULCH OR AN EROSION CONTROL BLANKET
OCTOBER 1	IF THE SLOPE IS STABILIZED WITH AN EROSION CONTROL BLANKET AND SEEDED. ALL DISTURBED AREAS TO BE PROTECTED WITH AN ANNUAL GRASS MUST BE SEEDED AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET AND MULCHED.
NOVEMBER 15	ALL STONE LINED DITCHES AND CHANNELS MUST BE CONSTRUCTED AND STABILIZED. SLOPES THAT ARE COVERED WITH RIPRAP MUST BE CONSTRUCTED BY THAT DATE.

6. DURING WINTER CONSTRUCTION PERIOD ALL SNOW SHALL BE REMOVED FROM AREAS OF SEEDING AND MULCHING PRIOR TO PLACEMENT.
7. AREAS WITHIN 100 FEET OF STREAMS THAT ARE NOT STABILIZED WITH VEGETATION BY DEC. 1 SHALL BE MULCHED AND ANCHORED WITH NETTING. IF WORK CONTINUES IN THIS AREA DURING THE WINTER, A DOUBLE LINE OF SEDIMENT BARRIERS MUST BE USED.

HOUSEKEEPING:

1. SPILL PREVENTION. CONTROLS MUST BE USED TO PREVENT POLLUTANTS FROM BEING DISCHARGED FROM MATERIALS ON SITE, INCLUDING STORAGE PRACTICES TO MINIMIZE EXPOSURE OF THE MATERIALS TO STORMWATER, AND APPROPRIATE SPILL PREVENTION, CONTAINMENT, AND RESPONSE PLANNING AND IMPLEMENTATION.
2. GROUNDWATER PROTECTION. DURING CONSTRUCTION, LIQUID PETROLEUM PRODUCTS AND OTHER HAZARDOUS MATERIALS WITH THE POTENTIAL TO CONTAMINATE GROUNDWATER MAY NOT BE STORED OR HANDLED IN AREAS OF THE SITE DRAINING TO AN INFILTRATION AREA. AN "INFILTRATION AREA" IS ANY AREA OF THE SITE THAT BY DESIGN OR AS A RESULT OF SOILS, TOPOGRAPHY, AND OTHER RELEVANT FACTORS ACCUMULATES RUNOFF THAT INFILTRATES INTO THE SOIL. DIKES, BERMS, SUMPS, AND OTHER FORMS OF SECONDARY CONTAINMENT THAT PREVENT DISCHARGE TO GROUNDWATER MAY BE USED TO ISOLATE PORTIONS OF THE SITE FOR THE PURPOSES OF STORAGE AND HANDLING OF THESE MATERIALS.
3. FUGITIVE SEDIMENT AND DUST. ACTIONS MUST BE TAKEN TO ENSURE THAT ACTIVITIES DO NOT RESULT IN NOTICEABLE EROSION OF SOILS OR FUGITIVE DUST EMISSIONS DURING OR AFTER CONSTRUCTION. OIL MAY NOT BE USED FOR DUST CONTROL. ANY OFFSITE TRACKING OF MUD OR SEDIMENT SHALL BE VACUUMED IMMEDIATELY AND PRIOR TO THE NEXT SIGNIFICANT STORM EVENT.
4. DEBRIS AND OTHER MATERIALS. LITTER, CONSTRUCTION DEBRIS, AND CHEMICALS EXPOSED TO STORMWATER MUST BE PREVENTED FROM BECOMING A POLLUTANT SOURCE.
5. TRENCH OR FOUNDATION DE-WATERING. TRENCH DE-WATERING IS THE REMOVAL OF WATER FROM TRENCHES, FOUNDATIONS, COFFER DAMS, PONDS, AND OTHER AREAS WITHIN THE CONSTRUCTION AREA THAT RETAIN WATER AFTER EXCAVATION. IN MOST CASES THE COLLECTED WATER IS HEAVILY SILTED AND HINDERS CORRECT SAFE CONSTRUCTION PRACTICES. THE COLLECTED WATER MUST BE REMOVED FROM THE PONDED AREA, EITHER THROUGH GRAVITY OR PUMPING, AND MUST BE SPREAD THROUGH NATURAL WOODED BUFFERS OR REMOVED TO AREAS THAT ARE SPECIFICALLY DESIGNED TO COLLECT THE MAXIMUM AMOUNT OF SEDIMENT POSSIBLE, LIKE A COFFERDAM SEDIMENTATION BASIN. AVOID ALLOWING THE WATER TO FLOW OVER DISTURBED AREAS OF THE SITE. EQUIVALENT MEASURES MAY BE TAKEN IF APPROVED BY THE DEPARTMENT.
6. NON-STORMWATER DISCHARGES. IDENTIFY AND PREVENT CONTAMINATION BY NON-STORMWATER DISCHARGES. WHERE ALLOWED NON-STORMWATER DISCHARGES EXIST, THEY MUST BE IDENTIFIED AND STEPS SHOULD BE TAKEN TO ENSURE THE IMPLEMENTATION OF APPROPRIATE POLLUTION PREVENTION MEASURES FOR THE NON-STORMWATER COMPONENT(S) OF THE DISCHARGE. AUTHORIZED NON-STORMWATER DISCHARGES ARE:
   - DISCHARGES FROM FIREFIGHTING ACTIVITY;
   - FIRE HYDRANT FLUSHINGS;
   - VEHICLE WASHWATER IF DETERGENTS ARE NOT USED AND WASHING IS LIMITED TO THE EXTERIOR OF VEHICLES (ENGINE, UNDERCARRIAGE AND TRANSMISSION WASHING IS PROHIBITED);
   - DUST CONTROL RUNOFF IN ACCORDANCE WITH PERMIT CONDITIONS AND APPENDIX (C)(3);
   - ROUTINE EXTERNAL BUILDING WASHDOWN, NOT INCLUDING SURFACE PAINT REMOVAL, THAT DOES NOT INVOLVE DETERGENTS;
   - PAVEMENT WASHWATER (WHERE SPILLS/LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE NOT OCCURRED, UNLESS ALL SPILLED MATERIAL HAD BEEN REMOVED) IF DETERGENTS ARE NOT USED;
   - UNCONTAMINATED AIR CONDITIONING OR COMPRESSOR CONDENSATE;
   - UNCONTAMINATED GROUNDWATER OR SPRING WATER;
   - FOUNDATION OR FOOTER DRAIN-WATER WHERE FLOWS ARE NOT CONTAMINATED;
   - UNCONTAMINATED EXCAVATION DEWATERING (SEE REQUIREMENTS IN APPENDIX C(5));
   - POTABLE WATER SOURCES INCLUDING WATERLINE FLUSHINGS; AND
   - LANDSCAPE IRRIGATION.
7. UNAUTHORIZED NON-STORMWATER DISCHARGES. THE DEPARTMENT'S APPROVAL UNDER THIS CHAPTER DOES NOT AUTHORIZE A DISCHARGE THAT IS MIXED WITH A SOURCE OF NON-STORMWATER, OTHER THAN THOSE DISCHARGES IN COMPLIANCE WITH APPENDIX C (6). SPECIFICALLY, THE DEPARTMENT'S APPROVAL DOES NOT AUTHORIZE DISCHARGES OF THE FOLLOWING:
   - WASTEWATER FROM THE WASHOUT OR CLEANOUT OF CONCRETE, STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS OR OTHER CONSTRUCTION MATERIALS;
   - FUELS, OILS OR OTHER POLLUTANTS USED IN VEHICLE AND EQUIPMENT OPERATION AND MAINTENANCE;
   - SOAPS, SOLVENTS, OR DETERGENTS USED IN VEHICLE AND EQUIPMENT WASHING; AND
   - TOXIC OR HAZARDOUS SUBSTANCES FROM A SPILL OR OTHER RELEASE.
8. ADDITIONAL REQUIREMENTS. ADDITIONAL REQUIREMENTS MAY BE APPLIED ON A SITE-SPECIFIC BASIS.

DEWATERING PROCEDURE:

SITE DEWATERING SHOULD BE COMPLETED IN ACCORDANCE WITH THE MAINE EROSION AND SEDIMENT CONTROL – BMP SECTION A-8 (CONSTRUCTION DEWATERING) DATED OCTOBER 2016 AS SUMMARIZED BELOW:

CONSIDERATIONS:

1. THE DISCHARGE AREAS SHOULD BE CHOSEN WITH CAREFUL CONSIDERATION TO DOWN GRADIENT WATER RESOURCES AND THE LANDSCAPE ABILITY TO TREAT WATER FLOWS FROM THE DEWATERING PROCESS. A WOODED BUFFER IS BEST. ALL BUFFER REQUIREMENTS ARE FOUND IN THE VEGETATED BUFFER BMP SECTION. THE DISCHARGE SHOULD BE STOPPED IMMEDIATELY IF THE RECEIVING AREA IS SHOWING ANY SIGNS OF UNSTABILITY OR EROSION.
2. IF THE COLLECTED RUNOFF IS CONTAMINATED WITH OIL, GREASE OR OTHER PETROLEUM PRODUCTS, OIL/WATER SEPARATOR OR A FILTRATION MECHANISM MAY BE NECESSARY PRIOR TO THE DISCHARGE. ANOTHER METHOD OF DISPOSAL SUCH AS CONTAINMENT AND TRUCKING AWAY BY A MAINE DEP LICENSED TRANSPORTER WILL NEED TO BE IMPLEMENTED IF THE WATER HAS BEEN CONTAMINATED BY TOXIC AND HAZARDOUS MATERIALS.
3. ALL REQUIREMENTS OF STATE LAW AND PERMIT REQUIREMENTS OF LOCAL, STATE AND FEDERAL AGENCIES MUST BE MET.

SPECIFICATIONS:

DEWATERING EXCAVATED AREAS MUST BE IN TWO DISTINCT PHASES. THE REMOVAL OF THE COLLECTED WATER WITHIN THE EXCAVATION AND THE TREATMENT OF THE COLLECTED WATER.

PHYSICAL DEWATERING

THE REMOVAL OF WATER FROM THE EXCAVATED AREA CAN BE ACCOMPLISHED BY NUMEROUS METHODS. THE MOST COMMON OF THESE ARE: GRAVITY DRAIN THROUGH DAYLIGHT CHANNELS, MECHANICAL PUMPING, SIPHONING, AND USING THE BUCKET OF CONSTRUCTION EQUIPMENT TO SCOOP AND DUMP WATER FROM THE EXCAVATION.

1. CHANNELS DUG DISHARGING WATER FROM THE EXCAVATED AREA NEED TO BE STABLE. IF FLOW VELOCITIES CAUSE EROSION WITHIN THE CHANNEL THEN DITCH LINING SHOULD BE USED.
2. BUCKETED WATER SHOULD BE DISHARGED IN A STABLE MANNER TO THE SEDIMENT REMOVAL AREA. A SPLASH PAD OF RIPRAP UNDERLAIN WITH GEOTEXTILE MAY BE NECESSARY TO PREVENT SCOURING OF THE SOIL IN THE BASIN.
3. DEWATERING IN PERIODS OF INTENSE, HEAVY RAIN, WHEN THE INFILTRATIVE CAPACITY OF THE SOIL IS EXCEEDED, SHOULD BE AVOIDED.

SEDIMENT REMOVAL:

MANY METHODS OF SETTLING OR FILTERING SEDIMENT ARE AVAILABLE FOR THE CONTRACTOR TO CONSIDER:

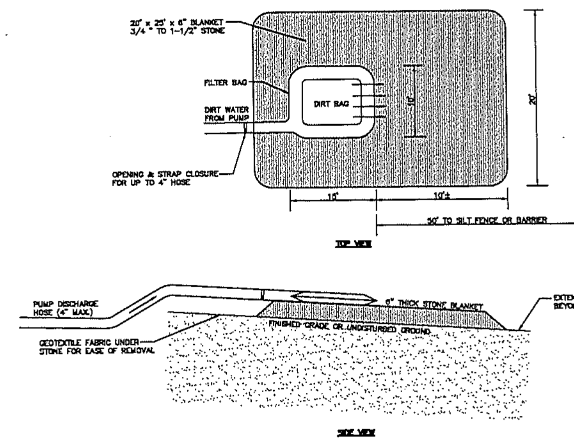
1. FLOW TO THE SEDIMENT REMOVAL STRUCTURE MAY NOT EXCEED THE SEDIMENT REMOVAL STRUCTURE'S CAPACITY TO SETTLE AND FILTER FLOW OR THE STRUCTURE'S VOLUME CAPACITY.
2. SEDIMENT REMOVAL BASINS SHOULD DISCHARGE WHEREVER POSSIBLE TO A WELL-VEGETATED BUFFER THROUGH SHEET FLOW AND SHOULD MAXIMIZE THE DISTANCE TO THE NEAREST WATER RESOURCE AND MINIMIZING THE SLOPE OF THE BUFFER AREA.
3. VARIOUS BASINS HAVE BEEN PROPOSED IN PAST PROJECTS:
   A. AN ENCLOSURE OF JERSEY BARRIERS WITH A LARGE PIECE OF SILT TAPE GEOTEXTILE.
   B. A TEMPORARY ENCLOSURE CONSTRUCTED WITH HAY BALES, SILT FENCE, OR BOTH. EROSION CONTROL MIX ALSO MAY BE INCORPORATED WITH SILT FENCE OR HAY BALES.
   C. DIRECT DISCHARGE TO A MANUFACTURED/PRE-MADE STRUCTURE SPECIFICALLY DESIGNED FOR SEDIMENT REMOVAL, LIKE SILT SAK, SILT BAG, OR OTHER SIMILAR PRODUCT.
   D. CONCRETE OR STEEL SETTLING CHAMBERED SYSTEMS FOR SEDIMENT REMOVAL.
   E. EXCAVATED OR BERMED SEDIMENTATION PONDS OR STRUCTURES. SIDE SLOPES NO GREATER THAN 2 TO 1, OR WITH A COMBINED INTERIOR AND EXTERIOR SLOPE OF NO GREATER THAN 5 TO 1. SEE THE SEDIMENT TRAP BMP SECTION.
   F. A STORMWATER DETENTION POND MAY BE USED AS A STILLING BASIN DURING CONSTRUCTION. HOWEVER, A SEDIMENT BARRIER NEEDS TO BE INSTALLED TO THE OUTLET STRUCTURE TO PREVENT THE DISCHARGE OF SEDIMENT. SEE THE SEDIMENT POND CONSTRUCTION BMP SECTION.

INSTALLATION REQUIREMENTS:

1. FOR TRENCH EXCAVATION, LIMIT THE TRENCH LENGTH TO 500 FEET AND PLACE THE EXCAVATED MATERIAL ON THE UP GRADIENT SIDE OF THE TRENCH.
2. INSTALL DIVERSION DITCHES OR BERMS TO MINIMIZE THE AMOUNT OF CLEAN STORMWATER RUNOFF ALLOWED INTO THE EXCAVATED AREA.
3. NEVER DISCHARGE TO AREAS THAT ARE BARE OR NEWLY VEGETATED.

MAINTENANCE:

DURING THE ACTIVE DEWATERING PROCESS, INSPECTION OF THE DEWATERING FACILITY SHOULD BE REVIEWED FREQUENTLY. SPECIAL ATTENTION SHOULD BE PAID TO THE BUFFER AREA FOR ANY SIGN OF EROSION AND CONCENTRATION OF FLOW THAT MAY COMPROMISE THE BUFFER AREA. OBSERVE WHERE POSSIBLE THE VISUAL QUALITY OF THE EFFLUENT AND DETERMINE IF ADDITIONAL TREATMENT CAN BE PROVIDED.



NOTES:

1. DIRT BAG MATERIAL BASED ON PARTICLE SIZE IN DIRTY WATER, I.E. FOR COARSE PARTICLES A WOVEN MATERIAL: FOR SILTS/CLAYS A NON-WOVEN MATERIAL.
2. DO NOT OVER PRESSURIZE DIRT BAG OR USE BEYOND CAPACITY.
3. LOCATE DISCHARGE SITE ON FLAT UPLAND AREAS AS FAR AWAY AS POSSIBLE FROM STREAMS, WETLANDS, OTHER RESOURCES AND POINTS OF CONCENTRATED FLOW.
4. DOWN GRADIENT RECEIVING AREA MUST BE WELL VEGETATED OR OTHERWISE STABLE FROM EROSION, E.G. FOREST FLOOR OR COARSE GRAVEL/STONE.
5. DISCHARGE NOT PERMITTED WITHIN 25' OF A STREAM OR WETLAND. CONSULT DEP IF STRUCTURE MUST BE WITHIN 75' OF STREAM OR WATER BODY. SECONDARY CONTAINMENT MAY BE REQUIRED.

PUMPED DISCHARGE SEDIMENT CONTROL DEVICE ("DIRT BAG")
NTS

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11703
LICENSED PROFESSIONAL ENGINEER

EROSION CONTROL NOTES AND DETAILS

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

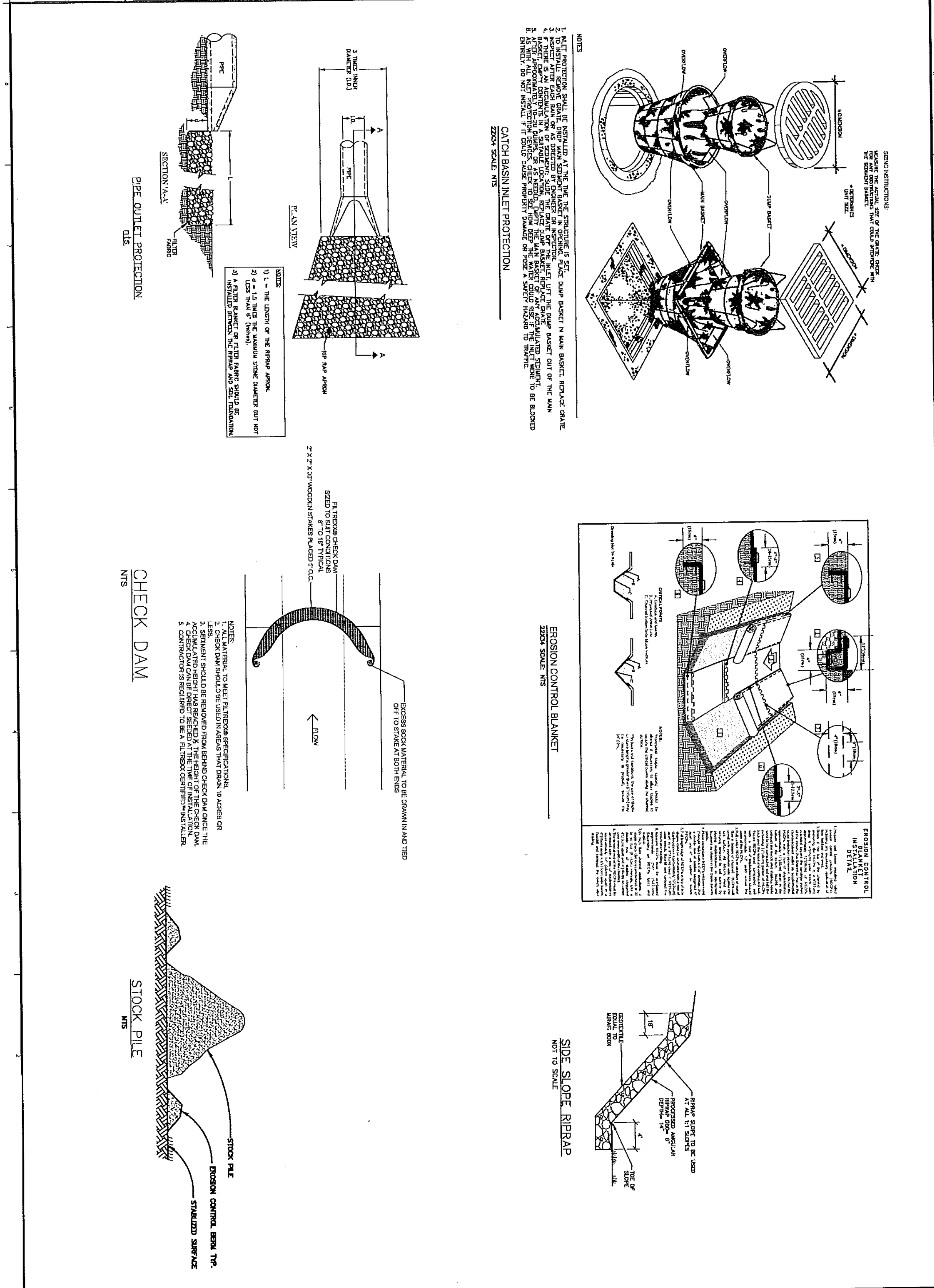
DRAWN BY: ZTQ CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way, Suite 2
Turner, ME 04282

DIRIGO ARCHITECTURAL
ENGINEERING • CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C2.3

Beta Zeta Properties, LLC
Christmas Creek Subdivision
NAE-2019-00883
Sheet 9 of 10
7/18/2019



CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE — THOMAS W. PERKINS — No. 11790 — LICENSED PROFESSIONAL ENGINEER

EROSION CONTROL DETAILS

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
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DRAWN BY: ZTQ CHECKED BY: TWP

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DIRIGO ARCHITECTURAL
ENGINEERING • CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C2.4

US Army Corps of Engineers ®
New England District

GENERAL PERMIT
WORK-START NOTIFICATION FORM
(Minimum Notice: Two weeks before work begins)

MAIL TO: Colin M. Greenan
U.S. Army Corps of Engineers, New England District
Maine Project Office
442 Civic Center Drive, Suite 350
Augusta, Maine 04330

A Corps of Engineers Permit (No. NAE-2019-00883) was issued to Josef Noren c/o Beta Zeta Properties, LLC. The permit authorized the permittee to place temporary and permanent fill below the ordinary high mark of an unnamed stream and in adjacent freshwater wetlands off 239 Tuttle Road at Cumberland, Maine in order to construct associated infrastructure for a 20 lot single family residence subdivision.

The people (e.g., contractor) listed below will do the work, and they understand the permit's conditions and limitations.

PLEASE PRINT OR TYPE

Name of Person/Firm: _____

_____

_____

Business Address: _____

_____

_____

Telephone: (____) _____ (____) _____

Proposed Work Dates: Start: _____

Finish: _____

PERMITTEE'S SIGNATURE: _____ DATE: _____

PRINTED NAME: _____ TITLE: _____

FOR USE BY THE CORPS OF ENGINEERS

Project Manager: GREENAN Submittals Required: No

Inspection Recommendation: random Maine General Permit compliance

US Army Corps
of Engineers ®
New England District

(Minimum Notice: Permittee must sign and return notification
within one month of the completion of work.)

COMPLIANCE CERTIFICATION FORM

Corps of Engineers Permit No: NAE-2019-00883

Name of Permittee: Josef Noren c/o Beta Zeta Properties, LLC

Permit Issuance Date: 8/7/2019

Please sign this certification and return it to the following address upon completion of the activity and any mitigation required by the permit. You must submit this after the mitigation is complete, but not the mitigation monitoring, which requires separate submittals.

****
* MAIL TO: U.S. Army Corps of Engineers, New England District *
* Policy & Technical Support Branch *
* Regulatory Division *
* 696 Virginia Road *
* Concord, Massachusetts 01742-2751 *
****

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit was completed in accordance with the terms and conditions of the above referenced permit, and any required mitigation was completed in accordance with the permit conditions.

Signature of Permittee

Date

Printed Name

Date of Work Completion

( )
Telephone Number

( )
Telephone Number

Portland Water District

FROM SEBAGO LAKE TO CASCO BAY

July 24, 2019

Zachary T. Quinn
7 Cobblestone Drive, Suite 2
Turner, Maine 04282

Re: 239 Tuttle Road, CU
Ability to Serve with PWD Water

Dear Mr. Quinn:

The Portland Water District has received your request for an Ability to Serve Determination for the noted site submitted on October 16, 2018. Based on the information provided per plans dated July 23, 2019, we can confirm that the District will be able to serve the proposed project as further described in this letter. **Please note that this letter constitutes approval of the water system as currently designed. Any changes affecting the approved water system will require further review and approval by PWD.**

Conditions of Service

The following conditions of service apply:

- The District can confirm that the existing water and sewer system in Tuttle Road has the capacity to serve the proposed twenty single family house lots within the Christmas Creek Subdivision in Cumberland. An 8-inch ductile iron water main extension can be installed from the 16-inch water main at Tuttle Road to the center of the last lot to be served within the proposed subdivision.
- New 1-inch domestic water services may be installed from the water main to the individual lots within the subdivision. The service(s) should enter through the properties frontage at least 10-feet from any side property lines.
- The existing sewer system has the capacity and ability to handle the additional flow generated by the single family homes within the proposed 20 lot subdivision.
- An approved backflow prevention device must be installed on the domestic service line directly after the meter prior to service activation. Please refer to the PWD website for more information on cross-connection control policies.

Prior to construction, the owner or contractor will need to complete the Main Extension Initiation form and pay all necessary fees. PWD will guide the applicant through the new development process.

Existing Site Service

According to District records, the project site does not currently have existing water service.

225 DOUGLASS STREET P.O. BOX 3553 PORTLAND, MAINE 04104-3553
PHONE: 207.774.5961 FAX: 207.761.8307 WEB: WWW.PWD.ORG

Water System Characteristics

According to District records, there is an 16-inch diameter HDPE water main in Tuttle Road and a public fire hydrant located approximately 500 feet from the site. Recent flow data is not available in this area. The most recent static pressure reading was 105 psi.

Public Fire Protection

The installation of new public hydrants to be accepted into the District water system will most likely be required. It is your responsibility to contact the Town of Cumberland Fire Department to ensure that this project is adequately served by existing and/or proposed hydrants.

Domestic Water Needs

The data noted above indicates there should be adequate pressure and volume of water to serve the domestic water needs of your proposed project. Based on the high water pressure in this area, we recommend that you consider the installation of pressure reducing devices that comply with state plumbing codes.

Private Fire Protection Water Needs

You have indicated that this project will not require water service to provide private fire protection to the site.

Should you disagree with this determination, you may request a review by the District's Internal Review Team. Your request for review must be in writing and state the reason for your disagreement with the determination. The request must be sent to MEANS@PWD.org or mailed to 225 Douglass Street, Portland Maine, 04104 c/o MEANS. The Internal Review Team will undertake review as requested within 2 weeks of receipt of a request for review.

If the District can be of further assistance in this matter, please let us know.

Sincerely,
Portland Water District

Robert A. Bartels, P.E.
Senior Project Engineer

Town of Falmouth

Wastewater Treatment Facilities
96 Clearwater Drive
Falmouth, Maine 04105

(207) 781-4462
(207) 781-2052 Fax

March 26, 2019

Mr. Zachary T. Quinn
Dirigo Architectural Engineering
7 Cobblestone Drive, Suite 2
Turner, Maine 04282

Regarding: Christmas Creek subdivision – Capacity to Serve

Dear Mr. Quinn:

In response to your recent inquiry, the Falmouth sewage treatment facility and sewer collection systems have adequate capacity to serve the proposed 20 residential unit, Christmas Creek subdivision, in Cumberland.

If we can be of any assistance, or if you require additional information, please feel free to contact us.

Sincerely;

Pete Clark
Superintendent, Falmouth Wastewater Department

TOWN OF CUMBERLAND, MAINE
290 TUTTLE ROAD
CUMBERLAND, MAINE 04021
TEL: 207-829-2205 FAX: 829-2224

April 11, 2019

Mr. Thomas Perkins, P.E.
Dirigo Architectural
7 Cobblestone Drive
Turner, ME 04282

Re: Christmas Creek Subdivision
Cumberland, Maine

Dear Tom:

The Town of Cumberland agrees to accept the sewer design flow from your project off Tuttle Road (20 units x 6HCF per month). The Town has the capacity to handle the requested flow amounts. Each of the 20 units will be required to have its own account and each permit will be $500 plus a $50 inspection fee. Monthly bills will be assessed upon occupancy through the Portland Water District. All inspections and permits are coordinated through the Codes office at Cumberland Town Hall.

Cumberland is a relatively new sewer system (less than 30 years in age) and we have been fortunate to have limited inflow and infiltration in our system. We presently own 30% of the Falmouth Treatment Plant. This new flow would be pumped via our Tuttle Road / Rt 88 distribution system.

Please let me know if you have any additional questions regarding this request.

Sincerely,

William R. Shane, P.E.
Town Manager

cc: Carla Nixon, Director of Planning
Bill Longley, Code Enforcement Officer

Thomas Perkins

From: John Brushwein <jbrushwein@cumberlandmaine.com>
Sent: Tuesday, April 23, 2019 4:48 PM
To: Thomas Perkins
Subject: RE: [Cumberland ME] Christmas Creek Subdivision - "Vining Way" (Sent by Tom Perkins, tperkins@dirigoae.com)

Tom,

The road name "Vining Way" has been approved.

John E. Brushwein, CMA
Assessor

John E. Brushwein, CMA
Tax Assessor, Town of Cumberland
290 Tuttle Road, Cumberland, Maine 04021
207.829.2204

-----Original Message-----
From: cmsmailer@civicplus.com [mailto:cmsmailer@civicplus.com]
Sent: Thursday, April 18, 2019 5:00 PM
To: John Brushwein <jbrushwein@cumberlandmaine.com>
Subject: [Cumberland ME] Christmas Creek Subdivision - "Vining Way" (Sent by Tom Perkins, tperkins@dirigoae.com)

Hello jbrushwein,

Tom Perkins (tperkins@dirigoae.com) has sent you a message via your contact form (https://www.cumberlandmaine.com/user/63/contact) at Cumberland ME.

If you don't want to receive such e-mails, you can change your settings at https://www.cumberlandmaine.com/user/63/edit.

Message:

Good afternoon -

We are working with planning board to approve a 20-lot subdivision on Tuttle Road. They have asked us to seek approval from your office to utilize the name "Vining Way" for the street name. The developers have chosen this name

in honor of the family that they purchased the land from last year. We also need to convert the lot numbers to E-911 street addresses.

If this is acceptable, could you kindly send us an email or letter signifying your acceptance? Feel free to contact us with any questions, or if we can provide any additional information.

Thanks - Tom

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

JANET T. MILLS
GOVERNOR

KIRK F. MOHNEY
DIRECTOR

June 24, 2019

Mr. Thomas W. Perkins
Dirigo Architectural Engineering
7 Cobblestone Dr., Suite 2
Turner, ME 04282

RE: Christmas Creek subdivision, Tuttle Rd., Cumberland (MHPC#1757-18)

Dear Mr. Perkins:

My staff archaeologist, Dr. Arthur Spiess, has reviewed the archaeological survey report for this project by Sarah Haugh, TetraTech Inc. dated June 2019. The report is acceptable as written, and we agree with the conclusions in the report (no archaeological sites on the project).

I find that there will be no historic or archaeological properties affected by the proposed subdivision.

Sincerely,

Kirk F. Mohney

Kirk F. Mohney
State Historic Preservation Officer

cc: Sarah Haugh

PHONE: (207) 287-2132

FAX: (207) 287-2335

Thomas Perkins

From: Zachary Quinn
Sent: Wednesday, February 20, 2019 11:48 AM
To: Thomas Perkins
Subject: FW: [EXTERNAL SENDER] RE: New England Cottontail - Christmas Creek

---

From: Stearns, Cory R <Cory.R.Stearns@maine.gov>
Sent: Tuesday, February 19, 2019 10:20 AM
To: Zachary Quinn <zquinn@dirigoae.com>
Cc: Perry, John <John.Perry@maine.gov>
Subject: RE: [EXTERNAL SENDER] RE: New England Cottontail - Christmas Creek

The genetic results from the samples collected on site have come in. As I suspected, all samples were snowshoe hare. Therefore, I do not have any concerns over New England cottontails at this site.

-Cory

Cory Stearns
Wildlife Biologist
Maine Dept. Inland Fisheries and Wildlife
15 Game Farm Rd
Gray, ME 04039
(207) 657-5759

From: Stearns, Cory R
Sent: Tuesday, January 29, 2019 4:26 PM
To: 'Zachary Quinn' <zquinn@dirigoae.com>
Cc: Perry, John <John.Perry@maine.gov>
Subject: RE: [EXTERNAL SENDER] RE: New England Cottontail - Christmas Creek

I visited the site last week, and conditions were good for finding droppings. I did confirm and collect Lagomorph (either cottontail or snowshoe hare) droppings. I *suspect* they are from snowshoe hare (an abundant game species), but due to the crusty snow conditions (tracks were not identifiable) we won't be positive about species identification until a genetic analysis is conducted. I'll submit the pellets to the University of New Hampshire this week, and we should have a conclusive answer within a few weeks. I'll notify you as soon as the final results come in. In the meantime, let us know if you have any questions.

-Cory

Cory Stearns
Wildlife Biologist
Maine Dept. Inland Fisheries and Wildlife
15 Game Farm Rd
Gray, ME 04039
(207) 657-5759

Thomas Perkins

From: Greenan, Colin M CIV (US) <Colin.M.Greenan@usace.army.mil>
Sent: Tuesday, May 7, 2019 4:01 PM
To: Thomas Perkins
Cc: Woodruff, Christine; Zachary Quinn
Subject: RE: Beta Zeta Properties, LLC off 239 Tuttle Road at Cumberland, Maine Corps File No. NAE-2019-00883

Many thanks Tom!

--
Colin M. Greenan
Maine Project Office
U.S. Army Corps of Engineers
442 Civic Center Drive, Suite 350
Augusta, Maine 04330

ph. (978) 318-8676

In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

-----Original Message-----
From: Thomas Perkins [mailto:tperkins@dirigoae.com]
Sent: Tuesday, May 7, 2019 3:59 PM
To: Greenan, Colin M CIV (US) <Colin.M.Greenan@usace.army.mil>
Cc: Woodruff, Christine <Christine.Woodruff@maine.gov>; Zachary Quinn <zquinn@dirigoae.com>
Subject: [Non-DoD Source] FW: Beta Zeta Properties, LLC off 239 Tuttle Road at Cumberland, Maine Corps File No. NAE-2019-00883

Good afternoon, Colin –

Please see below from our wetland scientist regarding the vernal pool in question (or lack thereof in this case).

Thanks - Tom

From: David Chapman <dchapman@sebagotechnics.com>
Sent: Tuesday, May 7, 2019 9:10 AM
To: Thomas Perkins <tperkins@dirigoae.com>
Cc: Gary Fullerton <gfullerton@sebagotechnics.com>; Mike Jakubowski <mjakubowski@sebagotechnics.com>; Zachary Quinn <zquinn@dirigoae.com>
Subject: Re: Beta Zeta Properties, LLC off 239 Tuttle Road at Cumberland, Maine Corps File No. NAE-2019-00883

Hi, Tom,

I walked it on Sunday and didn't find any eggs. It appears to be connected to the road ditch and appears to be a wetland but not a vernal pool.

Get Outlook for Android <Blockedhttps://aka.ms/ghei36>

On Mon, May 6, 2019 at 3:21 PM -0400, "Thomas Perkins" <tperkins@dirigoae.com <mailto:tperkins@dirigoae.com> > wrote:

> Good afternoon, Dave -
>
> Did you find any eggs (vernal, not Easter)? I'd like to get back to Colin at ACOE.
>
> Thanks - Tom

SEBAGO TECHNICS

CIVIL ENGINEERING • SURVEYING • LANDSCAPE ARCHITECTURE

CLASS 'B' HIGH INTENSITY SOIL SURVEY REPORT

Prepared for:

Christmas Creek Subdivision

Tuttle Road, Cumberland, Maine

Beta Zeta Properties, LLC

Prepared by:

Sebago Technics, Inc.
75 John Roberts Road Suite 4A
South Portland, Maine 04106

March 28, 2019

CLASS 'B' HIGH INTENSITY SOIL SURVEY

Christmas Creek Subdivision

TABLE OF CONTENTS

Section 1

Introduction

Sebago Technics has completed a Class 'B' High Intensity Soil Survey for Christmas Creek Subdivision, located off Tuttle Road in Cumberland, Maine. The soils found on the above referenced site have been observed in the field using test pits dug by an excavator and hand-augered borings (see Soil Map for Survey Limits in Appendix E). The test pits were located by Global Positioning Systems (GPS) technology and incorporated into the soil map. The soil map has been merged into the existing base plan prepared by Dirigo Architectural. Topography is based on two-foot contour intervals prepared by BH2M, Inc.

The soil map units and soil boundaries have been drawn, reviewed, and forwarded to Thomas W. Perkins, Dirigo Architectural for consideration during engineering and stormwater design of the proposed 20-lot subdivision. Soils found at the site are described below and were examined and classified to identify potential soil limitations relating to the development of the property. This report has been prepared as part of the project requirements for the Maine Department of Environmental Protection, and may be used to support permitting procedures as required under the Site Location of Development Act, Natural Resources Protection Act (NRPA), Stormwater Management Law, or other pertinent regulation.

Section 2

Purpose of Soil Survey

The purpose of this Class 'B' High Intensity Soil Survey was to investigate, identify, describe, and map the soils on the above referenced site for the proposed 20-lot subdivision. The accompanying soil survey map depicts the location and types of soil found on the project site. The soil information may be used to obtain hydrologic soil group ratings to assist in the calculations for stormwater runoff curve values required by the Maine Department of Environmental Protection (MDEP). This soil information may also be used to evaluate soil suitability relating to development as a residential subdivision.

Section 3

Site Location and Description

The site is located off Tuttle Road in Cumberland, Maine. The abutting properties include wooded land around three sides with residential dwellings to the south along Tuttle Road. The lot to be developed includes approximately 51 acres of land. This property was previously a Christmas tree farm and consists of mostly uplands with a stream running north-south bisecting the parcel. The wetlands on the property were delineated by Sebago Technics, Inc. in July, 2018.

Section 4

Site Investigation

Site-specific soil information was collected at various locations across the site by Gary M. Fullerton, CSS of Sebago Technics, Inc. in January and March, 2019. The areas examined were marked in the field with pink flagging and test pits were designated with letters from TP-1 to TP-7, and borings were designated with letters from B-8 to B-10. Test pits were observed using an excavator and borings were observed using a hand auger.

Test pit/boring locations were selected based on topographic relief, landforms and vegetation stands, which typically are indicative of soil type variations. They were examined for soil colors, rock content, texture, consistence, root depths, redoximorphic features, and depth to bedrock. From this information, soil logs were completed and are included in Appendix D. In addition to these test pits and borings, several additional hand-augered borings were reviewed to verify consistency within map units for which detailed information was not gathered.

The test pits observed in the field were then located using a GPS unit capable of submeter accuracy on the respective dates that they were excavated. These points were then incorporated into the topographic survey to aid in the preparation of a soil map of the project area. The provided base map has a scale of 1 inch = 100 feet, with two-foot contour intervals on the site.

Drainage classifications of the soils on the site were determined by parameters found in the *Guidelines for Maine Certified Soil Scientists for Soil Identification and Mapping*, published by the Maine Association of Professional Soil Scientists in April 1989 and revised in March 2009.

Section 5

Soil Characteristics

The soils found on the site are predominantly developed from glaciomarine and glaciolacustrine deposits. The landforms typically associated with glaciomarine/ lacustrine deposits are coastal lowlands, lake plains and river valleys.

The poorly drained Scantic silt loam was primarily found in the wetland areas. This soil type contains seasonal high watertables at or near the ground surface. These were generally found on level to gently sloping land. The poorly to somewhat poorly drained Roundabout silt loam was found primarily in the northeasterly portion of the property. These were generally found on level to moderately steep sloping land. Roundabout soils have seasonal high watertables within 16 inches of the ground surface. The somewhat poorly drained Lamoine silt loam was found adjacent to the stream that bisects the property. Most of these soils were found on moderately steep slopes on the westerly side of the property but a small portion was found on gentle slopes. Lamoine soils contain seasonal high watertables between 7 and 16 inches of the ground surface.

The moderately well drained Nicholville silt loam was found on the easterly side of the site. These were found on level land with seasonal high watertables between 16 and 40 inches of the ground

surface. The well drained Salmon very fine sandy loam was found in the central portion of the property on moderately steep slopes. These soils have seasonal high watertables greater than 40 inches of the ground surface. The well drained Suffield silt loam was found on the westernmost portion of the property on level and strongly sloping land. These soils have seasonal high watertables greater than 40 inches of the ground surface.

These soils should respond to use and management as determined and described in the Soil Series of Maine Soil Interpretations published by the Maine Association of Professional Soil Scientists in cooperation with the USDA Natural Resources Conservation Service, dated January 1987 and revised January 1988 and 1989. Soil survey interpretations are enclosed in Appendix C of this report.

This site may contain inclusions of soil types that differ from the soil map units. The areas where these soils were found are too small to be mapped and, for the purpose of this soil survey, there appears to be less than 1 contiguous acre of this soil in any part of the site. It also appears that the total area of this soil type in any given map unit is less than 25 percent, therefore classifying these soil types as inclusions.

Section 6

Soil Map and Map Unit Descriptions

The attached soil survey map depicts the size and location of the soil map units relative to each other and existing site features. Each soil map unit typically consists of three letters (e.g., AdB), with the first two letters representing a phase of the established soil series found within soil map unit areas as shown on the soil map. This soil map unit phase name is a representation of the soil characteristics, such as texture, stoniness, drainage, and depth to bedrock, all of which may affect the use and management of the soil. The third capitalized letter represents the surface slope gradient of the area within the soil map unit (e.g., B represents 3 to 8 percent slopes). Therefore in this example “AdB” is interpreted as Adams loamy fine sand on a 3 to 8 percent slope. There may be small areas of different soils within a soil map unit, known as inclusions. Inclusions may exist within a delineated soil map unit, although the size of the inclusion may be too small to stand as a soil map unit alone (<1 acre). The soil map units found at the site are listed with soil potential rating classes in Appendix C of this report.

Section 7

Conclusions

The soils found consist of glaciolacustrine and glaciomarine deposits. The site contains very fine-textured soils as well as a variety of slopes ranging from 0 to 25 percent, with even steeper slopes found in some areas. No bedrock was found within the areas investigated, but it is possible that there could be small areas of shallow bedrock.

Site investigations suggest some limitations inherent to some of the soils identified at the site, mainly high water tables and fine-textured soils. Most may be overcome by appropriate planning, engineering and site preparation of these areas. Such site features as the depth to bedrock, runoff volumes, seasonal soil saturation depths, potential for frost and erosion activity, rock outcrops, and jurisdictional wetland areas were examined. The following is a summary of areas and on-site features identified in the field with potential negative effects relating to the development of this parcel for a 20-lot subdivision:

1. Jurisdictional wetland areas and streams were identified on the property. Alteration to wetland areas will require regulatory permitting together with appropriate engineering to support roads and structures. These hydric soils are not suitable for development in their current state and would require filling if developed. These soils typically require larger stormwater management areas, have higher erosion potential and have high frost potential in paved areas. Wetlands were primarily found in the Scantic and Roundabout soil map units.

2. The property has fine-textured soils with moderately steep slopes adjacent to the wetland areas. These areas are highly prone to erosion due to the limiting nature of the soils to allow for infiltration into and percolation through the subsoil. Runoff rates are high in these soils especially on slopes greater than 8 percent. Best management practices are highly recommended to prevent erosion and sedimentation.

Section 8

Limitations

The scope of this investigation has been limited to this Class 'B' High Intensity Soil Survey in general accordance with standards and guidelines established by the Maine Association of Professional Soil Scientists. The soil survey report and soil map have been prepared for the exclusive use of Beta Zeta Properties, LLC, Dirigo Architecture, and Sebago Technics, Inc. for specific application for the proposed Christmas Creek Subdivision on Tuttle Road in Cumberland, Maine.

No other warranty, expressed or implied, is made. The conclusions and recommendations presented in this soil report are based on data obtained at the referenced site and our interpretations of this information. This report and soil map may not reflect soil variations that may occur between our observation test pits. Data from this soil report and soil map should not be used for any other purpose. Soils which are considered non-limiting for one use may be considered limiting for another use. The soil mapping units used in the soil report and on the soil map are at least in part influenced by the intended use of the soil survey and information provided may not always be adequate for uses other than that which the soil survey was originally developed.

APPENDICES

APPENDIX A

SOIL NARRATIVE REPORT

SOIL NARRATIVE REPORT

Christmas Creek Subdivision

Date: Soil profiles observed January and March, 2019 by Sebago Technics, Inc.

Base Map: Topographic Survey Map by BH2M, Inc.

2 (two) foot contour intervals on-site

Map Scale 1 inch = 100 feet

Ground Control: Test pits located by GPS with sub-meter accuracy

The Maine Association of Professional Soil Scientists has adopted standards for soil surveys. Soil surveys are divided into four classes of survey, which are dependent upon the amount of information required for the project. The following is a summary of requirements for this High Intensity Soil Survey.

Class 'B' High Intensity Soil Survey Standards

1. Map units will not contain dissimilar limiting inclusions larger than one acre.
2. Scale of 1 inch = 200 feet or larger.
3. Dissimilar limiting inclusions may total more than one acre per map unit delineation, in the aggregate, if not continuous.
4. Ground control - test pits for which detailed data is recorded are located by means of a compass by chaining, pacing, or taping from known survey points; or other methods of equal or greater accuracy.
5. Base map with 5-foot contour lines with ground survey.

The accompanying soil profile descriptions, soil survey map and this soil narrative report were done in accordance with the standards adopted by the Maine Association of Professional Soil Scientists, March 2009.

This Soil Survey was prepared in relation to a proposed 20-lot subdivision.

Gary M. Fullerton, C.S.S. #462

March 28, 2019
Date

APPENDIX B

SOIL LEGEND/MDEP FORM E

CLASS 'B' HIGH INTENSITY SOIL SURVEY

Christmas Creek Subdivision

March 28, 2019

SOIL LEGEND

SOIL TYPES:

Symbol	Soil Series	Phase	Slope	HSG	Drainage Class
LaB	Lamoine	Silt Loam	3-8%	D	SWPD
LaD	Lamoine	Silt Loam	8-15%	D	SWPD
NiA	Nicholville	Silt Loam	0-3%	B	SWPD
RoA	Roundabout	Silt Loam	0-3%	D	PD/SWPD
RoB	Roundabout	Silt Loam	3-8%	D	PD/SWPD
RoC	Roundabout	Silt Loam	8-15%	D	PD/SWPD
RoD	Roundabout	Silt Loam	15-25%	D	PD/SWPD
SaD	Salmon	Very Fine Sandy Loam	15-25%	B	WD
SnA	Scantic	Silt Loam	0-3%	D	PD
SnB	Scantic	Silt Loam	3-8%	D	PD
SuA	Suffield	Silt Loam	0-3%	C	WD
SuB	Suffield	Silt Loam	3-8%	C	WD

FORM E

SOIL CONDITIONS SUMMARY TABLE

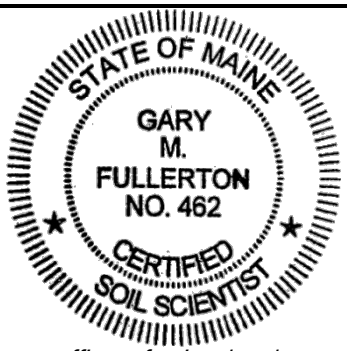
for SUBSURFACE INVESTIGATIONS at DEP SITE LOCATION PROJECTS

Project Name: **Christmas Creek Subdivision**	DEP Project #:
Applicant Name: **Beta Zeta Properties, LLC**	Consultant Name: **Sebago Technics, Inc.**
Project Location *(municipality)*: **Cumberland**	Type of Investigation: **Class 'B' High Intensity Soil Survey**

Lot No.	Exploration Symbol *(alph/num)*	✓ or ✖ if at SSWD field	● soil profile/condition *(L.S.E.)* ● soil series name *(C.S.S.)* ● geologic unit *(C.G.)* *(as appropriate to the investigation)*	Depths to *(check one)*: ☒ inches ☐ cm			Ground Surface Slope *(%)*
				Mottling	Bedrock	Restrictive Layer	
	TP-1		LAMOINE	8	---	8	3-8
	TP-2		SUFFIELD	---	---	16	3-8
	TP-3		LAMOINE	11	---	11	8-15
	TP-4		LAMOINE	14	---	60	8-15
	TP-5		SALMON	48	---	22	8-15
	TP-6		NICHOLVILLE	27	---	40	0-3
	TP-7		LAMOINE	13	---	13	3-8
	B-8		SCANTIC	5	---	14	0-3
	B-9		ROUNDABOUT	8	---	8	3-8
	B-10		SCANTIC	0	---	24	0-3

Professional Endorsements *(as applicable)*

L.S.E.	signature:	Date:
	name printed/typed:	Lic. #:
C.S.S.	signature:	Date: **03-28-19**
	name printed/typed: **Gary M. Fullerton**	Cert. #: **462**
C.G.	signature:	Date:
	name printed/typed:	Cert. #:



affix professional seal

APPENDIX C

SOIL SURVEY INTERPRETATIONS

SOIL SURVEY INTERPRETATIONS

Soil survey interpretations are derived from the inherent soil characteristics found within the soil profile. The interpretations are predictions (numeric and descriptive) of soil suitability for a specific use, based on the soil's characteristics. These interpretations have many practical applications, such as estimating costs for land development, calculating storm water runoff, determining structural bearing strengths, estimating erodibility, etc. Soil potential ratings have been developed using soil survey interpretations to compare soil series, based on limitations or potentials, for a given use.

Limitations of Soil Interpretations

Soil interpretations are very useful for many purposes and projects, although they do have limitations, including:

1. An interpretation for a specific purpose is rarely adaptable for another use without management considerations.
2. Use of interpretations for specific areas has an inherent limitation relating to variability of the soil map unit. As the size of the soil survey area and the soil map units increase, soil interpretations provide a less reliable prediction of actual soil conditions.
3. Interpretations are also limited by the natural variability within a soil profile, which directly affects the precision of the soil interpretation.
4. Soil interpretations are predictions of potentials or limitations based on soil properties. A soil may possess several limiting factors and therefore all site specific soil properties must be known for accurate interpretations.
5. Soil interpretations are used to predict the costs of development and to ultimately determine feasibility of a project. It should be noted that most soil limitations can be overcome with engineering solutions to make a soil suitable for a proposed use.

Soil Potential Rating Factors

Soil potential ratings have been developed as a useful form of soil interpretations. These ratings are based on local conditions, local experience and expertise, and laws, codes and rules governing the use of soils for various purposes. Potential ratings include the feasibility of a soil for a particular use relative to other soils within a given area. Factors considered in preparing soil potential ratings are the feasibility of using certain technology and practices to overcome limiting factors and the relative cost of implementing these practices. Some examples of unfavorable soil qualities inherent in Maine soils are listed below:

1. **Depth to Water Table** – The depth to water table affects the natural drainage of the soil in which in turn affects the soils potential for development. A soil with a shallow depth to seasonal high water table requires construction methods such as added fill and artificial drainage to overcome this limitation. A soil with a seasonal high water table deeper than 6 feet below the soil surface would have higher potential than a soil with a seasonal high water table at 18 inches.

2. **Flooding** – Soils are rated on the basis of whether they are subject to flooding or not. Flooding is separated into three categories: none, occasional (floods at least once in ten years), and frequent (floods at least once every two years). Soils subject to flooding have less potential for development than those that do not flood.

3. **Slope** – Soils are rated on the basis of slope. The less sloping areas require less corrective measures than the steeper areas and thus have a greater potential for development.

4. **Depth to Bedrock** – The presence of bedrock affects the use of soils for development. Soils with shallow depth over bedrock have less potential for development than deep soils.

5. **Surface Stones** – The presence of stones and boulders on the soil surface affect the use of the soil for development. In preparing a site for a dwelling or septic sewage disposal area, surface stones have to be removed.

6. **Depth to Restrictive Layer** – Some soils have a restrictive layer that begins at a shallow depth. This layer can impede natural drainage and permeability. This soil factor is important when designing a septic sewage disposal system.

7. **Soil Profile and Condition** – The Maine Subsurface Wastewater Disposal Rules provides a table by which each soil can be categorized by profile group and soil condition. The profile group is based on parent material or origin of the soil, texture of the soil, and the presence of any restricting layer within the soil profile. The soil condition refers to the depth to bedrock or drainage class.

Low density development includes single family unit residences with basements and comparable buildings and septic tank absorption fields, with or without on-site sources of water. Development may be as a single unit or as a cluster of units in a development. Paved roads in a development are also included in the rating. Soil potentials have been developed by selecting the best soil in a county for low density development. This “reference soil” is the best because it has all the best characteristics for all rated uses with regards to development. For low density urban development, a reference soil has the following properties:

- A water table level greater than 6 feet
- The soil does not flood
- Slope is 0-3 percent
- The soil lacks a restrictive layer
- The depth to bedrock is more than 5 feet
- Surface stone cover is 0.1 to 15 percent
- The soil requires a medium sized rating for a septic sewage disposal field
- There is low potential for groundwater contamination from septic field effluent

This reference soil is assigned a value of 100 index points. Costs are also developed for all other soils in the county for overcoming the various soil limitations. These costs are converted to index points and subtracted from the reference soil. The result is a method of comparing development costs for the soils in a county. Environmental constraints as well as long term maintenance costs are also a factor in developing soil potentials.

The Soil Potential index is a mathematical expression of a soil's position in the overall range of potentials which is 100 to 0. Since the entire range is large, these numerical ratings are separated into Soil Potential Rating Classes of very low to very high.

The composite rating for development was determined by a weighted average of individual soil potential indices as follows: septic tank absorption fields, 45 percent; dwellings with basements, 20 percent; and local roads and streets, 35 percent.

Soil Potential Rating Classes

Soil Potential Rating Classes are based on the expected performance of a soil if feasible measures are taken to overcome its limitations, the cost of such measures, and the magnitude of the limitations that remain after measures have been applied. The development rating (fourth column in the rating tables) is a weighted sum of the septic, dwelling, and road indices. The septic system has the most restrictive site requirements and the dwelling has the least restrictive site requirements.

Very High Potential – Site conditions and soil properties are favorable. Installation costs are lowest for that use and there are no soil limitations. Soils in the group have soil properties similar to the reference soil. The Soil Potential Index for this rating class is 100 for each soil use.

High Potential – Site conditions and soil properties are not as favorable as the reference soil condition. The cost of measures for overcoming soil limitations is slight. The index for this rating class ranges from 83 to 99 for each soil use.

Medium Potential – Site conditions and soil properties are below soils with high potential. Costs of the measures for overcoming soil limitations are significant. The index for this rating class ranges from 60 to 82.

Low Potential – Site conditions and soil properties are significantly below soils with medium potential. Costs of measures required to overcome soil limitations are very high. The index for this rating class ranges from 40 to 59 for each soil use.

Very Low Potential – There are severe soil limitations for which economical corrective measures are prohibitive or unavailable and costs of these measures are extremely high. Also, soil limitations which detract from environmental quality may continue even after installation of corrective measures. The index for this rating class is less than 40. They may also be prohibited for use by local or state laws.

Drainage Classes

Drainage classes are the relative wetness that a soil under normal conditions has relating to the soil water table. The following seven drainage classes are used for the soils found in Maine:

1. **Excessively Drained (ED)** soils with water that is removed very rapidly. The occurrence of internal free water is very rare or very deep.
2. **Somewhat Excessively Drained (SWED)** soils with water that is removed rapidly through the soil. Internal free water occurrence is very rare or very deep.

3. **Well Drained (WD)** soils with water that is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep.

4. **Moderately Well Drained (MWD)** soils with water that is moved somewhat slowly during some periods of the year. Internal free water is moderately deep and transitory to permanent throughout the soil profile.

5. **Somewhat Poorly Drained (SWPD)** soils with water that is removed from the soil slowly and remains wet from significant periods of time during the growing season. The depth to internal free water is shallow to moderately deep, transitory to permanent.

6. **Poorly Drained (PD)** soils with water that is removed so slowly that the soil is wet at shallow depths during the growing season or remains in a wet state for long periods.

7. **Very Poorly Drained (VPD)** soils with water that is removed from the soil so slowly that the free water remains at or near the ground surface during the growing season. Internal free water is very shallow and persistent or permanent.

Slope Class

A	**Level and nearly level**	0-3 percent
B	**Gently sloping (undulating)**	3-8 percent
C	**Strongly sloping (rolling)**	8-15 percent
D	**Moderately steep (hilly)**	15-25 percent
E	**Steep**	25-45 percent
F	**Very Steep**	45+ percent

Depth to Bedrock

1.	**Very Shallow**	Less than 10-inches to bedrock
2.	**Shallow**	10-inches to less than 20-inches to bedrock
3.	**Moderately Deep**	20-inches to less than 40-inches to bedrock
4.	**Deep**	40-inches to less than 60-inches to bedrock
5.	**Very Deep**	Greater than 60-inches to bedrock

Classes of Surface Stones

1.	**Stony or bouldery**	0.01 to 0.1 percent surface coverage
2.	**Very stony/ boulder**	0.1 to 3.0 percent surface coverage
3.	**Extremely stony/ bouldery**	3.0 to 15 percent surface coverage
4.	**Rubbly**	15 to 50 percent surface coverage
5.	**Very Rubbly**	More than 50 percent surface coverage

CLASS 'B' HIGH INTENSITY SOIL SURVEY

Christmas Creek Subdivision

March 28, 2019

SOIL POTENTIAL RATING CLASSES

MAP UNIT	SEPTICS	BUILDINGS	ROADS	DEVELOPMENT
LaB Lamoine, 3 to 8 percent	VERY LOW	MEDIUM	VERY LOW	VERY LOW
LaD Lamoine, 8 to 15 percent	VERY LOW	MEDIUM	VERY LOW	VERY LOW
NiA Nicholville, 0 to 3 percent	MEDIUM	HIGH	MEDIUM	MEDIUM
RoA Roundabout, 0 to 3 percent	VERY LOW	MEDIUM	MEDIUM	LOW
RoB Roundabout, 3 to 8 percent	VERY LOW	MEDIUM	MEDIUM	LOW
RoC Roundabout, 8 to 15 percent	VERY LOW	MEDIUM	MEDIUM	LOW
RoD Roundabout, 15 to 25 percent	VERY LOW	MEDIUM	MEDIUM	LOW
SaD Salmon, 15 to 25 percent	MEDIUM	HIGH	MEDIUM	MEDIUM
SnA Scantic, 0 to 3 percent	VERY LOW	VERY LOW	VERY LOW	VERY LOW
SnB Scantic, 3 to 8 percent	VERY LOW	VERY LOW	VERY LOW	VERY LOW
SuA Suffield, 0 to 3 percent	MEDIUM	HIGH	MEDIUM	MEDIUM
SuC Suffield, 3 to 8 percent	MEDIUM	HIGH	MEDIUM	MEDIUM

LAMOINE (LaB, LaD)

(Frigid Aeric Epiaquepts)

SETTING

Parent Material: Marine or lacustrine sediments

Landform: Level or gently sloping marine or lake plains

Position in Landscape: Lower to intermediate positions

Slope Gradient Ranges: (B) 3-8% (D) 15-25%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Somewhat poorly drained

Typical Profile:

- **Surface layer:** Very dark brown silt loam, 7”
- **Subsoil layer:** Light olive brown grayish brown, mottled silt loam to light olive brown silty clay loam, mottled, 17”
- **Substratum:** Olive silt clay, mottled, 65”

Hydrologic Group: D

Surface Runoff: Medium

Permeability: Moderate or moderately slow in surface layer, slow and moderately slow in the upper part of the subsoil, slow or very slow in the lower part of the subsoil and substratum.

Depth to Bedrock: Very deep, > 60” (Variable in portions of the site)

Hazard to Flooding: None

INCLUSIONS WITHIN MAPPING UNIT

Similar: Scantic, Roundabout

Contrasting: Salmon

USE AND MANAGEMENT

A limiting factor for building site development is wetness due to the presence of a shallow water table November through June. Proper foundation drainage or site modification is recommended for construction. Use of this soil for roadways, underground piping, and foundations is poor due to wetness and very fine textured soils.

NICHOLVILLE (NiA)

(Frigid Aquic Haplorthods)

SETTING

Parent Material: Wind and water deposited silts and very fine sands.

Landform: Lake plains, uplands.

Position in Landscape: Moderately high on long planar slightly convex slopes.

Slope Gradient Ranges: (A) 0-3%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Moderately well drained

Typical Profile:

Surface layer:	Very dark grayish brown, silt loam, 10”
Subsoil layer:	Dark yellowish brown silt loam to mottled yellowish brown very fine sandy loam, 18”
Substratum:	Grayish brown loamy very fine sand, 60”

Hydrologic Group: B

Surface Runoff: Medium

Permeability: Moderate throughout

Depth to Bedrock: Very deep, >60”

Hazard to Flooding: None

INCLUSIONS WITHIN MAPPING UNIT

Similar: Salmon

Contrasting: Lamoine

USE AND MANAGEMENT

Nicholville has a medium rating for roadfill material due to frost action susceptibility. Proper foundation drainage or site modification is recommended for construction. Seasonal high watertables exist within 40 inches of the ground surface.

ROUNDABOUT (RoA, RoB, RoC, RoD)

(Frigid Aeric Haplaquepts)

SETTING

Parent Material: Marine, lacustrine sediments

Landform: Level, gently sloping marine, lake plains

Position in Landscape: Lower to intermediate positions

Slope Gradient Ranges: (A) 0-3% (B) 3-8% (C) 8-15% (D) 15-25%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Variable composition of fill at varying depths

Typical Profile:

- **Surface layer:** Very dark brown silt loam, 7”
- **Subsoil layer:** Olive brown, silt loam, mottled 26”; olive gray very fine sandy loam, 30”
- **Substratum:** Olive, mottled silt loam, 60”

Hydrologic Group: D

Surface Runoff: Slow to medium

Permeability: Moderate or moderately slow in solum, slow and moderately slow or slow in the medium textured substratum, rapid and very rapid in the course textured substratum

Depth to Bedrock: Very deep, >60” (Variable in portions of the site)

Hazard to Flooding: None

INCLUSIONS WITHIN MAPPING UNIT

Similar: Scantic, Lamoine

Contrasting: Salmon

USE AND MANAGEMENT

Development with subsurface wastewater disposal is rated severe due to a seasonal high water table within 16 inches in these soils. A limiting factor for building site development is wetness due to the presence of shallow water table throughout November through May. Proper foundation drainage or site modification is recommended for construction. Use of this soil for roadways is poor due to wetness. Underground piping has severe limitations due to wetness.

SALMON (SaD)

(Frigid Typic Haplorthods

SETTING

Parent Material: Wind and water deposited silts and very fine sands

Landform: Lake plains, uplands

Position in Landscape: Moderately high on long planar slightly convex slopes

Slope Gradient Ranges: (D) 15-25%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Well drained

Typical Profile:

Surface layer:	Dark grayish brown very fine sandy loam, 8”
Subsurface layer:	Strong brown very fine sandy loam, 15”
Subsoil layer:	Yellowish brown very fine sandy loam, 23”
Substratum:	Grayish brown very fine sandy loam, 70”

Hydrologic Group: B

Surface Runoff: Slow

Permeability: Moderate throughout the soil

Depth to Bedrock: Very deep, >60”

Hazard to Flooding: None

INCLUSIONS WITHIN MAPPING UNIT

Similar: Suffield

Contrasting: Roundabout

USE AND MANAGEMENT

Soils are rated high for buildings and medium for roads. Soils contain many fines and are not suitable for construction fill. Septic systems are limited by restrictive layers typically found in the finer horizons of the soil profile. Seasonal high watertable is typically greater than 40 inches from the ground surface.

SCANTIC (SnA, SnB)

(Frigid Typic Epiaquepts)

SETTING

Parent Material: Marine, lacustrine sediments

Landform: Level or gently sloping marine or lake plains

Position in Landscape: Lower to intermediate positions

Slope Gradient Ranges: (A) 0-3% (B) 3-8%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Poorly drained

Typical Profile:

Surface layer:	Dark grayish brown silt loam, 9”
Subsurface layer:	Mottled olive gray silt loam, 11”
Subsoil layer:	Mottled olive gray silty clay loam, 16”
Substratum:	Mottled olive gray silty clay, 65”

Hydrologic Group: D

Surface Runoff: Slow

Permeability: Moderate or moderately slow in upper profile, slow to very slow in the subsoil and substratum

Depth to Bedrock: Very deep, >60”

Hazard to Flooding: May flood occasionally on lowest fringes during spring and periods of excessive precipitation

INCLUSIONS WITHIN MAPPING UNIT

Similar: Lamoine, Roundabout

Contrasting: Nicholville

USE AND MANAGEMENT

A limiting factor for building site development is wetness due to the presence of shallow water table throughout most of the year. Proper foundation drainage or site modification is recommended for construction. Use of this soil for roadways is severe due to low strength and frost action. Underground piping has severe limitations due to wetness.

SUFFIELD (SuA, SuC)

(Mesic Dystric Eutrudepts)

SETTING

Parent Material: Marine, lacustrine sediments

Landform: gently sloping to very steep marine or lake plains

Position in Landscape: Moderately high on convex slopes

Slope Gradient Ranges: (A) 0-3% (C) 8-15%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Well drained

Typical Profile:

Surface layer:	Dark brown silt loam, 7”
Subsurface layer:	Light olive brown silt loam, 5”
Subsoil layer:	Light olive brown silt loam, firm, 23”
Substratum:	light olive brown silty clay, very firm, 30”

Hydrologic Group: C

Surface Runoff: Slow

Permeability: Moderate in upper profile, slow to very slow in substratum

Depth to Bedrock: Very deep, >60”

Hazard to Flooding: None

INCLUSIONS WITHIN MAPPING UNIT

Similar: Salmon, Lamoine

Contrasting: Nicholville

USE AND MANAGEMENT

Soils are rated high for buildings and medium for roads. Soils contain many fines and are not suitable for construction fill. Septic systems are limited by restrictive layers typically found in the finer horizons of the soil profile.

APPENDIX D

SOIL TEST PITS

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
CHRISTMAS CREEK SUBDIVISION	BETA ZETA PROPERTIES, LLC	CUMBERLAND

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-1** ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
	FRIABLE		
SILTY CLAY		5Y 4/2	
LOAM			
		OLIVE GRAY	
			COMMON,
			MEDIUM,
	FIRM		& DISTINCT
SILTY CLAY			

LIMIT OF EXCAVATION = 10'

hydric	Slope %	Limiting factor	ground water
■ non-hydric	3-8	8"	■ restrictive layer
			☐ bedrock

C.S.S. Soil Series / phase name: **LAMOINE** — **SWPD** Drainage Class — **D** Hydrologic Group

L.S.E. Soil Classification: _____ Profile — _____ Drainage Class — _____ Design Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-2** ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SILT		5Y 4/4	
LOAM			
	FRIABLE	OLIVE	
		5Y 5/3	
SILTY CLAY		OLIVE	NONE
LOAM			OBSERVED
		5Y 4/2	
SILTY	FIRM		
CLAY		OLIVE GRAY	
VERY FINE SAND	FRIABLE	5Y 5/3	
		OLIVE	
SILTY	FIRM	5Y 4/2	
CLAY		OLIVE GRAY	

LIMIT OF EXCAVATION = 11'

hydric	Slope %	Limiting factor	ground water
■ non-hydric	3-8	16"	■ restrictive layer
			☐ bedrock

C.S.S. Soil Series / phase name: **SUFFIELD** — **WD** Drainage Class — **C** Hydrologic Group

L.S.E. Soil Classification: _____ Profile — _____ Drainage Class — _____ Design Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-3** ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
		2.5Y 4/3	
SILT	FRIABLE	OLIVE BROWN	
LOAM			
		5Y 5/2	COMMON,
SILTY CLAY			MEDIUM,
LOAM		OLIVE GRAY	& DISTINCT
	FIRM		
		5Y 4/2	NONE
SILTY CLAY			OBSERVED
		OLIVE GRAY	

LIMIT OF EXCAVATION = 10'

hydric	Slope %	Limiting factor	ground water
■ non-hydric	8-15	11"	■ restrictive layer
			☐ bedrock

C.S.S. Soil Series / phase name: **LAMOINE** — **SWPD** Drainage Class — **D** Hydrologic Group

L.S.E. Soil Classification: _____ Profile — _____ Drainage Class — _____ Design Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-4** ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
		2.5Y 5/6	
LOAM			
		LIGHT OLIVE	
		BROWN	
	FRIABLE		
SILT LOAM		10YR 3/3	
		DARK BROWN	
SILTY CLAY		5Y 5/2	COMMON,
LOAM		OLIVE GRAY	MEDIUM,
			& DISTINCT
VERY FINE		5Y 5/3	
SANDY LOAM		OLIVE	
VERY FINE SAND			
WITH SILT		5Y 4/3	MANY,
LENSES		OLIVE	COARSE,
			& PROMINENT
SILTY CLAY	FIRM	5Y 4/2	
		OLIVE GRAY	

LIMIT OF EXCAVATION = 10'

hydric	Slope %	Limiting factor	ground water
■ non-hydric	8-15	14"	☐ restrictive layer
			☐ bedrock

C.S.S. Soil Series / phase name: **LAMOINE** — **SWPD** Drainage Class — **D** Hydrologic Group

L.S.E. Soil Classification: _____ Profile — _____ Drainage Class — _____ Design Class

Professional Endorsements *(as applicable)*

C.S.S.	signature:	Date: 1/17/19
	name printed/typed: **Gary M. Fullerton**	Lic.#: 462
L.S.E.	signature:	Date:
	name printed/typed:	Lic.#:

STATE OF MAINE
GARY M. FULLERTON
NO. 462
CERTIFIED SOIL SCIENTIST

affix professional seal

Chistrmas Creek Subdivision
USACE Permit - Section 6

FORM F

18280

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
CHRISTMAS CREEK SUBDIVISION	BETA ZETA PROPERTIES, LLC	CUMBERLAND

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-5 ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
FINE		2.5Y 4/4	
SANDY			
LOAM		OLIVE BROWN	
	FRIABLE		
SILT		2.5Y 5/3	
LOAM		LIGHT OLIVE	
		BROWN	
VERY FINE	FIRM	5Y 5/4	
SANDY LOAM		OLIVE	
VERY FINE	FRIABLE		
SAND		5Y 4/3	
			COMMON,
		OLIVE	MEDIUM,
VERY FINE			& DISTINCT
SANDY LOAM			
		5Y 4/4	
FINE SAND		OLIVE	
SILTY	FIRM	5Y 4/2	
CLAY		OLIVE GRAY	

LIMIT OF EXCVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	8-15	22"	restrictive layer

C.S.S. Soil Series / phase name: SALMON — WD (Drainage Class) — B (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-6 ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
		2.5Y 3/2	
		VERY DARK	
		GRAYISH BROWN	
SILT			
LOAM			
		5Y 5/4	
	FRIABLE		
		OLIVE	
		5Y 4/3	
		OLIVE	
		5Y 4/3	
VERY FINE			COMMON,
SAND		OLIVE	MEDIUM,
			& DISTINCT
SILTY	FIRM	5Y 4/2	
CLAY		OLIVE GRAY	

LIMIT OF EXCAVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	0-3	27"	ground water

C.S.S. Soil Series / phase name: NICHOLVILLE — MWD (Drainage Class) — B (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-7 ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
		2.5Y 3/3	
SILT		DARK OLIVE	
LOAM	FRIABLE	BROWN	
		5Y 4/4	
		OLIVE	
SILTY		5Y 5/2	
CLAY	FIRM		COMMON,
LOAM		OLIVE GRAY	MEDIUM,
			& DISTINCT
		5Y 4/2	
SILTY	VERY		
CLAY	FIRM	OLIVE GRAY	

LIMIT OF EXCVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	3-8	13"	ground water

C.S.S. Soil Series / phase name: LAMOINE — SWPD (Drainage Class) — D (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: _____ ☐ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

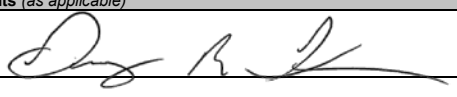
Texture	Consistency	Color	Mottling

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric			ground water

C.S.S. Soil Series / phase name: _____ (Drainage Class) — _____ (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

Professional Endorsements *(as applicable)*

C.S.S. signature:  Date: 1/17/19

name printed/typed: Gary M. Fullerton Lic.#: 462

L.S.E. signature: Date:

name printed/typed: Lic.#:

affix professional seal

FORM F

18280

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
CHRISTMAS CREEK SUBDIVISION	BETA ZETA PROPERTIES, LLC	CUMBERLAND

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: B-8 ☐ Test Pit ■ Boring

2-3 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SILTY CLAY LOAM	FRIABLE	5Y 3/2 DARK OLIVE GRAY	COMMON, MEDIUM, DISTINCT
SILTY CLAY	FIRM	5Y 5/2 OLIVE GRAY	

LIMIT OF EXCAVATION = 24"

hydric	non-hydric	Slope %	Limiting factor	ground water	restrictive layer	bedrock
☐	■	0-3	5"	■	☐	☐

C.S.S. Soil Series / phase name: SCANTIC — PD (Drainage Class) — D (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: B-9 ☐ Test Pit ■ Boring

2-3 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
FINE SANDY LOAM	FRIABLE	7.5YR 3/4 DARK BROWN	
	FIRM	2.5Y 5/4 LIGHT OLIVE BROWN	COMMON, MEDIUM, DISTINCT
VERY FINE SANDY LOAM			
LOAMY VERY FINE SAND			

LIMIT OF EXCAVATION = 30"

hydric	non-hydric	Slope %	Limiting factor	ground water	restrictive layer	bedrock
☐	■	3-8	8"	■	☐	☐

C.S.S. Soil Series / phase name: ROUNDABOUT — SWPD (Drainage Class) — D (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: B-10 ☐ Test Pit ■ Boring

2-3 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SILTY CLAY LOAM	FRIABLE	2.5Y 3/2 VERY DARK GRAYISH BROWN	COMMON, MEDIUM, DISTINCT
SILTY CLAY	FIRM	5Y 3/1 VERY DARK GRAY	

LIMIT OF EXCAVATION = 24"

hydric	non-hydric	Slope %	Limiting factor	ground water	restrictive layer	bedrock
■	☐	0-3	0"	☐	☐	☐

C.S.S. Soil Series / phase name: SCANTIC — PD (Drainage Class) — D (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: _____ ☐ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling

hydric	non-hydric	Slope %	Limiting factor	ground water	restrictive layer	bedrock
☐	☐	_____	_____	☐	☐	☐

C.S.S. Soil Series / phase name: _____ — _____ (Drainage Class) — _____ (Hydrologic Group)

L.S.E. Soil Classification: _____ (Profile) — _____ (Drainage Class) — _____ (Design Class)

Professional Endorsements *(as applicable)*

C.S.S. signature: Gary M. Fullerton — Date: 3/19/19

name printed/typed: Gary M. Fullerton — Lic.#: 462

L.S.E. signature: _____ — Date: _____

name printed/typed: _____ — Lic.#: _____

STATE OF MAINE
GARY M. FULLERTON
NO. 462
CERTIFIED SOIL SCIENTIST

affix professional seal

APPENDIX E

CLASS ‘B’ HIGH INTENSITY SOIL MAP

SOIL TYPES

SYMBOL	SOIL SERIES	PHASE	SLOPE	HSG	DRAINAGE CLASS
LaB	LAMOINE	SILT LOAM	3–8%	D	SWPD (SOMEWHAT POORLY DRAINED)
LaD	LAMOINE	SILT LOAM	15–25%	D	SWPD (SOMEWHAT POORLY DRAINED)
NiA	NICHOLVILLE	SILT LOAM	0–3%	B	MWD (MODERATELY WELL DRAINED)
RoA	ROUNDABOUT	SILT LOAM	0–3%	D	PD/SWPD (POORLY DRAINED/ SOMEWHAT POORLY DRAINED)
RoB	ROUNDABOUT	SILT LOAM	3–8%	D	PD/SWPD (POORLY DRAINED/ SOMEWHAT POORLY DRAINED)
RoC	ROUNDABOUT	SILT LOAM	8–15%	D	PD/SWPD (POORLY DRAINED/ SOMEWHAT POORLY DRAINED)
RoD	ROUNDABOUT	SILT LOAM	15–25%	D	PD/SWPD (POORLY DRAINED/ SOMEWHAT POORLY DRAINED)
SaD	SALMON	VERY FINE SANDY LOAM	15–25%	B	WD (WELL DRAINED)
SnA	SCANTIC	SILT LOAM	0–3%	D	PD (POORLY DRAINED)
SnB	SCANTIC	SILT LOAM	3–8%	D	PD (POORLY DRAINED)
SuA	SUFFIELD	SILT LOAM	0–3%	C	WD (WELL DRAINED)
SuC	SUFFIELD	SILT LOAM	15–25%	C	WD (WELL DRAINED)

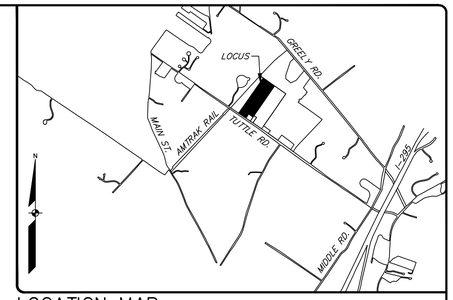
NOTE

THIS CLASS 'B' HIGH INTENSITY SOIL MAP CONFORMS TO THE GUIDELINES FOR MAINE CERTIFIED SOIL SCIENTISTS FOR SOIL IDENTIFICATION AND MAPPING, DATED MARCH 2009 FOR CLASS 'B' HIGH INTENSITY SOIL SURVEYS. THE SOIL MAP UNITS AS DEPICTED WERE IN PART INFLUENCED BY THE INTENDED USE FOR A PROPOSED 20–LOT SUBDIVISION AND THE SOILS WHICH WERE NON–LIMITING FOR ONE USE MAY BE CONSIDERED LIMITING FOR ANOTHER USE. THEREFORE, THIS CLASS 'B' HIGH INTENSITY SOIL MAP MAY NOT BE ADEQUATE FOR ANOTHER USE. (REFER TO SOIL NARRATIVE REPORT DATED MARCH 28, 2019 AND SOIL PROFILE DESCRIPTIONS.)

STATE OF MAINE
GARY M. FULLERTON NO. 462
CERTIFIED SOIL SCIENTIST

GARY M. FULLERTON
CERTIFIED SOIL SCIENTIST #462

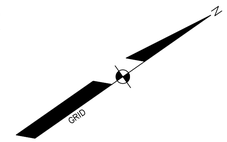
MARCH 28, 2019
DATE

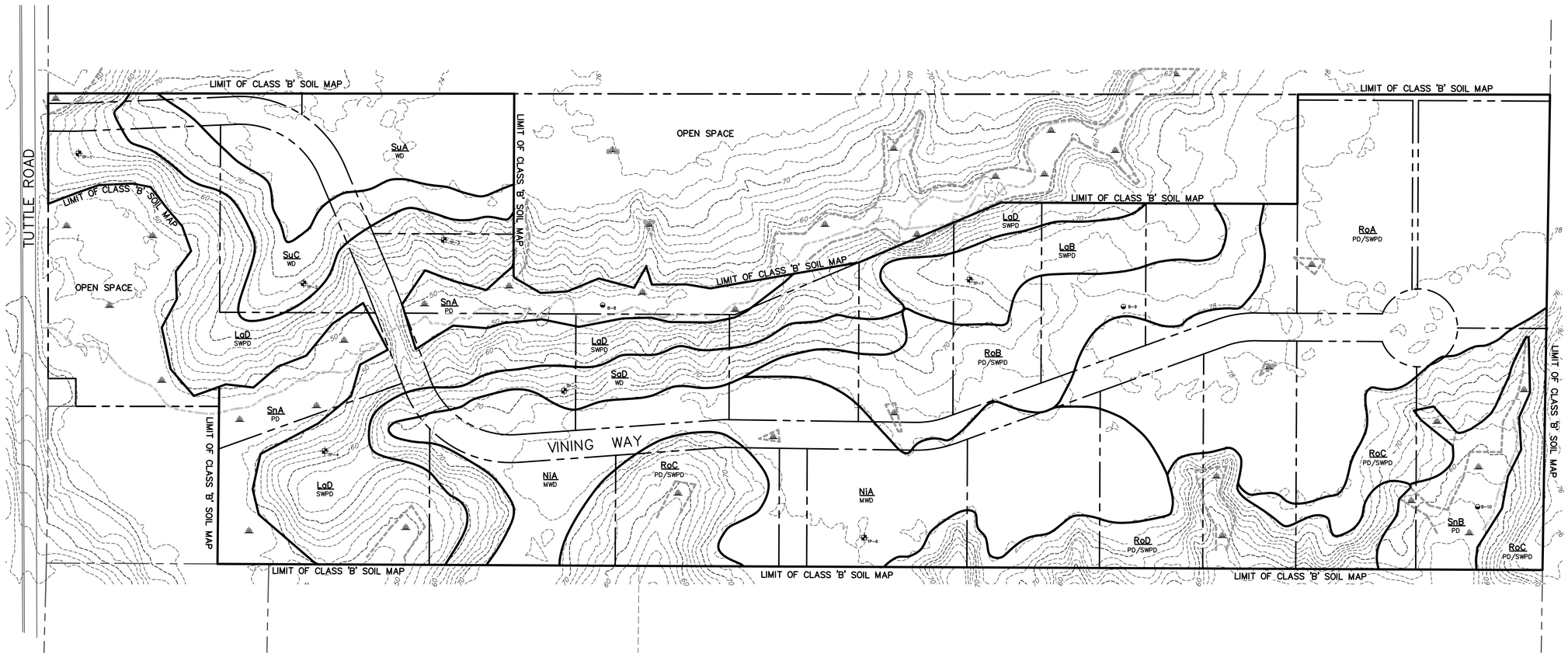


LOCATION MAP N.T.S.

LEGEND

EXISTING	DESCRIPTION
	WETLAND EDGE
	WETLANDS
120 118	CONTOURS
TP-1	TEST PIT
B-1	BORING
	SOILS
	STREAM





GRAPHIC SCALE
100 0 50 100 200
(IN FEET)
1 INCH = 100 FT.

DESIGNED	CHECKED
GMF	GMF

REVI	BY:	DATE:	STATUS:
A	GMF	3-28-19	SUBMITTED TO CLIENT

SEBAGO TECHNICS
WWW.SEBAGOTECHNICS.COM
75 John Roberts Rd.
Suite 4A
South Portland, ME 04106
Tel: 207-200-2100

CLASS 'B' HIGH INTENSITY SOIL MAP

OF:
CHRISTMAS CREEK SUBDIVISION
TUTTLE ROAD
CUMBERLAND, MAINE

FOR:
BETA ZETA PROPERTIES, LLC
9 KIMBERLEY CIRCLE
BRUNSWICK, ME 04011

PROJECT NO.	SCALE
18280	1" = 100'

SHEET 1 OF 1

18280SL.dwg, TAB:SOILS

QUITCLAIM EASEMENT DEED

KNOW ALL MEN BY THESE PRESENTS, that **Beta Zeta Properties, LLC**, a Maine limited liability company with an address of 9 Kimberly Circle, Brunswick, Maine 04011, in its capacity as Declarant of the Christmas Creek Subdivision (the "Subdivision") located in the Town of Cumberland, Maine (together with its successors and assigns the "Grantor") as depicted on a certain Final Plan of "Christmas Creek" approved by the Town of Cumberland Planning Board and recorded in the Cumberland County Registry of Deeds in Book ____, Page ____ (the "Subdivision Plan") and subject to the terms of that certain Declaration of Easements, Covenants and Restrictions and Reservation of Rights Affecting the Subdivision Called Christmas Creek in the Town of Cumberland, County of Cumberland and State of Maine recorded in the said Registry of Deeds in Book ____, Page ____ (the "Declaration"), does hereby give, grant and quitclaim to the **Town of Cumberland, Maine**, a municipal corporation with a mailing address of 290 Tuttle Road, Cumberland, Maine ("Grantee"), in perpetuity and in accordance with 33 M.R.S.A. § 1582, a fifteen (15) foot wide recreational trail easement over land of Grantor situated in the Town of Cumberland, County of Cumberland and State of Maine, as more particularly described in "*Schedule A - Easement Area*" attached hereto and incorporated herein by reference (the "Easement Area"), and as shown on the Subdivision Plan, (1) for the purpose of making a trail therein contained available to the public for the purposes of: (a) hiking, (b) walking, (c) running or jogging, (d) cross-country skiing, (e) birding or nature watching, (f) accessing the Town-owned trail system on adjacent or neighboring properties, and (g) other similar uses, provided however, that such uses shall not unreasonably interfere with the quiet enjoyment of the owners of the lots in the Subdivision and, provided further, that no (i) vehicular or motorized travel, except for power-driven mobility devices for use by persons who have mobility impairments and/or emergency vehicles in the event of a medical emergency occurring within the Easement Area, (ii) gatherings of groups larger than 15, (iii) alcohol or smoking of marijuana or tobacco (whether legally possessed or not), (iii) erection of permanent structures or structures visible from the Subdivision, (iv) placement of benches, picnic tables or portable bathroom facilities or trash receptacles unless the Grantee agrees to diligently and regularly empty the same, (v) fires, (vi) tree harvesting or removal, except as provided in Section 2, or (vii) animals of any kind except for leashed dogs (in accordance with Town rules and ordinances) shall be permitted, (2) to erect and maintain appropriate trail signage, and (3) to enter thereon at all reasonable times with persons or machinery to maintain, monitor, mow and/or repair the Easement Area, trail, signage and appurtenances, as described herein.

The above described easement is hereby conveyed subject to the following scope and conditions:

1. The easement rights in the Easement Area are granted on an "as is" basis, subject to the rights of the Grantor, its successors and assigns, including, without limitation, the Owners' Association (as that term is defined in the Declaration) (hereinafter, "Owner") described herein and in the Declaration. Without limiting the generality of the foregoing, nothing herein shall prohibit Owner or individual owners in the Subdivision from using the trail system in the Easement Area in a manner consistent with the terms hereof and in common with public recreational users as a member, or members, of the general public. This easement is not intended to be construed as a conservation easement pursuant to 33 M.R.S.A §476 *et seq*.

2. Grantee agrees to conduct, at its cost, reasonable, regular and ongoing maintenance (including leaf, brush and limb removal, mowing, raking, regrading and mulch repair/replacement over time and any repairs necessary to maintain the footbridge constructed in the Easement Area by Declarant in good working order as determined by Grantee) on the trails and paths located in the Easement Area, provided, however, that Grantee shall not relocate the paths or trails outside of the Easement Area or engage in the removal of any trees, shrubs or other screening located adjacent to such Easement Area without the advance consent of the Owner and, in the case of those portions of the Easement Area bordering lots in the Subdivision, the consent of the owners of such lots, except that such consent shall not be required if the removal is of a tree or portion of a tree that has fallen into the Easement Area as a result of storm or other weather damage. Grantee shall use reasonable efforts to monitor use of the Easement Area and enforce the terms hereof and the Grantee's policies and rules for use of Grantee's trail system generally.

3. Notwithstanding anything herein to the contrary, use of the Easement Area by any individual shall be at such individual's own risk. Owner shall have the right to install and maintain, at its option, signage to this effect in, or adjacent to, the Easement Area, provided, however, that failure to do so shall not alter the assumed risk of the user. The parties hereby expressly agree that (a) Grantor has agreed to the grant of an easement herein as requested by the Grantee, (b) Grantor will not receive any monetary consideration for the granting of such easement, (c) Grantor and any other Owners, by virtue of granting the easement rights herein contained, do not assume any duty to, or for the benefit of, the general public for any defects in the trail facilities or conditions or the Easement Area, all such duty (if any) being assumed by the Grantee, (d) Owner shall have no duty to monitor the Easement Area for any dangerous conditions or to warn any party thereof, and (e) that Grantor and any other Owner shall be entitled to the full protection afforded to an owner of property who permits access to such owner's premises for recreational uses by 14 M.R.S.A. §159-A. Further, Grantee agrees to indemnify, defend and hold Owner harmless, from and against any and all losses, costs, claims, expenses and liabilities suffered by Owner on account of any injury to person or damage to property caused by or to Grantee, its agents, employees, contractors, invitees, or any other party claiming through Grantee within the Easement Area. Nothing in this Section shall be construed as a waiver of any defenses or immunities afforded to Grantee by the Maine Tort Claims Act against any third party.

4. Grantee's easement rights are limited strictly to the rights herein conveyed. Grantor does not by this deed convey Grantee a right-of-way over any other portion of Grantor's property or the Subdivision. Grantor's grant of the easement shall not be deemed to imply a right-of-way or easement over any other part of the Subdivision in favor of the Grantee.

5. Grantee acknowledges by acceptance of this deed that Grantor makes no warranties with respect to matters affecting title or the effect of any title encumbrances upon Grantee's rights hereunder.

6. Grantee is hereby granted the right to enforce this Recreation Trail Easement by proceedings at law and in equity, including the right to require the restoration of the Trail Corridor to a condition in compliance herewith. If a Court (or other decision maker chosen by mutual consent of the parties) determines that this Recreation Trail Easement has been breached by a party hereto or his/her/its assigns, agents, employees, contractors, invitees, licensees, permittees, tenants, guests, or lessees, which breach continues after first giving thirty (30) days' written notice of default by certified mail, return receipt requested to the breaching party, then the breaching party will reimburse the non-breaching party for any reasonable costs of enforcement, including court costs, reasonable attorney's fees, and any other payments ordered by such Court or decision maker. Grantor is not responsible for injury to or change in the Easement Area originating from outside of the Easement Area or Grantor's abutting reserved land or from natural causes, such as, but not limited to, fire, flood, storm, earth movement, natural evolution of plant and animal communities, or from any prudent action taken by Grantor under emergency conditions to prevent, abate, or mitigate significant injury to the Easement Area resulting from such causes.

IN WITNESS WHEREOF, Beta Zeta Properties, LLC, has caused this instrument to be signed and sealed this ____ day of _____, 2019.

Signed, Sealed and Delivered
In the Presence of

Beta Zeta Properties, LLC

_____ By: _____
Witness

Its

State of Maine
County of _____, ss. _____, 2019

Personally appeared the above-named _____, _____ of Beta Zeta Properties, LLC and acknowledged the foregoing to be his free act and deed in his said capacity, and the free act and deed of the said Beta Zeta Properties, LLC.

Before me,

_____
Notary Public/Attorney at Law

_____
Typed or Printed Name

ACCEPTED BY THE TOWN OF CUMBERLAND:

By:_____ _____
William R. Shane, its duly authorized Town Manager Date

Schedule A – Easement Area

Thomas Perkins

From: Dan Small <dsmall@cumberlandmaine.com>
Sent: Friday, April 19, 2019 7:29 PM
To: Thomas Perkins
Cc: Zachary Quinn; Carla Nixon; William Shane
Subject: Re: Christmas Creek Subdivision - 239 Tuttle Road
Attachments: image001.jpg; image002.png; image003.png; image004.png

Tom,
I am all set with the road being 3000' long.
Regards,
Dan

Daniel R. Small, EFO
Chief of Department
Cumberland Fire Department
366 Tuttle Road
Cumberland, ME 04021

(207) 829-5421 office
(207) 829-4256 fax
(207) 233-0414 cell
dsmall@cumberlandmaine.com<mailto:dsmall@cumberlandmaine.com>

On Apr 18, 2019, at 5:28 PM, Thomas Perkins <tperkins@dirigoae.com<mailto:tperkins@dirigoae.com>> wrote:

Good afternoon, Chief –

One of your deputies was kind enough to provide your email to me. We have been working with the Planning Board for approval of a 20-lot subdivision off Tuttle Road. The road is approximately 3000' long and capped with a large diameter cul-d-sac. Along the road are six fire hydrants spaced to comply with NFPA requirements. Attached is a plan showing the proposed layout.

The Planning Board has asked us to secure your approval on:

* The length of the road exceeding 2000'. Due to the long, rectangular shape of the parcel and presence of wetland areas, it was not feasible to layout a loop road or means of creating multiple access points
* The turning radius of the cul-d-sac is sufficient for emergency vehicle access. We designed the cul-d-sac to comply with the town's road construction ordinance, and selected the larger diameter option

We would be happy to meet with you to discuss, or are available by phone if you have any questions. If these are acceptable, please kindly reply stating such and we will submit to the board for their records.

Thanks - Tom

[Description: NEW DAE LOGO - Small]

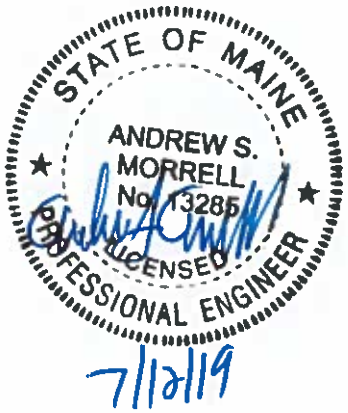
Thomas W. Perkins, PE (ME, NH, CT)
LEED AP, M.ASCE

STORMWATER MANAGEMENT REPORT
FOR
CHRISTMAS CREEK
(20-LOT SUBDIVISION)
239 Tuttle Road
Cumberland, Maine

For
Beta Zeta Properties LLC

JANUARY 2019

REVISED
JUNE 2019
JULY 2019



Prepared By:

Berry Huff McDonald Milligan, Inc.
Engineers Surveyors Planners
28 State Street
Gorham, ME 04038
207-839-2771
FAX 207-839-8250
amorrell@bh2m.com

TABLE OF CONTENTS

LIST OF APPENDICES

STORMWATER MANAGEMENT REPORT

For:
Beta Zeta Properties LLC
239 Tuttle Road
Cumberland, Maine

1.0 INTRODUCTION

Beta Zeta Properties LLC is proposing to build a 20-lot residential subdivision located at 239 Tuttle Road in Cumberland. The project will include construction of a paved public road, underground utilities, and stormwater management infrastructure to support development of the subdivision. The proposed infrastructure improvements will create approximately 1.923 acres of linear impervious area associated with the proposed roadway. An allocation of 0.10 acres of impervious has been considered for each lot totaling an additional 2.000 acres of impervious area totaling 3.923 acres of impervious area for the project. This proposed development will also create approximately 20.957 acres of vegetated area totaling 24.880 acres of developed area.

The following stormwater management plan has been prepared in accordance with the Maine Department of Environmental Protections "Stormwater Management Rules" Chapters 500, 501 and 502 as well as the most recent version of the "Maine Stomwater Best Management Practices Manual". The proposed project will also require a Site Location of Development Act Permit and will be required to meet the Basic, General, and Flooding Standards. Please note that the project is also subject to a PBR for a stream crossing.

1.1 OVERVIEW OF MODELING METHODOGY AND SOURCE INFORMATION

Hydrologic Analysis: The pre and post development conditions have been modeled using modeling software (Hydrocad Version 10) which is based upon the methodology contained within the USDA Soil Conservation Service Technical Release 55. Type III 24-hour storm distributions for Cumberland County were used for the analysis. The following frequencies and 24-hour rainfall amounts were used for the analysis:

Return Period	24-Hour Rainfall Depth
2-Year Storm	3.10 inches
10-Year Storm	4.60 inches
25-Year Storm	5.80 inches
50-Year Storm	6.90 inches
100-Year Storm	8.10 inches

Soils: The soils used for the stormwater analysis were digitized from the Medium Intensity Soils Maps for Cumberland County. Refer to Sheets A and B for soils information.

The soils include:

Map Unit Name	Hydrologic Soil Group
Belgrade	B
Elmwood	B
Lamoine	C/D*
Limerick-Saco	B/D*
Scantic	D
Suffield	C
Swanton	C/D*
Windsor (Loamy Sand)	A

*Assumed D

Topography: LIDAR data from the Maine Office of GIS.

Natural Resources: Wetland delineations provided by Sebago Technics

1.2 DESCRIPTION OF POINTS OF ANALYSIS

The watershed model analyzes the discharge of runoff at three Analysis Points as described below:

Analysis Point #1
Description: Three culverts under Tuttle Road on the southern property border.
Pre-Development Tributary Drainage Areas: SA-1, 1A
Post Development Tributary Drainage Areas: SA-1,1A, 1B, 1C

Analysis Point #2
Description: Eastern property line of the project site.
Pre-Development Tributary Drainage Areas: SA-2
Post Development Tributary Drainage Areas: SA-2, 2A, 2B

Analysis Point #3
Description: Northern property line.
Pre-Development Tributary Drainage Areas: SA-3
Post Development Tributary Drainage Areas: SA-3

1.3 PRE DEVELOPMENT CONDITIONS

The Existing Conditions are shown on Sheet A of the accompanying plans. The parcel to be developed encompasses an area of approximately 50.58 acres and is located at 239 Tuttle Road in Cumberland. The parcel is mostly wooded and is primarily surrounded by forest, and residential properties. The parcel lies within the

watershed of two unnamed streams. The parcel does not lie within an urban impaired stream watershed.

The watershed that was analyzed for this project is approximately 128 acres in size. The analysis points are located along the boundary of the parcel and are described in Section 1.2 of this report. The watershed generally flows from North to South and is bounded by Tuttle Road to the South and forested land to the North, East, and West.

The Pre-Development Drainage Plan is included as Sheet A of the accompanying plans and the Calculations are attached as Appendix C.

The Pre-Development Drainage Model predicts the following peak flow rates:

Pre-Development Peak Flows (cu. ft./sec)					
Analysis Point	**2-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
AP-1	18.87	40.60	81.84	112.80	145.23
AP-2 (SA-2)	6.02	13.81	20.80	27.52	35.06
AP-3 (SA-3)	0.82	1.74	2.55	3.32	4.17
Cumulative	**25.71**	**56.15**	**105.19**	**143.64**	**184.46**

1.4 POST DEVELOPMENT CONDITIONS

The proposed project will include development of 20 single family house lots as well as a paved public road. Below is a summary of the proposed impervious area for full build-out of the project. The project has been broken into two parts for treatment; linear for all aspects of the proposed road, and non-linear for the lots to be developed. For the purpose of this analysis it is assumed that each house lot will include 4,356 sq. ft. of impervious area and 40,000 sq. ft. of lawn area.

Proposed Linear Impervious Area (Roadway)	=	1.923 ac.
Allocated Impervious Area (Lots, Houses, Driveways)	=	2.000 ac.
Proposed Linear Lawn Area (Roadway)	=	2.592 ac.
Allocated Lawn Area (Lots, Yards)	=	18.365 ac.
Proposed Developed Area	=	25.880 ac.

The proposed project will include Limited Disturbance Forested Buffers, a Wet Pond and a Grassed Underdrain Soil Filter Field to provide water quality treatment and attenuation of peak flows for portions of the project.

The Post Development Drainage Plan is included as Sheet B of the accompanying plan set and the Calculations are attached as Appendix D.

The Post-Development Watershed Model predicts the following peak flow rates:

Post Development Peak Flows (cu. ft./sec)					
Analysis Point	**2-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
AP-1	22.27	53.14	79.67	104.83	132.72
AP-2	5.88	12.46	24.81	37.39	54.97
AP-3 (SA-3)	0.70	1.43	2.06	1.43	2.06
Cumulative	**28.85**	**67.03**	**106.54**	**143.65**	**189.75**

The proposed stormwater design treats the runoff and reduces the Post Development peak flow rates to less than the Pre Development peak flow rates for all storm events except for AP# 1 for the 2, and 10 year storm events and AP#2 for the 25, 50, and 100 year storm event. These increases are minor and will not create any adverse impacts. A limited disturbance buffer at least 75' wide has been proposed meeting Maine DEP BMP requirements at each of these locations (see attached plans for more information).

1.5 BASIC STANDARDS

Basic Standards are the Erosion and Sediment Control measures detailed in the E & S plan shown on Sheet 9 of the project plans.

1.6 STORMWATER QUANTITY

The following Tables compare the Pre and Post Development peak discharge rates for the 2, 10, and 25-year return periods.

Peak Flow Comparison (cu. ft./sec)										
Analysis Point	**2-Year**		**10-Year**		**25-Year**		**50-Year**		**100-Year**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
AP-1	18.87	22.27	40.60	53.14	81.84	79.67	112.80	104.83	145.23	132.23
AP-2	6.02	5.88	13.81	12.46	20.80	24.81	27.52	37.39	35.06	54.97
AP-3	0.82	0.70	1.74	1.43	2.06	2.55	3.32	1.43	4.17	2.06
Cumulative	**25.71**	**28.85**	**56.15**	**67.03**	**105.19**	**106.54**	**143.64**	**143.65**	**184.46**	**189.75**

The proposed stormwater design treats the runoff and reduces the Post Development peak flow rates to less than the Pre Development peak flow rates for all storm events except for AP# 1 for the 2, and 10 year storm events and AP#2 for the 25, 50, and 100 year storm event. These increases are minor and will not create any adverse impacts. A limited disturbance buffer at least 75' wide has been proposed meeting Maine DEP BMP requirements at each of these locations (see attached plans for more information).

1.7 STORMWATER QUALITY

The stormwater management system includes storm drains, vegetated swales, forested buffers, a grassed underdrain filter and a wet pond. The proposed BMP's have been

designed in accordance with the design requirements outlined in the Maine Stormwater Best Management Practices Manual. Refer to Appendix E for detailed calculations. Below is a summary of the treatment areas for the project. Refer to Appendix E for detailed calculations. See below for buffer sizing.

Linear Treatment

Total Proposed Linear Impervious Area:	1.923 acres
Total Proposed Linear Developed Area:	4.738 acres
Total Treated Linear Impervious Area:	1.506 acres
Total Treated Linear Developed Area:	3.861 acres
Linear Impervious Area Treatment %:	**78.32% (75% Required)**
Linear Developed Area Treatment %:	**81.50% (50% Required)**

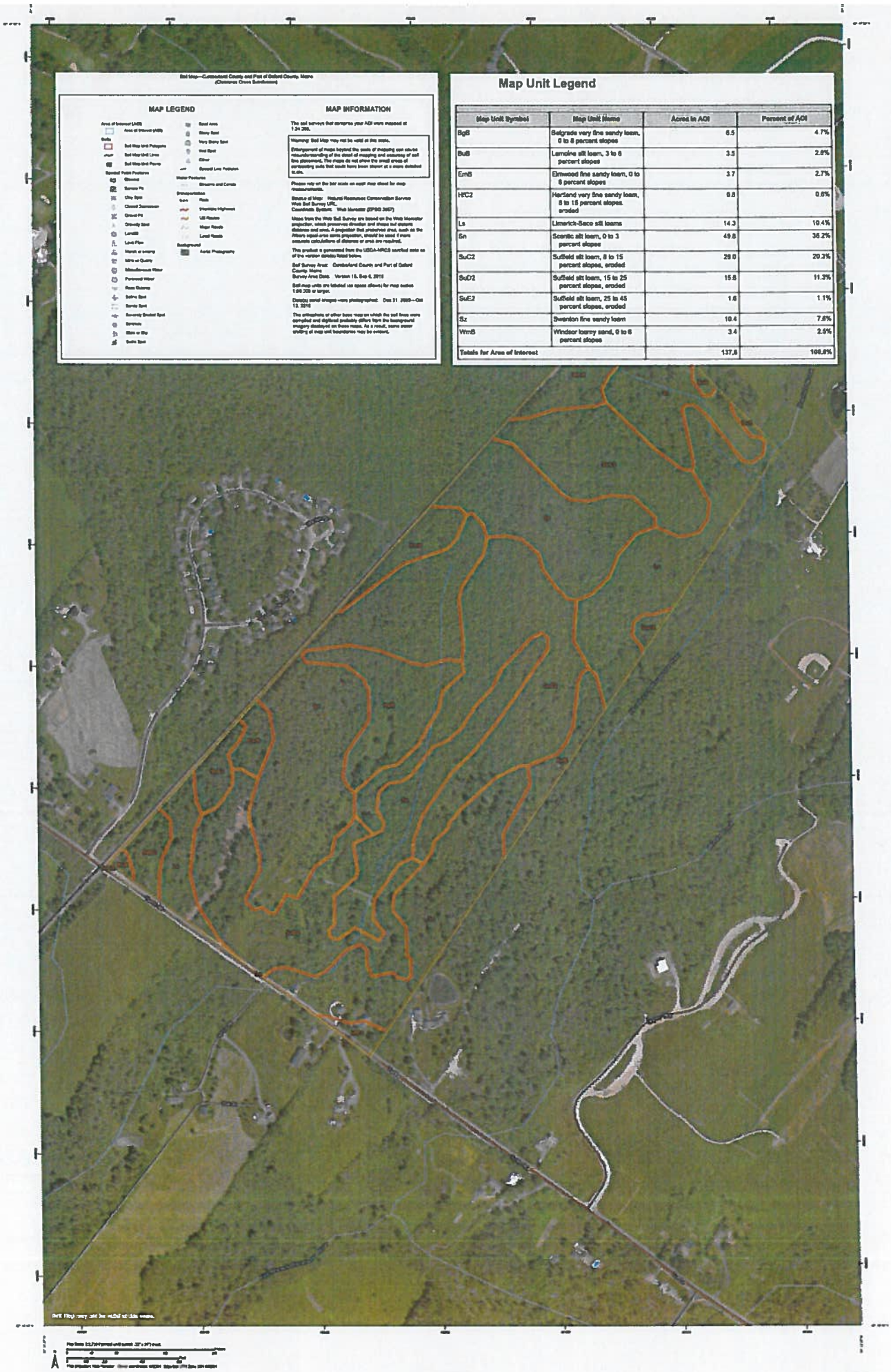
Non-Linear Treatment

Total Proposed Impervious Area:	2.000 acres
Total Proposed Developed Area:	20.948 acres
Total Treated Impervious Area:	2.000 acres
Total Treated Developed Area:	20.312 acres
Impervious Area Treatment %:	**100.00% (95% Required)**
Developed Area Treatment %:	**96.96% (80% Required)**

1.8 CONCLUSION

The proposed stormwater management facilities have been designed to mitigate impacts associated with development on the stormwater runoff. The proposed facilities have been designed to meet the Basic, General and Flooding Standards required by Chapter 500.

Appendix A
Figures


Soil Map—Cumberland County and Part of Oxford County, Maine
(Chadwicks Creek Subdivision)
MAP LEGEND
MAP INFORMATION
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Map Unit Polygons
Soil Map Unit Lines
Soil Map Unit Points
Special Point Features
Blowout
Borrow Pit
Clay Spot
Closed Depression
Gravel Pit
Gravelly Spot
Landfill
Lava Flow
Marsh or swamp
Mine or Quarry
Miscellaneous Water
Perennial Water
Rock Outcrop
Saline Spot
Sandy Spot
Severely Eroded Spot
Sinkhole
Slide or Slip
Sodic Spot
Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other
Special Line Features
Water Features
Streams and Canals
Transportation
Rails
Interstate Highways
US Routes
Major Roads
Local Roads
Background
Aerial Photography
The soil surveys that comprise your AOI were mapped at 1:24,000.
Warning: Soil Map may not be valid at this scale.
Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.
Please rely on the bar scale on each map sheet for map measurements.
Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)
Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.
This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.
Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 15, Sep 6, 2019
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.
Date(s) aerial images were photographed: Dec 31, 2009—Oct 13, 2016
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.
Soil Map may not be valid at this scale.
Map Unit Legend
Map Unit Symbol
Map Unit Name
Acres in AOI
Percent of AOI
BgB
Belgrade very fine sandy loam, 0 to 8 percent slopes
6.5
4.7%
BuB
Lamoine silt loam, 3 to 8 percent slopes
3.5
2.6%
ErB
Elmwood fine sandy loam, 0 to 8 percent slopes
3.7
2.7%
HrC2
Hartland very fine sandy loam, 8 to 15 percent slopes, eroded
0.8
0.6%
Ls
Limerick-Saco silt loams
14.3
10.4%
Sn
Scantic silt loam, 0 to 3 percent slopes
49.8
36.2%
SuC2
Suffield silt loam, 8 to 15 percent slopes, eroded
28.0
20.3%
SuD2
Suffield silt loam, 15 to 25 percent slopes, eroded
15.5
11.3%
SuE2
Suffield silt loam, 25 to 45 percent slopes, eroded
1.6
1.1%
Sz
Swanton fine sandy loam
10.4
7.6%
WmB
Windsor loamy sand, 0 to 8 percent slopes
3.4
2.5%
Totals for Area of Interest
137.6
100.0%
Soil Map may not be valid at this scale.
Natural Resources Conservation Service
Web Soil Survey
National Cooperative Soil Survey
Page 1 of 3

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0 North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with respect to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

The AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 19. The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713- 3242, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography. Basemap files were provided in digital form by State of Maine, Maine Office of GIS (MeGIS). Ortho imagery was produced at a scale of 1:600 and is dated August 2012. The projection used in the preparation of this map is Maine State Plane West (FIPSZONE 1802). The horizontal datum is NAD 83, GRS1980 spheroid.

The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date stream channel configurations and floodplain delineations than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

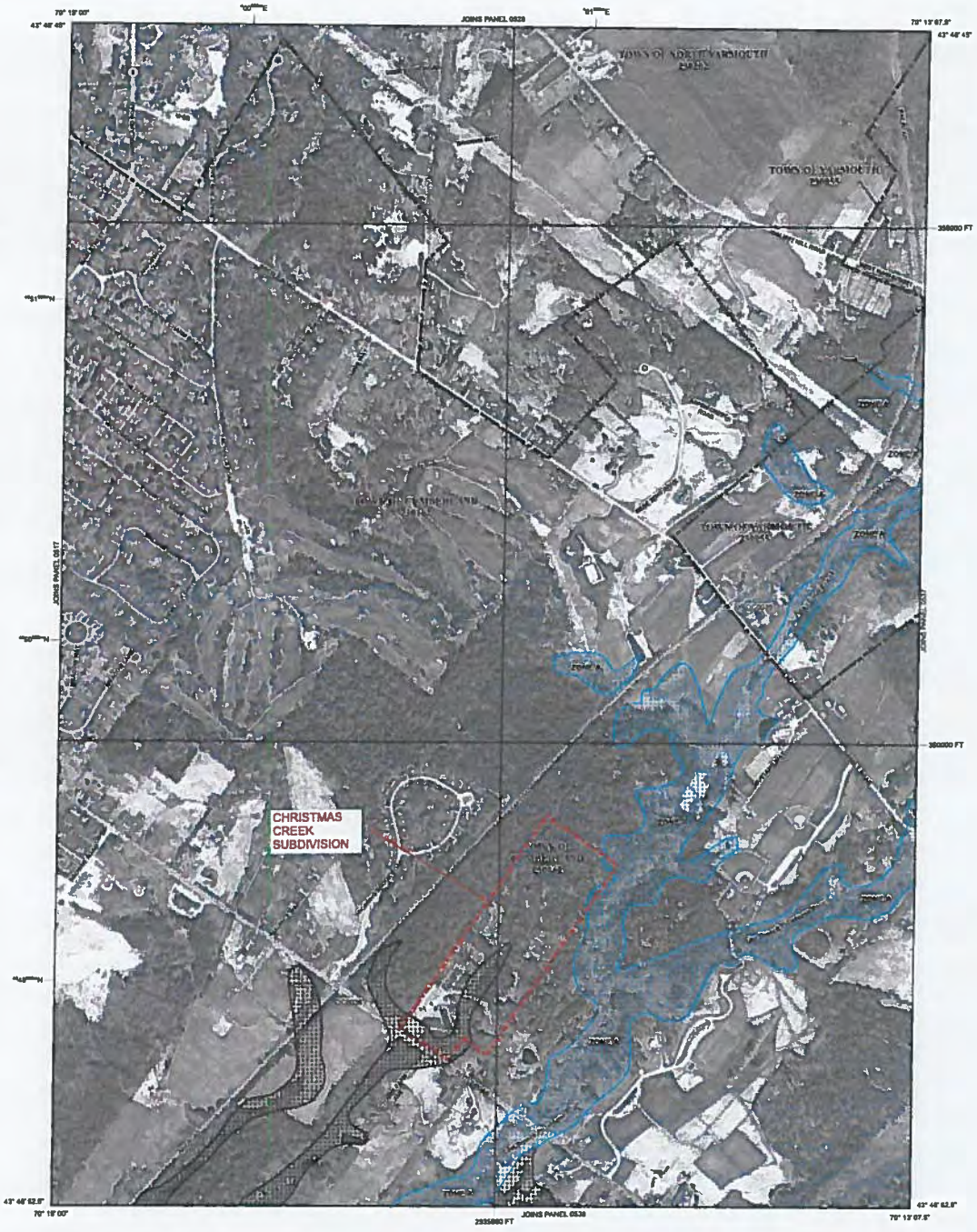
Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the Map Service Center (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

State of Maine Floodway Rules: Under the Maine Revised Statutes Annotated (M.R.S.A.) Title 38 § 439-A, 7C where the floodway is not designated on the Flood Insurance Rate Map, the floodway is considered to be the channel of a river or other water course and the adjacent land areas to a distance of one-half the width of the floodplain, as measured from the normal high water mark to the upland limit of the floodplain, unless a technical evaluation certified by a registered professional engineer is provided demonstrating the actual floodway based upon approved FEMA modeling methods.

Only coastal structures that are certified to provide protection from the 1-percent-annual-chance flood are shown on this panel. However, all structures taken into consideration for the purpose of coastal flood hazard analysis and mapping are present in the DFIRM database in S_Gen_Struct.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway Boundary
Zone D Boundary
CBRS and OPA Boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

Limit of Moderate Wave Action

Limit of Moderate Wave Action coincident with Zone break.

Base Flood Elevation line and value; elevation in feet*

Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

Cross section line

Transect line

Culvert

Bridge

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western hemisphere

1000-foot ticks: Maine State Plane West Zone (FIPS Zone 1802), Transverse Mercator projection

1000-meter Universal Transverse Mercator grid values, zone 19

Bench mark (see explanation in Notes to Users section of this FIRM panel)

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0536F

FIRM
FLOOD INSURANCE RATE MAP
CUMBERLAND COUNTY, MAINE
(ALL JURISDICTIONS)

PANEL 536 OF 662
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CUMBERLAND, TOWN OF	230040	0536	F
NORTH YARMOUTH, TOWN OF	230050	0536	F
YARMOUTH, TOWN OF	230060	0536	F

PRELIMINARY
NOVEMBER 5, 2013

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
23005C0536F
EFFECTIVE DATE

Federal Emergency Management Agency

Appendix B
Wetland Delineation

SEBAGO
TECHNICS

December 3, 2018
18080

WETLAND DELINEATION
TUTTLE ROAD, CUMBERLAND

INTRODUCTION:

The purpose of this investigation is to determine the presence or absence of wetlands at an approximately 50-acre parcel identified as Map R4, Lot 10 by the Cumberland Assessor's Office.

The project area is located along the northeast side of Tuttle Road, Maine approximately 750 feet southeast of the intersection of Crossing Brook Road and Tuttle Road. The lot is centered at approximately N43 degrees, 19.1 minutes, W70 degrees, 14 minutes.

The Sebago Technics wetland delineation was conducted from July 5 to 20, 2018. The investigation involved plant identification, topographic analysis, and soil auger borings. The survey area (the "site") consists of the lot and is depicted on the attached Wetland and Stream Map.

STI identified wetland boundaries with a Trimble Juno handheld GPS connected to a Trimble R2 backpack antenna capable of submeter accuracy. Stream courses were identified from lidar-derived surface data generated in Global Mapper using a 2006 point cloud data set obtained from NOAA coastal data viewer along with data collected with the Trimble GPS.

LITERATURE REVIEW & SITE DESCRIPTION:

The site is located on the *U.S.G.S. Cumberland Center, Maine Quadrangle 7.5 Minute Series (1989 Edition)*. A review of the web soil survey for this site shows that the soil consists of Belgrade very fine sandy loam, Suffield silt loam, or Scantic silt loam. Belgrade soil forms in glacial lakebeds and toeslopes. Suffield soil forms on backslope portions of coastal plains, and Scantic soil forms in glacial marine terrace environments.

A review of *National Wetlands Inventory maps* reveals federally mapped wetlands at the south end and northeast corner of the site as well as a stream which traverses the property from north to south.

METHODOLOGY AND CLASSIFICATION:

The delineation of wetlands was conducted according to Town of Cumberland wetlands regulations and the *Corps of Engineers Wetlands Delineation Manual* dated January 1987, and according to performance standards and the supplemental definitions issued 1 August 1995 by the New England Division, U.S. Army Corps of Engineers. The term "wetlands" is defined by federal regulation to mean "...those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions..." (33 C.F.R. Part 323.2). In order to properly define these areas, three mandatory criteria must be met. These criteria define hydrophytic vegetation, hydric soils, and wetland hydrology. Hydrophytic vegetation fits into the wetland category when more than 50 percent of the dominant vegetation is within the range of obligate through facultative on the *National List of Plant Species That Occur in Wetlands: Northeast (Region 1)*. Hydric soil is any soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. Wetland hydrology is the permanent or periodic inundation, or saturation of soil by groundwater for a significant period (usually two weeks or more) during the growing season. All three of the mandatory criteria, i.e., hydrophytic vegetation, hydric soil conditions, and wetland hydrology, were present within the mapped wetland areas.

The State of Maine Department of Environmental Protection Natural Resource Protection Act (Chapter 310 - Wetland and Waterbodies Protection) classifies some wetland areas as Wetlands of Special Significance. All coastal wetlands and great ponds are considered Wetlands of Special Significance. Additionally, certain freshwater wetlands are considered Wetlands of Special Significance. Freshwater Wetlands of Special Significance have one or more of the following characteristics:

1. Critically imperiled or imperiled community. The freshwater wetland contains a natural community that is critically imperiled (S1) or imperiled (S2) as defined by the Natural Areas Program.
2. Significant wildlife habitat. The freshwater wetland contains significant wildlife habitat as defined by 38 M.R.S.A. § 480-B (10).
3. Location near coastal wetland. The freshwater wetland area is located within 250 feet of a coastal wetland.
4. Location near GPA great pond. The freshwater wetland area is located within 250 feet of the normal high-water line, and within the same watershed, of any lake or pond classified as GPA under 38 M.R.S.A. § 465-A.
5. Aquatic vegetation, emergent marsh vegetation or open water. The freshwater wetland contains under normal circumstances at least 20,000 square feet of aquatic vegetation, emergent marsh vegetation or open water, unless the 20,000 or more-square foot area is the result of an artificial ponds or impoundment.
6. Wetlands subject to flooding. The freshwater wetland area is inundated with floodwater during a 100-year flood event based on flood insurance maps produced by the Federal Emergency Management Agency or other site-specific information.

7. Peatlands. The freshwater wetland is or contains peatlands, except that the department may determine that a previously mined peatland, or portion thereof, is not a wetland of special significance.
8. The freshwater wetland area is located within 25 feet of a river, stream or brook.

The identification of a Significant Vernal Pool must be conducted according to the State of Maine Department of Environmental Protection, Natural Resource Protection Act (Chapter 335 - Significant Wildlife Habitat). The policy reads:

> "A vernal pool, also referred to as a seasonal forest pool, is a natural, temporary to semi-permanent body of water occurring in a shallow depression that typically fills during the spring or fall and may dry during the summer. Vernal pools have no permanent inlet and no viable populations of predatory fish. A vernal pool may provide the primary breeding habitat for wood frogs *(Rana sylvatica)*, spotted salamanders *(Ambystoma maculatum)*, blue-spotted salamanders *(Ambystoma laterale)*, and fairy shrimp *(Eubranchipus sp.)*, as well as valuable habitat for other plants and wildlife, including several rare, threatened, and endangered species. A vernal pool intentionally created for the purposes of compensatory mitigation is included in this definition.
>
> "Whether a vernal pool is a Significant Vernal Pool is determined by the number and type of pool-breeding amphibian egg masses in a pool, or the presence of fairy shrimp, or use by threatened or endangered species as specified in Section 9(B). The Significant Vernal Pool habitat consists of the vernal pool depression and a portion of the critical terrestrial habitat within a 250-foot radius of the spring or fall high water mark of the depression. An activity that takes place in, on, over, or adjacent to a Significant Vernal Pool habitat must meet the standards of this chapter."

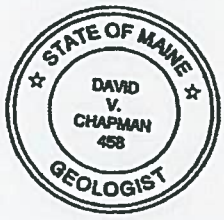
Many natural wetland areas can be ruled out as being or containing a Significant Vernal Pool based on the following criteria: land surface morphology, permanent standing water, a permanently flowing inlet or outlet and/or the presence of fish. However, under many circumstances it is impossible to determine whether or not a particular wetland contains a Significant Vernal Pool. Under these circumstances, two or more vernal pool surveys during the Spring are required to determine whether or not a Significant Vernal Pool exists on-site.

CONCLUSIONS:

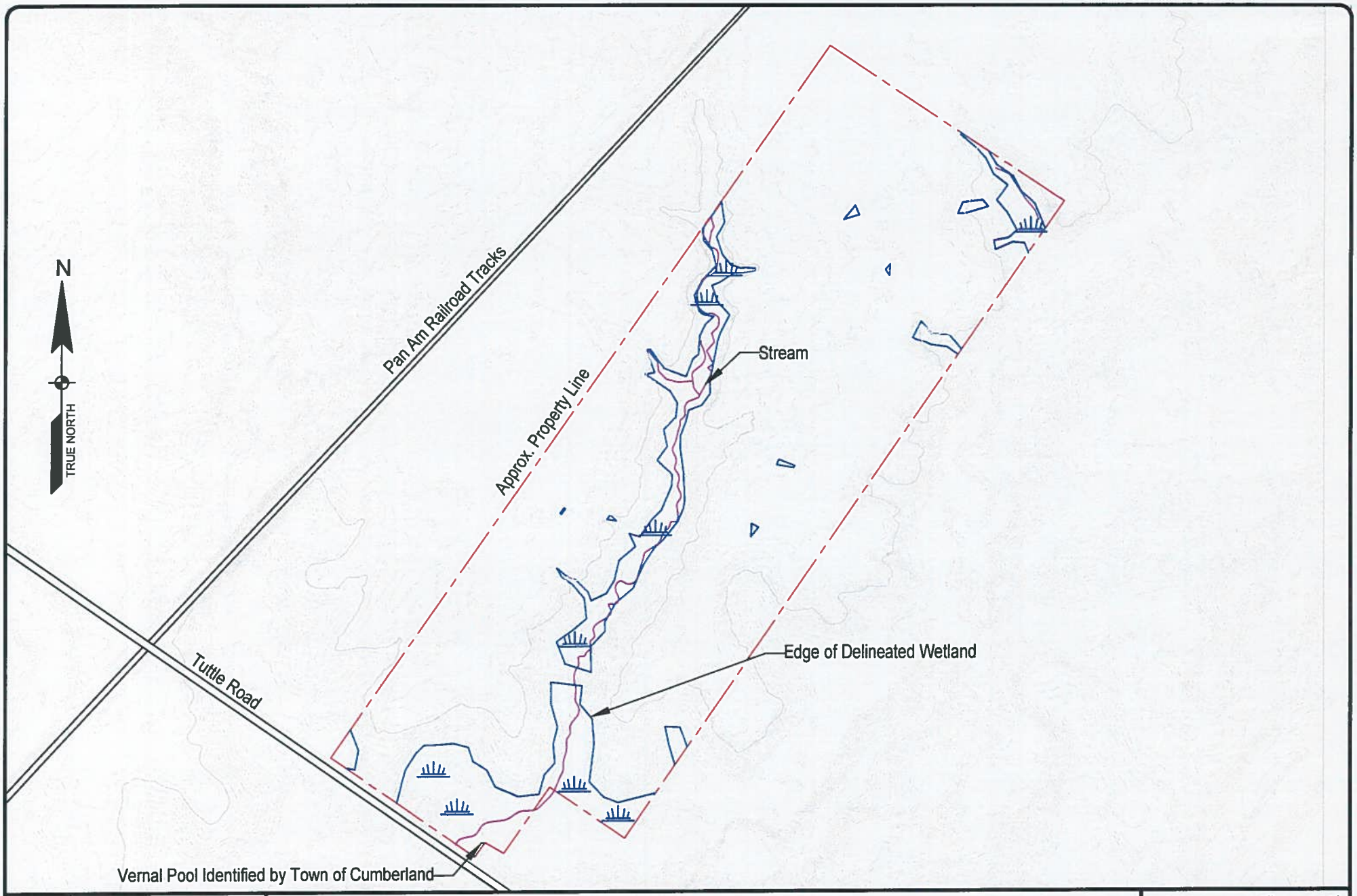
The conclusions of this wetland delineation are as follows:

- Wetland areas and streams were observed at the site. These areas are depicted on the attached Wetland and Stream Map.
- One potential vernal pool was identified on a Town of Cumberland map (#193 on vernal_pool_map_east_of_main_st.pdf from wwwlcumberlandmaine.com) and is depicted on the Wetland and Stream Map.
- Wetlands within 25 feet of the streams are considered to be wetlands of special significance.

Sincerely,
SEBAGO TECHNICS, INC.



Dave Chapman, LSE
Certified Geologist #458



WETLAND AND STREAM MAP

SCALE: 1" = 400'

DATE: 12-3-18

SHEET: 1 OF 1

LOCATION: TUTTLE ROAD
CUMBERLAND, MAINE

FOR: DIRIGO ARCHITECTURAL ENGINEERING
7 COBBLESTONE DRIVE, SUITE 2
TURNER, MAINE 04282

SEBAGO TECHNICS
WWW.SEBAGOTECHNICS.COM
75 John Roberts Rd. Suite 1A
South Portland, ME 04106
Tel. 207-200-2100
250 Goddard Rd. Suite B
Lewiston, ME 04240
Tel. 207-783-5656

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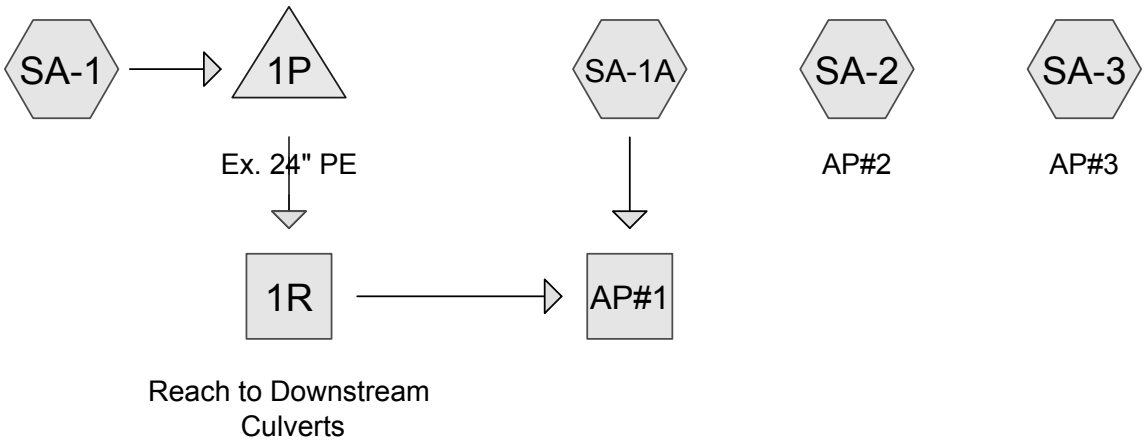
Appendix C
Pre Development Calculations



Subcat Reach Pond Link

Routing Diagram for Pre Development - Christmas Creek
Prepared by Hewlett-Packard, Printed 7/12/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.223	75	1/4 acre lots, 38% imp, HSG B (SA-1)
2.222	83	1/4 acre lots, 38% imp, HSG C (SA-1)
10.162	87	1/4 acre lots, 38% imp, HSG D (SA-1)
0.201	98	Existing Road (SA-1A, SA-3)
1.841	30	Woods, Good, HSG A (SA-1)
13.502	55	Woods, Good, HSG B (SA-1)
31.395	70	Woods, Good, HSG C (SA-1, SA-1A, SA-2, SA-3)
67.831	77	Woods, Good, HSG D (SA-1, SA-1A, SA-2, SA-3)
128.376	**73**	**TOTAL AREA**

Summary for Subcatchment SA-1:

Runoff = 24.16 cfs @ 13.75 hrs, Volume= 6.608 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

Area (sf)	CN	Description
53,285	75	1/4 acre lots, 38% imp, HSG B
96,783	83	1/4 acre lots, 38% imp, HSG C
442,657	87	1/4 acre lots, 38% imp, HSG D
80,198	30	Woods, Good, HSG A
588,128	55	Woods, Good, HSG B
675,215	70	Woods, Good, HSG C
2,473,442	77	Woods, Good, HSG D
4,409,708	73	Weighted Average
4,184,473		94.89% Pervious Area
225,236		5.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 4.59 cfs @ 12.54 hrs, Volume= 0.599 af, Depth> 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	7,297	98	Existing Road
	228,869	70	Woods, Good, HSG C
	143,641	77	Woods, Good, HSG D
	379,807	73	Weighted Average
	372,510		98.08% Pervious Area
	7,297		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	150	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.8	188	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
34.9	595	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 6.02 cfs @ 12.98 hrs, Volume= 1.120 af, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

Area (sf)	CN	Description
447,059	70	Woods, Good, HSG C
275,055	77	Woods, Good, HSG D
722,114	73	Weighted Average
722,114		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 0.82 cfs @ 12.96 hrs, Volume= 0.148 af, Depth> 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	1,460	98	Existing Road
	16,419	70	Woods, Good, HSG C
	62,559	77	Woods, Good, HSG D
	80,438	76	Weighted Average
	78,978		98.18% Pervious Area
	1,460		1.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 0.76" for 2 YEAR STORM event
Inflow = 18.33 cfs @ 14.56 hrs, Volume= 6.403 af
Outflow = 18.22 cfs @ 15.08 hrs, Volume= 6.131 af, Atten= 1%, Lag= 31.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.82 fps, Min. Travel Time= 18.2 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 26.4 min

Peak Storage= 19,882 cf @ 14.77 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 109.952 ac, 4.86% Impervious, Inflow Depth > 0.73" for 2 YEAR STORM event
Inflow = 18.87 cfs @ 15.05 hrs, Volume= 6.729 af
Outflow = 18.87 cfs @ 15.05 hrs, Volume= 6.729 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Ex. 24" PE

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 0.78" for 2 YEAR STORM event
Inflow = 24.16 cfs @ 13.75 hrs, Volume= 6.608 af
Outflow = 18.33 cfs @ 14.56 hrs, Volume= 6.403 af, Atten= 24%, Lag= 48.5 min
Primary = 18.33 cfs @ 14.56 hrs, Volume= 6.403 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 51.36' @ 14.56 hrs Surf.Area= 27,321 sf Storage= 48,009 cf
Flood Elev= 54.00' Surf.Area= 60,890 sf Storage= 163,108 cf

Plug-Flow detention time= 36.4 min calculated for 6.382 af (97% of inflow)
Center-of-Mass det. time= 27.8 min (936.6 - 908.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	163,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**24.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	54.00'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=18.33 cfs @ 14.56 hrs HW=51.36' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 18.33 cfs @ 5.83 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment SA-1:

Runoff = 55.57 cfs @ 13.66 hrs, Volume= 14.546 af, Depth> 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

Area (sf)	CN	Description
53,285	75	1/4 acre lots, 38% imp, HSG B
96,783	83	1/4 acre lots, 38% imp, HSG C
442,657	87	1/4 acre lots, 38% imp, HSG D
80,198	30	Woods, Good, HSG A
588,128	55	Woods, Good, HSG B
675,215	70	Woods, Good, HSG C
2,473,442	77	Woods, Good, HSG D
4,409,708	73	Weighted Average
4,184,473		94.89% Pervious Area
225,236		5.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 10.43 cfs @ 12.51 hrs, Volume= 1.307 af, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	7,297	98	Existing Road
	228,869	70	Woods, Good, HSG C
	143,641	77	Woods, Good, HSG D
	379,807	73	Weighted Average
	372,510		98.08% Pervious Area
	7,297		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	150	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.8	188	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
34.9	595	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 13.81 cfs @ 12.92 hrs, Volume= 2.451 af, Depth> 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

Area (sf)	CN	Description
447,059	70	Woods, Good, HSG C
275,055	77	Woods, Good, HSG D
722,114	73	Weighted Average
722,114		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 1.74 cfs @ 12.91 hrs, Volume= 0.308 af, Depth> 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	1,460	98	Existing Road
	16,419	70	Woods, Good, HSG C
	62,559	77	Woods, Good, HSG D
	80,438	76	Weighted Average
	78,978		98.18% Pervious Area
	1,460		1.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 1.68" for 10 YEAR STORM event
Inflow = 50.07 cfs @ 14.31 hrs, Volume= 14.187 af
Outflow = 39.28 cfs @ 14.78 hrs, Volume= 13.672 af, Atten= 22%, Lag= 28.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.09 fps, Min. Travel Time= 13.6 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 21.3 min

Peak Storage= 32,134 cf @ 14.55 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 109.952 ac, 4.86% Impervious, Inflow Depth > 1.63" for 10 YEAR STORM event
Inflow = 40.60 cfs @ 14.78 hrs, Volume= 14.979 af
Outflow = 40.60 cfs @ 14.78 hrs, Volume= 14.979 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Ex. 24" PE

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 1.72" for 10 YEAR STORM event
Inflow = 55.57 cfs @ 13.66 hrs, Volume= 14.546 af
Outflow = 50.07 cfs @ 14.31 hrs, Volume= 14.187 af, Atten= 10%, Lag= 38.9 min
Primary = 27.26 cfs @ 14.32 hrs, Volume= 13.498 af
Secondary = 22.81 cfs @ 14.31 hrs, Volume= 0.688 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 54.21' @ 14.32 hrs Surf.Area= 60,890 sf Storage= 163,108 cf
Flood Elev= 54.00' Surf.Area= 60,890 sf Storage= 163,108 cf

Plug-Flow detention time= 71.3 min calculated for 14.140 af (97% of inflow)
Center-of-Mass det. time= 64.1 min (958.2 - 894.1)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	163,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**24.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	54.00'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=27.18 cfs @ 14.32 hrs HW=54.18' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 27.18 cfs @ 8.65 fps)

Secondary OutFlow Max=19.84 cfs @ 14.31 hrs HW=54.19' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 19.84 cfs @ 1.07 fps)

Summary for Subcatchment SA-1:

Runoff = 84.16 cfs @ 13.62 hrs, Volume= 21.812 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

Area (sf)	CN	Description
53,285	75	1/4 acre lots, 38% imp, HSG B
96,783	83	1/4 acre lots, 38% imp, HSG C
442,657	87	1/4 acre lots, 38% imp, HSG D
80,198	30	Woods, Good, HSG A
588,128	55	Woods, Good, HSG B
675,215	70	Woods, Good, HSG C
2,473,442	77	Woods, Good, HSG D
4,409,708	73	Weighted Average
4,184,473		94.89% Pervious Area
225,236		5.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 15.66 cfs @ 12.49 hrs, Volume= 1.953 af, Depth> 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	7,297	98	Existing Road
	228,869	70	Woods, Good, HSG C
	143,641	77	Woods, Good, HSG D
	379,807	73	Weighted Average
	372,510		98.08% Pervious Area
	7,297		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	150	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.8	188	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
34.9	595	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 20.80 cfs @ 12.91 hrs, Volume= 3.666 af, Depth> 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

Area (sf)	CN	Description
447,059	70	Woods, Good, HSG C
275,055	77	Woods, Good, HSG D
722,114	73	Weighted Average
722,114		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 2.55 cfs @ 12.90 hrs, Volume= 0.450 af, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	1,460	98	Existing Road
	16,419	70	Woods, Good, HSG C
	62,559	77	Woods, Good, HSG D
	80,438	76	Weighted Average
	78,978		98.18% Pervious Area
	1,460		1.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 2.48" for 25 YEAR STORM event
Inflow = 119.91 cfs @ 13.60 hrs, Volume= 20.959 af
Outflow = 79.54 cfs @ 14.14 hrs, Volume= 20.252 af, Atten= 34%, Lag= 32.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.41 fps, Min. Travel Time= 10.5 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 19.5 min

Peak Storage= 50,240 cf @ 13.97 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 109.952 ac, 4.86% Impervious, Inflow Depth > 2.42" for 25 YEAR STORM event
Inflow = 81.84 cfs @ 14.14 hrs, Volume= 22.204 af
Outflow = 81.84 cfs @ 14.14 hrs, Volume= 22.204 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Ex. 24" PE

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 2.59" for 25 YEAR STORM event
Inflow = 84.16 cfs @ 13.62 hrs, Volume= 21.812 af
Outflow = 119.91 cfs @ 13.60 hrs, Volume= 20.959 af, Atten= 0%, Lag= 0.0 min
Primary = 28.00 cfs @ 13.60 hrs, Volume= 15.576 af
Secondary = 91.91 cfs @ 13.60 hrs, Volume= 5.383 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 54.50' @ 13.60 hrs Surf.Area= 60,890 sf Storage= 163,108 cf
Flood Elev= 54.00' Surf.Area= 60,890 sf Storage= 163,108 cf

Plug-Flow detention time= 60.1 min calculated for 20.889 af (96% of inflow)
Center-of-Mass det. time= 48.8 min (935.1 - 886.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	163,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**24.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	54.00'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=28.00 cfs @ 13.60 hrs HW=54.50' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 28.00 cfs @ 8.91 fps)

Secondary OutFlow Max=91.76 cfs @ 13.60 hrs HW=54.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 91.76 cfs @ 1.85 fps)

Summary for Subcatchment SA-1:

Runoff = 111.68 cfs @ 13.61 hrs, Volume= 28.917 af, Depth> 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

Area (sf)	CN	Description
53,285	75	1/4 acre lots, 38% imp, HSG B
96,783	83	1/4 acre lots, 38% imp, HSG C
442,657	87	1/4 acre lots, 38% imp, HSG D
80,198	30	Woods, Good, HSG A
588,128	55	Woods, Good, HSG B
675,215	70	Woods, Good, HSG C
2,473,442	77	Woods, Good, HSG D
4,409,708	73	Weighted Average
4,184,473		94.89% Pervious Area
225,236		5.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 20.69 cfs @ 12.49 hrs, Volume= 2.583 af, Depth> 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	7,297	98	Existing Road
	228,869	70	Woods, Good, HSG C
	143,641	77	Woods, Good, HSG D
	379,807	73	Weighted Average
	372,510		98.08% Pervious Area
	7,297		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	150	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.8	188	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
34.9	595	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 27.52 cfs @ 12.90 hrs, Volume= 4.853 af, Depth> 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

Area (sf)	CN	Description
447,059	70	Woods, Good, HSG C
275,055	77	Woods, Good, HSG D
722,114	73	Weighted Average
722,114		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 3.32 cfs @ 12.89 hrs, Volume= 0.588 af, Depth> 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	1,460	98	Existing Road
	16,419	70	Woods, Good, HSG C
	62,559	77	Woods, Good, HSG D
	80,438	76	Weighted Average
	78,978		98.18% Pervious Area
	1,460		1.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 3.26" for 50 YEAR STORM event
Inflow = 155.51 cfs @ 13.65 hrs, Volume= 27.467 af
Outflow = 109.63 cfs @ 13.95 hrs, Volume= 26.698 af, Atten= 30%, Lag= 18.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.58 fps, Min. Travel Time= 9.4 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 18.5 min

Peak Storage= 61,715 cf @ 13.80 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 109.952 ac, 4.86% Impervious, Inflow Depth > 3.20" for 50 YEAR STORM event
Inflow = 112.80 cfs @ 13.94 hrs, Volume= 29.281 af
Outflow = 112.80 cfs @ 13.94 hrs, Volume= 29.281 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Ex. 24" PE

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 3.43" for 50 YEAR STORM event
Inflow = 111.68 cfs @ 13.61 hrs, Volume= 28.917 af
Outflow = 155.51 cfs @ 13.65 hrs, Volume= 27.467 af, Atten= 0%, Lag= 2.3 min
Primary = 28.27 cfs @ 13.65 hrs, Volume= 16.850 af
Secondary = 127.24 cfs @ 13.65 hrs, Volume= 10.617 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 54.61' @ 13.65 hrs Surf.Area= 60,890 sf Storage= 163,108 cf
Flood Elev= 54.00' Surf.Area= 60,890 sf Storage= 163,108 cf

Plug-Flow detention time= 50.3 min calculated for 27.376 af (95% of inflow)
Center-of-Mass det. time= 36.0 min (916.8 - 880.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	163,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**24.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	54.00'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=28.27 cfs @ 13.65 hrs HW=54.60' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 28.27 cfs @ 9.00 fps)

Secondary OutFlow Max=127.02 cfs @ 13.65 hrs HW=54.60' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 127.02 cfs @ 2.10 fps)

Summary for Subcatchment SA-1:

Runoff = 142.61 cfs @ 13.61 hrs, Volume= 37.004 af, Depth> 4.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

Area (sf)	CN	Description
53,285	75	1/4 acre lots, 38% imp, HSG B
96,783	83	1/4 acre lots, 38% imp, HSG C
442,657	87	1/4 acre lots, 38% imp, HSG D
80,198	30	Woods, Good, HSG A
588,128	55	Woods, Good, HSG B
675,215	70	Woods, Good, HSG C
2,473,442	77	Woods, Good, HSG D
4,409,708	73	Weighted Average
4,184,473		94.89% Pervious Area
225,236		5.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 26.32 cfs @ 12.48 hrs, Volume= 3.300 af, Depth> 4.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	7,297	98	Existing Road
	228,869	70	Woods, Good, HSG C
	143,641	77	Woods, Good, HSG D
	379,807	73	Weighted Average
	372,510		98.08% Pervious Area
	7,297		1.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.2	150	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.8	188	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
34.9	595	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 35.06 cfs @ 12.90 hrs, Volume= 6.203 af, Depth> 4.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

Area (sf)	CN	Description
447,059	70	Woods, Good, HSG C
275,055	77	Woods, Good, HSG D
722,114	73	Weighted Average
722,114		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 4.17 cfs @ 12.88 hrs, Volume= 0.743 af, Depth> 4.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	1,460	98	Existing Road
	16,419	70	Woods, Good, HSG C
	62,559	77	Woods, Good, HSG D
	80,438	76	Weighted Average
	78,978		98.18% Pervious Area
	1,460		1.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 4.14" for 100 YEAR STORM event
Inflow = 210.78 cfs @ 13.65 hrs, Volume= 34.962 af
Outflow = 141.13 cfs @ 13.87 hrs, Volume= 34.161 af, Atten= 33%, Lag= 12.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.73 fps, Min. Travel Time= 8.6 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 17.7 min

Peak Storage= 72,704 cf @ 13.72 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 109.952 ac, 4.86% Impervious, Inflow Depth > 4.09" for 100 YEAR STORM event
Inflow = 145.23 cfs @ 13.85 hrs, Volume= 37.461 af
Outflow = 145.23 cfs @ 13.85 hrs, Volume= 37.461 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Ex. 24" PE

Inflow Area = 101.233 ac, 5.11% Impervious, Inflow Depth > 4.39" for 100 YEAR STORM event
Inflow = 142.61 cfs @ 13.61 hrs, Volume= 37.004 af
Outflow = 210.78 cfs @ 13.65 hrs, Volume= 34.962 af, Atten= 0%, Lag= 2.6 min
Primary = 28.69 cfs @ 13.65 hrs, Volume= 17.993 af
Secondary = 182.09 cfs @ 13.65 hrs, Volume= 16.969 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 54.77' @ 13.65 hrs Surf.Area= 60,890 sf Storage= 163,108 cf
Flood Elev= 54.00' Surf.Area= 60,890 sf Storage= 163,108 cf

Plug-Flow detention time= 42.1 min calculated for 34.962 af (94% of inflow)
Center-of-Mass det. time= 26.3 min (902.0 - 875.7)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	163,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

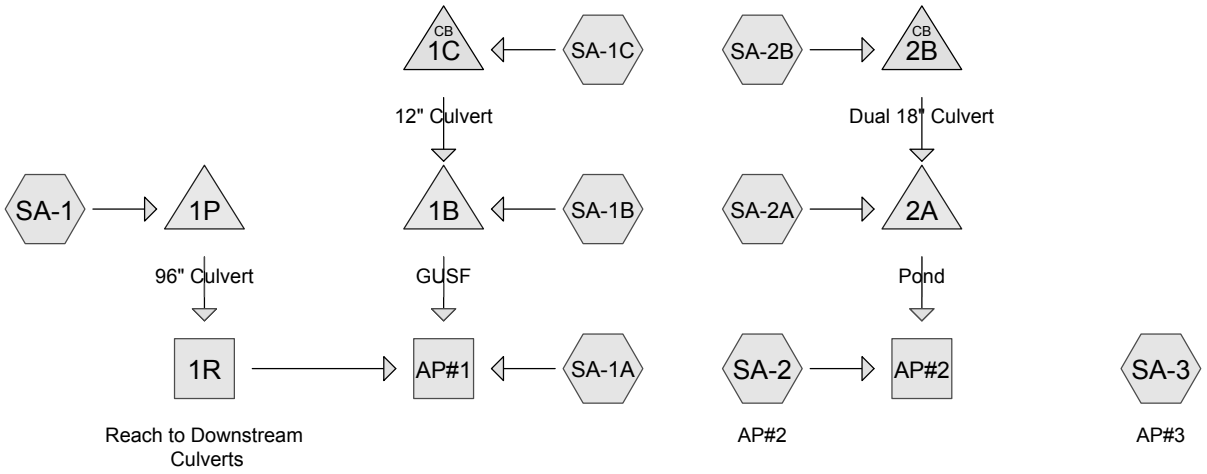
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**24.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	54.00'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=28.68 cfs @ 13.65 hrs HW=54.77' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 28.68 cfs @ 9.13 fps)

Secondary OutFlow Max=181.71 cfs @ 13.65 hrs HW=54.77' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 181.71 cfs @ 2.36 fps)

Appendix D
Post Development Calculations



Subcat Reach Pond Link

Routing Diagram for Post Development - Christmas Creek
Prepared by Hewlett-Packard, Printed 7/12/2019

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.223	75	1/4 acre lots, 38% imp, HSG B (SA-1)
2.222	83	1/4 acre lots, 38% imp, HSG C (SA-1)
10.162	87	1/4 acre lots, 38% imp, HSG D (SA-1)
10.737	74	Allocated Grass (C) (SA-1, SA-1A, SA-2, SA-2A, SA-2B)
7.628	80	Allocated Grass (D) (SA-1, SA-1A, SA-2, SA-2A, SA-2B, SA-3)
2.000	98	Allocated Impervious (SA-1, SA-1A, SA-2, SA-2A, SA-2B)
0.201	98	Existing Road (SA-1A, SA-3)
2.320	74	Proposed Grass (C) (SA-1, SA-1A, SA-1B, SA-1C, SA-2, SA-2A, SA-2B, SA-3)
1.076	80	Proposed Grass (D) (SA-1, SA-1A, SA-1B, SA-1C, SA-2, SA-2A, SA-2B)
1.923	98	Proposed Impervious (SA-1, SA-1A, SA-1B, SA-1C, SA-2A, SA-2B, SA-3)
1.841	30	Woods, Good, HSG A (SA-1)
13.502	55	Woods, Good, HSG B (SA-1)
16.401	70	Woods, Good, HSG C (SA-1, SA-1A, SA-2, SA-2A, SA-3)
57.139	77	Woods, Good, HSG D (SA-1, SA-1A, SA-2, SA-3)
128.376	**75**	**TOTAL AREA**

Summary for Subcatchment SA-1:

Runoff = 24.37 cfs @ 13.76 hrs, Volume= 6.604 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	6,556	98	Proposed Impervious
*	3,163	74	Proposed Grass (C)
*	3,905	80	Proposed Grass (D)
*	13,068	98	Allocated Impervious
*	94,430	74	Allocated Grass (C)
*	139,148	80	Allocated Grass (D)
	53,285	75	1/4 acre lots, 38% imp, HSG B
	96,783	83	1/4 acre lots, 38% imp, HSG C
	442,657	87	1/4 acre lots, 38% imp, HSG D
	80,198	30	Woods, Good, HSG A
	588,128	55	Woods, Good, HSG B
	390,952	70	Woods, Good, HSG C
	2,237,942	77	Woods, Good, HSG D
	4,150,215	74	Weighted Average
	3,905,356		94.10% Pervious Area
	244,860		5.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 6.59 cfs @ 12.26 hrs, Volume= 0.637 af, Depth> 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	8,116	98	Existing Road
*	9,725	98	Proposed Impervious
*	6,534	98	Allocated Impervious
*	16,034	74	Proposed Grass (C)
*	4,698	80	Proposed Grass (D)
*	20,000	74	Allocated Grass (C)
*	40,000	80	Allocated Grass (D)
	178,736	70	Woods, Good, HSG C
	73,200	77	Woods, Good, HSG D
	357,043	75	Weighted Average
	332,668		93.17% Pervious Area
	24,375		6.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	108	0.0180	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.4	42	0.1200	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.4	145	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
17.7	552	Total			

Summary for Subcatchment SA-1B:

Runoff = 0.81 cfs @ 12.01 hrs, Volume= 0.048 af, Depth> 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	5,887	98	Proposed Impervious
*	5,903	74	Proposed Grass (C)
*	4,920	80	Proposed Grass (D)
	16,710	84	Weighted Average
	10,823		64.77% Pervious Area
	5,887		35.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.4	401	0.0800	15.75	472.49	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
0.7	419	Total			

Summary for Subcatchment SA-1C:

Runoff = 0.68 cfs @ 12.02 hrs, Volume= 0.040 af, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	5,278	98	Proposed Impervious
*	5,129	74	Proposed Grass (C)
*	3,121	80	Proposed Grass (D)
	13,528	85	Weighted Average
	8,250		60.98% Pervious Area
	5,278		39.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.6	452	0.0750	13.30	219.46	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 & 0.0 '/' Top.W=10.00' n= 0.035
0.9	468	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 5.47 cfs @ 12.96 hrs, Volume= 0.999 af, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	11,979	98	Allocated Impervious
*	222,107	74	Allocated Grass (C)
*	49,329	80	Allocated Grass (D)
*	6,764	74	Proposed Grass (C)
*	7,422	80	Proposed Grass (D)
	141,396	70	Woods, Good, HSG C
	134,498	77	Woods, Good, HSG D
	573,495	75	Weighted Average
	561,516		97.91% Pervious Area
	11,979		2.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-2A:

Runoff = 6.61 cfs @ 12.16 hrs, Volume= 0.524 af, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	26,136	98	Allocated Impervious
*	29,066	98	Proposed Impervious
*	75,612	74	Allocated Grass (C)
*	32,943	80	Allocated Grass (D)
*	37,343	74	Proposed Grass (C)
*	11,151	80	Proposed Grass (D)
	1,326	70	Woods, Good, HSG C
	213,577	81	Weighted Average
	158,375		74.15% Pervious Area
	55,202		25.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	47	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.5	1,844	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
11.2	1,909	Total			

Summary for Subcatchment SA-2B:

Runoff = 6.82 cfs @ 12.16 hrs, Volume= 0.532 af, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	29,403	98	Allocated Impervious
*	55,570	74	Allocated Grass (C)
*	60,852	80	Allocated Grass (D)
*	25,383	98	Proposed Impervious
*	23,350	74	Proposed Grass (C)
*	11,671	80	Proposed Grass (D)
	206,229	82	Weighted Average
	151,443		73.43% Pervious Area
	54,786		26.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	42	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.4	1,800	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
10.7	1,860	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 0.70 cfs @ 12.95 hrs, Volume= 0.126 af, Depth> 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR STORM Rainfall=3.10"

	Area (sf)	CN	Description
*	641	98	Existing Road
*	1,883	98	Proposed Impervious
*	3,380	74	Proposed Grass (C)
*	10,000	80	Allocated Grass (D)
	2,036	70	Woods, Good, HSG C
	43,321	77	Woods, Good, HSG D
	61,261	78	Weighted Average
	58,737		95.88% Pervious Area
	2,524		4.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 0.70" for 2 YEAR STORM event
Inflow = 22.46 cfs @ 14.16 hrs, Volume= 5.577 af
Outflow = 21.52 cfs @ 14.69 hrs, Volume= 5.323 af, Atten= 4%, Lag= 32.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.87 fps, Min. Travel Time= 17.1 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 24.2 min

Peak Storage= 22,052 cf @ 14.41 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 104.167 ac, 6.18% Impervious, Inflow Depth > 0.69" for 2 YEAR STORM event
Inflow = 22.27 cfs @ 14.69 hrs, Volume= 5.998 af
Outflow = 22.27 cfs @ 14.69 hrs, Volume= 5.998 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach AP#2:

Inflow Area = 22.803 ac, 12.28% Impervious, Inflow Depth > 0.76" for 2 YEAR STORM event
Inflow = 5.88 cfs @ 12.96 hrs, Volume= 1.441 af
Outflow = 5.88 cfs @ 12.96 hrs, Volume= 1.441 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1B: GUSF

Inflow Area = 0.694 ac, 36.92% Impervious, Inflow Depth > 1.52" for 2 YEAR STORM event
Inflow = 1.49 cfs @ 12.01 hrs, Volume= 0.088 af
Outflow = 0.12 cfs @ 13.18 hrs, Volume= 0.038 af, Atten= 92%, Lag= 69.7 min
Primary = 0.02 cfs @ 13.18 hrs, Volume= 0.020 af
Secondary = 0.09 cfs @ 13.18 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 53.53' @ 13.18 hrs Surf.Area= 1,991 sf Storage= 2,229 cf
Flood Elev= 54.50' Surf.Area= 2,386 sf Storage= 3,248 cf

Plug-Flow detention time= 184.5 min calculated for 0.038 af (44% of inflow)
Center-of-Mass det. time= 98.0 min (887.1 - 789.1)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	3,248 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,035	0	0
53.00	1,537	1,286	1,286
54.00	2,386	1,962	3,248

Device	Routing	Invert	Outlet Devices
#1	Primary	49.83'	**6.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 49.83' / 49.53' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	49.83'	**0.7" Vert. Orifice/Grate** C= 0.600
#3	Secondary	53.50'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.02 cfs @ 13.18 hrs HW=53.53' (Free Discharge)
↑**1=Culvert** (Passes 0.02 cfs of 1.25 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 9.23 fps)

Secondary OutFlow Max=0.09 cfs @ 13.18 hrs HW=53.53' (Free Discharge)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 0.09 cfs @ 0.50 fps)

Summary for Pond 1C: 12" Culvert

Inflow Area = 0.311 ac, 39.02% Impervious, Inflow Depth > 1.56" for 2 YEAR STORM event
Inflow = 0.68 cfs @ 12.02 hrs, Volume= 0.040 af
Outflow = 0.68 cfs @ 12.02 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.68 cfs @ 12.02 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 53.50' @ 12.02 hrs
Flood Elev= 54.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.00'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 53.00' / 52.77' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.02 hrs HW=53.48' (Free Discharge)
↑**1=Culvert** (Barrel Controls 0.65 cfs @ 2.52 fps)

Summary for Pond 1P: 96" Culvert

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 0.83" for 2 YEAR STORM event
Inflow = 24.37 cfs @ 13.76 hrs, Volume= 6.604 af
Outflow = 22.46 cfs @ 14.16 hrs, Volume= 5.577 af, Atten= 8%, Lag= 23.8 min
Primary = 22.46 cfs @ 14.16 hrs, Volume= 5.577 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 51.87' @ 14.16 hrs Surf.Area= 32,922 sf Storage= 63,452 cf
Flood Elev= 69.34' Surf.Area= 264,698 sf Storage= 2,624,904 cf

Plug-Flow detention time= 71.5 min calculated for 5.577 af (84% of inflow)
Center-of-Mass det. time= 34.8 min (941.5 - 906.7)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	2,667,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108
69.00	255,557	2,373,353	2,536,461
69.50	269,000	131,139	2,667,600

Device	Routing	Invert	Outlet Devices
#1	Primary	51.00'	**96.0" Round Culvert w/ 36.0" inside fill** L= 60.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 33.05 sf
#2	Secondary	69.34'	**100.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=22.45 cfs @ 14.16 hrs HW=51.87' (Free Discharge)
1=Culvert (Barrel Controls 22.45 cfs @ 4.37 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 2A: Pond

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 1.32" for 2 YEAR STORM event
Inflow = 13.43 cfs @ 12.16 hrs, Volume= 1.056 af
Outflow = 0.44 cfs @ 17.51 hrs, Volume= 0.442 af, Atten= 97%, Lag= 321.0 min
Primary = 0.44 cfs @ 17.51 hrs, Volume= 0.442 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 63.97' @ 17.51 hrs Surf.Area= 10,663 sf Storage= 67,378 cf (27,571 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**18.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.50' / 58.29' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	58.50'	**2.7" Vert. Orifice/Grate** C= 0.600
#4	Device 1	66.00'	**8.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Primary OutFlow Max=0.44 cfs @ 17.51 hrs HW=63.97' (Free Discharge)
└**1=Culvert** (Passes 0.44 cfs of 18.49 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.44 cfs @ 11.15 fps)
  └**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=61.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2B: Dual 18" Culvert

Inflow Area = 4.734 ac, 26.57% Impervious, Inflow Depth > 1.35" for 2 YEAR STORM event
Inflow = 6.82 cfs @ 12.16 hrs, Volume= 0.532 af
Outflow = 6.82 cfs @ 12.16 hrs, Volume= 0.532 af, Atten= 0%, Lag= 0.0 min
Primary = 6.82 cfs @ 12.16 hrs, Volume= 0.532 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 68.07' @ 12.16 hrs
Flood Elev= 71.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**18.0" Round Culvert X 2.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.00' / 66.75' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=6.75 cfs @ 12.16 hrs HW=68.06' (Free Discharge)
↑**1=Culvert** (Barrel Controls 6.75 cfs @ 3.54 fps)

Summary for Subcatchment SA-1:

Runoff = 54.67 cfs @ 13.64 hrs, Volume= 14.271 af, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	6,556	98	Proposed Impervious
*	3,163	74	Proposed Grass (C)
*	3,905	80	Proposed Grass (D)
*	13,068	98	Allocated Impervious
*	94,430	74	Allocated Grass (C)
*	139,148	80	Allocated Grass (D)
	53,285	75	1/4 acre lots, 38% imp, HSG B
	96,783	83	1/4 acre lots, 38% imp, HSG C
	442,657	87	1/4 acre lots, 38% imp, HSG D
	80,198	30	Woods, Good, HSG A
	588,128	55	Woods, Good, HSG B
	390,952	70	Woods, Good, HSG C
	2,237,942	77	Woods, Good, HSG D
	4,150,215	74	Weighted Average
	3,905,356		94.10% Pervious Area
	244,860		5.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 14.32 cfs @ 12.25 hrs, Volume= 1.340 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	8,116	98	Existing Road
*	9,725	98	Proposed Impervious
*	6,534	98	Allocated Impervious
*	16,034	74	Proposed Grass (C)
*	4,698	80	Proposed Grass (D)
*	20,000	74	Allocated Grass (C)
*	40,000	80	Allocated Grass (D)
	178,736	70	Woods, Good, HSG C
	73,200	77	Woods, Good, HSG D
	357,043	75	Weighted Average
	332,668		93.17% Pervious Area
	24,375		6.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	108	0.0180	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.4	42	0.1200	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.4	145	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
17.7	552	Total			

Summary for Subcatchment SA-1B:

Runoff = 1.47 cfs @ 12.01 hrs, Volume= 0.087 af, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	5,887	98	Proposed Impervious
*	5,903	74	Proposed Grass (C)
*	4,920	80	Proposed Grass (D)
	16,710	84	Weighted Average
	10,823		64.77% Pervious Area
	5,887		35.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.4	401	0.0800	15.75	472.49	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
0.7	419	Total			

Summary for Subcatchment SA-1C:

Runoff = 1.21 cfs @ 12.01 hrs, Volume= 0.073 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	5,278	98	Proposed Impervious
*	5,129	74	Proposed Grass (C)
*	3,121	80	Proposed Grass (D)
	13,528	85	Weighted Average
	8,250		60.98% Pervious Area
	5,278		39.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.6	452	0.0750	13.30	219.46	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 & 0.0 '/' Top.W=10.00' n= 0.035
0.9	468	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 11.95 cfs @ 12.92 hrs, Volume= 2.111 af, Depth> 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	11,979	98	Allocated Impervious
*	222,107	74	Allocated Grass (C)
*	49,329	80	Allocated Grass (D)
*	6,764	74	Proposed Grass (C)
*	7,422	80	Proposed Grass (D)
	141,396	70	Woods, Good, HSG C
	134,498	77	Woods, Good, HSG D
	573,495	75	Weighted Average
	561,516		97.91% Pervious Area
	11,979		2.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-2A:

Runoff = 12.66 cfs @ 12.16 hrs, Volume= 1.003 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	26,136	98	Allocated Impervious
*	29,066	98	Proposed Impervious
*	75,612	74	Allocated Grass (C)
*	32,943	80	Allocated Grass (D)
*	37,343	74	Proposed Grass (C)
*	11,151	80	Proposed Grass (D)
	1,326	70	Woods, Good, HSG C
	213,577	81	Weighted Average
	158,375		74.15% Pervious Area
	55,202		25.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	47	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.5	1,844	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
11.2	1,909	Total			

Summary for Subcatchment SA-2B:

Runoff = 12.81 cfs @ 12.15 hrs, Volume= 1.003 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	29,403	98	Allocated Impervious
*	55,570	74	Allocated Grass (C)
*	60,852	80	Allocated Grass (D)
*	25,383	98	Proposed Impervious
*	23,350	74	Proposed Grass (C)
*	11,671	80	Proposed Grass (D)
	206,229	82	Weighted Average
	151,443		73.43% Pervious Area
	54,786		26.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	42	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.4	1,800	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
10.7	1,860	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 1.43 cfs @ 12.91 hrs, Volume= 0.253 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR STORM Rainfall=4.60"

	Area (sf)	CN	Description
*	641	98	Existing Road
*	1,883	98	Proposed Impervious
*	3,380	74	Proposed Grass (C)
*	10,000	80	Allocated Grass (D)
	2,036	70	Woods, Good, HSG C
	43,321	77	Woods, Good, HSG D
	61,261	78	Weighted Average
	58,737		95.88% Pervious Area
	2,524		4.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 1.66" for 10 YEAR STORM event
Inflow = 52.28 cfs @ 13.96 hrs, Volume= 13.177 af
Outflow = 51.65 cfs @ 14.31 hrs, Volume= 12.827 af, Atten= 1%, Lag= 21.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.21 fps, Min. Travel Time= 12.3 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 18.2 min

Peak Storage= 38,151 cf @ 14.11 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 104.167 ac, 6.18% Impervious, Inflow Depth > 1.64" for 10 YEAR STORM event
Inflow = 53.14 cfs @ 14.31 hrs, Volume= 14.278 af
Outflow = 53.14 cfs @ 14.31 hrs, Volume= 14.278 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach AP#2:

Inflow Area = 22.803 ac, 12.28% Impervious, Inflow Depth > 1.54" for 10 YEAR STORM event
Inflow = 12.46 cfs @ 12.92 hrs, Volume= 2.935 af
Outflow = 12.46 cfs @ 12.92 hrs, Volume= 2.935 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1B: GUSF

Inflow Area = 0.694 ac, 36.92% Impervious, Inflow Depth > 2.77" for 10 YEAR STORM event
Inflow = 2.68 cfs @ 12.01 hrs, Volume= 0.160 af
Outflow = 1.46 cfs @ 12.12 hrs, Volume= 0.110 af, Atten= 45%, Lag= 6.5 min
Primary = 0.03 cfs @ 12.12 hrs, Volume= 0.023 af
Secondary = 1.44 cfs @ 12.12 hrs, Volume= 0.087 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 53.73' @ 12.12 hrs Surf.Area= 2,154 sf Storage= 2,626 cf
Flood Elev= 54.50' Surf.Area= 2,386 sf Storage= 3,248 cf

Plug-Flow detention time= 112.2 min calculated for 0.110 af (69% of inflow)
Center-of-Mass det. time= 45.0 min (820.2 - 775.1)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	3,248 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,035	0	0
53.00	1,537	1,286	1,286
54.00	2,386	1,962	3,248

Device	Routing	Invert	Outlet Devices
#1	Primary	49.83'	**6.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 49.83' / 49.53' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	49.83'	**0.7" Vert. Orifice/Grate** C= 0.600
#3	Secondary	53.50'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.03 cfs @ 12.12 hrs HW=53.72' (Free Discharge)
↑**1=Culvert** (Passes 0.03 cfs of 1.29 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.46 fps)

Secondary OutFlow Max=1.36 cfs @ 12.12 hrs HW=53.72' (Free Discharge)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 1.36 cfs @ 1.25 fps)

Summary for Pond 1C: 12" Culvert

Inflow Area = 0.311 ac, 39.02% Impervious, Inflow Depth > 2.82" for 10 YEAR STORM event
Inflow = 1.21 cfs @ 12.01 hrs, Volume= 0.073 af
Outflow = 1.21 cfs @ 12.01 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Primary = 1.21 cfs @ 12.01 hrs, Volume= 0.073 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 53.70' @ 12.01 hrs
Flood Elev= 54.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.00'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 53.00' / 52.77' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.16 cfs @ 12.01 hrs HW=53.68' (Free Discharge)
↑**1=Culvert** (Barrel Controls 1.16 cfs @ 2.88 fps)

Summary for Pond 1P: 96" Culvert

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 1.80" for 10 YEAR STORM event
Inflow = 54.67 cfs @ 13.64 hrs, Volume= 14.271 af
Outflow = 52.28 cfs @ 13.96 hrs, Volume= 13.177 af, Atten= 4%, Lag= 19.3 min
Primary = 52.28 cfs @ 13.96 hrs, Volume= 13.177 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 52.59' @ 13.96 hrs Surf.Area= 42,210 sf Storage= 90,529 cf
Flood Elev= 69.34' Surf.Area= 264,698 sf Storage= 2,624,904 cf

Plug-Flow detention time= 44.2 min calculated for 13.177 af (92% of inflow)
Center-of-Mass det. time= 23.8 min (916.2 - 892.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	2,667,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108
69.00	255,557	2,373,353	2,536,461
69.50	269,000	131,139	2,667,600

Device	Routing	Invert	Outlet Devices
#1	Primary	51.00'	**96.0" Round Culvert w/ 36.0" inside fill** L= 60.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 33.05 sf
#2	Secondary	69.34'	**100.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=52.20 cfs @ 13.96 hrs HW=52.59' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 52.20 cfs @ 5.52 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2A: Pond

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 2.50" for 10 YEAR STORM event
Inflow = 25.46 cfs @ 12.15 hrs, Volume= 2.007 af
Outflow = 2.00 cfs @ 13.96 hrs, Volume= 0.824 af, Atten= 92%, Lag= 108.5 min
Primary = 2.00 cfs @ 13.96 hrs, Volume= 0.824 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 66.14' @ 13.96 hrs Surf.Area= 13,503 sf Storage= 93,137 cf (53,330 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 65.2 min (855.7 - 790.5)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**18.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.50' / 58.29' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	58.50'	**2.7" Vert. Orifice/Grate** C= 0.600
#4	Device 1	66.00'	**8.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Primary OutFlow Max=1.85 cfs @ 13.96 hrs HW=66.14' (Free Discharge)
└**1=Culvert** (Passes 1.85 cfs of 22.33 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.53 cfs @ 13.21 fps)
  └**4=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.32 cfs @ 1.21 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=61.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2B: Dual 18" Culvert

Inflow Area = 4.734 ac, 26.57% Impervious, Inflow Depth > 2.54" for 10 YEAR STORM event
Inflow = 12.81 cfs @ 12.15 hrs, Volume= 1.003 af
Outflow = 12.81 cfs @ 12.15 hrs, Volume= 1.003 af, Atten= 0%, Lag= 0.0 min
Primary = 12.81 cfs @ 12.15 hrs, Volume= 1.003 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 68.66' @ 12.15 hrs
Flood Elev= 71.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**18.0" Round Culvert X 2.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.00' / 66.75' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=12.77 cfs @ 12.15 hrs HW=68.65' (Free Discharge)
1=Culvert (Inlet Controls 12.77 cfs @ 3.61 fps)

Summary for Subcatchment SA-1:

Runoff = 81.99 cfs @ 13.62 hrs, Volume= 21.234 af, Depth> 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	6,556	98	Proposed Impervious
*	3,163	74	Proposed Grass (C)
*	3,905	80	Proposed Grass (D)
*	13,068	98	Allocated Impervious
*	94,430	74	Allocated Grass (C)
*	139,148	80	Allocated Grass (D)
	53,285	75	1/4 acre lots, 38% imp, HSG B
	96,783	83	1/4 acre lots, 38% imp, HSG C
	442,657	87	1/4 acre lots, 38% imp, HSG D
	80,198	30	Woods, Good, HSG A
	588,128	55	Woods, Good, HSG B
	390,952	70	Woods, Good, HSG C
	2,237,942	77	Woods, Good, HSG D
	4,150,215	74	Weighted Average
	3,905,356		94.10% Pervious Area
	244,860		5.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 21.10 cfs @ 12.25 hrs, Volume= 1.972 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	8,116	98	Existing Road
*	9,725	98	Proposed Impervious
*	6,534	98	Allocated Impervious
*	16,034	74	Proposed Grass (C)
*	4,698	80	Proposed Grass (D)
*	20,000	74	Allocated Grass (C)
*	40,000	80	Allocated Grass (D)
	178,736	70	Woods, Good, HSG C
	73,200	77	Woods, Good, HSG D
	357,043	75	Weighted Average
	332,668		93.17% Pervious Area
	24,375		6.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	108	0.0180	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.4	42	0.1200	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.4	145	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
17.7	552	Total			

Summary for Subcatchment SA-1B:

Runoff = 2.01 cfs @ 12.01 hrs, Volume= 0.121 af, Depth> 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	5,887	98	Proposed Impervious
*	5,903	74	Proposed Grass (C)
*	4,920	80	Proposed Grass (D)
	16,710	84	Weighted Average
	10,823		64.77% Pervious Area
	5,887		35.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.4	401	0.0800	15.75	472.49	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
0.7	419	Total			

Summary for Subcatchment SA-1C:

Runoff = 1.65 cfs @ 12.01 hrs, Volume= 0.100 af, Depth> 3.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	5,278	98	Proposed Impervious
*	5,129	74	Proposed Grass (C)
*	3,121	80	Proposed Grass (D)
	13,528	85	Weighted Average
	8,250		60.98% Pervious Area
	5,278		39.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.6	452	0.0750	13.30	219.46	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 & 0.0 '/' Top.W=10.00' n= 0.035
0.9	468	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 17.65 cfs @ 12.90 hrs, Volume= 3.110 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	11,979	98	Allocated Impervious
*	222,107	74	Allocated Grass (C)
*	49,329	80	Allocated Grass (D)
*	6,764	74	Proposed Grass (C)
*	7,422	80	Proposed Grass (D)
	141,396	70	Woods, Good, HSG C
	134,498	77	Woods, Good, HSG D
	573,495	75	Weighted Average
	561,516		97.91% Pervious Area
	11,979		2.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-2A:

Runoff = 17.72 cfs @ 12.16 hrs, Volume= 1.416 af, Depth> 3.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	26,136	98	Allocated Impervious
*	29,066	98	Proposed Impervious
*	75,612	74	Allocated Grass (C)
*	32,943	80	Allocated Grass (D)
*	37,343	74	Proposed Grass (C)
*	11,151	80	Proposed Grass (D)
	1,326	70	Woods, Good, HSG C
	213,577	81	Weighted Average
	158,375		74.15% Pervious Area
	55,202		25.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	47	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.5	1,844	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
11.2	1,909	Total			

Summary for Subcatchment SA-2B:

Runoff = 17.78 cfs @ 12.15 hrs, Volume= 1.407 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	29,403	98	Allocated Impervious
*	55,570	74	Allocated Grass (C)
*	60,852	80	Allocated Grass (D)
*	25,383	98	Proposed Impervious
*	23,350	74	Proposed Grass (C)
*	11,671	80	Proposed Grass (D)
	206,229	82	Weighted Average
	151,443		73.43% Pervious Area
	54,786		26.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	42	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.4	1,800	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
10.7	1,860	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 2.06 cfs @ 12.89 hrs, Volume= 0.365 af, Depth> 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR STORM Rainfall=5.80"

	Area (sf)	CN	Description
*	641	98	Existing Road
*	1,883	98	Proposed Impervious
*	3,380	74	Proposed Grass (C)
*	10,000	80	Allocated Grass (D)
	2,036	70	Woods, Good, HSG C
	43,321	77	Woods, Good, HSG D
	61,261	78	Weighted Average
	58,737		95.88% Pervious Area
	2,524		4.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 2.53" for 25 YEAR STORM event
Inflow = 78.22 cfs @ 13.93 hrs, Volume= 20.086 af
Outflow = 77.57 cfs @ 14.23 hrs, Volume= 19.670 af, Atten= 1%, Lag= 17.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.40 fps, Min. Travel Time= 10.6 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 16.0 min

Peak Storage= 49,414 cf @ 14.05 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 104.167 ac, 6.18% Impervious, Inflow Depth > 2.51" for 25 YEAR STORM event
Inflow = 79.67 cfs @ 14.22 hrs, Volume= 21.813 af
Outflow = 79.67 cfs @ 14.22 hrs, Volume= 21.813 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach AP#2:

Inflow Area = 22.803 ac, 12.28% Impervious, Inflow Depth > 2.50" for 25 YEAR STORM event
Inflow = 24.81 cfs @ 12.60 hrs, Volume= 4.744 af
Outflow = 24.81 cfs @ 12.60 hrs, Volume= 4.744 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1B: GUSF

Inflow Area = 0.694 ac, 36.92% Impervious, Inflow Depth > 3.82" for 25 YEAR STORM event
Inflow = 3.65 cfs @ 12.01 hrs, Volume= 0.221 af
Outflow = 2.98 cfs @ 12.06 hrs, Volume= 0.171 af, Atten= 18%, Lag= 3.1 min
Primary = 0.03 cfs @ 12.06 hrs, Volume= 0.025 af
Secondary = 2.96 cfs @ 12.06 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 53.86' @ 12.06 hrs Surf.Area= 2,270 sf Storage= 2,931 cf
Flood Elev= 54.50' Surf.Area= 2,386 sf Storage= 3,248 cf

Plug-Flow detention time= 92.4 min calculated for 0.171 af (77% of inflow)
Center-of-Mass det. time= 35.7 min (803.1 - 767.4)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	3,248 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,035	0	0
53.00	1,537	1,286	1,286
54.00	2,386	1,962	3,248

Device	Routing	Invert	Outlet Devices
#1	Primary	49.83'	**6.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 49.83' / 49.53' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	49.83'	**0.7" Vert. Orifice/Grate** C= 0.600
#3	Secondary	53.50'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.03 cfs @ 12.06 hrs HW=53.86' (Free Discharge)
↑**1=Culvert** (Passes 0.03 cfs of 1.31 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.63 fps)

Secondary OutFlow Max=2.86 cfs @ 12.06 hrs HW=53.86' (Free Discharge)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 2.86 cfs @ 1.61 fps)

Summary for Pond 1C: 12" Culvert

Inflow Area = 0.311 ac, 39.02% Impervious, Inflow Depth > 3.88" for 25 YEAR STORM event
Inflow = 1.65 cfs @ 12.01 hrs, Volume= 0.100 af
Outflow = 1.65 cfs @ 12.01 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Primary = 1.65 cfs @ 12.01 hrs, Volume= 0.100 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 53.85' @ 12.01 hrs
Flood Elev= 54.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.00'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 53.00' / 52.77' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.58 cfs @ 12.01 hrs HW=53.83' (Free Discharge)
↑**1=Culvert** (Barrel Controls 1.58 cfs @ 3.09 fps)

Summary for Pond 1P: 96" Culvert

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 2.67" for 25 YEAR STORM event
Inflow = 81.99 cfs @ 13.62 hrs, Volume= 21.234 af
Outflow = 78.22 cfs @ 13.93 hrs, Volume= 20.086 af, Atten= 5%, Lag= 18.8 min
Primary = 78.22 cfs @ 13.93 hrs, Volume= 20.086 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 53.13' @ 13.93 hrs Surf.Area= 49,340 sf Storage= 115,128 cf
Flood Elev= 69.34' Surf.Area= 264,698 sf Storage= 2,624,904 cf

Plug-Flow detention time= 36.4 min calculated for 20.019 af (94% of inflow)
Center-of-Mass det. time= 21.5 min (906.2 - 884.7)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	2,667,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108
69.00	255,557	2,373,353	2,536,461
69.50	269,000	131,139	2,667,600

Device	Routing	Invert	Outlet Devices
#1	Primary	51.00'	**96.0" Round Culvert w/ 36.0" inside fill** L= 60.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 33.05 sf
#2	Secondary	69.34'	**100.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=78.16 cfs @ 13.93 hrs HW=53.13' (Free Discharge)
1=Culvert (Barrel Controls 78.16 cfs @ 6.17 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 2A: Pond

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 3.52" for 25 YEAR STORM event
Inflow = 35.49 cfs @ 12.15 hrs, Volume= 2.823 af
Outflow = 11.72 cfs @ 12.53 hrs, Volume= 1.634 af, Atten= 67%, Lag= 22.7 min
Primary = 11.12 cfs @ 12.53 hrs, Volume= 1.628 af
Secondary = 0.60 cfs @ 12.53 hrs, Volume= 0.006 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 66.55' @ 12.53 hrs Surf.Area= 13,963 sf Storage= 98,756 cf (58,949 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= 300.3 min calculated for 0.720 af (26% of inflow)
Center-of-Mass det. time= 51.7 min (834.2 - 782.5)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**18.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.50' / 58.29' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	58.50'	**2.7" Vert. Orifice/Grate** C= 0.600
#4	Device 1	66.00'	**8.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Primary OutFlow Max=11.04 cfs @ 12.53 hrs HW=66.54' (Free Discharge)
└**1=Culvert** (Passes 11.04 cfs of 22.98 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.54 cfs @ 13.56 fps)
  └**4=Sharp-Crested Vee/Trap Weir** (Weir Controls 10.50 cfs @ 2.41 fps)

Secondary OutFlow Max=0.49 cfs @ 12.53 hrs HW=66.54' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.49 cfs @ 0.56 fps)

Summary for Pond 2B: Dual 18" Culvert

Inflow Area = 4.734 ac, 26.57% Impervious, Inflow Depth > 3.57" for 25 YEAR STORM event
Inflow = 17.78 cfs @ 12.15 hrs, Volume= 1.407 af
Outflow = 17.78 cfs @ 12.15 hrs, Volume= 1.407 af, Atten= 0%, Lag= 0.0 min
Primary = 17.78 cfs @ 12.15 hrs, Volume= 1.407 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 69.50' @ 12.15 hrs
Flood Elev= 71.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**18.0" Round Culvert X 2.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.00' / 66.75' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=17.78 cfs @ 12.15 hrs HW=69.50' (Free Discharge)
1=Culvert (Inlet Controls 17.78 cfs @ 5.03 fps)

Summary for Subcatchment SA-1:

Runoff = 108.16 cfs @ 13.61 hrs, Volume= 28.016 af, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	6,556	98	Proposed Impervious
*	3,163	74	Proposed Grass (C)
*	3,905	80	Proposed Grass (D)
*	13,068	98	Allocated Impervious
*	94,430	74	Allocated Grass (C)
*	139,148	80	Allocated Grass (D)
	53,285	75	1/4 acre lots, 38% imp, HSG B
	96,783	83	1/4 acre lots, 38% imp, HSG C
	442,657	87	1/4 acre lots, 38% imp, HSG D
	80,198	30	Woods, Good, HSG A
	588,128	55	Woods, Good, HSG B
	390,952	70	Woods, Good, HSG C
	2,237,942	77	Woods, Good, HSG D
	4,150,215	74	Weighted Average
	3,905,356		94.10% Pervious Area
	244,860		5.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 27.55 cfs @ 12.25 hrs, Volume= 2.583 af, Depth> 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	8,116	98	Existing Road
*	9,725	98	Proposed Impervious
*	6,534	98	Allocated Impervious
*	16,034	74	Proposed Grass (C)
*	4,698	80	Proposed Grass (D)
*	20,000	74	Allocated Grass (C)
*	40,000	80	Allocated Grass (D)
	178,736	70	Woods, Good, HSG C
	73,200	77	Woods, Good, HSG D
	357,043	75	Weighted Average
	332,668		93.17% Pervious Area
	24,375		6.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	108	0.0180	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.4	42	0.1200	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.4	145	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
17.7	552	Total			

Summary for Subcatchment SA-1B:

Runoff = 2.50 cfs @ 12.01 hrs, Volume= 0.152 af, Depth> 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	5,887	98	Proposed Impervious
*	5,903	74	Proposed Grass (C)
*	4,920	80	Proposed Grass (D)
	16,710	84	Weighted Average
	10,823		64.77% Pervious Area
	5,887		35.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.4	401	0.0800	15.75	472.49	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
0.7	419	Total			

Summary for Subcatchment SA-1C:

Runoff = 2.05 cfs @ 12.01 hrs, Volume= 0.126 af, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	5,278	98	Proposed Impervious
*	5,129	74	Proposed Grass (C)
*	3,121	80	Proposed Grass (D)
	13,528	85	Weighted Average
	8,250		60.98% Pervious Area
	5,278		39.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.6	452	0.0750	13.30	219.46	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 & 0.0 '/' Top.W=10.00' n= 0.035
0.9	468	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 23.09 cfs @ 12.90 hrs, Volume= 4.078 af, Depth> 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	11,979	98	Allocated Impervious
*	222,107	74	Allocated Grass (C)
*	49,329	80	Allocated Grass (D)
*	6,764	74	Proposed Grass (C)
*	7,422	80	Proposed Grass (D)
	141,396	70	Woods, Good, HSG C
	134,498	77	Woods, Good, HSG D
	573,495	75	Weighted Average
	561,516		97.91% Pervious Area
	11,979		2.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-2A:

Runoff = 22.41 cfs @ 12.16 hrs, Volume= 1.808 af, Depth> 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	26,136	98	Allocated Impervious
*	29,066	98	Proposed Impervious
*	75,612	74	Allocated Grass (C)
*	32,943	80	Allocated Grass (D)
*	37,343	74	Proposed Grass (C)
*	11,151	80	Proposed Grass (D)
	1,326	70	Woods, Good, HSG C
	213,577	81	Weighted Average
	158,375		74.15% Pervious Area
	55,202		25.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	47	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.5	1,844	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
11.2	1,909	Total			

Summary for Subcatchment SA-2B:

Runoff = 22.38 cfs @ 12.15 hrs, Volume= 1.789 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	29,403	98	Allocated Impervious
*	55,570	74	Allocated Grass (C)
*	60,852	80	Allocated Grass (D)
*	25,383	98	Proposed Impervious
*	23,350	74	Proposed Grass (C)
*	11,671	80	Proposed Grass (D)
	206,229	82	Weighted Average
	151,443		73.43% Pervious Area
	54,786		26.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	42	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.4	1,800	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
10.7	1,860	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 2.66 cfs @ 12.88 hrs, Volume= 0.472 af, Depth> 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR STORM Rainfall=6.90"

	Area (sf)	CN	Description
*	641	98	Existing Road
*	1,883	98	Proposed Impervious
*	3,380	74	Proposed Grass (C)
*	10,000	80	Allocated Grass (D)
	2,036	70	Woods, Good, HSG C
	43,321	77	Woods, Good, HSG D
	61,261	78	Weighted Average
	58,737		95.88% Pervious Area
	2,524		4.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 3.38" for 50 YEAR STORM event
Inflow = 102.85 cfs @ 13.92 hrs, Volume= 26.823 af
Outflow = 102.16 cfs @ 14.19 hrs, Volume= 26.350 af, Atten= 1%, Lag= 16.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.54 fps, Min. Travel Time= 9.6 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 14.9 min

Peak Storage= 58,968 cf @ 14.03 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 104.167 ac, 6.18% Impervious, Inflow Depth > 3.36" for 50 YEAR STORM event
Inflow = 104.83 cfs @ 14.18 hrs, Volume= 29.162 af
Outflow = 104.83 cfs @ 14.18 hrs, Volume= 29.162 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach AP#2:

Inflow Area = 22.803 ac, 12.28% Impervious, Inflow Depth > 3.41" for 50 YEAR STORM event
Inflow = 37.39 cfs @ 12.35 hrs, Volume= 6.479 af
Outflow = 37.39 cfs @ 12.35 hrs, Volume= 6.479 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1B: GUSF

Inflow Area = 0.694 ac, 36.92% Impervious, Inflow Depth > 4.81" for 50 YEAR STORM event
Inflow = 4.55 cfs @ 12.01 hrs, Volume= 0.278 af
Outflow = 3.87 cfs @ 12.06 hrs, Volume= 0.228 af, Atten= 15%, Lag= 2.7 min
Primary = 0.03 cfs @ 12.06 hrs, Volume= 0.026 af
Secondary = 3.84 cfs @ 12.06 hrs, Volume= 0.202 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 53.93' @ 12.06 hrs Surf.Area= 2,329 sf Storage= 3,089 cf
Flood Elev= 54.50' Surf.Area= 2,386 sf Storage= 3,248 cf

Plug-Flow detention time= 82.7 min calculated for 0.228 af (82% of inflow)
Center-of-Mass det. time= 32.3 min (794.2 - 761.9)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	3,248 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,035	0	0
53.00	1,537	1,286	1,286
54.00	2,386	1,962	3,248

Device	Routing	Invert	Outlet Devices
#1	Primary	49.83'	**6.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 49.83' / 49.53' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	49.83'	**0.7" Vert. Orifice/Grate** C= 0.600
#3	Secondary	53.50'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.03 cfs @ 12.06 hrs HW=53.93' (Free Discharge)
↑**1=Culvert** (Passes 0.03 cfs of 1.32 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.71 fps)

Secondary OutFlow Max=3.78 cfs @ 12.06 hrs HW=53.93' (Free Discharge)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 3.78 cfs @ 1.77 fps)

Summary for Pond 1C: 12" Culvert

Inflow Area = 0.311 ac, 39.02% Impervious, Inflow Depth > 4.87" for 50 YEAR STORM event
Inflow = 2.05 cfs @ 12.01 hrs, Volume= 0.126 af
Outflow = 2.05 cfs @ 12.01 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.01 hrs, Volume= 0.126 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 53.99' @ 12.01 hrs
Flood Elev= 54.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.00'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 53.00' / 52.77' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.96 cfs @ 12.01 hrs HW=53.96' (Free Discharge)
↑**1=Culvert** (Barrel Controls 1.96 cfs @ 3.25 fps)

Summary for Pond 1P: 96" Culvert

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 3.53" for 50 YEAR STORM event
Inflow = 108.16 cfs @ 13.61 hrs, Volume= 28.016 af
Outflow = 102.85 cfs @ 13.92 hrs, Volume= 26.823 af, Atten= 5%, Lag= 18.5 min
Primary = 102.85 cfs @ 13.92 hrs, Volume= 26.823 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 53.60' @ 13.92 hrs Surf.Area= 55,535 sf Storage= 139,612 cf
Flood Elev= 69.34' Surf.Area= 264,698 sf Storage= 2,624,904 cf

Plug-Flow detention time= 32.7 min calculated for 26.734 af (95% of inflow)
Center-of-Mass det. time= 20.6 min (899.7 - 879.1)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	2,667,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108
69.00	255,557	2,373,353	2,536,461
69.50	269,000	131,139	2,667,600

Device	Routing	Invert	Outlet Devices
#1	Primary	51.00'	**96.0" Round Culvert w/ 36.0" inside fill** L= 60.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 33.05 sf
#2	Secondary	69.34'	**100.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=102.81 cfs @ 13.92 hrs HW=53.60' (Free Discharge)
1=Culvert (Barrel Controls 102.81 cfs @ 6.67 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 2A: Pond

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 4.48" for 50 YEAR STORM event
Inflow = 44.78 cfs @ 12.15 hrs, Volume= 3.597 af
Outflow = 28.30 cfs @ 12.32 hrs, Volume= 2.401 af, Atten= 37%, Lag= 10.2 min
Primary = 19.31 cfs @ 12.32 hrs, Volume= 2.222 af
Secondary = 8.99 cfs @ 12.32 hrs, Volume= 0.179 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 66.80' @ 12.32 hrs Surf.Area= 14,247 sf Storage= 102,322 cf (62,515 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= 209.6 min calculated for 1.487 af (41% of inflow)
Center-of-Mass det. time= 43.8 min (820.6 - 776.8)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**18.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.50' / 58.29' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	58.50'	**2.7" Vert. Orifice/Grate** C= 0.600
#4	Device 1	66.00'	**8.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Primary OutFlow Max=18.81 cfs @ 12.32 hrs HW=66.79' (Free Discharge)
└**1=Culvert** (Passes 18.81 cfs of 23.36 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.55 cfs @ 13.77 fps)
  └**4=Sharp-Crested Vee/Trap Weir** (Weir Controls 18.26 cfs @ 2.90 fps)

Secondary OutFlow Max=8.24 cfs @ 12.32 hrs HW=66.79' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 8.24 cfs @ 1.44 fps)

Summary for Pond 2B: Dual 18" Culvert

Inflow Area = 4.734 ac, 26.57% Impervious, Inflow Depth > 4.53" for 50 YEAR STORM event
Inflow = 22.38 cfs @ 12.15 hrs, Volume= 1.789 af
Outflow = 22.38 cfs @ 12.15 hrs, Volume= 1.789 af, Atten= 0%, Lag= 0.0 min
Primary = 22.38 cfs @ 12.15 hrs, Volume= 1.789 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 70.52' @ 12.15 hrs
Flood Elev= 71.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**18.0" Round Culvert X 2.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.00' / 66.75' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=22.34 cfs @ 12.15 hrs HW=70.52' (Free Discharge)
1=Culvert (Inlet Controls 22.34 cfs @ 6.32 fps)

Summary for Subcatchment SA-1:

Runoff = 137.47 cfs @ 13.61 hrs, Volume= 35.713 af, Depth> 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	6,556	98	Proposed Impervious
*	3,163	74	Proposed Grass (C)
*	3,905	80	Proposed Grass (D)
*	13,068	98	Allocated Impervious
*	94,430	74	Allocated Grass (C)
*	139,148	80	Allocated Grass (D)
	53,285	75	1/4 acre lots, 38% imp, HSG B
	96,783	83	1/4 acre lots, 38% imp, HSG C
	442,657	87	1/4 acre lots, 38% imp, HSG D
	80,198	30	Woods, Good, HSG A
	588,128	55	Woods, Good, HSG B
	390,952	70	Woods, Good, HSG C
	2,237,942	77	Woods, Good, HSG D
	4,150,215	74	Weighted Average
	3,905,356		94.10% Pervious Area
	244,860		5.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7	150	0.0067	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
74.4	2,446	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	2,049	0.0080	13.41	24,141.26	**Trap/Vee/Rect Channel Flow,** Bot.W=30.00' D=12.00' Z= 10.0 '/' Top.W=270.00' n= 0.035
123.6	4,645	Total			

Summary for Subcatchment SA-1A:

Runoff = 34.72 cfs @ 12.24 hrs, Volume= 3.275 af, Depth> 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	8,116	98	Existing Road
*	9,725	98	Proposed Impervious
*	6,534	98	Allocated Impervious
*	16,034	74	Proposed Grass (C)
*	4,698	80	Proposed Grass (D)
*	20,000	74	Allocated Grass (C)
*	40,000	80	Allocated Grass (D)
	178,736	70	Woods, Good, HSG C
	73,200	77	Woods, Good, HSG D
	357,043	75	Weighted Average
	332,668		93.17% Pervious Area
	24,375		6.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	108	0.0180	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.4	42	0.1200	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.4	145	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.9	257	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
17.7	552	Total			

Summary for Subcatchment SA-1B:

Runoff = 3.04 cfs @ 12.01 hrs, Volume= 0.187 af, Depth> 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	5,887	98	Proposed Impervious
*	5,903	74	Proposed Grass (C)
*	4,920	80	Proposed Grass (D)
	16,710	84	Weighted Average
	10,823		64.77% Pervious Area
	5,887		35.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.4	401	0.0800	15.75	472.49	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
0.7	419	Total			

Summary for Subcatchment SA-1C:

Runoff = 2.48 cfs @ 12.01 hrs, Volume= 0.154 af, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	5,278	98	Proposed Impervious
*	5,129	74	Proposed Grass (C)
*	3,121	80	Proposed Grass (D)
	13,528	85	Weighted Average
	8,250		60.98% Pervious Area
	5,278		39.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
0.6	452	0.0750	13.30	219.46	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 & 0.0 '/' Top.W=10.00' n= 0.035
0.9	468	Total			

Summary for Subcatchment SA-2: AP#2

Runoff = 29.14 cfs @ 12.89 hrs, Volume= 5.174 af, Depth> 4.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	11,979	98	Allocated Impervious
*	222,107	74	Allocated Grass (C)
*	49,329	80	Allocated Grass (D)
*	6,764	74	Proposed Grass (C)
*	7,422	80	Proposed Grass (D)
	141,396	70	Woods, Good, HSG C
	134,498	77	Woods, Good, HSG D
	573,495	75	Weighted Average
	561,516		97.91% Pervious Area
	11,979		2.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	252	0.0140	0.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	475	0.0460	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
67.0	877	Total			

Summary for Subcatchment SA-2A:

Runoff = 27.55 cfs @ 12.15 hrs, Volume= 2.245 af, Depth> 5.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	26,136	98	Allocated Impervious
*	29,066	98	Proposed Impervious
*	75,612	74	Allocated Grass (C)
*	32,943	80	Allocated Grass (D)
*	37,343	74	Proposed Grass (C)
*	11,151	80	Proposed Grass (D)
	1,326	70	Woods, Good, HSG C
	213,577	81	Weighted Average
	158,375		74.15% Pervious Area
	55,202		25.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	47	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.5	1,844	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
11.2	1,909	Total			

Summary for Subcatchment SA-2B:

Runoff = 27.40 cfs @ 12.15 hrs, Volume= 2.213 af, Depth> 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	29,403	98	Allocated Impervious
*	55,570	74	Allocated Grass (C)
*	60,852	80	Allocated Grass (D)
*	25,383	98	Proposed Impervious
*	23,350	74	Proposed Grass (C)
*	11,671	80	Proposed Grass (D)
	206,229	82	Weighted Average
	151,443		73.43% Pervious Area
	54,786		26.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	42	0.0200	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	18	0.0200	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.10"
5.4	1,800	0.0100	5.57	167.05	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=3.00' Z= 3.0 '/' Top.W=19.00' n= 0.035
10.7	1,860	Total			

Summary for Subcatchment SA-3: AP#3

Runoff = 3.32 cfs @ 12.87 hrs, Volume= 0.593 af, Depth> 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR STORM Rainfall=8.10"

	Area (sf)	CN	Description
*	641	98	Existing Road
*	1,883	98	Proposed Impervious
*	3,380	74	Proposed Grass (C)
*	10,000	80	Allocated Grass (D)
	2,036	70	Woods, Good, HSG C
	43,321	77	Woods, Good, HSG D
	61,261	78	Weighted Average
	58,737		95.88% Pervious Area
	2,524		4.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.5	150	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.4	433	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
66.9	583	Total			

Summary for Reach 1R: Reach to Downstream Culverts

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 4.34" for 100 YEAR STORM event
Inflow = 130.15 cfs @ 13.92 hrs, Volume= 34.472 af
Outflow = 129.45 cfs @ 14.16 hrs, Volume= 33.942 af, Atten= 1%, Lag= 14.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.68 fps, Min. Travel Time= 8.8 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 14.1 min

Peak Storage= 68,727 cf @ 14.01 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 2.00' Flow Area= 280.0 sf, Capacity= 878.74 cfs

100.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 20.0 '/' Top Width= 180.00'
Length= 890.0' Slope= 0.0030 '/'
Inlet Invert= 47.70', Outlet Invert= 45.00'

‡

Summary for Reach AP#1:

Inflow Area = 104.167 ac, 6.18% Impervious, Inflow Depth > 4.32" for 100 YEAR STORM event
Inflow = 132.72 cfs @ 14.15 hrs, Volume= 37.508 af
Outflow = 132.72 cfs @ 14.15 hrs, Volume= 37.508 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach AP#2:

Inflow Area = 22.803 ac, 12.28% Impervious, Inflow Depth > 4.44" for 100 YEAR STORM event
Inflow = 54.97 cfs @ 12.25 hrs, Volume= 8.429 af
Outflow = 54.97 cfs @ 12.25 hrs, Volume= 8.429 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1B: GUSF

Inflow Area = 0.694 ac, 36.92% Impervious, Inflow Depth > 5.91" for 100 YEAR STORM event
Inflow = 5.52 cfs @ 12.01 hrs, Volume= 0.342 af
Outflow = 4.74 cfs @ 12.05 hrs, Volume= 0.291 af, Atten= 14%, Lag= 2.6 min
Primary = 0.03 cfs @ 12.05 hrs, Volume= 0.027 af
Secondary = 4.71 cfs @ 12.05 hrs, Volume= 0.264 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 54.00' @ 12.05 hrs Surf.Area= 2,382 sf Storage= 3,237 cf
Flood Elev= 54.50' Surf.Area= 2,386 sf Storage= 3,248 cf

Plug-Flow detention time= 74.1 min calculated for 0.290 af (85% of inflow)
Center-of-Mass det. time= 30.5 min (787.7 - 757.3)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	3,248 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,035	0	0
53.00	1,537	1,286	1,286
54.00	2,386	1,962	3,248

Device	Routing	Invert	Outlet Devices
#1	Primary	49.83'	**6.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 49.83' / 49.53' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	49.83'	**0.7" Vert. Orifice/Grate** C= 0.600
#3	Secondary	53.50'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.03 cfs @ 12.05 hrs HW=53.99' (Free Discharge)
↑**1=Culvert** (Passes 0.03 cfs of 1.33 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.79 fps)

Secondary OutFlow Max=4.66 cfs @ 12.05 hrs HW=53.99' (Free Discharge)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 4.66 cfs @ 1.89 fps)

Summary for Pond 1C: 12" Culvert

Inflow Area = 0.311 ac, 39.02% Impervious, Inflow Depth > 5.97" for 100 YEAR STORM event
Inflow = 2.48 cfs @ 12.01 hrs, Volume= 0.154 af
Outflow = 2.48 cfs @ 12.01 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.0 min
Primary = 2.48 cfs @ 12.01 hrs, Volume= 0.154 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 54.18' @ 12.01 hrs
Flood Elev= 54.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	53.00'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 53.00' / 52.77' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.38 cfs @ 12.01 hrs HW=54.14' (Free Discharge)
↑**1=Culvert** (Inlet Controls 2.38 cfs @ 3.03 fps)

Summary for Pond 1P: 96" Culvert

Inflow Area = 95.276 ac, 5.90% Impervious, Inflow Depth > 4.50" for 100 YEAR STORM event
Inflow = 137.47 cfs @ 13.61 hrs, Volume= 35.713 af
Outflow = 130.15 cfs @ 13.92 hrs, Volume= 34.472 af, Atten= 5%, Lag= 18.6 min
Primary = 130.15 cfs @ 13.92 hrs, Volume= 34.472 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 54.08' @ 13.92 hrs Surf.Area= 61,965 sf Storage= 168,198 cf
Flood Elev= 69.34' Surf.Area= 264,698 sf Storage= 2,624,904 cf

Plug-Flow detention time= 30.2 min calculated for 34.472 af (97% of inflow)
Center-of-Mass det. time= 20.0 min (894.1 - 874.1)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	2,667,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	8,500	0	0
50.00	12,504	21,004	21,004
52.00	34,355	46,859	67,863
54.00	60,890	95,245	163,108
69.00	255,557	2,373,353	2,536,461
69.50	269,000	131,139	2,667,600

Device	Routing	Invert	Outlet Devices
#1	Primary	51.00'	**96.0" Round Culvert w/ 36.0" inside fill** L= 60.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 48.00' / 47.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 33.05 sf
#2	Secondary	69.34'	**100.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=130.09 cfs @ 13.92 hrs HW=54.08' (Free Discharge)
1=Culvert (Barrel Controls 130.09 cfs @ 7.14 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 2A: Pond

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 5.55" for 100 YEAR STORM event
Inflow = 54.94 cfs @ 12.15 hrs, Volume= 4.458 af
Outflow = 44.98 cfs @ 12.24 hrs, Volume= 3.255 af, Atten= 18%, Lag= 5.3 min
Primary = 23.77 cfs @ 12.23 hrs, Volume= 2.774 af
Secondary = 21.22 cfs @ 12.24 hrs, Volume= 0.481 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 67.04' @ 12.24 hrs Surf.Area= 14,515 sf Storage= 105,741 cf (65,934 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= 168.4 min calculated for 2.341 af (53% of inflow)
Center-of-Mass det. time= 39.7 min (811.4 - 771.7)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**18.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.50' / 58.29' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	58.50'	**2.7" Vert. Orifice/Grate** C= 0.600
#4	Device 1	66.00'	**8.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Primary OutFlow Max=23.73 cfs @ 12.23 hrs HW=67.03' (Free Discharge)
└**1=Culvert** (Inlet Controls 23.73 cfs @ 13.43 fps)
  ├**3=Orifice/Grate** (Passes < 0.56 cfs potential flow)
  └**4=Sharp-Crested Vee/Trap Weir** (Passes < 27.20 cfs potential flow)

Secondary OutFlow Max=20.84 cfs @ 12.24 hrs HW=67.03' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 20.84 cfs @ 1.97 fps)

Summary for Pond 2B: Dual 18" Culvert

Inflow Area = 4.734 ac, 26.57% Impervious, Inflow Depth > 5.61" for 100 YEAR STORM event
Inflow = 27.40 cfs @ 12.15 hrs, Volume= 2.213 af
Outflow = 27.40 cfs @ 12.15 hrs, Volume= 2.213 af, Atten= 0%, Lag= 0.0 min
Primary = 27.40 cfs @ 12.15 hrs, Volume= 2.213 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 71.91' @ 12.15 hrs
Flood Elev= 71.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**18.0" Round Culvert X 2.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.00' / 66.75' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=27.32 cfs @ 12.15 hrs HW=71.89' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 27.32 cfs @ 7.73 fps)

Appendix E
Water Quality and BMP Sizing Calculations

BH2M
28 State Street
Gorham, Maine 04038

WATER QUALITY CALCULATIONS
Christmas Creek

Subcatchment ID	Proposed Linear Impervious Area (sf)	Non-Linear Impervious Area (sf)	Linear Lawn Area (sf)	Non-Linear Lawn Area (sf)	Non-Linear Developed Area (sf)	Existing Impervious Area (sf)	Existing Vegetated Area (sf)	Treated Linear Impervious Area (sf)	Treated Linear Developed Area (sf)	Treated Non-Linear Impervious Area (sf)	Treated Non-Linear Developed Area (sf)	BMP ID
1	6,556	13,068	7,068	233,578	246,646	0	3,889,945	0	0	13,068	246,646	Buffer
1A	9,725	6,534	9,557	71,175	77,709	8,116	251,936	0	0	6,534	60,000	Buffer
1B	5,887	0	10,823	0	0	0	0	5,887	16,710	0	0	GUSF
1C	5,278	0	8,250	0	0	0	0	5,278	13,528	0	0	GUSF
2	0	11,979	0	285,631	297,610	0	275,894	0	0	11,979	297,610	Buffer
2A	29,066	26,136	48,494	108,555	134,691	0	1,326	29,066	77,560	26,136	134,691	Pond
2B	25,383	29,403	35,021	116,422	145,825	0	0	25,383	60,404	29,403	145,825	Pond
3	1,883	0	3,380	10,000	10,000	641	45,357	0	0	0	0	None
Total	**83,778**	**87,120**	**122,593**	**825,361**	**912,481**	**8,757**	**4,464,458**	**65,614**	**168,202**	**87,120**	**884,772**	

Linear Treatment Summary	
Total Proposed Linear Impervious Area (sq. ft.)=	83,778
Total Proposed Linear Developed Area (sq. ft.)=	206,371
Total Treated Linear Impervious Area (sq. ft.)=	65,614
Total Treated Linear Developed Area (sq. ft.)=	168,202
Impervious Area Treatment % =	**78.32%**
Developed Area Treatment % =	**81.50%**

Non-Linear Treatment Summary	
Total Proposed Impervious Area (sq. ft.)=	87,120
Total Proposed Developed Area (sq. ft.)=	912,481
Total Treated Impervious Area (sq. ft.)=	87,120
Total Treated Developed Area (sq. ft.)=	884,772
Impervious Area Treatment % =	**100.00%**
Developed Area Treatment % =	**96.96%**

BH2M
28 State Street
Gorham, Maine 04038

WET POND DESIGN
Christmas Creek

Elevation	Surface Area (ft^2)	Stage Volume (ft^3)	Cumulative Volume (ft^3)	Volume Above Permanent Pool (ft^3)	Comments
52	1,557	0	0		
53	2,130	1,844	1,844		
54	2,729	2,430	4,273		
55	3,353	3,041	7,314		
56	4,002	3,678	10,992		
57	4,676	4,339	15,331		
58	5,376	5,026	20,357		
59	6,100	5,738	26,095		
60	6,850	6,475	32,570		Mean Depth= 4.75
61	7,625	7,238	39,807	0	Water Quality Elevation
62	8,917	8,271	48,078	8,271	
63	9,790	9,354	57,432	17,625	
64	10,688	10,239	67,671	27,864	
65	11,611	11,150	78,820	39,013	Channel Protection Elevation
66	13,349	12,480	91,300	51,493	
66.5	13,911	6,815	98,115	58,308	Spillway
67	14,473	7,096	105,211	65,404	
68	15,623	15,048	120,259	80,452	

Summary of Wet Pond Criteria	
WQ Volume Required (ft^3)	38,897
WQ Volume Provided (ft^3)	39,807
WQ Surface Elevation	61.00
CP Volume Required (ft^3)	19,449
CP Volume Provided (ft^3)	39,013
CP Surface Elevation	65.00
Length of Underdrain Bench Req'd	58
Invert of Underdrain	58.50
Length to Width Ratio	>3:1
Mean Depth	0.00
Embankment Elevation	68.00
Spillway Elevation	66.50
25 Year Surface Elevation (Plugged OCS)	66.91
100 Year Surface Elevation (Plugged OCS)	67.41

Freeboard (ft)
1.09
0.59

Subcatchments Tributary to Wet Pond		
Subcatchment ID	Imp. Area (ac.)	Lawn Area (ac.)
2A	1.267	3.605
2B	1.258	3.477
Total	**1.250**	**1.917**

Orifice Sizing	
Discharge Coefficient	0.62
Orifice Diameter (inches)	2.75
Orifice Diameter (feet)	0.23
Orifice Area (ft^2)	0.041
Orifice Centerline Elevation	58.61

Orifice Eqn: $C*A*(2gH)^{\wedge 1/2}$

Q (cfs)	Stage Elevation	Total Drawdown at Stage (feet)	Pond Area (ft^2)	Drawdown Time (hrs)
0.3167	61.0	0.00	7,625	0.00
0.5182	65.0	4.00	11,611	24.90
			Total Drawdown Time =	**24.90**

Required Sediment Storage		
Area to be Sanded	1.2	acres
Sand Used per Storm	500	lbs/acre-storm
Weight of Sand	90	lbs/cf
# of Storms per Year	10	storms/year
Sediment Storage Required	**69.44**	**cf/year**

Provided Storage Volume		
Total # of CB's	0	
Sump Depth	2	ft
CB Diameter	4	ft
CB Sediment Storage Volume	0.00	cf
Forebay Volume	1200	cf
Total Volume	**103.00**	**cf**

Wet Pond Sizing Calculations

Water Quality Volume Sizing							
Subcatchment ID	Proposed Impervious Area (ft^2)	WQ Impervious Area Runoff Depth (inches)	WQ Impervious Volume Required (ft^3)	Proposed Landscaped Area (ft^2)	WQ Landscape Area Runoff Depth (inches)	WQ Landscape Volume Required (ft^3)	Total WQ Volume Required (ft^3)
2A	55,202	2.00	9,200	157,049	0.80	10,470	19,670
2B	54,786	2.00	9,131	151,443	0.80	10,096	19,227
Total	**109,988**		**18,331**	**157,049**		**20,566**	**38,897**

Channel Protection Volume Sizing							
Subcatchment ID	Proposed Impervious Area (ft^2)	CP Impervious Area Runoff Depth (inches)	CP Impervious Volume Required (ft^3)	Proposed Landscaped Area (ft^2)	CP Landscape Area Runoff Depth (inches)	CP Landscape Volume Required (ft^3)	Total CP Volume Required (ft^3)
2A	55,202	1.00	4,600	157,049	0.40	5,235	9,835
2B	54,786	1.00	4,566	151,443	0.40	5,048	9,614
Total	**109,988**		**9,166**	**308,492**		**10,283**	**19,449**

Total Water Quality Volume Required =	**38,897 ft^3**
Total Channel Protection Volume Required =	**19,449 ft^3**

Grassed Underdrained Soil Filter Calculations

Subcatchment ID	Impervious Area (sf)	WQ Impervious Area Runoff Depth (inches)	WQ Impervious Volume Required (ft3)	Landscaped Area (sf)	WQ Landscape Area Runoff Depth (inches)	WQ Landscape Volume Required (ft^3)	Total WQ Volume Required (ft^3)
1B	5,887	1.00	491	10,823	0.40	361	851
1C	5,278	1.00	440	8,250	0.40	275	715
Total	**11,165**		**440**	**19,073**		**636**	**1,566**

Summary of Underdrain Filter Sizing	
Total WQ Volume Required (ft^3)	1,566
WQ Volume Provided (ft^3)	2,127
Filter Surface Elevation	52.00
WQ Surface Elevation	53.50
Invert of Underdrain	49.67
5% of Tributary Impervious Area (ft^2)	558
2% of Tributary Landscaped (ft^2)	381
Filter Surface Area Required (ft^2)	940
Filter Surface Area Provided (ft^2)	1,035

Underdrain Filter Volume				
Elevation	Surface Area (ft^2)	Average Stage Area (ft^2)	Stage Volume (ft^3)	Cumulative Volume (ft^3)
52	1,035	0	0	0
53	1,537	1,286	1,286	1,286
53.5	1,827	1,682	841	2,127
Water Quality Volume Provided (at Elevation 53.5) =				**2,127**

Orifice Sizing	
Discharge Coefficient	0.62
Orifice Size (inches)	0.75
Orifice Size (feet)	0.06
Orifice Area (ft^2)	0.003
Orifice Centerline Elevation	49.92

Orifice Eqn: $C*A*(2gH)^{\wedge 1/2}$

Q (cfs)	Stage Elevation	Total Drawdown at Stage	Pond Area	Drawdown Time (hrs)
0.0220	**52**	**0.00**	**1,035**	**0.00**
0.0268	**53**	**1.00**	**1,537**	**15.95**
0.0289	**53.5**	**0.50**	**1,827**	**8.79**
			Total Drawdown Time =	**24.74**

Required Sediment Storage		
Area to be Sanded	0.3	acres
Sand Used per Storm	500	lbs/acre-storm
Weight of Sand	90	lbs/cf
# of Storms per Year	10	storms/year
Sediment Storage Required	**14.24**	**cf/year**

Provided Storage Volume		
Total # of CB's	0	
Sump Depth	2	ft
CB Diameter	4	ft
CB Sediment Storage Volume	0.00	cf
Forebay Volume	1200	cf
Total Volume	**1200.00**	**cf**

BH2M
28 State Street
Gorham, Maine 04038

OUTLET CONTROL STRUCTURE DESIGN
Christmas Creek SUBDIVISION

Rim Elevation=	65	
Weir Perimeter (L)=	5.01 ft	Use Model # R-2560-E2
Orifice Area (a)=	2.00 sf	
# of Grates=	2	
g=	32.185	
C=	0.62	

Weir Flow ($Q=3.27*L*H^{1.5}$)				
Stage Elevation	Notes	Head (ft)	Available Capacity (cfs)	Target Capacity (cfs)*
63.97	2 Year Elevation	-1.03	#NUM!	0.44
66.14	10 Year Elevation	1.14	39.91	2.00
66.55	25 Year Elevation	1.55	63.27	11.12

Orifice Flow ($Q=C*a*(2gH)^{0.5}$)				
Stage Elevation	Notes	Head (ft)	Available Capacity (cfs)	Target Capacity (cfs)*
63.97	2 Year Elevation	-1.03	#NUM!	0.44
66.14	10 Year Elevation	1.14	21.24	2
66.55	25 Year Elevation	1.55	24.77	11.12

*Note: Target Capacity is the Primary Outflow from the Hydrocad Model

Summary for Pond 2A: Pond

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 5.55" for 100 YEAR STORM event
Inflow = 54.94 cfs @ 12.15 hrs, Volume= 4.458 af
Outflow = 44.98 cfs @ 12.24 hrs, Volume= 3.255 af, Atten= 18%, Lag= 5.3 min
Primary = 23.77 cfs @ 12.23 hrs, Volume= 2.774 af
Secondary = 21.22 cfs @ 12.24 hrs, Volume= 0.481 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 67.04' @ 12.24 hrs Surf.Area= 14,515 sf Storage= 105,741 cf (65,934 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= 168.4 min calculated for 2.341 af (53% of inflow)
Center-of-Mass det. time= 39.7 min (811.4 - 771.7)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**18.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.50' / 58.29' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	58.50'	**2.7" Vert. Orifice/Grate** C= 0.600
#4	Device 1	66.00'	**8.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Primary OutFlow Max=23.73 cfs @ 12.23 hrs HW=67.03' (Free Discharge)
└**1=Culvert** (Inlet Controls 23.73 cfs @ 13.43 fps)
  └**3=Orifice/Grate** (Passes < 0.56 cfs potential flow)
  └**4=Sharp-Crested Vee/Trap Weir** (Passes < 27.20 cfs potential flow)

Secondary OutFlow Max=20.84 cfs @ 12.24 hrs HW=67.03' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 20.84 cfs @ 1.97 fps)

Summary for Pond 1B: GUSF

Inflow Area = 0.694 ac, 36.92% Impervious, Inflow Depth > 5.91" for 100 YEAR STORM event
Inflow = 5.52 cfs @ 12.01 hrs, Volume= 0.342 af
Outflow = 4.74 cfs @ 12.05 hrs, Volume= 0.291 af, Atten= 14%, Lag= 2.6 min
Primary = 0.03 cfs @ 12.05 hrs, Volume= 0.027 af
Secondary = 4.71 cfs @ 12.05 hrs, Volume= 0.264 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 54.00' @ 12.05 hrs Surf.Area= 2,382 sf Storage= 3,237 cf
Flood Elev= 54.50' Surf.Area= 2,386 sf Storage= 3,248 cf

Plug-Flow detention time= 74.1 min calculated for 0.290 af (85% of inflow)
Center-of-Mass det. time= 30.5 min (787.7 - 757.3)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	3,248 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,035	0	0
53.00	1,537	1,286	1,286
54.00	2,386	1,962	3,248

Device	Routing	Invert	Outlet Devices
#1	Primary	49.83'	**6.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 49.83' / 49.53' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	49.83'	**0.7" Vert. Orifice/Grate** C= 0.600
#3	Secondary	53.50'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.03 cfs @ 12.05 hrs HW=53.99' (Free Discharge)
└**1=Culvert** (Passes 0.03 cfs of 1.33 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.79 fps)

Secondary OutFlow Max=4.66 cfs @ 12.05 hrs HW=53.99' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 4.66 cfs @ 1.89 fps)

Summary for Pond 3P: Plugged OCS

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 3.52" for 25 YEAR STORM event
Inflow = 35.49 cfs @ 12.15 hrs, Volume= 2.823 af
Outflow = 14.42 cfs @ 12.47 hrs, Volume= 1.468 af, Atten= 59%, Lag= 19.1 min
Secondary = 14.42 cfs @ 12.47 hrs, Volume= 1.468 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 66.91' @ 12.47 hrs Surf.Area= 14,375 sf Storage= 103,959 cf (64,152 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= 344.1 min calculated for 0.554 af (20% of inflow)
Center-of-Mass det. time= 83.0 min (865.5 - 782.5)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Secondary OutFlow Max=14.10 cfs @ 12.47 hrs HW=66.91' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 14.10 cfs @ 1.73 fps)

Summary for Pond 3P: Plugged OCS

Inflow Area = 9.637 ac, 26.20% Impervious, Inflow Depth > 5.55" for 100 YEAR STORM event
Inflow = 54.94 cfs @ 12.15 hrs, Volume= 4.458 af
Outflow = 46.16 cfs @ 12.23 hrs, Volume= 3.098 af, Atten= 16%, Lag= 4.7 min
Secondary = 46.16 cfs @ 12.23 hrs, Volume= 3.098 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Starting Elev= 61.00' Surf.Area= 7,625 sf Storage= 39,807 cf
Peak Elev= 67.41' @ 12.23 hrs Surf.Area= 14,949 sf Storage= 111,303 cf (71,496 cf above start)
Flood Elev= 68.00' Surf.Area= 15,623 sf Storage= 120,259 cf (80,452 cf above start)

Plug-Flow detention time= 175.8 min calculated for 2.177 af (49% of inflow)
Center-of-Mass det. time= 53.7 min (825.3 - 771.7)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	120,259 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	1,557	0	0
53.00	2,130	1,844	1,844
54.00	2,729	2,430	4,273
55.00	3,353	3,041	7,314
56.00	4,002	3,678	10,992
57.00	4,676	4,339	15,331
58.00	5,376	5,026	20,357
59.00	6,100	5,738	26,095
60.00	6,850	6,475	32,570
61.00	7,625	7,238	39,807
62.00	8,917	8,271	48,078
63.00	9,790	9,354	57,432
64.00	10,688	10,239	67,671
65.00	11,611	11,150	78,820
66.00	13,349	12,480	91,300
67.00	14,473	13,911	105,211
68.00	15,623	15,048	120,259

Device	Routing	Invert	Outlet Devices
#1	Secondary	66.50'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Secondary OutFlow Max=45.45 cfs @ 12.23 hrs HW=67.41' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 45.45 cfs @ 2.51 fps)

Appendix F
Operation and Maintenance Manual

OPERATIONS & MAINTENANCE PLAN
FOR STORMWATER FACILITIES

For: Christmas Creek
Tuttle Road
Cumberland, Maine

Project Narrative

The proposed project is a 20-lot residential development. The development includes roadways, underground utilities and stormwater management facilities. The proposed development is subject to the standard and special conditions of the Site Location of Development Permit issued by the Maine Department of Environmental Protection. The following outlines the proposed BMP's and their required inspection, maintenance, and reporting.

The Applicant, Beta Zeta Properties LLC will be responsible for all operation and maintenance of the proposed site improvements during construction. The Homeowners Association will be responsible for Post Construction operation and maintenance. The roads have been designed to the Town's public road standard with the intent that roadways will be accepted by the Town. If/when the roads are accepted by the Town, BMP's within the public right of way will be the responsibility of the Town.

Contacts:

Design Engineer: BH2M
28 State Street
Gorham, Me. 04038
(207) 839-2771

Developer/Applicant: Beta Zeta Properties LLC
239 Tuttle Road
Cumberland, ME 04021

Owner: Christmas Creek Homeowners Association

Post Construction Stormwater Inspector: (See definition of Inspector in Post Construction Stormwater Infrastructure Management Ordinance)

_____
_____
_____
_____

Contractors:

_____
_____

Inspection

The applicant and owner is responsible for complying with the Maine DEP Site Location of Development Permit. The Applicant will be responsible for inspection and maintenance during construction and the Home Owners Association will be responsible for Post-Construction operations. The development is also subject to State Stormwater Management Law and will be subject to a "Five-year Recertification for Long-Term Maintenance of Stormwater Management Systems". Attached is the Recertification Form.

Purpose

The following O&M Plan provides guidance and schedules for compliance with the Town's Post Construction Stormwater Infrastructure Management Ordinance and the State Stormwater Law.

Definitions

Significant Period of Rain: 1" or more of rain in a 24-hour period. An inspection is required within three (3) days after a significant storm event and all repairs shall be initiated within seven (7) days.

O&M Plan

The following is a summary of the required inspection and maintenance for the Post-Construction BMP's.

Vegetated Swales/Ditches

1. On-site inspection of the vegetated ditches shall be on a monthly schedule and after a significant period of rainfall.

    a) Ditches should be inspected to repair erosion problems, remove any accumulated debris and to check the condition and integrity of the check dams.
    b) Ditches shall be mowed periodically to a minimum grass height of 6". Ditches shall be maintained such that woody vegetation is removed from the flow line of the ditch or areas that may impede the capacity of the ditch.
    c) The use of pesticides and fertilizer should be limited to what is needed to promote a healthy/stable growth of vegetation.

Access Roads

1. On-site inspection of the roads shall be performed at least twice annually and after a significant period of rainfall.

a) All low spots of pooling water shall be re-graded to direct the water off the pavement and to the appropriate, catch basin or ditch.
b) Areas of erosions shall be repaired immediately. This includes all grassy area adjacent to the road.
c) Sweeping the roadway free of sand after the winter season should be completed annually in the spring of the year.

Storm Drain and Catch Basins

1. Inspect catch basin inlets on a monthly basis for debris or conditions which could inhibit flow entry. Remove debris and properly dispose.

2. Inspect all catch basin structures annually.

    a) Check that rims are securely attached and properly set to optimize flow entry.
    b) Measure and record silt accumulation, if any. Sumps shall be cleaned at least on a yearly basis in the spring. All sediment removed should be disposed of properly.

3. Check pipelines annually to determine silt accumulation, if any. Remove excess silt if found.

Snow Storage Areas

1. On-site inspection of the snow storage areas on an annual schedule.

    a.) Carefully inspect to determine the condition of vegetation and remove any accumulated debris. If repairs are needed, they should be accomplished immediately.

Sediment Forebay

1. On-site inspection of the rip-rap on a monthly schedule or after a significant period of rainfall.
    a.) Carefully inspect to determine if high flows have caused scour beneath the rip-rap or dislodged any of the stones. If repairs are needed, they should be accomplished immediately.

Wet Pond

1. Inlet & Outlet Inspections: The inlet and outlet of the basin should be checked periodically to ensure that flow structures are not blocked by debris. Inspections should be conducted monthly during wet weather conditions from March to November.

2. Erosion & Instability: Basins should be inspected annually for erosion, destabilization of side slopes, embankment settling and other signs of structural

failure, and loss of storage volume due to sediment accumulation. Corrective action should be taken immediately upon identification of problems.

3. Embankment Maintenance: Embankments should be maintained to preserve their integrity as impoundment structures, including, but not necessarily limited to, vegetative maintenance (mowing, control of woody vegetation), rodent control, erosion control and repair, and outlet control structure maintenance and repair. Basins should be mowed no more than twice a year during the growing season to maintain maximum grass heights less than 12 inches. All accumulated trash and debris shall be removed.

4. Sediment Removal: Sediment should be removed from the pretreatment structure at least annually and from the basin when necessary.

5. Measurement of Sediment Accumulation: Inspect for sediment accumulation. If sediment reaches 2' in depth, the pond shall be drained and the sediment removed.

6. Gravel Trench Outlet Inspection: The gravel trench outlet should be inspected after every major storm in the first few months to ensure proper function. Thereafter, the gravel trench should be inspected at least once every six months. Inspection consists of verifying that the pond is slowly emptying through the gravel filter for a short time (12-24 hours) after a storm and that potentially clogging material such as accumulations of decaying leaves are not preventing discharge through the gravel.

7. Gravel Replacement: The top several inches of the gravel in the outlet trench must be replaced with fresh material when water ponds above the permanent pool for more than 72 hours. The removed sediments should be disposed of in an acceptable manner.

8. Maintenance Dredging: Wet ponds lose 0.5-1.0% of their volume annually due to sediment accumulation. Dredging is required when accumulated volume loss reaches 15%, or approximately every 15-20 years.

9. Outlet Control Structures: Remove covers and check for clogging, debris accumulation or structural problems a minimum of two times per year and clean as needed. Special care shall be taken to inspect and maintain the orifices found in the weir wall of the outlet control structure.

Grassed Underdrain Filter

1. On-site inspection of Grassed Underdrain Filters shall be twice per year (May 1 and October 1). The following shall be accomplished:

   a.) Record date of inspection
   b.) Identify person making the inspection
   c.) Record observed water depth. (If no rain within last 24-36 hours should be dry.

d.) Inspect rip rap for debris accumulation
e.) Remove debris.
f.) Mow grassed slopes and/or repair slopes if eroded.
g.) Clean accumulated sediment from forebay.

Limited Disturbance Stormwater Buffers

1. Inspect forested buffers on an annual basis.
   a) Inspect buffers for evidence of erosion or areas of concentrated flow.
   b) Inspect buffers for signs of development encroachment within the deed restricted buffer.

Inspection/Maintenance Responsibility

The Applicant shall be responsible for inspection and maintenance during construction. It shall be the Home Owners Association responsibility to retain the services of the Post-Construction Stormwater Inspector and provide for the repair and maintenance noted by inspections, if any. When maintenance is required by inspection, the Association shall perform the required maintenance and/or repairs in a timely fashion and notify the Inspector when the maintenance is complete. The Association shall maintain detailed records of the inspections and maintenance performed.

For Post-Construction Inspections, the qualified post-construction stormwater inspector retained by the Owner shall submit signed certifications to the Town on or by June 30 of each year.

During construction, it is the responsibility of the Applicant to inspect, maintain and repair Post-Construction BMP's until such time that the BMP's are accepted by the Owner.

Attachments

1. Inspection & Maintenance Log

2. See attached Appendix B "Inspection and Maintenance" from MDEP Stormwater Regulations.

3. See attached "Appendix C" from MDEP Stormwater Regulations for performance standards.

INSPECTION SUMMARY
CHRISTMAS CREEK

Inspection of	**Schedule ***
• Vegetated Swales	
Inspect	Monthly
• Access Drives and Parking Areas	
Inspect	Twice Annually
Sweep Road	Annually
• Storm Drain and Catch Basins	
Inspect (CB Inlets)	Monthly
Inspect (CB Sumps)	Annually
Measure Silt & Remove	Annually
• Snow Storage Areas	
Inspect	Annually
Remove Litter	Annually
• Sediment Forebay	
Inspect	Monthly
Remove Litter	Annually
• Wet Pond	
Inspect	Monthly
Remove Litter	Annually
• Grassed Underdrain Filter	
Inspect	Bi-Annually
Remove Litter	Annually
• Stormwater Buffers	
Inspect	Bi-Annually

* After significant rainstorm in addition to regular inspections. Inspections shall be within 3 days of significant rainfall.

INSPECTION AND MAINTENANCE LOG

Christmas Creek
Post Construction Stormwater
Inspection & Maintenance Log

Date of Inspection:_____

Inspection by:_____

Purpose of Inspection: Monthly, Yearly, Significant Rainfall (circle one)

- Vegetated Swales
  Description of Conditions:
  _____
  _____
  _____

  Maintenance & Date of Repairs:
  _____
  _____
  _____

  Follow Up Needed:
  _____
  _____

- Access Drives and Parking Areas
  Description of Conditions:
  _____
  _____
  _____

  Maintenance & Date of Repairs:
  _____
  _____
  _____

  Annual Sweeping (date & Contractors):
  _____
  _____
  _____

  Follow Up Needed:
  _____
  _____

- Storm drain and catch basins
  Description:

  Description of Conditions:

  _____
  _____
  _____

  Maintenance & Date of Repairs:

  _____
  _____
  _____

  Sediment Inspection & Removal:

  _____
  _____
  _____

  Date & Contractor for Sump Cleaning:

  _____
  _____
  _____

  Follow Up Needed:

  _____
  _____

- Snow Storage Areas
  Description of Conditions:

  _____
  _____
  _____

  Maintenance & Date of Repairs:

  _____
  _____
  _____

  Follow Up Needed:

  _____
  _____

- Sediment Forebay
  Description of Conditions:

  _____
  _____
  _____

  Maintenance & Date of Repairs:

  _____
  _____
  _____

  Follow Up Needed:

  _____
  _____

- Wet Pond
  Description:

  Description of Conditions:

  _____
  _____
  _____

  Maintenance & Date of Repairs:

  _____
  _____
  _____

  Sediment Inspection & Removal:

  _____
  _____
  _____

  Date & Contractor for Sump Cleaning:

  _____
  _____
  _____

  Follow Up Needed:

  _____
  _____

- Grassed Underdrain Filter
  Description:

  Description of Conditions:

  _____
  _____
  _____

  Maintenance & Date of Repairs:

  _____
  _____
  _____

  Sediment Inspection & Removal:

  _____
  _____
  _____

  Date & Contractor for Sump Cleaning:

  _____
  _____
  _____

  Follow Up Needed:

  _____
  _____

- Level Spreader/Buffer
  Description:

  Description of Conditions:

  _____
  _____
  _____

  Maintenance & Date of Repairs:

  _____
  _____
  _____

  Sediment Inspection & Removal:

  _____
  _____
  _____

Date & Contractor for Sump Cleaning:

_____

_____

_____

Follow Up Needed:

_____

_____

_____

Inspector Signature

APPENDIX B. Inspection and maintenance

This appendix applies to all projects, except that a project that is eligible for stormwater PBR need only meet the standards in Section 1.

See Appendix D(5) for additional maintenance requirements related to infiltration of stormwater.

1. During construction. The following standards must be met during construction.

(a) **Inspection and corrective action**. Inspect disturbed and impervious areas, erosion control measures, materials storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. Inspect these areas at least once a week as well as before and within 24 hours after a storm event (rainfall), and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in the permit, shall conduct the inspections.

(b) **Maintenance**. If best management practices (BMPs) need to be repaired, the repair work should be initiated upon discovery of the problem but no later than the end of the next workday. If additional BMPs or significant repair of BMPs are necessary, implementation must be completed within 7 calendar days and prior to any storm event (rainfall). All measures must be maintained in effective operating condition until areas are permanently stabilized.

(c) **Documentation**. Keep a log (report) summarizing the inspections and any corrective action taken. The log must include the name(s) and qualifications of the person making the inspections, the date(s) of the inspections, and major observations about the operation and maintenance of erosion and sedimentation controls, materials storage areas, and vehicles access points to the parcel. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and location(s) where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken.

The log must be made accessible to Department staff and a copy must be provided upon request. The permittee shall retain a copy of the log for a period of at least three years from the completion of permanent stabilization.

2. Post-construction. The following standards must be met after construction.

(a) **Plan**. Carry out an approved inspection and maintenance plan that is consistent with the minimum requirements of this section. The plan must address inspection and maintenance of the project's permanent erosion control measures and stormwater management system. This plan may be combined with the plan listed in Section 2(a) of this appendix. See Section 7(C)(2) for submission requirements.

(b) **Inspection and maintenance**. All measures must be maintained in effective operating condition. A person with knowledge of erosion and stormwater control, including the standards and conditions in the permit, shall conduct the inspections. The following areas, facilities, and measures must be inspected and identified deficiencies must be corrected. Areas, facilities, and measures other than those listed below may also require inspection on a specific site. Inspection or maintenance tasks other than those discussed below must be included in the maintenance plan developed for a specific site.

NOTE: Expanded and more-detailed descriptions for specific maintenance tasks may be found in the Maine DEP's "Stormwater Management for Maine: Best Management Practices."

(i) Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows. See permanent stabilization standards in Appendix A(5).

(ii) Inspect ditches, swales and other open stormwater channels in the spring, in late fall, and after heavy rains to remove any obstructions to flow, remove accumulated sediments and debris, to control vegetated growth that could obstruct flow, and to repair any erosion of the ditch lining. Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable. If the ditch has a riprap lining, replace riprap on areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged. The channel must receive adequate routine maintenance to maintain capacity and prevent or correct any erosion of the channel's bottom or sideslopes.

(iii) Inspect culverts in the spring, in late fall, and after heavy rains to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and to repair any erosion damage at the culvert's inlet and outlet.

(iv) Inspect and clean out catch basins. Clean-out must include the removal and legal disposal of any accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins. If the basin outlet is designed to trap floatable materials, then remove the floating debris and any floating oils (using oil-absorptive pads).

(v) Inspect resource and treatment buffers once a year for evidence of erosion, concentrating flow, and encroachment by development. If flows are concentrating within a buffer, site grading, level spreaders, or ditch turn-outs must be used to ensure a more even distribution of flow into a buffer. Check down slope of all spreaders and turn-outs for erosion. If erosion is present, adjust or modify the spreader's or turnout's lip to ensure a better distribution of flow into a buffer. Clean-out any accumulation of sediment within the spreader bays or turn-out pools.

(vi) Inspect at least once per year, each stormwater management pond or basin, including the pond's embankments, outlet structure, and emergency spillway. Remove and dispose of accumulated sediments in the pond. Control woody vegetation on the pond's embankments.

(vii) Inspect at least one per year, each underdrained filter, including the filter embankments, vegetation, underdrain piping, and overflow spillway. Remove and dispose of accumulated sediments in the filter. If needed, rehabilitate any clogged surface linings, and flush underdrain piping.

(viii) Inspect each manufactured system installed on the site, including the system's inlet, treatment chamber(s), and outlet at least once per year, or in accordance with the maintenance

guidelines recommended by the manufacturer based on the estimated runoff and pollutant load expected to the system from the project. Remove and dispose of accumulated sediments, debris, and contaminated waters from the system and, if applicable, remove and replace any clogged or spent filter media.

(c) **Regular maintenance**

(i) Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader. Grading of gravel roads, or grading of the gravel shoulders of gravel or paved roads, must be routinely performed to ensure that stormwater drains immediately off the road surface to adjacent buffer areas or stable ditches, and is not impeded by accumulations of graded material on the road shoulder or by excavation of false ditches in the shoulder. If water bars or open-top culverts are used to divert runoff from road surfaces, clean-out any sediments within or at the outlet of these structures to restore their function.

(ii) Manage each buffer's vegetation consistently with the requirements in any deed restrictions for the buffer. Wooded buffers must remain fully wooded and have no disturbance to the duff layer. Vegetation in non-wooded buffers may not be cut more than three times per year, and may not be cut shorter than six inches.

NOTE: Contact the Department's Division of Watershed Management (Maine DEP) for assistance developing inspection and maintenance requirements for other drainage control and runoff treatment measures installed on the site. The maintenance needs for most measures may be found in the Maine DEP's "Stormwater Management for Maine: Best Management Practices."

(d) **Documentation**. Keep a log (report) summarizing inspections, maintenance, and any corrective actions taken. The log must include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, indicate where the sediment and debris was disposed after removal. The log must be made accessible to Department staff and a copy provided to the Department upon request. The permittee shall retain a copy of the log for a period of at least five years from the completion of permanent stabilization.

3. Re-certification. Submit a certification of the following to the Department within three months of the expiration of each five-year interval from the date of issuance of the permit.

(a) **Identification and repair of erosion problems**. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.

(b) **Inspection and repair of stormwater control system**. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.

(c) **Maintenance**. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the Department, and the maintenance log is being maintained.

Municipalities with separate storm sewer systems regulated under the Maine Pollutant Discharge Elimination System (MPDES) Program may report on all regulated systems under their control as part of their required annual reporting in lieu of separate certification of each system. Municipalities not regulated by the MPDES Program, but that are responsible for maintenance of permitted stormwater systems, may report on multiple stormwater systems in one report.

4. Duration of maintenance. Perform maintenance as described and required in the permit unless and until the system is formally accepted by the municipality or quasi-municipal district, or is placed under the jurisdiction of a legally created association that will be responsible for the maintenance of the system. If a municipality or quasi-municipal district chooses to accept a stormwater management system, or a component of a stormwater system, it must provide a letter to the Department stating that it assumes responsibility for the system. The letter must specify the components of the system for which the municipality or district will assume responsibility, and that the municipality or district agrees to maintain those components of the system in compliance with Department standards. Upon such assumption of responsibility, and approval by the Department, the municipality, quasi-municipal district, or association becomes a co-permittee for this purpose only and must comply with all terms and conditions of the permit.

5. Additional requirements. Additional requirements may be applied on a site-specific basis.

APPENDIX C. Housekeeping

These performance standards apply to all projects except for stormwater PBR projects.

1. **Spill prevention.** Controls must be used to prevent pollutants from construction and waste materials stored on site to enter stormwater, which includes storage practices to minimize exposure of the materials to stormwater. The site contractor or operator must develop, and implement as necessary, appropriate spill prevention, containment, and response planning measures.

   NOTE: Any spill or release of toxic or hazardous substances must be reported to the Department. For oil spills, call 1-800-482-0777 which is available 24 hours a day. For spills of toxic or hazardous material, call 1-800-452-4664 which is available 24 hours a day. For more information, visit the Department's website at : http://www.maine.gov/dep/spills/emergspillresp/

2. **Groundwater protection.** During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials. Any project proposing infiltration of stormwater must provide adequate pre-treatment of stormwater prior to discharge of stormwater to the infiltration area, or provide for treatment within the infiltration area, in order to prevent the accumulation of fines, reduction in infiltration rate, and consequent flooding and destabilization.

   See Appendix D for license by rule standards for infiltration of stormwater.

   NOTE: Lack of appropriate pollutant removal best management practices (BMPs) may result in violations of the groundwater quality standard established by 38 M.R.S.A. §465-C(1).

3. **Fugitive sediment and dust.** Actions must be taken to ensure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control, but other water additives may be considered as needed. A stabilized construction entrance (SCE) should be included to minimize tracking of mud and sediment. If off-site tracking occurs, public roads should be swept immediately and no less than once a week and prior to significant storm events. Operations during dry months, that experience fugitive dust problems, should wet down unpaved access roads once a week or more frequently as needed with a water additive to suppress fugitive sediment and dust.

   NOTE: Dewatering a stream without a permit from the Department may violate state water quality standards and the *Natural Resources Protection Act*.

4. **Debris and other materials.** Minimize the exposure of construction debris, building and landscaping materials, trash, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials to precipitation and stormwater runoff. These materials must be prevented from becoming a pollutant source.

   NOTE: To prevent these materials from becoming a source of pollutants, construction and post-construction activities related to a project may be required to comply with applicable

provision of rules related to solid, universal, and hazardous waste, including, but not limited to, the Maine solid waste and hazardous waste management rules; Maine hazardous waste management rules; Maine oil conveyance and storage rules; and Maine pesticide requirements.

5. Excavation de-watering. Excavation de-watering is the removal of water from trenches, foundations, coffer dams, ponds, and other areas within the construction area that retain water after excavation. In most cases the collected water is heavily silted and hinders correct and safe construction practices. The collected water removed from the ponded area, either through gravity or pumping, must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved by the Department.

NOTE: Dewatering controls are discussed in the "Maine Erosion and Sediment Control BMPs, Maine Department of Environmental Protection."

6. Authorized Non-stormwater discharges. Identify and prevent contamination by non-stormwater discharges. Where allowed non-stormwater discharges exist, they must be identified and steps should be taken to ensure the implementation of appropriate pollution prevention measures for the non-stormwater component(s) of the discharge. Authorized non-stormwater discharges are:

(a) Discharges from firefighting activity;

(b) Fire hydrant flushings;

(c) Vehicle washwater if detergents are not used and washing is limited to the exterior of vehicles (engine, undercarriage and transmission washing is prohibited);

(d) Dust control runoff in accordance with permit conditions and Appendix (C)(3);

(e) Routine external building washdown, not including surface paint removal, that does not involve detergents;

(f) Pavement washwater (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material had been removed) if detergents are not used;

(g) Uncontaminated air conditioning or compressor condensate;

(h) Uncontaminated groundwater or spring water;

(i) Foundation or footer drain-water where flows are not contaminated;

(j) Uncontaminated excavation dewatering (see requirements in Appendix C(5));

(k) Potable water sources including waterline flushings; and

(l) Landscape irrigation.

7. Unauthorized non-stormwater discharges . The Department's approval under this Chapter does not authorize a discharge that is mixed with a source of non-stormwater, other than those discharges in compliance with Appendix C (6). Specifically, the Department's approval does not authorize discharges of the following:

(a) Wastewater from the washout or cleanout of concrete, stucco, paint, form release oils, curing compounds or other construction materials;

(b) Fuels, oils or other pollutants used in vehicle and equipment operation and maintenance;

(c) Soaps, solvents, or detergents used in vehicle and equipment washing; and

(d) Toxic or hazardous substances from a spill or other release.

(8) Additional requirements. Additional requirements may be applied on a site-specific basis.

Appendix G
Suggested Buffer Deed Descriptions

Section 4. Draft Deed Restriction Language for Buffers

A. Forested buffer, limited disturbance

DECLARATION OF RESTRICTIONS (Forested Buffer, Limited Disturbance)

THIS DECLARATION OF RESTRICTIONS is made this _____day of _____, 20___, by _____ (name), _____ (street address), _____ (city or town), _____ (county) County, Maine, _____ (zip code), (herein referred to as the "Declarant"), pursuant to a permit received from the Maine Department of Environmental Protection under the Stormwater Management Law, to preserve a buffer area on a parcel of land near _____ (road name), _____ (known feature and/or town).

WHEREAS, the Declarant holds title to certain real property situated in _____ (town), Maine described in a deed from _____ (name) to _____ (name of Declarant) dated _____, 20____, and recorded in Book ____ Page ____ at the _____County Registry of Deeds, herein referred to as the "property"; and

WHEREAS, Declarant desires to place certain restrictions, under the terms and conditions herein, over a portion of said real property (hereinafter referred to as the "Restricted Buffer") described as follows: (Note: Insert description of restricted buffer area location here)

WHEREAS, pursuant to the Stormwater Management Law, 38 M.R.S.A. Section 420-D and Chapter 500 of rules promulgated by the Maine Board of Environmental Protection ("Stormwater Management Rules"), Declarant has agreed to impose certain restrictions on the Restricted Buffer Area as more particularly set forth herein and has agreed that these restrictions may be enforced by the Maine Department of Environmental Protection or any successor (hereinafter the "MDEP"),

NOW, THEREFORE, the Declarant hereby declares that the Restricted Buffer Area is and shall forever be held, transferred, sold, conveyed, occupied and maintained subject to the conditions and restrictions set forth herein. The Restrictions shall run with the Restricted Buffer Area and shall be binding on all parties having any right, title or interest in and to the Restricted Buffer Area, or any portion thereof, and their heirs, personal representatives, successors, and assigns. Any present or future owner or occupant of the Restricted Buffer Area or any portion thereof, by the acceptance of a deed of conveyance of all or part of the Covenant Area or an instrument conveying any interest therein, whether or not the deed or instrument shall so express, shall be deemed to have accepted the Restricted Buffer Area subject to the Restrictions and shall agree to be bound by, to comply with and to be subject to each and every one of the Restrictions hereinafter set forth.

1. Restrictions on Restricted Buffer Area. Unless the owner of the Restricted Buffer Area, or any successors or assigns, obtains the prior written approval of the MDEP, the Restricted Buffer Area must remain undeveloped in perpetuity. To maintain the ability of the Restricted Buffer Area to filter and absorb stormwater, and to maintain compliance with the Stormwater Management Law and the permit issued thereunder to the Declarant, the use of the Restricted Buffer Area is hereinafter limited as follows.

a. No soil, loam, peat, sand, gravel, concrete, rock or other mineral substance, refuse, trash, vehicle bodies or parts, rubbish, debris, junk waste, pollutants or other fill material may be placed, stored or dumped on the Restricted Buffer Area, nor may the topography of the area be altered or manipulated in any way;

b. Any removal of trees or other vegetation within the Restricted Buffer Area must be limited to the following:

(i) No purposefully cleared openings may be created and an evenly distributed stand of trees and other vegetation must be maintained. An "evenly distributed stand of trees " is defined as maintaining a minimum rating score of 24 points in any 25 foot by 50 foot square (2500 square feet) area, as determined by the following rating scheme:

Diameter of tree at 4½ feet above ground level	Points
2 - 4 inches	1
4 - 8 inches	2
8 - 12 inches	4
>12 inches	8

Where existing trees and other vegetation result in a rating score less than 24 points, no trees may be cut or sprayed with biocides except for the normal maintenance of dead, windblown or damaged trees and for pruning of tree branches below a height of 12 feet provided two thirds of the tree's canopy is maintained;

(ii) No undergrowth, ground cover vegetation, leaf litter, organic duff layer or mineral soil may be disturbed except that one winding path, that is no wider than six feet and that does not provide a downhill channel for runoff, is allowed through the area;

c. No building or other temporary or permanent structure may be constructed, placed or permitted to remain on the Restricted Buffer Area, except for a sign, utility pole or fence;

d. No trucks, cars, dirt bikes, ATVs, bulldozers, backhoes, or other motorized vehicles or mechanical equipment may be permitted on the Restricted Buffer Area;

e. Any level lip spreader directing flow to the Restricted Buffer Area must be regularly inspected and adequately maintained to preserve the function of the level spreader.

Any activity on or use of the Restricted Buffer Area inconsistent with the purpose of these Restrictions is prohibited. Any future alterations or changes in use of the Restricted Buffer Area must receive prior approval in writing from the MDEP. The MDEP may approve such alterations and changes in use if such alterations and uses do not impede the stormwater control and treatment capability of the Restricted Buffer Area or if adequate and appropriate alternative means of stormwater control and treatment are provided.

2. Enforcement. The MDEP may enforce any of the Restrictions set forth in Section 1 above.

3. Binding Effect. The restrictions set forth herein shall be binding on any present or future owner of the Restricted Buffer Area. If the Restricted Buffer Area is at any time owned by more than one owner, each owner shall be bound by the foregoing restrictions to the extent that any of the Restricted Buffer Area is included within such owner's property.

4. Amendment. Any provision contained in this Declaration may be amended or revoked only by the recording of a written instrument or instruments specifying the amendment or the revocation signed by the owner or owners of the Restricted Buffer Area and by the MDEP.

5. Effective Provisions of Declaration. Each provision of this Declaration, and any agreement, promise, covenant and undertaking to comply with each provision of this Declaration, shall be deemed a land use restriction running with the land as a burden and upon the title to the Restricted Buffer Area.

6. Severability. Invalidity or unenforceability of any provision of this Declaration in whole or in part shall not affect the validity or enforceability of any other provision or any valid and enforceable part of a provision of this Declaration.

7. Governing Law. This Declaration shall be governed by and interpreted in accordance with the laws of the State of Maine.

_____
(NAME)

STATE OF MAINE _____ County, _____, 20__.
County) (date)

Personally appeared before me the above named _____, who swore to the truth of the foregoing to the best of (his/her) knowledge, information and belief and acknowledged the foregoing instrument to be (his/her) free act and deed.

_____
Notary Public

_____

Appendix H
Test Pit Logs

FORM F

18280

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
CHRISTMAS CREEK SUBDIVISION	BETA ZETA PROPERTIES, LLC	CUMBERLAND

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-1 ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling
	FRIABLE		
SILTY CLAY LOAM		5Y 4/2	
		OLIVE GRAY	
			COMMON, MEDIUM, & DISTINCT
	FIRM		
SILTY CLAY			

LIMIT OF EXCAVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	3-8	8"	

C.S.S. Soil Series / phase name: LAMOINE | SWPD (Drainage Class) | C/D (Hydrologic Group)

L.S.E. Soil Classification: ____ (Profile) | ____ (Drainage Class) | ____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-2 ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling
SILT LOAM		5Y 4/4	
	FRIABLE	OLIVE	
		5Y 5/3	
SILTY CLAY LOAM		OLIVE	NONE OBSERVED
		5Y 4/2	
SILTY CLAY	FIRM	OLIVE GRAY	
VERY FINE SAND	FRIABLE	5Y 5/3 OLIVE	
SILTY CLAY	FIRM	5Y 4/2 OLIVE GRAY	

LIMIT OF EXCAVATION = 11'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	3-8	16"	

C.S.S. Soil Series / phase name: SUFFIELD | WD (Drainage Class) | C (Hydrologic Group)

L.S.E. Soil Classification: ____ (Profile) | ____ (Drainage Class) | ____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-3 ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling
		2.5Y 4/3	
SILT LOAM	FRIABLE	OLIVE BROWN	
		5Y 5/2	COMMON, MEDIUM, & DISTINCT
SILTY CLAY LOAM		OLIVE GRAY	
	FIRM		
		5Y 4/2	NONE OBSERVED
SILTY CLAY		OLIVE GRAY	

LIMIT OF EXCAVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	8-15	11"	

C.S.S. Soil Series / phase name: LAMOINE | SWPD (Drainage Class) | C/D (Hydrologic Group)

L.S.E. Soil Classification: ____ (Profile) | ____ (Drainage Class) | ____ (Design Class)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-4 ■ Test Pit ☐ Boring

0 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (inches)

Texture	Consistency	Color	Mottling
		2.5Y 5/6	
LOAM			
		LIGHT OLIVE BROWN	
	FRIABLE		
SILT LOAM		10YR 3/3 DARK BROWN	
SILTY CLAY LOAM		5Y 5/2 OLIVE GRAY	COMMON, MEDIUM, & DISTINCT
VERY FINE SANDY LOAM		5Y 5/3 OLIVE	
VERY FINE SAND WITH SILT LENSES		5Y 4/3 OLIVE	MANY, COARSE, & PROMINENT
SILTY CLAY	FIRM	5Y 4/2 OLIVE GRAY	

LIMIT OF EXCAVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	8-15	14"	

C.S.S. Soil Series / phase name: LAMOINE | SWPD (Drainage Class) | C/D (Hydrologic Group)

L.S.E. Soil Classification: ____ (Profile) | ____ (Drainage Class) | ____ (Design Class)

Professional Endorsements *(as applicable)*

C.S.S. signature: Gary M. Fullerton — Date: 1/17/19

name printed/typed: Gary M. Fullerton — Lic #: 462

L.S.E. signature: ____ — Date: ____

name printed/typed: ____ — Lic #: ____

STATE OF MAINE
GARY M. FULLERTON NO. 462
CERTIFIED SOIL SCIENTIST

affix professional seal

Sebago Technics, Inc.

FORM F

18280

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
CHRISTMAS CREEK SUBDIVISION	BETA ZETA PROPERTIES, LLC	CUMBERLAND

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-5 ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
FINE SANDY LOAM	FRIABLE	2.5Y 4/4 OLIVE BROWN	
SILT LOAM		2.5Y 5/3 LIGHT OLIVE BROWN	
VERY FINE SANDY LOAM	FIRM	5Y 5/4 OLIVE	
VERY FINE SAND	FRIABLE	5Y 4/3 OLIVE	COMMON, MEDIUM, & DISTINCT
FINE SAND		5Y 4/4 OLIVE	
SILTY CLAY	FIRM	5Y 4/2 OLIVE GRAY	

LIMIT OF EXCVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	8-15	22"	bedrock

C.S.S. Soil Series / phase name: SALMON — Drainage Class: WD — Hydrologic Group: B

L.S.E. Soil Classification: — Profile: — Drainage Class: — Design Class:

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-6 ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SILT LOAM	FRIABLE	2.5Y 3/2 VERY DARK GRAYISH BROWN	
VERY FINE SAND		5Y 5/4 OLIVE	COMMON, MEDIUM, & DISTINCT
SILTY CLAY	FIRM	5Y 4/3 OLIVE	
		5Y 4/3 OLIVE	
		5Y 4/2 OLIVE GRAY	

LIMIT OF EXCAVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	0-3	27"	bedrock

C.S.S. Soil Series / phase name: NICHOLVILLE — Drainage Class: MWD — Hydrologic Group: B

L.S.E. Soil Classification: — Profile: — Drainage Class: — Design Class:

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-7 ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SILT LOAM	FRIABLE	2.5Y 3/3 DARK OLIVE BROWN	
SILTY CLAY LOAM	FIRM	5Y 4/4 OLIVE	
		5Y 5/2 OLIVE GRAY	COMMON, MEDIUM, & DISTINCT
SILTY CLAY	VERY FIRM	5Y 4/2 OLIVE GRAY	

LIMIT OF EXCVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric	3-8	13"	bedrock

C.S.S. Soil Series / phase name: LAMOINE — Drainage Class: SWPD — Hydrologic Group: C/D

L.S.E. Soil Classification: — Profile: — Drainage Class: — Design Class:

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: — ☐ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling

LIMIT OF EXCAVATION = 10'

hydric / non-hydric	Slope %	Limiting factor	ground water / restrictive layer / bedrock
non-hydric			bedrock

C.S.S. Soil Series / phase name: — Drainage Class: — Hydrologic Group:

L.S.E. Soil Classification: — Profile: — Drainage Class: — Design Class:

Professional Endorsements *(as applicable)*

C.S.S. signature: Gary M. Fullerton — Date: 1/17/19

name printed/typed: Gary M. Fullerton — Lic #: 462

L.S.E. signature: — Date:

name printed/typed: — Lic #:

STATE OF MAINE GARY M. FULLERTON NO. 462 CERTIFIED SOIL SCIENTIST

affix professional seal

Appendix I
Emergency Spillway Calculations

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jun 25 2019

Wet Pond - Christmas Creek

Trapezoidal

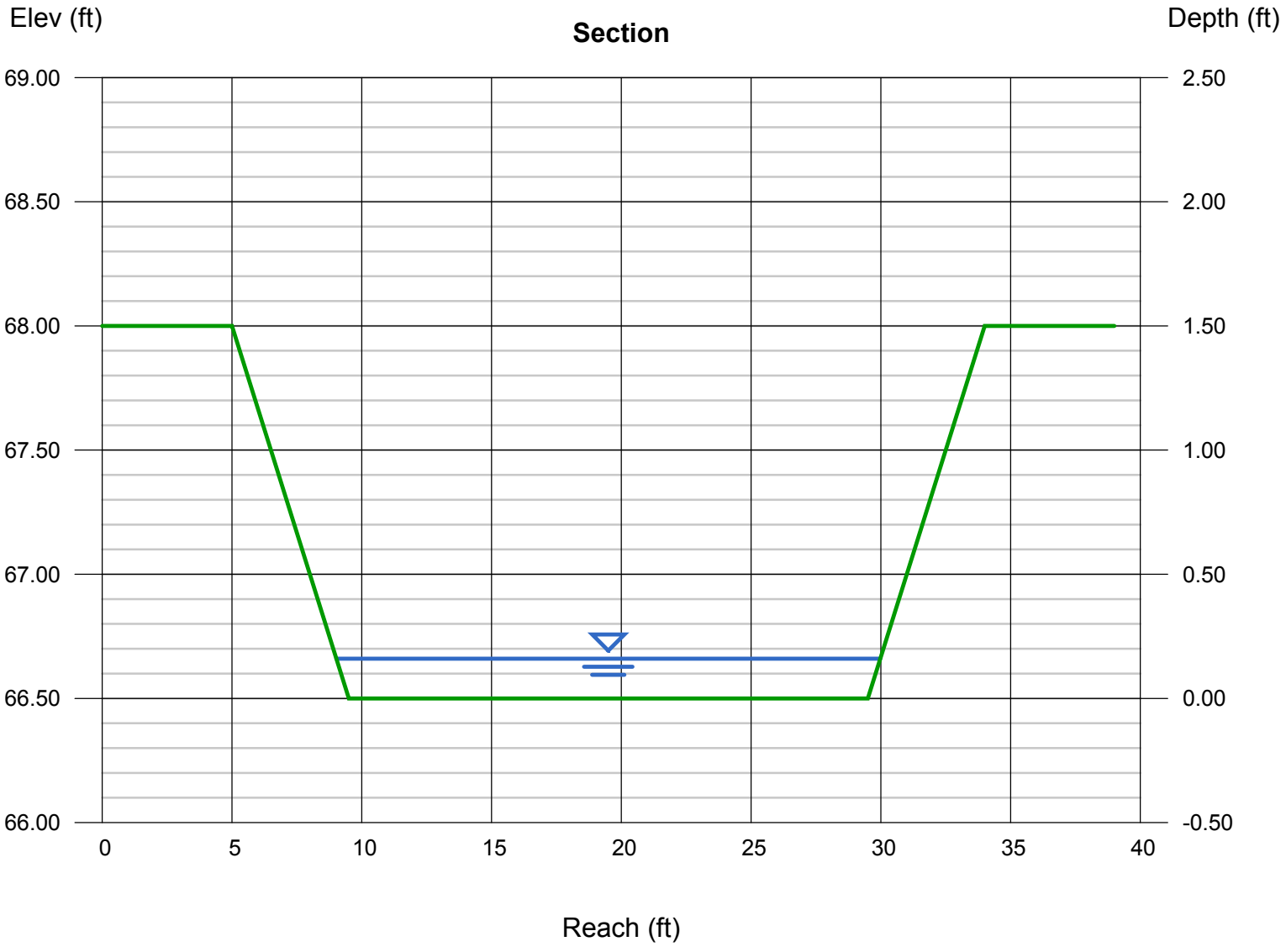
Bottom Width (ft)	= 20.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 66.50
Slope (%)	= 33.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 21.22

Highlighted

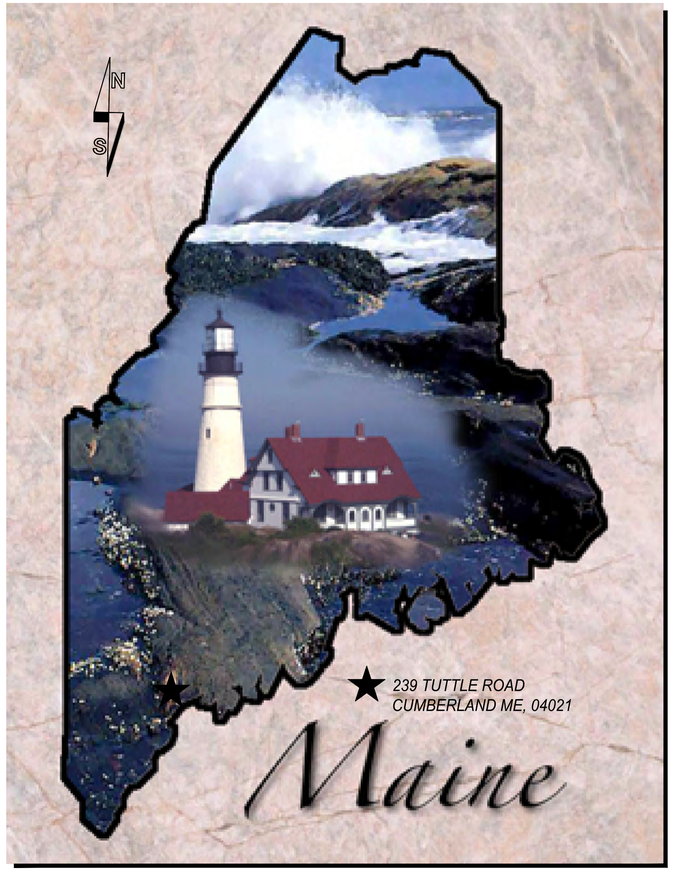
Depth (ft)	= 0.16
Q (cfs)	= 21.22
Area (sqft)	= 3.28
Velocity (ft/s)	= 6.48
Wetted Perim (ft)	= 21.01
Crit Depth, Yc (ft)	= 0.33
Top Width (ft)	= 20.96
EGL (ft)	= 0.81



CHRISTMAS CREEK SUBDIVISION

CUMBERLAND, MAINE

PROJECT #: 18-015



LOCATION MAP

VICINITY MAP

DRAWING INDEX

CIVIL

FINAL APPLICATION APPROVAL

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

7/18/2019

DIRIGO ARCHITECTURAL

ENGINEERING ▲ CONSTRUCTION MANAGEMENT

"STATEMENT AND NOTICE OF COOPERATION"

RELEASE OF THESE PLANS CONTEMPLATES FURTHER COOPERATION AMONG THE OWNER, HIS CONTRACTOR AND THE ENGINEER. DESIGN AND CONSTRUCTION ARE COMPLEX. ALTHOUGH THE ENGINEER AND HIS CONSULTANTS HAVE PERFORMED THEIR SERVICES WITH DUE CARE AND DILIGENCE, THEY CANNOT GUARANTEE PERFECTION. COMMUNICATION IS IMPERFECT, AND EVERY CONTINGENCY CANNOT BE ANTICIPATED. ANY AMBIGUITY OR DISCREPANCY DISCOVERED BY THE USE OF THESE PLANS NEED TO BE REPORTED IMMEDIATELY TO THE ENGINEER. FAILURE TO NOTIFY THE ENGINEER COMPOUNDS MISUNDERSTANDING AND INCREASES CONSTRUCTION COSTS. A FAILURE TO COOPERATE BY A SIMPLE NOTICE TO THE ENGINEER RELIEVES THE ENGINEER FROM RESPONSIBILITY FOR ALL CONSEQUENCES. CHANGES MADE FROM THE PLANS WITHOUT CONSENT OF THE ENGINEER ARE UNAUTHORIZED, AND RELIEVE THE ENGINEER OF RESPONSIBILITY FOR ALL CONSEQUENCES ARRIVING OUT OF SUCH CHANGES. IN MANY CASES SUCH RELIEF OF RESPONSIBILITY INCLUDES RELIEF OF OWNER RESPONSIBILITY. THE CONTRACTOR AND HIS SUBCONTRACTORS NEED BE DILIGENT IN THESE MATTERS AT ALL TIMES PRIOR TO AND DURING CONSTRUCTION. REFER TO CONTRACT GENERAL AND SUPPLEMENTAL CONDITION AND SPECIFICATIONS (PROJECT MANUAL) FOR ADDITIONAL DETAILS AND CONDITIONS.

N/F
MICHAEL D. BUNKER
MAP R4, LOT 9
BK 33137, PG 129

30000
TP 1

30002
TP 3

30001
TP 2

30006
TP 7

30004
TP 5

30003
TP 4

30005
TP 6

N/F
TOWN OF CUMBERLAND
MAP R4, LOT 13
135 TUTTLE ROAD

N/F
PORTLAND WATER DISTRICT
MAP R4, LOT 10A
229 TUTTLE ROAD
BK 4980, PG 53

N/F
CALLY THORUP
MAP R4, LOT 10B
225 TUTTLE ROAD
BK 27643, PG 270

100 YEAR FLOOD PLAIN

N/F
KATHERINE K. ROSSITER &
EMILY A. ROSSITER
MAP R4, LOT 11A
221 TUTTLE ROAD
BK 32582, PG 53

N/F
BRETT W. AUSTIN &
ERIN M. AUSTIN
MAP R4, LOT 11B
215 TUTTLE ROAD
BK 32582, PG 53

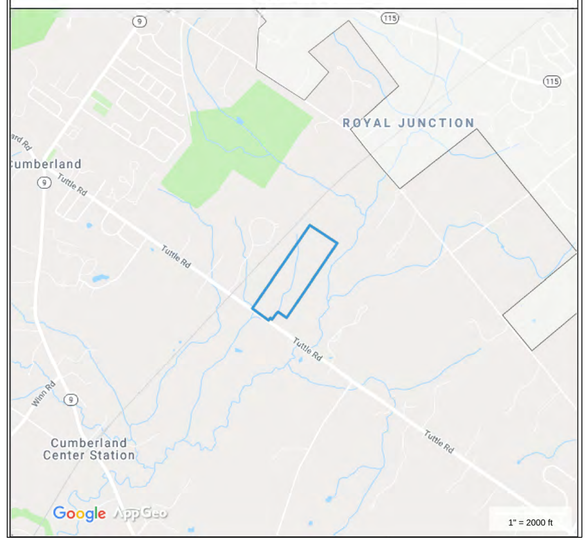
N/F
BRETT W. AUSTIN &
ERIN M. AUSTIN
MAP R4, LOT 11B
215 TUTTLE ROAD
BK 32477, PG 319

LEGEND

- BOUNDARY LINE
- SET BACK
- TREE CLEARING LIMITS
- IRON ROD / MONUMENT FOUND
- IRON ROD / MONUMENT TO BE SET
- PROPOSED TRAIL SYSTEM
- TRAIL BRIDGE CROSSING
- EDGE OF WETLANDS.
- STREAM BED
- 100 YEAR FLOOD PLAIN
- WETLAND
- TEST PIT

EXISTING CONDITIONS PLAN — 1 / C1.0
22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200'

Location Map



LOCATION MAP — 2 / C1.0
22X34 SCALE: 1"=2000'
11X17 SCALE: 1"=4000'

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

EXISTING CONDITIONS PLAN

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

DRAWN BY: ZTQ | CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way,
Suite 2
Turner, ME 04282

DIRIGO ARCHITECTURAL
ENGINEERING • CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019

PROJECT NO. 18-015

SHEET NO.

C1.0

Jul 30, 2019 - 2:51pm
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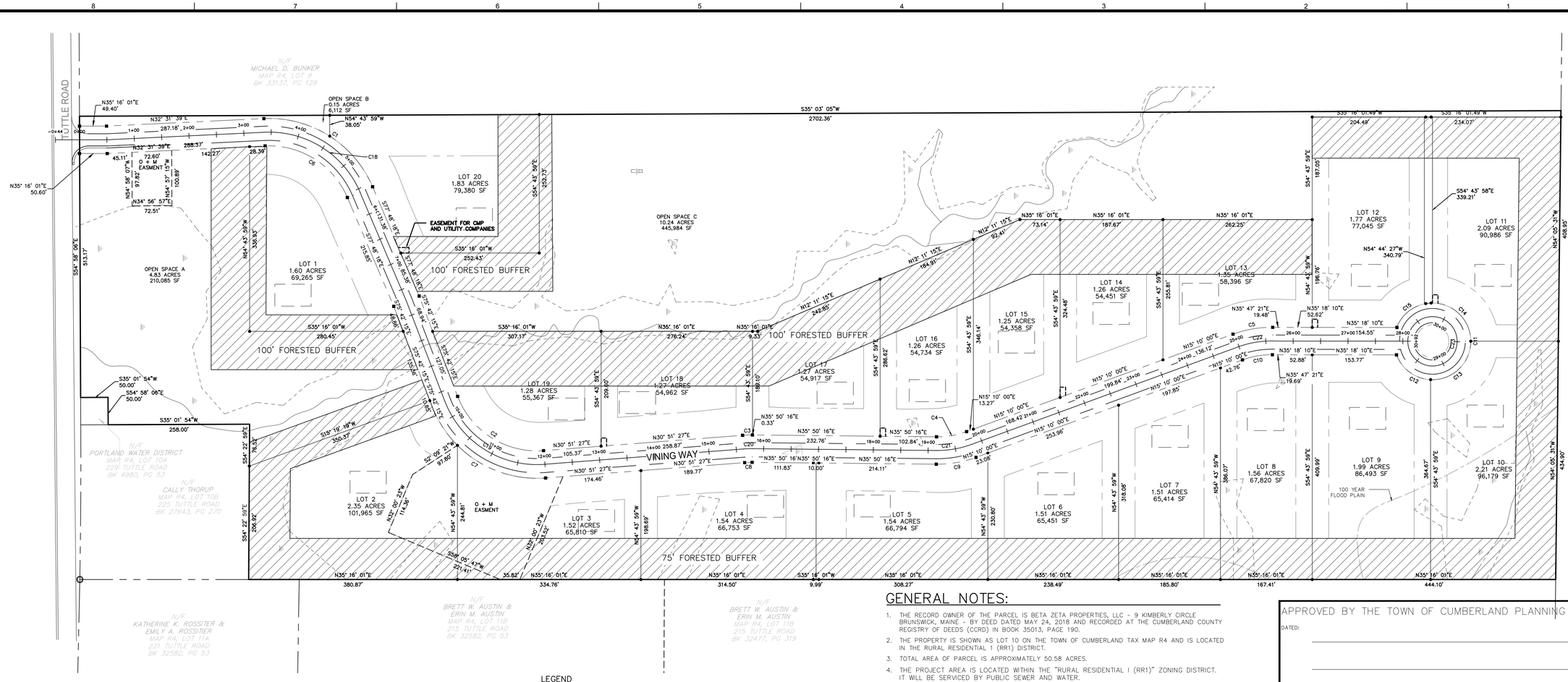


Curve Table: Vining Way				
Curve #	Radius	Arc Length	Chord Bearing	Chord Length
C1	205.00	249.27	N67° 21' 40.75"E	234.19'
C2	155.00	198.67	N67° 34' 35.88"E	185.35'
C3	205.00	17.82	N33° 20' 51.23"E	17.81'
C4	155.00	55.92	N25° 30' 07.99"E	55.62'
C5	205.00	73.79	N25° 28' 40.79"E	73.39'
C6	155.00	188.47	N67° 21' 40.75"E	177.07'
C7	205.00	262.76	N67° 34' 35.88"E	245.14'
C8	155.00	13.47	N33° 20' 51.23"E	13.47'
C9	205.00	73.96	N25° 30' 07.99"E	73.56'
C10	155.00	55.79	N25° 28' 40.79"E	55.49'
C11	70.00	389.02	N54° 35' 56.77"W	49.70'
C18	180.00	218.87	N67° 21' 40.75"E	205.63'
C19	180.00	230.71	N67° 34' 35.88"E	215.24'
C20	180.00	15.65	N33° 20' 51.23"E	15.64'
C21	180.00	64.94	N25° 30' 07.99"E	64.59'
C22	180.00	64.79	N25° 28' 40.79"E	64.44'
C23	45.00	141.90	N35° 18' 10.09"E	90.00'

Curve Table				
Curve #	Radius	Arc Length	Chord Bearing	Chord Length
C12	70.00	81.32	N71° 19' 34"E	76.83
C13	70.00	113.57	N8° 26' 07"W	101.51
C14	70.00	112.04	S79° 14' 06"W	100.45
C15	70.00	71.70	S4° 11' 50"E	68.60

LEGEND

- BOUNDARY LINE
- SET BACK
- TREE CLEARING LIMITS
- IRON ROD / MONUMENT FOUND
- IRON ROD / MONUMENT TO BE SET
- PROPOSED TRAIL SYSTEM
- TRAIL BRIDGE CROSSING
- EDGE OF WETLANDS.
- STREAM BED
- 100 YEAR FLOOD PLAIN
- WETLAND

CLUSTERED				
Net Residential Density/Acreage	**Square Feet**	**Acres**	**% of Parcel**	**Comments**
Gross Area	2,203,371	50.58	100.0%	Measurement provided by licensed surveyor
- Roads/Parking	-	0.00	0.0%	Included in ROW/Easements
- Slope > 20%	-	0.00	0.0%	Steep slopes coincide with wetland delineation
- Wetlands	287,613	6.60	13.1%	Measurement provided by licensed surveyor
- 100-Yr Flood Areas	3,369	0.08	0.2%	Per FEMA Flood Plain Map
- ROW/Easements	160,717	3.69	7.3%	Total ROW including road and utility easements
- Resource Protection Districts	-	0.00	0.0%	Within wetland delineation
Net Area Available for Lots	1,751,672	40.21	79.5%	
Open Space Allotment	651,814	14.96	29.6%	Per attached subdivision plan, >25% MIN
Net Residential Density Limit	87,120	2.00		With public sewer and water
Maximum Number of Lots	**20.11**			

GENERAL NOTES:

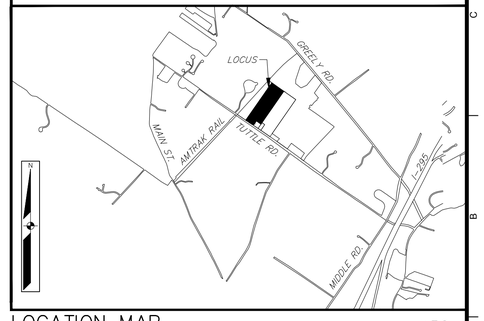
1. THE RECORD OWNER OF THE PARCEL IS BETA ZETA PROPERTIES, LLC - 9 KIMBERLY CIRCLE BRUNSWICK, MAINE - BY DEED DATED MAY 24, 2018 AND RECORDED AT THE CUMBERLAND COUNTY REGISTRY OF DEEDS (CCRD) IN BOOK 35013, PAGE 190.
2. THE PROPERTY IS SHOWN AS LOT 10 ON THE TOWN OF CUMBERLAND TAX MAP R4 AND IS LOCATED IN THE RURAL RESIDENTIAL 1 (RR1) DISTRICT.
3. TOTAL AREA OF PARCEL IS APPROXIMATELY 50.58 ACRES.
4. THE PROJECT AREA IS LOCATED WITHIN THE "RURAL RESIDENTIAL I (RR1)" ZONING DISTRICT. IT WILL BE SERVICED BY PUBLIC SEWER AND WATER.

   FOR CLUSTERED SUBDIVISION
   MINIMUM LOT SIZE: 30,000 SF
   MINIMUM FRONTAGE: 100 FT
   SETBACKS: FRONT: 50 FT SIDE: 30 FT REAR: 75 FT
5. ROADWAY TYPE: RESIDENTIAL ACCESS > 50 VPD

   ROW WIDTH: 50 FT
   PAVEMENT WIDTH: 26 FT
   SHOULDERS: 2 FT (GRAVEL) & 4 FT PAVED SHOULDER (PEDESTRIAN LANE)
   SIDEWALK: N/A
   DESIGN SPEED: 25 MPH
6. BOUNDARY AND INFORMATION SHOWN HEREON IS BASED UPON A FIELD SURVEY PERFORMED BY SEBAGO TECHNICS, INC. IN AUGUST OF 2018.
7. PLAN REFERENCES:
   A. "MAINE STATE HIGHWAY COMMISSION RIGHT OF WAY MAP, STATE HIGHWAY, CUMBERLAND, CUMBERLAND COUNTY, STATE AID NO.3," S.H.C. FILE #S-3-289, DATED JUNE 1966 AND RECORDED AT THE CCRD IN PLAN BOOK 73, PAGE 34.
   B. "STANDARD BOUNDARY SURVEY OF DILLENBACK PARCEL, TUTTLE ROAD, CUMBERLAND MAINE, TOWN OF CUMBERLAND PURCHASE," PREPARED BY SQUAW BAY CORP. DATED MARCH 1994 AND RECORDED AT THE CCRD IN PLAN BOOK 194, PAGE 113.
   C. "STANDARD BOUNDARY SURVEY ON GREELY ROAD, CUMBERLAND, CUMBERLAND COUNTY, MAINE FOR THE TOWN OF CUMBERLAND, OWNER OF RECORD: GREGORY & KATHERINE FOWLER," PREPARED BY WALT DUNLAP, PLS, DATED SEPTEMBER 18, 1996 AND RECORDED AT THE CCRD IN PLAN BOOK 196, PAGE 334.
   D. "DIVISION OF PROPERTY, 223 TUTTLE ROAD, CUMBERLAND, MAINE, MADE FOR GREG VINING, MARCH 1, 2010 BY CULLENBERG LAND SURVEYING," RECORDED AT THE CCRD IN PLAN BOOK 210, PAGE 61.
   E. "TUTTLE ROAD LOT, CUMBERLAND, MAINE, STANDARD BOUNDARY SURVEY," PREPARED BY HARTY & HARTY PROFESSIONAL LAND SURVEYORS FOR WILLIAM R. GORMAN, DATED DECEMBER 1, 2010. UNRECORDED. PROJECT #10169.
   F. "PLAN OF A PRIVATE STREET ON TUTTLE ROAD IN CUMBERLAND, MAINE FOR OWNER OF RECORD: MICHAEL BUNKER," PREPARED BY WAYNE T. WOOD & CO. DATED MAY 2016, JOB #216074.
8. PLAN ORIENTATION IS GRID NORTH, MAINE STATE PLANE COORDINATE SYSTEM, WEST ZONE 1802-NAD83, ELEVATIONS DEPICTED HEREON ARE NAVD88, BASED ON DUAL FREQUENCY GPS OBSERVATIONS AND MAINE GIS.
9. THE LOCUS PROPERTY AS DEPICTED HEREON DOES FALL WITHIN A SPECIAL FLOOD HAZARD AREA AS DELINEATED ON THE FLOOD INSURANCE RATE MAP FOR CUMBERLAND, MAINE, CUMBERLAND COUNTY, COMMUNITY-PANEL NUMBER 23016200015B, HAVING AN EFFECTIVE DATE OF MAY 19, 1981. A PORTION OF THE LOCUS FALLS WITHIN AN AREA IDENTIFIED AS ZONE B, AREAS BETWEEN LIMITS OF 100-YEAR FLOOD AND 500-YEAR FLOOD. THE REMAINING PORTION OF THE LOCUS PROPERTY FALLS WITHIN AN AREA IDENTIFIED AS ZONE C, AREAS OF MINIMAL FLOODING.
10. A WETLAND DELINEATION WAS PERFORMED ON THIS PROJECT SITE IN JULY 2018 BY DAVID V. CHAPMAN, CERTIFIED SOIL SCIENTIST OF SEBAGO TECHNICS, INC. THIS DELINEATION CONFORMS TO THE STANDARDS AND METHODS OUTLINED IN THE 1987 WETLANDS DELINEATION MANUAL AND NORTHEAST REGIONAL SUPPLEMENT AUTHORED AND PUBLISHED BY THE U.S. ARMY CORPS OF ENGINEERS. ALL WETLAND FLAGS WERE LOCATED USING GLOBAL POSITIONING SYSTEMS (GPS) TECHNOLOGY CAPABLE OF DECIMETER ACCURACY. SEE "WETLAND DELINEATION, TUTTLE ROAD, CUMBERLAND" SOILS REPORT DATED JULY 23, 2018 AND PREPARED BY SEBAGO TECHNICS, INC. PROJECT #18280. WETLANDS ARE APPROXIMATE ONLY.
11. STREAMS SHOWN HEREON WERE INTERPOLATED FROM 2006 LIDAR DATA AND ARE APPROXIMATE ONLY.
12. DUE TO A LACK OF ORIGINAL MONUMENTS AND EVIDENCE OF PROPERTY LINE LOCATIONS, A BOUNDARY LINE AGREEMENT IS RECOMMENDED ALONG THE INDICATED LINE.

APPROVED BY THE TOWN OF CUMBERLAND PLANNING BOARD

DATED: _____



LOCATION MAP N.T.S.

SURVEYOR'S STATEMENT

THIS SURVEY WAS PERFORMED UNDER MY DIRECT SUPERVISION AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT WAS DONE IN ACCORDANCE WITH CHAPTER 90, PART 1 (PROFESSIONAL STANDARDS OF PRACTICE) AND PART 2 (TECHNICAL STANDARDS OF PRACTICE) OF THE MAINE BOARD OF LICENSURE FOR PROFESSIONAL LAND SURVEYORS.

JIMMY C. COURBRON, P.L.S #2532

_____
JIMMY C. COURBRON, PLS *DATE*

State of Maine, Cumberland ss
Registry of Deeds
Received _____ 20____
at___h___m___M and recorded in
Plan Book _____ Page ____
Attest:_____
Register

0 200 400 Feet

Jul 30, 2019 - 2:51pm
C:\Users\Zachary Quinn\AppData\Local\Temp\AcPublish_21716\18-015 Cumberland.dwg

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE THOMAS W. PERKINS No. 11710 REGISTERED PROFESSIONAL ENGINEER

SUBDIVISON PLAN

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
DRAWN BY: ZTQ		CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way,
Suite 2
Turner, ME 04282

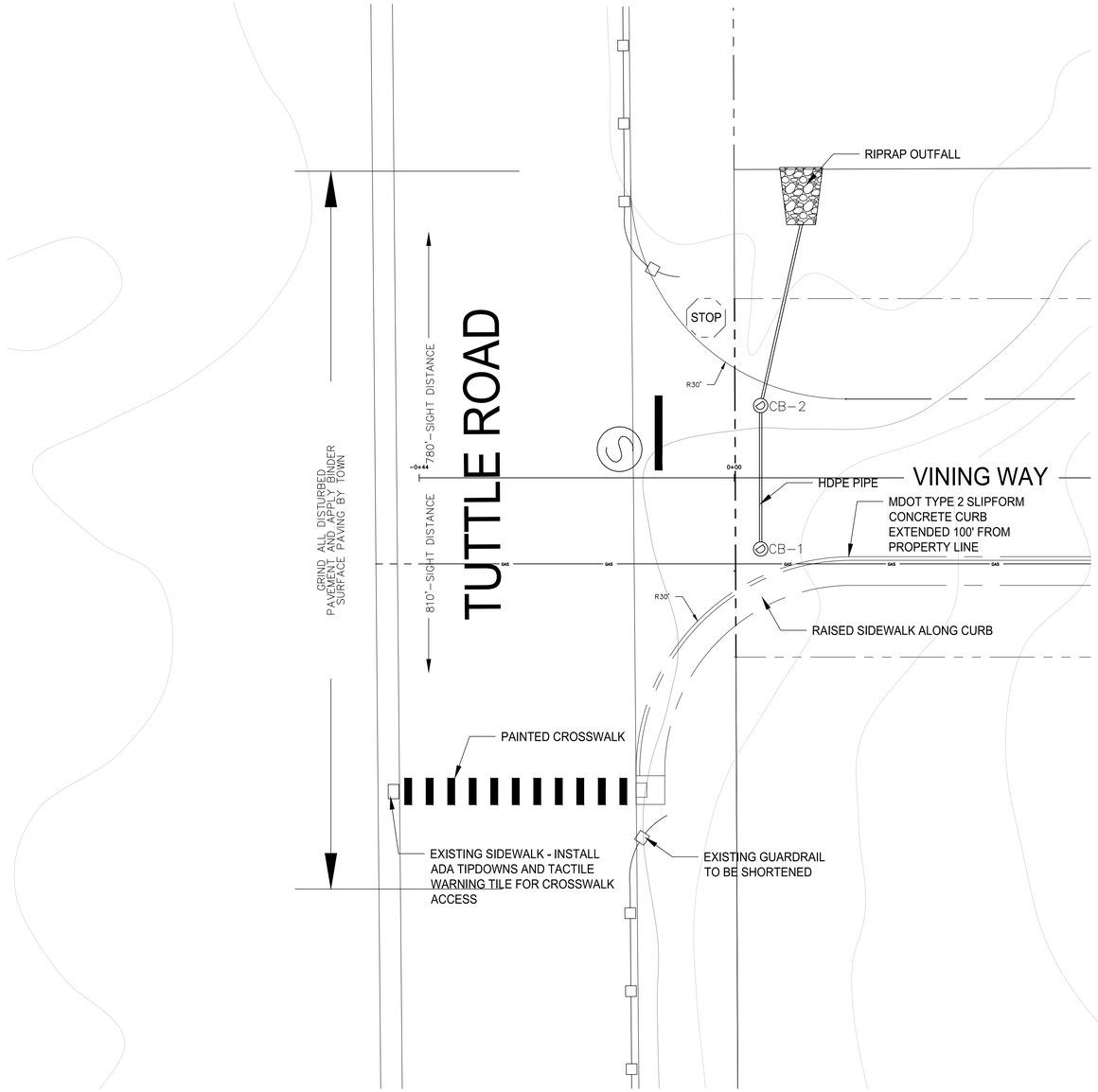
DIRIGO ARCHITECTURAL ENGINEERING + CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019

PROJECT NO. 18-015

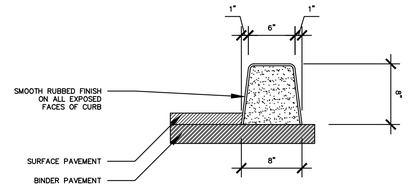
SHEET NO.

C2.0

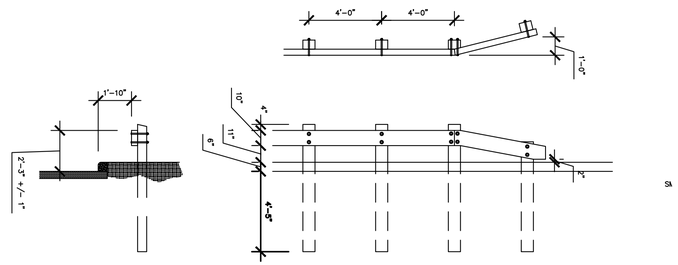


ENLARGED ENTRANCE PLAN — 1 / C2.1

22X34 SCALE: 1"=10'
11X17 SCALE: 1"=20'



TYPICAL VERTICAL SLIPFORM CURB 6" X 8" — 2 / C2.1



TIMBER GUARDRAIL NOTES:
POSTS: 6X10 PT
RAILS: 4X10 PT
BOLTS: $\frac{3}{4}$" X 12" GALVANIZED

TIMBER GUARDRAIL — 3 / C2.1

CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

ENLARGED ENTRANCE PLAN

REV.	DATE:	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

DRAWN BY: ZTQ | CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way,
Suite 2
Turner, ME 04282

DIRIGO ARCHITECTURAL
ENGINEERING ▪ CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019

PROJECT NO. 18-015

SHEET NO.
C2.1

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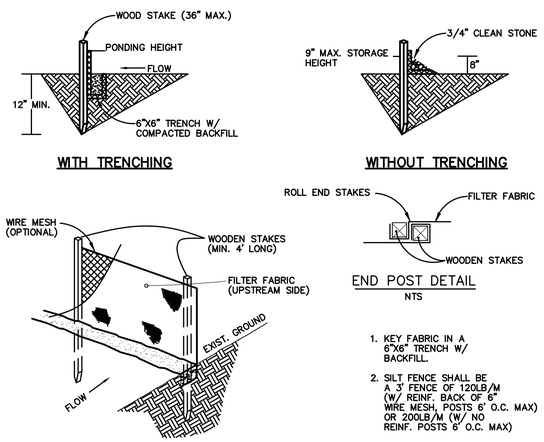
LEGEND

SILT FENCE / COMPOST SOCK

WETLANDS

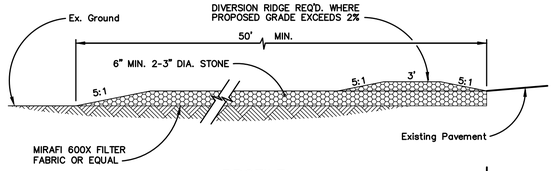


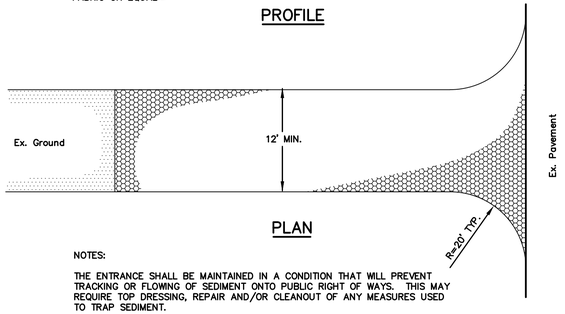
1. KEY FABRIC IN A 6"X6" TRENCH W/ BACKFILL.
2. SILT FENCE SHALL BE A 3' FENCE OF 120LB/M (W/ REINF. BACK OF 6" WIRE MESH, POSTS 6' O.C. MAX) OR 200LB/M (W/ NO REINF. POSTS 6' O.C. MAX)

SILT FENCE DETAIL
N.T.S.

EROSION CONTROL PLAN
22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200'

1 / C2.2





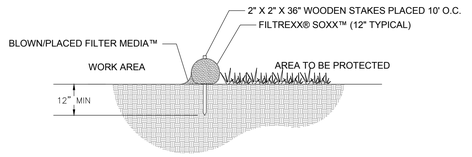
NOTES:

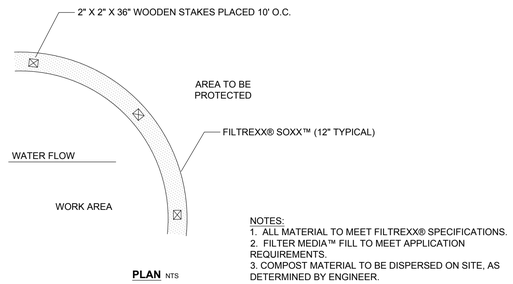
THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT OF WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT OF WAY.

WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

STABILIZED CONSTRUCTION ENTRANCE
NTS





NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

COMPOST SOCK FOR SEDIMENT CONTROL
NTS

CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

EROSION CONTROL PLAN

REV.	DATE	DESCRIPTION
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DRAWN BY: ZTQ | CHECKED BY: TWP

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7 Cobblestone Way,
Suite 2
Turner, ME 04282

DIRIGO ARCHITECTURAL
ENGINEERING • CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019

PROJECT NO. 18-015

SHEET NO.
C2.2

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EROSION AND SEDIMENT CONTROL PLAN

THIS PLAN HAS BEEN DEVELOPED AS A STRATEGY TO CONTROL SOIL EROSION AND SEDIMENTATION DURING AND AFTER CONSTRUCTION. THIS PLAN IS BASED ON THE STANDARDS AND SPECIFICATIONS FOR EROSION PREVENTION IN DEVELOPING AREAS AS CONTAINED IN THE LATEST REVISION OF TO THE 2016 MAINE EROSION AND SEDIMENT CONTROL BMP'S MANUAL FOR DESIGNERS AND ENGINEERS, AND THE LATEST REVISION TO THE 2014 MAINE EROSION AND SEDIMENT CONTROL FIELD GUIDE FOR CONTRACTORS. SEE MANUALS FOR ADDITIONAL INFORMATION AND DETAILS.

THE PROPOSED LOCATIONS OF SILTATION AND EROSION CONTROL STRUCTURES ARE SHOWN ON THE SITE PLAN.

1. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE IN ACCORDANCE WITH THE "MAINE EROSION AND SEDIMENT CONTROL BMP'S", DEPARTMENT OF ENVIRONMENTAL PROTECTION, LATEST REVISION.
2. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION WILL BE LEFT IN AN UNTREATED OR UNVEGETATED CONDITION FOR A MINIMUM TIME. AREAS SHALL BE PERMANENTLY STABILIZED WITHIN 7 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 7 DAYS OF INITIAL DISTURBANCE OF THE SOIL. IF THE DISTURBANCE IS WITHIN 75 FEET OF A WETLAND OR WATERBODY, THE AREA SHALL BE STABILIZED WITHIN 2 DAYS OR PRIOR TO ANY STORM EVENT, WHICHEVER COMES FIRST.
3. EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRES OF THE SITE IS WITHOUT STABILIZATION AT ANY ONE TIME.
4. EXPOSED AREA SHOULD BE LIMITED TO THAT WHICH CAN BE MULCHED IN ONE DAY.
5. CONTINUATION OF EARTHWORK OPERATIONS ON ADDITIONAL AREAS SHALL NOT BEGIN UNTIL THE EXPOSED SOIL SURFACE ON THE AREA BEING WORKED HAS BEEN STABILIZED SUCH THAT NO MORE THAN ONE ACRE OF THE SITE IS WITHOUT EROSION CONTROL PROTECTION.
6. SEDIMENT BARRIERS (EROSION CONTROL MIX, STONE CHACK DAMS, STABILIZED CONSTRUCTION ENTRANCE, ETC.) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF THE CONTRIBUTING DRAINAGE AREA ABOVE THEM. THE CONTRACTOR SHALL MAINTAIN THE STABILIZED CONSTRUCTION ENTRANCE UNTIL ALL DISTURBED AREAS ARE STABILIZED.
7. INSTALL EROSION CONTROL MIX AT TOE OF SLOPES TO FILTER SILT FROM RUNOFF. SEE E.C. MIX DETAIL FOR PROPER INSTALLATION. EROSION CONTROL MIX WILL REMAIN IN PLACE PER NOTE #5. THE USE OF AN EROSION CONTROL MIX BERM IS PROHIBITED AT THE BASE OF SLOPES STEEPER THAN 8% OR WHERE THERE IS FLOWING WATER.
8. ALL ERSOION CONTROL STRUCTUREES WILL BE INSPECTED, REPLACED, AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY BEFORE AND FOLLOWING ANY SIGNIFICANT RAINFALL (ONE INCH OR MORE IN A 24-HOUR PERIOD) OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSURE. IF AN INSPECTION DETERMINES THAT A CORRECTIVE ACTION IS REQUIRED, THE ACTION OR REPAIR SHALL BE STARTED BY THE END OF THE NEXT WORKDAY AND COMPLETED WITHIN SEVEN DAYS OR BEFORE THE NEXT STORM EVENT. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE HALF THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE STABILIZED BY TURF. EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS OF PERMANENT STABILIZATION. PERMANENT STABILIZATION IS 90% GRASS CATCH IN VEGETATED AREAS.
9. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL BE STEEPER THAN ONE AND ONE HALF TO ONE (1.5 TO 1).
10. IF FINAL SEEDING OF THE DISTURBED AREAS IS NOT COMPLETED 45 DAYS PRIOR TO THE FIRST KILLING FROST, USE TEMPORARY MULCHING (DORMANT SEEDING MAY BE ATTEMPTED AS WELL) TO PROTECT THE SITE AND DELAY SEEDING UNTIL THE NEXT RECOMMENDED SEEDING PERIOD.
11. TEMPORARY SEEDING OF DISTURBED AREAS THAT HAVE NOT BEEN FINAL GRADED SHALL BE COMPLETED BY AUG. 15 OR 45 DAYS PRIOR TO THE FIRST KILLING FROST (OCT. 1) TO PROTECT FROM SPRING RUNOFF PROBLEMS.
12. DURING THE CONSTRUCTION PHASE, INTERCEPTED SEDIMENT WILL BE RETURNED TO THE SITE AND REGRADED ONTO OPEN AREAS. POST SEEDING SEDIMENT, IF ANY WILL BE DISPOSED OF IN AN ACCEPTABLE MANNER.
13. REVEGETATION MEASURES WILL COMMENCE UPON COMPLETION OF CONSTRUCTION EXCEPT AS NOTED ABOVE. ALL DISTURBED AREAS NOT OTHERWISE STABILIZED WILL BE GRADED, SMOOTHED, AND PREPARED FOR FINAL SEEDING AS FOLLOWS:
    a. FOUR INCHES OF LOAM WILL BE SPREAD OVER DISTURBED AREAS AND SMOOTHED TO A UNIFORM SURFACE.
    b. APPLY LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST. IF SOIL TESTING IS NOT FEASIBLE ON SMALL OR VARIABLE SITES, OR WHERE TIMING IS CRITICAL, FERTILIZER MAY BE APPLIED AT THE RATE OF 800 POUNDS PER ACRE OR 18.4 POUNDS PER 1,000 SQUARE FEET USING 10–20–20 (N–P205–K20) OR EQUIVALENT. APPLY GROUND LIMESTONE (EQUIVALENT TO 50% CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS PER ACRE (138 LB PER 1,000 SQ. FT.).
    c. FOLLOWING SEED BED PREPARATION, DITCHES AND BACK SLOPES WILL BE SEEDED TO A MIXTURE OF 47% CREEPING RED FESCUE, 5% REDTOP, AND 48% TALL FESCUE. THE LAWN AREAS WILL BE SEEDED TO A PREMIUM TURF MIXTURE OF 44% KENTUCKY BLUEGRASS, 44% CREEPING RED FESCUE, AND 12% PERENNIAL RYEGRASS: SEEDING RATE IS 1.03 LBS PER 1000 SQ. FT. LAWN QUALITY SOD MAY BE SUBSTITUTED FOR SEED. SEED MIX SHALL CONTAIN 10% ANNUAL RYE GRASS.
    d. HAY MULCH AT THE RATE OF 70–90 LBS PER 1000 SQUARE FEET OR A HYDRO–APPLICATION OF ASPHALT, WOOD OR PAPER FIBER SHALL BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SUCH AS CURASOL OR RMB PLUS WILL BE USED ON HAY MULCH FOR WIND CONTROL.
14. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS ONCE THE SITE IS STABILIZED WITH 90% GRASS CATCH IN VEGETATED AREAS. TEMPORARY EROSION AND SEDIMENT CONTROL BLANKET SHALL BE USED IN ALL DITCHES AND SWALES AS SHOWN IN DETAILS.
15. WETLANDS WILL BE PROTECTED WITH EROSION CONTROL MIX OR SILT FENCE INSTALLED AT THE EDGE FOR THE WETLAND OR THE BOUNDARY OF WETLAND DISTURBANCE. ALL AREAS WITHIN 75 FEET OF A PROTECTED NATURAL RESOURCE MUST BE PROTECTED WITH A DOUBLE ROW OF SEDIMENT BARRIERS DURING WINTER CONSTRUCTION.
16. ALL STORMWATER WILL BE PREVENTED FROM RUNNING ONTO STOCKPILES. SADIMENT BARRIERS WILL BE INSTALLED DOWNGRADIENT OF ALL STOCKPILES.
17. PERMANENT POST-CONSTRUCTION BMP'S (VEGETATED SWALES, WET PONDS, ETC.) WILL NOT BE USED TO MANAGE FLOWS DURING CONSTRUCTION WITHOUT SPECIAL PROTECTION AND/OR RESTORATION.

MULCH AND MULCH ANCHORING

MULCH

LOCATION	MULCH	RATE (1000 S.F.)
PROTECTED AREA	STRAW OR HAY *	100 POUNDS
WINDY AREAS	SHREDDED OR CHOPPED CORNSTALKS	185–275 POUNDS
	STRAW OR HAY (ANCHORED) *	100 POUNDS
MODERATE TO HIGH VELOCITY AREAS OR STEEP SLOPES (GREATER THAN OR EQUAL TO 3:1)	JUTE MESH OR EXCELSIOR MAT	AS REQUIRED AS REQUIRED

(GREATER THAN OR EQUAL TO 3:1)

* A HYDRO–APPLICATION OF ASPHALT, WOOD, OR PAPER FIBER MAY BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SUCH AS CURASOL OR RMB PLUS SHALL BE USED ON HAY MULCH FOR WIND CONTROL.

MULCH ANCHORING

ANCHOR MULCH WITH PEG AND TWINE (1 SQ. YD./BLOCK); MULCH NETTING (AS PER MANUFACTURED; WOOD CELLULOSE FIBER (750 LBS/ACRE); USE OF A SERRATED STRAIGHT DISK. WETTING FOR SMALL AREAS AND ROAD DITCHES MAY BE PERMITTED.

Additional temporary seed mixture (for periods less than 12 months).

Season	Seed	Rate
Summer (5/15 – 8/15)	Sudangrass Oats	40 lbs/acre 80 lbs/acre
Late Summer/Early Fall (8/15 – 9/15)	Prennial Ryegrass	40 lbs/acre
Fall (9/15 – 11/1)	Winter Rye	112 lbs/acre
Winter (11/1 – 4/1)	Mulch w/ Dormant Seed	80 lbs/acre*
Spring (4/1 – 7/1)	Oats Annual Ryegrass	80 lbs/acre 40 lbs/acre

*Seed Rate Only

EROSION CONTROL DURING CONSTRUCTION

WINTER CONSTRUCTION

1. WINTER CONSTRUCTION PERIOD: OCTOBER 1 THROUGH APRIL 15
2. OVERWINTER STABILIZATION OF DITCHES AND CHANNELS:
   ALL STONE-LINED DITCHES AND CHANNELS MUST BE CONSTRUCTED AND STABILIZED BY NOVEMBER 15. ALL GRASS LINED DITCHES AND CHANNELS MUST BE CONSTRUCTED AND STABILIZED BY SEPTEMBER 1. IF A DITCH OR CHANNEL IS NOT GRASS-LINED BY SEPTEMBER 1, THEN ONE OF THE FOLLOWING ACTIONS MUST BE TAKEN TO STABILIZE THE DITCH FOR LATE FALL AND WINTER.
   A. INSTALL A SOD LINING IN THE DITCH:
   A DITCH MUST BE LINED WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES: PINNING THE SOD ONTO THE SOIL WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL, AND ANCHORING SOD AT THE BASE OF THE DITCH WITH JUTE OR PLASTIC MESH TO PREVENT THE SOD FROM SLOUGHING DURING FLOW CONDITIONS. SEE THE PERMANENT VEGETATION BMP SECTION.
   B. INSTALL A STONE LINING IN THE DITCH:
   A DITCH MUST BE LINED WITH STONE RIPRAP BY NOVEMBER 15. A REGISTERED PROFESSIONAL ENGINEER MUST BE HIRED TO DETERMINE THE STONE SIZE AND LINING THICKNESS NEEDED TO WITHSTAND THE ANTICIPATED FLOW VELOCITIES AND FLOW DEPTHS WITHIN THE DITCH. IF NECESSARY, THE CONTRACTOR WILL REGRADE THE DITCH PRIOR TO PLACING THE STONE LINING SO TO PREVENT THE STONE LINING FROM REDUCING THE DITCH'S CROSS-SECTIONAL AREA.
3. OVERWINTER STABILIZATION OF DISTURBED SLOPES:
   ALL STONE-COVERED SLOPES MUST BE CONSTRUCTED AND STABILIZED BY NOVEMBER 15. ALL SLOPES TO BE VEGETATED MUST BE SEEDED AND MULCHED BY SEPTEMBER 1. THE DEPARTMENT WILL CONSIDER ANY AREA HAVING A GRADE GREATER THAN 15% TO BE A SLOPE. IF A SLOPE TO BE VEGETATED IS NOT STABILIZED BY SEPTEMBER 1, THEN ONE OF THE FOLLOWING ACTIONS MUST BE TAKEN TO STABILIZE THE SLOPE FOR LATE FALL AND WINTER. STABILIZE THE SOIL WITH TEMPORARY VEGATATION AND EROSION CONTROL MATS. BY OCTOBER 1 THE DISTURBED SLOPE MUST BE SEEDED WITH WINTER RYE AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET AND THEN INSTALL EROSION CONTROL MATS OR ANCHORED MULCH OVER THE SEEDING. IF THE RYE FAILS TO GROW AT LEAST THREE INCHES OR FAILS TO COVER AT LEAST 75% OF THE SLOPE BY NOVEMBER 1, THEN THE CONTRACTOR WILL COVER THE SLOPE WITH A LAYER OF EROSION CONTROL MIX OR WITH STONE RIPRAP AS DESCRIBED IN THE FOLLOWING STANDARDS.
   A. STABILIZE THE SOIL WITH SOD:
   THE DISTURBED SLOPE MUST BE STABILIZED WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES THE CONTRACTOR PINNING THE SOD ONTO THE SLOPE WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, AND WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL. THE CONTRACTOR WILL NOT USE LATE SEASON SOD INSTALLATION TO STABILIZE SLOPES HAVING A GRADE GREATER THAN 33% (3H:1V) OR HAVING GROUNDWATER SEEPS ON THE SLOPE FACE.
   B. STABILIZE THE SOIL WITH EROSION CONTROL MIX:
   EROSION CONTROL MIX MUST BE PROPERLY INSTALLED BY NOVEMBER 15. THE CONTRACTOR WILL NOT USE EROSION CONTROL MIX TO STABILIZE SLOPES HAVING GREATER THAN 50% (2H:1V) OR HAVING GROUNDWATER SEEPS ON THE SLOPE FACE. SEE THE TEMPORARY MULCHING BMP SECTION.
   C. STABILIZE THE SOIL WITH STONE RIPRAP:
   PLACE A LAYER OF STONE RIPRAP ON THE SLOPE BY NOVEMBER 15. THE DEVELOPMENT'S OWNER WILL HIRE A REGISTERED PROFESSIONAL ENGINEER TO DETERMINE THE STONE SIZE NEEDED FOR STABILITY ON THE SLOPE AND TO DESIGN A FILTER LAYER FOR UNDERNEATH THE RIPRAP. SEE THE RIPRAP SLOPE STABILLIZATION BMP SECTION.
4. OVERWINTER STABILIZATION OF DISTURBED SOILS:
   BY SEPTEMBER 15, ALL DISTURBED SOILS ON AREAS HAVING A SLOPE LESS THAN 15% MUST BE SEEDED AND MULCHED. IF THE DISTURBED AREAS ARE NOT STABILIZED BY THIS DATE, THEN ONE OF THE FOLLOWING ACTIONS MUST BE TAKEN TO STABILIZE THE SOIL FOR LATE FALL AND WINTER.
   A. STABILIZE THE SOIL WITH TEMPORARY VEGETATION:
   BY OCTOBER 1, SEED THE DISTURBED SOIL WITH WINTER RYE AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET, LIGHTLY MULCH THE SEEDED SOIL WITH HAY OR STRAW AT 75 POUNDS PER 1000 SQUARE FEET, AND ANCHOR THE MULCH WITH PLASTIC NETTING. MONITOR GROWTH OF THE RYE OVER THE NEXT 30 DAYS. IF THE RYE FAILS TO GROW AT LEAST THREE INCHES OR FAILS TO COVER AT LEAST 75% OF THE DISTURBED SOILD BEFORE NOVEMBER 1, THEN MULCH THE AREA FOR OVER-WINTER PROTECTION AS DESCRIBED BELOW.
   B. STABILIZE THE SOIL WITH SOD:
   STABILIZE THE DISTURBED SOIL WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES PINNING THE SOD ONTO THE SOIL WITH WIRE PINS, ROLLINIG THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, AND WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL.
   C. STABILIZE THE SOIL WITH MULCH:
   BY NOVEMBER 15, MULCH THE DISTURBED SOIL BY SPREADING HAY OR STRAW AT A RATE OF AT LEAST 150 POUNDS PER 1000 SQUARE FEET ON THE AREA SO THAT NO SOIL IS VISIBLE THROUGH THE MULCH. IMMEDIATELY AFTER APPLYING THE MULCH, ANCHOR THE MULCH WITH PLASTIC NETTING TO PREVENT WIND FROM MOVING THE MULCH OFF THE DISTURBED SOIL.
5. MAINTENANCE:
   IF AN INSPECTION DETERMINES THAT A CORRECTIVE ACTION IS REQUIRED, THE ACTION OR REPAIR SHALL BE STARTED BY THE END OF THE NEXT WORKDAY AND COMPLETED WITHIN SEVEN DAYS OR BEFORE THE NEXT STORM EVENT. MAINTENANCE MEASURES SHALL BE APPLIED AS NEEDED DURING THE ENTIRE CONSTRUCTION SEASON. ONCE A WEEK AND BEFORE AND AFTER EACH RAINFALL, SNOW STORM OR PERIOD OF THAWING AND RUNOFF, THE SITE CONTRACTOR SHALL PERFORM A VISUAL INSPECTION OF ALL INSTALLED EROSION CONTROL MEASURES AND PERFORM REPAIRS AS NEEDED TO INSURE THEIR CONTINUOUS FUNCTION. FOLLOWING THE TEMPORARY AND/OR FINAL SEEDING AND MULCHING, THE CONTRACTOR SHALL, IN THE SPRING, INSPECT AND REPAIR ANY DAMAGES AND/OR BARE SPOTS. AN ESTABLISHED VEGETATIVE COVER MEANS A MINIMUM OF 85 TO 90% OF AREAS VEGETATED WITH VIGOROUS GROWTH.

   STABILIZATION SCHEDULE BEFORE WINTER:

SEPTEMBER 15	ALL DISTURBED AREAS MUST BE SEEDED AND MULCHED. ALL SLOPES MUST BE STABILIZED, SEEDED AND MULCHED. ALL GRASS LINED DITCHES AND CHANNELS MUST BE STABILIZED WITH MULCH OR AN EROSION CONTROL BLANKET
OCTOBER 1	IF THE SLOPE IS STABILIZED WITH AN EROSION CONTROL BLANKET AND SEEDED. ALL DISTURBED AREAS TO BE PROTECTED WITH AN ANNUAL GRASS MUST BE SEEDED AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET AND MULCHED.
NOVEMBER 15	ALL STONE LINED DITCHES AND CHANNELS MUST BE CONSTRUCTED AND STABILIZED. SLOPES THAT ARE COVERED WITH RIPRAP MUST BE CONSTRUCTED BY THAT DATE.

6. DURING WINTER CONSTRUCTION PERIOD ALL SNOW SHALL BE REMOVED FROM AREAS OF SEEDING AND MULCHING PRIOR TO PLACEMENT.
7. AREAS WITHIN 100 FEET OF STREAMS THAT ARE NOT STABILIZED WITH VEGETATION BY DEC. 1 SHALL BE MULCHED AND ANCHORED WITH NETTING. IF WORK CONTINUES IN THIS AREA DURING THE WINTER, A DOUBLE LINE OF SEDIMENT BARRIERS MUST BE USED.

HOUSEKEEPING:

1. SPILL PREVENTION. CONTROLS MUST BE USED TO PREVENT POLLUTANTS FROM BEING DISCHARGED FROM MATERIALS ON SITE, INCLUDING STORAGE PRACTICES TO MINIMIZE EXPOSURE OF THE MATERIALS TO STORMWATER, AND APPROPRIATE SPILL PREVENTION, CONTAINMENT, AND RESPONSE PLANNING AND IMPLEMENTATION.
2. GROUNDWATER PROTECTION. DURING CONSTRUCTION, LIQUID PETROLEUM PRODUCTS AND OTHER HAZARDOUS MATERIALS WITH THE POTENTIAL TO CONTAMINATE GROUNDWATER MAY NOT BE STORED OR HANDLED IN AREAS OF THE SITE DRAINING TO AN INFILTRATION AREA. AN "INFILTRATION AREA" IS ANY AREA OF THE SITE THAT BY DESIGN OR AS A RESULT OF SOILS, TOPOGRAPHY, AND OTHER RELEVANT FACTORS ACCUMULATES RUNOFF THAT INFILTRATES INTO THE SOIL. DIKES, BERMS, SUMPS, AND OTHER FORMS OF SECONDARY CONTAINMENT THAT PREVENT DISCHARGE TO GROUNDWATER MAY BE USED TO ISOLATE PORTIONS OF THE SITE FOR THE PURPOSES OF STORAGE AND HANDLING OF THESE MATERIALS.
3. FUGITIVE SEDIMENT AND DUST. ACTIONS MUST BE TAKEN TO ENSURE THAT ACTIVITIES DO NOT RESULT IN NOTICEABLE EROSION OF SOILS OR FUGITIVE DUST EMISSIONS DURING OR AFTER CONSTRUCTION. OIL MY NOT BE USED FOR DUST CONTROL. ANY OFFSITE TRACKING OF MUD OR SEDIMENT SHALL BE VACUUMED IMMEDIATELY AND PRIOR TO THE NEXT SIGNIFICANT STORM EVENT.
4. DEBRIS AND OTHER MATERIALS. LITTER, CONSTRUCTION DEBRIS, AND CHEMICALS EXPOSED TO STORMWATER MUST BE PREVENTED FROM BECOMING A POLLUTANT SOURCE.
5. TRENCH OR FOUNDATION DE-WATERING. TRENCH DE-WATERING IS THE REMOVAL OF WATER FROM TRENCHES, FOUNDATIONS, COFFER DAMS, PONDS, AND OTHER AREAS WITHIN THE CONSTRUCTION AREA THAT RETAIN WATER AFTER EXCAVATION. IN MOST CASES THE COLLECTED WATER IS HEAVILY SILTED AND HINDERS CORRECT SAFE CONSTRUCTION PRACTICES. THE COLLECTED WATER MUST BE REMOVED FROM THE PONDED AREA, EITHER THROUGH GRAVITY OR PUMPING, AND MUST BE SPREAD THROUGH NATURAL WOODED BUFFERS OR REMOVED TO AREAS THAT ARE SPECIFICALLY DESIGNED TO COLLECT THE MAXIMUM AMOUNT OF SEDIMENT POSSIBLE, LIKE A COFFERDAM SEDIMENTATION BASIN AVOID ALLOWING THE WATER TO FLOW OVER DISTURBED AREAS OF THE SITE. EQUIVALENT MEASURES MAY BE TAKEN IF APPROVED BY THE DEPARTMENT.
6. NON-STORMWATER DISCHARGES. IDENTIFY AND PREVENT CONTAMINATION BY NON-STORMWATER DISCHARGES. WHERE ALLOWED NON-STORMWATER DISCHARGES EXIST, THEY MUST BE IDENTIFIED AND STEPS SHOULD BE TAKEN TO ENSURE THE IMPLEMENTATION OF APPROPRIATE POLLUTION PREVENTION MEASURES FOR THE NON-STORMWATER COMPONENT(S) OF THE DISCHARGE. AUTHORIZED NON-STORMWATER DISCHARGES ARE:
   - DISCHARGES FROM FIREFIGHTING ACTIVITY;
   - FIRE HYDRANT FLUSHINGS;
   - VEHICLE WASHWATER IF DETERGENTS ARE NOT USED AND WASHING IS LIMITED TO THE EXTERIOR OF VEHICLES (ENGINE, UNDERCARRIAGE AND TRANSMISSION WASHING IS PROHIBITED);
   - DUST CONTROL RUNOFF IN ACCORDANCE WITH PERMIT CONDITIONS AND APPENDIX (C)(3);
   - ROUTINE EXTERNAL BUILDING WASHDOWN, NOT INCLUDING SURFACE PAINT REMOVAL, THAT DOES NOT INVOLVE DETERGENTS;
   - PAVEMENT WASHWATER (WHERE SPILLS/LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE NOT OCCURRED, UNLESS ALL SPILLED MATERIAL HAD BEEN REMOVED) IF DETERGENTS ARE NOT USED;
   - UNCONTAMINATED AIR CONDITIONING OR COMPRESSOR CONDENSATE;
   - UNCONTAMINATED GROUNDWATER OR SPRING WATER;
   - FOUNDATION OR FOOTER DRAIN-WATER WHERE FLOWS ARE NOT CONTAMINATED;
   - UNCONTAMINATED EXCAVATION DEWATERING (SEE REQUIREMENTS IN APPENDIX C(5));
   - POTABLE WATER SOURCES INCLUDING WATERLINE FLUSHINGS; AND
   - LANDSCAPE IRRIGATION.
7. UNAUTHORIZED NON-STORMWATER DISCHARGES. THE DEPARTMENT'S APPROVAL UNDER THIS CHAPTER DOES NOT AUTHORIZE A DISCHARGE THAT IS MIXED WITH A SOURCE OF NON STORMWATER, OTHER THAN THOSE DISCHARGES IN COMPLIANCE WITH APPENDIX C (6). SPECIFICALLY, THE DEPARTMENT?S APPROVAL DOES NOT AUTHORIZE DISCHARGES OF THE FOLLOWING:
   - WASTEWATER FROM THE WASHOUT OR CLEANOUT OF CONCRETE, STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS OR OTHER CONSTRUCTION MATERIALS;
   - FUELS, OILS OR OTHER POLLUTANTS USED IN VEHICLE AND EQUIPMENT OPERATION AND MAINTENANCE;
   - SOAPS, SOLVENTS, OR DETERGENTS USED IN VEHICLE AND EQUIPMENT WASHING; AND
   - TOXIC OR HAZARDOUS SUBSTANCES FROM A SPILL OR OTHER RELEASE.
8. ADDITIONAL REQUIREMENTS. ADDITIONAL REQUIREMENTS MAY BE APPLIED ON A SITE-SPECIFIC BASIS.

DEWATERING PROCEDURE:

SITE DEWATERING SHOULD BE COMPLETED IN ACCORDANCE WITH THE MAINE EROSION AND SEDIMENT CONTROL – BMP SECTION A–8 (CONSTRUCTION DEWATERING) DATED OCTOBER 2016 AS SUMMARIZED BELOW:

CONSIDERATIONS:

1. THE DISCHARGE AREAS SHOULD BE CHOSEN WITH CAREFUL CONSIDERATION TO DOWN GRADIENT WATER RESOURCES AND THE LANDSCAPE ABILITY TO TREAT WATER FLOWS FROM THE DEWATERING PROCESS. A WOODED BUFFER IS BEST. ALL BUFFER REQUIREMENTS ARE FOUND IN THE VEGETATED BUFFER BMP SECTION. THE DISCHARGE SHOULD BE STOPPED IMMEDIATELY IF THE RECEIVING AREA IS SHOWING ANY SIGNS OF UNSTABILITY OR EROSION.
2. IF THE COLLECTED RUNOFF IS CONTAMINATED WITH OIL, GREASE OR OTHER PETROLEUM PRODUCTS, OIL/WATER SEPARATOR OR A FILTRATION MECHANISM MAY BE NECESSARY PRIOR TO THE DISCHARGE. ANOTHER METHOD OF DISPOSAL SUCH AS CONTAINMENT AND TRUCKING AWAY BY A MAINE DEP LICENSED TRANSPORTER WILL NEED TO BE IMPLEMENTED IF THE WATER HAS BEEN CONTAMINATED BY TOXIC AND HAZARDOUS MATERIALS.
3. ALL REQUIREMENTS OF STATE LAW AND PERMIT REQUIREMENTS OF LOCAL, STATE AND FEDERAL AGENCIES MUST BE MET.

SPECIFICATIONS:

DEWATERING EXCAVATED AREAS MUST BE IN TWO DISTINCT PHASES. THE REMOVAL OF THE COLLECTED WATER WITHIN THE EXCAVATION AND THE TREATMENT OF THE COLLECTED WATER.

PHYSICAL DEWATERING

THE REMOVAL OF WATER FROM THE EXCAVATED AREA CAN BE ACCOMPLISHED BY NUMEROUS METHODS. THE MOST COMMON OF THESE ARE: GRAVITY DRAIN THROUGH DAYLIGHT CHANNELS, MECHANICAL PUMPING, SIPHONING, AND USING THE BUCKET OF CONSTRUCTION EQUIPMENT TO SCOOP AND DUMP WATER FROM THE EXCAVATION.

1. CHANNELS DUG DISHARGING WATER FROM THE EXCAVATED AREA NEED TO BE STABLE. IF FLOW VELOCITIES CAUSE EROSION WITHIN THE CHANNEL THEN DITCH LINING SHOULD BE USED.
2. BUCKETED WATER SHOULD BE DISHARGED IN A STABLE MANNER TO THE SEDIMENT REMOVAL AREA. A SPLASH PAD OF RIPRAP UNDERLAIN WITH GEOTEXTILE MAY BE NECESSARY TO PREVENT SCOURING OF THE SOIL IN THE BASIN.
3. DEWATERING IN PERIODS OF INTENSE, HEAVY RAIN, WHEN THE INFILTRATIVE CAPACITY OF THE SOIL IS EXCEEDED, SHOULD BE AVOIDED.

SEDIMENT REMOVAL:

MANY METHODS OF SETTLING OR FILTERING SEDIMENT ARE AVAILABLE FOR THE CONTRACTOR TO CONSIDER:

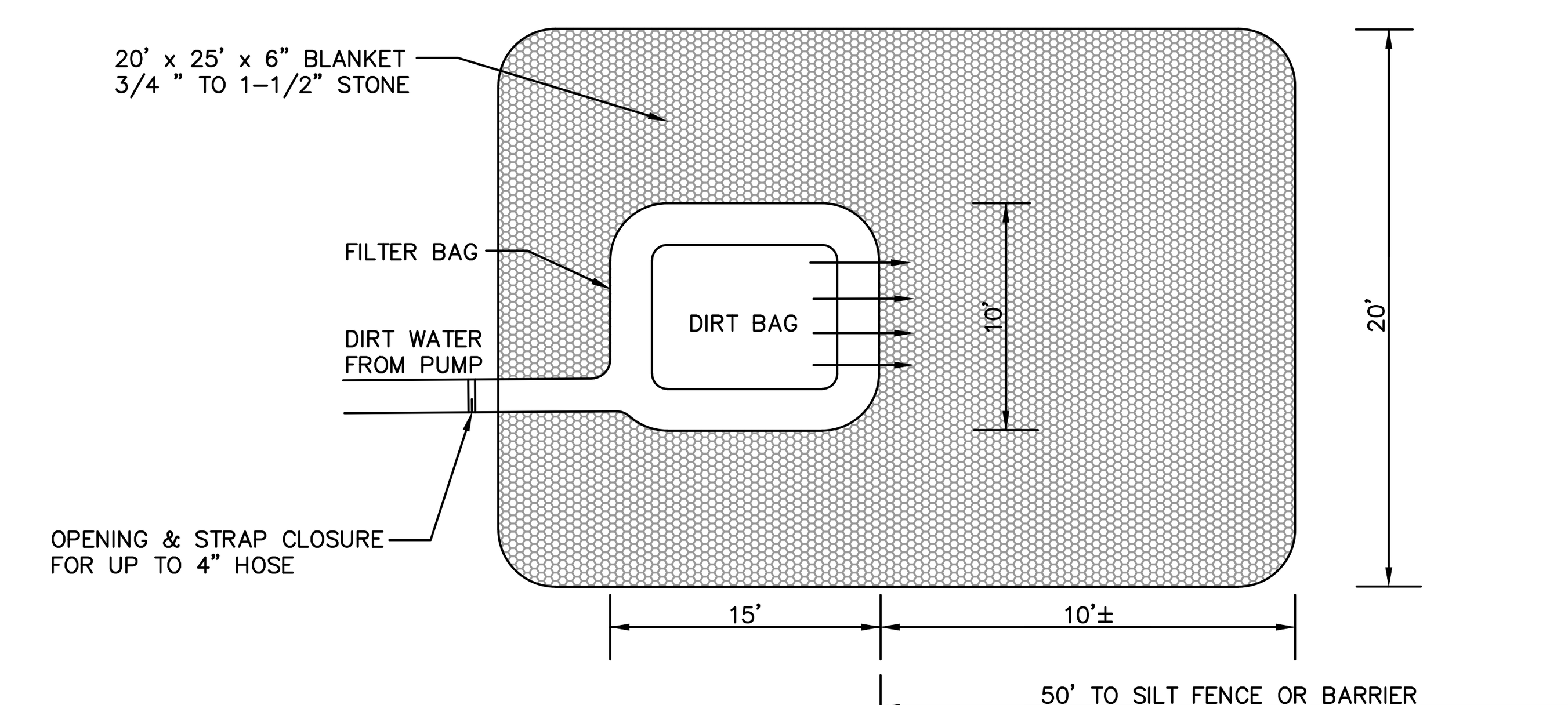
1. FLOW TO THE SEDIMENT REMOVAL STRUCTURE MAY NOT EXCEED THE SEDIMENT REMOVAL STRUCTURE'S CAPACITY TO SETTLE AND FILTER FLOW OR THE STRUCTURE'S VOLUME CAPACITY.
2. SEDIMENT REMOVAL BASINS SHOULD DISCHARGE WHEREVER POSSIBLE TO A WELL–VEGETATED BUFFER THROUGH SHEET FLOW AND SHOULD MAXIMIZE THE DISTANCE TO THE NEAREST WATER RESOURCE AND MINIMIZING THE SLOPE OF THE BUFFER AREA.
3. VARIOUS BASINS HAVE BEEN PROPOSED IN PAST PROJECTS:
   A. AN ENCLOSURE OF JERSEY BARRIERS WITH A LARGE PIECE OF SILT TAPE GEOTEXTILE.
   B. A TEMPORARY ENCLOSURE CONSTRUCTED WITH HAY BALES, SILT FENCE, OR BOTH. EROSION CONTROL MIX ALSO MAY BE INCORPORATED WITH SILT FENCE OR HAY BALES.
   C. DIRECT DISCHARGE TO A MANUFACTURED/PRE–MADE STRUCTURE SPECIFICALLY DESIGNED FOR SEDIMENT REMOVAL, LIKE SILT SAK, SILT BAG, OR OTHER SIMILAR PRODUCT.
   D. CONCRETE OR STEEL SETTLING CHAMBERED SYSTEMS FOR SEDIMENT REMOVAL.
   E. EXCAVATED OR BERMED SEDIMENTATION PONDS OR STRUCTURES. SIDE SLOPES NO GREATER THAN 2 TO 1, OR WITH A COMBINED INTERIOR AND EXTERIOR SLOPE OF NO GREATER THAN 5 TO 1. SEE THE SEDIMENT TRAP BMP SECTION.
   F. A STORMWATER DETENTION POND MAY BE USED AS A STILLING BASIN DURING CONSTRUCTION. HOWEVER, A SEDIMENT BARRIER NEEDS TO BE INSTALLED TO THE OUTLET STRUCTURE TO PREVENT THE DISCHARGE OF SEDIMENT. SEE THE SEDIMENT POND CONSTRUCTION BMP SECTION.

INSTALLATION REQUIREMENTS:

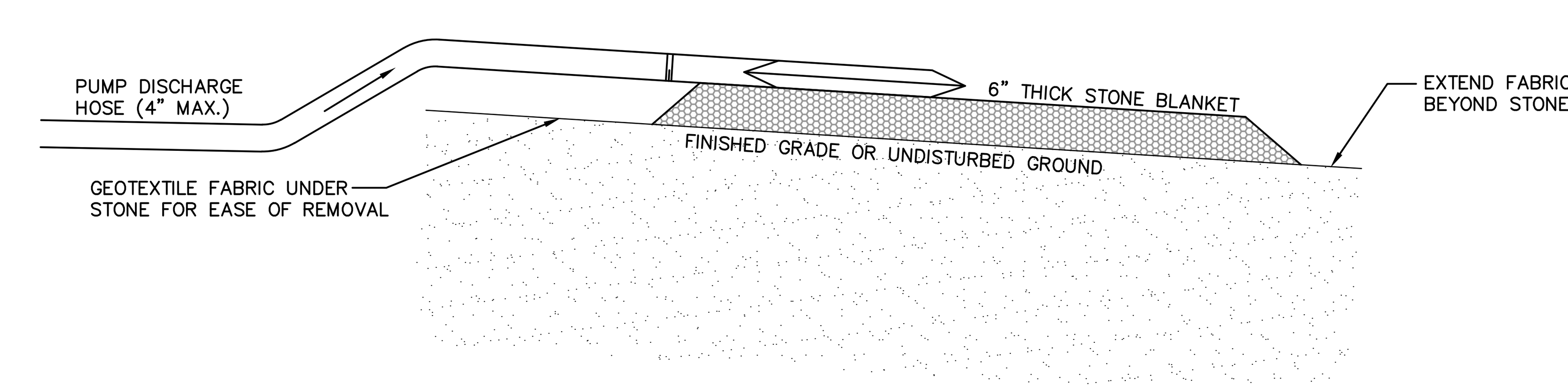
1. FOR TRENCH EXCAVATION, LIMIT THE TRENCH LENGTH TO 500 FEET AND PLACE THE EXCAVATED MATERIAL ON THE UP GRADIENT SIDE OF THE TRENCH.
2. INSTALL DIVERSION DITCHES OR BERMS TO MINIMIZE THE AMOUNT OF CLEAN STORMWATER RUNOFF ALLOWED INTO THE EXCAVATED AREA.
3. NEVER DISCHARGE TO AREAS THAT ARE BARE OR NEWLY VEGETATED.

MAINTENANCE:

DURING THE ACTIVE DEWATERING PROCESS, INSPECTION OF THE DEWATERING FACILITY SHOULD BE REVIEWED FREQUENTLY. SPECIAL ATTENTION SHOULD BE PAID TO THE BUFFER AREA FOR ANY SIGN OF EROSION AND CONCENTRATION OF FLOW THAT MAY COMPROMISE THE BUFFER AREA. OBSERVE WHERE POSSIBLE THE VISUAL QUALITY OF THE EFFLUENT AND DETERMINE IF ADDITIONAL TREATMENT CAN BE PROVIDED.



TOP VIEW



SIDE VIEW

NOTES:

1. DIRT BAG MATERIAL BASED ON PARTICLE SIZE IN DIRTY WATER, I.E. FOR COARSE PARTICLES A WOVEN MATERIAL; FOR SILTS/CLAYS A NON–WOVEN MATERIAL.
2. DO NOT OVER PRESSURIZE DIRT BAG OR USE BEYOND CAPACITY.
3. LOCATE DISCHARGE SITE ON FLAT UPLAND AREAS AS FAR AWAY AS POSSIBLE FROM STREAMS, WETLANDS, OTHER RESOURCES AND POINTS OF CONCENTRATED FLOW.
4. DOWN GRADIENT RECEIVING AREA MUST BE WELL VEGETATED OR OTHERWISE STABLE FROM EROSION, E.G. FOREST FLOOR OR COARSE GRAVEL/STONE.
5. DISCHARGE NOT PERMITTED WITHIN 25' OF A STREAM OR WETLAND. CONSULT DEP IF STRUCTURE MUST BE WITHIN 75' OF STREAM OR WATER BODY. SECONDARY CONTAINMENT MAY BE REQUIRED.

PUMPED DISCHARGE SEDIMENT CONTROL DEVICE ("DIRT BAG")

NTS

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

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STATE OF MAINE — THOMAS W. PERKINS — No. 11710 — LICENSED PROFESSIONAL ENGINEER

EROSION CONTROL NOTES AND DETAILS

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
DRAWN BY: ZTQ		CHECKED BY: TWP

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DATE: 7/18/2019

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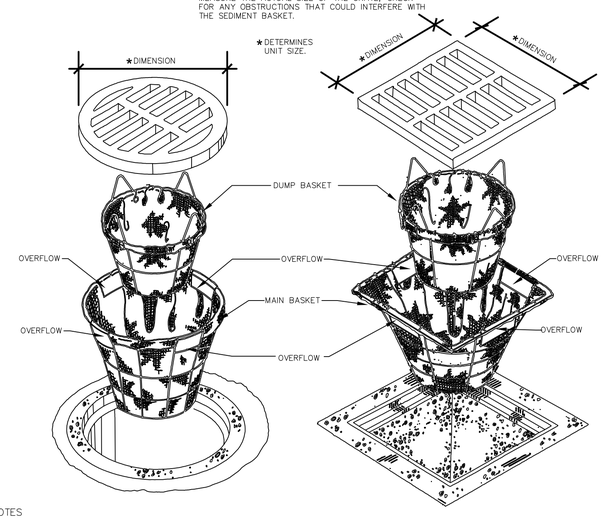
C2.3

SIZING INSTRUCTIONS:

MEASURE THE ACTUAL SIZE OF THE GRATE; CHECK FOR ANY OBSTRUCTIONS THAT COULD INTERFERE WITH THE SEDIMENT BASKET.

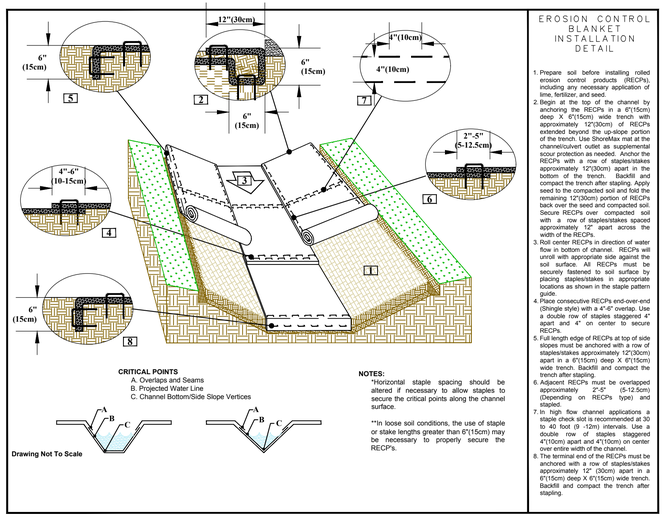


NOTES

1. INLET PROTECTION SHALL BE INSTALLED AT THE TIME THE STRUCTURE IS SET.
2. TO INSTALL: REMOVE GRATE, DROP MAIN SEDIMENT BASKET IN OPENING, PLACE DUMP BASKET IN MAIN BASKET, REPLACE GRATE.
3. INSPECT AFTER EACH RAIN OR AS DIRECTED BY ENGINEER OR INSPECTOR.
4. IF THERE IS AN ACCUMULATION OF SEDIMENT; SLIDE THE GRATE OFF THE INLET, LIFT THE DUMP BASKET OUT OF THE MAIN BASKET, EMPTY CONTENTS IN A SUITABLE LOCATION, REPLACE DUMP BASKET, REPLACE GRATE.
5. AFTER APPOOXIMATELY 10-20 DUMPS, OR AS NEEDED, EMPTY THE MAIN BASKET OF ANY ACCUMULATED SEDIMENT.
6. AS WITH ALL INLET PROTECTION DEVICES, CHECK TO SEE HOW DEEP THE WATER COULD RISE IF THE INLET WERE TO BE BLOCKED ENTIRELY. DO NOT INSTALL IF IT COULD CAUSE PROPERTY DAMAGE OR POSE A SAFETY HAZARD TO TRAFFIC.

CATCH BASIN INLET PROTECTION

22X34 SCALE: NTS



EROSION CONTROL BLANKET INSTALLATION DETAIL

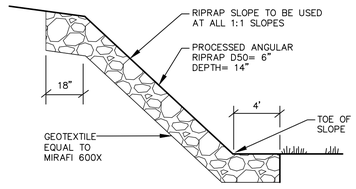
1. Prepare soil before installing rolled erosion control products (RECPs), including any necessary application of lime, fertilizer, and seed.
2. Begin at the top of the channel by anchoring the RECPs in a 6"(15cm) deep X 6"(15cm) wide trench with approximately 12"(30cm) of RECPs extended beyond the up-slope portion of the trench. Use ShoreMax mat at the channel/culvert outlet as supplemental scour protection as needed. Anchor the RECPs with a row of staples/stakes approximately 12"(30cm) apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to the compacted soil and fold the remaining 12"(30cm) portion of RECPs back over the seed and compacted soil. Secure RECPs over compacted soil with a row of staples/stakes spaced approximately 12" apart across the width of the RECPs.
3. Roll center RECPs in direction of water flow in bottom of channel. RECPs will unroll with appropriate side against the soil surface. All RECPs must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide.
4. Place consecutive RECPs end-over-end (Shingle style) with a 4"-6" overlap. Use a double row of staples staggered 4" apart and 4" on center to secure RECPs.
5. Full length edge of RECPs at top of side slopes must be anchored with a row of staples/stakes approximately 12"(30cm) apart in a 6"(15cm) deep X 6"(15cm) wide trench. Backfill and compact the trench after stapling.
6. Adjacent RECPs must be overlapped approximately 2"-5" (5-12.5cm) (Depending on RECPs type) and stapled.
7. In high flow channel applications a staple check slot is recommended at 30 to 40 foot (9 -12m) intervals. Use a double row of staples staggered 4"(10cm) apart and 4"(10cm) on center over entire width of the channel.
8. The terminal end of the RECPs must be anchored with a row of staples/stakes approximately 12" (30cm) apart in a 6"(15cm) deep X 6"(15cm) wide trench. Backfill and compact the trench after stapling.

NOTES:
*Horizontal staple spacing should be altered if necessary to allow staples to secure the critical points along the channel surface.

**In loose soil conditions, the use of staple or stake lengths greater than 6"(15cm) may be necessary to properly secure the RECP's.

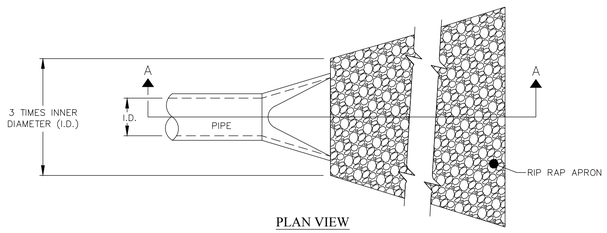
EROSION CONTROL BLANKET

22X34 SCALE: NTS



SIDE SLOPE RIPRAP

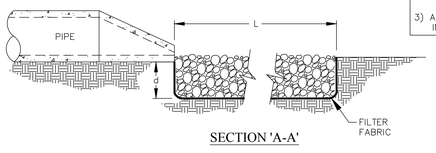
NOT TO SCALE



PLAN VIEW

NOTES:

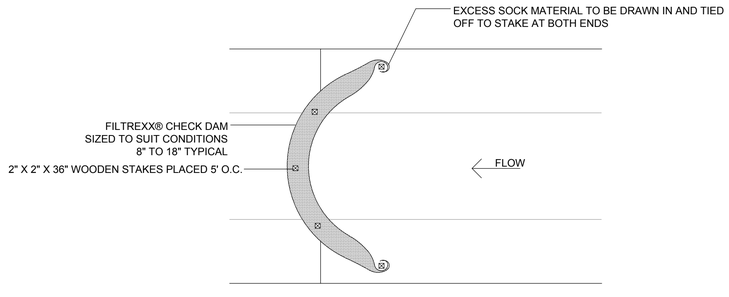
1) L = THE LENGTH OF THE RIPRAP APRON.
2) d = 1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESS THAN 6" (inches).
3) A FILTER BLANKET OR FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIPRAP AND SOIL FOUNDATION.



SECTION 'A-A'

PIPE OUTLET PROTECTION

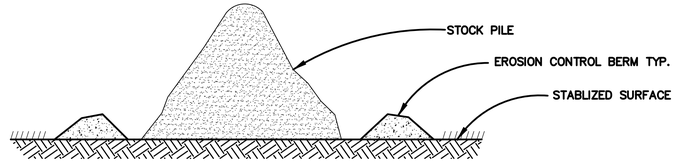
nts



NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. CHECK DAM SHOULD BE USED IN AREAS THAT DRAIN 10 ACRES OR LESS.
3. SEDIMENT SHOULD BE REMOVED FROM BEHIND CHECK DAM ONCE THE ACCUMULATED HEIGHT HAS REACHED ½ THE HEIGHT OF THE CHECK DAM.
4. CHECK DAM CAN BE DIRECT SEEDED AT THE TIME OF INSTALLATION.
5. CONTRACTOR IS REQUIRED TO BE A FILTREXX CERTIFIED™ INSTALLER.

CHECK DAM

NTS



STOCK PILE

NTS

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

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STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

EROSION CONTROL DETAILS

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5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
DRAWN BY: ZTQ		CHECKED BY: TWP

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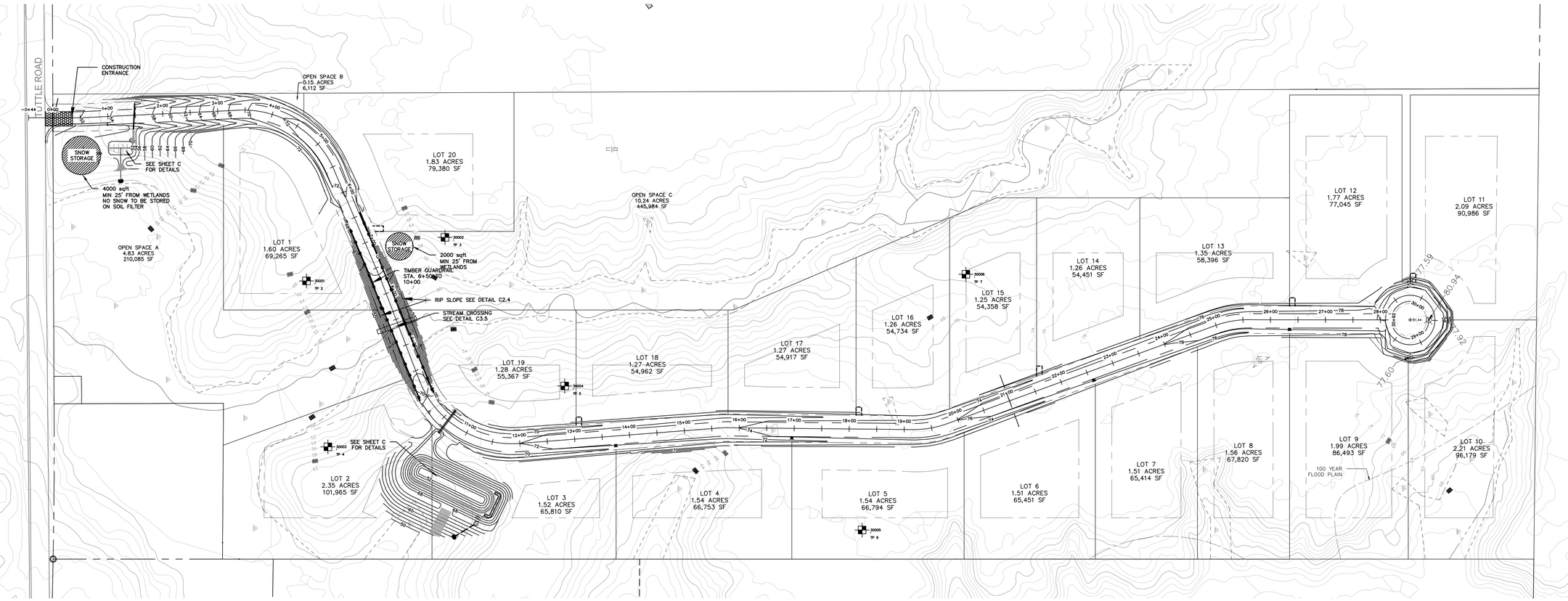
DATE: 7/18/2019

PROJECT NO. 18-015

SHEET NO.

C2.4



GRADING AND DRAINAGE PLAN

1 / C3.0

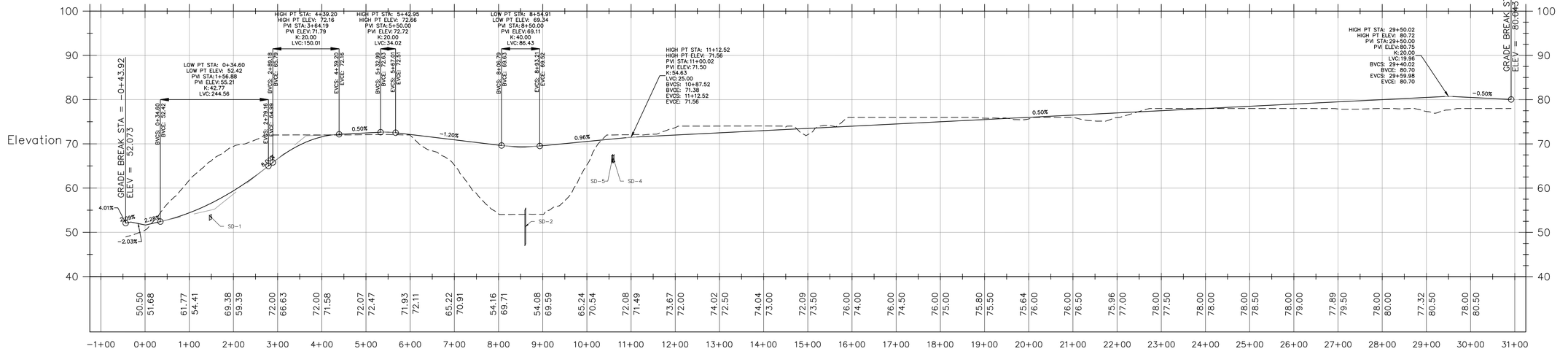
22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200'

WETLAND IMPACT = 3150 SF

LEGEND

WETLAND

TEST PIT



PROFILE

2 / C3.0

22X34 SCALE: V:1"=4' H:1"=40'
11X17 SCALE: V:1"=8' H:1"=80'

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

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STATE OF MAINE
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GRADING + DRAINAGE PLAN AND PROFILE

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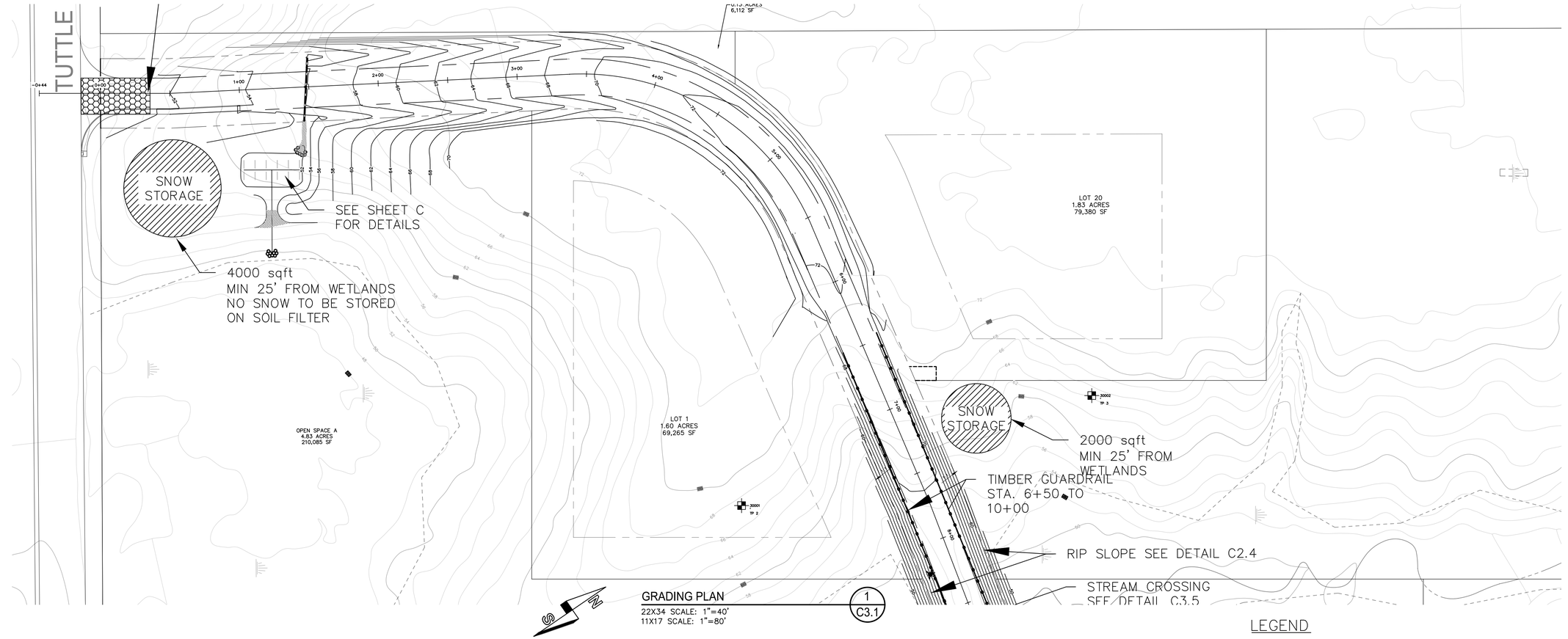


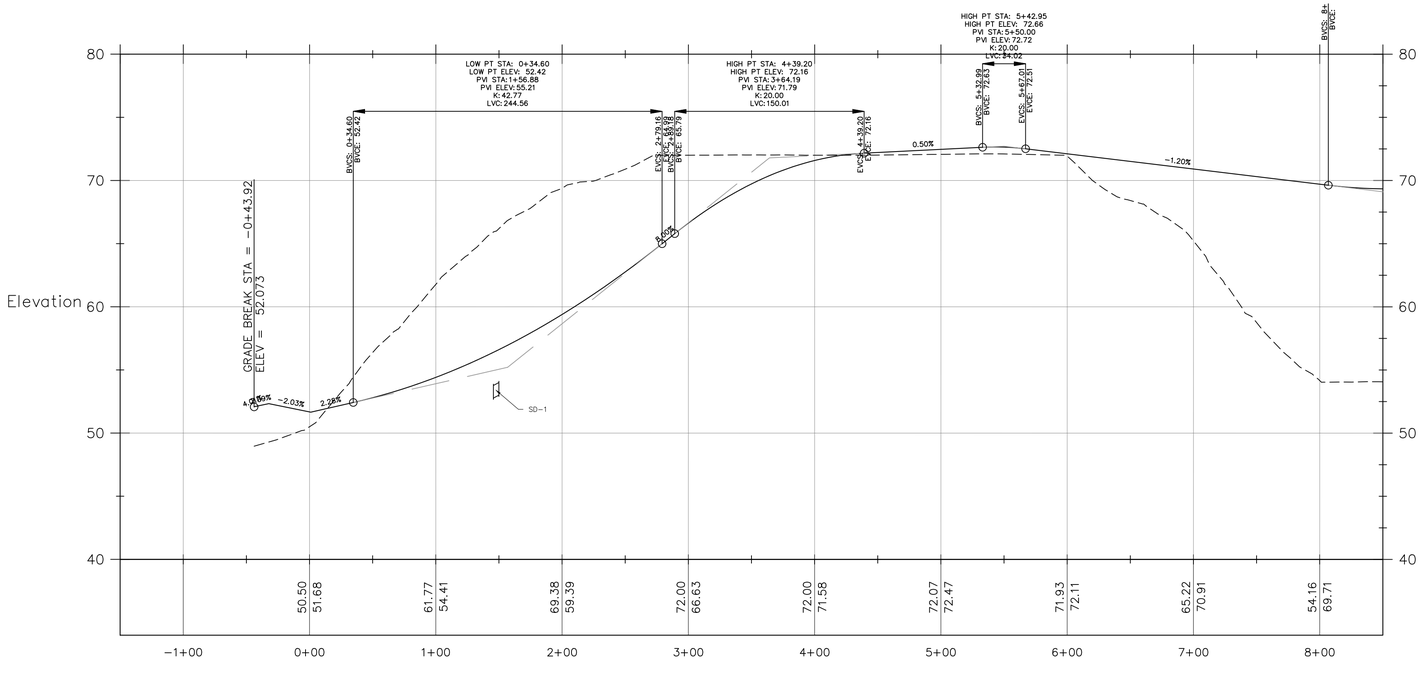
GRADING PLAN
22X34 SCALE: 1"=40'
11X17 SCALE: 1"=80'

1
C3.1

LEGEND

WETLAND

TEST PIT



CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

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GRADING PLAN & PROFILE

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C3.1

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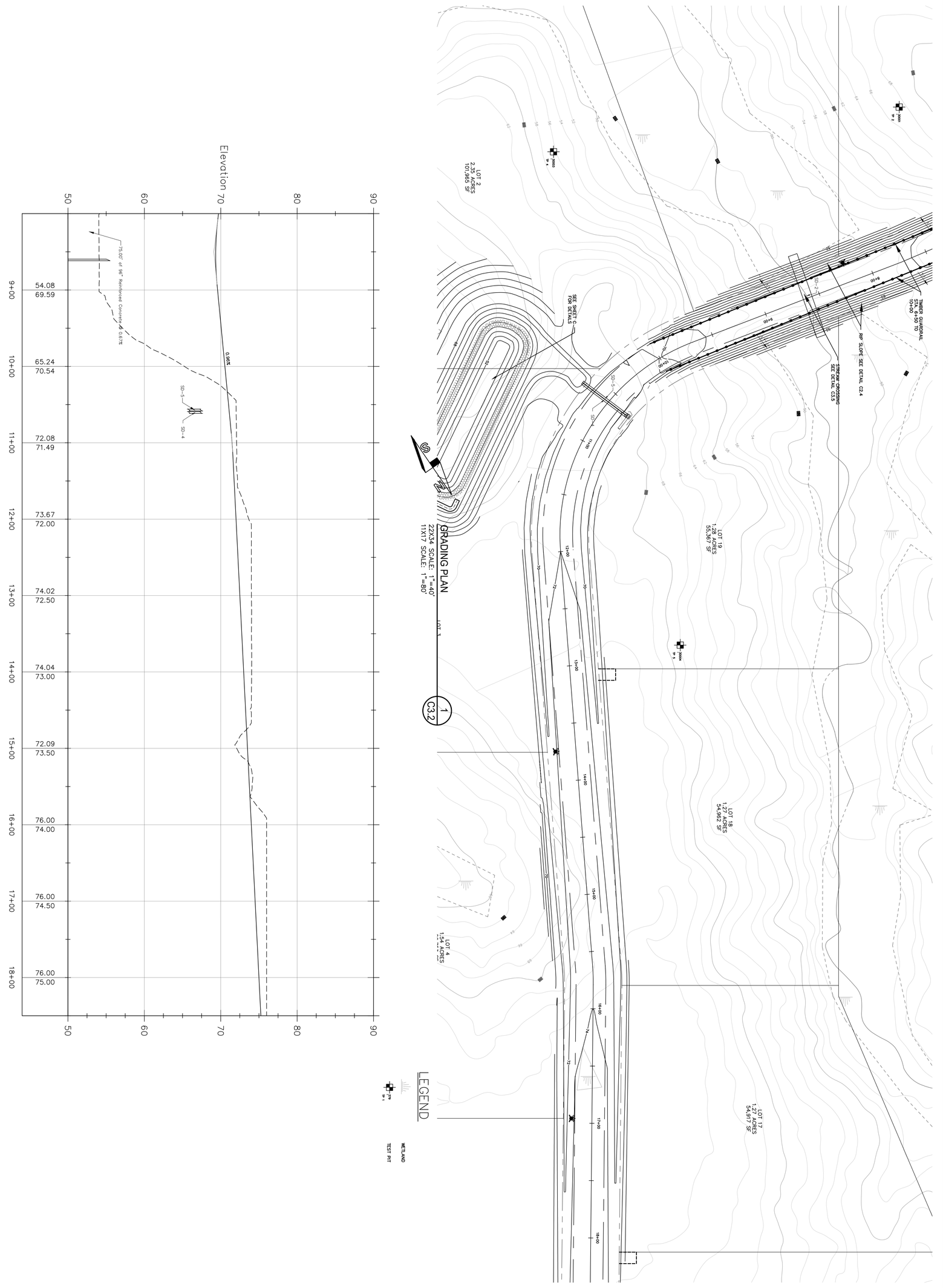

GRADING PLAN & PROFILE

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THOMAS W. PERKINS
STATE OF MAINE
REGISTERED PROFESSIONAL ENGINEER

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CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

C3.2

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PROJECT NO. 18-015

DATE: 7/18/2019

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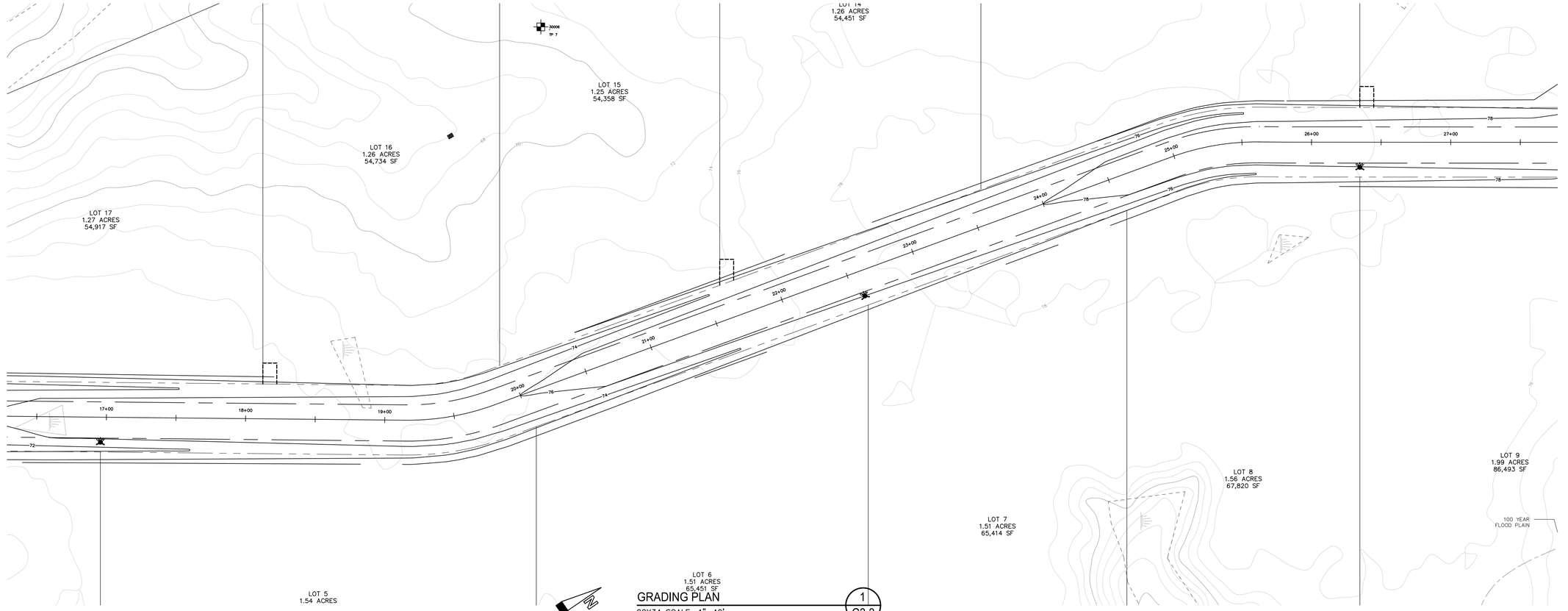

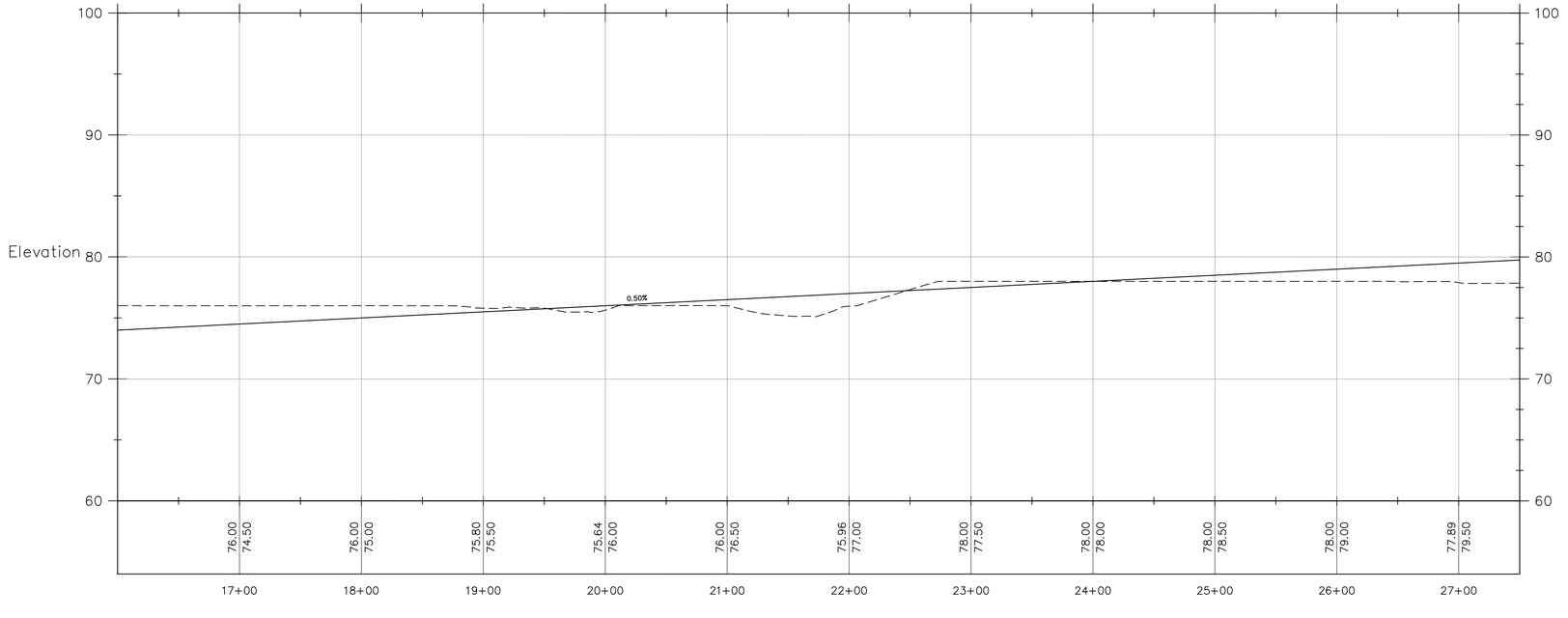

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

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STATE OF MAINE
THOMAS W. PERKINS
No. 11710
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GRADING PLAN & PROFILE

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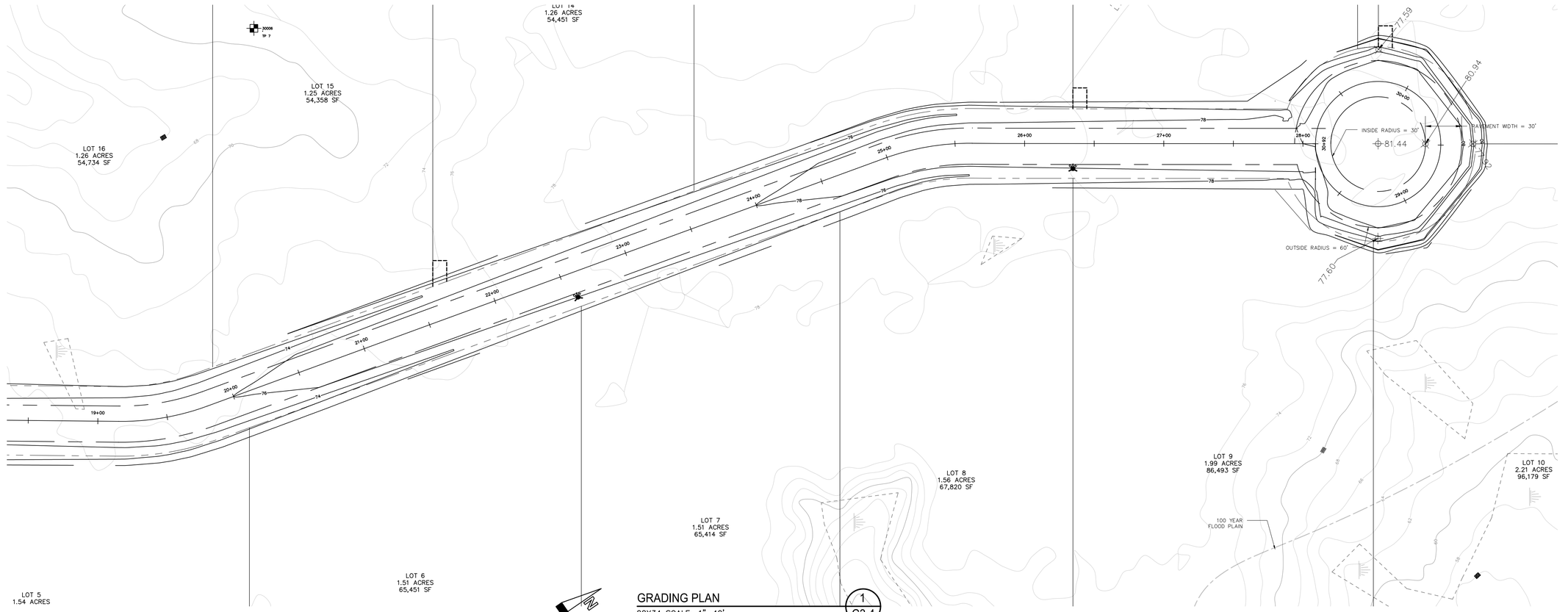
DATE: 7/18/2019

PROJECT NO. 18-015

SHEET NO.

C3.3



GRADING PLAN

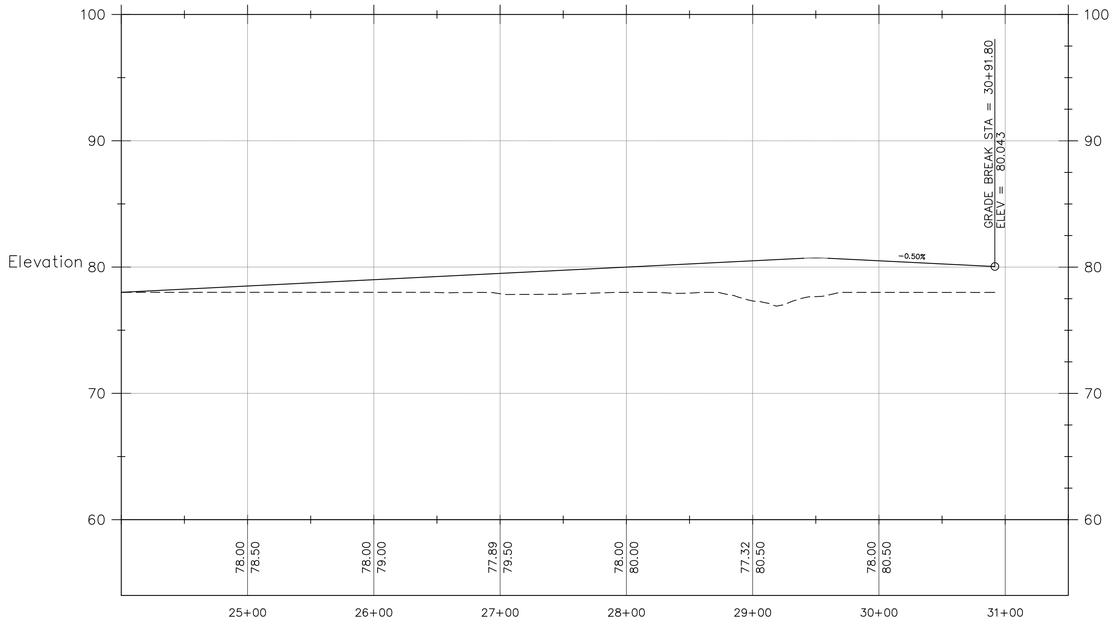
22X34 SCALE: 1"=40'
11X17 SCALE: 1"=80'

1 / C3.4

LEGEND

WETLAND

379 TP 1 — TEST PIT



Jul 30, 2019 - 2:52pm
C:\Users\Zachary Quinn\AppData\Local\Temp\AcPublish_21716\18-015 Cumberland.dwg

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

GRADING PLAN & PROFILE

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

DRAWN BY: ZTQ | CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way,
Suite 2
Turner, ME 04282

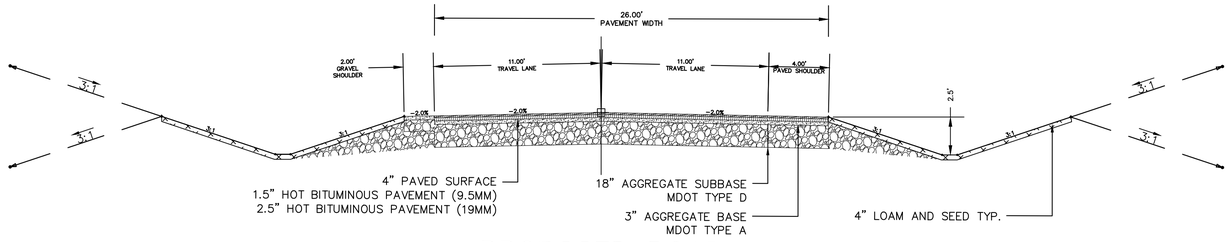
DIRIGO ARCHITECTURAL
ENGINEERING • CONSTRUCTION MANAGEMENT
EM: tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019

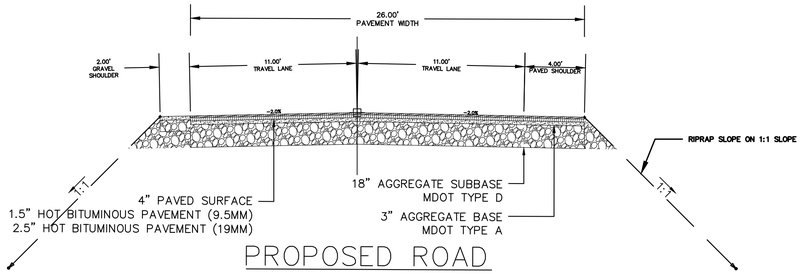
PROJECT NO. 18-015

SHEET NO.

C3.4

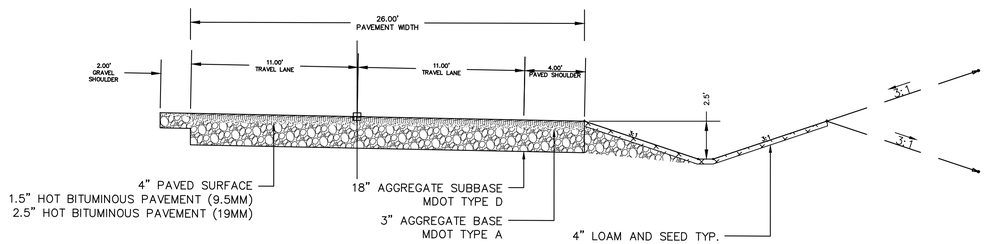


PROPOSED ROAD
STA. 1+00 TO 6+00
STA. 10+25 TO 27+90

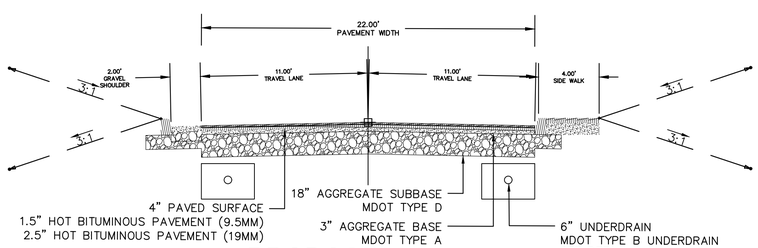


PROPOSED ROAD
STA. 6+00 TO 10+25

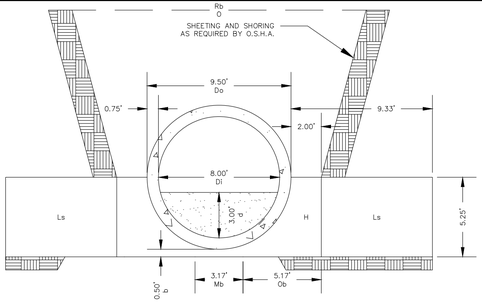
NOTE:
GUARDRAIL TO BE PROVIDED ALONG
1:1 SLOPE. SEE DETAIL 3/C2.1



PROPOSED ROAD
STA. 27+90 TO 30+80



PROPOSED ROAD
STA. 00+00 TO 1+00

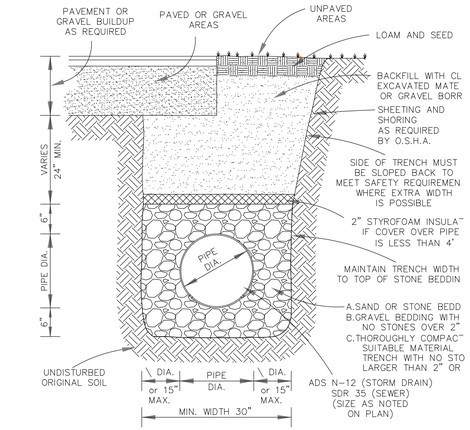


ITEM	DESCRIPTION	MATERIAL CATEGORY	COMPACTION REQUIREMENTS
Do	PIPE O.D.	REINF. CONC. PIPE	–
Mb	MIDDLE BEDDING	I.	LOOSELY PLACED, UNCOMPACTED
O	OVERFILL	II.	95% MOD PROCTOR
d	STREAM BED FILL	IV.	NONE
Ls	LOWER SIDE	III.	90% EQUIV. FIRMNESS, MOD PROCTOR
H	HAUNCH	I.	95% MOD PROCTOR
Rb	ROAD BASE	SEE ROAD SECTION	SEE ROAD SECTIONS
Ob	OUTER BEDDING	I.	95% MOD PROCTOR

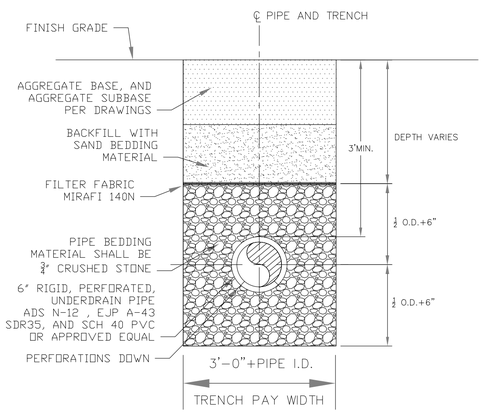
SOIL TYPES	MDOT SPEC
CAT 1.	703.20 GRAVEL BORROW
CAT. II.	703.19 GRANULAR BORROW
CAT. III.	703.18 COMMON BORROW
CAT. IV.	ON–SITE MATERIAL

LOCATION	INVERT ELEV	STREAM BEDDING ELEV
8+60, 37.5' L ±	44.50	47.50
8+60, 37.5' R ±	44.00	47.00

STREAM CROSSING – PIPE SECTION
NOT TO SCALE



STORM DRAIN / SEWER TRENCH DETAIL
NOT TO SCALE



MDOT TYPE "B" UNDERDRAIN TRENCH DETAIL
NOT TO SCALE

CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

ROAD SECTIONS AND DETAILS

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
DRAWN BY: ZTQ		CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way, Suite 2
Turner, ME 04282

DIRIGO ARCHITECTURAL
ENGINEERING ▲ CONSTRUCTION MANAGEMENT
EM: tperkins@dirigoae.com W: www.dirigoae.com

DATE: 7/18/2019
PROJECT NO. 18-015
SHEET NO.
C3.5

NOTES:

1. BOUNDARY: SEBAGO TECHNICS
75 JOHN ROBERTS ROAD, SUITE 4A
SOUTH PORTLAND, ME 04106

2. SOILS MAPPING: CUMBERLAND COUNTY MEDIUM INTENSITY SOILS MAPS

3. TOPOGRAPHY: MAINE STATE GIS 2' CONTOURS

Tc SUMMARY

SUBCATCHMENT	Tc ROUTE
SA-1	150' SHEET, 2446' SHALLOW, 2049' CHANNEL
SA-1A	150' SHEET, 188' SHALLOW, 257' SHALLOW
SA-2	150' SHEET, 252' SHALLOW, 475' SHALLOW
SA-3	150' SHEET, 433' SHALLOW

PRE DEVELOPMENT FLOWS

ANALYSIS POINT	2 YR. STORM	10 YR. STORM	25 YR. STORM	50 YR. STORM	100 YR. STORM
AP-1	18.87 CFS	40.60 CFS	81.84 CFS	112.80 CFS	145.23 CFS
AP-2 (SA-2)	6.02 CFS	13.81 CFS	20.80 CFS	27.52 CFS	35.06 CFS
AP-3 (SA-3)	0.82 CFS	1.74 CFS	2.55 CFS	3.32 CFS	4.17 CFS

SINCE AP#1, 2, & 3 ULTIMATELY ALL FLOW TO THE STREAM AND THE CULVERTS UNDER TUTTLE ROAD THE FOLLOWING IS A SUMMARY OF THE CUMULATIVE PEAK FLOWS:

TUTTLE ROAD CULVERTS	25.71 CFS	56.15 CFS	105.19 CFS	143.64 CFS	184.46 CFS

LEGEND

SYMBOL	DESCRIPTION
TP	TEST PIT
12	POND
12	DRAINAGE SUB AREA
R12	REACH
	DRAINAGE AREA BOUNDARY
	TIME OF CONCENTRATION ROUTE
	LIMIT OF WETLANDS
64	EXISTING CONTOUR
64	PROPOSED CONTOUR

SOILS LEGEND

SYMBOL	DESCRIPTION
	SOIL BOUNDARY LINES
— — — -	LIMIT OF WETLANDS

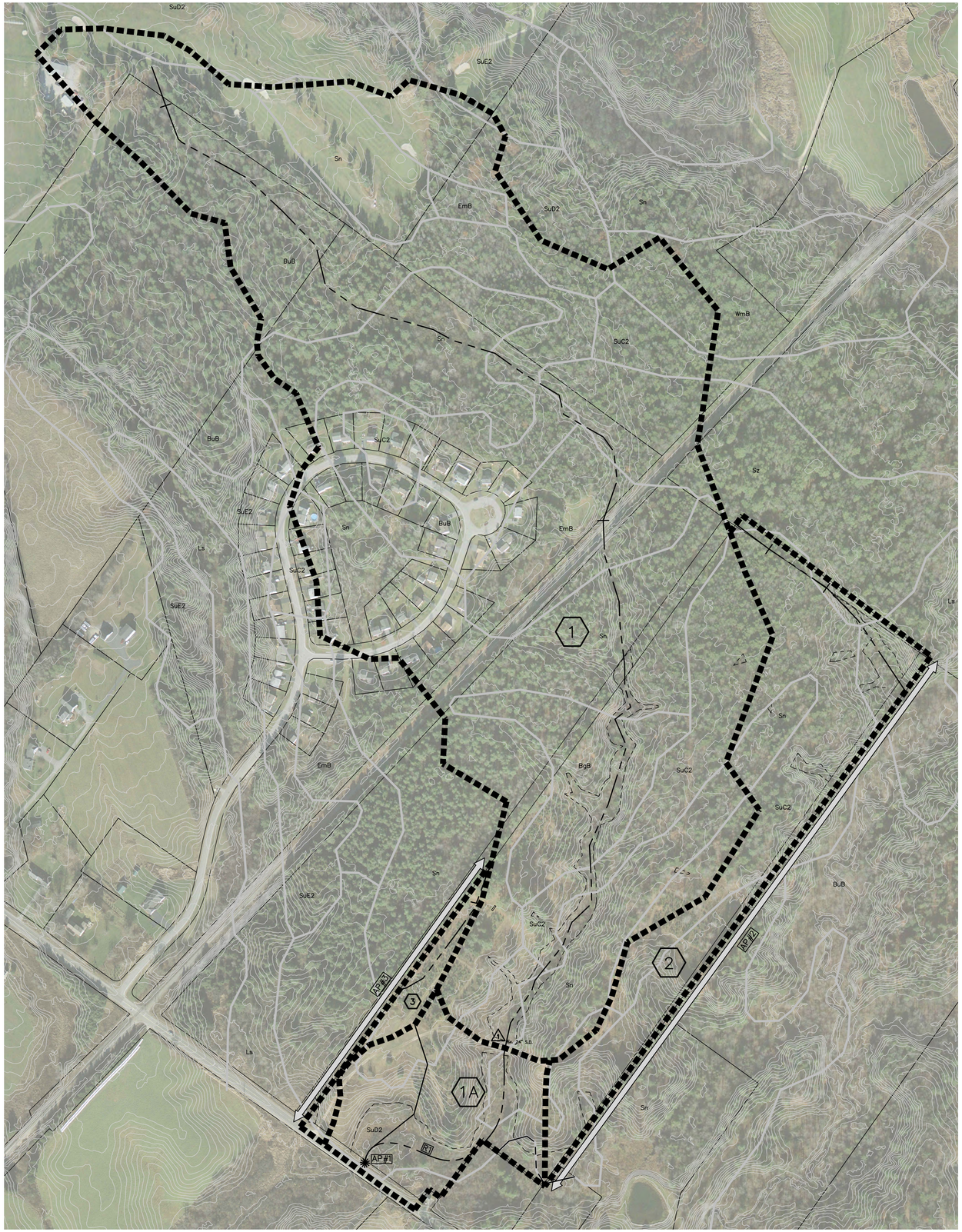
SLOPE DESIGNATION

A = 0 – 3%
B = 3– 8%
C = 8 – 20%
D = 20%+

HYDROLOGIC SOIL GROUP

SOIL	GROUP
BELGRADE (BgB)	B
ELMWOOD (EmB)	B
LAMOINE (BuB)	C/D*
LIMERICK-SACO (Ls)	B/D*
SCANTIC (Sn)	D
SUFFIELD (SuC2,D2,E2)	C
SWANTON (Sz)	C/D*
WINDSOR (WmB)	A

* ASSUME TYPE D SOIL



Scale: 1" = 200'
200' 0 100' 200' 400'

REVISION

NO.	DATE	DESCRIPTION
1	1/28/19	Planning Board - Preliminary Application
2	6/25/19	Revised Per Town Comments
3	7/12/19	Revised Per Town Comments

STATE OF MAINE
ANDREW S. MORRELL
No. 12861
REGISTERED PROFESSIONAL ENGINEER

BH2M
Berry, Huff, McDonald, Milligan Inc.
Engineers, Surveyors
28 State Street
Gorham, Maine 04038
Tel. (207) 839-2771
Fax (207) 839-8250

FOR
Beta Zeta Properties LLC.
239 Tuttle Road
Cumberland, Maine

PRE DEVELOPMENT

CHRISTMAS CREEK

TUTTLE ROAD
CUMBERLAND, MAINE

DESIGNED	DATE
A. Fagan	Dec. 2018
DRAWN	SCALE
A. Fagan	1" = 200'
CHECKED	JOB. NO.
A. Morrell	18167

SHEET
A

Subcatchment ID	Proposed Linear Impervious Area (sf)	Non-Linear Impervious Area (sf)	Linear Lawn Area (sf)	Non-Linear Lawn Area (sf)	Non-Linear Developed Area (sf)	Existing Impervious Area (sf)	Existing Vegetated Area (sf)	Treated Linear Impervious Area (sf)	Treated Linear Developed Area (sf)	Treated Non-Linear Impervious Area (sf)	Treated Non-Linear Developed Area (sf)	BMP ID
1	6,556	13,068	7,068	233,578	246,646	0	3,889,945	0	0	13,068	246,646	Buffer
1A	9,725	6,534	9,557	71,175	77,709	8,116	251,936	0	0	6,534	60,000	Buffer
1B	5,887	0	10,823	0	0	0	0	5,887	16,710	0	0	GUSF
1C	5,278	0	8,250	0	0	0	0	5,278	13,528	0	0	GUSF
2	0	11,979	0	285,631	297,610	0	275,894	0	0	11,979	297,610	Buffer
2A	29,066	26,136	48,494	106,555	134,691	0	1,326	29,066	77,560	26,136	134,691	Pond
2B	25,383	29,403	35,021	116,422	145,825	0	0	25,383	60,404	29,403	145,825	Pond
3	1,883	0	3,380	10,000	10,000	641	45,357	0	0	0	0	None
Total	**83,778**	**87,120**	**122,593**	**825,361**	**912,481**	**8,757**	**4,464,458**	**65,614**	**168,202**	**87,120**	**884,772**	

Linear Treatment Summary	
Total Proposed Linear Impervious Area (sq. ft.)=	83,778
Total Proposed Linear Developed Area (sq. ft.)=	206,371
Total Treated Linear Impervious Area (sq. ft.)=	65,614
Total Treated Linear Developed Area (sq. ft.)=	168,202
Impervious Area Treatment % =	**78.32%**
Developed Area Treatment % =	**81.50%**

Non-Linear Treatment Summary	
Total Proposed Impervious Area (sq. ft.)=	87,120
Total Proposed Developed Area (sq. ft.)=	912,481
Total Treated Impervious Area (sq. ft.)=	87,120
Total Treated Developed Area (sq. ft.)=	884,772
Impervious Area Treatment % =	**100.00%**
Developed Area Treatment % =	**96.96%**

POST DEVELOPMENT FLOWS
FLOW RATE = POST (PRE)

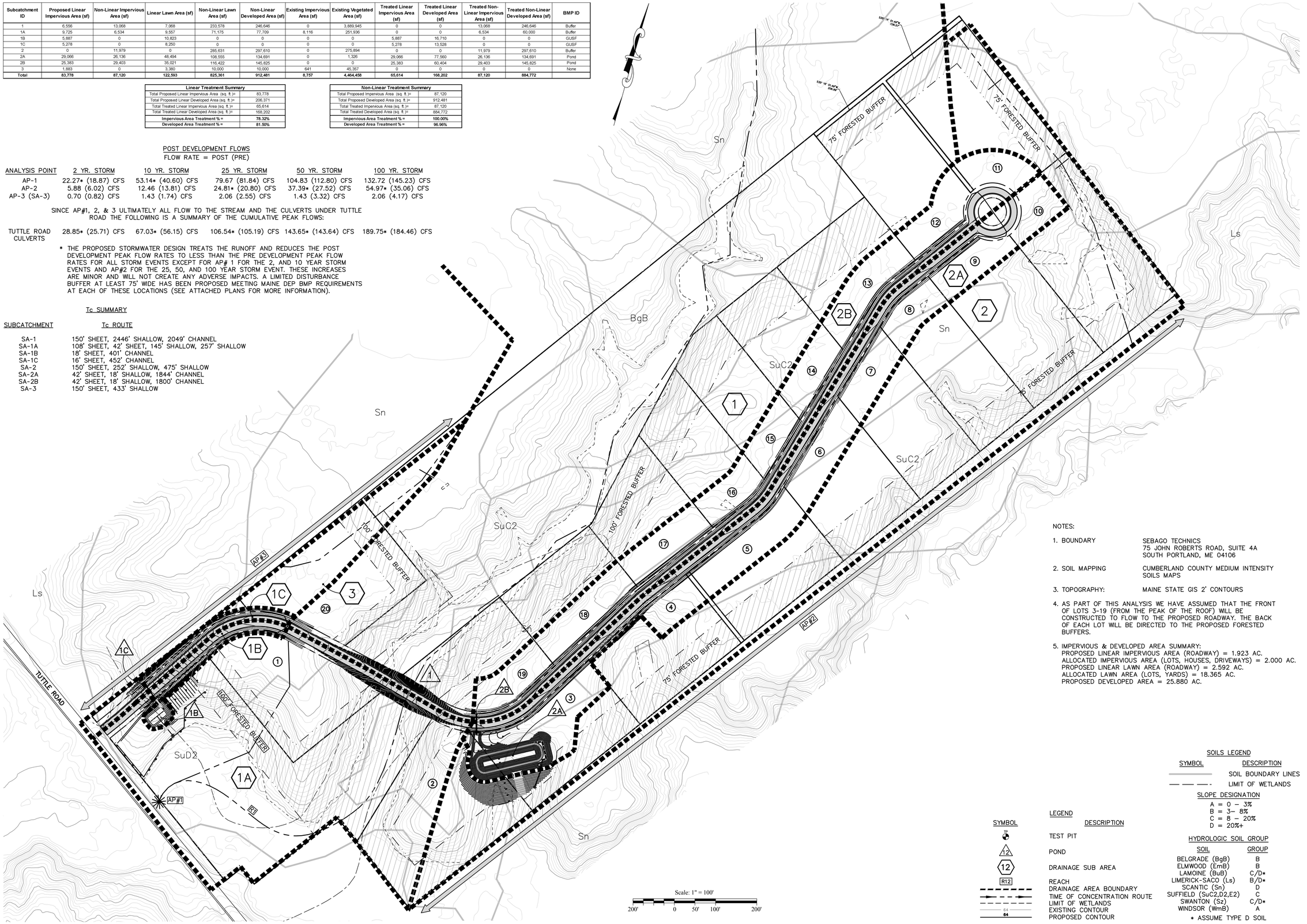
ANALYSIS POINT	2 YR. STORM	10 YR. STORM	25 YR. STORM	50 YR. STORM	100 YR. STORM
AP-1	22.27* (18.87) CFS	53.14* (40.60) CFS	79.67 (81.84) CFS	104.83 (112.80) CFS	132.72 (145.23) CFS
AP-2	5.88 (6.02) CFS	12.46 (13.81) CFS	24.81* (20.80) CFS	37.39* (27.52) CFS	54.97* (35.06) CFS
AP-3 (SA-3)	0.70 (0.82) CFS	1.43 (1.74) CFS	2.06 (2.55) CFS	1.43 (3.32) CFS	2.06 (4.17) CFS
TUTTLE ROAD CULVERTS	28.85* (25.71) CFS	67.03* (56.15) CFS	106.54* (105.19) CFS	143.65* (143.64) CFS	189.75* (184.46) CFS

SINCE AP#1, 2, & 3 ULTIMATELY ALL FLOW TO THE STREAM AND THE CULVERTS UNDER TUTTLE ROAD THE FOLLOWING IS A SUMMARY OF THE CUMULATIVE PEAK FLOWS:

* THE PROPOSED STORMWATER DESIGN TREATS THE RUNOFF AND REDUCES THE POST DEVELOPMENT PEAK FLOW RATES TO LESS THAN THE PRE DEVELOPMENT PEAK FLOW RATES FOR ALL STORM EVENTS EXCEPT FOR AP# 1 FOR THE 2, AND 10 YEAR STORM EVENTS AND AP#2 FOR THE 25, 50, AND 100 YEAR STORM EVENT. THESE INCREASES ARE MINOR AND WILL NOT CREATE ANY ADVERSE IMPACTS. A LIMITED DISTURBANCE BUFFER AT LEAST 75' WIDE HAS BEEN PROPOSED MEETING MAINE DEP BMP REQUIREMENTS AT EACH OF THESE LOCATIONS (SEE ATTACHED PLANS FOR MORE INFORMATION).

Tc SUMMARY

SUBCATCHMENT	Tc ROUTE
SA-1	150' SHEET, 2446' SHALLOW, 2049' CHANNEL
SA-1A	108' SHEET, 42' SHEET, 145' SHALLOW, 257' SHALLOW
SA-1B	18' SHEET, 401' CHANNEL
SA-1C	16' SHEET, 452' CHANNEL
SA-2	150' SHEET, 252' SHALLOW, 475' SHALLOW
SA-2A	42' SHEET, 18' SHALLOW, 1844' CHANNEL
SA-2B	42' SHEET, 18' SHALLOW, 1800' CHANNEL
SA-3	150' SHEET, 433' SHALLOW



NOTES:

1. BOUNDARY — SEBAGO TECHNICS, 75 JOHN ROBERTS ROAD, SUITE 4A, SOUTH PORTLAND, ME 04106
2. SOIL MAPPING — CUMBERLAND COUNTY MEDIUM INTENSITY SOILS MAPS
3. TOPOGRAPHY: — MAINE STATE GIS 2' CONTOURS
4. AS PART OF THIS ANALYSIS WE HAVE ASSUMED THAT THE FRONT OF LOTS 3-19 (FROM THE PEAK OF THE ROOF) WILL BE CONSTRUCTED TO FLOW TO THE PROPOSED ROADWAY. THE BACK OF EACH LOT WILL BE DIRECTED TO THE PROPOSED FORESTED BUFFERS.
5. IMPERVIOUS & DEVELOPED AREA SUMMARY:
   PROPOSED LINEAR IMPERVIOUS AREA (ROADWAY) = 1.923 AC.
   ALLOCATED IMPERVIOUS AREA (LOTS, HOUSES, DRIVEWAYS) = 2.000 AC.
   PROPOSED LINEAR LAWN AREA (ROADWAY) = 2.592 AC.
   ALLOCATED LAWN AREA (LOTS, YARDS) = 18.365 AC.
   PROPOSED DEVELOPED AREA = 25.880 AC.

SOILS LEGEND

SYMBOL	DESCRIPTION
	SOIL BOUNDARY LINES
— — — -	LIMIT OF WETLANDS

SLOPE DESIGNATION
A = 0 – 3%
B = 3– 8%
C = 8 – 20%
D = 20%+

LEGEND

SYMBOL	DESCRIPTION
	TEST PIT
12	POND
12	DRAINAGE SUB AREA
R12	REACH
	DRAINAGE AREA BOUNDARY
	TIME OF CONCENTRATION ROUTE
	LIMIT OF WETLANDS
64	EXISTING CONTOUR
64	PROPOSED CONTOUR

HYDROLOGIC SOIL GROUP

SOIL	GROUP
BELGRADE (BgB)	B
ELMWOOD (EmB)	B
LAMOINE (BuB)	C/D*
LIMERICK-SACO (Ls)	B/D*
SCANTIC (Sn)	D
SUFFIELD (SuC2,D2,E2)	C
SWANTON (Sz)	C/D*
WINDSOR (WmB)	A

* ASSUME TYPE D SOIL

REVISION		
NO.	DATE	DESCRIPTION
1	1/28/19	Planning Board - Preliminary Application
2	6/25/19	Revised Per Town Comments
3	7/12/19	Revised Per Town Comments

STATE OF MAINE — ANDREW S. MORRELL — No. 12881 — REGISTERED PROFESSIONAL ENGINEER

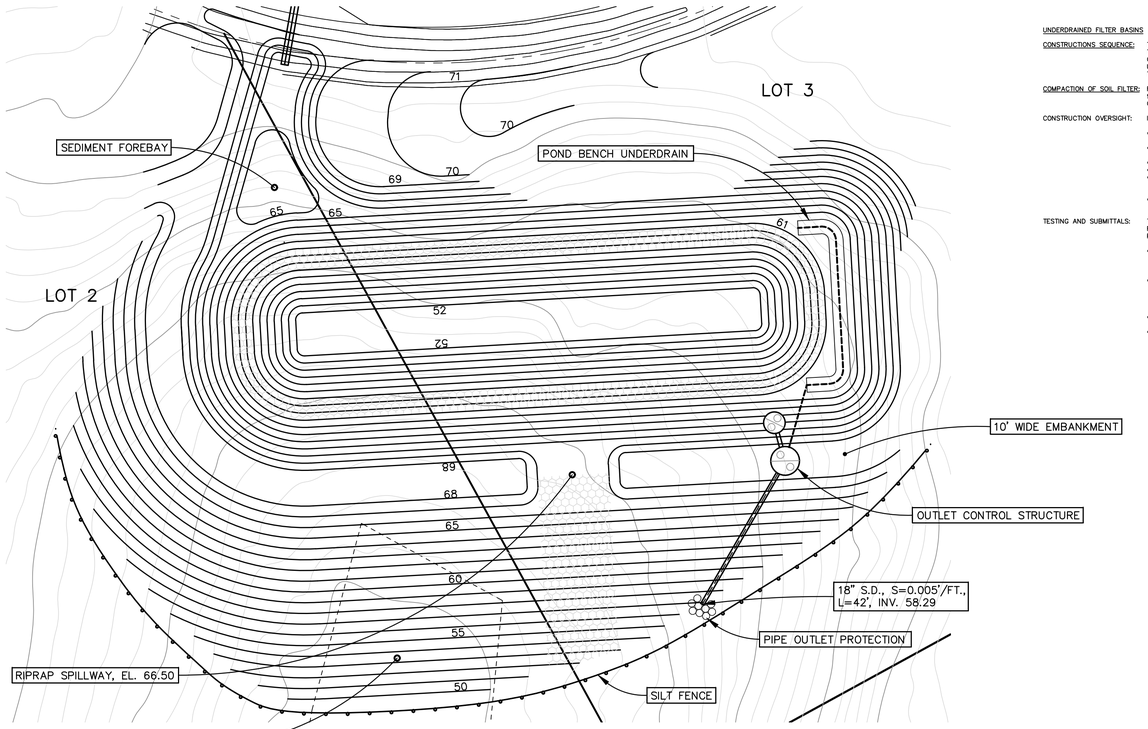
BH2M
Berry, Huff, McDonald, Milligan Inc.
Engineers, Surveyors
28 State Street
Gorham, Maine 04038
Tel. (207) 839-2771
Fax (207) 839-8250

FOR
Beta Zeta Properties LLC.
239 Tuttle Road
Cumberland, Maine

POST DEVELOPMENT
CHRISTMAS CREEK
TUTTLE ROAD
CUMBERLAND, MAINE

DESIGNED	DATE
A. Fagan	Dec. 2018
DRAWN	SCALE
A. Fagan	1" = 100'
CHECKED	JOB. NO.
A. Morrell	18167

SHEET
B

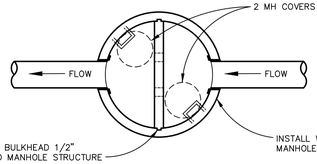


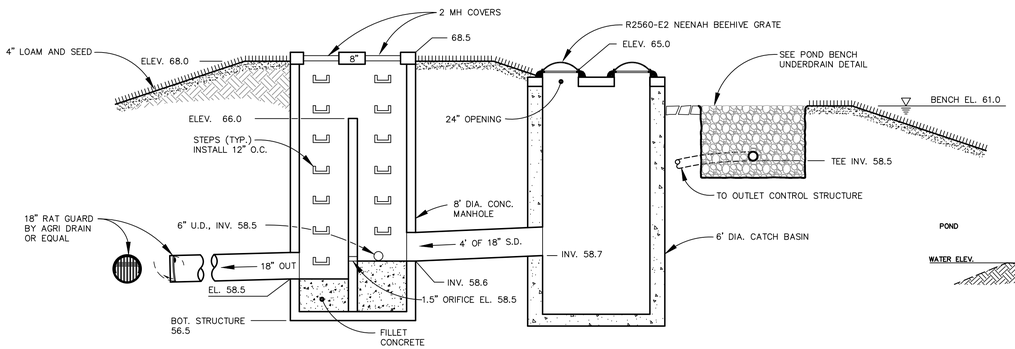
POND

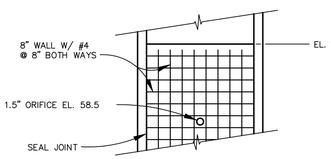
Scale: 1" = 20'

20' 0 20' 40'

INSTALL "ADS CO. 24" RAT GUARDS", BY PORTLAND PLASTIC PIPE, AT INLET AND OUTLET PIPES







OUTLET CONTROL STRUCTURE

NTS

UNDERDRAINED FILTER BASINS

CONSTRUCTIONS 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 GRADES 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.
- 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 DEP SPECIFICATIONS.
- TOWN OF OLD ORCHARD BEACH WILL BE PROVIDED WITH INSPECTION DOCUMENTATION WITHIN ONE-WEEK OF THE COMPLETED INSPECTION AND APPROVAL OF INSTALLATION.

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 COMPOSITE OF THREE DIFFERENT LOCATION (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 1996A) 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 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.
- AFTER PERMANENT STABILIZATION IS ATTAINED, THE CONTRACTOR SHALL FLOOD THE FILTER BASIN AND ADJUST THE 2-INCH BALL VALVE TO OBTAIN A 24-48 HOUR RELEASE TIME.

CONSTRUCTION OVERSIGHT
THE APPLICANT WILL RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER TO INSPECT THE CONSTRUCTION AND STABILIZATION OF ALL STORMWATER MANAGEMENT STRUCTURES. IF NECESSARY, THE INSPECTING ENGINEER WILL INTERPRET THE POND'S CONSTRUCTION PLAN FOR THE CONTRACTOR. ONCE ALL STORMWATER MANAGEMENT STRUCTURES ARE CONSTRUCTED AND STABILIZED, THE INSPECTING ENGINEER WILL NOTIFY THE DEPARTMENT 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 GIVING THE DATE OF EACH INSPECTION, THE TIME OF EACH INSPECTION, THE ITEMS INSPECTED ON EACH VISIT, AND INCLUDED ANY TESTING DATA OR SIEVE ANALYSIS DATA OF EVERY MINERAL SOIL AND SOIL MEDIA SPECIFIED IN THE PLANS AND USED ON SITE.

LOT GRADING AND DRIVEWAY LOCATION
INSPECTIONS BY A PROFESSIONAL ENGINEER WILL CONSIST OF A VISIT TO THE SITE PRIOR TO CONSTRUCTION TO CONSULT WITH THE EARTHWORK CONTRACTOR AND A POST CONSTRUCTION MEETING TO CONFIRM GRADING ON LOTS AND FOR ALL DRIVEWAYS TO ENSURE RUNOFF IS DIRECTED ACCORDING TO PLANS AND TO OVERSEE THE RE-STABILIZATION OF THE LOT INTO A VEGETATED COVER.

BUFFERS - GENERAL
INSPECTIONS BY A PROFESSIONAL ENGINEER WILL CONSIST OF A VISIT TO THE SITE PRIOR TO CONSTRUCTION TO ESTABLISH THE APPROPRIATE LOCATION OF THE BUFFERS THAT NEED TO BE RETAINED AND UNDISTURBED. GENERAL FOREST USE MEANS THAT THE LAND MUST BE MAINTAINED WITH A FOREST COVER AND UNDISTURBED SOIL, DUFF LAYER GROUND COVER VEGETATION, AND UNDERSTORY VEGETATION. TIMBER MAY BE HARVESTED ON A SELECT BASIS PROVIDED THAT NO MORE THAN 40% OF THE VOLUME IS HARVESTED WITHIN ANY 10 YEAR PERIOD.

STONE BERMED LEVEL LIP SPREADER
INSPECTIONS BY A PROFESSIONAL ENGINEER SHALL CONSIST OF WEEKLY VISITS TO THE SITE TO INSPECT EACH LEVEL SPREADERS CONSTRUCTION, STONE BERM MATERIAL AND PLACEMENT, SETTLING BASIN FROM INITIAL GROUND DISTURBANCE TO FINAL STABILIZATION OF THE LEVER SPREADER.

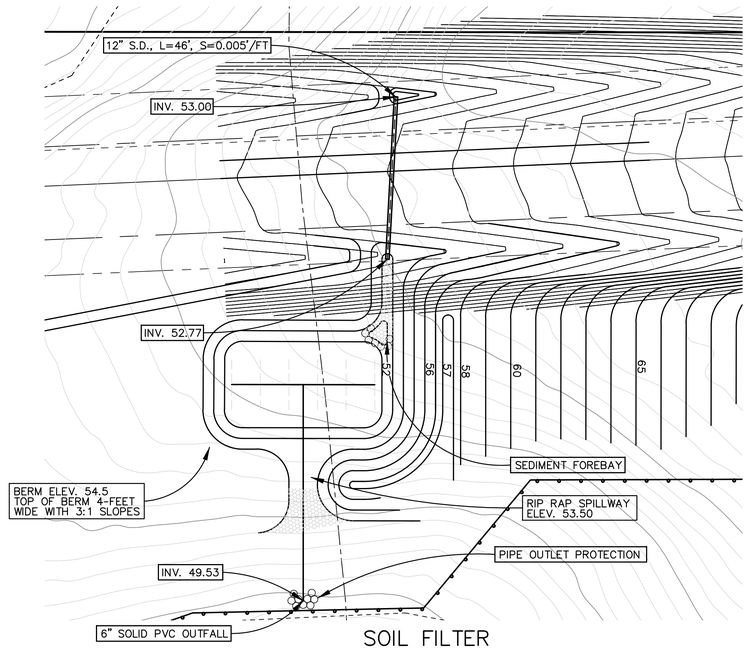
WETPONDS

INSPECTION BY A PROFESSIONAL ENGINEER WILL CONSIST OF WEEKLY VISITS TO THE SITE TO INSPECT THE INSTALLATION OF EACH POND'S EMBANKMENT CONSTRUCTION, STORMWATER INLET, UNDERDRAINED GRAVEL OUTLET, GRAVEL OUTLET FILTER MATERIAL MAKEUP AND PLACEMENT, OUTLET CONTROL STUCTURE, CLAY LINER, AND EMERGENCY SPILLWAY CONSTRUCTION FROM INITIAL GROUND DISTURBANCE TO FINAL STABILIZATION OF THE POND. AN INSPECTION OF THE UNDER DRAINED GRAVEL OUTLET SHALL ALSO BE PERFORMED ONE YEAR AFTER THE FINAL STABILIZATION OF THE POND.

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.

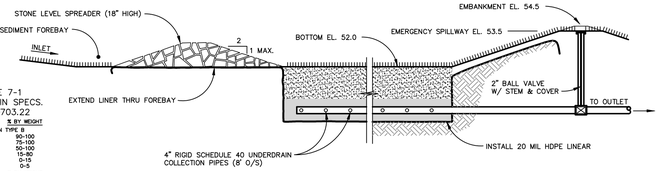
THE MAINE EROSION AND SEDIMENT CONTROL HANDBOOK FOR CONSTRUCTION: BEST MANAGEMENT PRACTICES AS PUBLISHED IN 1991 BY THE CUMBERLAND COUNTY SOIL AND WATER CONSERVATION DISTRICT AND THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION HAS BEEN CHANGED TO THE " MAINE EROSION AND SEDIMENT CONTROL



SOIL FILTER

Scale: 1" = 20'

20' 0 20' 40'



PROFILE

TABLE 7-1
UNDERDRAIN SPECS.
MDOT #703.22

SIEVE SIZE	% BY WEIGHT UNDERDRAIN TYPE B
1"	90-100
1/2"	75-100
#4	50-100
#60	10-35
#200	0-15
	0-5

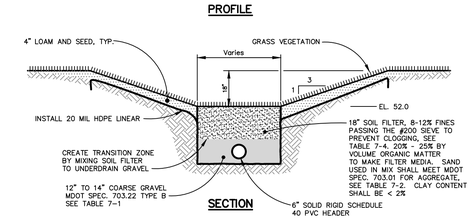
SIEVE SIZE	% BY WEIGHT UNDERDRAIN TYPE C
1"	100
3/4"	90-100
3/8"	0-75
#4	0-25
#10	0-5

TABLE 7-2
AGGREGATE SPECS.
MDOT #703.01

SIEVE SIZE	% BY WEIGHT
3/8"	100
#4	90-100
#8	80-100
#16	50-85
#30	25-60
#60	10-30
#100	2-10
#200	0-5

TABLE 7-4
COARSE LOAMY SAND SIEVE ANALYSIS SPECIFICATION

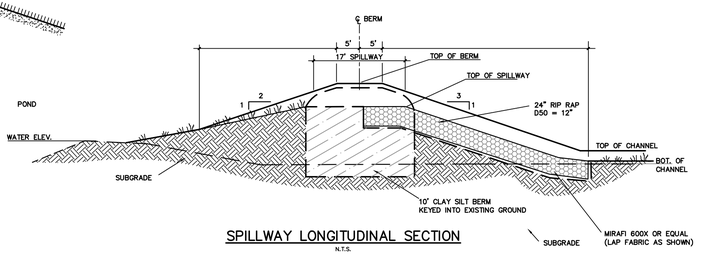
SIEVE #	% PASSING BY WEIGHT
10	85-100
40	70-100
60	15-40
200	0-8



SECTION

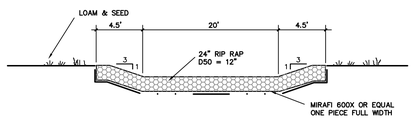
GRASSED UNDERDRAIN SOIL FILTER

NTS



SPILLWAY LONGITUDINAL SECTION

N.T.S.



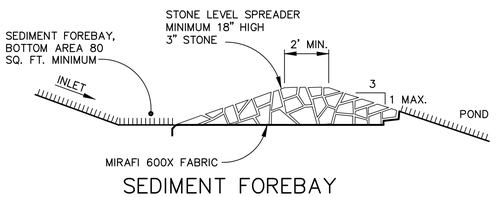
SPILLWAY TRANSVERSE SECTION

N.T.S.

DETENTION / RETENTION POND EMBANKMENT NOTES:

THE FOUNDATION AREA SHALL BE CLEARED OF TREES, LOGS, ROOTS BRUSH, BOULDERS, SOD, RUBBISH & TOPSOIL. THE ENGINEER SHALL OBSERVE & APPROVE THE EMBANKMENT SUBGRADE PRIOR TO PLACING ANY FILL TO DETERMINE SUITABILITY & POSSIBLE NEED FOR A CUTOFF TRENCH.

FILL MATERIAL FOR THE EMBANKMENT SHALL CONSIST OF SILT AND/OR CLAY MATERIAL APPROVED BY THE ENGINEER. THE CONTRACTOR SHOULD NOTE THAT ACCEPTABLE MATERIAL MAY NOT BE FOUND ON-SITE. ALL FILL MATERIAL SHALL BE FREE OF SOD, ROOTS, FROZEN SOIL, STONES GREATER THAN 6" IN DIA. & OTHER OBJECTIONABLE MATERIAL. ALL SNOW, ICE, OR FROZEN FILL SHALL BE REMOVED PRIOR TO ADDING ADDITIONAL FILL. FILLING SHALL COMMENCE IN THE LOWEST POINT OF THE CUTOFF TRENCH AND/OR DAM & CONTINUE IN HORIZONTAL LIFTS NO GREATER THAN 12". 92% MODIFIED PROCTOR DENSITIES SHALL BE OBTAINED IN EACH LIFT PRIOR TO ADDITIONAL LIFTS. THE DISTRIBUTION & GRADATION OF THE FILL SHALL BE SUCH THAT NO LENSES, POCKETS, STREAKS, OR LAYERS OF SUBSTANTIALLY DIFFERENT MATERIALS ARE PLACED IN THE LAYERS IN THE EMBANKMENT. FILL WITHIN 5' OF THE DISCHARGE PIPE & STRUCTURE SHALL BE COMPACTED TO 95% MODIFIED PROCTOR.



SEDIMENT FOREBAY

NTS

REVISION NO.	DATE	DESCRIPTION
1	1/29/19	Planning Board - Preliminary Application
2	3/12/19	Revised Per DEP Comments
3	7/12/19	Revised Per Town Comments

BH2M
Berry, Huff, McDonald, Milligan Inc.
Engineers, Surveyors
28 State Street
Gorham, Maine 04038
Tel. (207) 839-2771
Fax (207) 839-8250

FOR
Beta Zeta Properties I.L.C.
239 Tuttle Road
Cumberland, Maine

POND DETAILS

CHRISTMAS CREEK

TUTTLE ROAD
CUMBERLAND, MAINE

DESIGNED	DATE
A. Fagan	Dec. 2018
DRAWN	SCALE
A. Fagan	As Noted
CHECKED	JOB. NO.
A. Morrell	18167

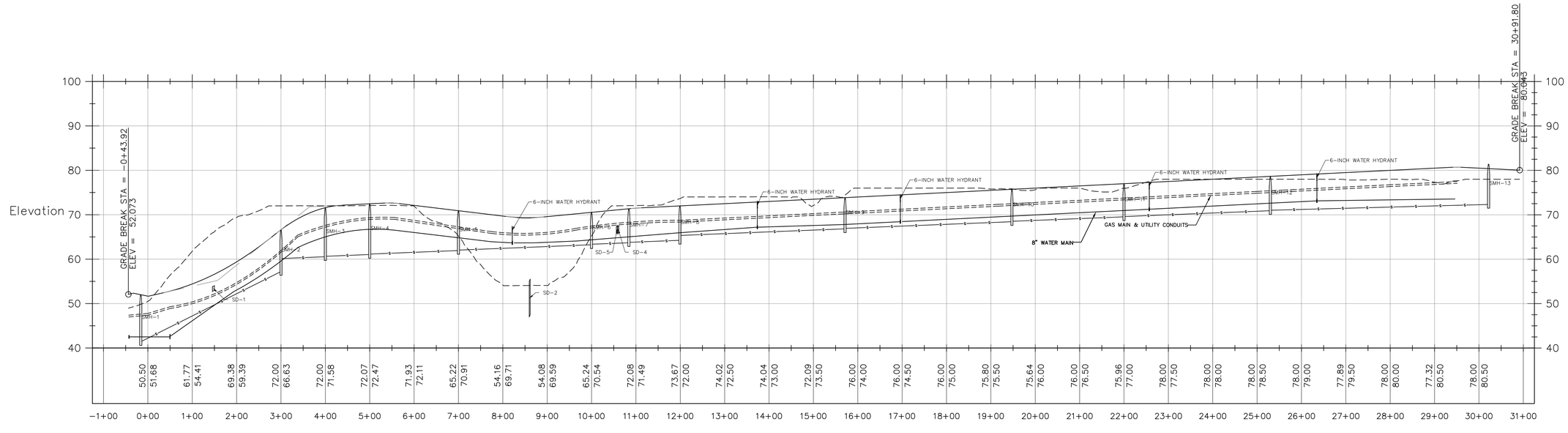
SHEET
C

OVERALL UTILITY PLAN

1 / C4.0

22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200'

NOTE: UTILITY EASMENT TO BE GRANTED TO ALL UTILITIES WITHIN ROAD RIGHT OF WAY. 50' WIDTH



CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

OVERALL UTILITY PLAN

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
DRAWN BY: ZTQ		CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way,
Suite 2
Turner, ME 04282

DIRIGO ARCHITECTURAL
ENGINEERING + CONSTRUCTION MANAGEMENT
EM:tperkins@dirigoae.com W:www.dirigoae.com

DATE: 7/18/2019

PROJECT NO. 18-015

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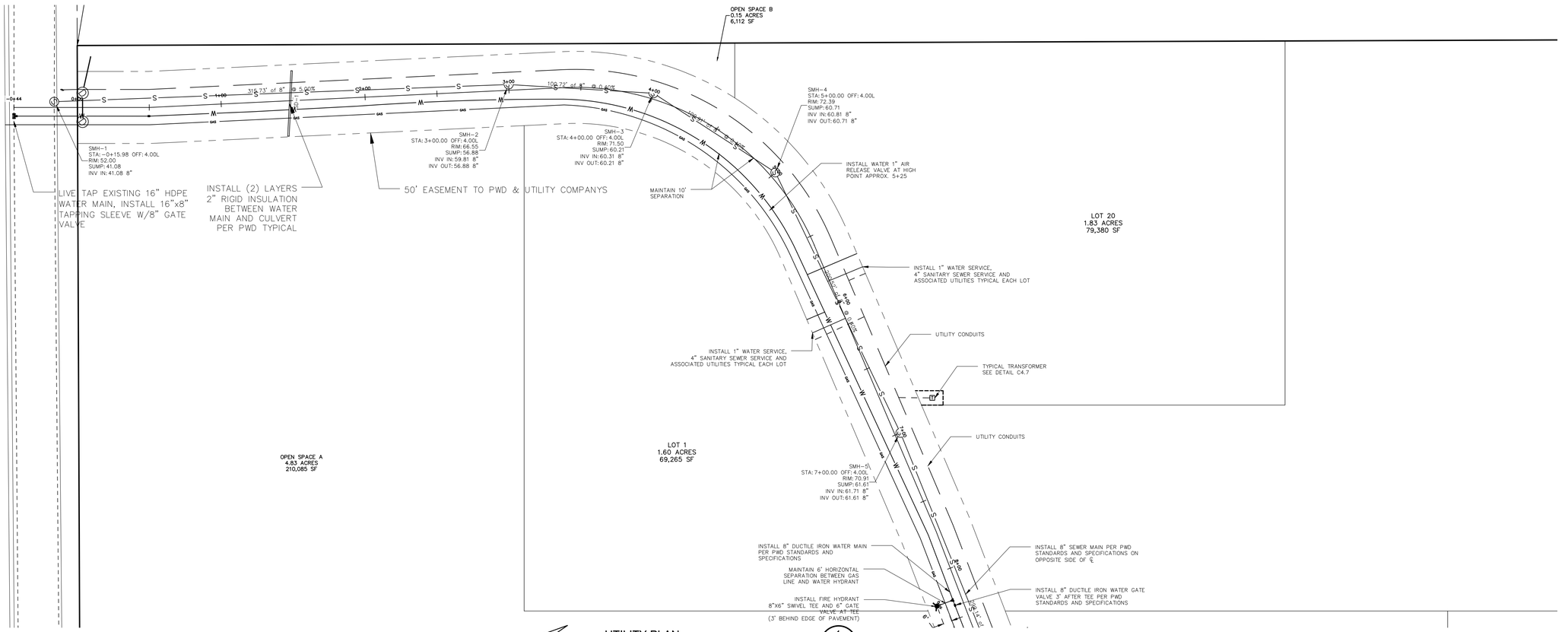
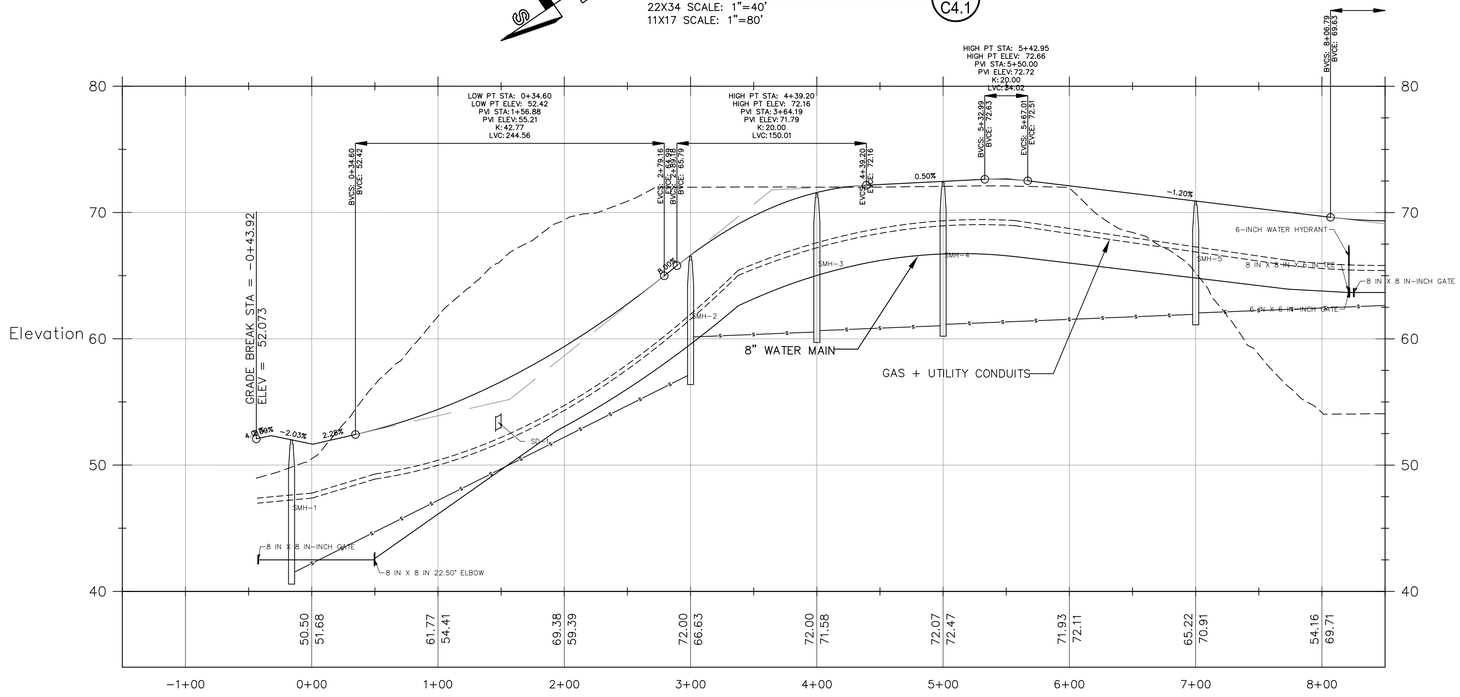
C4.0



UTILITY PLAN
22X34 SCALE: 1"=40'
11X17 SCALE: 1"=80'
1
C4.1



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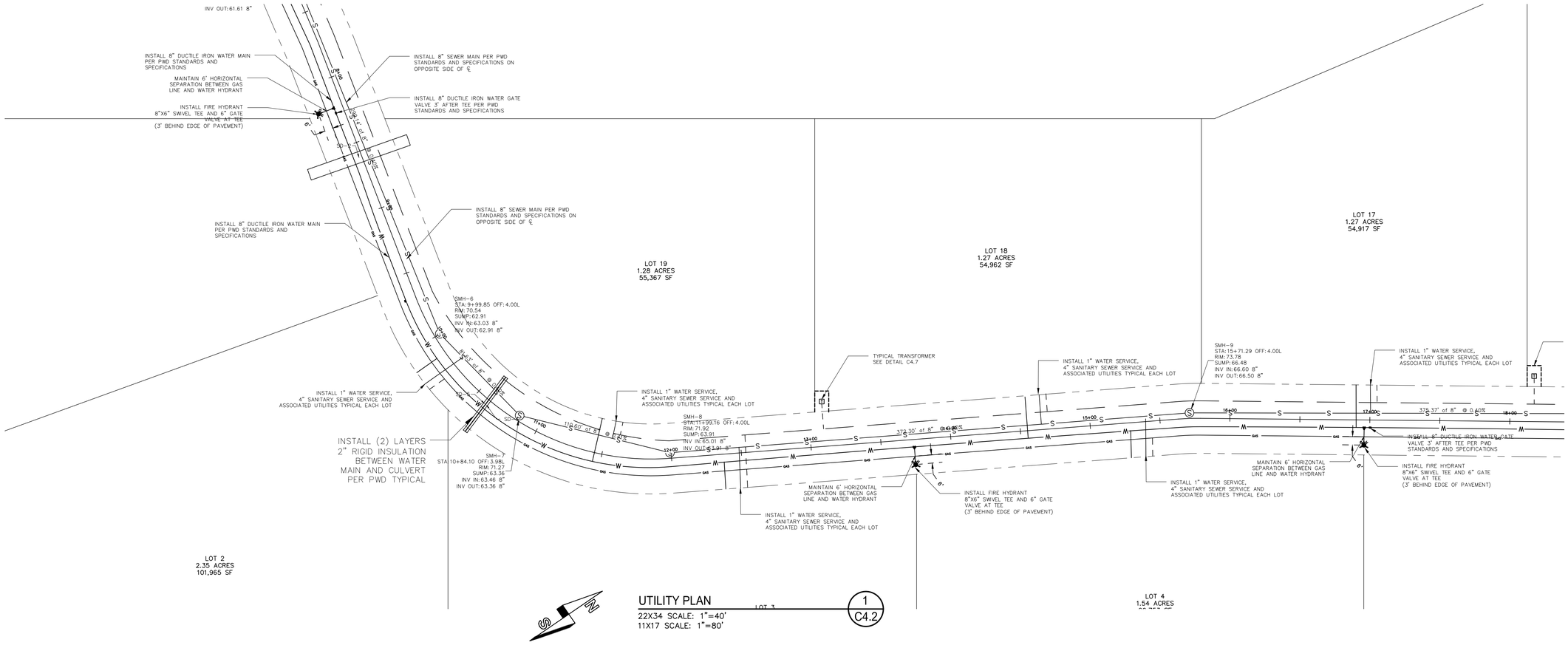
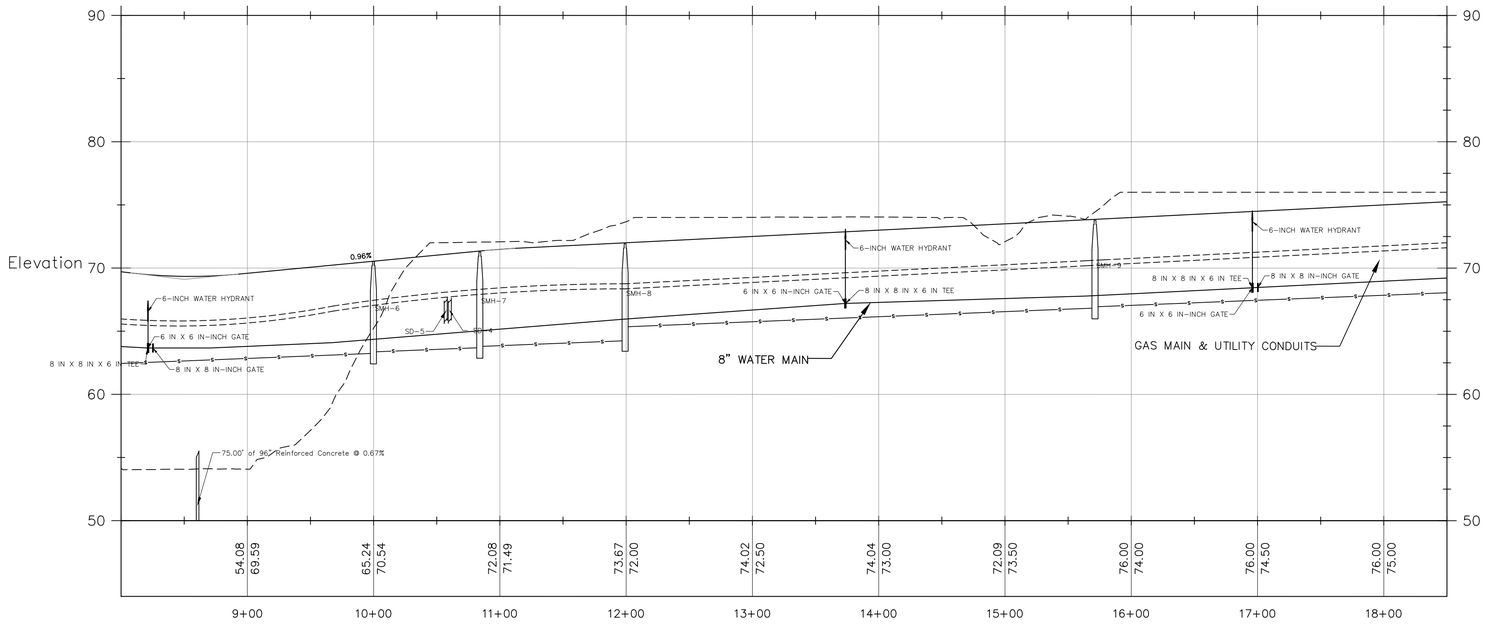


UTILITY PLAN
22X34 SCALE: 1"=40'
11X17 SCALE: 1"=80'

1
C4.2



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STATE OF MAINE
THOMAS W. PERKINS
No. 11710
PROFESSIONAL ENGINEER
LICENSED

UTILITY PLAN

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DATE: 7/18/2019

PROJECT NO. 18-015

SHEET NO.

C4.2

LOT 17
1.27 ACRES
54,917 SF

LOT 16
1.26 ACRES
54,734 SF

LOT 15
1.25 ACRES
54,358 SF

LOT 14
1.26 ACRES
54,451 SF

LOT 9
1.99 ACRES
86,493 SF

LOT 8
1.56 ACRES
67,820 SF

LOT 7
1.51 ACRES
65,414 SF

LOT 6
1.51 ACRES
65,451 SF

LOT 5
1.54 ACRES

.00L

LOT

TAIN 6" HORIZONTAL
ATION BETWEEN GAS
ND WATER HYDRANT

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AND ASSOCIATED UTILITIES TYPICAL EACH LOT

TYPICAL TRANSFORMER SEE DETAIL C4.7

INSTALL 8" DUCTILE IRON WATER GATE VALVE 3' AFTER TEE PER PWD STANDARDS AND SPECIFICATIONS

INSTALL FIRE HYDRANT 8"X6" SWIVEL TEE AND 6" GATE VALVE AT TEE (3' BEHIND EDGE OF PAVEMENT)

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AND ASSOCIATED UTILITIES TYPICAL EACH LOT

SMH-10
STA:19+47.37 OFF: 4.00L
RIM: 75.66
SUMP: 68.11
INV IN: 68.20 8"
INV OUT: 68.11 8"

375.37' of 8" @ 0.40%

17+00

18+00

19+00

20+00

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AND ASSOCIATED UTILITIES TYPICAL EACH LOT

TYPICAL TRANSFORMER SEE DETAIL C4.7

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AND ASSOCIATED UTILITIES TYPICAL EACH LOT

SMH-11
STA: 21+99.99 OFF: 4.00L
RIM: 76.92
SUMP: 69.20
INV IN: 69.26 8"
INV OUT: 69.20 8"

275.25' of 8" @ 0.40%

330.44' of 8" @ 0.40%

21+00

22+00

23+00

24+00

MAINTAIN 6" HORIZONTAL SEPARATION BETWEEN GAS LINE AND WATER HYDRANT

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AND ASSOCIATED UTILITIES TYPICAL EACH LOT

INSTALL FIRE HYDRANT 8"X6" SWIVEL TEE AND 6" GATE VALVE AT TEE (3' BEHIND EDGE OF PAVEMENT)

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AND ASSOCIATED UTILITIES TYPICAL EACH LOT

SMH-12
STA: 25+29.88 OFF: 4.00L
RIM: 78.57
SUMP: 70.58
INV IN: 70.69 8"
INV OUT: 70.58 8"

324.63' of 8" @ 0.40%

25+00

26+00

27+00

TYPICAL TRANSFORMER SEE DETAIL C4.7

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AN ASSOCIATED UTILITIES TYPICAL E

INSTALL FIRE HYDRANT 8"X6" SWIVEL TEE AND 6" GATE VALVE AT TEE (3' BEHIND EDGE OF PAVEMENT)

INSTALL 1 4" SANIT ASSOCIATI

MAINTAIN 6" HORIZONTAL SEPARATION BETWEEN GAS LINE AND WATER HYDRANT

INSTALL 1" WATER SERVICE, 4" SANITARY SEWER SERVICE AND ASSOCIATED UTILITIES TYPICAL EACH LOT

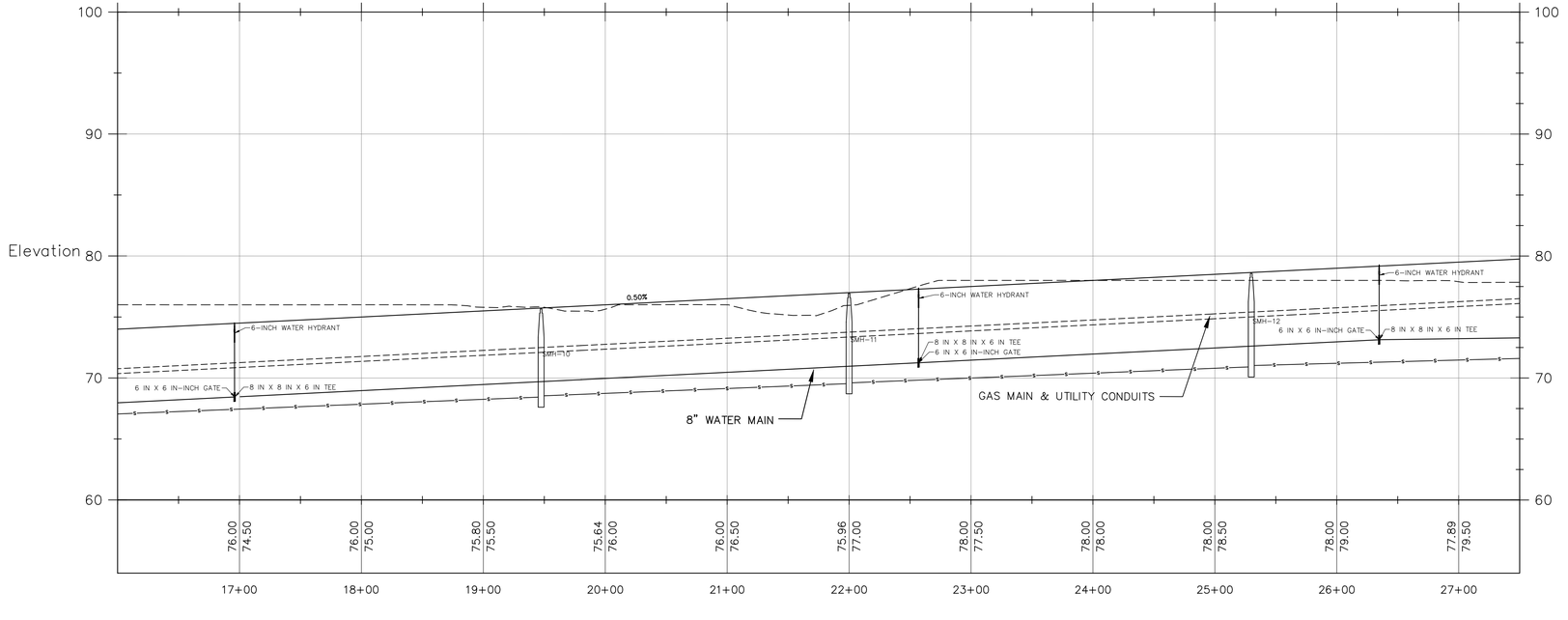
N

S

UTILITY PLAN

22X34 SCALE: 1"=40'
11X17 SCALE: 1"=80'

1 / C4.3



CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

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STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

REV.	DATE	DESCRIPTION
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DRAWN BY: ZTQ | CHECKED BY: TWP

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Suite 2
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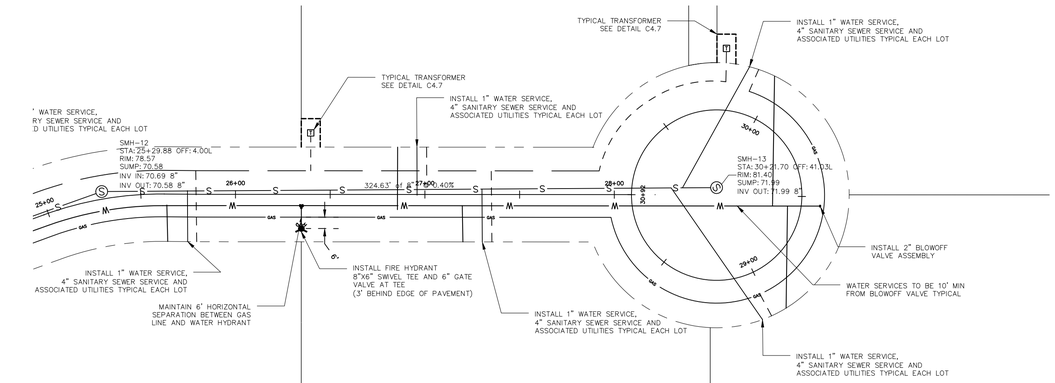
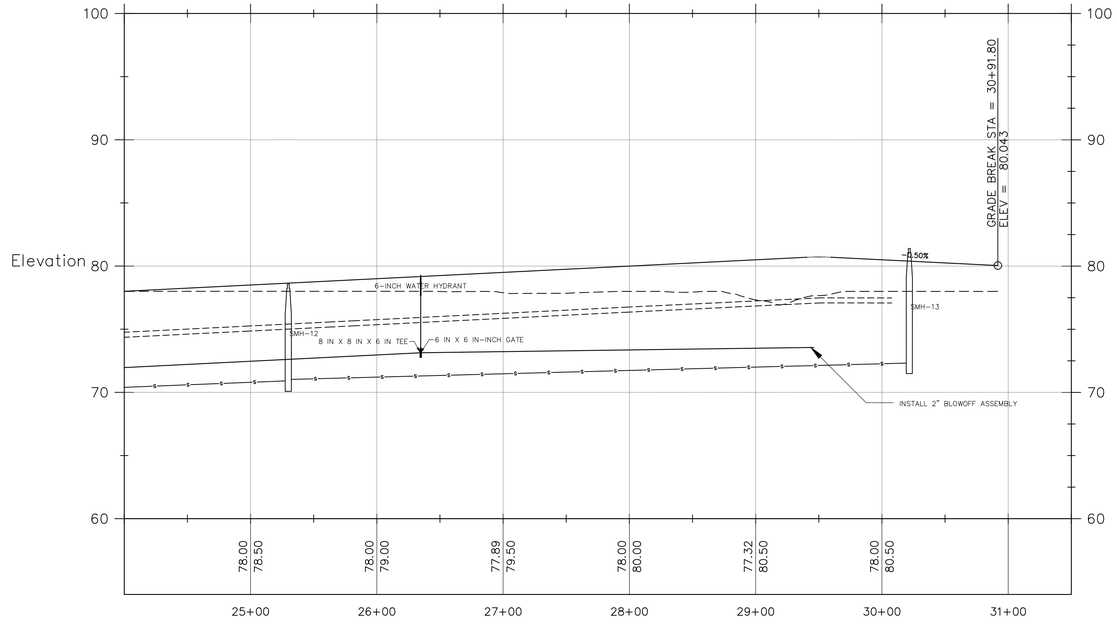


UTILITY PLAN — 1 / C4.4
22X34 SCALE: 1"=40'
11X17 SCALE: 1"=80'



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STATE OF MAINE — THOMAS W. PERKINS No. 11710 — LICENSED PROFESSIONAL ENGINEER

UTILITY PLAN

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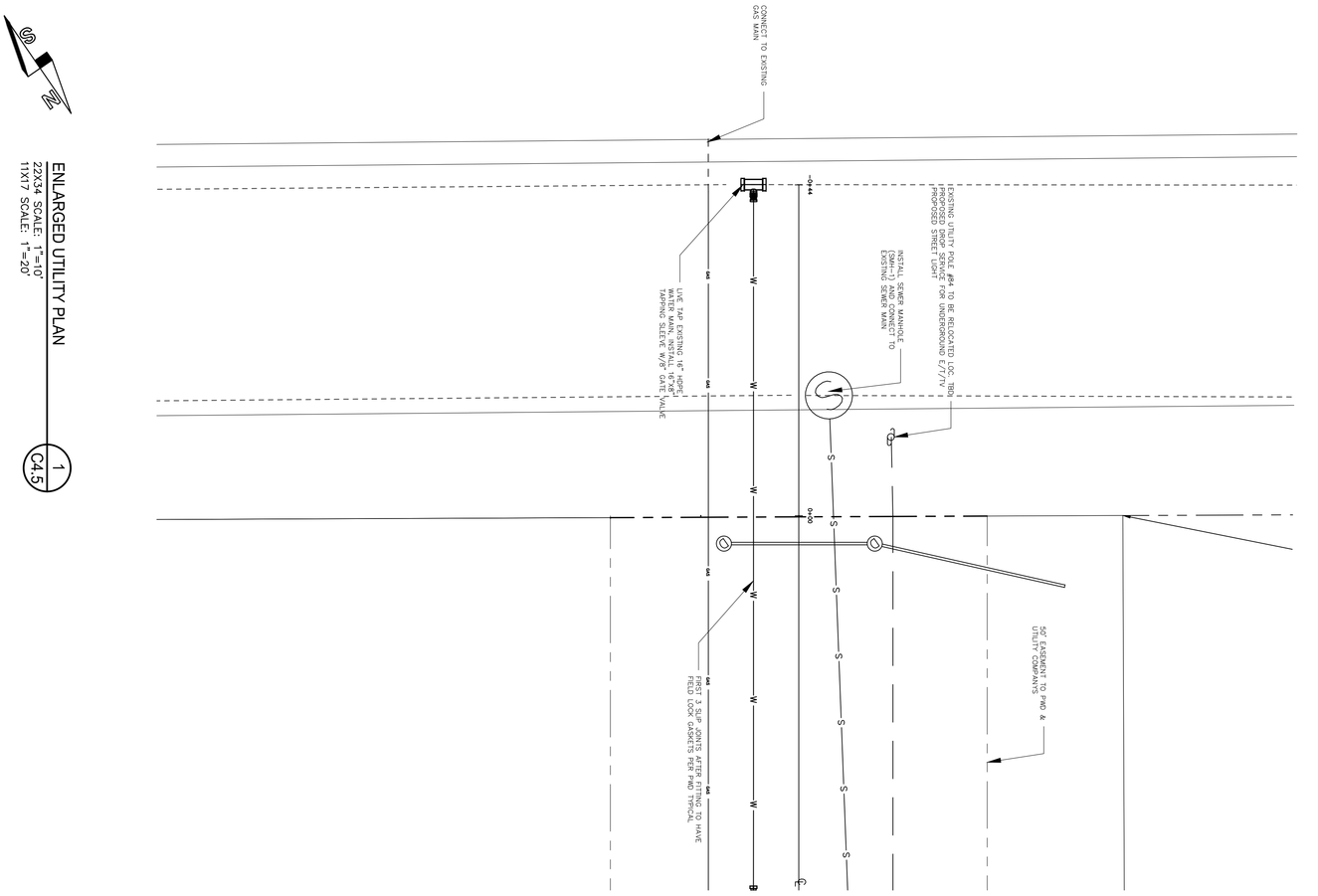

ENLARGED UTILITY PLAN
22X34 SCALE: 1"=10'
11X17 SCALE: 1"=20'

1
C4.5

C4.5	SHEET NO.	
PROJECT NO. 18-015	DATE: 7/18/2019	

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DRAWN BY: ZTQ | CHECKED BY: TWP

THOMAS W. PERKINS
REGISTERED PROFESSIONAL ENGINEER
STATE OF MAINE

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CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

STRUCTURE TABLE			
STRUCTURE NAME:	DETAILS:	PIPES IN:	PIPES OUT
SMH-1	48" RIM = 52.00 SUMP = 41.1 INV IN = 41.08	Pipe - (100), 8" INV IN =41.08	
SMH-2	48" RIM = 66.55 SUMP = 56.9 INV IN = 59.81 INV OUT = 56.88	Pipe - (99), 8" INV IN =59.81	Pipe - (100), 8" INV OUT =56.88
SMH-3	48" RIM = 71.50 SUMP = 60.2 INV IN = 60.31 INV OUT = 60.21	Pipe - (98), 8" INV IN =60.31	Pipe - (99), 8" INV OUT =60.21
SMH-4	48" RIM = 72.39 SUMP = 60.7 INV IN = 60.81 INV OUT = 60.71	Pipe - (97), 8" INV IN =60.81	Pipe - (98), 8" INV OUT =60.71
SMH-5	48" RIM = 70.91 SUMP = 61.6 INV IN = 61.71 INV OUT = 61.61	Pipe - (96), 8" INV IN =61.71	Pipe - (97), 8" INV OUT =61.61
SMH-6	48" RIM = 70.54 SUMP = 62.9 INV IN = 63.03 INV OUT = 62.91	Pipe - (95), 8" INV IN =63.03	Pipe - (96), 8" INV OUT =62.91
SMH-7	48" RIM = 71.27 SUMP = 63.4 INV IN = 63.46 INV OUT = 63.36	Pipe - (94), 8" INV IN =63.46	Pipe - (95), 8" INV OUT =63.36
SMH-8	48" RIM = 71.92 SUMP = 63.9 INV IN = 65.01 INV OUT = 63.91	Pipe - (93), 8" INV IN =65.01	Pipe - (94), 8" INV OUT =63.91
SMH-9	48" RIM = 73.78 SUMP = 66.5 INV IN = 66.60 INV OUT = 66.50	Pipe - (92), 8" INV IN =66.60	Pipe - (93), 8" INV OUT =66.50
SMH-10	48" RIM = 75.66 SUMP = 68.1 INV IN = 68.20 INV OUT = 68.11	Pipe - (91), 8" INV IN =68.20	Pipe - (92), 8" INV OUT =68.11
SMH-11	48" RIM = 76.92 SUMP = 69.2 INV IN = 69.26 INV OUT = 69.20	Pipe - (90), 8" INV IN =69.26	Pipe - (91), 8" INV OUT =69.20
SMH-12	48" RIM = 78.57 SUMP = 70.6 INV IN = 70.69 INV OUT = 70.58	Pipe - (88), 8" INV IN =70.69	Pipe - (90), 8" INV OUT =70.58
SMH-13	48" RIM = 81.40 SUMP = 72.0 INV OUT = 71.99		Pipe - (88), 8" INV OUT =71.99

Pipe Table						
NAME	SIZE	LENGTH	SLOPE	MATERIAL	INVERT	OUTVERT
SD-1	12"	45.46'	0.51%	Corrugated HDPE Pipe	53.00	52.77
SD-2	96"	75.00'	0.67%	Reinforced Concrete	47.50	47.00
SD-4	18"	48.35'	0.52%	Corrugated HDPE Pipe	66.00	65.75
SD-5	18"	48.35'	0.52%	Corrugated HDPE Pipe	66.00	65.75

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

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STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER

TABLES

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
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DRAWN BY: ZTQ CHECKED BY: TWP

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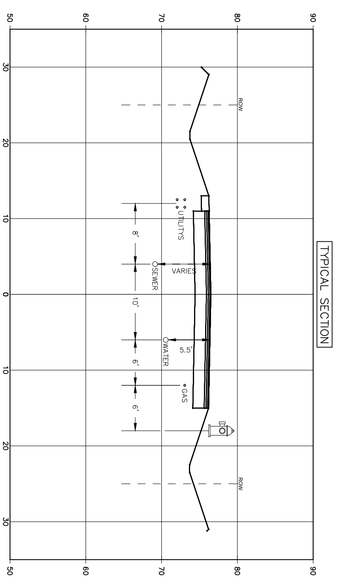

DIRIGO ARCHITECTURAL
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EM:tperkins@dirigoae.com W:www.dirigoae.com

PH: (207) 225 - 3040
7 Cobblestone Way,
Suite 2
Turner, ME 04282

SHEET NO.

PROJECT NO. 18-015

DATE: 6/28/2019

SECTION

REV.	DATE	DESCRIPTION
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION
5	7/18/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION

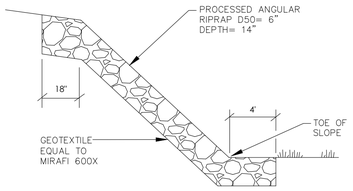
DRAWN BY: ZTQ | CHECKED BY: TWP

THOMAS W. PERKINS
6/28/19
STATE OF MAINE
REGISTERED PROFESSIONAL ENGINEER
LICENSED

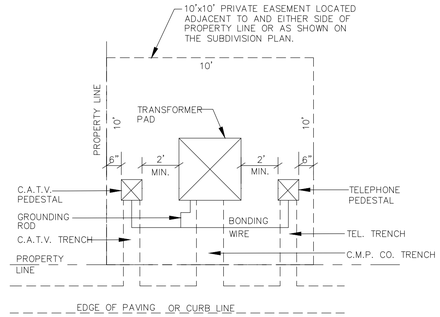
SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

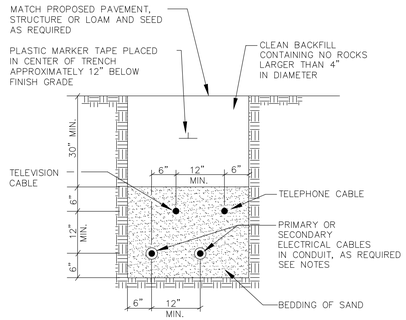


SIDE SLOPE RIPRAP
NOT TO SCALE



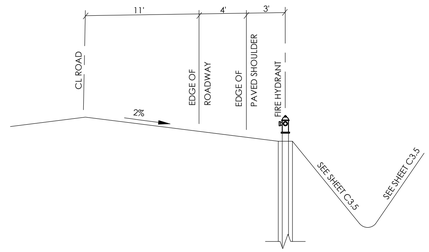
NOTE:
TRANSFORMER PAD AND COVER TO BE CONCRETE OR FIBERGLASS MEETING CENTRAL MAINE POWER SPECIFICATIONS.

TRANSFORMER DETAIL
NOT TO SCALE



TYPICAL UNDERGROUND CABLE INSTALLATION (SHARED TRENCH)
NOT TO SCALE

NOTES
1. CABLES SHALL BE INSTALLED IN SCHEDULE 40 PVC CONDUIT WHERE DUCTS ARE UNDER PUBLIC OR PRIVATE STREETS OR WAYS, PAVED AREAS, DRIVEWAYS, AND ALL POWER TRANSMISSION RIGHT OF WAYS (CMP HANDBOOK OF REQUIREMENTS, APRIL 25, 2006, SECTION 910)
2. INSTALLATION SHALL NOT ALLOW THE INTER-TWINING OF CABLES.
3. BEDDING AND BACKFILL SHALL BE FREE OF ROOTS, STUMPS, AND OTHER DEBRIS.



TYP. FIRE HYDRANT LOCATION
NOT TO SCALE

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER
7/10/18

UTILITY DETAILS

REV.	DATE	DESCRIPTION
2	3/29/19	DEP PERMITTING
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION

DRAWN BY: ZTQ | CHECKED BY: TWP

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DATE: 7/10/2019

PROJECT NO. 18-015

SHEET NO.

C4.7

Jul 30, 2019 - 2:56pm
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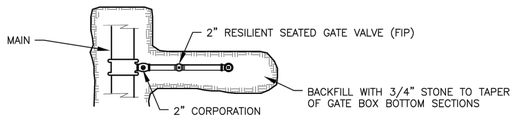
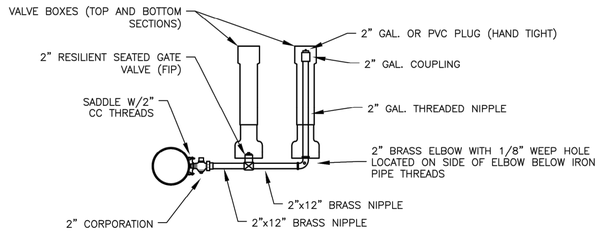
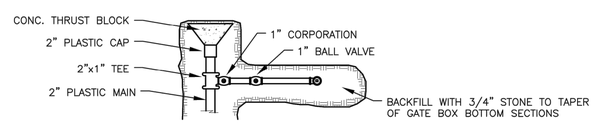


TOP VIEW

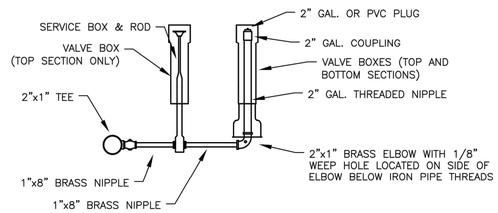


SIDE VIEW

SIDE-ARM BLOW-OFF (4" & LARGER MAINS)

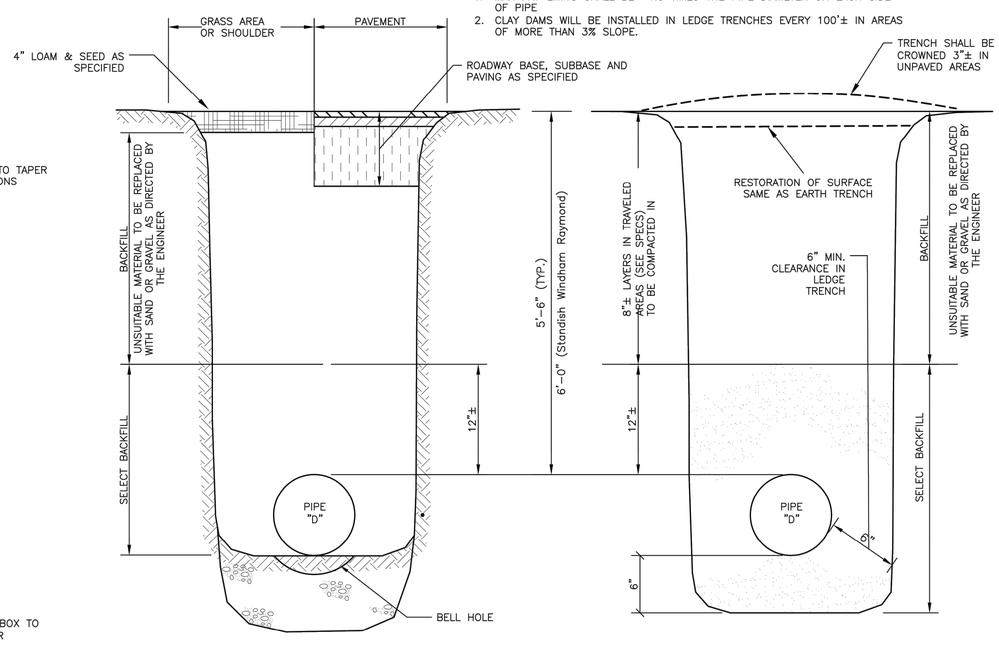


TOP VIEW



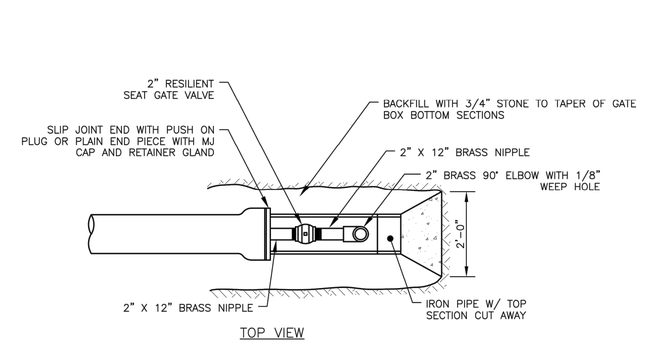
SIDE VIEW

SIDE-ARM BLOW-OFF (2" MAIN)

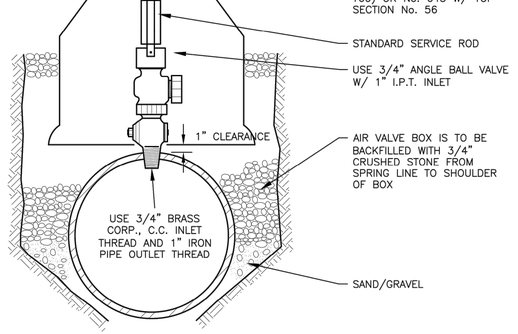


SECTION THRU EARTH TRENCH

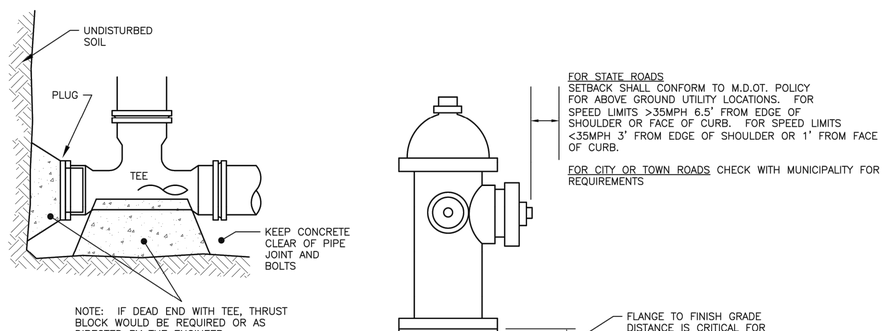
SECTION THRU LEDGE TRENCH

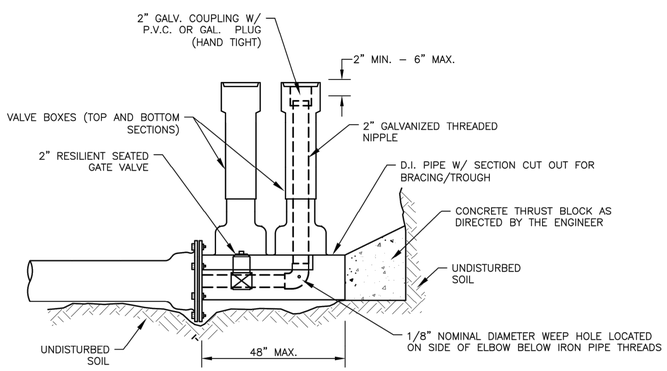


TOP VIEW

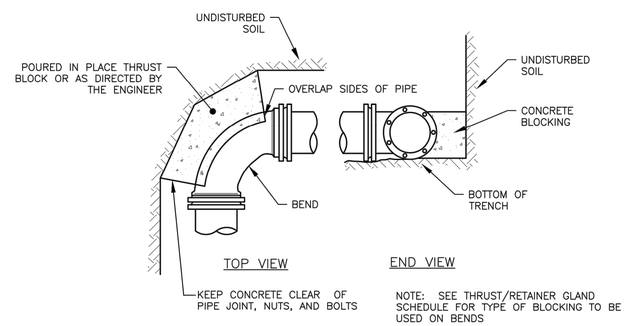


TYPICAL AIR VALVE (1")



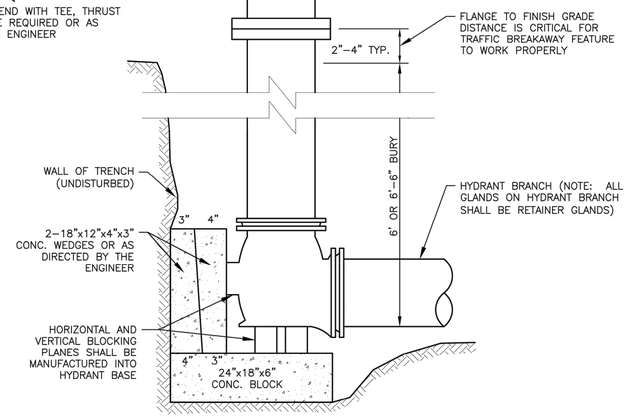


STANDARD 2" BLOW OFF



TOP VIEW END VIEW

STANDARD BEND BLOCKING



TYPICAL HYDRANT INSTALLATION DETAIL

CHRISTMAS CREEK SUBDIVISION

CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE — THOMAS W. PERKINS No. 11710 — LICENSED PROFESSIONAL ENGINEER — 7/10/18

UTILITY DETAILS

REV.	DATE	DESCRIPTION
2	3/29/19	DEP PERMITTING
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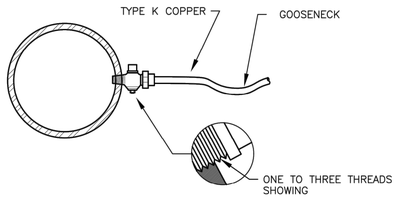
DATE: 7/10/2019

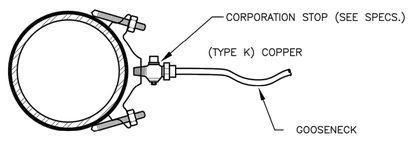
PROJECT NO. 18-015

SHEET NO.

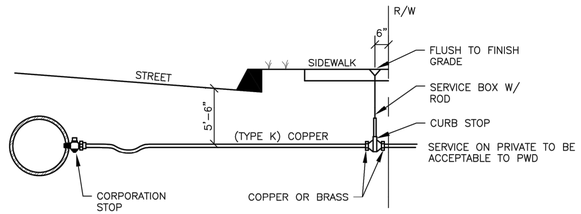
C4.8



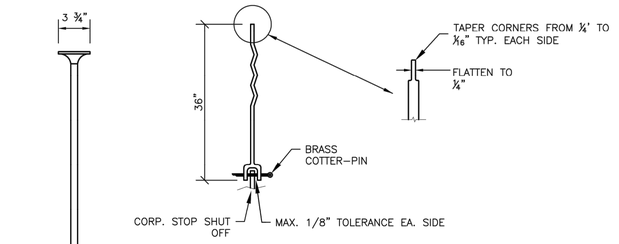
SERVICE TAP
(3/4" AND 1" C.C. THREAD)



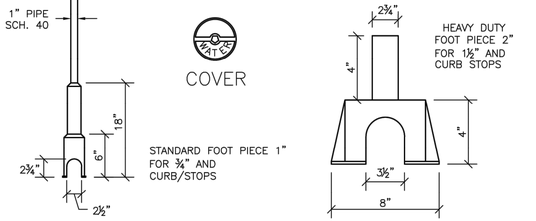
SERVICE SADDLE
(1-1/2" AND 2" C.C. THREAD)



TYPICAL SERVICE CONNECTION

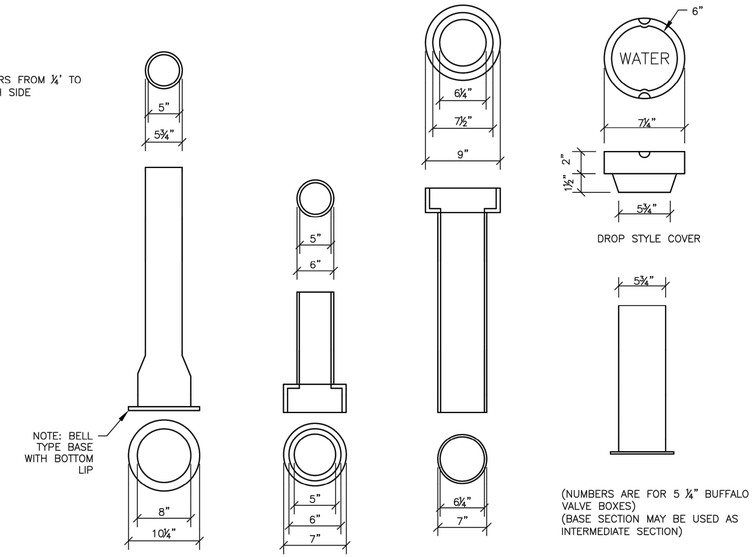


SERVICE ROD

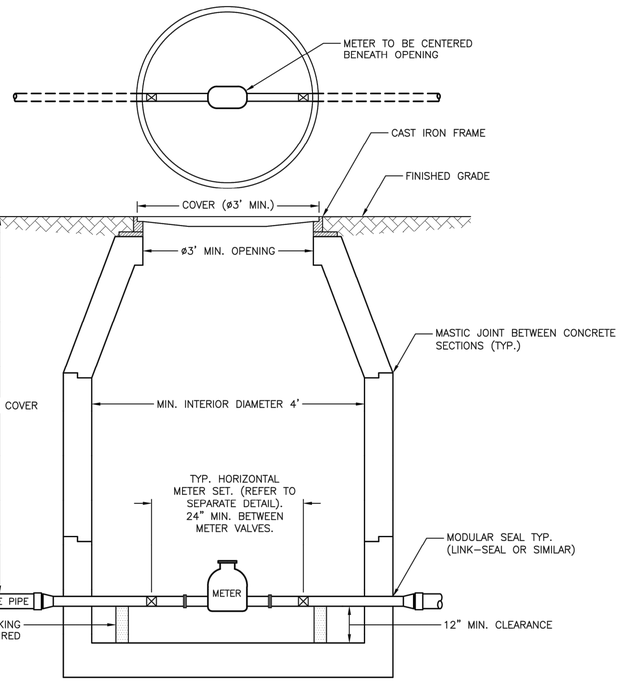


SERVICE BOX FOOT PIECE

NOTE: ANY EXTENSION OF SERVICE BOX REQUIRES:
1. 1" FEMALE IRON PIPE COUPLING
2. 1" THREADED PIPE (THIS IS TO BE A NON-WELDED, TWO PIECE ARRANGEMENT. SLIP ON ADAPTERS ARE NOT PERMISSIBLE.)



VALVE BOX & COVER



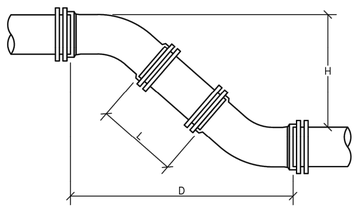
TYPICAL SMALL METER PIT
(⅝" TO 2" METER)

METER PIT AND COVER NOTES

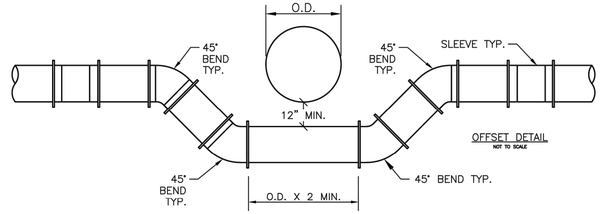
1. THE METER PIT SHALL BE SUPPLIED AND INSTALLED BY THE CUSTOMER AND LOCATED ON PRIVATE PROPERTY BETWEEN 10' AND 20' FROM THE PROPERTY LINE.
2. THE METER PIT SHALL BE MADE OF PRECAST CONCRETE OF SUFFICIENT SIZE TO PROVIDE 5.5' MINIMUM GROUND COVER FROM FINISHED GRADE TO THE TOP OF THE SERVICE PIPE. ANY SEAMS BETWEEN CONCRETE SECTIONS SHALL BE SEALED WITH MASTIC JOINT. ALL OPENINGS IN THE CONCRETE FOR SERVICE PIPING SHALL BE SEALED WITH A MODULAR SEAL (LINK-SEAL OR SIMILAR).
3. THE INTERIOR OF THE METER PIT SHALL BE A MINIMUM OF 4' IN DIAMETER, AND THE METER PIT OPENING SHALL BE A MINIMUM OF 30" IN DIAMETER WITH A CAST IRON FRAME. THE METER PIT COVER SHALL BE CAST IRON, 32" MINIMUM IN DIAMETER, AND BE EITHER PERMANENTLY LABELED "WATER" OR HAVE NO LABEL. ANY STEEL PLATE MATERIAL SHALL BE COATED WITH A RUST INHIBITOR PAINT.
4. WALL-MOUNTED LADDER RUNGS SHALL NOT BE INSTALLED WITHIN METER PIT.
5. ALL PIPING INSIDE AND EXTENDING THROUGH THE METER PIT SHALL BE MADE OF COPPER, WITH A MINIMUM OF 6" CLEARANCE FROM THE METER PIT FLOOR. BLOCKING SHALL BE INSTALLED AS REQUIRED TO SUPPORT THE PIPE.
6. CUSTOMER SHALL ENSURE THE METER PIT AND COVER ARE PROPERLY RATED FOR TRAFFIC FLOW, IF APPLICABLE.

METER NOTES

7. ONLY PWD PERSONNEL ARE AUTHORIZED TO INSTALL WATER METERS. PWD PERSONNEL ARE ADDITIONALLY AUTHORIZED TO OPERATE METER VALVES AS NEEDED FOR INSTALLATION AND MAINTENANCE.
8. PWD WILL SUPPLY THE WATER METER. ALL OTHER FITTINGS, INCLUDING A METER RESETTER FOR 1" OR SMALLER METERS, SHALL BE SUPPLIED AND INSTALLED BY CUSTOMER.
9. FOR 1.5" AND 2" METERS, CUSTOMER SHALL INSTALL A FLANGED METER SPOOL PIECE, SUPPLIED BY PWD AT NO ADDITIONAL CHARGE, PRIOR TO METER SET. THE METER SPOOL WILL BE MADE AVAILABLE FOR CUSTOMER PICKUP AT PWD CUSTOMER SERVICE, 225 DOUGLASS STREET, PORTLAND DURING NORMAL BUSINESS HOURS.
10. CUSTOMER WILL INSTALL TWO BALL VALVES AT LEAST 24" APART FOR METER INSTALLATION, ALLOWING FOR THE WATER METER TO BE CENTERED UNDER THE METER PIT OPENING. THE BALL VALVES SHALL BE SOLDERED IN PLACE.
11. THE METER PIT MAY HOUSE UP TO TWO 5/8", 3/4" OR 1" METERS WITH PRIOR APPROVAL FROM PWD.



	6" PIPE		8" PIPE		12" PIPE	
H	D	L	D	L	D	L
12"	1' 6-1/2"	0' 10-1/2"	1' 7-1/2"	0' 9-1/2"	1' 11-1/2"	0' 5-1/2"
13"	1' 7-1/2"	0' 11-7/8"	1' 8-1/2"	0' 10-7/8"	2' 0-1/2"	0' 6-7/8"
14"	1' 8-1/2"	1' 1-5/16"	1' 9-1/2"	1' 0-5/16"	2' 1-1/2"	0' 8-5/16"
15"	1' 9-1/2"	1' 2-11/16"	1' 10-1/2"	1' 1-11/16"	2' 2-1/2"	0' 9-11/16"
16"	1' 10-1/2"	1' 4-1/8"	1' 11-1/2"	1' 3-1/8"	2' 3-1/2"	0' 11-1/8"
17"	1' 11-1/2"	1' 5-9/16"	2' 0-1/2"	1' 4-9/16"	2' 4-1/2"	1' 0-9/16"
18"	2' 0-1/2"	1' 6-15/16"	2' 1-1/2"	1' 5-15/16"	2' 5-1/2"	1' 1-15/16"
19"	2' 1-1/2"	1' 8-3/8"	2' 2-1/2"	1' 7-3/8"	2' 6-1/2"	1' 3-3/8"
20"	2' 2-1/2"	1' 9-13/16"	2' 3-1/2"	1' 8-13/16"	2' 7-1/2"	1' 4-13/16"
21"	2' 3-1/2"	1' 11-3/16"	2' 4-1/2"	1' 10-3/16"	2' 8-1/2"	1' 6-3/16"
22"	2' 4-1/2"	2' 0-5/8"	2' 5-1/2"	1' 11-5/8"	2' 9-1/2"	1' 7-5/8"
23"	2' 5-1/2"	2' 2"	2' 6-1/2"	2' 1"	2' 10-1/2"	1' 9"
24"	2' 6-1/2"	2' 3-7/16"	2' 7-1/2"	2' 2-7/16"	2' 11-1/2"	1' 10-7/16"
25"	2' 7-1/2"	2' 4-7/8"	2' 8-1/2"	2' 3-7/8"	3' 0-1/2"	1' 11-7/8"
26"	2' 8-1/2"	2' 6-1/4"	2' 9-1/2"	2' 5-1/4"	3' 1-1/2"	2' 1-1/4"
27"	2' 9-1/2"	2' 7-11/16"	2' 10-1/2"	2' 6-11/16"	3' 2-1/2"	2' 2-11/16"
28"	2' 10-1/2"	2' 9-1/8"	2' 11-1/2"	2' 8-1/8"	3' 3-1/2"	2' 4-1/8"
29"	2' 11-1/2"	2' 10-1/2"	3' 0-1/2"	2' 9-1/2"	3' 4-1/2"	2' 5-1/2"
30"	3' 0-1/2"	2' 11-15/16"	3' 1-1/2"	2' 10-15/16"	3' 5-1/2"	2' 6-15/16"
31"	3' 1-1/2"	3' 1-5/16"	3' 2-1/2"	3' 0-5/16"	3' 6-1/2"	2' 8-5/16"
32"	3' 2-1/2"	3' 2-3/4"	3' 3-1/2"	3' 1-3/4"	3' 7-1/2"	2' 9-3/4"
33"	3' 3-1/2"	3' 4-3/16"	3' 4-1/2"	3' 3-3/16"	3' 8-1/2"	2' 11-3/16"
34"	3' 4-1/2"	3' 5-9/16"	3' 5-1/2"	3' 4-9/16"	3' 9-1/2"	3' 0-9/16"
35"	3' 5-1/2"	3' 7"	3' 6-1/2"	3' 6"	3' 10-1/2"	3' 2"
36"	3' 6-1/2"	3' 8-7/16"	3' 7-1/2"	3' 7-7/16"	3' 11-1/2"	3' 3-7/16"
37"	3' 7-1/2"	3' 9-13/16"	3' 8-1/2"	3' 8-13/16"	4' 0-1/2"	3' 4-13/16"
38"	3' 8-1/2"	3' 11-1/4"	3' 9-1/2"	3' 10-1/4"	4' 1-1/2"	3' 6-1/4"
39"	3' 9-1/2"	4' 0-11/16"	3' 10-1/2"	3' 11-11/16"	4' 2-1/2"	3' 7-11/16"
40"	3' 10-1/2"	4' 2-1/16"	3' 11-1/2"	4' 1-1/16"	4' 3-1/2"	3' 9-1/16"
41"	3' 11-1/2"	4' 3-1/2"	4' 0-1/2"	4' 2-1/2"	4' 4-1/2"	3' 10-1/2"
42"	4' 0-1/2"	4' 4-7/8"	4' 1-1/2"	4' 3-7/8"	4' 5-1/2"	3' 11-7/8"
43"	4' 1-1/2"	4' 6-5/16"	4' 2-1/2"	4' 5-5/16"	4' 6-1/2"	4' 1-5/16"
44"	4' 2-1/2"	4' 7-3/4"	4' 3-1/2"	4' 6-3/4"	4' 7-1/2"	4' 2-3/4"
45"	4' 3-1/2"	4' 9-1/8"	4' 4-1/2"	4' 8-1/8"	4' 8-1/2"	4' 4-1/8"
46"	4' 4-1/2"	4' 10-9/16"	4' 5-1/2"	4' 9-9/16"	4' 9-1/2"	4' 5-9/16"
47"	4' 5-1/2"	4' 11-15/16"	4' 6-1/2"	4' 10-15/16"	4' 10-1/2"	4' 6-15/16"
48"	4' 6-1/2"	5' 1-3/8"	4' 7-1/2"	5' 0-3/8"	4' 11-1/2"	4' 8-3/8"
49"	4' 7-1/2"	5' 2-13/16"	4' 8-1/2"	5' 1-13/16"	5' 0-1/2"	4' 9-13/16"
50"	4' 8-1/2"	5' 4-3/16"	4' 9-1/2"	5' 3-3/16"	5' 1-1/2"	4' 11-3/16"
51"	4' 9-1/2"	5' 5-5/8"	4' 10-1/2"	5' 4-5/8"	5' 2-1/2"	5' 0-5/8"
52"	4' 10-1/2"	5' 7-1/16"	4' 11-1/2"	5' 6-1/16"	5' 3-1/2"	5' 2-1/16"
53"	4' 11-1/2"	5' 8-7/16"	5' 0-1/2"	5' 7-7/16"	5' 4-1/2"	5' 3-7/16"
54"	5' 0-1/2"	5' 9-7/8"	5' 1-1/2"	5' 8-7/8"	5' 5-1/2"	5' 4-7/8"
55"	5' 1-1/2"	5' 11-5/16"	5' 2-1/2"	5' 10-5/16"	5' 6-1/2"	5' 6-5/16"



OFFSET DETAIL
NOT TO SCALE

TYPICAL MAIN OFFSET

NOTE: DIMENSIONS APPLICABLE FOR SIGMA COMPACT BENDS. FOR TYLER COMPACT BENDS, ADD 1/2" TO "D" DIMENSION AND SUBTRACT 1/2" FROM "L" DIMENSION. FOR OTHER FITTINGS REFER TO MANUFACTURER'S RECOMMENDATIONS.

CHRISTMAS CREEK SUBDIVISION
CUMBERLAND MAINE

SIGNED COPY OF DRAWING ON FILE AT DIRIGO A/E OFFICE

STATE OF MAINE
THOMAS W. PERKINS
No. 11710
LICENSED PROFESSIONAL ENGINEER
7/10/18

UTILITY DETAILS

REV.	DATE	DESCRIPTION
2	3/29/19	DEP PERMITTING
3	4/30/19	MAJOR SUBDIVISION FINAL PLAN SUBMISSION
4	7/10/19	UTILITY DRAWINGS - PWD - FINAL SUBMISSION

DRAWN BY: ZTQ | CHECKED BY: TWP

PH: (207) 225 - 3040
7 Cobblestone Way, Suite 2
Turner, ME 04282

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PROJECT NO. 18-015

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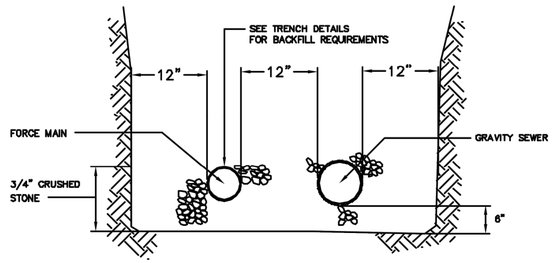
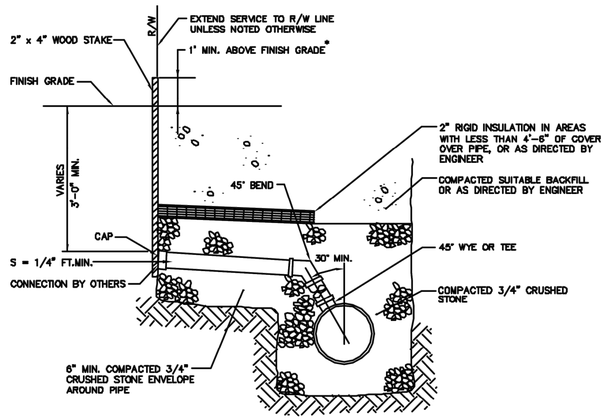
C4.9



TWO PIPE TRENCH DETAIL

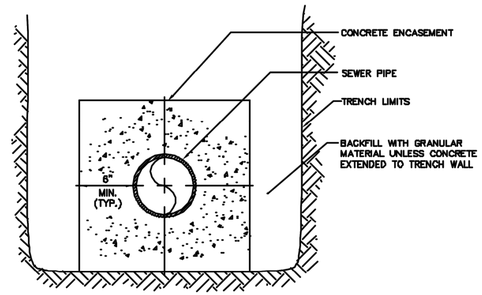


NOTES:

- PIPE DIAMETERS MAY VARY, SEE TYPICAL PIPE TRENCH DETAIL, THIS SHEET.
- WHERE 30° MINIMUM ANGLE BETWEEN SEWER CONNECTION AT THE SEWER MAIN AND THE VERTICAL CANNOT BE MAINTAINED, PROVIDE A PRECAST SEWER CHIMNEY.
- IF STAKE IS CUT OFF FLUSH OR SLIGHTLY BELOW GRADE, PROVIDE MIN. OF TWO 16d. GALV. SPIKES DRIVEN INTO TOP OF 2" x 4" TO PROVIDE METAL DETECTABILITY.

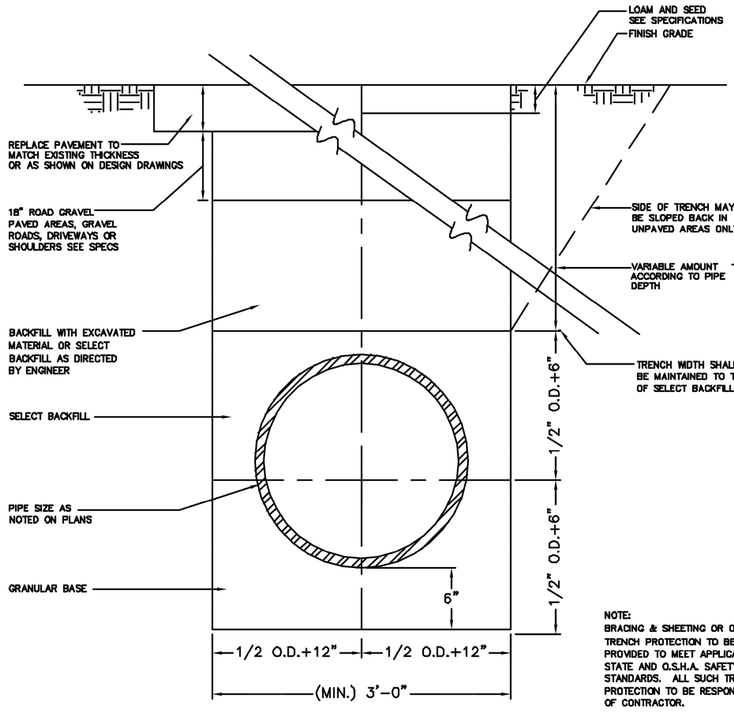
HORIZONTAL SEWER CONNECTION

N.T.S.



CONCRETE ENCASEMENT FOR SEWER MAINS

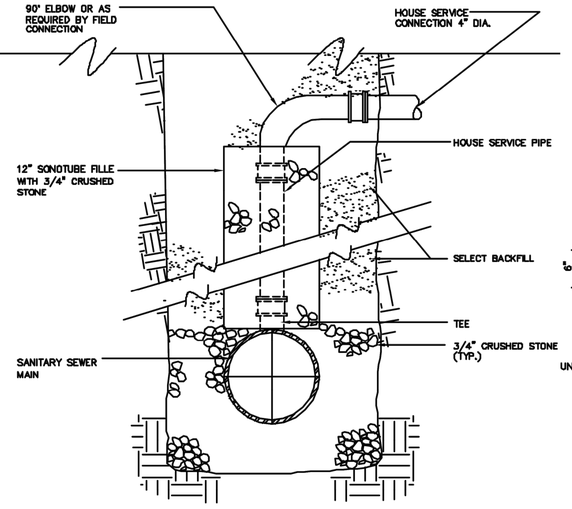
N.T.S.



NOTE:
BRACING & SHEETING OR OTHER TRENCH PROTECTION TO BE PROVIDED TO MEET APPLICABLE STATE AND O.S.H.A. SAFETY STANDARDS. ALL SUCH TRENCH PROTECTION TO BE RESPONSIBILITY OF CONTRACTOR.

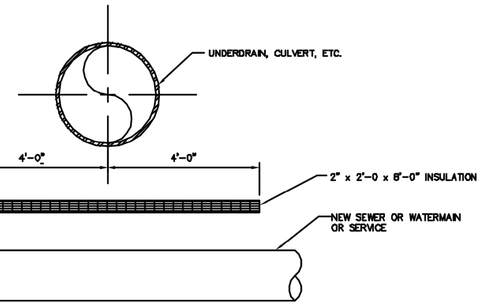
TRENCH SECTION

N.T.S.



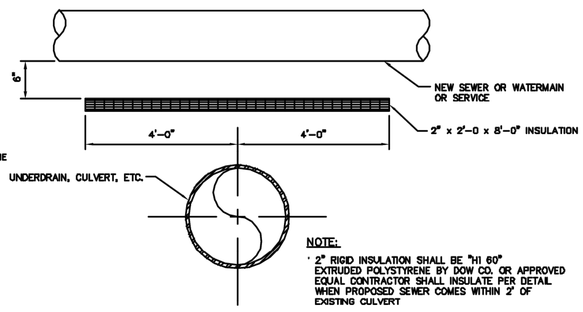
CHIMNEY DETAIL

N.T.S.



INSULATION DETAIL "A"

N.T.S.



NOTE:

- 2" RIGID INSULATION SHALL BE "HI 60" EXTRUDED POLYSTYRENE BY DOW CO. OR APPROVED EQUAL CONTRACTOR SHALL INSULATE PER DETAIL WHEN PROPOSED SEWER COMES WITHIN 2' OF EXISTING CULVERT

INSULATION DETAIL "B"

N.T.S.

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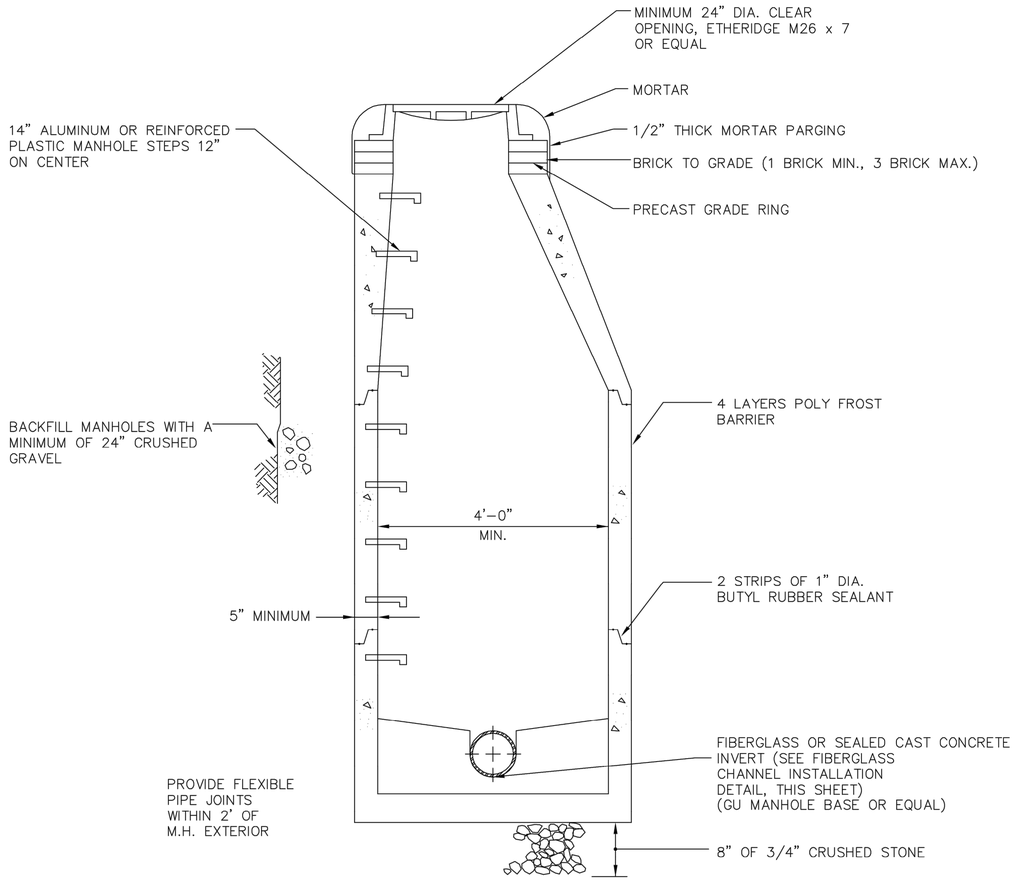
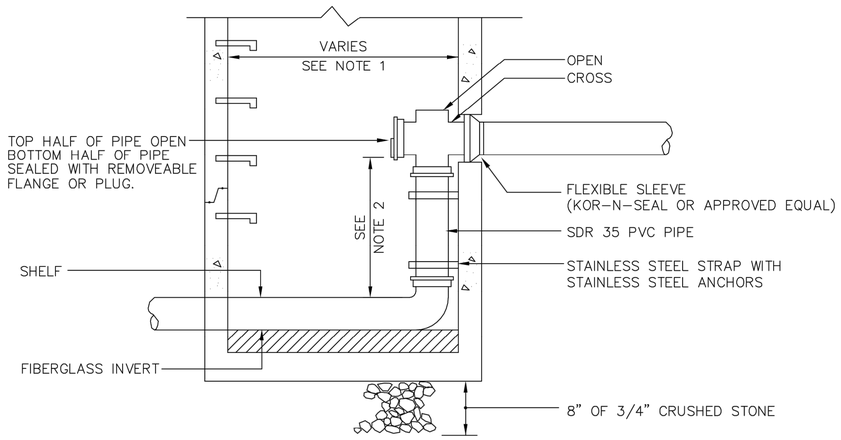


PRECAST MANHOLE



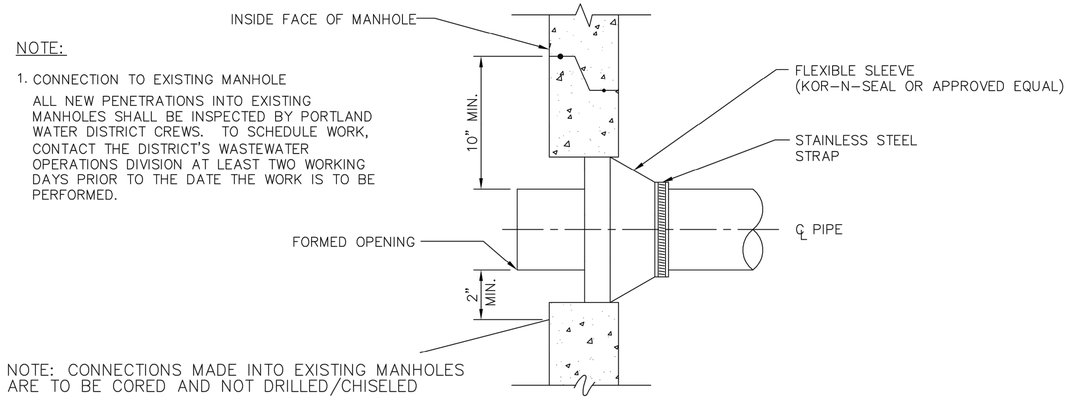
PRECAST DROP MANHOLE

NOTES:

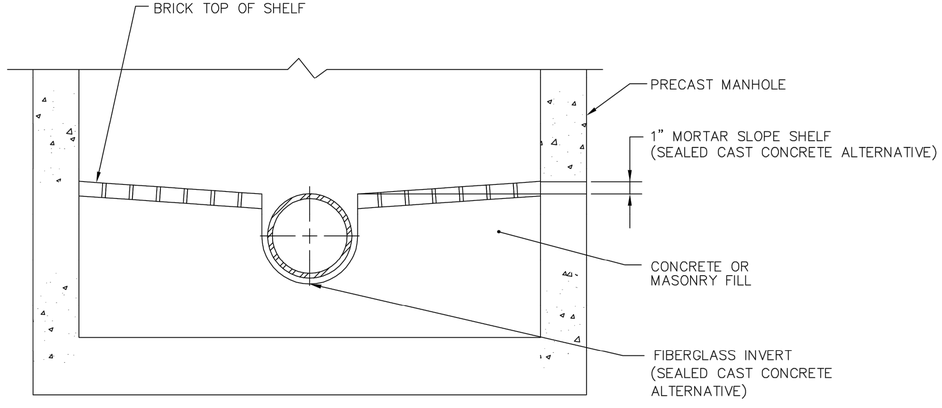
1. USE 4' I.D. M.H. WITH 8" OR SMALLER PIPE
   USED 5' I.D. M.H. WITH IO" OR LARGER PIPE
2. MINIMUM HEIGHT OF DROP IS 2'-0"
3. SEE PRECAST MANHOLE SECTION FOR TYPICAL
4. MANHOLE INFORMATION, INCLUDING NOTES.
5. PROVIDE DROP PIPE FOR ALL INVERT DIFFERENTIALS GREATER THAN TWO (2) FEET.
6. CUT OFF TOP 1/3 OF PIPE PLUG.
7. INSTALL PVC TEE AND PLUG FACING UP AT INSIDE DROP INSTALLATION AT EXISTING MANHOLE LOCATED ON WEST STREET.

NOTE:

1. CONNECTION TO EXISTING MANHOLE
   ALL NEW PENETRATIONS INTO EXISTING MANHOLES SHALL BE INSPECTED BY PORTLAND WATER DISTRICT CREWS. TO SCHEDULE WORK, CONTACT THE DISTRICT'S WASTEWATER OPERATIONS DIVISION AT LEAST TWO WORKING DAYS PRIOR TO THE DATE THE WORK IS TO BE PERFORMED.



NEW PIPE TO EXISTING MANHOLE CONNECTION DETAIL – 4" TO 24"



FIBERGLASS CHANNEL INSTALLATION

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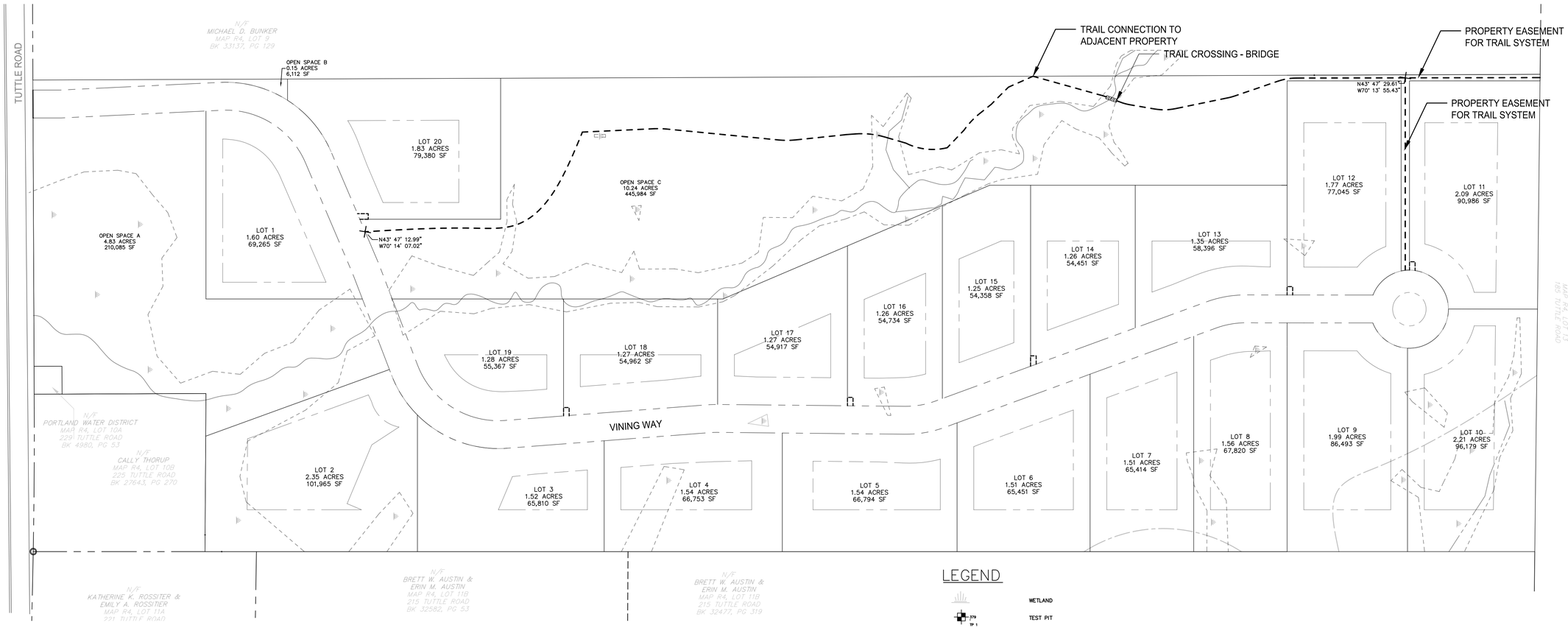
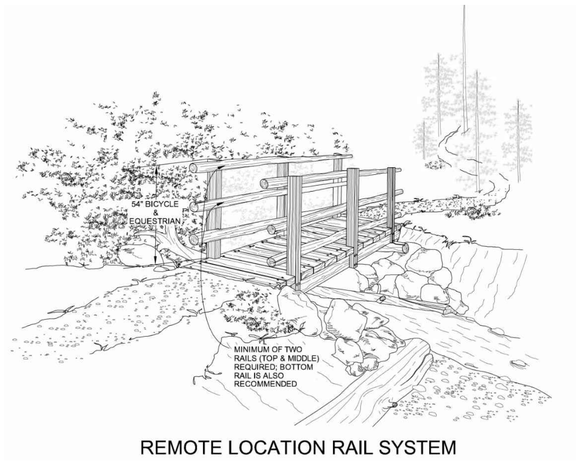




REMOTE LOCATION RAIL SYSTEM

AASHTO RURAL TRAIL BRIDGE DETAIL 2
NTS C5.0

TRAIL PLAN 1
22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200' C5.0

LEGEND

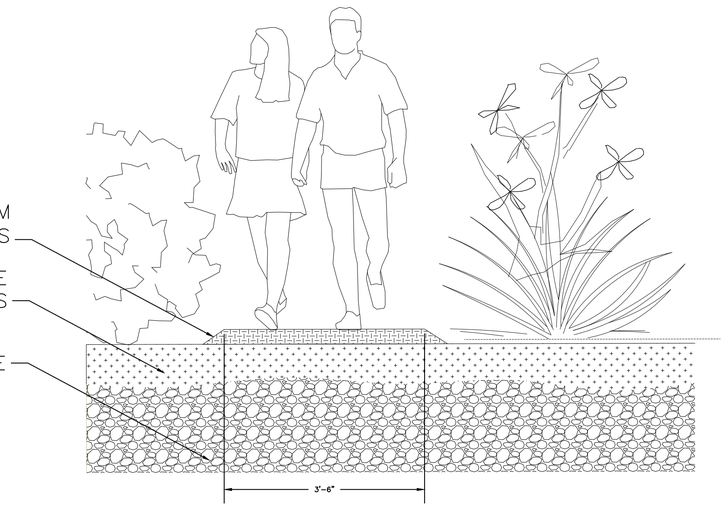
PROPOSED TRAIL SYSTEM

TRAIL BRIDGE CROSSING

LEGEND

WETLAND

379
TP 1
TEST PIT



TRAIL CONSTRUCTION 3
NTS C5.0

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TRAIL PLAN

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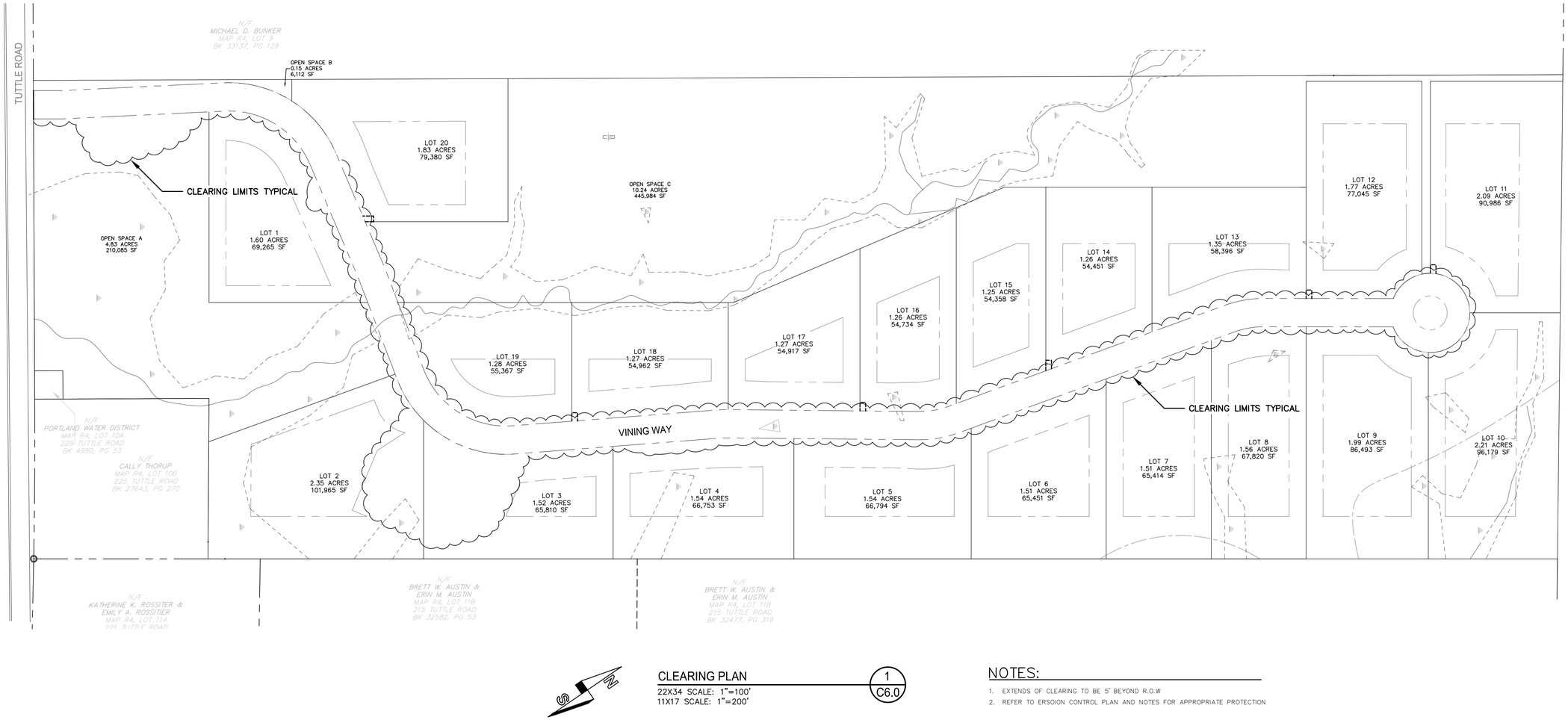

CLEARING PLAN
22X34 SCALE: 1"=100'
11X17 SCALE: 1"=200'
1
C6.0

NOTES:

1. EXTENDS OF CLEARING TO BE 5' BEYOND R.O.W
2. REFER TO ERSOION CONTROL PLAN AND NOTES FOR APPROPRIATE PROTECTION

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