# MAJOR SUBDIVISION
# PRELIMINARY PLAN APPLICATION
# TO TOWN OF WINDHAM

**FOR**

# GRAY ROAD RETIREMENT COMMUNITY

## GRAY ROAD
## WINDHAM, MAINE

**PREPARED FOR**

## WELD, LLC
**PO BOX 1361**
**WINDHAM, ME 04062**

**PREPARED BY**

DM ROMA
CONSULTING ENGINEERS

**59 HARVEST HILL ROAD**
**WINDHAM, ME 04062**

**JULY 23, 2018**

**Project Name:** GRAY ROAD RETIREMENT COMMUNITY

**Tax Map:** 9 **Lot:** 27K AND PORTION OF 27E

**Number of lots/dwelling units:** 12 DWELLING UNITS **Estimated road length:** 800 FEET

**Is the total disturbance proposed > 1 acre?** ☒ **Yes** ☐ **No**

**Contact Information**

1. Applicant

Name: WELD, LLC

Mailing Address: PO BOX 1361, WINDHAM, ME 04062

Telephone: _____ Fax: _____ E-mail: _____

2. Record owner of property

X (Check here if same as applicant)

Name: _____

Mailing Address: _____

Telephone: _____ Fax: _____ Email: _____

3. Contact Person/Agent (if completed and signed by applicant's agent, provide written documentation of authority to act on behalf of applicant)

Name: DUSTIN ROMA

Company Name: DM ROMA CONSULTING ENGINEERS

Mailing Address: PO BOX 1116, WINDHAM, ME 04062

Telephone: (207) 310 - 0506 Fax: _____ E-mail: DUSTIN@DMROMA.COM

I certify all the information in this application form and accompanying materials is true and accurate to the best of my knowledge.

Dustin Roma 7-23-18

Signature Date

**Preliminary Plan - Major Subdivision: Submission Requirements**

| A. | Mandatory Written Information | Applicant | Staff |
|---|---|---|---|
| 1 | A fully executed and signed application form | X | |
| 2 | Evidence of payment of the application and escrow fees | X | |
| 3 | Proposed name of the subdivision | X | |
| 4 | Verification of right, title, or interest in the property, and any abutting property, by deed, purchase and sales agreement, option to purchase, or some other proof of interest. | X | |
| 5 | Copy of the most recently recorded deed for the parcel, along with a copy of all existing deed restrictions, easements, rights-of-way, or some other proof of interest | X | |
| 6 | Copy of any existing or proposed covenants or deed restrictions intended to cover all or part of the lots or dwellings in the subdivision | X | |
| 7 | Copy of any existing or proposed easements on the property | X | |
| 8 | Name, registration number and seal of the Maine Licensed Professional Land Surveyor who conducted the survey | X | |
| 9 | Name, registration number and seal of any other licensed professional of the state who prepared the plan (if applicable) | X | |
| 10 | An indication of the type of sewage disposal to be used in the subdivision | X | |
| | i. If connecting to public sewer, provide a letter from Portland Water District stating the District has the capacity to collect and treat the waste water | N/A | |
| | ii. If using subsurface waste water disposal systems (septic), submit test pit analyses prepared by a Maine Licensed Site Evaluator or Certified Soil Scientist. Test pit locations must be shown on a map. | PENDING | |
| 11 | Indicate type of water supply system(s) to be used in the subdivision. | X | |
| 12 | If connecting to public water, submit a written statement from the Portland Water District indicating there is adequate supply and pressure for the subdivision. | PENDING | |
| 13 | Names and addresses of the record owner, applicant, and adjoining property owners | X | |
| 14 | An acceptable title opinion proving right of access to the proposed subdivision or site for any property proposed for development on or off of a private way or private road. | N/A | |
| 15 | The name and contact information for the road association who's private way or road is used to access the subdivision. | N/A | |

Applicant Staff

| | | | |
|---|---|---|---|
| 16 | Financial Capacity. | PENDING | |
| | i. Estimated costs of development, and itemization of major costs | X | |
| | ii. Financing - provide one of the following: | | |
| | a. Letter of commitment to fund from financial institution, governmental agency, or other funding agency | | |
| | b. Annual corporate report with explanatory material showing availability of liquid assets to finance development | | |
| | c. Bank statement showing availability of funds if personally financing development | | |
| | d. Cash equity commitment | | |
| | e. Financial plan for remaining financing | | |
| | f. Letter from financial institution indicating an intention to finance | | |
| | iii. If a corporation, Certificate of Good Standing from the Secretary of State | | |
| 17 | Technical Capacity | X | |
| | i. A statement of the applicant's experience and training related to the nature of the development, including developments receiving permits from the Town. | X | |
| | ii. Resumes or similar documents showing experience and qualifications of full-time, permanent or temporary staff contracted with or employed by the applicant who will design the development. | X | |

| **B.** | **Mandatory Plan Information** | | |
|---|---|---|---|
| 1 | Name of subdivision, date and scale | X | |
| 2 | Stamp of the Maine License Professional Land Surveyor that conducted the survey, including at least one copy of original stamped seal that is embossed and signed | X | |
| 3 | Stamp with date and signature of the Maine Licensed Professional Engineer that prepared the plans. | X | |
| 4 | North arrow identifying all of the following: Grid North, Magnetic North, declination between Grid and Magnetic, and whether Magnetic or Grid bearings were used in the plan design | X | |
| 5 | Location map showing the subdivision within the municipality | X | |
| 6 | Vicinity plan showing the area within 250 feet, to include: | X | |
| | i. approximate location of all property lines and acreage of parcels | X | |
| | ii. locations, widths, and names of existing, filed, or proposed streets, easements or building footprints | X | |
| | iii. location and designations of any public spaces | X | |
| | iv. outline of proposed subdivision, together with its street system and indication of future probably street system, if the proposed subdivision encompasses only part of the applicants entire property. | X | |
| 7 | Standard boundary survey of parcel, including all contiguous land in common ownership within the last 5 years | X | |
| 8 | Proposed lot lines with approximate dimensions and area of each lot. | X | |
| 9 | Contour lines at 2-foot intervals, or at intervals required by the Board, showing elevations in relation to the required datum. | X | |

| | | Applicant | Staff |
|---|---|---|---|
| 10 | Typical cross sections of the proposed grading for roadways, sidewalks, etc., including width, type of pavement, elevations, and grades. | X | |
| 11 | Wetland areas shall be delineated on the survey. If none, please note. | X | |
| 12 | Number of acres within the proposed subdivision, location of property lines, existing buildings, vegetative cover type, specimen trees, if present, and other essential existing physical features. | X | |
| 13 | Rivers, streams, and brooks within or adjacent to the proposed subdivision. If any portion of the proposed subdivision is located in the direct watershed of a great pond, note which great pond. | X | |
| 14 | Zoning district in which the proposed subdivision is located, and the location of any zoning boundaries affecting the subdivision. | X | |
| 15 | Location & size of existing and proposed sewers, water mains, culverts, bridges, and drainage ways on or adjacent to the property to be subdivided. The Board may require this information to be depicted via cross-section, plan or profile views. | X | |
| 16 | Location, names, and present width of existing streets, highways, easements, building lines, parks, and other open spaces on or adjacent to the subdivision | X | |
| 17 | Location and widths of any streets, public improvements, or open space within the subdivision (if any) shown on the official map and the comprehensive plan | X | |
| 18 | All parcels of land proposed to be dedicated to public use and the conditions of such dedication. | X | |
| 19 | Location of any open space to be preserved or common areas to be created, and general description of proposed ownership, improvement, and management | X | |
| 20 | Approximate location of treeline after development | X | |
| 21 | Delineate boundaries of any flood hazard areas and the 100-year flood elevation as depicted on the Town's Flood Insurance Rate Map | X | |
| 22 | Show any areas within or adjacent to the proposed subdivision which have been identified by the Maine Department of Inland Fisheries and Wildlife "Beginning with Habitat project maps or within the Comprehensive Plan.. | X | |
| 23 | Show areas within or adjacent to the proposed subdivision which are either listed on or eligible for the National Register of Historic Places, or have been identified in the comprehensive plan or by the Maine Historic Preservation Commission as sensitive or likely to contain such sites | X | |
| 24 | Erosion & Sedimentation control plan, prepared in accordance with MDEP Stormwater Law Chapter 500 Basic Standards, and the MDEP Maine Erosion and Sediment Control Best Management Practices, published March 2003. | X | |
| 25 | Stormwater management plan, prepared by a Maine Licensed Professional Engineer in accordance with the most recent edition of Stormwater Management for Maine: BMPS Technical Design Manual, published by the MDEP 2006. | X | |

| C. | Submission information for which a waiver may be granted. | Applicant | Staff |
|---|---|---|---|
| 1 | High-intensity soil survey by a Certified Soil Scientist | WAIVER | |
| 2 | Landscape Plan | X | |
| 3 | Hydrogeologic assessment - required if i) subdivision is not served by public sewer and either any part of the subdivision is over a sand and gravel aquifer or has an average density of more than one dwelling unit per 100,000 square feet, or ii) where site considerations or development design indicate greater potential of adverse impacts on groundwater quality. | WAIVER | |
| | a) map showing basic soil types | | |
| | b) depth to the water table at representative points | | |
| | c) Drainage conditions throughout the subdivision | | |
| | d) data on existing ground water quality | | |
| | e) analysis and evaluation of the effect of the subdivision on groundwater | | |
| | f) map showing location of any subsurface wastewater disposal systems and drinking water wells within the subdivision & within 200 feet of the subdivision boundaries. | | |
| 4 | Estimate of the amount and type of vehicular traffic to be generated on a daily basis and at peak hours | X | |
| 5 | Traffic Impact Analysis for subdivisions involving 28 or more parking spaces or projected to generate more than 140 vehicle trips per day. | N/A | |
| 6 | If any portion of the subdivision is in the direct watershed of a great pond, | N/A | |
| | i) phosphorous impact analysis and control plan | | |
| | ii) long term maintenance plan for all phosphorous control measures | | |
| | iii) contour lines at an interval of 2 feet | | |
| | iv) delineate areas with sustained slopes greater than 25% covering more than one acre | | |

| Electronic Submission | X | |
|---|---|---|

# PROJECT NARRATIVE

## SECTION 1 – PROPOSED USE NARRATIVE

The property is an 11-acre vacant lot with frontage access from Roosevelt Trail and Swett Road. The proposed project includes the construction of six (6) detached two-family dwellings for a total of 12 units in a condominium ownership that will designed in accordance with the Town's standards for a Retirement Community. The driveway will be a 24-foot wide paved surface and will include sidewalks. The project will be served by public water from the Portland Water District and shared private wastewater disposal fields. Electrical and gas service will be extended to the units underground. The project has been designed so that it may be expanded to accommodate additional project phases in the future.

## SECTION 2 – RECORD OWNER INFORMATION

See Application Form

## SECTION 3 – ABUTTING PROPERTY OWNERS

See Boundary Survey and Subdivision Plan

## SECTION 4 – TITLE, RIGHT, OR INTEREST

See attached deed.

## SECTION 5 – COVENANTS OR DEED RESTRICTIONS

The lots will be part of a condominium that will maintain all common facilities including driveways, stormwater management components, roadways, septic systems and lawn areas.

## SECTION 6 – EASEMENTS

There are no known existing easements on the property.

## SECTION 7 – LICENSED PROFESSIONALS

The plans and applications were prepared by DM Roma Consulting Engineers. Dustin Roma is a Maine Licensed Professional Engineer PE#12131. The Boundary Survey was prepared by Survey, Inc. Soils analysis and wetland delineation was performed by Mark Hampton.

**SECTION 8 – TECHNICAL ABILITY**

The design professionals at DM Roma Consulting Engineers, Survey Inc, and Mark Hampton Associates have been performing similar consulting and design work in Southern Maine for many years, including many projects in Windham and the surrounding communities.

**SECTION 9 – UTILITIES**

The project will be served with domestic potable water by the Portland Water District. The District will review the project development plans and provide a letter indicating their ability to serve the project upon completion of their review. Two private on-site wastewater disposal systems are currently being designed and will be submitted with the final plan.

**SECTION 10 –WATER SUPPLY AND SEWAGE DISPOSAL**

See section 9.

**SECTION 11 – SOLID WASTES**

The residential lots will utilize the Town's curbside trash collection program to dispose of solid wastes.

**SECTION 12 – VEHICLE TRAFFIC**

Vehicle sight distance at the proposed driveway intersections looking right and left is over 700 feet. Based on the Institute of Transportation Engineers Trip Generation Manual, 9$^{th}$ edition, 12 residential dwellings are expected to generate 12 peak hour trip-ends and 120 total daily vehicle trips.

**SECTION 13 – UNIQUE NATURAL AREAS**

There are no known unique natural areas within the project vicinity.

**SECTION 14 – STORMWATER MANAGEMENT**

A stormwater management report and stormwater maintenance plan is included as an attachment.

**SECTION 15 – FINANCIAL CAPACITY**

The expected construction costs to complete the sitework portion of the project, excluding building foundations, are as follows:

| | |
|---|---|
| • Clear and grub roadway areas | $15,000 |
| • Construct gravel roadways | $50,000 |
| • Bituminous Pavement | $30,000 |
| • Electrical Conduit & Risers | $15,000 |
| • Stormwater BMPs | $6,000 |
| • Leach Field & Septic | $18,000 |
| • Water main and services | $45,000 |
| Total Construction Costs | $179,000 |

The applicant already owns the land, so land costs were not included in the project budget. A letter indicating the ability to fund the project will be submitted with the final plan.

MAINE REAL ESTATE TAX-Paid

# QUITCLAIM DEED WITH COVENANT

MAINE STATUTORY SHORT FORM

DLN: **1001740012061**

*KNOW ALL MEN BY THESE PRESENTS,* that we, **Roger C. Reeves and Jean K. Reeves**, of 384 Gray Road, Windham, ME 04062, for consideration paid, grant to **Weld, LLC**, of 545 Roosevelt Trail, Windham, ME 04062, with **QUITCLAIM COVENANT**, the following described real property:

See attached Exhibit A

For title of Grantor, reference is hereby made to a Quitclaim Deed from Jean K. Reeves dated June 26, 2001 and recorded in the Cumberland County Registry of Deeds in Book 16469, Page 327. Reference is also made to Warranty Deed from Melvin E. Peterson and Sharon M. Peterson to Roger C. Reeves and Jean K. Reeves dated July 2, 1980 and recorded in said Registry of Deeds in Book 4626, Page 62. Further reference is made to Quitclaim Deed from Roger C. Reeves to Jean K. Reeves dated June 26, 2001 and recorded in said Registry of Deeds in Book 16469, Page 323. Further reference is made to Quitclaim Deed from Ronald E. Wain and Sandra J. Wain to be recorded herewith in the Cumberland County Registry of Deeds.

Witness our hands and seals this 17th day of January, 2017.

Signed, sealed and delivered in the presence of:

Witness

Witness

Roger C. Reeves

Jean K. Reeves

STATE OF MAINE
COUNTY OF Cumberland, ss

Date: January 17, 2017

Personally appeared the above-named **Roger C. Reeves and Jean K. Reeves** and acknowledged the foregoing to be their free act and deed.

Before me,

Notary Public

Jeffrey R. Vigue
Attorney at Law

Print name:

My commission expires:

**EXHIBIT A**

A certain lot or parcel of land with the buildings thereon, situated on the Northeasterly side of Swett Road in the Town of Windham, County of Cumberland and State of Maine being more particularly described as follows:

Beginning at the Westerly corner of land now or formerly of Mary Lou Chambers (by deed recorded in the Cumberland County Registry of Deeds in Book 27748, Page 51) on the assumed Northeasterly side line of Swett Road;

Thence N 10°39'31" W along the assumed Northwesterly side line of the said Swett Road 52.40 feet to a 5/8" capped rebar (#1328) set in the ground at the Southerly corner of land now or formerly of Ronald E. and Sandra J. Wain;

Thence N 61°56'32" E along land of the said Wain 206.69 feet to a 5/8" capped rebar (#1328) set in the ground at the Easterly corner of land of the said Wain;

Thence N 12°58'27" W along land of Ronald E. and Sandra J. Wain (by deed recorded in the Cumberland County Registry of Deeds in Book 20155, Page 339) a distance of 250.20 feet to a 2" iron pin found set in the ground at the Northerly corner of land of the said Wain and on the Southeasterly boundary of land now or formerly of Coda A. Clark and Klarizza V. Cruz (by deed recorded in the Cumberland County Registry of Deeds in Book 32625, Page 78);

Thence N 50°18'46" E along land of the said Clark and Cruz, land now or formerly of George E. and Madeline A. Geyer (by deed recorded in the Cumberland County Registry of Deeds in Book 4364, Page 146), land now or formerly of Anita D. Quinlan (by deed recorded in the Cumberland County Registry of Deeds in Book 9154, Page 273) and land now or formerly of Francis E. sand Helen T. Hurgin (by deed recorded in the Cumberland County Registry of Deeds in Book 7058, Page 182) a total distance of 1107.83 feet to a 2" iron pipe found set in the ground at the Easterly corner of land of the said Hurgin, the Southerly corner of land now or formerly of Bruce A. Worrey (by deed recorded in the Cumberland County Registry of Deeds in Book 27581, Page 213) and the Westerly corner of land now or formerly of Jean K. and Roger C. Reeves (by deed recorded in the Cumberland County Registry of Deeds in Book 4640, Page 36);

Thence S 15°20'48" E along land of the said Reeves 251.06 feet to a 1" iron pin found set in the ground at the Northerly corner of land now or formerly of Julia Footman (by deed recorded in the Cumberland County Registry of Deeds in Book 10969, Page 337);

Thence S 38°51'28" W along land of the said Footman 540.46 feet to a 1" iron pin found set in the ground at the Westerly corner of land of the said Footman and the Northerly corner of land now or formerly of Elton H. and Patricia C. Seamans (by deed recorded in the Cumberland County Registry of Deeds in Book 3625, Page 68);

**DOC :2817 BK:33768 PG:288**
RECEIVED - RECORDED, CUMBERLAND COUNTY REGISTER OF DEEDS
01/18/2017, 11:44:42A
Register of Deeds Nancy A. Lane E-RECORDED

Thence S 41°10'00" W along land of the said Seamans and also land now or formerly of Christian B. and Colleen F. Olsen (by deeds recorded in the Cumberland County Registry of Deeds in Book 9256, Page 96 and Book 4572, Page 127) a total distance of 708.61 feet to a 5/8" capped rebar (#1328) found set in the ground at the Easterly corner of land now or formerly of Carl Chambers (by deed recorded in the Cumberland County Registry of Deeds in Book 30004, Page 323);

Thence N 12°28'36" W along land of the said Carl Chambers 100.19 feet to a ¾" iron pipe found set in the ground at the Northerly corner of land of the said Carl Chambers and at the Easterly corner of land of the said Mary Lou Chambers;

Thence N 14°20'01" W along land of the said Mary Lou Chambers 99.60 feet to a 1" iron pipe found set in the ground at the Northerly corner of land of the said Chambers;

Thence S 61°56'32" W along land of the said Chambers 208.13 feet to the point of beginning.

All bearings are Magnetic.

# WARRANTY DEED

(Maine Statutory Short Form)

**CHRISTIAN B. OLSEN** and **COLLEEN F. OLSEN**, of Windham, Maine, for consideration paid, grant to **WELD, LLC**, a Maine limited liability company with a place of business at 545 Roosevelt Trail, Windham, ME 04062, with WARRANTY COVENANTS, the land in Windham, County of Cumberland and State of Maine, bounded and described as follows:

MAINE REAL ESTATE TAX PAID

Two certain lots or parcels of land located in Windham, County of Cumberland and State of Maine, bounded and described as follows:

**PARCEL ONE:**

A certain lot or parcel of land situated on the northwesterly side of State Route 202 (a/k/a the Gray Road) in the Town of Windham, County of Cumberland and State of Maine, bounded and described as follows:

> **BEGINNING** on the northwesterly sideline of State Route 202 at an iron rod with cap #1172 marking the most southerly corner of land of Grantors herein as described in deed from United Maine Craftsmen, dated March 1, 1980, and recorded in the Cumberland Registry of Deeds in Book 4572, Page 127;
>
> Thence, North 39° 46' 17" West along a stonewall and land now or formerly of Heritage Metal Craft (8705/383) a distance of 304.22 feet to a found one-inch iron pipe;
>
> Thence, North 38° 06' 25" East along land now or formerly of Gary Magur and along land now or formerly of Roger C. Reeves (4626/062) a distance of 131.28 feet to an iron rod with cap #1172;
>
> Thence, South 53° 47' 17" East along remaining land of the Grantors herein – 297.60 feet to an iron rod with cap #1172 on the said northwesterly sideline of State Route 202;
>
> Thence, South 38° 06' 25" West along said Route 202 a distance of 205.00 feet to the **POINT OF BEGINNING**. Containing 50,010 square feet, more or less.
>
> Bearings are referenced to the 1985 Magnetic Meridian.

Meaning and intending to convey a *portion only* of the premises conveyed to Christian B. Olsen and Colleen F. Olsen by Deed of United Maine Craftsmen, dated March 1, 1980, and recorded in the Cumberland Registry of Deeds in Book 4572, Page

127; see also Deed from Christian B. Olsen and Colleen F. Olsen to Christian B. Olsen and Colleen F. Olsen, dated July 25, 1990, and recorded in said Registry of Deeds in Book 9256, Page 96.

Being subject to an easement for utility poles and wires conveyed by Heritage Metalcraft, Inc. to Central Maine Power Company and New England Telephone and Telegraph Company, dated June 8, 1982, and recorded in said Registry in Book 5009, Page 299.

**PARCEL TWO**:

A certain lot or parcel of land situated on the northwesterly side of State Route 202 (a/k/a the Gray Road) in the Town of Windham, County of Cumberland and State of Maine, bounded and described as follows:

> **BEGINNING** on the northwesterly sideline of State Route 202 at an iron rod with cap #1172 marking the most easterly corner of land of Grantors herein as described in deed from United Maine Craftsmen, dated March 1, 1980, and recorded in the Cumberland Registry of Deeds in Book 4572, Page 127;
>
> Thence, South 38° 06' 25" West along said State Route 202 a distance of 170.00 feet to an iron rod with cap #1172;
>
> Thence, North 50° 26' 10" West along remaining land of the Grantors herein a distance of 297.54 feet to an iron rod with cap #1172;
>
> Thence, North 38° 06' 25" East along land now or formerly of Roger C. Reeves (4626/062) a distance of 170.00 feet to a found one inch iron pipe;
>
> Thence, South 50° 26' 10" East along land now or formerly of Elton H. Seamans (3625/068) a distance of 297.54 feet to the **POINT OF BEGINNING**. Containing 50,564 square feet, more or less.
>
> Bearings are referenced to the 1985 Magnetic Meridian.

Meaning and intending to convey a *portion only* of the premises conveyed to Christian B. Olsen and Colleen F. Olsen by Deed of United Maine Craftsmen, dated March 1, 1980, and recorded in the Cumberland Registry of Deeds in Book 4572, Page 127; also being a *portion only* of the premises described in the Deed from Christian B. Olsen and Colleen F. Olsen to Christian B. Olsen and Colleen F. Olsen, dated July 25, 1990, and recorded in said Registry of Deeds in Book 9256, Page 96.

Being subject to an easement for utility poles and wires conveyed by Christian B. Olsen and Colleen F. Olsen to Central Maine Power Company, dated June 8, 1982, and recorded in said Registry in Book 5009, Page 299.

Also conveying all rights, easements, privileges and appurtenances belonging to the premises hereinabove described.

WITNESS our hands and seals on April 27, 2018.

Witness

Christian B. Olsen

Witness

Colleen F. Olsen

STATE OF MAINE
Cumberland, ss.

April 27, 2018

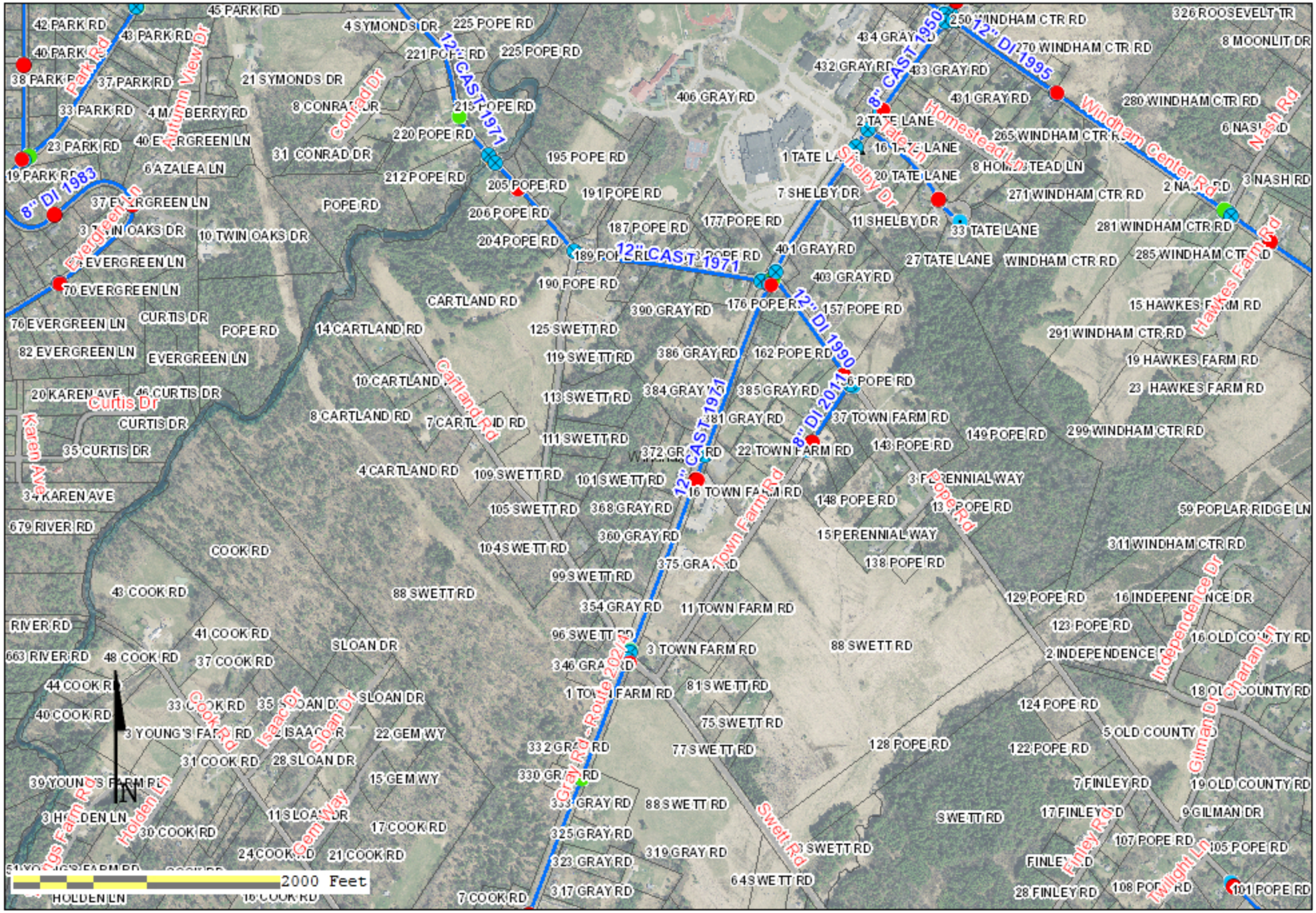
Then personally appeared before me, Christian B. Olsen, and acknowledged the foregoing instrument to be his free act and deed.

Notary Public/Attorney-at-Law

Printed name

KENNETH M. LEFEBVRE
NOTARY PUBLIC-MAINE
MY COMMISSION EXPIRES 01-22-2025

Received
Recorded Register of Deeds
May 03,2018 09:33:25A
Cumberland County
Nancy A. Lane


Gray Road - Swett to Pope
PORTLAND WATER DISTRICT
May 03, 2018
2000 Feet
N
Gray Rd - Route 202
Swett Rd
Town Farm Rd
Pope Rd
Windham Center Rd
Homestead Ln
Tate Ln
Shelby Dr
Hawkes Farm Rd
Nash Rd
Independence Dr
Gilman Dr
Finley Rd
Twilight Ln
Curtis Dr
Karen Ave
Cartland Rd
Evergreen Ln
Park Rd
Autumn View Dr
Conrad Dr
Isaac Dr
Sloan Dr
Cook Rd
Holden Ln
Gem Way
12" CAST 1950
12" DI 1995
8" CAST 1971
12" CAST 1971
12" DI 1990
8" DI 2011
12" CAST 1971
8" DI 1983
326 ROOSEVELT TR
250 WINDHAM CTR RD
270 WINDHAM CTR RD
8 MOONLIT DR
434 GRAY RD
432 GRAY RD
433 GRAY RD
431 GRAY RD
280 WINDHAM CTR RD
265 WINDHAM CTR RD
6 NASH RD
3 NASH RD
2 NASH RD
271 WINDHAM CTR RD
281 WINDHAM CTR RD
285 WINDHAM CTR RD
291 WINDHAM CTR RD
299 WINDHAM CTR RD
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33 PARK RD
23 PARK RD
19 PARK RD
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21 SYMONDS DR
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122 POPE RD
128 POPE RD
107 POPE RD
105 POPE RD
101 POPE RD
POPE RD
4 MULBERRY RD
40 EVERGREEN LN
37 EVERGREEN LN
6 AZALEA LN
31 CONRAD DR
8 CONRAD DR
10 TWIN OAKS DR
70 EVERGREEN LN
76 EVERGREEN LN
82 EVERGREEN LN
EVERGREEN LN
CURTIS DR
46 CURTIS DR
35 CURTIS DR
20 KAREN AVE
34 KAREN AVE
14 CARTLAND RD
10 CARTLAND RD
8 CARTLAND RD
4 CARTLAND RD
CARTLAND RD
125 SWETT RD
119 SWETT RD
113 SWETT RD
111 SWETT RD
109 SWETT RD
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88 SWETT RD
81 SWETT RD
77 SWETT RD
75 SWETT RD
64 SWETT RD
679 RIVER RD
663 RIVER RD
COOK RD
43 COOK RD
41 COOK RD
48 COOK RD
37 COOK RD
44 COOK RD
40 COOK RD
33 COOK RD
31 COOK RD
30 COOK RD
24 COOK RD
21 COOK RD
17 COOK RD
7 COOK RD
SLOAN DR
35 SLOAN DR
28 SLOAN DR
11 SLOAN DR
22 GEM WY
15 GEM WY
39 YOUNGS FARM RD
3 YOUNGS FARM RD
3 HOLDEN LN
HOLDEN LN
16 COOK RD
1 TOWN FARM RD
3 TOWN FARM RD
11 TOWN FARM RD
22 TOWN FARM RD
37 TOWN FARM RD
16 TOWN FARM RD
15 PERENNIAL WAY
3 PERENNIAL WAY
59 POPLAR RIDGE LN
16 INDEPENDENCE DR
2 INDEPENDENCE DR
18 OLD COUNTY RD
5 OLD COUNTY RD
19 OLD COUNTY RD
9 GILMAN DR
7 FINLEY RD
17 FINLEY RD
28 FINLEY RD
FINLEY RD
SWETT RD
1 TATE LANE
2 TATE LANE
16 TATE LANE
20 TATE LANE
33 TATE LANE
27 TATE LANE
7 SHELBY DR
11 SHELBY DR
8 HOMESTEAD LN
15 HAWKES FARM RD
19 HAWKES FARM RD
23 HAWKES FARM RD
WINDHAM CTR RD

DM ROMA
CONSULTING ENGINEERS

# STORMWATER MANAGEMENT REPORT

**GRAY ROAD RETIREMENT COMMUNITY**
**WINDHAM, MAINE**

## A. Narrative

Weld, LLC is proposing to develop a 11.4-acre parcel off Gray Road (Rt. 202) in Windham. The project site is located on Lot 27K on the Town of Windham Assessors Map 9 and is located in the Farm Residential District and Retirement Community and Care Facility Overlay District.

This proposed retirement community development will consist of six (6) residential duplex buildings, totaling twelve (12) residential units including the construction of approximately 800 linear feet of paved roadway, utilities and stormwater infrastructure. In general, the site drains either easterly to Gray Road or northwesterly to a drainage wetland draining northerly along the property boundary. Runoff along Gray Road drains across the street, eventually discharging to Black Brook. Runoff collected in the wetlands along the northwesterly property line are eventually tributary to the Pleasant River. Both waterbodies are ultimately tributary to the Presumpscot River.

## B. Alterations to Land Cover

The 11.4-acre parcel consists of undeveloped woodland. The proposed development will generate approximately 43,305 square feet (0.99± acres) of new impervious area consisting of the six (6) structures (duplexes ~ 14,400 square feet (0.33± acres)), and 28,905 square feet (0.66± acres) of new roadway and driveways . An additional 78,692 square feet (1.81± acres) of proposed lawn and landscaping will generate a total site developed area of approximately 122,356 square feet (2.81± acres).

Since the project site will not generate more than one (1) acre of new impervious surface or five (5) acres of new developed area, a Stormwater Permit will not be required from the Maine Department of Environmental Protection (MDEP). The site will be required to obtain an MDEP Stormwater Permit by Rule prior to construction since it will generate more than one (1) acre of land disturbance. The project will be reviewed by the Town of Windham as a Major Subdivision.

The site is generally moderate to steeply sloped (5%-33%), with a portion of the site in the vicinity of the proposed roadway intersection with Gray Road being relatively flat (2%-5%). The site drains in two predominant drainage patterns; with the northwesterly portion of the

site draining to the northwesterly property limits, and the southeasterly portion of the site draining to the southwest and into a drainage swale along Gray Road. The onsite soils are primarily Belgrade very fine sandy loam, Lamoine silt loam, Lyman-Turnbridge complex, Paxton fine sandy loam, and Woodbridge fine sandy loam as identified on the Medium Intensity Soil Maps for Cumberland County, Maine published by the Natural Resources Conservation Service. The soils within the proposed development are in the hydrologic soil group "B", "C". "C/D" and "D".

The soils boundaries and hydrologic soils group (HSG) designations are indicated on the Watershed Maps and the Medium Intensity Soils Map has been included as Attachment 1 of this report.

C. Methodology and Modeling Assumptions

The proposed stormwater management system has been designed utilizing Best Management Practices to maintain existing drainage patterns while providing stormwater quality improvement measures. The goal of the storm drainage system design is to remove potential stormwater pollutants from runoff generated by the development while providing attenuation of the peak rates of runoff leaving the site. The method utilized to predict the surface water runoff rates in this analysis is a computer program entitled HydroCAD, which is based on the same methods that were originally developed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, and utilized in the TR-20 modeling program. Peak rates of runoff are forecasted based upon land use, hydrologic soil conditions, vegetative cover, contributing watershed area, time of concentration, rainfall data, storage volumes of detention basins and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains and constructed stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2-, 10- and 25 years was obtained from Appendix H of the MDEP, Chapter 500 Stormwater Management, last revised in 2015. The National Weather Service developed four synthetic storm types to simulate rainfall patterns around the country. For analysis in Cumberland County, Maine, the type III rainfall pattern with a 24-hour duration is appropriate.

D. Basic Standards

The project is required by the Town and the MDEP to provide permanent and temporary Erosion Control Best Management Practices. These methods are incorporated into the project design and outlined in detail in the plan set.

E. General Standard

The Town of Windham requires the entire project to meet the General Standards outlined in the MDEP Chapter 500 to provide water quality treatment for no less than 95% of the new impervious surface and 80% of the total developed area associated with the project.

To provide the required stormwater treatment for the development, two (2) underdrained filter basins and roofline dripedges along the residential buildings will be constructed as part of the site's stormwater infrastructure. As a result of the proposed stormwater infrastructure the project provides water quality treatment for over 95% of the equivalent new impervious and for over 86% of the new developed areas. Calculations can be found on the Watershed Maps and enclosed as Attachment 2 in this report.

F. Flooding Standard

The Town of Windham Land Use Ordinance requires the project to detain, retain or result in the infiltration of stormwater from the 24-hour storms of the 2-year, 10-year and 25-year frequencies such that the peak flows of stormwater from the project site do not exceed the peak flows of stormwater prior to undertaking the project. To maintain these rates, two (2) underdrained filter basins have been proposed as part of the stormwater infrastructure.

The proposed project design has been modeled to evaluate and analyze the stormwater runoff characteristics of the site prior to construction of the project and upon completion of all proposed construction activities. Since the project site is not being completely utilized, the study was performed on the area of development. The first study point (SP-1) is located along the southeasterly portion of the site, to the north of the proposed roadway intersection with Gray Road. The second study point (SP-2) is along the westerly property limit which discharged and then conveyed overland in an existing natural drainage channel.

The following table summarizes the analysis prepared for this stormwater management report:

**Table 1 – Peak Rates of Stormwater Runoff**

| Study Point | 2-Year (cfs) | | 10-Year (cfs) | | 25-Year (cfs) | |
|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post |
| SP-1 | 0.25 | 0.28 | 0.95 | 0.63 | 1.68 | 1.46 |
| SP-2 | 2.89 | 2.59 | 6.60 | 5.31 | 9.91 | 8.62 |

As illustrated by the table above, the proposed BMP's as incorporated in the project's storm water design, effectively reduces the peak flow at all study points, during all storms except for a relatively small increase at Study Point 1 during the 2-year storm. We do not anticipate any increase in flooding or downstream erosion as a result of the 0.03 cfs increase (12%).

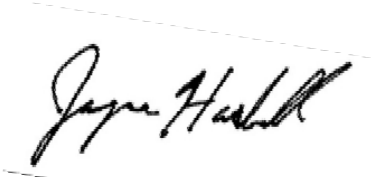
The watershed maps showing pre-development and post-development drainage patterns are included in the plan set and the computations performed with the HydroCAD software program are included as Attachment 3 of this report.

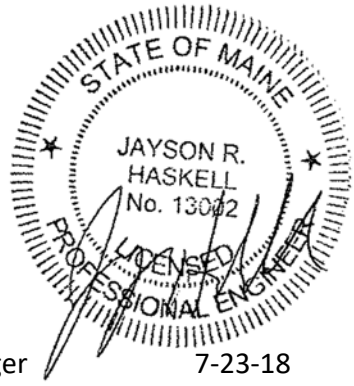
G. Maintenance of common facilities or property

The applicant will be responsible for the maintenance of the stormwater facilities until a homeowners' association is created. Enclosed within this submission is an Inspection, Maintenance and Housekeeping Plan for the project.

Prepared by:

DM ROMA CONSULTING ENGINEERS






J.P. Connolly
Senior Project Engineer

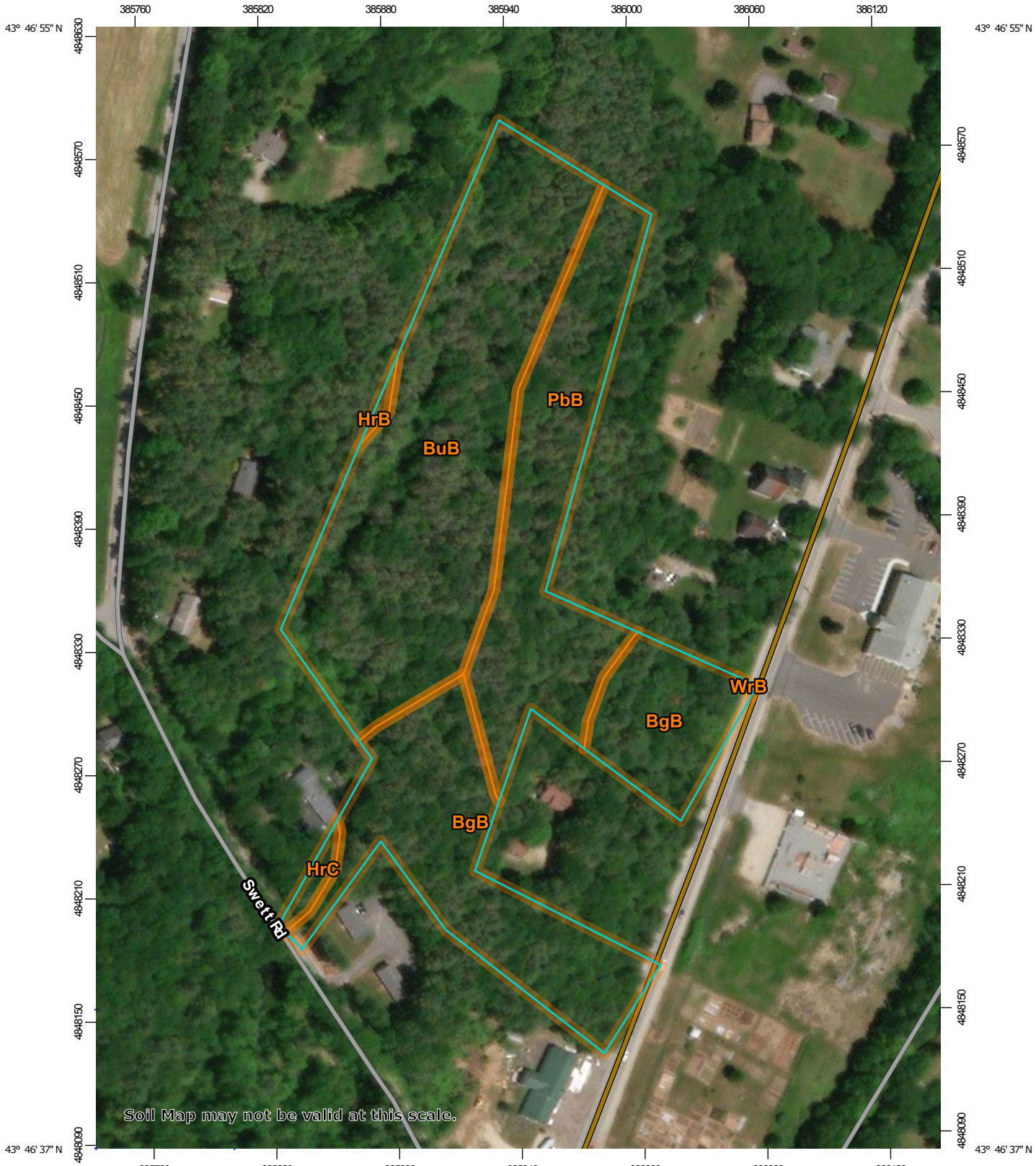
Jayson R. Haskell P.E.
Southern Maine Regional Manager

7-23-18

# ATTACHMENT 1

# MEDIUM INTENSITY SOILS MAP

Soil Map—Cumberland County and Part of Oxford County, Maine




Map Scale: 1:2,660 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**

- Streams and Canals

**Transportation**

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**

- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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 13, Sep 11, 2017

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

Date(s) aerial images were photographed: Apr 29, 2012—Jun 26, 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.

# 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 | 3.6 | 31.4% |
| BuB | Lamoine silt loam, 3 to 8 percent slopes | 5.0 | 43.4% |
| HrB | Lyman-Tunbridge complex, 0 to 8 percent slopes, rocky | 0.0 | 0.3% |
| HrC | Lyman-Tunbridge complex, 8 to 15 percent slopes, rocky | 0.1 | 1.1% |
| PbB | Paxton fine sandy loam, 3 to 8 percent slopes | 2.7 | 23.7% |
| WrB | Woodbridge fine sandy loam, 0 to 8 percent slopes | 0.0 | 0.1% |
| **Totals for Area of Interest** | | **11.5** | **100.0%** |

# ATTACHMENT 2

## STORMWATER TREATMENT CALCULATIONS

## Stormwater Treatment Table

Gray Road Retirement Community

| | Total Watershed Area (SF) | New Driveway and Road Impervious Area (SF) | New Building Area (SF)* | New Landscaped Area (SF) | Existing/Offsite Impervious Area (SF)** | Existing/Offsite Landscaped Area (SF)** | Existing Undeveloped Area (SF) | Treatment Provided | New Impervious Area Treated In Treatment Device (SF) | New Landscaped Area Treated In Treatment Device (SF) | Treatment Device |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WS-10 | 40,340 | 9,784 | 6,000 | 22,684 | 0 | 0 | 1,873 | Yes | 9,784 | 22,684 | FB1 |
| WS-20 | 65,417 | 16,977 | 7,200 | 41,268 | 0 | 0 | -28 | Yes | 16,977 | 41,268 | FB2 |
| WS-1 | 18,291 | 2,144 | 1,200 | 7,399 | 2,856 | 0 | 4,692 | NO | 0 | 0 | None |
| WS-2 | 138,834 | 0 | 0 | 7,701 | 0 | 0 | 131,133 | NO | 0 | 0 | None |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Total | | **28,905** | **14,400** | **79,052** | | | | | **26,761** | **63,951** | |

* All new buildings shall install a roofline drip edge to provide treatment for the rooftop impervious surface. The building's impervious area is included in the watershed and overall treatment calculations below, but not included in the BMP sizing calculations for each treatment device.

** The project is not taking credit for the Existing or Offsite impervious and landscaped areas, but are included in the BMP sizing calculations for each treatment device.

*** Development associated with a wetland road crossing is exempt from the Chapter 500 General Standards. Approximately 4,346 s.f. of impervious surface from Sta. 6+10 to Sta. 7+50 has been removed from Watershed WS-20.

| | | |
|---|---|---|
| New Impervious Area = | 43,305 | sf |
| Impervious Area Requiring Treatment (95%) = | 41,140 | sf |
| Impervious Area Treatment Provided = | 41,161 | sf |
| | 95% | New Impervious Area Treated |

| | | |
|---|---|---|
| New Developed Area = | 122,356 | sf |
| Developed Area Requiring Treatment (80%) = | 97,885 | sf |
| Developed Area Treatment Provided = | 105,112 | sf |
| | 86% | New Developed Area Treated |

## Filter Basin FB-1

| | | | |
|---|---|---|---|
| Tributary Impervious Area= | 9,784 | sf | (WS-10 Impervious Area) |
| Tributary Landscaped Area= | 22,684 | sf | (WS-10 Landscaped Area) |

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

**WQV (Required) = 1,571 cf**

Stage Storage Volume

| Elevation | Area (sf) | Storage (cf) |
|---|---|---|
| 253.75 | 990 | 0 |
| 256 | 2,491 | 3,917 |

Outlet Elevation = 255.25

Storage Volume Provided = 2,611 cf > Required

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

**Filter Area Required = 943 sf**

**Filter Area Provided = 990 sf > Required**

## Filter Basin FB-2

| | | | |
|---|---|---|---|
| Tributary Impervious Area= | 16,977 | sf | (WS-20 Impervious Area) |
| Tributary Landscaped Area= | 41,268 | sf | (WS-20 Landscaped Area) |

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

**WQV (Required) = 2,790 cf**

Stage Storage Volume

| Elevation | Area (sf) | Storage (cf) |
|---|---|---|
| 248.5 | 2,975 | 0 |
| 251 | 4,833 | 9,761 |

Outlet Elevation = 250.00

Storage Volume Provided= 5,856 cf > Required

Filter Bottom Calculation

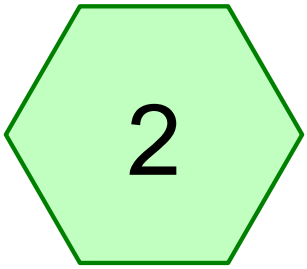
Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

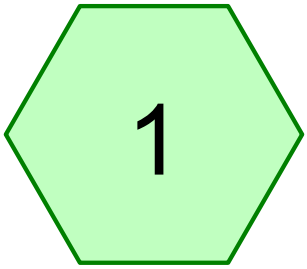
**Filter Area Required = 1,674 sf**

**Filter Area Provided = 2,975 sf > Required**

# ATTACHMENT 3

## HYDROCAD OUTPUT




Subcat Reach Pond Link

**Routing Diagram for 17070 - PRE**

Prepared by {enter your company name here}, Printed 7/23/2018

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1:** Runoff Area=58,625 sf 4.86% Impervious Runoff Depth=0.40"
Flow Length=372' Tc=25.7 min CN=61 Runoff=0.25 cfs 1,973 cf

**Subcatchment 2:** Runoff Area=204,250 sf 0.00% Impervious Runoff Depth=0.92"
Flow Length=447' Tc=24.4 min CN=73 Runoff=2.89 cfs 15,650 cf

**Total Runoff Area = 262,875 sf Runoff Volume = 17,623 cf Average Runoff Depth = 0.80"**
**98.92% Pervious = 260,024 sf 1.08% Impervious = 2,851 sf**

## Summary for Subcatchment 1:

Runoff = 0.25 cfs @ 12.51 hrs, Volume= 1,973 cf, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 2,851 | 98 | Gray Road - Ex. Paved roads, HSG B |
| * | 912 | 96 | Ex. driveway - Gravel surface, HSG B |
| | 54,862 | 58 | Woods/grass comb., Good, HSG B |
| | 58,625 | 61 | Weighted Average |
| | 55,774 | | 95.14% Pervious Area |
| | 2,851 | | 4.86% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 21.2 | 150 | 0.0483 | 0.12 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 4.5 | 222 | 0.0270 | 0.82 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 25.7 | 372 | Total | | | |

## Summary for Subcatchment 2:

Runoff = 2.89 cfs @ 12.38 hrs, Volume= 15,650 cf, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

| Area (sf) | CN | Description |
|---|---|---|
| 48,931 | 58 | Woods/grass comb., Good, HSG B |
| 35,748 | 72 | Woods/grass comb., Good, HSG C |
| 119,571 | 79 | Woods/grass comb., Good, HSG D |
| 204,250 | 73 | Weighted Average |
| 204,250 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 22.3 | 150 | 0.0427 | 0.11 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 39 | 0.0153 | 0.62 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 0.7 | 85 | 0.1879 | 2.17 | | **Shallow Concentrated Flow, Seg C to D**<br>Woodland Kv= 5.0 fps |
| 0.3 | 173 | 0.0404 | 11.41 | 272.75 | **Channel Flow, Seg D to E**<br>Area= 23.9 sf Perim= 25.6' r= 0.93'<br>n= 0.025 Earth, clean & winding |
| 24.4 | 447 | Total | | | |

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1:** Runoff Area=58,625 sf 4.86% Impervious Runoff Depth=1.14"
Flow Length=372' Tc=25.7 min CN=61 Runoff=0.95 cfs 5,547 cf

**Subcatchment 2:** Runoff Area=204,250 sf 0.00% Impervious Runoff Depth=1.97"
Flow Length=447' Tc=24.4 min CN=73 Runoff=6.60 cfs 33,555 cf

**Total Runoff Area = 262,875 sf Runoff Volume = 39,102 cf Average Runoff Depth = 1.78"**
**98.92% Pervious = 260,024 sf 1.08% Impervious = 2,851 sf**

## Summary for Subcatchment 1:

Runoff = 0.95 cfs @ 12.41 hrs, Volume= 5,547 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 2,851 | 98 | Gray Road - Ex. Paved roads, HSG B |
| * | 912 | 96 | Ex. driveway - Gravel surface, HSG B |
| | 54,862 | 58 | Woods/grass comb., Good, HSG B |
| | 58,625 | 61 | Weighted Average |
| | 55,774 | | 95.14% Pervious Area |
| | 2,851 | | 4.86% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 21.2 | 150 | 0.0483 | 0.12 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 4.5 | 222 | 0.0270 | 0.82 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 25.7 | 372 | Total | | | |

## Summary for Subcatchment 2:

Runoff = 6.60 cfs @ 12.35 hrs, Volume= 33,555 cf, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

| Area (sf) | CN | Description |
|---|---|---|
| 48,931 | 58 | Woods/grass comb., Good, HSG B |
| 35,748 | 72 | Woods/grass comb., Good, HSG C |
| 119,571 | 79 | Woods/grass comb., Good, HSG D |
| 204,250 | 73 | Weighted Average |
| 204,250 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 22.3 | 150 | 0.0427 | 0.11 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 39 | 0.0153 | 0.62 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 0.7 | 85 | 0.1879 | 2.17 | | **Shallow Concentrated Flow, Seg C to D**<br>Woodland Kv= 5.0 fps |
| 0.3 | 173 | 0.0404 | 11.41 | 272.75 | **Channel Flow, Seg D to E**<br>Area= 23.9 sf Perim= 25.6' r= 0.93'<br>n= 0.025 Earth, clean & winding |
| 24.4 | 447 | Total | | | |

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1:** Runoff Area=58,625 sf 4.86% Impervious Runoff Depth=1.87"
Flow Length=372' Tc=25.7 min CN=61 Runoff=1.68 cfs 9,150 cf

**Subcatchment 2:** Runoff Area=204,250 sf 0.00% Impervious Runoff Depth=2.92"
Flow Length=447' Tc=24.4 min CN=73 Runoff=9.91 cfs 49,760 cf

**Total Runoff Area = 262,875 sf Runoff Volume = 58,910 cf Average Runoff Depth = 2.69"**
**98.92% Pervious = 260,024 sf 1.08% Impervious = 2,851 sf**

## Summary for Subcatchment 1:

Runoff = 1.68 cfs @ 12.39 hrs, Volume= 9,150 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 2,851 | 98 | Gray Road - Ex. Paved roads, HSG B |
| * | 912 | 96 | Ex. driveway - Gravel surface, HSG B |
| | 54,862 | 58 | Woods/grass comb., Good, HSG B |
| | 58,625 | 61 | Weighted Average |
| | 55,774 | | 95.14% Pervious Area |
| | 2,851 | | 4.86% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 21.2 | 150 | 0.0483 | 0.12 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 4.5 | 222 | 0.0270 | 0.82 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 25.7 | 372 | Total | | | |

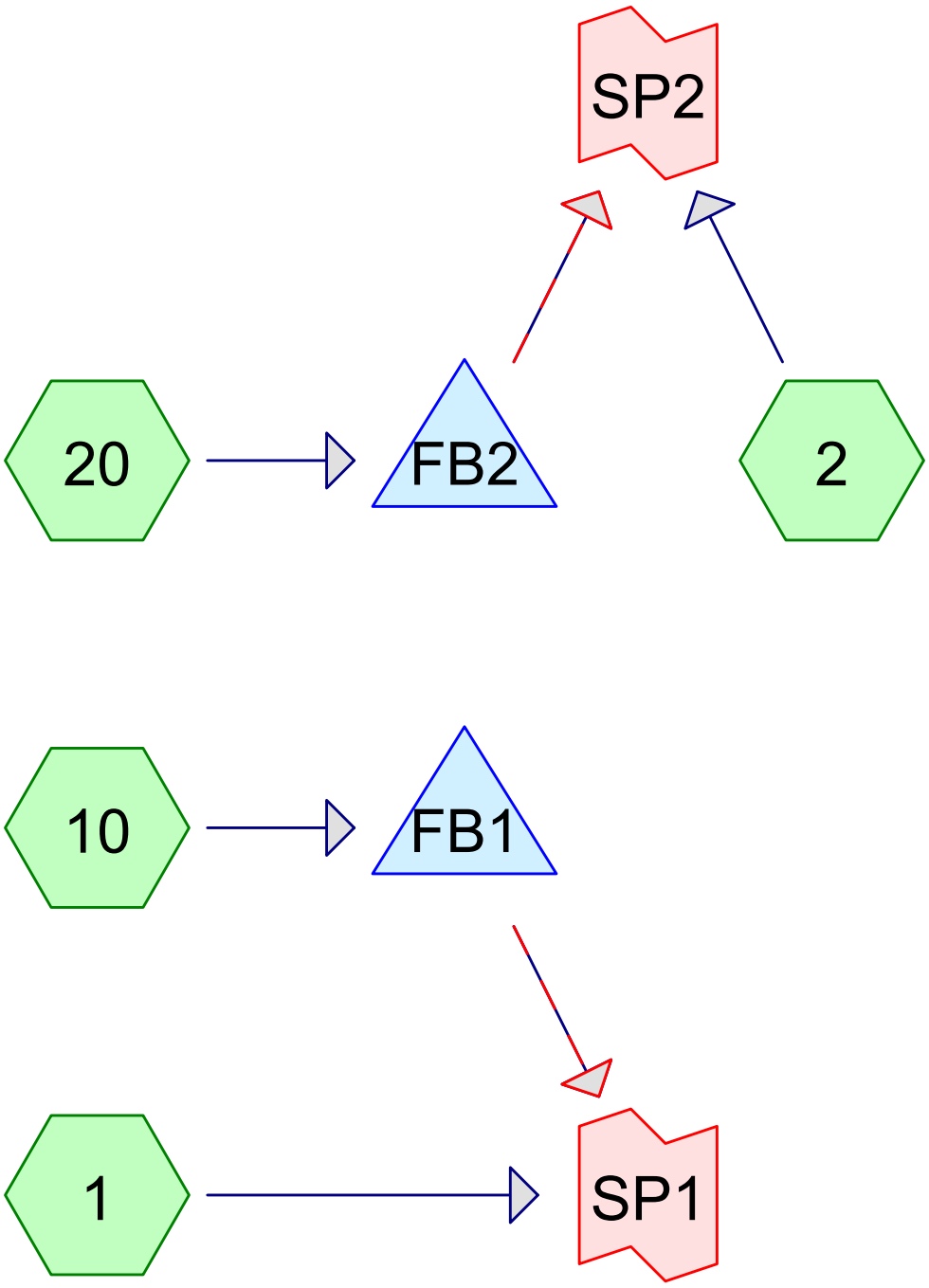
## Summary for Subcatchment 2:

Runoff = 9.91 cfs @ 12.35 hrs, Volume= 49,760 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

| Area (sf) | CN | Description |
|---|---|---|
| 48,931 | 58 | Woods/grass comb., Good, HSG B |
| 35,748 | 72 | Woods/grass comb., Good, HSG C |
| 119,571 | 79 | Woods/grass comb., Good, HSG D |
| 204,250 | 73 | Weighted Average |
| 204,250 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 22.3 | 150 | 0.0427 | 0.11 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 39 | 0.0153 | 0.62 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 0.7 | 85 | 0.1879 | 2.17 | | **Shallow Concentrated Flow, Seg C to D**<br>Woodland Kv= 5.0 fps |
| 0.3 | 173 | 0.0404 | 11.41 | 272.75 | **Channel Flow, Seg D to E**<br>Area= 23.9 sf Perim= 25.6' r= 0.93'<br>n= 0.025 Earth, clean & winding |
| 24.4 | 447 | Total | | | |




Subcat Reach Pond Link

**Routing Diagram for 17070 - POST**
Prepared by {enter your company name here}, Printed 7/23/2018

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1:** Runoff Area=18,290 sf 34.06% Impervious Runoff Depth=0.87"
Flow Length=326' Tc=20.1 min CN=72 Runoff=0.26 cfs 1,323 cf

**Subcatchment 2:** Runoff Area=138,834 sf 0.00% Impervious Runoff Depth=1.08"
Flow Length=447' Tc=24.4 min CN=76 Runoff=2.40 cfs 12,529 cf

**Subcatchment 10:** Runoff Area=40,340 sf 39.57% Impervious Runoff Depth=1.03"
Flow Length=265' Tc=24.6 min CN=75 Runoff=0.65 cfs 3,452 cf

**Subcatchment 20:** Runoff Area=61,519 sf 39.55% Impervious Runoff Depth=1.33"
Flow Length=348' Tc=17.0 min CN=80 Runoff=1.55 cfs 6,795 cf

**Pond FB1:** Peak Elev=255.14' Storage=2,390 cf Inflow=0.65 cfs 3,452 cf
Primary=0.02 cfs 3,027 cf Secondary=0.00 cfs 0 cf Outflow=0.02 cfs 3,027 cf

**Pond FB2:** Peak Elev=249.29' Storage=2,562 cf Inflow=1.55 cfs 6,795 cf
Primary=0.21 cfs 6,802 cf Secondary=0.00 cfs 0 cf Outflow=0.21 cfs 6,802 cf

**Link SP1:** Inflow=0.28 cfs 4,351 cf
Primary=0.28 cfs 4,351 cf

**Link SP2:** Inflow=2.59 cfs 19,331 cf
Primary=2.59 cfs 19,331 cf

**Total Runoff Area = 258,983 sf Runoff Volume = 24,100 cf Average Runoff Depth = 1.12"**
**82.04% Pervious = 212,461 sf 17.96% Impervious = 46,522 sf**

## Summary for Subcatchment 1:

Runoff = 0.26 cfs @ 12.31 hrs, Volume= 1,323 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 2,856 | 98 | Gray Road - Ex. Paved roads, HSG B |
| | 7,199 | 61 | >75% Grass cover, Good, HSG B |
| | 2,173 | 98 | Paved roads w/curbs & sewers, HSG B |
| | 4,862 | 55 | Woods, Good, HSG B |
| | 1,200 | 98 | Roofs, HSG B |
| | 18,290 | 72 | Weighted Average |
| | 12,061 | | 65.94% Pervious Area |
| | 6,229 | | 34.06% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 19.6 | 150 | 0.0212 | 0.13 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.2 | 60 | 0.0667 | 4.16 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.2 | 49 | 0.0050 | 3.72 | 4.57 | **Pipe Channel, Seg C to D**<br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 67 | 0.0220 | 14.16 | 679.46 | **Trap/Vee/Rect Channel Flow, Seg D to E**<br>Bot.W=2.00' D=4.00' Z= 3.0 & 2.0 '/' Top.W=22.00'<br>n= 0.025 Earth, clean & winding |
| 20.1 | 326 | Total | | | |

## Summary for Subcatchment 2:

Runoff = 2.40 cfs @ 12.36 hrs, Volume= 12,529 cf, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

| Area (sf) | CN | Description |
|---|---|---|
| 7,437 | 58 | Woods/grass comb., Good, HSG B |
| 31,851 | 72 | Woods/grass comb., Good, HSG C |
| 99,546 | 79 | Woods/grass comb., Good, HSG D |
| 138,834 | 76 | Weighted Average |
| 138,834 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 22.3 | 150 | 0.0427 | 0.11 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 39 | 0.0153 | 0.62 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 0.7 | 85 | 0.1879 | 2.17 | | **Shallow Concentrated Flow, Seg C to D**<br>Woodland Kv= 5.0 fps |
| 0.3 | 173 | 0.0404 | 11.41 | 272.75 | **Channel Flow, Seg D to E**<br>Area= 23.9 sf Perim= 25.6' r= 0.93'<br>n= 0.025 Earth, clean & winding |
| 24.4 | 447 | Total | | | |

## Summary for Subcatchment 10:

Runoff = 0.65 cfs @ 12.37 hrs, Volume= 3,452 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

| Area (sf) | CN | Description |
|---|---|---|
| 6,000 | 98 | Roofs, HSG B |
| 9,964 | 98 | Paved roads w/curbs & sewers, HSG B |
| 1,873 | 55 | Woods, Good, HSG B |
| 22,503 | 61 | >75% Grass cover, Good, HSG B |
| 40,340 | 75 | Weighted Average |
| 24,376 | | 60.43% Pervious Area |
| 15,964 | | 39.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 23.6 | 150 | 0.0133 | 0.11 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.9 | 79 | 0.0080 | 1.44 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.1 | 36 | 0.0200 | 6.39 | 39.41 | **Trap/Vee/Rect Channel Flow, Seg C to D**<br>Bot.W=0.08' D=0.50' Z= 48.0 & 1.0 '/' Top.W=24.58'<br>n= 0.013 Asphalt, smooth |
| 24.6 | 265 | Total | | | |

## Summary for Subcatchment 20:

Runoff = 1.55 cfs @ 12.25 hrs, Volume= 6,795 cf, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

| Area (sf) | CN | Description |
|---|---|---|
| 7,200 | 98 | Roofs, HSG B |
| 10,765 | 98 | Paved roads w/curbs & sewers, HSG B |
| 6,364 | 98 | Paved roads w/curbs & sewers, HSG D |
| 23,529 | 61 | >75% Grass cover, Good, HSG B |
| 13,661 | 80 | >75% Grass cover, Good, HSG D |
| 61,519 | 80 | Weighted Average |
| 37,190 | | 60.45% Pervious Area |
| 24,329 | | 39.55% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.0 | 150 | 0.0353 | 0.16 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.7 | 149 | 0.0469 | 3.49 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.3 | 49 | 0.0050 | 3.21 | 2.52 | **Pipe Channel, Seg C to D**<br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 17.0 | 348 | Total | | | |

## Summary for Pond FB1:

Inflow Area = 40,340 sf, 39.57% Impervious, Inflow Depth = 1.03" for 2-Year event
Inflow = 0.65 cfs @ 12.37 hrs, Volume= 3,452 cf
Outflow = 0.02 cfs @ 20.54 hrs, Volume= 3,027 cf, Atten= 96%, Lag= 490.2 min
Primary = 0.02 cfs @ 20.54 hrs, Volume= 3,027 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 255.14' @ 20.54 hrs Surf.Area= 2,699 sf Storage= 2,390 cf

Plug-Flow detention time= 935.6 min calculated for 3,024 cf (88% of inflow)
Center-of-Mass det. time= 879.0 min ( 1,757.0 - 878.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 253.75' | 5,397 cf | **Custom Stage Data (Irregular)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 253.75 | 999 | 125.1 | 0 | 0 | 999 |
| 254.00 | 1,149 | 140.1 | 268 | 268 | 1,317 |
| 256.00 | 4,317 | 181.1 | 5,129 | 5,397 | 2,413 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 251.58' | **0.7" Vert. Orifice/Grate** C= 0.600 |
| #2 | Device 1 | 251.58' | **4.0" Round Culvert**<br>L= 30.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 251.58' / 251.40' S= 0.0060 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf |
| #3 | Device 2 | 253.75' | **2.410 in/hr Exfiltration over Surface area** |

| | | | |
|---|---|---|---|
| | | | Conductivity to Groundwater Elevation = 240.00' |
| #4 | Device 1 | 255.25' | **4.0" Horiz. Orifice/Grate** C= 0.600 |
| | | | Limited to weir flow at low heads |
| #5 | Secondary | 255.55' | **6.0' 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=0.02 cfs @ 20.54 hrs HW=255.14' TW=0.00' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.02 cfs @ 9.04 fps)
  - **2=Culvert** (Passes 0.02 cfs of 0.53 cfs potential flow)
    - **3=Exfiltration** (Passes 0.02 cfs of 0.16 cfs potential flow)
  - **4=Orifice/Grate** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=253.75' TW=0.00' (Dynamic Tailwater)
- **5=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Pond FB2:

| | | | | | |
|---|---|---|---|---|---|
| Inflow Area = | 61,519 sf, | 39.55% Impervious, | Inflow Depth = | 1.33" | for 2-Year event |
| Inflow = | 1.55 cfs @ | 12.25 hrs, Volume= | 6,795 cf | | |
| Outflow = | 0.21 cfs @ | 13.36 hrs, Volume= | 6,802 cf, | Atten= 86%, | Lag= 66.8 min |
| Primary = | 0.21 cfs @ | 13.36 hrs, Volume= | 6,802 cf | | |
| Secondary = | 0.00 cfs @ | 0.00 hrs, Volume= | 0 cf | | |

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 249.29' @ 13.36 hrs Surf.Area= 3,520 sf Storage= 2,562 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 114.5 min ( 969.1 - 854.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 248.50' | 9,681 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 248.50 | 2,975 | 224.1 | 0 | 0 | 2,975 |
| 250.00 | 4,048 | 252.4 | 5,247 | 5,247 | 4,106 |
| 251.00 | 4,833 | 271.3 | 4,435 | 9,681 | 4,936 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 248.50' | **2.410 in/hr Exfiltration over Surface area** |
| | | | Conductivity to Groundwater Elevation = 240.00' |
| #2 | Secondary | 250.00' | **6.0' 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=0.21 cfs @ 13.36 hrs HW=249.29' TW=0.00' (Dynamic Tailwater)
- **1=Exfiltration** ( Controls 0.21 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=248.50' TW=0.00' (Dynamic Tailwater)
- **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Link SP1:

Inflow Area = 58,630 sf, 37.85% Impervious, Inflow Depth > 0.89" for 2-Year event
Inflow = 0.28 cfs @ 12.31 hrs, Volume= 4,351 cf
Primary = 0.28 cfs @ 12.31 hrs, Volume= 4,351 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

## Summary for Link SP2:

Inflow Area = 200,353 sf, 12.14% Impervious, Inflow Depth = 1.16" for 2-Year event
Inflow = 2.59 cfs @ 12.37 hrs, Volume= 19,331 cf
Primary = 2.59 cfs @ 12.37 hrs, Volume= 19,331 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1:** Runoff Area=18,290 sf 34.06% Impervious Runoff Depth=1.89"
Flow Length=326' Tc=20.1 min CN=72 Runoff=0.61 cfs 2,888 cf

**Subcatchment 2:** Runoff Area=138,834 sf 0.00% Impervious Runoff Depth=2.21"
Flow Length=447' Tc=24.4 min CN=76 Runoff=5.08 cfs 25,567 cf

**Subcatchment 10:** Runoff Area=40,340 sf 39.57% Impervious Runoff Depth=2.13"
Flow Length=265' Tc=24.6 min CN=75 Runoff=1.41 cfs 7,157 cf

**Subcatchment 20:** Runoff Area=61,519 sf 39.55% Impervious Runoff Depth=2.55"
Flow Length=348' Tc=17.0 min CN=80 Runoff=3.02 cfs 13,057 cf

**Pond FB1:** Peak Elev=255.61' Storage=3,850 cf Inflow=1.41 cfs 7,157 cf
Primary=0.03 cfs 3,362 cf Secondary=0.19 cfs 2,195 cf Outflow=0.22 cfs 5,557 cf

**Pond FB2:** Peak Elev=250.07' Storage=5,534 cf Inflow=3.02 cfs 13,057 cf
Primary=0.26 cfs 12,199 cf Secondary=0.28 cfs 862 cf Outflow=0.55 cfs 13,061 cf

**Link SP1:** Inflow=0.63 cfs 8,445 cf
Primary=0.63 cfs 8,445 cf

**Link SP2:** Inflow=5.31 cfs 38,628 cf
Primary=5.31 cfs 38,628 cf

**Total Runoff Area = 258,983 sf Runoff Volume = 48,669 cf Average Runoff Depth = 2.26"**
**82.04% Pervious = 212,461 sf 17.96% Impervious = 46,522 sf**

## Summary for Subcatchment 1:

Runoff = 0.61 cfs @ 12.29 hrs, Volume= 2,888 cf, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 2,856 | 98 | Gray Road - Ex. Paved roads, HSG B |
| | 7,199 | 61 | >75% Grass cover, Good, HSG B |
| | 2,173 | 98 | Paved roads w/curbs & sewers, HSG B |
| | 4,862 | 55 | Woods, Good, HSG B |
| | 1,200 | 98 | Roofs, HSG B |
| | 18,290 | 72 | Weighted Average |
| | 12,061 | | 65.94% Pervious Area |
| | 6,229 | | 34.06% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 19.6 | 150 | 0.0212 | 0.13 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.2 | 60 | 0.0667 | 4.16 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.2 | 49 | 0.0050 | 3.72 | 4.57 | **Pipe Channel, Seg C to D**<br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 67 | 0.0220 | 14.16 | 679.46 | **Trap/Vee/Rect Channel Flow, Seg D to E**<br>Bot.W=2.00' D=4.00' Z= 3.0 & 2.0 '/' Top.W=22.00'<br>n= 0.025 Earth, clean & winding |
| 20.1 | 326 | Total | | | |

## Summary for Subcatchment 2:

Runoff = 5.08 cfs @ 12.35 hrs, Volume= 25,567 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

| Area (sf) | CN | Description |
|---|---|---|
| 7,437 | 58 | Woods/grass comb., Good, HSG B |
| 31,851 | 72 | Woods/grass comb., Good, HSG C |
| 99,546 | 79 | Woods/grass comb., Good, HSG D |
| 138,834 | 76 | Weighted Average |
| 138,834 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 22.3 | 150 | 0.0427 | 0.11 | | **Sheet Flow, Seg A to B** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 39 | 0.0153 | 0.62 | | **Shallow Concentrated Flow, Seg B to C** Woodland Kv= 5.0 fps |
| 0.7 | 85 | 0.1879 | 2.17 | | **Shallow Concentrated Flow, Seg C to D** Woodland Kv= 5.0 fps |
| 0.3 | 173 | 0.0404 | 11.41 | 272.75 | **Channel Flow, Seg D to E** Area= 23.9 sf Perim= 25.6' r= 0.93' n= 0.025 Earth, clean & winding |
| 24.4 | 447 | Total | | | |

## Summary for Subcatchment 10:

Runoff = 1.41 cfs @ 12.35 hrs, Volume= 7,157 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

| Area (sf) | CN | Description |
|---|---|---|
| 6,000 | 98 | Roofs, HSG B |
| 9,964 | 98 | Paved roads w/curbs & sewers, HSG B |
| 1,873 | 55 | Woods, Good, HSG B |
| 22,503 | 61 | >75% Grass cover, Good, HSG B |
| 40,340 | 75 | Weighted Average |
| 24,376 | | 60.43% Pervious Area |
| 15,964 | | 39.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 23.6 | 150 | 0.0133 | 0.11 | | **Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10" |
| 0.9 | 79 | 0.0080 | 1.44 | | **Shallow Concentrated Flow, Seg B to C** Unpaved Kv= 16.1 fps |
| 0.1 | 36 | 0.0200 | 6.39 | 39.41 | **Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.08' D=0.50' Z= 48.0 & 1.0 '/' Top.W=24.58' n= 0.013 Asphalt, smooth |
| 24.6 | 265 | Total | | | |

## Summary for Subcatchment 20:

Runoff = 3.02 cfs @ 12.24 hrs, Volume= 13,057 cf, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.60"

| Area (sf) | CN | Description |
|---|---|---|
| 7,200 | 98 | Roofs, HSG B |
| 10,765 | 98 | Paved roads w/curbs & sewers, HSG B |
| 6,364 | 98 | Paved roads w/curbs & sewers, HSG D |
| 23,529 | 61 | >75% Grass cover, Good, HSG B |
| 13,661 | 80 | >75% Grass cover, Good, HSG D |
| 61,519 | 80 | Weighted Average |
| 37,190 | | 60.45% Pervious Area |
| 24,329 | | 39.55% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.0 | 150 | 0.0353 | 0.16 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.7 | 149 | 0.0469 | 3.49 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.3 | 49 | 0.0050 | 3.21 | 2.52 | **Pipe Channel, Seg C to D**<br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 17.0 | 348 | Total | | | |

## Summary for Pond FB1:

Inflow Area = 40,340 sf, 39.57% Impervious, Inflow Depth = 2.13" for 10-Year event
Inflow = 1.41 cfs @ 12.35 hrs, Volume= 7,157 cf
Outflow = 0.22 cfs @ 13.52 hrs, Volume= 5,557 cf, Atten= 84%, Lag= 70.3 min
Primary = 0.03 cfs @ 13.52 hrs, Volume= 3,362 cf
Secondary = 0.19 cfs @ 13.52 hrs, Volume= 2,195 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 255.61' @ 13.52 hrs Surf.Area= 3,531 sf Storage= 3,850 cf

Plug-Flow detention time= 652.8 min calculated for 5,551 cf (78% of inflow)
Center-of-Mass det. time= 569.5 min ( 1,425.7 - 856.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 253.75' | 5,397 cf | **Custom Stage Data (Irregular)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 253.75 | 999 | 125.1 | 0 | 0 | 999 |
| 254.00 | 1,149 | 140.1 | 268 | 268 | 1,317 |
| 256.00 | 4,317 | 181.1 | 5,129 | 5,397 | 2,413 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 251.58' | **0.7" Vert. Orifice/Grate** C= 0.600 |
| #2 | Device 1 | 251.58' | **4.0" Round Culvert**<br>L= 30.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 251.58' / 251.40' S= 0.0060 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf |
| #3 | Device 2 | 253.75' | **2.410 in/hr Exfiltration over Surface area** |

| | | | |
|---|---|---|---|
| | | | Conductivity to Groundwater Elevation = 240.00' |
| #4 | Device 1 | 255.25' | **4.0" Horiz. Orifice/Grate** C= 0.600 |
| | | | Limited to weir flow at low heads |
| #5 | Secondary | 255.55' | **6.0' 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=0.03 cfs @ 13.52 hrs HW=255.61' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.63 fps)
  └─**2=Culvert** (Passes < 0.56 cfs potential flow)
    └─**3=Exfiltration** (Passes < 0.21 cfs potential flow)
  └─**4=Orifice/Grate** (Passes < 0.25 cfs potential flow)

**Secondary OutFlow** Max=0.19 cfs @ 13.52 hrs HW=255.61' TW=0.00' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 0.58 fps)

## Summary for Pond FB2:

Inflow Area = 61,519 sf, 39.55% Impervious, Inflow Depth = 2.55" for 10-Year event
Inflow = 3.02 cfs @ 12.24 hrs, Volume= 13,057 cf
Outflow = 0.55 cfs @ 12.97 hrs, Volume= 13,061 cf, Atten= 82%, Lag= 43.8 min
Primary = 0.26 cfs @ 12.97 hrs, Volume= 12,199 cf
Secondary = 0.28 cfs @ 12.97 hrs, Volume= 862 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 250.07' @ 12.97 hrs Surf.Area= 4,101 sf Storage= 5,534 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 206.3 min ( 1,041.9 - 835.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 248.50' | 9,681 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 248.50 | 2,975 | 224.1 | 0 | 0 | 2,975 |
| 250.00 | 4,048 | 252.4 | 5,247 | 5,247 | 4,106 |
| 251.00 | 4,833 | 271.3 | 4,435 | 9,681 | 4,936 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 248.50' | **2.410 in/hr Exfiltration over Surface area** |
| | | | Conductivity to Groundwater Elevation = 240.00' |
| #2 | Secondary | 250.00' | **6.0' 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=0.26 cfs @ 12.97 hrs HW=250.07' TW=0.00' (Dynamic Tailwater)
└─**1=Exfiltration** ( Controls 0.26 cfs)

**Secondary OutFlow** Max=0.28 cfs @ 12.97 hrs HW=250.07' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.28 cfs @ 0.66 fps)

## Summary for Link SP1:

Inflow Area = 58,630 sf, 37.85% Impervious, Inflow Depth > 1.73" for 10-Year event
Inflow = 0.63 cfs @ 12.29 hrs, Volume= 8,445 cf
Primary = 0.63 cfs @ 12.29 hrs, Volume= 8,445 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

## Summary for Link SP2:

Inflow Area = 200,353 sf, 12.14% Impervious, Inflow Depth = 2.31" for 10-Year event
Inflow = 5.31 cfs @ 12.35 hrs, Volume= 38,628 cf
Primary = 5.31 cfs @ 12.35 hrs, Volume= 38,628 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1:** Runoff Area=18,290 sf 34.06% Impervious Runoff Depth=2.83"
Flow Length=326' Tc=20.1 min CN=72 Runoff=0.93 cfs 4,314 cf

**Subcatchment 2:** Runoff Area=138,834 sf 0.00% Impervious Runoff Depth=3.21"
Flow Length=447' Tc=24.4 min CN=76 Runoff=7.41 cfs 37,117 cf

**Subcatchment 10:** Runoff Area=40,340 sf 39.57% Impervious Runoff Depth=3.11"
Flow Length=265' Tc=24.6 min CN=75 Runoff=2.08 cfs 10,463 cf

**Subcatchment 20:** Runoff Area=61,519 sf 39.55% Impervious Runoff Depth=3.60"
Flow Length=348' Tc=17.0 min CN=80 Runoff=4.26 cfs 18,462 cf

**Pond FB1:** Peak Elev=255.72' Storage=4,270 cf Inflow=2.08 cfs 10,463 cf
Primary=0.03 cfs 3,434 cf Secondary=1.05 cfs 5,416 cf Outflow=1.08 cfs 8,850 cf

**Pond FB2:** Peak Elev=250.25' Storage=6,303 cf Inflow=4.26 cfs 18,462 cf
Primary=0.28 cfs 13,852 cf Secondary=1.94 cfs 4,623 cf Outflow=2.21 cfs 18,475 cf

**Link SP1:** Inflow=1.46 cfs 13,164 cf
Primary=1.46 cfs 13,164 cf

**Link SP2:** Inflow=8.62 cfs 55,592 cf
Primary=8.62 cfs 55,592 cf

**Total Runoff Area = 258,983 sf Runoff Volume = 70,356 cf Average Runoff Depth = 3.26"**
**82.04% Pervious = 212,461 sf 17.96% Impervious = 46,522 sf**

## Summary for Subcatchment 1:

Runoff = 0.93 cfs @ 12.28 hrs, Volume= 4,314 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 2,856 | 98 | Gray Road - Ex. Paved roads, HSG B |
| | 7,199 | 61 | >75% Grass cover, Good, HSG B |
| | 2,173 | 98 | Paved roads w/curbs & sewers, HSG B |
| | 4,862 | 55 | Woods, Good, HSG B |
| | 1,200 | 98 | Roofs, HSG B |
| | 18,290 | 72 | Weighted Average |
| | 12,061 | | 65.94% Pervious Area |
| | 6,229 | | 34.06% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 19.6 | 150 | 0.0212 | 0.13 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.2 | 60 | 0.0667 | 4.16 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.2 | 49 | 0.0050 | 3.72 | 4.57 | **Pipe Channel, Seg C to D**<br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.013 Corrugated PE, smooth interior |
| 0.1 | 67 | 0.0220 | 14.16 | 679.46 | **Trap/Vee/Rect Channel Flow, Seg D to E**<br>Bot.W=2.00' D=4.00' Z= 3.0 & 2.0 '/' Top.W=22.00'<br>n= 0.025 Earth, clean & winding |
| 20.1 | 326 | Total | | | |

## Summary for Subcatchment 2:

Runoff = 7.41 cfs @ 12.34 hrs, Volume= 37,117 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

| Area (sf) | CN | Description |
|---|---|---|
| 7,437 | 58 | Woods/grass comb., Good, HSG B |
| 31,851 | 72 | Woods/grass comb., Good, HSG C |
| 99,546 | 79 | Woods/grass comb., Good, HSG D |
| 138,834 | 76 | Weighted Average |
| 138,834 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 22.3 | 150 | 0.0427 | 0.11 | | **Sheet Flow, Seg A to B**<br>Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 39 | 0.0153 | 0.62 | | **Shallow Concentrated Flow, Seg B to C**<br>Woodland Kv= 5.0 fps |
| 0.7 | 85 | 0.1879 | 2.17 | | **Shallow Concentrated Flow, Seg C to D**<br>Woodland Kv= 5.0 fps |
| 0.3 | 173 | 0.0404 | 11.41 | 272.75 | **Channel Flow, Seg D to E**<br>Area= 23.9 sf Perim= 25.6' r= 0.93'<br>n= 0.025 Earth, clean & winding |
| 24.4 | 447 | Total | | | |

## Summary for Subcatchment 10:

Runoff = 2.08 cfs @ 12.35 hrs, Volume= 10,463 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

| Area (sf) | CN | Description |
|---|---|---|
| 6,000 | 98 | Roofs, HSG B |
| 9,964 | 98 | Paved roads w/curbs & sewers, HSG B |
| 1,873 | 55 | Woods, Good, HSG B |
| 22,503 | 61 | >75% Grass cover, Good, HSG B |
| 40,340 | 75 | Weighted Average |
| 24,376 | | 60.43% Pervious Area |
| 15,964 | | 39.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 23.6 | 150 | 0.0133 | 0.11 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.9 | 79 | 0.0080 | 1.44 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.1 | 36 | 0.0200 | 6.39 | 39.41 | **Trap/Vee/Rect Channel Flow, Seg C to D**<br>Bot.W=0.08' D=0.50' Z= 48.0 & 1.0 '/' Top.W=24.58'<br>n= 0.013 Asphalt, smooth |
| 24.6 | 265 | Total | | | |

## Summary for Subcatchment 20:

Runoff = 4.26 cfs @ 12.23 hrs, Volume= 18,462 cf, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

| Area (sf) | CN | Description |
|---|---|---|
| 7,200 | 98 | Roofs, HSG B |
| 10,765 | 98 | Paved roads w/curbs & sewers, HSG B |
| 6,364 | 98 | Paved roads w/curbs & sewers, HSG D |
| 23,529 | 61 | >75% Grass cover, Good, HSG B |
| 13,661 | 80 | >75% Grass cover, Good, HSG D |
| 61,519 | 80 | Weighted Average |
| 37,190 | | 60.45% Pervious Area |
| 24,329 | | 39.55% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 16.0 | 150 | 0.0353 | 0.16 | | **Sheet Flow, Seg A to B**<br>Grass: Dense n= 0.240 P2= 3.10" |
| 0.7 | 149 | 0.0469 | 3.49 | | **Shallow Concentrated Flow, Seg B to C**<br>Unpaved Kv= 16.1 fps |
| 0.3 | 49 | 0.0050 | 3.21 | 2.52 | **Pipe Channel, Seg C to D**<br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 17.0 | 348 | Total | | | |

## Summary for Pond FB1:

Inflow Area = 40,340 sf, 39.57% Impervious, Inflow Depth = 3.11" for 25-Year event
Inflow = 2.08 cfs @ 12.35 hrs, Volume= 10,463 cf
Outflow = 1.08 cfs @ 12.72 hrs, Volume= 8,850 cf, Atten= 48%, Lag= 22.4 min
Primary = 0.03 cfs @ 12.72 hrs, Volume= 3,434 cf
Secondary = 1.05 cfs @ 12.72 hrs, Volume= 5,416 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 255.72' @ 12.72 hrs Surf.Area= 3,753 sf Storage= 4,270 cf

Plug-Flow detention time= 431.7 min calculated for 8,841 cf (84% of inflow)
Center-of-Mass det. time= 366.8 min ( 1,212.0 - 845.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 253.75' | 5,397 cf | **Custom Stage Data (Irregular)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 253.75 | 999 | 125.1 | 0 | 0 | 999 |
| 254.00 | 1,149 | 140.1 | 268 | 268 | 1,317 |
| 256.00 | 4,317 | 181.1 | 5,129 | 5,397 | 2,413 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 251.58' | **0.7" Vert. Orifice/Grate** C= 0.600 |
| #2 | Device 1 | 251.58' | **4.0" Round Culvert**<br>L= 30.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 251.58' / 251.40' S= 0.0060 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf |
| #3 | Device 2 | 253.75' | **2.410 in/hr Exfiltration over Surface area** |

| | | | |
|---|---|---|---|
| | | | Conductivity to Groundwater Elevation = 240.00' |
| #4 | Device 1 | 255.25' | **4.0" Horiz. Orifice/Grate** C= 0.600 |
| | | | Limited to weir flow at low heads |
| #5 | Secondary | 255.55' | **6.0' 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=0.03 cfs @ 12.72 hrs HW=255.72' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.76 fps)
  └─**2=Culvert** (Passes < 0.57 cfs potential flow)
    └─**3=Exfiltration** (Passes < 0.23 cfs potential flow)
  └─**4=Orifice/Grate** (Passes < 0.29 cfs potential flow)

**Secondary OutFlow** Max=1.04 cfs @ 12.72 hrs HW=255.72' TW=0.00' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Weir Controls 1.04 cfs @ 1.03 fps)

## Summary for Pond FB2:

Inflow Area = 61,519 sf, 39.55% Impervious, Inflow Depth = 3.60" for 25-Year event
Inflow = 4.26 cfs @ 12.23 hrs, Volume= 18,462 cf
Outflow = 2.21 cfs @ 12.54 hrs, Volume= 18,475 cf, Atten= 48%, Lag= 18.5 min
Primary = 0.28 cfs @ 12.54 hrs, Volume= 13,852 cf
Secondary = 1.94 cfs @ 12.54 hrs, Volume= 4,623 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 250.25' @ 12.54 hrs Surf.Area= 4,241 sf Storage= 6,303 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 172.1 min ( 997.9 - 825.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 248.50' | 9,681 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 248.50 | 2,975 | 224.1 | 0 | 0 | 2,975 |
| 250.00 | 4,048 | 252.4 | 5,247 | 5,247 | 4,106 |
| 251.00 | 4,833 | 271.3 | 4,435 | 9,681 | 4,936 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 248.50' | **2.410 in/hr Exfiltration over Surface area** |
| | | | Conductivity to Groundwater Elevation = 240.00' |
| #2 | Secondary | 250.00' | **6.0' 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=0.28 cfs @ 12.54 hrs HW=250.25' TW=0.00' (Dynamic Tailwater)
└─**1=Exfiltration** ( Controls 0.28 cfs)

**Secondary OutFlow** Max=1.93 cfs @ 12.54 hrs HW=250.25' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.93 cfs @ 1.26 fps)

## Summary for Link SP1:

Inflow Area = 58,630 sf, 37.85% Impervious, Inflow Depth > 2.69" for 25-Year event
Inflow = 1.46 cfs @ 12.68 hrs, Volume= 13,164 cf
Primary = 1.46 cfs @ 12.68 hrs, Volume= 13,164 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

## Summary for Link SP2:

Inflow Area = 200,353 sf, 12.14% Impervious, Inflow Depth = 3.33" for 25-Year event
Inflow = 8.62 cfs @ 12.44 hrs, Volume= 55,592 cf
Primary = 8.62 cfs @ 12.44 hrs, Volume= 55,592 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

# ATTACHMENT 4

# INSPECTION, MAINTENANCE & HOUSEKEEPING PLAN

DM ROMA
CONSULTING ENGINEERS

# INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

## GRAY ROAD RETIREMENT COMMUNITY
## WINDHAM, MAINE

**Responsible Party**

Owner: Weld, LLC
P.O. Box 1361
Windham, Maine 04062

The owner/applicant is responsible for the maintenance of all stormwater management structures and related site components and the keeping of a maintenance log book with service records until such time that a homeowner's association is created. Records of all inspections and maintenance work performed must be kept on file with the owner and retained for a minimum of five years. The maintenance log will be made available to the upon request. At a minimum, the maintenance of stormwater management systems will be performed on the prescribed schedule.

The procedures outlined in this plan are provided as a general overview of the anticipated practices to be utilized on this site. In some instances, additional measures may be required due to unexpected conditions. *The Maine Erosion and Sedimentation Control BMP* and *Stormwater Management for Maine: Best Management Practices* Manuals published by the Maine Department of Environmental Protection (MDEP) should be referenced for additional information.

**During Construction**

1. **Inspection and Corrective Action:** It is the contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. Inspection shall occur on all disturbed and impervious areas, erosion control measures, material storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week as well as 24 hours before and after a storm event 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.

2. **Maintenance:** Erosion controls shall be maintained in effective operating condition until areas are permanently stabilized. 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 BMPs need to be maintained or modified,

additional BMPs are necessary, or other corrective action is needed, implementation must be completed within seven calendar days and prior to any rainfall event.

3. **Documentation:** A report summarizing the inspections and any corrective action taken must be maintained on site. The log must include the name(s) and qualifications of the person making the inspections; the date(s) of the inspections; and the major observations about the operation and maintenance of erosion and sedimentation controls, materials storage areas, and vehicle 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 Town staff, and a copy must be provided upon request. The owner shall retain a copy of the log for a period of at least three years from the completion of permanent stabilization.

**Housekeeping**

1. **Spill prevention:** Controls must be used to prevent pollutants from construction and waste materials 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.

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.

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.

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.

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.

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:** Approval from the Town does not authorize a discharge that is mixed with a source of non-stormwater, other than those discharges in compliance with Section 6 above. Specifically, the Town'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.

**Post construction**

1. **Inspection and Corrective Action:** All measures must be maintained by the owner in effective operating condition. A person with knowledge of erosion and stormwater control, including the standards and conditions of 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.

   A. **Vegetated Areas:** 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 is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   B. **Ditches, Swales, and Open Channels:** Inspect ditches, swales, and other open channels in the spring, late fall, and after heavy rains to remove any obstructions to flow, remove accumulated sediments and debris, control vegetative growth that could obstruct flow, and 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 side slopes.

   C. **Culverts:** Inspect culverts in the spring, 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.

   D. **Catch Basins:** Inspect and, if required, clean out catch basins at least once a year, preferably in early spring. 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).

**E. Underdrained Filter Basin:** Basin should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The basin should drain within 48 hours following a one-inch storm and if a larger storm fills the system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity. If water ponds on the surface of the bed for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up in the forebay and basin and remove as needed. Mowing of the basin can only occur semi-annually to a height of no less than 6 inches utilizing a hand-held string trimmer or push-mower. Any bare areas or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. The basin should also be inspected annually for destabilization of side slopes, embankment settling and other signs of structural failure.

**F. Roofline Dripedge:** The dripedges should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The reservoir crushed stone should drain within 48 hours following a one-inch storm and if a larger storm fills the system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the stone reservoir course shall be removed and the filter bed be rototilled to reestablish the soil's filtration capacity. If water ponds in the reservoir course for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up at surface and remove as needed. The dripedges are part of the stormwater management plan and cannot be paved over or altered in anyway.

**G. Regular Maintenance:** Clear accumulations of winter sand along roadway once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along pavement shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

**H. 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 Town staff 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. Attached is a sample log.

# MAINTENANCE LOG

## GRAY ROAD RETIREMENT COMMUNITY
## WINDHAM, MAINE

The following stormwater management and erosion control items shall be inspected and maintained as prescribed in the Maintenance Plan with recommended frequencies as identified below. The owner is responsible for keeping this maintenance log on file for a minimum of five years and shall provide a copy to the Town upon request. Inspections are to be performed by a qualified third party inspector and all corrective actions shall be performed by personnel familiar with stormwater management systems and erosion controls.

| Maintenance Item | Maintenance Event | Date Performed | Responsible Personnel | Comments |
|---|---|---|---|---|
| Vegetated Areas | Inspect slopes and embankments early in Spring. | | | |
| Ditches, swales, and other open channels | Inspect after major rainfall event producing 1" of rain in two hours. | | | |
| | Inspect for erosion or slumping & repair | | | |
| | Mowed at least annually. | | | |
| Culverts | Inspect semiannually and after major rainfall. | | | |
| | Repair erosion at inlet or outlet of pipe. | | | |
| | Repair displaced riprap. | | | |
| | Clean accumulated sediment in culverts when >20% full. | | | |
| Catch Basins | Inspect to ensure that structure is properly draining. | | | |
| | Remove accumulated sediment semiannually. | | | |
| | Inspect grates/inlets and remove debris as needed. | | | |

# MAINTENANCE LOG

## GRAY ROAD RETIREMENT COMMUNITY
## WINDHAM, MAINE

| Maintenance Item | Maintenance Event | Date Performed | Responsible Personnel | Comments |
|---|---|---|---|---|
| Underdrained Filter Basin, And Roofline Dripedges | Check after each rainfall event to ensure that pond drains within 24-48 hours. | | | |
| | Replace top several inches of filter if pond does not drain within 72 hours. | | | |
| | Mow grass no more than twice a year to no less than 6 inches in height. | | | |
| | Inspect semi-annually for erosion or sediment accumulation and repair as necessary. | | | |
| Regular Maintenance | Clear accumulation of winter sand in paved areas annually. | | | |