MAJOR SUBDIVISION
PRELIMINARY PLAN APPLICATION
TO TOWN OF WINDHAM

FOR

WOODSIDE CONDOMINIUM
RETIREMENT COMMUNITY

GRAY ROAD
WINDHAM, MAINE

PREPARED FOR

WELD, LLC
PO BOX 1361
WINDHAM, ME 04062

PREPARED BY

DM ROMA
CONSULTING ENGINEERS

PO BOX 1116
WINDHAM, ME 04062

APRIL 22, 2019

PROJECT NARRATIVE

SECTION 1 – PROPOSED USE NARRATIVE

The property is an 11-acre undeveloped lot with frontage access from Roosevelt Trail and Swett Road. The initial phase of construction was designed and approved as a 14-unit project consisting of 7 duplex buildings. The proposed expanded project includes 36 additional dwelling units for a total of 50 units in 25 duplex buildings with approximately 1,500 feet of road construction. The dwelling units will be in a condominium ownership that are 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 paved sidewalks and curbing. The project will be served by public water from the Portland Water District and shared private wastewater disposal fields. Electrical service will be extended to the units underground. We are currently investigating the possibility of extending natural gas infrastructure to serve the development in coordination with an adjacent town project.

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. The septic system design and soils investigation were completed by Steve Marcotte, a Certified Geologist and Licensed Site Evaluator with Summitt Geoengineering.

SECTION 8 – TECHNICAL ABILITY

The design professionals at DM Roma Consulting Engineers, Survey Inc, and Summitt Geoengineering 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. Private on-site wastewater disposal systems are currently being designed and permitted as Engineered Systems with the Maine Department of Health and Human Services 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 waste.

SECTION 12 – VEHICLE TRAFFIC

Vehicle sight distance at the two proposed driveway intersections looking right and left is over 700 feet. Based on the Institute of Transportation Engineers Trip Generation Manual, 9th edition, Land Use Code 252 – Senior Adult Housing, Attached is expected to generate 3.44 weekday trips, 0.20 AM Peak-Hour trips, 0.25 PM Peak-Hour Trips and 0.31 Saturday Peak-Hour Trips. Accordingly, the proposed 50 senior housing units can be expected to generate a total of 172 trips during a typical weekday, 10 trips in the weekday morning peak hour, 13 trips in the evening peak hour and 16 trips in the Saturday peak hour.

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 entire 50-unit project and 1,500 feet of roadway, excluding building foundations, are as follows:

• Clear and grub roadway areas	$40,000
• Construct gravel roadways	$150,000
• Bituminous Pavement	$65,000
• Electrical Conduit & Risers	$40,000
• Stormwater BMPs	$60,000
• Leach Field & Septic	$200,000
• Water main and services	$60,000
• Erosion Control & Misc.	$25,000
Total Construction Costs	$640,000

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.

Preliminary Plan - Major Subdivision

Project Name: WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY

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

Number of lots/dwelling units: 36 NEW, 50 TOTAL **Estimated road length:** 1,200 LF OF NEW ROAD

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: 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.

_____ 4-22-19

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		
	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.	X	
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	

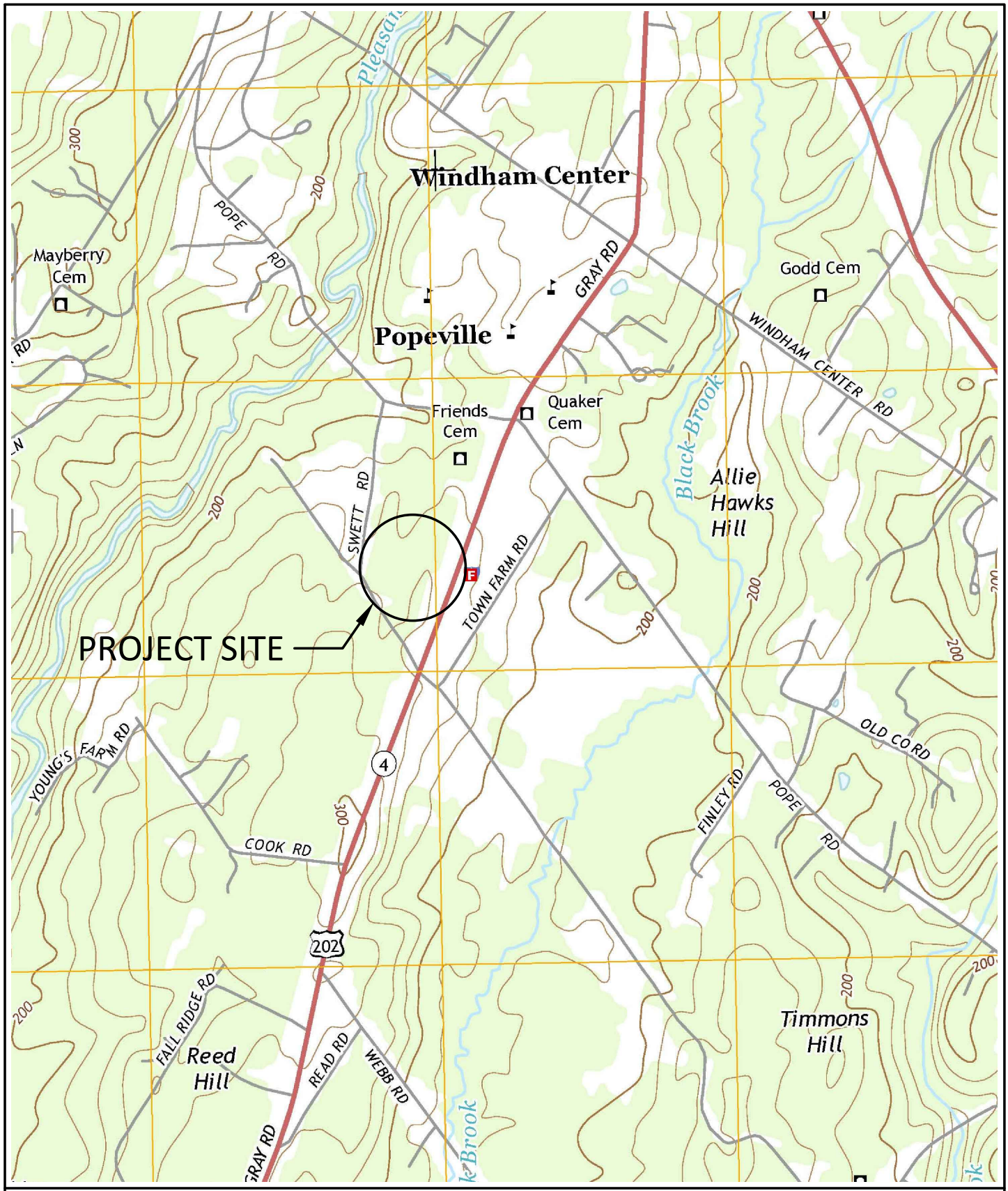
		Applicant	Staff
16	Financial Capacity.		
	i. Estimated costs of development, and itemization of major costs	X	
	ii. Financing - provide one of the following:		
	a. Letter of commitment to fund from financial institution, governmental agency, or other funding agency		
	b. Annual corporate report with 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	PENDING	
	iii. If a corporation, Certificate of Good Standing from the Secretary of State	X	
17	Technical Capacity		
	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:		
	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	N/A	
	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.	N/A	
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	N/A	
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	
26	For Cluster Subdivisions that do not maximize the development potential of the property being subdivided, a conceptual master plan for the remaining land showing future roads, Open Space, and lot layout, consistent with the requirements of 911.K., Custer Developments will be submitted.	N/A	

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.	X	
	a) map showing basic soil types	X	
	b) depth to the water table at representative points	X	
	c) Drainage conditions throughout the subdivision	X	
	d) data on existing ground water quality	X	
	e) analysis and evaluation of the effect of the subdivision on groundwater	X	
	f) map showing location of any subsurface wastewater disposal systems and drinking water wells within the subdivision & within 200 feet of the subdivision boundaries.	X	
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.	WAIVER	
6	If any portion of the subdivision is in the direct watershed of a great pond,		
	i) phosphorous impact analysis and control plan	N/A	
	ii) long term maintenance plan for all phosphorous control measures	N/A	
	iii) contour lines at an interval of 2 feet	N/A	
	iv) delineate areas with sustained slopes greater than 25% covering more than one acre	N/A	

Electronic Submission	X	



SITE LOCATION MAP

WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY
WINDHAM, MAINE

FOR RECORD OWNER:
WELD, LLC
PO BOX 1361
WINDHAM, ME 04062

SCALE: 1"=1500'
DATE: 04-08-2019
JOB NUMBER: 17070

DM ROMA
CONSULTING ENGINEERS
P.O. BOX 1116
WINDHAM, ME 04062
(207) 310 - 0506

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

March 25, 2019

Dustin Roma
DM Roma Consulting Engineers
PO BOX 1116
Windham, ME 04062

RE: Soil Evaluation for Proposed Condominiums
Gray Road & Swett Road, Windham, Maine

Dear Mr. Roma:

On March 25th, 2019, six test pits were dug and assessed on the subject parcel identified on the Town of Windham tax maps as Map 9, Lot 27K on Gray Road for proposed condominiums. The test pits were evaluated and located by GPS by Alexander Finamore, LSE #391.

Test pits were identified as Test Pits 100-105 and all located in an upland setting outside of previously delineated wetlands. All six test pits were located in a wooded setting. Soils were of glacial till origin with sandy loam textures over laying loamy sands. Evidence of a seasonal water table was found at 19 inches in Test Pit 103 and 25 inches in Test Pit 104. Evidence of a restrictive layer was found at 33 inches in Test Pit 101, 34 inches in Test Pit 102, 25 inches in Test Pit 103, and 28 inches in Test Pit 104.

Therefore, the proposed development has suitable soils for a First Time System according to the Maine Subsurface Wastewater Disposal Code. Please find the soil profile descriptions of the test pits attached.

If you have any questions, please feel free to email me at: mainelysoils@gmail.com or call 207-650-4313.

Sincerely,

Alexander A. Finamore, LSE #391
Owner - Mainely Soils, LLC

FORM F

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
Woodside Condo Retirement Community	Weld, LLC	Windham

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-100 | [X] Test Pit | [ ] Boring

1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SANDY LOAM	FRIABLE	DARK BROWN 10YR 3/2	NONE OBSERVED
		DARK YELLOWISH BROWN 10YR 3/4	
		YELLOWISH BROWN 10YR 5/4	FREE WATER & ROOTS 15"
LOAMY FINE SAND			
LIMIT OF EXCAVATION = 38"			

[ ] hydric [■] non-hydric | Slope %: 5-8 | Limiting factor: 38" | x ground water x restrictive layer bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: 2 (Profile) | C (Soil Condition)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-101 | [X] Test Pit | [ ] Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SANDY LOAM	FRIABLE	DARK BROWN 10YR 3/2	NONE OBSERVED
		DARK YELLOWISH BROWN 10YR 3/4	
LOAMY SAND W/ ROUND PEBBLES		YELLOWISH BROWN 10YR 5/4	ROOTS @ 19" FREE WATER @ 23"
STONY REFUSAL = 33"			

[■] hydric [ ] non-hydric | Slope %: 3 | Limiting factor: 33" | [ ] ground water [ ] restrictive layer [ ] bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: 3 (Profile) | C (Soil Condition)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-102 | [X] Test Pit | [ ] Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SANDY LOAM	FRIABLE	DARK BROWN 10YR 3/2	NONE OBSERVED
		DARK YELLOWISH BROWN 10YR 3/4	
LOAMY SAND W/ ROUND PEBBLES		YELLOWISH BROWN 10YR 5/4	ROOTS @ 15"
MEDIUM SAND W/ ROUND PEBBLES	SOMEWHAT FIRM	BROWN 10YR 5/3	
STONY REFUSAL = 34"			

[ ] hydric [■] non-hydric | Slope %: 2 | Limiting factor: 25" | [■] ground water [ ] restrictive layer bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: 7 (Profile) | C (Soil Condition)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-103 | [X] Test Pit | [ ] Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SANDY LOAM	FRIABLE	DARK BROWN 10YR 3/2	NONE OBSERVED
		DARK YELLOWISH BROWN 10YR 3/4	
		YELLOWISH BROWN 10YR 5/4	ROOTS @ 13"
LOAMY FINE SAND W/ ROUND PEBBLES	SOMEWHAT FIRM	PALE BROWN 10YR 6/3	COMMON, MEDIUM & DISTINCT
STONY REFUSAL = 25"			

[ ] hydric [ ] non-hydric | Slope %: 2 | Limiting factor: 19" | [■] ground water [ ] restrictive layer bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: 7 (Profile) | C (Soil Condition)

Professional Endorsements *(as applicable)*

C.S.S.	signature:	Date:
	name printed/typed:	Lic.#:
L.S.E.	signature: Alexander A. Finamore	Date: 3/25/19
	name printed/typed: Alexander A. Finamore	Lic.#: 391

FORM F

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
Woodside Condo Retirement Community	Weld, LLC	Windham

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-104 | [X] Test Pit | [ ] Boring

1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SANDY LOAM	FRIABLE	DARK BROWN 10YR 3/2	NONE OBSERVED
		DARK YELLOWISH BROWN 10YR 3/4	
		YELLOWISH BROWN 10YR 5/4	ROOTS @ 12"
LOAMY FINE SAND W/ ROUND PEBBLES			FREE WATER @ 24"
		OLIVE BROWN 2.5Y 4/3	FEW FINE & FAINT
STONY REFUSAL = 28"			

[ ] hydric [ ] non-hydric | Slope %: 10 | Limiting factor: 25" | [ ] ground water [ ] restrictive layer bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: 3 (Profile) | C (Soil Condition)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: | [ ] Test Pit | [ ] Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling
SANDY LOAM	FRIABLE	DARK BROWN 10YR 3/2	NONE OBSERVED
		DARK YELLOWISH BROWN 10YR 3/4	
			ROOTS @ 15"
LOAMY MEDIUM SAND W/ ROUND PEBBLES		YELLOWISH BROWN 10YR 5/6	
LIMIT OF EXCAVATION = 42"			

[ ] hydric [ ] non-hydric | Slope %: 10 | Limiting factor: >42" | [ ] ground water [ ] restrictive layer bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: 5 (Profile) | C (Soil Condition)

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: | [ ] Test Pit | [ ] Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling

[ ] hydric [ ] non-hydric | Slope % | Limiting factor | [ ] ground water [ ] restrictive layer bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: Profile | Soil Condition

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: | [X] Test Pit | [ ] Boring

" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistency	Color	Mottling

[ ] hydric [ ] non-hydric | Slope % | Limiting factor | [ ] ground water [ ] restrictive layer bedrock

C.S.S. Soil Series / phase name: | Drainage Class | Hydrologic Group

L.S.E. Soil Classification: Profile | Soil Condition

Professional Endorsements *(as applicable)*

C.S.S.	signature:	Date:
	name printed/typed:	Lic.#:
L.S.E.	signature: 	Date: 3/25/19
	name printed/typed: Alexander A. Finamore	Lic.#: 391

MAINE
Department of the Secretary of State
Bureau of Corporations, Elections and Commissions

Corporate Name Search

Information Summary

Subscriber activity report

This record contains information from the CEC database and is accurate as of: Wed Jan 02 2019 11:21:29. Please print or save for your records.

Legal Name	Charter Number	Filing Type	Status
WELD,LLC	20165965DC	LIMITED LIABILITY COMPANY (DOMESTIC)	GOOD STANDING

Filing Date	Expiration Date	Jurisdiction
06/23/2016	N/A	MAINE

Other Names **(A=Assumed ; F=Former)**

NONE

Clerk/Registered Agent

CRAIG E HOLMAN
PO BOX 1361
WINDHAM, ME 04062

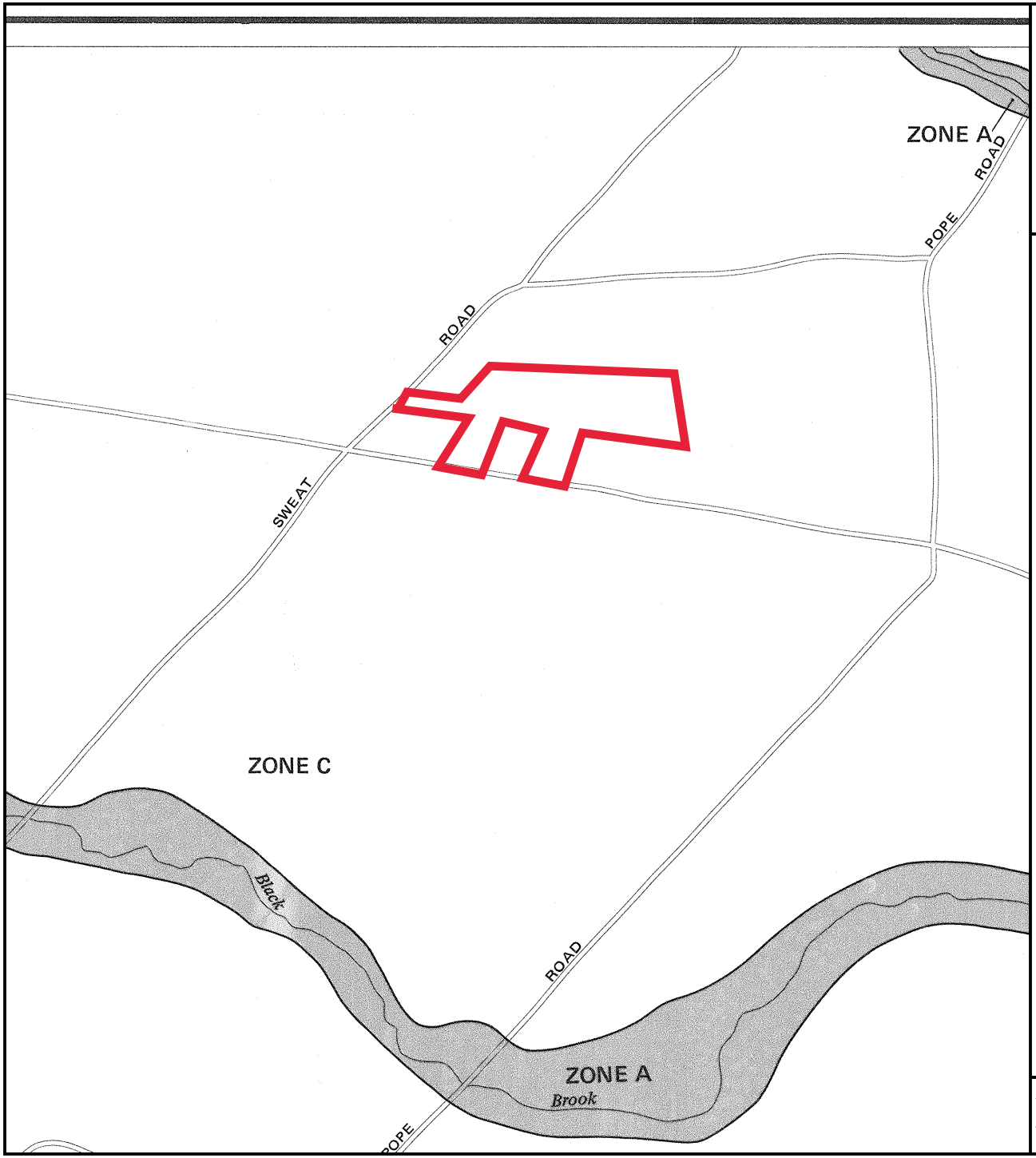
Back to previous screen | New Search

Click on a link to obtain additional information.

List of Filings	View list of filings	
Obtain additional information:		
Additional Addresses	Plain Copy	Certified copy
Certificate of Existence (more info)	Short Form without amendments ($30.00)	Long Form with amendments ($30.00)

You will need Adobe Acrobat version 3.0 or higher in order to view PDF files.
If you encounter problems, visit the troubleshooting page.

Get Acrobat Reader



APPROXIMATE SCALE

800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
WINDHAM, MAINE
CUMBERLAND COUNTY

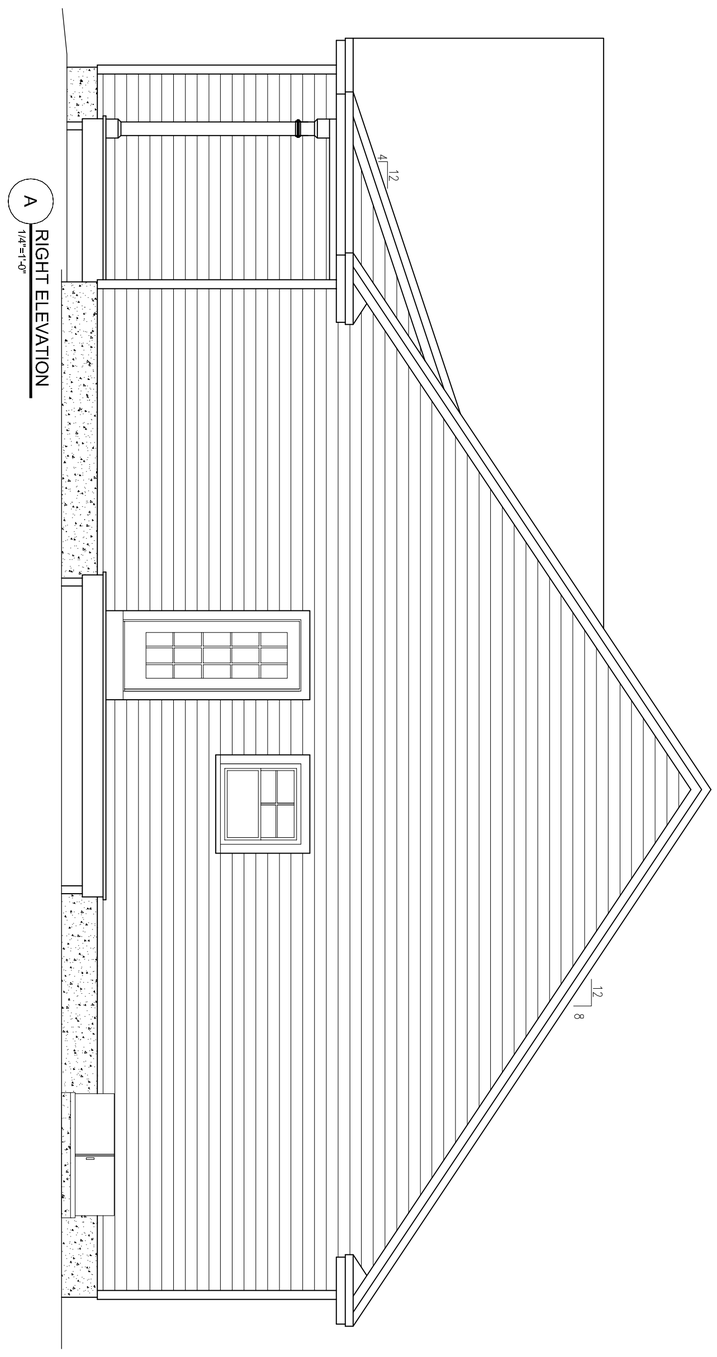
PANEL 30 OF 35
(SEE MAP INDEX FOR PANELS NOT PRINTED)

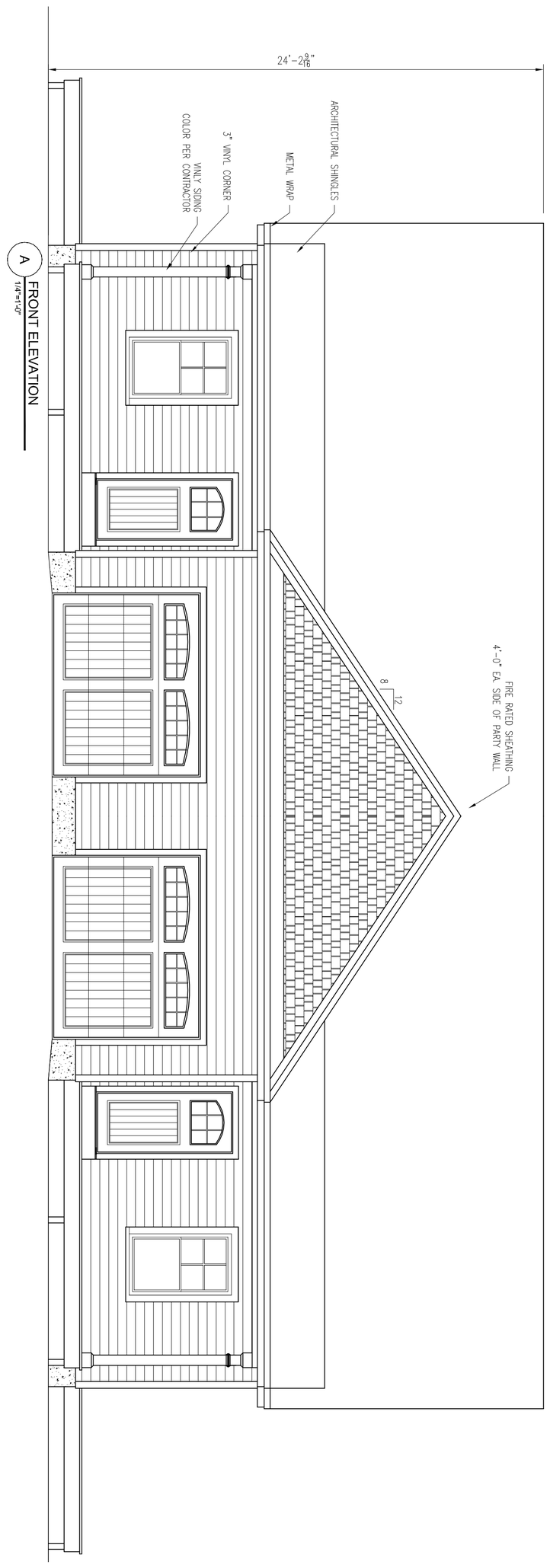
COMMUNITY-PANEL NUMBER
230189 0030 B

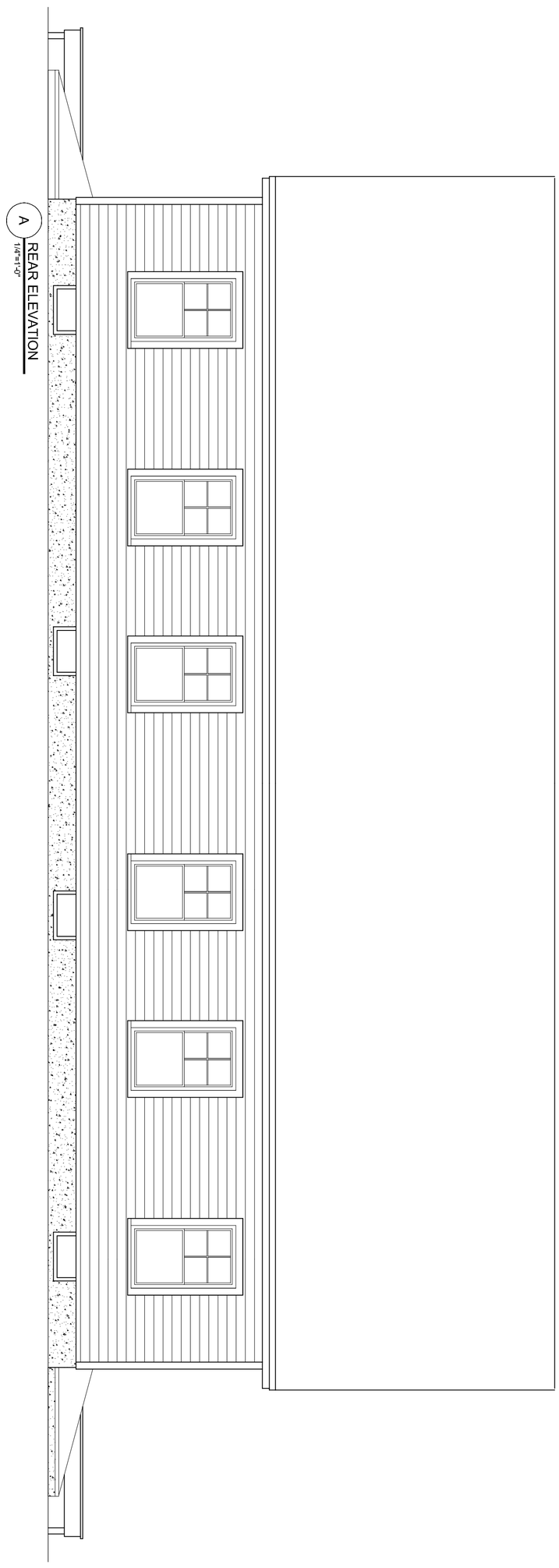
EFFECTIVE DATE:
SEPTEMBER 2, 1981

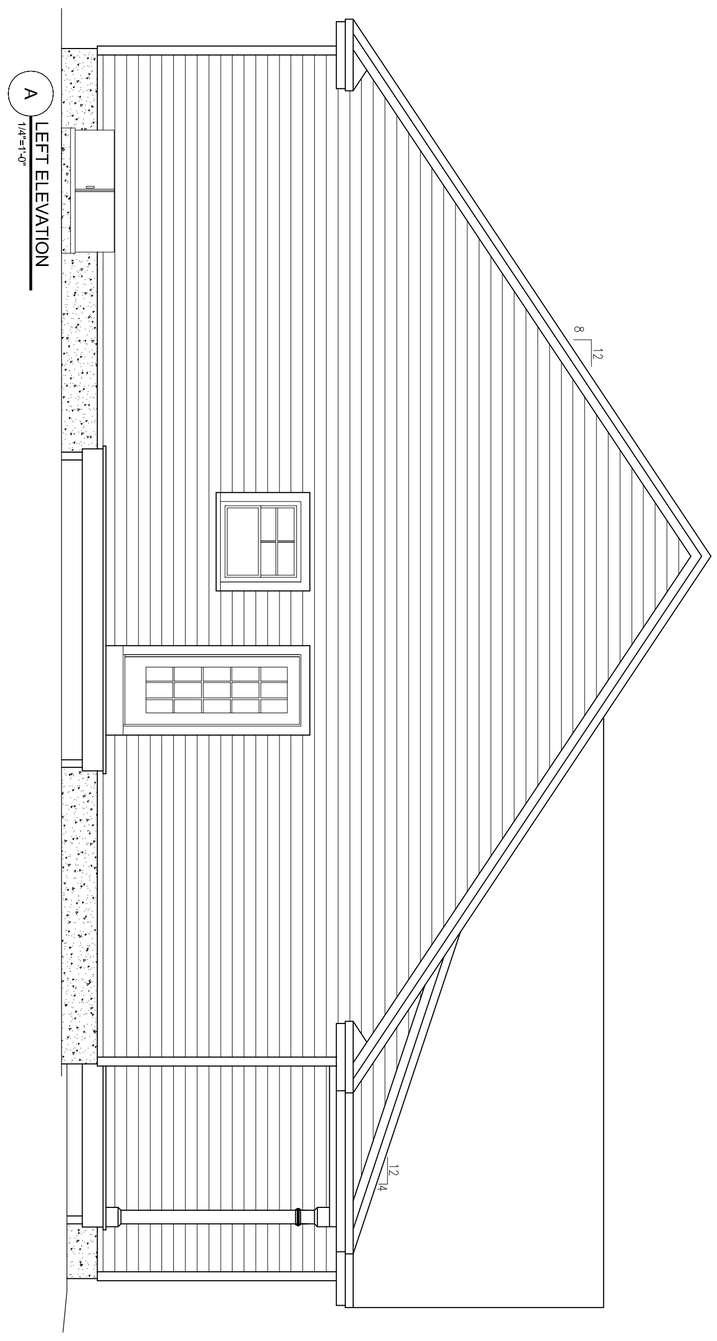
federal emergency management agency
federal insurance administration

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov









Project 18-032
Date 7/13/16
Scale 1/4"=1'-0"
Sheet A1

Drafter designer
ROY ARCHITECTURAL DESIGN
99 PAVILION ROAD
CORNISH, ME 04020
PHONE: 332-7716

No.	Revision/Issue	Date
	FINAL	

Builders Name and Address

WELD LLC
P.O. BOX 1362
WINDHAM MAINE 04062

EXTERIOR ELEVATIONS

FARM BROOK

THE DESIGNERS OF ROY ARCHITECTURAL DESIGN ARE NOT ARCHITECTS, AND OR ENGINEERS. THE DRAWINGS ARE PROVIDED FOR GENERAL INFORMATIONAL PURPOSES ONLY AND HAVE NOT BEEN REVIEWED OR APPROVED BY A LICENSED ARCHITECT OR PROFESSIONAL ENGINEER. UNLESS OTHERWISE INSTRUCTED, ROY ARCHITECTURAL DESIGN WILL BUILD THE PROJECT IN ACCORDANCE WITH THESE CONCEPTUAL DRAWINGS. ALL CONTRACTORS AND SUBCONTRACTORS ARE TO FOLLOW LOCAL CODES AND BUILDING PRACTICES. TOP OF WALL HEIGHT MAY VARY PER SITE CONDITIONS. ALL SITE CONDITIONS ARE TO BE FIELD VERIFIED PER ON SITE CONDITIONS. NO WARRANTIES ARE MADE WITH REGARD TO THESE CONCEPTUAL DRAWINGS.

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April 22, 2019

Summit #18323

Jayson Haskell, P.E.
DM Roma Consulting Engineers
PO Box 1116
Windham, ME 04062

Reference: Preliminary Soils and Septic System Siting Investigation
Woodside Condominium Retirement Community (Phase 2)
Gray Road, Windham, Maine

Dear Jayson:

Summit Geoengineering Services (SGS) completed a Preliminary Soils and Septic System Siting Investigation at the above referenced 11.4-acre property in on April 17, 2019. The purpose of the investigation was to evaluate soils and site conditions for septic system suitability in accordance with the State of Maine Subsurface Wastewater Disposal Rules (August 3, 2015) for first-time systems.

Information used for this investigation includes a development site plan prepared by DM Roma Consulting Engineers (DM Roma).

Proposed Development

The purpose of this investigation was to identify the approximate location of subsurface wastewater disposal systems for Phase 2 of the retirement community development, which consists of thirty-six (36) two-bedroom retirement home units. Phase 2 of the retirement community development will be served by three subsurface wastewater disposal systems. Information for the proposed subsurface wastewater disposal systems are summarized in the table below.

System Designation	Units Served	Design Flow (GPD)	Subsurface Wastewater Disposal System Description
E	15 thru 44 (30) 2-bedroom units	5,400	Fuji Clean CEN-series Advanced Treatment System[3], with Stone Trenches or Chambers disposal field (Engineered System)
F	45 and 46 (2) 2-bedroom units	360	Eljen GSF disposal field
G	47 thru 50 (4) 2-bedroom units	720	Eljen GSF disposal field

Notes:
1. Systems A, B, C and D are associated with Phase 1 of the development
2. GPD = gallons per day
3. Fuji Clean CEN-series allow for 75% reduction in stone bed/trench and chamber disposal fields

145 Lisbon Street (PO Box 7216) Lewiston, Maine 04243 | (207) 576-3313
173 Pleasant Street Rockland, Maine 04841 | (207) 318-7761
www.summitgeoeng.com

Soils and Septic System Description

SGS observed soils at the three proposed disposal field locations with a hand shovel, hand auger and/or tile probe. Proposed disposal fields and associated soil test pit locations were located with a sub-meter Trimble Geo7x GPS system. Reconnaissance soil mapping was performed for the proposed engineered disposal field E, and soil test pit logs were completed for proposed disposal fields F and G. Results of reconnaissance soil mapping for disposal field E and soil test pit locations for disposal fields F and G are shown on the site plan included as Attachment 1. Soil test pit logs are provided in Attachment 2.

Engineered Disposal Field E

On the eastern (uphill) side of the proposed disposal field, soils consist of sandy loam to gravelly loamy sand (lodgment till) overlying bedrock at a depth greater than 2 feet below the ground surface (soil profile and drainage condition 3C/AIII). On the western (downhill) side of the proposed disposal field, soils consist of sandy loam overlying silt loam soils (soil profile and drainage condition 8C and 8D).

Formal soils test pit/boring logs were not completed because it is a proposed engineered system and test pits with an excavator are necessary to obtain the information necessary to complete of a wastewater mounding and transmission analysis.

The proposed disposal field will be a raise mound with a minimum of 12 inches of sand placed over 8C/8D soils. The stone bed square foot equivalent loading rate for the proposed disposal field is medium-large (3.3 ft^2 per GPD). Wastewater effluent conveyed to the field will be treated by a FujiClean CEN-series treatment unit which allows for a 75% reduction in loading rate (0.825 ft^2 per GPD). The approximate disposal field location is provided in Attachment 1.

One known water supply well is located approximately 175 feet southwest of the proposed disposal field. It is our understanding that existing wells located 300 feet from the proposed disposal field will be abandoned and replaced with a well at least 300 feet from the proposed disposal field, or necessary hydrogeological data will be obtained in support of a first-time system variance to the 300-foot setback requirement.

A minor water course is located approximately 150 feet west of the proposed disposal field on an adjoining property. Preliminary discussions with the State indicate that a first-time variance to the minimum 150-foot setback would likely be granted if a FujiClean CEN-series treatment unit is incorporated into the proposed engineered system design. Additional minor water course (stream) location data needs to be obtained on the adjoining property to verify the setback distance and whether a first-time system variance is required.

Non-Engineered Disposal Fields F and G

Soil test pit logs for proposed disposal field F and G are provided in Attachment 2. Soils consist of sandy loam to gravelly loamy sand (lodgment till) overlying bedrock at a depth greater than 2 feet below the ground surface (soil profile and drainage condition 3C/AIII and 3D/AIII). The proposed disposal fields will be a raise mounds and the stone bed square foot equivalent loading rate for soils is medium-large (3.3 ft^2 per GPD).

No variances are required for the permitting and construction of disposal fields F and G.

145 Lisbon Street (PO Box 7216) Lewiston, Maine 04243 | (207) 576-3313
173 Pleasant Street Rockland, Maine 04841 | (207) 318-7761
www.summitgeoeng.com

CONCLUSIONS

Proposed subsurface wastewater disposal system E is an engineered system (> 2,000 GPD) that may require a first-time system variance for a reduced setback to a minor water course (stream). In addition, existing water supply well(s) located within 300 feet of the proposed disposal field will need to be abandoned and replaced with a well at least 300 feet from the proposed disposal field, or necessary hydrogeological data will be obtained in support of a first-time system variance to the 300-foot setback requirement. Prior to submitting a permit application for this proposed engineered system, additional minor water course location data needs to be collected, a complete application must be prepared including an engineered system plan set, application forms, soil test pits, and a groundwater mounding and site transmission analysis.

Proposed subsurface wastewater disposal systems F and G meet the State of Maine Subsurface Wastewater Disposal Rules (August 3, 2015) criteria for first-time systems. A complete HHE-200 application must be prepared by a Licensed Site Evaluator and approved by the Local Plumbing Inspector prior to installation.

If you have any questions concerning this letter, please feel free to contact me.

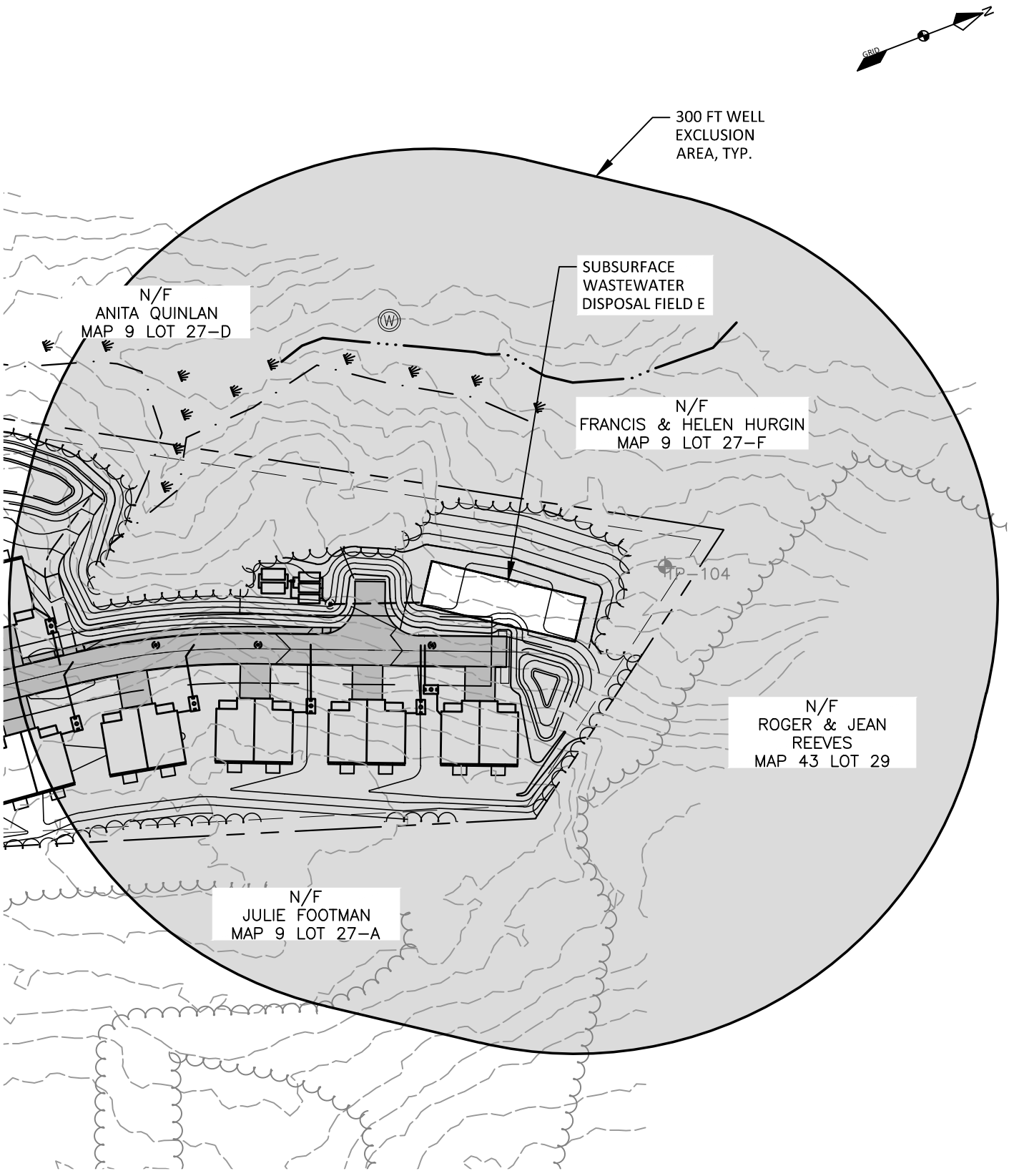
Sincerely yours,
Summit Geoengineering Services

Stephen B. Marcotte, C.G., L.S.E.
Maine Licensed Site Evaluator #387

enclosures

Attachment 1

Septic System Location Plan



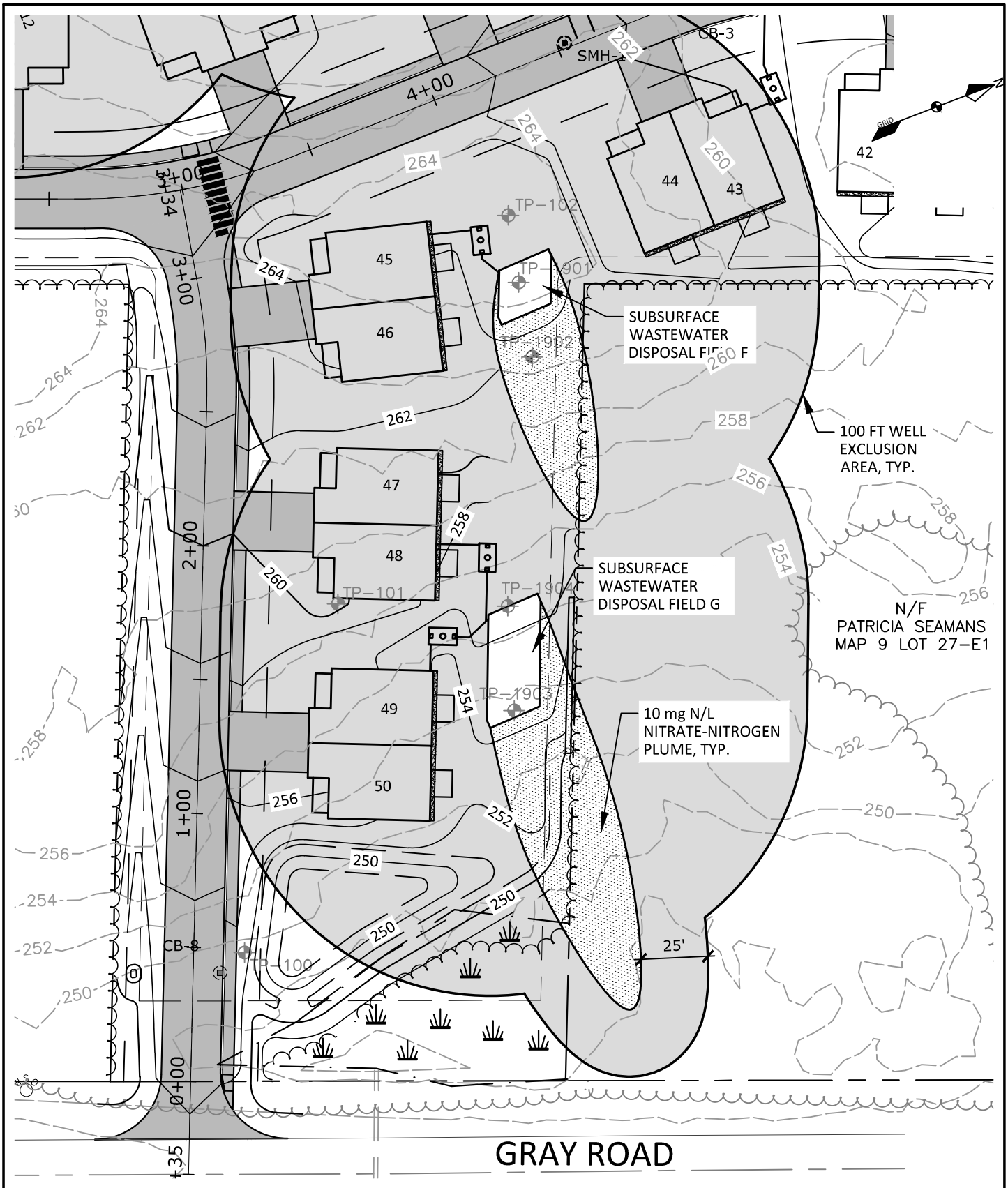
PLAN OF WASTEWATER DISPOSAL SYSTEMS E

WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY
WINDHAM, MAINE

FOR RECORD OWNER:
WELD,LLC
PO BOX 1361
WINDHAM, MAINE 04062

SCALE: 1"=100'
DATE: 4-22-2019
JOB NUMBER: 17070

DM ROMA
CONSULTING ENGINEERS
P.O. BOX 1116
WINDHAM, ME 04062
(207) 310 - 0506



PLAN OF WASTEWATER DISPOSAL SYSTEMS F & G

WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY
WINDHAM, MAINE

FOR RECORD OWNER:
WELD,LLC
PO BOX 1361
WINDHAM, MAINE 04062

SCALE: 1"=50'
DATE: 4-22-2019
JOB NUMBER: 17070

DM ROMA
CONSULTING ENGINEERS
P.O. BOX 1116
WINDHAM, ME 04062
(207) 310 - 0506

Attachment 2

Soil Test Pit and Boring Logs

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name:	Applicant Name:	Project Location (municipality):
Woodside Condominium Phase 2	WELD, LLC	Windham

Observation Hole # TP19-01 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	Fine Sandy Loam	Friable	Brown	None Noted
6–12	Cobbly and Gravelly Sandy Loam		Yellowish Brown	
12–18				
18–24	Gravelly Loamy Sand	Somewhat Firm	Light Olive Brown	
24–30	Bedrock at 26"			
30–36				
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	AIII	3%	26	☐ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				■ Bedrock

Observation Hole # TP19-02 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	Fine Sandy Loam	Friable	Brown	None Noted
6–12	Fine Sandy Loam w/ trace pebbles		Yellowish Brown	
12–18				
18–24				
24–30	Gravelly Loamy Sand	Somewhat Firm	Light Olive Brown	
30–36	Bedrock at 33"			
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	AIII	7%	33	☐ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				■ Bedrock

Observation Hole # TP19-03 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6			Brown	
6–12	Fine Sandy Loam	Friable	Yellowish Brown	Few & Faint
12–18	Gravelly Loamy Sand	Firm	Light Olive Brown	
18–24				Free Water
24–30	Bedrock at 26"			
30–36				
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	D/AIII	8%	12	■ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				☐ Bedrock

Observation Hole # TP19-04 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6			Brown	
6–12	Fine Sandy Loam	Friable	Yellowish Brown	Few & Faint
12–18	Gravelly Loamy Sand	Firm	Light Olive Brown	
18–24				Free Water
24–30	Bedrock at 26"			
30–36				
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	C/AIII	8%	26	☐ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				■ Bedrock

INVESTIGATOR INFORMATION AND SIGNATURE

Signature: Steve Marcotte	Date: 4/17/2019
Name Printed/typed: STEPHEN B. MARCOTTE	Cert/Lic/Reg.# 387
Title: ■ Licensed Site Evaluator ☐ Certified Geologist ☐ Other:	

STATE OF MAINE
STEPHEN MARCOTTE
#S387
LICENSED SITE EVALUATOR

Attachment 3

Fuji Clean Advanced Treatment System Information

Department of Health and Human Services
Maine People Living Safe, Healthy and Productive Lives
Paul R. LePage, Governor
Ricker Hamilton, Commissioner

Department of Health and Human Services
Maine Center for Disease Control and Prevention
286 Water Street
11 State House Station
Augusta, Maine 04333-0011
Tel.: (207) 287-8016; Fax: (207) 287-9058
TTY Users: Dial 711 (Maine Relay)

Tel. (207) 287-2070 Drinking Water Program Fax (207) 287-4172

April 9, 2018

Fuji Clean USA, LLC
Attn.: Scott Samuelson, Managing Director
41-2 Greenwood Road
Brunswick, ME 04011

Subject: Disposal Field Size Reduction, Fuji Clean Models CEN5, CEN7, CEN10, and CEN21

Dear Mr. Samuelson:

The Division of Environmental and Community Health has reviewed your proposal for 75 percent reductions in disposal field sizing compared to the standard sizing requirements in the Maine Subsurface Wastewater Disposal Rules for systems which incorporate Fuji Clean Models CEN5, CEN7, CEN10, and CEN21 wastewater treatment systems. This request is predicated upon the ability of the Fuji Clean system to produce BOD5 and TSS levels below 10 mg/l, each as verified in the NSF report dated April 2015.

The Division approves the request for reduced disposal field area and reduced separation distances as follows:

1. A minimum separation distance of 12 inches shall be maintained between the seasonal high groundwater table and the lowest elevation of the system's disposal field;

2. A minimum separation distance of 12 inches shall be maintained between bedrock and the lowest elevation of the system's disposal field;

3. Stone beds and trenches are allowed a 75 percent reduction in size, based upon the standard sizing requirements of the Rules;

4. Proprietary devices such as but not limited to plastic chambers and gravel-less pipe trenches are allowed a 75 percent reduction in size based upon the standard sizing requirements of the Rules, absent prohibitions by manufacturers; and

5. Maintenance agreement contracts must be included with all system installations. Terms and duration of the contracts shall be in accordance with Fuji Clean's company policies.

This letter supersedes the letter dated October 12, 2016.

Because installation and maintenance has a significant effect on the working order of onsite sewage disposal systems, including their components, the Division makes no representation or guarantee as to the efficiency and/or operation of this system.

Should you have any questions, please feel free to contact me at (207) 287-5695, or by fax at (207) 287-4172.

Sincerely,

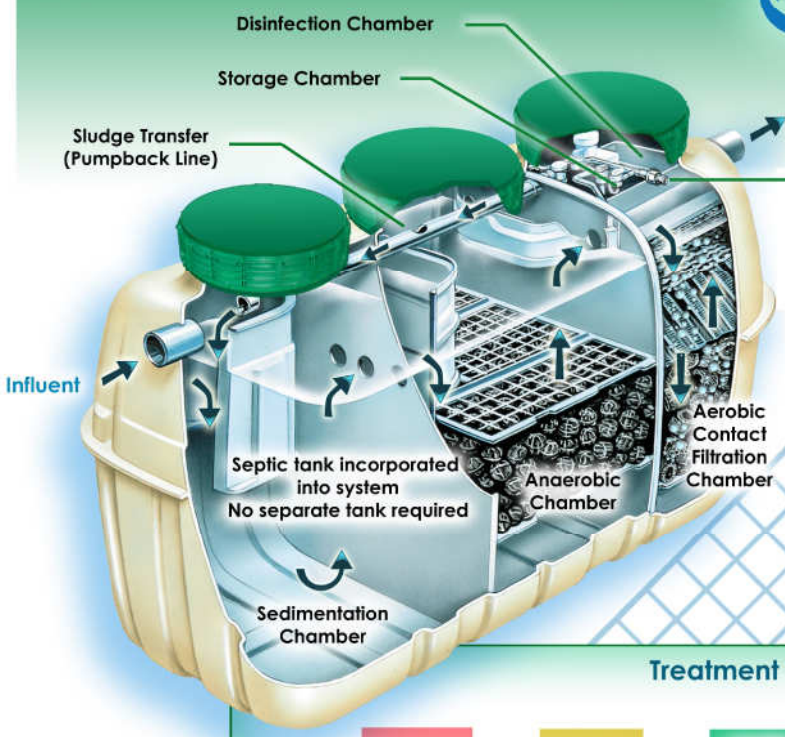
James A. Jacobsen, Environmental Specialist IV
Division of Environmental and Community Health
Drinking Water Program
Engineering Review Team
286 Water Street, Augusta, ME 04333
e-mail: james.jacobsen@maine.gov

xc: File

/jaj

MODEL CE & CEN SERIES *Technical Specification Sheet*

MaineSepticSolution
FujiClean TowardCleanWater



FujiMac RII Linear Diaphragm Blower
- 40-300L/min Blower Options
- US & CAN UL Listed

Fuji Clean Advantages

- Over 2 million installed systems worldwide
- 1-tank system – no septic tank necessary
- No moving parts in tank
- Built-in equalization - levels variable inflow
- NSF 40 and 40/245 certified
- TN removal to 70+% with CEN models
- Phosphorous reduction technology
- Smallest footprint vs. competitors
- Lowest power use vs. competitors
- Lightweight tank - easy installation
- Quick and easy O&M - no mess
- Rapid startup and restart for seasonal homes

Treatment Process

Design Specification Table	CE Series BOD, TSS, TN							CEN Series BOD, TSS, Enhanced TN			
MODEL:	CE5	CE7	CE10	CE14	CE21	CE30	CE6KG	CEN5	CEN7	CEN10	CEN21
Load Hydraulic (GPD)	360	540	720	1,000	1,900	2,700	6,000	360	540	720	1,900
EFFLUENT (assumes domestic strength influent):											
BOD – Effluent (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
BOD (removal pounds/day)	.52	.73	1.04	1.46	2.08	3.12	6.93	.69	.97	1.38	2.9
TSS (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
TN (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
BLOWER DETAIL:											
Blower Model	MAC80R	MAC80R	MAC100R	MAC100R	MAC150R	MAC200R	MAC200R (3)	MAC80R	MAC100R	MAC100R	MAC200R
Normal Pressure (kPa)	15	15	18	18	20	20	20	15	18	18	20
Airflow Volume (CFM; L/Min.)	2.8 CFM 80 L/MIN	2.8 CFM 80 L/MIN	3.5 CFM 100 L/MIN	3.5 CFM 100 L/MINJ	5.3 CFM 150 L/MIN	7.0 CFM 200 L/MIN	21.0 CFM 600 L/MIN	2.8 CFM 80 L/MIN	3.5 CFM 100 L/MIN	3.5 CFM 100 L/MIN	7.0 CFM 200 L/MIN
Power Use (kWh/day)	1.1	1.1	1.6	1.6	2.4	3.4	10.2	1.1	1.6	1.6	3.4
Weight (lbs.)	11	11	11	11	13	13	13 x 3	11	11	11	13
Outlet Diameter (OD, inches)	0.70	0.70	0.70	0.70	1.0	1.0	1.0 x 3	.070	0.70	0.70	1.0
TANK DETAIL:											
Material	Fibre-Reinforced Plastic							Fibre-Reinforced Plastic			
Height (inches)	61.8	65.7	73.6	77.4	81.3	87.2	87.2	65.7	73.6	77.4	87.2
Length (inches)	85	95.7	98.8	118.9	152.8	183.7	434.7	95.7	98.8	118.9	183.7
Width (inches)	43.7	49.2	56.7	68.9	72.4	78.3	115.3	49.2	56.7	68.9	78.3
Weight (lbs.)	397	463	705	926	1,168	1,543	2,900	463	705	926	1,543
Inlet Invert (inches)	49	53	61	62	65	71	67	53	61	62	71
Outlet Invert (inches)	47	51	59	59.5	63	69	64	51	59	59.5	69
Access Ports Quantity & Diameter (inches)	3@20"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	4@24"x24" 3@24"x48"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"
Tank Volume Total (gallons)	545	749	1,069	1,498	2,252	3,199	7,267	749	1,069	1,498	3,199

April 22, 2019

Summit #18323

Dustin Roma, P.E.
DM Roma Consulting Engineers
PO Box 1116
Windham, ME 04062

Reference: Nitrate-Nitrogen Assessment
Woodside Condominium Retirement Community (Phase 2)
Gray Road, Windham, Maine

Dear Dustin:

Summit Geoengineering Services (SGS) performed this nitrate-nitrogen assessment to estimate the groundwater quality impact caused by the proposed subsurface wastewater disposal systems for Woodside Condominium Retirement Community Phase 2. The property consists of approximately 11.4-acres of forestland located on the west side of Gray Road in Windham, Maine. A site location map showing the site and vicinity is provided as Attachment 1.

Phase 1 of the retirement community development has already been permitted with the Town of Windham and consists of fourteen (14) two-bedroom retirement home units on the southern portion of the property. Phase 1 is served by four (4) non-engineered subsurface wastewater disposal systems with design flows ranging from 360 gallons per day (GPD) to 720 GPD (Systems A, B, C and D). SGS prepared a nitrate-nitrogen assessment for Phase 1 dated November 16, 2018. The subject of this assessment is Phase 2 of the retirement community development, which consists of thirty-six (36) two-bedroom retirement home units.

Information used for our evaluation includes a development plan provided by DM Roma Consulting Engineers (DM Roma), preliminary soils and septic system siting report prepared by SGS (refer to Attachment 2), and published soil maps, geologic maps and literature.

Site Setting

The site is located on a north-south trending ridge on the west side of Gray Road (Route 202) as shown on Figure 1 in Attachment 1. A surface water drainage divide is located in the approximate center of the site. The eastern portion of the site drains easterly toward Gray Road. The western portion of the site drains westerly to a large wetland area located partially on the property, and partially on adjoining properties on Swett Road.

Review of Maine Geological Survey maps[1] indicate the surficial geology at the site and vicinity is mapped as glacial till with areas of exposed or shallow bedrock. No mapped significant sand and gravel aquifers are located within approximately 1 mile of the property. Glacial till consist of moderate compact, poorly sorted, weakly to non-stratified mixture of silt, sand, pebble, cobbles and boulders deposited by glacial ice, and is generally deposited directly on top of bedrock.

[1] https://www.maine.gov/dacf/mgs/pubs/index.shtml

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SGS observed soils on-site during field explorations for siting the proposed subsurface wastewater disposal fields. Soils at the proposed disposal field locations consist predominately of sandy loam to gravelly loamy sand over bedrock. Sandy loam overlying silt loam soils (glaciolacustrine deposits) were observed in the low-lying areas on the western portion of the site. Bedrock outcrops are visible in some areas of the property. Depths to bedrock at the proposed disposal field locations for Phase 2 is two-feet or more below the ground surface.

Water Supply

The proposed development will be served by public water via a Portland Water District water main on Gray Road (Route 202). Properties on Gray Road in the site vicinity are served by public water. Adjoining properties to the south and west on Swett Road are served by on-site wells.

Subsurface Wastewater Disposal Fields

Phase 2 of the retirement community development will be served by three subsurface wastewater disposal systems, as described in the preliminary soils and septic system siting report prepared by SGS included as Attachment 2. Design information for the proposed subsurface wastewater disposal systems are summarized in the table below.

Subsurface Wastewater Disposal Systems

System Designation	Units Served	Design Flow (GPD)	Subsurface Wastewater Disposal System Description
E	15 thru 44	5400	Fuji Clean CEN-series Advance Treatment System[3] Stone Trenches or Chambers disposal field (Engineered System)
F	45 and 46	360	Eljen GSF disposal field
G	47 thru 50	720	Eljen GSF disposal field

Notes:
1. Systems A, B, C and D are associated with Phase 1 of the development
2. GPD = gallons per day; mg-N/L = milligrams nitrogen per liter
3. Fuji Clean CEN-series treats septic tank effluent to 10 mg-N/L total nitrogen

Nitrate-Nitrogen Assessment

A nitrate-nitrogen assessment was performed to estimate the distance from the disposal fields at which the concentration in groundwater would reach the Federal National Primary Drinking Water Standard and the Maine Maximum Exposure Guideline of 10 milligrams nitrogen per liter (mg-N/L). The average concentration of nitrate in septic tank effluent discharged from the disposal field used in this assessment is 40 mg-N/L.[2]

[2] MEDEP, Site Location of Development Permit Application (October 2015) Section 17.B.2.(a).

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The concentration of nitrate-nitrogen in groundwater downgradient of the disposal fields will reduce as it flows away from the disposal field and mixes with groundwater, is removed by vegetation, or is converted to nitrogen gas by soil microbes in wetland areas (denitrification).

Based on our understanding of site geology, treated septic tank effluent will drain to the disposal field and infiltrate downward through unsaturated soil until a seasonally perched water table above the bedrock surface is encountered. Thereupon flow is lateral and hydraulically downgradient. The direction of shallow groundwater flow for the subsurface conditions observed at this site is downhill (topographically downgradient).

The distance at which groundwater downgradient of disposal fields reaches 10 mg-N/L (plume length) was estimated using a three-dimensional analytical solution[3,4] for a point source in a uniform flow field. Variables used for the calculations include the permeability and effective porosity of soils, hydraulic gradient, and the daily mass of nitrate-nitrogen applied to groundwater. The analytical solution does not consider nitrogen removal by soil microbes, vegetation or sorption. Input parameters for the analytical point source solution are summarized in the table below.

Analytical Solution Input Parameters

Parameter	Value	Source Reference
Permeability	1.2 feet/day	Estimated based on the range of permeabilities for Paxton fine sandy loam (1.2 to 4.0 ft/day) listed in the Cumberland County Soil Survey [5]
Effective Porosity	0.18	Published average value for silt [6]
Hydraulic Gradient	Varies	Half of the average topographic gradient upgradient/downgradient of the disposal field.

The three-dimensional analytical solution was adapted to simulate a linear source area (disposal field) by assuming the direction of groundwater flow is perpendicular to the length of the field and calculating the additive effects of injecting nitrate-nitrogen into groundwater at point sources located 10 feet apart along the downgradient side of the disposal field. For each point source, the steady state nitrate concentration was calculated for a regularly-spaced grid of points (point cloud) extending 5 feet apart along the plume center line to a distance of 350 feet, and at points located 5 feet apart extending cross gradient from the plume center line to a distance of 125 feet. The additive effects of each point source were then calculated by superimposing the point clouds, adding concentration values, and using data for points along the plume center line to determine the estimated plume length. The 10 mg-N/L nitrate plume lengths were calculated based on an assumed background nitrate concentration of 2 mg-N/L.

[3] Baetsle, L.H. (1969), Migration of Radionuclides in Porous Media; Progress in Nuclear Energy, Series SIL, Health Physics. Pergamon Press, pp. 707-730.
[4] Chang, et al. (1998). Utilizing Baetsle's Equation to Model the Fate and Transport of MTBE in Groundwater, Proceedings of the Petroleum Hydrocarbons and Organic Chemicals in Ground Water Prevention, Detection, and Remediation Conference, Houston, TX.
[5] USDA Soil Conservation Services (1974), Soil Survey of Cumberland County, Maine.
[6] Fetter, C.W. (1994). Applied Hydrogeology, 3rd Edition, Prentice Hall

Results of our nitrate-nitrogen assessment are summarized in the table below. The table includes the methodology of evaluation used for each of the three proposed subsurface wastewater disposal systems and the estimated 10 mg-N/L plume length.

Nitrate-Nitrogen Assessment Summary

System Designation	10 mg-N/L Plume Length	Methodology of Evaluation
E	0 feet	Total nitrogen concentration in treated effluent from the Fuji Clean CEN-series advance treatment units is 10 mg-N/L.
F	80 feet	Three-dimensional analytical point source solution using input parameters noted above.
G	120 feet	Three-dimensional analytical point source solution using input parameters noted above.

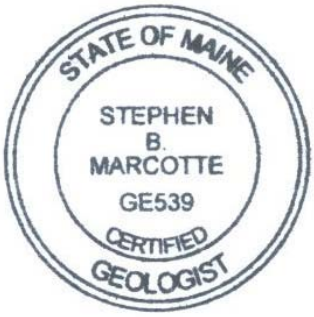
Conclusion:

Proposed subsurface wastewater disposal system E will not result in an increase of nitrate-nitrogen above 10 mg/L in groundwater at the property boundary.

Results of our analysis indicate the proposed subsurface wastewater disposal system F and G will result in an increase of nitrate-nitrogen above 10 mg/L in groundwater at the property boundary. Given that the properties on Gray Road are served with public water and there are no known water supply wells near the plume, we proposed that the applicant request a waiver to the Town of Windham Land Use Ordinance for meeting the nitrate-nitrogen drinking water standard requirement this disposal field.

Our findings are based on our interpretation of site conditions and the information provided to us. If there are changes in lot layout, proposed septic system design flows, or significant changes in disposal field size, we request the opportunity to review the changes and conduct further analysis as necessary to confirm the changes do not alter our conclusions.

Sincerely yours,
Summit Geoengineering Services



Stephen B. Marcotte, C.G., L.S.E.
Senior Geologist

Enclosures

Attachment 1

Site Location Map

PLAN REFERENCE

USGS TOPOGRAPHIC MAP FOR NORTH WINDHAM, MAINE 7.5-MINUTE QUADRANGLE

FIGURE 1: SITE LOCATION PLAN

WOODSIDE CONDOS COMMUNITY (PHASE 2)

GRAY ROAD - WINDHAM, ME

PREPARED FOR

DM ROMA CONSULTING ENGINEERS

DATE: 4-22-2019	DRAWN BY: SBM	CHECKED BY: SBM
JOB: 18323	SCALE: 1" = 2000'	FILE: 18323 MAP

145 LISBON ST. - SUITE 701
LEWISTON, ME 04240
Tel.: (207) 576-3313

173 PLEASANT STREET
ROCKLAND, ME 04841
Tel.: (207) 318-7761

SUMMIT
GEOENGINEERING SERVICES
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Attachment 2

Preliminary Soils and Septic System Siting Report

April 22, 2019

Summit #18323

Jayson Haskell, P.E.
DM Roma Consulting Engineers
PO Box 1116
Windham, ME 04062

Reference: Preliminary Soils and Septic System Siting Investigation
Woodside Condominium Retirement Community (Phase 2)
Gray Road, Windham, Maine

Dear Jayson:

Summit Geoengineering Services (SGS) completed a Preliminary Soils and Septic System Siting Investigation at the above referenced 11.4-acre property in on April 17, 2019. The purpose of the investigation was to evaluate soils and site conditions for septic system suitability in accordance with the State of Maine Subsurface Wastewater Disposal Rules (August 3, 2015) for first-time systems.

Information used for this investigation includes a development site plan prepared by DM Roma Consulting Engineers (DM Roma).

Proposed Development

The purpose of this investigation was to identify the approximate location of subsurface wastewater disposal systems for Phase 2 of the retirement community development, which consists of thirty-six (36) two-bedroom retirement home units. Phase 2 of the retirement community development will be served by three subsurface wastewater disposal systems. Information for the proposed subsurface wastewater disposal systems are summarized in the table below.

System Designation	Units Served	Design Flow (GPD)	Subsurface Wastewater Disposal System Description
E	15 thru 44 (30) 2-bedroom units	5,400	Fuji Clean CEN-series Advanced Treatment System[3], with Stone Trenches or Chambers disposal field (Engineered System)
F	45 and 46 (2) 2-bedroom units	360	Eljen GSF disposal field
G	47 thru 50 (4) 2-bedroom units	720	Eljen GSF disposal field

Notes:
1. Systems A, B, C and D are associated with Phase 1 of the development
2. GPD = gallons per day
3. Fuji Clean CEN-series allow for 75% reduction in stone bed/trench and chamber disposal fields

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Soils and Septic System Description

SGS observed soils at the three proposed disposal field locations with a hand shovel, hand auger and/or tile probe. Proposed disposal fields and associated soil test pit locations were located with a sub-meter Trimble Geo7x GPS system. Reconnaissance soil mapping was performed for the proposed engineered disposal field E, and soil test pit logs were completed for proposed disposal fields F and G. Results of reconnaissance soil mapping for disposal field E and soil test pit locations for disposal fields F and G are shown on the site plan included as Attachment 1. Soil test pit logs are provided in Attachment 2.

Engineered Disposal Field E

On the eastern (uphill) side of the proposed disposal field, soils consist of sandy loam to gravelly loamy sand (lodgment till) overlying bedrock at a depth greater than 2 feet below the ground surface (soil profile and drainage condition 3C/AIII). On the western (downhill) side of the proposed disposal field, soils consist of sandy loam overlying silt loam soils (soil profile and drainage condition 8C and 8D).

Formal soils test pit/boring logs were not completed because it is a proposed engineered system and test pits with an excavator are necessary to obtain the information necessary to complete of a wastewater mounding and transmission analysis.

The proposed disposal field will be a raise mound with a minimum of 12 inches of sand placed over 8C/8D soils. The stone bed square foot equivalent loading rate for the proposed disposal field is medium-large (3.3 ft^2 per GPD). Wastewater effluent conveyed to the field will be treated by a FujiClean CEN-series treatment unit which allows for a 75% reduction in loading rate (0.825 ft^2 per GPD). The approximate disposal field location is provided in Attachment 1.

One known water supply well is located approximately 175 feet southwest of the proposed disposal field. It is our understanding that existing wells located 300 feet from the proposed disposal field will be abandoned and replaced with a well at least 300 feet from the proposed disposal field, or necessary hydrogeological data will be obtained in support of a first-time system variance to the 300-foot setback requirement.

A minor water course is located approximately 150 feet west of the proposed disposal field on an adjoining property. Preliminary discussions with the State indicate that a first-time variance to the minimum 150-foot setback would likely be granted if a FujiClean CEN-series treatment unit is incorporated into the proposed engineered system design. Additional minor water course (stream) location data needs to be obtained on the adjoining property to verify the setback distance and whether a first-time system variance is required.

Non-Engineered Disposal Fields F and G

Soil test pit logs for proposed disposal field F and G are provided in Attachment 2. Soils consist of sandy loam to gravelly loamy sand (lodgment till) overlying bedrock at a depth greater than 2 feet below the ground surface (soil profile and drainage condition 3C/AIII and 3D/AIII). The proposed disposal fields will be a raise mounds and the stone bed square foot equivalent loading rate for soils is medium-large (3.3 ft^2 per GPD).

No variances are required for the permitting and construction of disposal fields F and G.

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CONCLUSIONS

Proposed subsurface wastewater disposal system E is an engineered system (> 2,000 GPD) that may require a first-time system variance for a reduced setback to a minor water course (stream). In addition, existing water supply well(s) located within 300 feet of the proposed disposal field will need to be abandoned and replaced with a well at least 300 feet from the proposed disposal field, or necessary hydrogeological data will be obtained in support of a first-time system variance to the 300-foot setback requirement. Prior to submitting a permit application for this proposed engineered system, additional minor water course location data needs to be collected, a complete application must be prepared including an engineered system plan set, application forms, soil test pits, and a groundwater mounding and site transmission analysis.

Proposed subsurface wastewater disposal systems F and G meet the State of Maine Subsurface Wastewater Disposal Rules (August 3, 2015) criteria for first-time systems. A complete HHE-200 application must be prepared by a Licensed Site Evaluator and approved by the Local Plumbing Inspector prior to installation.

If you have any questions concerning this letter, please feel free to contact me.

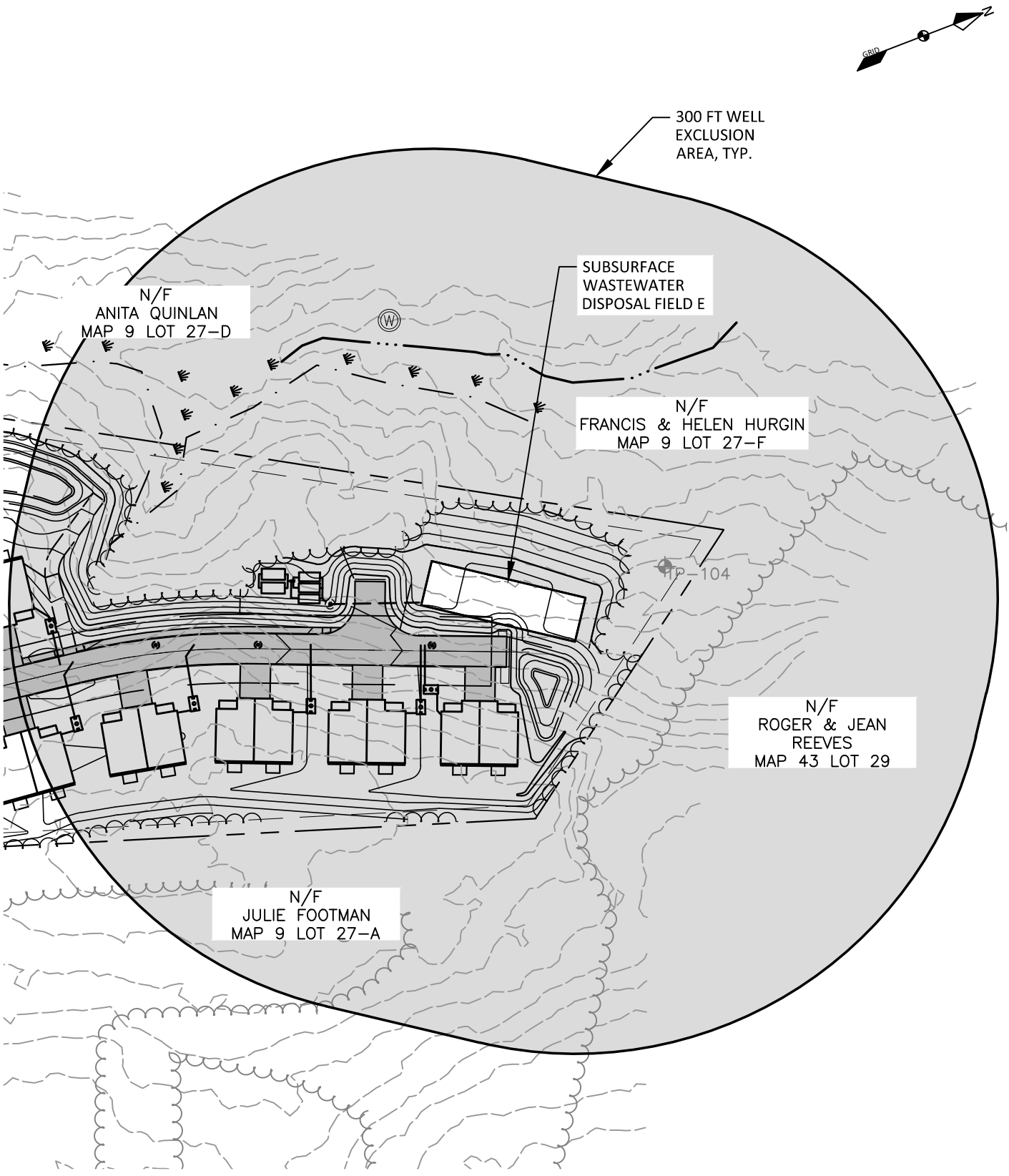
Sincerely yours,
Summit Geoengineering Services

Stephen B. Marcotte, C.G., L.S.E.
Maine Licensed Site Evaluator #387

enclosures

Attachment 1

Septic System Location Plan



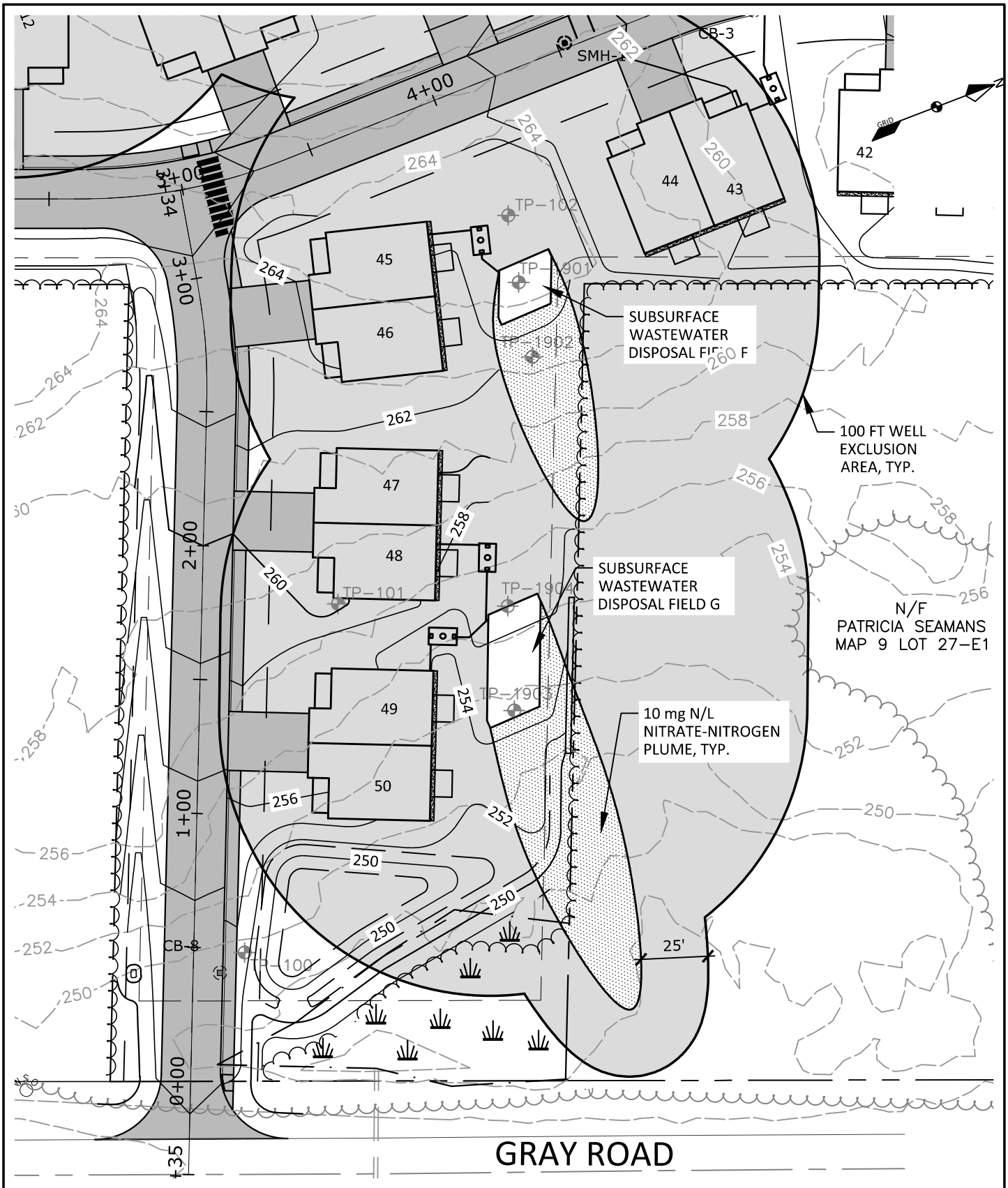
PLAN OF WASTEWATER DISPOSAL SYSTEMS E

WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY
WINDHAM, MAINE

FOR RECORD OWNER:
WELD,LLC
PO BOX 1361
WINDHAM, MAINE 04062

SCALE: 1"=100'
DATE: 4-22-2019
JOB NUMBER: 17070

DM ROMA
CONSULTING ENGINEERS
P.O. BOX 1116
WINDHAM, ME 04062
(207) 310 - 0506



PLAN OF WASTEWATER DISPOSAL SYSTEMS F & G

WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY
WINDHAM, MAINE

FOR RECORD OWNER:
WELD,LLC
PO BOX 1361
WINDHAM, MAINE 04062

SCALE: 1"=50'
DATE: 4-22-2019
JOB NUMBER: 17070

DM ROMA
CONSULTING ENGINEERS
P.O. BOX 1116
WINDHAM, ME 04062
(207) 310 - 0506

Attachment 2

Soil Test Pit and Boring Logs

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name:	Applicant Name:	Project Location (municipality):
Woodside Condominium Phase 2	WELD, LLC	Windham

Observation Hole # TP19-01 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	Fine Sandy Loam	Friable	Brown	None Noted
6–12	Cobbly and Gravelly Sandy Loam		Yellowish Brown	
12–18				
18–24	Gravelly Loamy Sand	Somewhat Firm	Light Olive Brown	
24–30	Bedrock at 26"			
30–36				
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	AIII	3%	26	☐ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				■ Bedrock

Observation Hole # TP19-02 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	Fine Sandy Loam	Friable	Brown	None Noted
6–12	Fine Sandy Loam w/ trace pebbles		Yellowish Brown	
12–18				
18–24				
24–30	Gravelly Loamy Sand	Somewhat Firm	Light Olive Brown	
30–36	Bedrock at 33"			
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	AIII	7%	33	☐ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				■ Bedrock

Observation Hole # TP19-03 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6			Brown	
6–12	Fine Sandy Loam	Friable	Yellowish Brown	Few & Faint
12–18	Gravelly Loamy Sand	Firm	Light Olive Brown	
18–24				Free Water
24–30	Bedrock at 26"			
30–36				
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	D/AIII	8%	12	■ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				☐ Bedrock

Observation Hole # TP19-04 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6			Brown	
6–12	Fine Sandy Loam	Friable	Yellowish Brown	Few & Faint
12–18	Gravelly Loamy Sand	Firm	Light Olive Brown	
18–24				Free Water
24–30	Bedrock at 26"			
30–36				
36–42				
42–48				

Soil	Classification	Slope	Limiting Factor	
3	C/AIII	8%	26	☐ Groundwater
Profile	Condition	Percent	Depth	☐ Restrictive Layer
				■ Bedrock

INVESTIGATOR INFORMATION AND SIGNATURE

Signature: Steve Marcotte	Date: 4/17/2019
Name Printed/typed: STEPHEN B. MARCOTTE	Cert/Lic/Reg.# 387
Title: ■ Licensed Site Evaluator ☐ Certified Geologist ☐ Other:	

STATE OF MAINE
STEPHEN MARCOTTE
#S387
LICENSED SITE EVALUATOR

Attachment 3

Fuji Clean Advanced Treatment System Information

Department of Health and Human Services
Maine People Living Safe, Healthy and Productive Lives
Paul R. LePage, Governor
Ricker Hamilton, Commissioner

Department of Health and Human Services
Maine Center for Disease Control and Prevention
286 Water Street
11 State House Station
Augusta, Maine 04333-0011
Tel.: (207) 287-8016; Fax: (207) 287-9058
TTY Users: Dial 711 (Maine Relay)

Tel. (207) 287-2070 Drinking Water Program Fax (207) 287-4172

April 9, 2018

Fuji Clean USA, LLC
Attn.: Scott Samuelson, Managing Director
41-2 Greenwood Road
Brunswick, ME 04011

Subject: Disposal Field Size Reduction, Fuji Clean Models CEN5, CEN7, CEN10, and CEN21

Dear Mr. Samuelson:

The Division of Environmental and Community Health has reviewed your proposal for 75 percent reductions in disposal field sizing compared to the standard sizing requirements in the Maine Subsurface Wastewater Disposal Rules for systems which incorporate Fuji Clean Models CEN5, CEN7, CEN10, and CEN21 wastewater treatment systems. This request is predicated upon the ability of the Fuji Clean system to produce BOD5 and TSS levels below 10 mg/l, each as verified in the NSF report dated April 2015.

The Division approves the request for reduced disposal field area and reduced separation distances as follows:

1. A minimum separation distance of 12 inches shall be maintained between the seasonal high groundwater table and the lowest elevation of the system's disposal field;

2. A minimum separation distance of 12 inches shall be maintained between bedrock and the lowest elevation of the system's disposal field;

3. Stone beds and trenches are allowed a 75 percent reduction in size, based upon the standard sizing requirements of the Rules;

4. Proprietary devices such as but not limited to plastic chambers and gravel-less pipe trenches are allowed a 75 percent reduction in size based upon the standard sizing requirements of the Rules, absent prohibitions by manufacturers; and

5. Maintenance agreement contracts must be included with all system installations. Terms and duration of the contracts shall be in accordance with Fuji Clean's company policies.

This letter supersedes the letter dated October 12, 2016.

Because installation and maintenance has a significant effect on the working order of onsite sewage disposal systems, including their components, the Division makes no representation or guarantee as to the efficiency and/or operation of this system.

Should you have any questions, please feel free to contact me at (207) 287-5695, or by fax at (207) 287-4172.

Sincerely,

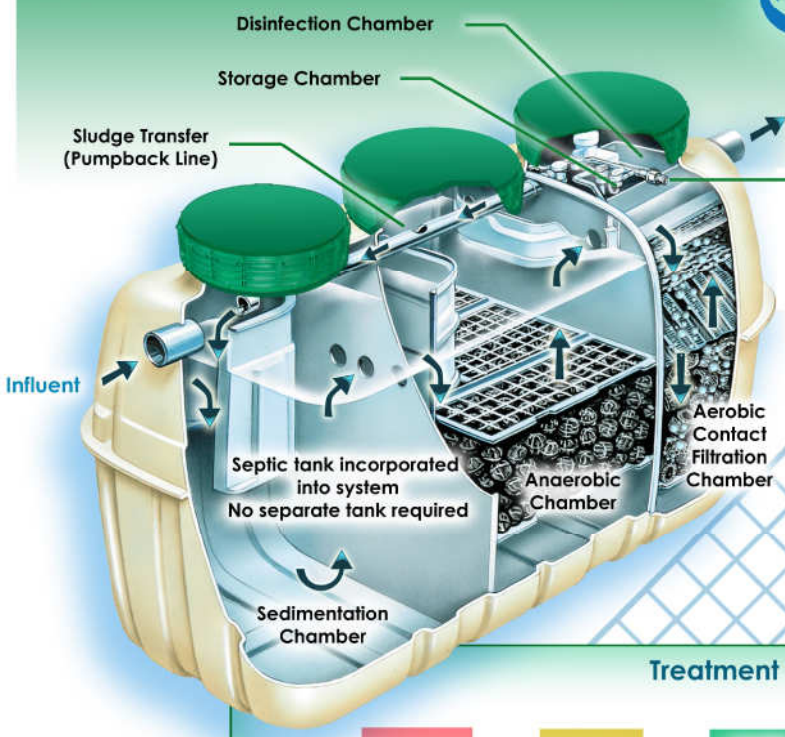
James A. Jacobsen, Environmental Specialist IV
Division of Environmental and Community Health
Drinking Water Program
Engineering Review Team
286 Water Street, Augusta, ME 04333
e-mail: james.jacobsen@maine.gov

xc: File

/jaj

MODEL CE & CEN SERIES *Technical Specification Sheet*

MaineSepticSolution
FujiClean TowardCleanWater



FujiMac RII Linear Diaphragm Blower
- 40-300L/min Blower Options
- US & CAN UL Listed

Fuji Clean Advantages

- Over 2 million installed systems worldwide
- 1-tank system – no septic tank necessary
- No moving parts in tank
- Built-in equalization - levels variable inflow
- NSF 40 and 40/245 certified
- TN removal to 70+% with CEN models
- Phosphorous reduction technology
- Smallest footprint vs. competitors
- Lowest power use vs. competitors
- Lightweight tank - easy installation
- Quick and easy O&M - no mess
- Rapid startup and restart for seasonal homes

Treatment Process

Design Specification Table	CE Series BOD, TSS, TN							CEN Series BOD, TSS, Enhanced TN			
MODEL:	CE5	CE7	CE10	CE14	CE21	CE30	CE6KG	CEN5	CEN7	CEN10	CEN21
Load Hydraulic (GPD)	360	540	720	1,000	1,900	2,700	6,000	360	540	720	1,900
EFFLUENT (assumes domestic strength influent):											
BOD – Effluent (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
BOD (removal pounds/day)	.52	.73	1.04	1.46	2.08	3.12	6.93	.69	.97	1.38	2.9
TSS (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
TN (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
BLOWER DETAIL:											
Blower Model	MAC80R	MAC80R	MAC100R	MAC100R	MAC150R	MAC200R	MAC200R (3)	MAC80R	MAC100R	MAC100R	MAC200R
Normal Pressure (kPa)	15	15	18	18	20	20	20	15	18	18	20
Airflow Volume (CFM; L/Min.)	2.8 CFM 80 L/MIN	2.8 CFM 80 L/MIN	3.5 CFM 100 L/MIN	3.5 CFM 100 L/MINJ	5.3 CFM 150 L/MIN	7.0 CFM 200 L/MIN	21.0 CFM 600 L/MIN	2.8 CFM 80 L/MIN	3.5 CFM 100 L/MIN	3.5 CFM 100 L/MIN	7.0 CFM 200 L/MIN
Power Use (kWh/day)	1.1	1.1	1.6	1.6	2.4	3.4	10.2	1.1	1.6	1.6	3.4
Weight (lbs.)	11	11	11	11	13	13	13 x 3	11	11	11	13
Outlet Diameter (OD, inches)	0.70	0.70	0.70	0.70	1.0	1.0	1.0 x 3	.070	0.70	0.70	1.0
TANK DETAIL:											
Material	Fibre-Reinforced Plastic							Fibre-Reinforced Plastic			
Height (inches)	61.8	65.7	73.6	77.4	81.3	87.2	87.2	65.7	73.6	77.4	87.2
Length (inches)	85	95.7	98.8	118.9	152.8	183.7	434.7	95.7	98.8	118.9	183.7
Width (inches)	43.7	49.2	56.7	68.9	72.4	78.3	115.3	49.2	56.7	68.9	78.3
Weight (lbs.)	397	463	705	926	1,168	1,543	2,900	463	705	926	1,543
Inlet Invert (inches)	49	53	61	62	65	71	67	53	61	62	71
Outlet Invert (inches)	47	51	59	59.5	63	69	64	51	59	59.5	69
Access Ports Quantity & Diameter (inches)	3@20"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	4@24"x24" 3@24"x48"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"
Tank Volume Total (gallons)	545	749	1,069	1,498	2,252	3,199	7,267	749	1,069	1,498	3,199

DM ROMA
CONSULTING ENGINEERS

STORMWATER MANAGEMENT REPORT

WOODSIDE CONDOMINIUM 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 25 residential duplex buildings, totaling 50 residential units including the construction of approximately 1,520 linear feet of paved roadway, utilities and stormwater infrastructure. An initial phase including the construction of units 1 through 14 and approximately 800 linear feet of roadway was previously approved by the Town of Windham Planning Board. Construction has not begun on Phase 1 at the time of this report in anticipation of potential design revisions associated with the full-build out of the project.

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 124,246 square feet (2.85± acres) of impervious area consisting of the 25 structures and paved road, driveways and sidewalk. An additional 224,961 square feet (5.16± acres) of proposed lawn and landscaping will generate a total site developed area of approximately 349,207 square feet (8.02± acres).

Since the project site will generate more than one (1) acre of impervious surface and over five (5) acres of developed area, a Stormwater Permit will be required from the Maine Department of Environmental Protection (MDEP). 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 MDEP and the Town of Windham require 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, four (4) underdrained filter basins, one (1) bio-retention cell, two (2) Filterra units, a forested buffer 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 96% of the equivalent new impervious and for over 80% 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, four (4) underdrained filter basins, one (1) bio-retention cell, a forested buffer and a detention pond 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. 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 third study point (SP-3) is located where the secondary access road intersects with Gray Road. This is also the location of an existing 18" culvert draining easterly across Gray Road.

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	0.56	0.56	1.31	1.07	2.03	1.55
SP-2	6.55	5.57	12.85	12.64	18.38	18.02
SP-3	2.64	2.61	5.72	5.35	8.56	8.34

As illustrated by the table above, the proposed BMP's as incorporated in the project's storm water design, effectively maintains or reduces the peak flow at all study points, during all storm events.

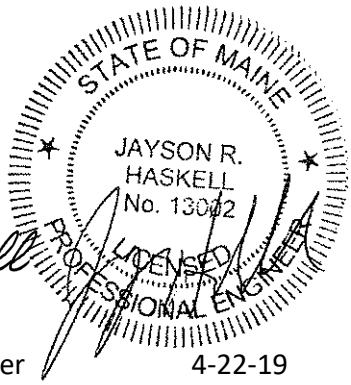
The watershed maps showing pre-development and post-development drainage patterns are included in the plan set and the computations performed with the HydroCAD software program are included as Attachment 3 of this report.

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

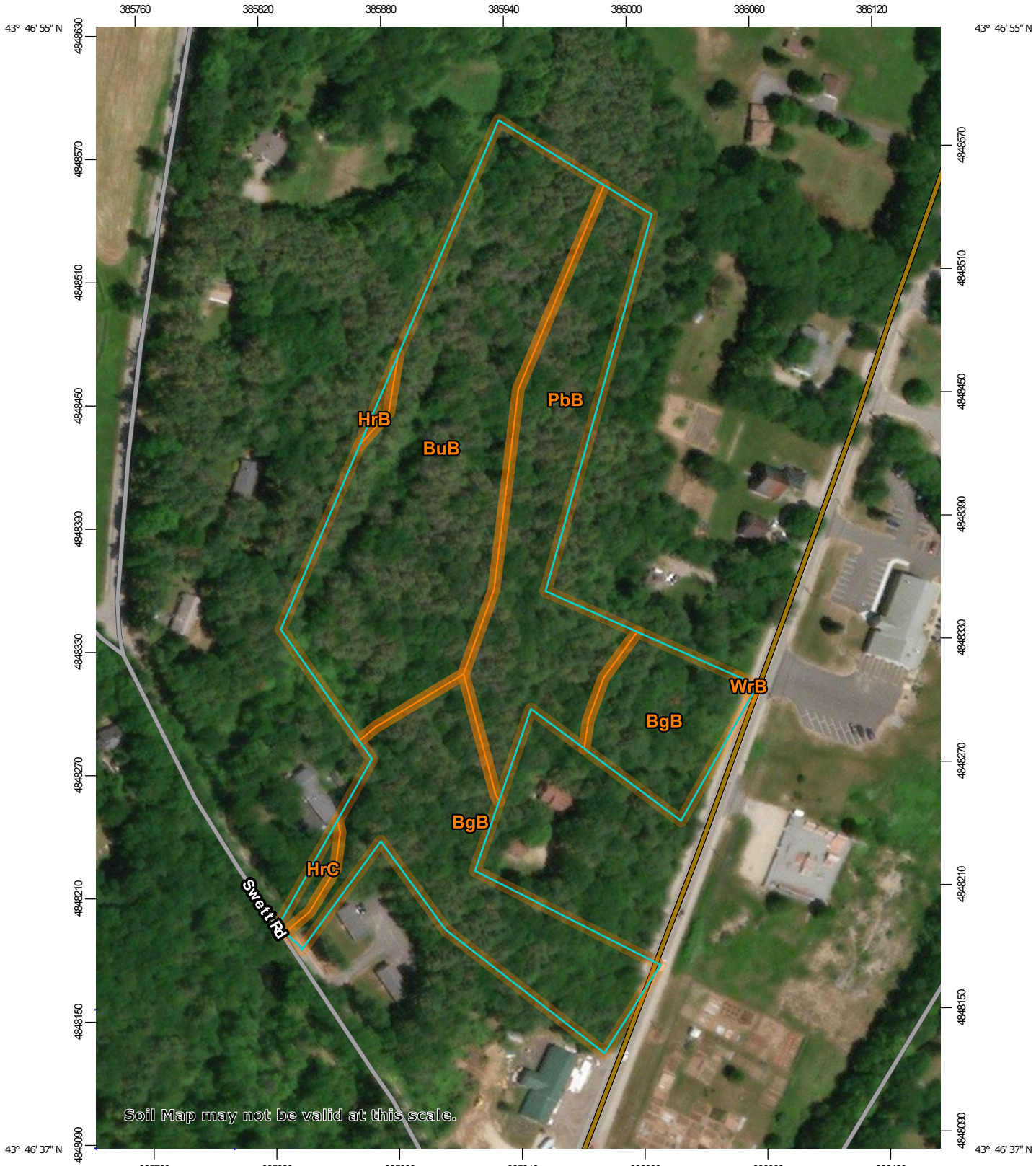
Jayson R. Haskell P.E.
Southern Maine Regional Manager

4-22-19

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

Woodside Condominium Retirement Community

	Total Watershed Area (SF)	New Driveway, Road & Roof Impervious Area (SF)	New Building Area Treated in Drip Edge (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-1	15,330	2,004	0	1,068	2,857	3,440	5,961	No	0	0	None
WS-10	32,243	19,660	0	12,583	0	0	0	Yes	19,660	12,583	FB1
WS-11	24,810	6,098	0	16,649	0	0	2,063	Yes	6,098	16,649	FB1
WS-12	9,560	0	3,192	6,233	0	0	136	Yes	0	6,233	BR1
WS-2	121,178	0	6,164	35,783	0	445	78,786	No	0	0	None
WS-20	15,129	7,980	0	7,149	0	0	0	Yes	7,980	7,149	FB2
WS-21	10,478	4,192	64	6,223	0	0	0	Yes	4,192	6,223	FB2
WS-22	22,657	13,886	0	8,771	0	0	0	Yes	13,886	8,771	FB3
WS-23	39,080	10,706	5,003	23,371	0	0	0	Yes	10,706	23,371	FB3
WS-24	25,045	285	2,820	16,698	0	0	5,242	Yes	285	16,698	FB2
WS-25	16,882	285	1,585	15,012	0	0	0	Yes	285	15,012	FB3
WS-3	109,754	2,105	2,330	15,786	22,042	9,188	58,302	No	0	0	None
WS-30	8,644	3,640	0	5,004	0	0	0	Yes	3,640	5,004	FB4
WS-31	23,284	9,948	798	12,537	0	0	0	Yes	9,948	12,537	FB4
WS-4	48,910	874	0	12,051	0	0	35,985	No	0	0	None
WS-40	5,006	5,006	0	0	0	0	0	Yes	5,006	0	FILTERRA-1
WS-41	23,682	10,511	0	9,464	0	0	3,707	Yes	10,511	9,464	FILTERRA-1
WS-42	30,952	0	5,110	20,578	0	0	5,264	Yes	0	20,578	BUFFER
WS-43	3,706	138	0	3,569	0	0	0	No	0	0	None - DB1
Total		**97,180**	**27,066**	**224,961**					**92,198**	**160,272**	

* All new buildings shall install a roofline drip edge to provide treatment for a portion of the rooftop impervious surface. The building's impervious area treated in a drip edge is included in the watershed and overall treatment calculations below, but not included in the BMP sizing calculations for each treatment device. Roof area not directed to a drip edge is accounted for in the "New Driveway, Road, & Roof Impervious Area".

** 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.

New Impervious Area =	124,246	sf
Impervious Area Requiring Treatment (95%) =	118,034	sf
Impervious Area Treatment Provided =	119,264	sf
	96%	New Impervious Area Treated
New Developed Area =	349,207	sf
Developed Area Requiring Treatment (80%) =	279,366	sf
Developed Area Treatment Provided =	279,535	sf
	80%	New Developed Area Treated

Filter Basin FB-1 (PHASE 1)

Tributary Impervious Area=	25,759	sf	(WS-10 & 11 Impervious Area)
Tributary Landscaped Area=	29,232	sf	(WS-10 & 11 Landscaped Area)

Water Quality Volume (WQV) Calculation

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

WQV (Required) = 3,121 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
253.75	2,103	0
257.25	5,037	11,846

Outlet Elevation = 255.25

Storage Volume Provided = 3,870 cf > Required

Filter Bottom Calculation

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

Filter Area Required = 1,873 sf

Filter Area Provided = 2,103 sf > Required

Filter Basin FB-2

Tributary Impervious Area=	12,457	sf	(WS-20, 21 & 24 Impervious Area)
Tributary Landscaped Area=	30,070	sf	(WS-20, 21 & 24 Landscaped Area)

Water Quality Volume (WQV) Calculation

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

WQV (Required) = 2,040 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
242	1,621	0
245.25	4,557	9,801

Outlet Elevation = 243.50

Storage Volume Provided= 3,320 cf > Required

Filter Bottom Calculation

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

Filter Area Required = 1,224 sf

Filter Area Provided = 1,621 sf > Required

Filter Basin FB-3

Tributary Impervious Area=	24,877 sf	(WS-22, 23 & WS 25 Impervious Ar
Tributary Landscaped Area=	47,154 sf	(WS-22, 23 & WS 25 Landscaped A

Water Quality Volume (WQV) Calculation

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

WQV (Required) = 3,645 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
239.5	2,525	0
242.5	5,520	11,827

Outlet Elevation = 241.00

Storage Volume Provided = 4,804 cf > Required

Filter Bottom Calculation

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

Filter Area Required = 2,187 sf

Filter Area Provided = 2,525 sf > Required

Filter Basins FB-4

Tributary Impervious Area=	13,589 sf	(WS-30 & 31 Impervious Area)
Tributary Landscaped Area=	17,541 sf	(WS-30 & 31 Landscaped Area)

Water Quality Volume (WQV) Calculation

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

WQV (Required) = 1,717 cf

Filter Basin FB-5 Stage Storage

Elevation	Area (sf)	Storage (cf)
248.4	1,234	0
251.4	3,767	6,378

Outlet Elevation = 249.60

Storage Volume Provided = 1,855 cf > Required

Filter Bottom Calculation

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

Filter Area Required = 1,030 sf

Filter Area Provided = 1,234 sf > Required

Bioretention Cell BR-1

Tributary Impervious Area=	0	&	(WS-12 Impervious Area)
Tributary Landscaped Area=	6,233	sf	(WS-12 Landscaped Area)

Water Quality Volume (WQV) Calculation

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

WQV (Required) = 208 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
256.9	205	0
258	828	456

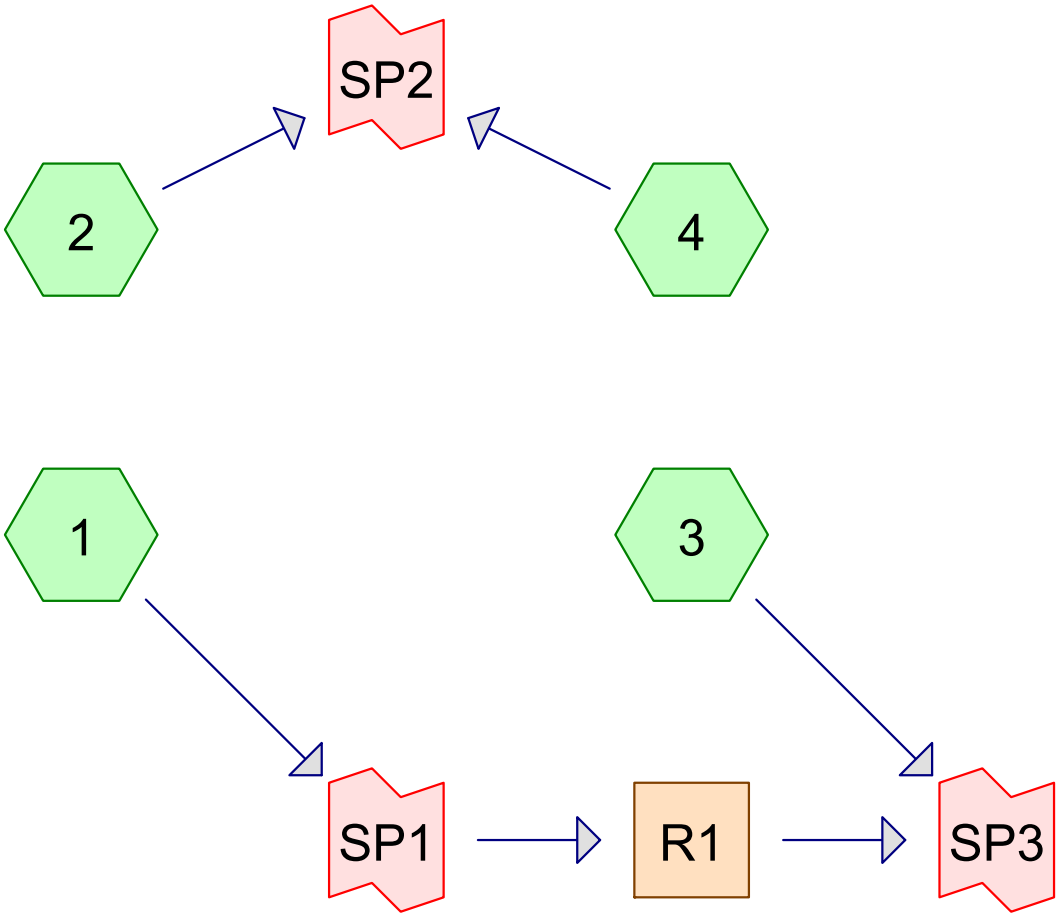
Storage From Filter Media (1/3 Filter Volume)=	103	cf
Outlet Elevation =	257.40	
Storage Volume Above Media=	128	cf
Total Storage Volume Provided=	**231**	**cf > Required**

Forested Stormwater Buffer With Level Spreader

Class:	Sandy Loam	
HSG:	C	
Buffer Length=	100	ft
Berm Length Per Acre Impervious =	120	ft
Berm Length Per Acre Landscape =	36	ft
Tributary Impervious Area =	0	
Tributary Landscaped Area =	20,578	
Required Berm Length:	17	ft
Provided Berm Length:	20	ft

ATTACHMENT 3

HYDROCAD OUTPUT



Subcat Reach Pond Link

Routing Diagram for 17070 - PRE
Prepared by DM Roma Consulting Engineers, Printed 4/22/2019
HydroCAD® 10.00-22 s/n 09237 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points x 2
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=58,629 sf 4.87% Impervious Runoff Depth=0.68"
Flow Length=345' Tc=27.9 min CN=61 Runoff=0.56 cfs 3,341 cf

Subcatchment 2: Runoff Area=204,250 sf 0.00% Impervious Runoff Depth=1.16"
Flow Length=447' Tc=24.4 min CN=73 Runoff=3.71 cfs 19,734 cf

Subcatchment 3: Runoff Area=138,301 sf 4.46% Impervious Runoff Depth=0.94"
Flow Length=609' Tc=17.0 min CN=68 Runoff=2.27 cfs 10,863 cf

Subcatchment 4: Runoff Area=133,222 sf 0.00% Impervious Runoff Depth=1.25"
Flow Length=249' Tc=17.1 min CN=75 Runoff=3.05 cfs 13,931 cf

Reach R1: Avg. Flow Depth=0.23' Max Vel=1.34 fps Inflow=0.56 cfs 3,341 cf
n=0.035 L=315.0' S=0.0184 '/' Capacity=181.79 cfs Outflow=0.55 cfs 3,341 cf

Link SP1: Inflow=0.56 cfs 3,341 cf
Primary=0.56 cfs 3,341 cf

Link SP2: Inflow=6.55 cfs 33,665 cf
Primary=6.55 cfs 33,665 cf

Link SP3: Inflow=2.64 cfs 14,204 cf
Primary=2.64 cfs 14,204 cf

Total Runoff Area = 534,402 sf Runoff Volume = 47,869 cf Average Runoff Depth = 1.07"
98.31% Pervious = 525,370 sf 1.69% Impervious = 9,032 sf

Summary for Subcatchment 1:

Runoff = 0.56 cfs @ 12.43 hrs, Volume= 3,341 cf, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	2,857	98	Gray Road - Ex. Paved roads, HSG B
*	0	98	Ex. Roofs
*	912	96	Ex. driveway - Gravel surface
	51,297	58	Woods/grass comb., Good, HSG B
	0	72	Woods/grass comb., Good, HSG C
	3,563	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	58,629	61	Weighted Average
	55,772	59	95.13% Pervious Area
	2,857	98	4.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.9	150	0.0360	0.10		**Sheet Flow, Seg A to B** Woods: Light underbrush n= 0.400 P2= 3.10"
4.0	195	0.0270	0.82		**Shallow Concentrated Flow, Seg B to C** Woodland Kv= 5.0 fps
27.9	345	Total			

Summary for Subcatchment 2:

Runoff = 3.71 cfs @ 12.36 hrs, Volume= 19,734 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

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	73	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 3:

Runoff = 2.27 cfs @ 12.26 hrs, Volume= 10,863 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	4,945	98	Gray Road - Ex. Paved roads, HSG B
*	10,756	96	Ex. driveway - Gravel surface, HSG B
*	5,119	96	Ex. driveway - Gravel surface, HSG C
*	1,230	98	Ex. Roofs,
	74,240	58	Woods/grass comb., Good, HSG B
	31,944	72	Woods/grass comb., Good, HSG C
	9,413	61	>75% Grass cover, Good, HSG B
	654	74	>75% Grass cover, Good, HSG C
	138,301	68	Weighted Average
	132,126	66	95.54% Pervious Area
	6,175	98	4.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	22	0.0363	0.07		**Sheet Flow, Seg A to B**
					Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	22	0.0238	1.07		**Sheet Flow, Seg B to C**
					Smooth surfaces n= 0.011 P2= 3.10"
9.1	47	0.0393	0.09		**Sheet Flow, Seg C to D**
					Woods: Light underbrush n= 0.400 P2= 3.10"
1.3	275	0.0458	3.45		**Shallow Concentrated Flow, Seg D to E**
					Unpaved Kv= 16.1 fps
1.2	243	0.0165	3.41	109.26	**Channel Flow, Seg E to F**
					Area= 32.0 sf Perim= 64.6' r= 0.50' n= 0.035
17.0	609	Total			

Summary for Subcatchment 4:

Runoff = 3.05 cfs @ 12.25 hrs, Volume= 13,931 cf, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

Area (sf)	CN	Description
68,745	72	Woods/grass comb., Good, HSG C
50,886	79	Woods/grass comb., Good, HSG D
12,476	74	>75% Grass cover, Good, HSG C
1,115	80	>75% Grass cover, Good, HSG D
133,222	75	Weighted Average
133,222	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	150	0.0846	0.15		**Sheet Flow, Seg A to B** Woods: Light underbrush n= 0.400 P2= 3.10"
0.2	99	0.0710	8.30	264.68	**Channel Flow, Seg B to C** Area= 31.9 sf Perim= 64.0' r= 0.50' n= 0.030 Earth, grassed & winding
17.1	249	Total			

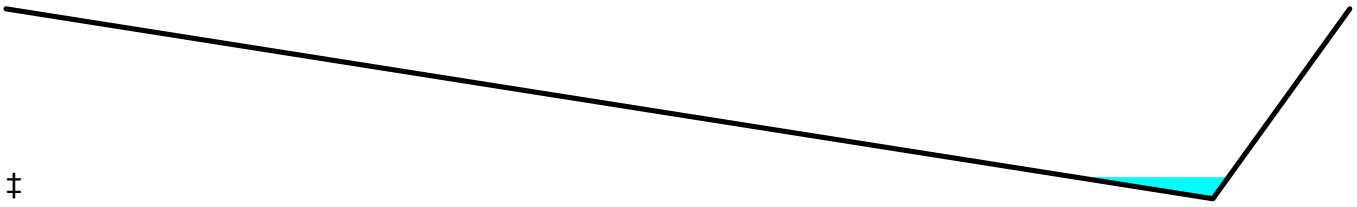
Summary for Reach R1:

Inflow Area = 58,629 sf, 4.87% Impervious, Inflow Depth = 0.68" for 2-Year event
Inflow = 0.56 cfs @ 12.43 hrs, Volume= 3,341 cf
Outflow = 0.55 cfs @ 12.49 hrs, Volume= 3,341 cf, Atten= 2%, Lag= 3.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Max. Velocity= 1.34 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 8.0 min

Peak Storage= 130 cf @ 12.49 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 181.79 cfs

Custom cross-section, Length= 315.0' Slope= 0.0184 '/'
Constant n= 0.035 Earth, dense weeds
Inlet Invert= 251.80', Outlet Invert= 246.00'



‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	252.00	0.00
28.71	250.00	2.00
31.97	252.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	32.0	32.6	10,071	181.79

Summary for Link SP1:

Inflow Area = 58,629 sf, 4.87% Impervious, Inflow Depth = 0.68" for 2-Year event
Inflow = 0.56 cfs @ 12.43 hrs, Volume= 3,341 cf
Primary = 0.56 cfs @ 12.43 hrs, Volume= 3,341 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link SP2:

Inflow Area = 337,472 sf, 0.00% Impervious, Inflow Depth = 1.20" for 2-Year event
Inflow = 6.55 cfs @ 12.31 hrs, Volume= 33,665 cf
Primary = 6.55 cfs @ 12.31 hrs, Volume= 33,665 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link SP3:

Inflow Area = 196,930 sf, 4.59% Impervious, Inflow Depth = 0.87" for 2-Year event
Inflow = 2.64 cfs @ 12.29 hrs, Volume= 14,204 cf
Primary = 2.64 cfs @ 12.29 hrs, Volume= 14,204 cf, Atten= 0%, Lag= 0.0 min

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

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points x 2
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=58,629 sf 4.87% Impervious Runoff Depth=1.52"
Flow Length=345' Tc=27.9 min CN=61 Runoff=1.31 cfs 7,402 cf

Subcatchment 2: Runoff Area=204,250 sf 0.00% Impervious Runoff Depth=2.26"
Flow Length=447' Tc=24.4 min CN=73 Runoff=7.42 cfs 38,414 cf

Subcatchment 3: Runoff Area=138,301 sf 4.46% Impervious Runoff Depth=1.93"
Flow Length=609' Tc=17.0 min CN=68 Runoff=4.89 cfs 22,243 cf

Subcatchment 4: Runoff Area=133,222 sf 0.00% Impervious Runoff Depth=2.40"
Flow Length=249' Tc=17.1 min CN=75 Runoff=5.90 cfs 26,592 cf

Reach R1: Avg. Flow Depth=0.31' Max Vel=1.65 fps Inflow=1.31 cfs 7,402 cf
n=0.035 L=315.0' S=0.0184 '/' Capacity=181.79 cfs Outflow=1.29 cfs 7,402 cf

Link SP1: Inflow=1.31 cfs 7,402 cf
Primary=1.31 cfs 7,402 cf

Link SP2: Inflow=12.85 cfs 65,006 cf
Primary=12.85 cfs 65,006 cf

Link SP3: Inflow=5.72 cfs 29,645 cf
Primary=5.72 cfs 29,645 cf

Total Runoff Area = 534,402 sf Runoff Volume = 94,651 cf Average Runoff Depth = 2.13"
98.31% Pervious = 525,370 sf 1.69% Impervious = 9,032 sf

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points x 2
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=58,629 sf 4.87% Impervious Runoff Depth=2.31"
Flow Length=345' Tc=27.9 min CN=61 Runoff=2.03 cfs 11,262 cf

Subcatchment 2: Runoff Area=204,250 sf 0.00% Impervious Runoff Depth=3.23"
Flow Length=447' Tc=24.4 min CN=73 Runoff=10.67 cfs 54,978 cf

Subcatchment 3: Runoff Area=138,301 sf 4.46% Impervious Runoff Depth=2.83"
Flow Length=609' Tc=17.0 min CN=68 Runoff=7.24 cfs 32,619 cf

Subcatchment 4: Runoff Area=133,222 sf 0.00% Impervious Runoff Depth=3.40"
Flow Length=249' Tc=17.1 min CN=75 Runoff=8.40 cfs 37,701 cf

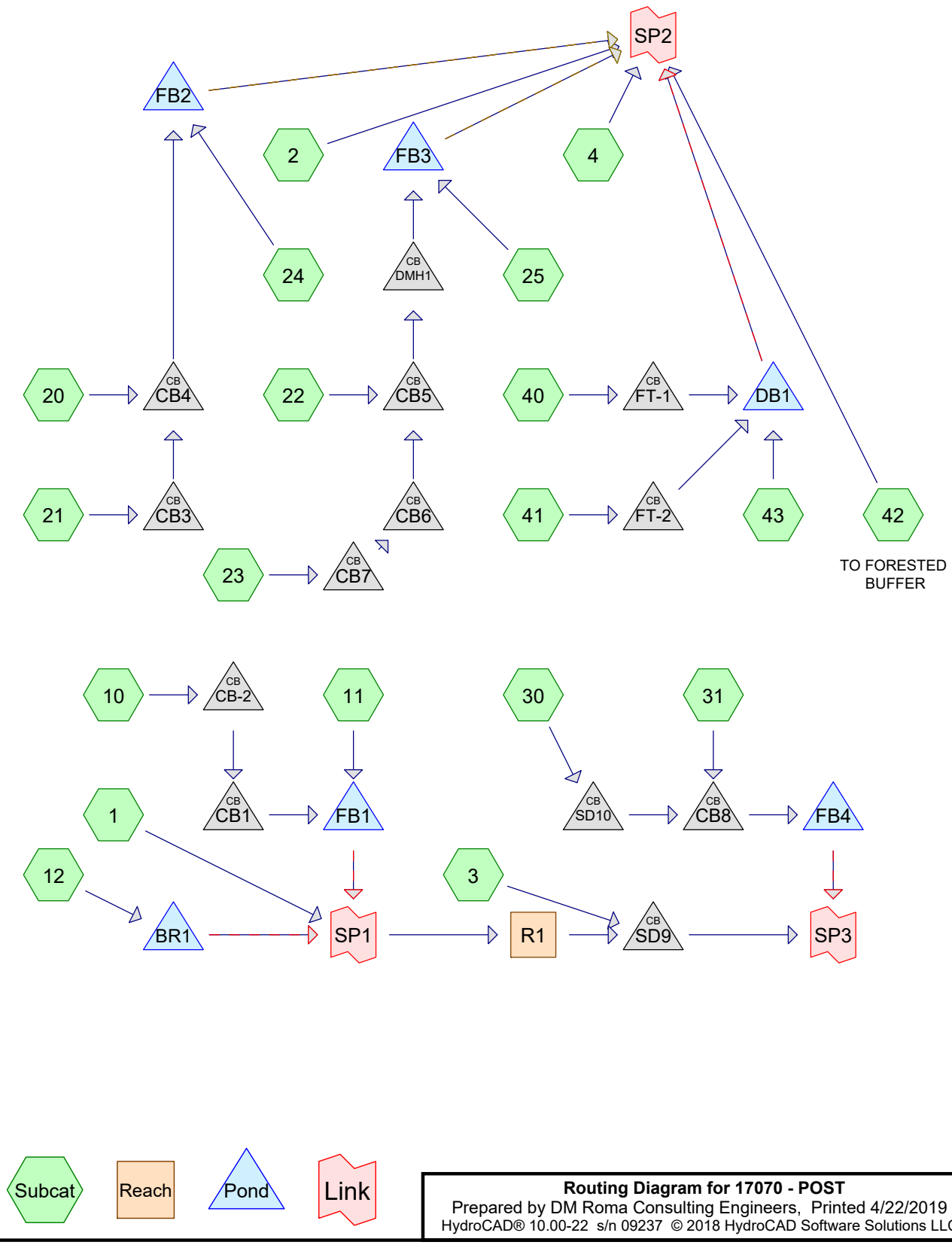
Reach R1: Avg. Flow Depth=0.37' Max Vel=1.84 fps Inflow=2.03 cfs 11,262 cf
n=0.035 L=315.0' S=0.0184 '/' Capacity=181.79 cfs Outflow=2.01 cfs 11,262 cf

Link SP1: Inflow=2.03 cfs 11,262 cf
Primary=2.03 cfs 11,262 cf

Link SP2: Inflow=18.38 cfs 92,680 cf
Primary=18.38 cfs 92,680 cf

Link SP3: Inflow=8.56 cfs 43,881 cf
Primary=8.56 cfs 43,881 cf

Total Runoff Area = 534,402 sf Runoff Volume = 136,560 cf Average Runoff Depth = 3.07"
98.31% Pervious = 525,370 sf 1.69% Impervious = 9,032 sf



Routing Diagram for 17070 - POST

Prepared by DM Roma Consulting Engineers, Printed 4/22/2019

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Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points x 2
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=15,330 sf 31.71% Impervious Runoff Depth=1.16"
Flow Length=114' Slope=0.0933 '/' Tc=8.7 min CN=73 Runoff=0.39 cfs 1,481 cf

Subcatchment 2: Runoff Area=121,178 sf 5.09% Impervious Runoff Depth=1.41"
Flow Length=334' Tc=20.8 min CN=78 Runoff=2.91 cfs 14,222 cf

Subcatchment 3: Runoff Area=109,753 sf 24.12% Impervious Runoff Depth=1.03"
Flow Length=542' Tc=16.5 min UI Adjusted CN=70 Runoff=2.05 cfs 9,382 cf

Subcatchment 4: Runoff Area=48,909 sf 1.79% Impervious Runoff Depth=1.41"
Flow Length=141' Tc=14.8 min CN=78 Runoff=1.34 cfs 5,740 cf

Subcatchment 10: Runoff Area=32,243 sf 60.97% Impervious Runoff Depth=1.76"
Flow Length=240' Tc=11.5 min CN=84 Runoff=1.17 cfs 4,725 cf

Subcatchment 11: Runoff Area=24,810 sf 24.58% Impervious Runoff Depth=1.07"
Flow Length=473' Tc=7.7 min CN=71 Runoff=0.60 cfs 2,210 cf

Subcatchment 12: Runoff Area=9,560 sf 33.39% Impervious Runoff Depth=1.16"
Flow Length=315' Tc=23.1 min CN=73 Runoff=0.18 cfs 924 cf

Subcatchment 20: Runoff Area=15,130 sf 52.74% Impervious Runoff Depth=1.96"
Flow Length=284' Tc=14.4 min CN=87 Runoff=0.59 cfs 2,470 cf

Subcatchment 21: Runoff Area=10,479 sf 40.61% Impervious Runoff Depth=1.76"
Flow Length=158' Tc=7.3 min CN=84 Runoff=0.44 cfs 1,536 cf

Subcatchment 22: Runoff Area=22,657 sf 61.29% Impervious Runoff Depth=2.18"
Flow Length=223' Tc=6.0 min CN=90 Runoff=1.20 cfs 4,114 cf

Subcatchment 23: Runoff Area=39,080 sf 40.20% Impervious Runoff Depth=1.76"
Flow Length=296' Tc=13.6 min CN=84 Runoff=1.38 cfs 5,726 cf

Subcatchment 24: Runoff Area=25,045 sf 12.40% Impervious Runoff Depth=1.46"
Flow Length=122' Tc=10.1 min UI Adjusted CN=79 Runoff=0.78 cfs 3,052 cf

Subcatchment 25: Runoff Area=16,882 sf 11.08% Impervious Runoff Depth=1.58"
Flow Length=107' Slope=0.1512 '/' Tc=6.8 min UI Adjusted CN=81 Runoff=0.64 cfs 2,217 cf

Subcatchment 30: Runoff Area=8,643 sf 42.12% Impervious Runoff Depth=1.52"
Flow Length=296' Tc=6.0 min CN=80 Runoff=0.32 cfs 1,094 cf

Subcatchment 31: Runoff Area=23,283 sf 46.15% Impervious Runoff Depth=1.52"
Flow Length=263' Tc=9.2 min CN=80 Runoff=0.78 cfs 2,946 cf

Subcatchment 40: Runoff Area=5,006 sf 100.00% Impervious Runoff Depth=2.89"
Flow Length=330' Tc=6.0 min CN=98 Runoff=0.32 cfs 1,205 cf

Subcatchment 41: Runoff Area=19,975 sf 52.62% Impervious Runoff Depth=1.96"
Flow Length=335' Tc=9.8 min CN=87 Runoff=0.85 cfs 3,260 cf

Subcatchment 42: TO FORESTED BUFFER Runoff Area=30,045 sf 17.47% Impervious Runoff Depth=1.30"
Flow Length=598' Tc=25.1 min UI Adjusted CN=76 Runoff=0.61 cfs 3,266 cf

Subcatchment 43: Runoff Area=8,971 sf 1.54% Impervious Runoff Depth=1.16"
Tc=0.0 min CN=73 Runoff=0.28 cfs 867 cf

Reach R1: Avg. Flow Depth=0.23' Max Vel=1.19 fps Inflow=0.56 cfs 9,357 cf
n=0.035 L=248.8' S=0.0141 '/' Capacity=158.90 cfs Outflow=0.53 cfs 9,357 cf

Pond BR1: Peak Elev=257.47' Storage=151 cf Inflow=0.18 cfs 924 cf
Primary=0.00 cfs 233 cf Secondary=0.21 cfs 690 cf Outflow=0.22 cfs 924 cf

Pond CB-2: Peak Elev=259.05' Inflow=1.17 cfs 4,725 cf
12.0" Round Culvert n=0.013 L=279.5' S=0.0147 '/' Outflow=1.17 cfs 4,725 cf

Pond CB1: Peak Elev=255.04' Inflow=1.17 cfs 4,725 cf
12.0" Round Culvert n=0.013 L=28.9' S=0.0069 '/' Outflow=1.17 cfs 4,725 cf

Pond CB3: Peak Elev=249.78' Inflow=0.44 cfs 1,536 cf
12.0" Round Culvert n=0.013 L=15.0' S=0.0133 '/' Outflow=0.44 cfs 1,536 cf

Pond CB4: Peak Elev=249.62' Inflow=0.93 cfs 4,005 cf
12.0" Round Culvert n=0.013 L=90.0' S=0.0117 '/' Outflow=0.93 cfs 4,005 cf

Pond CB5: Peak Elev=245.34' Inflow=2.36 cfs 9,840 cf
15.0" Round Culvert n=0.013 L=80.7' S=0.0211 '/' Outflow=2.36 cfs 9,840 cf

Pond CB6: Peak Elev=245.52' Inflow=1.38 cfs 5,726 cf
15.0" Round Culvert n=0.013 L=15.0' S=0.0133 '/' Outflow=1.38 cfs 5,726 cf

Pond CB7: Peak Elev=245.97' Inflow=1.38 cfs 5,726 cf
12.0" Round Culvert n=0.013 L=44.0' S=0.0034 '/' Outflow=1.38 cfs 5,726 cf

Pond CB8: Peak Elev=249.71' Inflow=1.09 cfs 4,039 cf
15.0" Round Culvert n=0.013 L=16.5' S=0.0061 '/' Outflow=1.09 cfs 4,039 cf

Pond DB1: Peak Elev=245.82' Storage=1,220 cf Inflow=1.31 cfs 5,332 cf
Primary=0.46 cfs 5,332 cf Secondary=0.00 cfs 0 cf Outflow=0.46 cfs 5,332 cf

Pond DMH1: Peak Elev=243.54' Inflow=2.36 cfs 9,840 cf
15.0" Round Culvert n=0.013 L=52.7' S=0.0123 '/' Outflow=2.36 cfs 9,840 cf

Pond FB1: Peak Elev=255.04' Storage=3,221 cf Inflow=1.74 cfs 6,935 cf
Primary=0.13 cfs 6,952 cf Secondary=0.00 cfs 0 cf Outflow=0.13 cfs 6,952 cf

Pond FB2: Peak Elev=243.25' Storage=2,624 cf Inflow=1.69 cfs 7,057 cf
Primary=0.38 cfs 7,064 cf Secondary=0.00 cfs 0 cf Outflow=0.38 cfs 7,064 cf

Pond FB3: Peak Elev=240.91' Storage=4,473 cf Inflow=2.99 cfs 12,057 cf
Primary=0.89 cfs 12,063 cf Secondary=0.00 cfs 0 cf Outflow=0.89 cfs 12,063 cf

Pond FB4: Peak Elev=249.71' Storage=2,057 cf Inflow=1.09 cfs 4,039 cf
Primary=0.06 cfs 4,040 cf Secondary=0.00 cfs 0 cf Outflow=0.06 cfs 4,040 cf

Pond FT-1: Peak Elev=248.74' Inflow=0.32 cfs 1,205 cf
4.0" Round Culvert n=0.013 L=52.4' S=0.0076 '/' Outflow=0.32 cfs 1,205 cf

Pond FT-2: Peak Elev=253.42' Inflow=0.85 cfs 3,260 cf
4.0" Round Culvert n=0.013 L=17.9' S=0.0223 '/' Outflow=0.85 cfs 3,260 cf

Pond SD10: Peak Elev=249.71' Inflow=0.32 cfs 1,094 cf
15.0" Round Culvert n=0.013 L=28.8' S=0.0069 '/' Outflow=0.32 cfs 1,094 cf

Pond SD9: Peak Elev=249.15' Inflow=2.55 cfs 18,738 cf
18.0" Round Culvert n=0.013 L=50.7' S=0.0296 '/' Outflow=2.55 cfs 18,738 cf

Link SP1: Inflow=0.56 cfs 9,357 cf
Primary=0.56 cfs 9,357 cf

Link SP2: Inflow=5.57 cfs 47,686 cf
Primary=5.57 cfs 47,686 cf

Link SP3: Inflow=2.61 cfs 22,778 cf
Primary=2.61 cfs 22,778 cf

Total Runoff Area = 586,979 sf Runoff Volume = 70,435 cf Average Runoff Depth = 1.44"
74.54% Pervious = 437,558 sf 25.46% Impervious = 149,421 sf

Summary for Subcatchment 1:

Runoff = 0.39 cfs @ 12.13 hrs, Volume= 1,481 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	2,857	98	Gray Road - Ex. Paved roads
	1,068	61	>75% Grass cover, Good, HSG B
	3,440	69	50-75% Grass cover, Fair, HSG B
	2,004	98	Proposed Sub. Road, paved roads w/curbs
	718	55	Woods, Good, HSG B
	5,243	58	Meadow, non-grazed, HSG B
	15,330	73	Weighted Average
	10,469		68.29% Pervious Area
	4,861		31.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	114	0.0933	0.22		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"

Summary for Subcatchment 2:

Runoff = 2.91 cfs @ 12.30 hrs, Volume= 14,222 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
	5,313	58	Woods/grass comb., Good, HSG B
	0	72	Woods/grass comb., Good, HSG C
	73,473	79	Woods/grass comb., Good, HSG D
	0	58	Meadow, non-grazed, HSG B
	0	78	Meadow, non-grazed, HSG D
	445	61	>75% Grass cover, Good, HSG B
	18,223	74	>75% Grass cover, Good, HSG C
	17,560	80	>75% Grass cover, Good, HSG D
*	6,164	98	Proposed Roofs w/ drip edge
*	0	98	Proposed Roof (no drip edge), Unconnected roofs, HSG A
	121,178	78	Weighted Average
	115,014		94.91% Pervious Area
	6,164		5.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	79	0.0993	0.21		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
9.5	69	0.0752	0.12		**Sheet Flow, Seg B to C** Woods: Light underbrush n= 0.400 P2= 3.10"
5.0	186	0.0151	0.61		**Shallow Concentrated Flow, Seg C to D** Woodland Kv= 5.0 fps
20.8	334	Total			

Summary for Subcatchment 3:

Runoff = 2.05 cfs @ 12.24 hrs, Volume= 9,382 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Adj	Description
*	1,230	98		Existing Roofs
*	2,330	98		Proposed Roofs w/ drip edge, Unconnected roofs,
*	2,105	98		Proposed Sub. Road, paved roads w/curbs
*	4,881	98		Gray Road - Ex. Paved roads
*	15,931	98		Existing driveways & misc. hardscape
	17,149	61		>75% Grass cover, Good, HSG B
	7,825	74		>75% Grass cover, Good, HSG C
	0	80		>75% Grass cover, Good, HSG D
	45,611	58		Woods/grass comb., Good, HSG B
	12,691	72		Woods/grass comb., Good, HSG C
	109,753	71	70	Weighted Average, UI Adjusted
	83,276			75.88% Pervious Area
	26,477			24.12% Impervious Area
	2,330			8.80% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	22	0.0363	0.07		**Sheet Flow, Seg A to B** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	22	0.0238	1.07		**Sheet Flow, Seg B to C** Smooth surfaces n= 0.011 P2= 3.10"
9.1	47	0.0393	0.09		**Sheet Flow, Seg C to D** Woods: Light underbrush n= 0.400 P2= 3.10"
1.3	275	0.0458	3.45		**Shallow Concentrated Flow, Seg D to E** Unpaved Kv= 16.1 fps
0.7	176	0.0079	3.95	38.48	**Trap/Vee/Rect Channel Flow, Seg E to F** Bot.W=2.00' D=1.50' Z= 3.0 '/' Top.W=11.00' n= 0.030 Earth, grassed & winding
16.5	542	Total			

Summary for Subcatchment 4:

Runoff = 1.34 cfs @ 12.22 hrs, Volume= 5,740 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	874	98	Proposed Sub. Road, paved roads w/curbs
	3,889	74	>75% Grass cover, Good, HSG C
	2,597	71	Meadow, non-grazed, HSG C
	8,814	80	>75% Grass cover, Good, HSG D
	12,809	78	Meadow, non-grazed, HSG D
	121	72	Woods/grass comb., Good, HSG C
	19,805	79	Woods/grass comb., Good, HSG D
	48,909	78	Weighted Average
	48,035		98.21% Pervious Area
	874		1.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	26	0.5033	0.32		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
13.4	115	0.0890	0.14		**Sheet Flow, Seg B to C** Woods: Light underbrush n= 0.400 P2= 3.10"
14.8	141	Total			

Summary for Subcatchment 10:

Runoff = 1.17 cfs @ 12.18 hrs, Volume= 4,725 cf, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
	7,632	98	Proposed Roofs (no drip edge), Unconnected roofs,
*	12,028	98	Proposed Sub. Road, paved roads w/curbs
	12,504	61	>75% Grass cover, Good, HSG B
	79	74	>75% Grass cover, Good, HSG C
	32,243	84	Weighted Average
	12,583		39.03% Pervious Area
	19,660		60.97% Impervious Area
	7,632		38.82% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	57	0.0138	0.09		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.2	15	0.0296	1.08		**Sheet Flow, Seg B to C** Smooth surfaces n= 0.011 P2= 3.10"
0.6	168	0.0109	4.71	28.84	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 48.0 & 1.0 '/' Top.W=24.50' n= 0.013 Asphalt, smooth
11.5	240	Total			

Summary for Subcatchment 11:

Runoff = 0.60 cfs @ 12.12 hrs, Volume= 2,210 cf, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

Area (sf)	CN	Description
6,098	98	Proposed Sub. Road, paved roads w/curbs
2,062	55	Woods, Good, HSG B
14,590	61	>75% Grass cover, Good, HSG B
2,060	74	>75% Grass cover, Good, HSG C
24,810	71	Weighted Average
18,712		75.42% Pervious Area
6,098		24.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	52	0.0383	0.13		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
1.1	421	0.0196	6.22	60.61	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=2.00' D=1.50' Z= 3.0 '/' Top.W=11.00' n= 0.030 Earth, grassed & winding
7.7	473	Total			

Summary for Subcatchment 12:

Runoff = 0.18 cfs @ 12.34 hrs, Volume= 924 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

Area (sf)	CN	Description
6,233	61	>75% Grass cover, Good, HSG B
0	98	Proposed Sub. Road, paved roads w/curbs
3,192	98	Proposed Roofs w/ drip edge, Unconnected roofs,
135	58	Woods/grass comb., Good, HSG B
9,560	73	Weighted Average
6,368		66.61% Pervious Area
3,192		33.39% Impervious Area
3,192		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.5	150	0.0150	0.11		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.6	165	0.0182	4.76	23.79	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
23.1	315	Total			

Summary for Subcatchment 20:

Runoff = 0.59 cfs @ 12.21 hrs, Volume= 2,470 cf, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	2,646	98	Proposed Roofs (no drip edge), Unconnected roofs,
*	5,334	98	Proposed Sub. Road, paved roads w/curbs
	759	61	>75% Grass cover, Good, HSG B
	4,144	74	>75% Grass cover, Good, HSG C
	2,247	80	>75% Grass cover, Good, HSG D
	0	72	Woods/grass comb., Good, HSG C
	15,130	87	Weighted Average
	7,150		47.26% Pervious Area
	7,980		52.74% Impervious Area
	2,646		33.16% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	60	0.0083	0.07		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.3	24	0.0291	1.18		**Sheet Flow, Seg B to C** Smooth surfaces n= 0.011 P2= 3.10"
0.4	200	0.0299	7.76	48.69	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 0.2 & 50.0 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
14.4	284	Total			

Summary for Subcatchment 21:

Runoff = 0.44 cfs @ 12.11 hrs, Volume= 1,536 cf, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	1,336	98	Proposed Roofs (no drip edge), Unconnected roofs,
*	64	98	Proposed Roofs w/ drip edge, Unconnected roofs,
*	2,856	98	Proposed Sub. Road, paved roads w/curbs
	0	61	>75% Grass cover, Good, HSG B
	6,223	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
	0	72	Woods/grass comb., Good, HSG C
	10,479	84	Weighted Average
	6,223		59.39% Pervious Area
	4,256		40.61% Impervious Area
	1,400		32.89% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	59	0.0410	0.14		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.2	99	0.0406	9.04	56.73	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
7.3	158	Total			

Summary for Subcatchment 22:

Runoff = 1.20 cfs @ 12.10 hrs, Volume= 4,114 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	5,759	98	Proposed Roofs (no drip edge), Unconnected pavement,
*	8,127	98	Proposed Sub. Road, paved roads w/curbs
	0	61	>75% Grass cover, Good, HSG B
	5,607	74	>75% Grass cover, Good, HSG C
	3,164	80	>75% Grass cover, Good, HSG D
	0	72	Woods/grass comb., Good, HSG C
	22,657	90	Weighted Average
	8,771		38.71% Pervious Area
	13,886		61.29% Impervious Area
	5,759		41.47% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	45	0.0530	0.14		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.4	24	0.0166	0.94		**Sheet Flow, Seg B to C** Smooth surfaces n= 0.011 P2= 3.10"
0.4	154	0.0253	7.14	44.78	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 0.2 & 50.0 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
6.0	223	Total			

Summary for Subcatchment 23:

Runoff = 1.38 cfs @ 12.20 hrs, Volume= 5,726 cf, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	4,835	98	Proposed Roofs (no drip edge), Unconnected roofs
*	5,003	98	Proposed Roofs w/ drip edge, Unconnected roofs
*	5,871	98	Proposed Sub. Road, paved roads w/curbs
	0	61	>75% Grass cover, Good, HSG B
	23,371	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
	0	72	Woods/grass comb., Good, HSG C
	39,080	84	Weighted Average
	23,371		59.80% Pervious Area
	15,709		40.20% Impervious Area
	9,838		62.63% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	150	0.0587	0.19		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.6	146	0.0164	4.13	76.46	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=2.00' D=1.00' Z= 30.0 & 3.0 '/' Top.W=35.00' n= 0.030 Earth, grassed & winding
13.6	296	Total			

Summary for Subcatchment 24:

Runoff = 0.78 cfs @ 12.15 hrs, Volume= 3,052 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Adj	Description
*	2,820	98		Proposed Roofs (no drip edge) Unconnected roofs
*	285	98		Proposed Roofs w/ drip edge, Unconnected roofs
*	0	98		Proposed Sub. Road, paved roads w/curbs
	0	61		>75% Grass cover, Good, HSG B
	249	74		>75% Grass cover, Good, HSG C
	16,449	80		>75% Grass cover, Good, HSG D
	5,242	72		Woods/grass comb., Good, HSG C
	25,045	80	79	Weighted Average, UI Adjusted
	21,940			87.60% Pervious Area
	3,105			12.40% Impervious Area
	3,105			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	108	0.0756	0.20		**Sheet Flow, Seg A to B**
					Grass: Dense n= 0.240 P2= 3.10"
1.0	14	0.3343	0.24		**Sheet Flow, Seg B to C**
					Grass: Dense n= 0.240 P2= 3.10"
10.1	122	Total			

Summary for Subcatchment 25:

Runoff = 0.64 cfs @ 12.11 hrs, Volume= 2,217 cf, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Adj	Description
*	1,585	98		Proposed Roofs (no drip edge) Unconnected roofs
*	285	98		Proposed Roofs w/ drip edge, Unconnected roofs
*	0	98		Proposed Sub. Road, paved roads w/curbs
	0	61		>75% Grass cover, Good, HSG B
	0	74		>75% Grass cover, Good, HSG C
	15,012	80		>75% Grass cover, Good, HSG D
	0	72		Woods/grass comb., Good, HSG C
	16,882	82	81	Weighted Average, UI Adjusted
	15,012			88.92% Pervious Area
	1,870			11.08% Impervious Area
	1,870			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	107	0.1512	0.26		**Sheet Flow, Seg A to B**
					Grass: Dense n= 0.240 P2= 3.10"

Summary for Subcatchment 30:

Runoff = 0.32 cfs @ 12.10 hrs, Volume= 1,094 cf, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	3,640	98	Proposed Sub. Road, paved roads w/curbs
	2,951	61	>75% Grass cover, Good, HSG B
	2,052	74	>75% Grass cover, Good, HSG C
	8,643	80	Weighted Average
	5,003		57.88% Pervious Area
	3,640		42.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	28	0.0260	1.17		**Sheet Flow, Seg A to B** Smooth surfaces n= 0.011 P2= 3.10"
0.5	268	0.0495	9.88	96.33	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=2.00' D=1.50' Z= 3.0 '/' Top.W=11.00' n= 0.030 Earth, grassed & winding
0.9	296	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 31:

Runoff = 0.78 cfs @ 12.13 hrs, Volume= 2,946 cf, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
	3,752	98	Proposed Roofs w/ drip edge, Unconnected roofs,
*	798	98	Proposed Roofs (no drip edge), Unconnected roofs,
*	6,196	98	Proposed Sub. Road, paved roads w/curbs
	9,697	61	>75% Grass cover, Good, HSG B
	2,840	74	>75% Grass cover, Good, HSG C
	23,283	80	Weighted Average
	12,537		53.85% Pervious Area
	10,746		46.15% Impervious Area
	4,550		42.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	56	0.0223	0.11		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.2	11	0.0466	1.22		**Sheet Flow, Seg B to C** Smooth surfaces n= 0.011 P2= 3.10"
0.3	196	0.0465	9.68	60.71	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 0.2 & 50.0 '/' Top.W=25.10' n= 0.013 Asphalt, smooth

9.2	263	Total

Summary for Subcatchment 40:

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 1,205 cf, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	5,006	98	Proposed Sub. Road, paved roads w/curbs
	5,006		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	22	0.0241	1.08		**Sheet Flow, Seg A to B** Smooth surfaces n= 0.011 P2= 3.10"
0.9	308	0.0181	6.04	37.88	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
1.2	330	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 41:

Runoff = 0.85 cfs @ 12.14 hrs, Volume= 3,260 cf, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	4,804	98	Proposed Roofs (no drip edge), Unconnected pavement,
*	5,707	98	Proposed Sub. Road, paved roads w/curbs
	0	61	>75% Grass cover, Good, HSG B
	9,464	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
	0	72	Woods/grass comb., Good, HSG C
	19,975	87	Weighted Average
	9,464		47.38% Pervious Area
	10,511		52.62% Impervious Area
	4,804		45.70% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	51	0.0169	0.09		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.8	284	0.0181	6.04	37.88	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
9.8	335	Total			

Summary for Subcatchment 42: TO FORESTED BUFFER

Runoff = 0.61 cfs @ 12.37 hrs, Volume= 3,266 cf, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Adj	Description
*	5,110	98		Proposed Roofs w/ drip edge, Unconnected pavement,
*	138	98		Proposed Sub. Road, paved roads w/curbs
	23,724	74		>75% Grass cover, Good, HSG C
	1,073	72		Woods/grass comb., Good, HSG C
	30,045	78	76	Weighted Average, UI Adjusted
	24,797			82.53% Pervious Area
	5,248			17.47% Impervious Area
	5,110			97.37% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	37	0.0133	0.08		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
1.0	372	0.0183	6.01	58.57	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=2.00' D=1.50' Z= 3.0 '/' Top.W=11.00' n= 0.030 Earth, grassed & winding
0.1	62	0.1672	18.16	177.03	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=2.00' D=1.50' Z= 3.0 '/' Top.W=11.00' n= 0.030 Earth, grassed & winding
16.3	127	0.0668	0.13		**Sheet Flow, Seg D to E** Woods: Light underbrush n= 0.400 P2= 3.10"
25.1	598	Total			

Summary for Subcatchment 43:

Runoff = 0.28 cfs @ 12.01 hrs, Volume= 867 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.10", Ia/S=0.10

	Area (sf)	CN	Description
*	0	98	Proposed Roofs w/ drip edge, Unconnected pavement,
*	138	98	Proposed Sub. Road, paved roads w/curbs
	3,569	74	>75% Grass cover, Good, HSG C
	5,264	72	Woods/grass comb., Good, HSG C
	8,971	73	Weighted Average
	8,833		98.46% Pervious Area
	138		1.54% Impervious Area

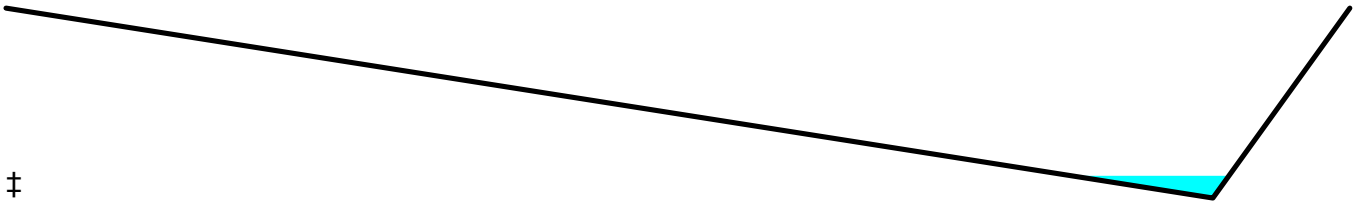
Summary for Reach R1:

Inflow Area = 81,943 sf, 41.26% Impervious, Inflow Depth = 1.37" for 2-Year event
Inflow = 0.56 cfs @ 12.30 hrs, Volume= 9,357 cf
Outflow = 0.53 cfs @ 12.35 hrs, Volume= 9,357 cf, Atten= 6%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Max. Velocity= 1.19 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 7.5 min

Peak Storage= 110 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 158.90 cfs

Custom cross-section, Length= 248.8' Slope= 0.0141 '/'
Constant n= 0.035 Earth, dense weeds
Inlet Invert= 251.80', Outlet Invert= 248.30'



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Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	252.00	0.00
28.71	250.00	2.00
31.97	252.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	32.0	32.6	7,954	158.90

Summary for Pond BR1:

Inflow Area = 9,560 sf, 33.39% Impervious, Inflow Depth = 1.16" for 2-Year event
Inflow = 0.18 cfs @ 12.34 hrs, Volume= 924 cf
Outflow = 0.22 cfs @ 12.33 hrs, Volume= 924 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 12.34 hrs, Volume= 233 cf
Secondary = 0.21 cfs @ 12.33 hrs, Volume= 690 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 257.47' @ 12.34 hrs Surf.Area= 356 sf Storage= 151 cf

Plug-Flow detention time= 183.8 min calculated for 922 cf (100% of inflow)
Center-of-Mass det. time= 185.8 min (1,044.0 - 858.1)

Volume	Invert	Avail.Storage	Storage Description
#1	256.90'	456 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)
256.90	205	64.0	0	0	205
257.40	309	73.5	128	128	314
258.00	828	227.5	329	456	4,004

Device	Routing	Invert	Outlet Devices
#1	Primary	254.00'	**0.2" Vert. Orifice/Grate** C= 0.600
#2	Device 1	254.48'	**4.0" Round Culvert** L= 29.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 254.48' / 254.00' S= 0.0164 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#3	Device 2	256.90'	**2.410 in/hr Exfiltration over Surface area**
#4	Secondary	257.40'	**5.0' long x 7.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78

Primary OutFlow Max=0.00 cfs @ 12.34 hrs HW=257.46' TW=0.00' (Dynamic Tailwater)
↑**1=Orifice/Grate** (Orifice Controls 0.00 cfs @ 8.95 fps)
↑**2=Culvert** (Passes 0.00 cfs of 0.53 cfs potential flow)
↑**3=Exfiltration** (Passes 0.00 cfs of 0.02 cfs potential flow)

Secondary OutFlow Max=0.19 cfs @ 12.33 hrs HW=257.46' TW=0.00' (Dynamic Tailwater)
↑**4=Broad-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 0.60 fps)

Summary for Pond CB-2:

Inflow Area = 32,243 sf, 60.97% Impervious, Inflow Depth = 1.76" for 2-Year event
Inflow = 1.17 cfs @ 12.18 hrs, Volume= 4,725 cf
Outflow = 1.17 cfs @ 12.18 hrs, Volume= 4,725 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.17 cfs @ 12.18 hrs, Volume= 4,725 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 259.05' @ 12.17 hrs
Flood Elev= 262.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	258.40'	**12.0" Round SD-2** L= 279.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 258.40' / 254.30' S= 0.0147 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.13 cfs @ 12.18 hrs HW=259.04' TW=254.86' (Dynamic Tailwater)
↑**1=SD-2** (Inlet Controls 1.13 cfs @ 2.14 fps)

Summary for Pond CB1:

Inflow Area = 32,243 sf, 60.97% Impervious, Inflow Depth = 1.76" for 2-Year event
Inflow = 1.17 cfs @ 12.18 hrs, Volume= 4,725 cf
Outflow = 1.17 cfs @ 12.18 hrs, Volume= 4,725 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.17 cfs @ 12.18 hrs, Volume= 4,725 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 255.04' @ 14.57 hrs
Flood Elev= 257.17'

Device	Routing	Invert	Outlet Devices
#1	Primary	254.20'	**12.0" Round SD-1** L= 28.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 254.20' / 254.00' S= 0.0069 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.13 cfs @ 12.18 hrs HW=254.86' TW=254.35' (Dynamic Tailwater)
1=SD-1 (Barrel Controls 1.13 cfs @ 2.89 fps)

Summary for Pond CB3:

Inflow Area = 10,479 sf, 40.61% Impervious, Inflow Depth = 1.76" for 2-Year event
Inflow = 0.44 cfs @ 12.11 hrs, Volume= 1,536 cf
Outflow = 0.44 cfs @ 12.11 hrs, Volume= 1,536 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 12.11 hrs, Volume= 1,536 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 249.78' @ 12.13 hrs
Flood Elev= 257.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	249.35'	**12.0" Round SD-4** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.35' / 249.15' S= 0.0133 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 12.11 hrs HW=249.77' TW=249.60' (Dynamic Tailwater)
1=SD-4 (Outlet Controls 0.42 cfs @ 2.00 fps)

Summary for Pond CB4:

Inflow Area = 25,609 sf, 47.78% Impervious, Inflow Depth = 1.88" for 2-Year event
Inflow = 0.93 cfs @ 12.16 hrs, Volume= 4,005 cf
Outflow = 0.93 cfs @ 12.16 hrs, Volume= 4,005 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.93 cfs @ 12.16 hrs, Volume= 4,005 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 249.62' @ 12.16 hrs
Flood Elev= 257.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	249.05'	**12.0" Round SD-3** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.05' / 248.00' S= 0.0117 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.90 cfs @ 12.16 hrs HW=249.61' TW=242.70' (Dynamic Tailwater)
↑—**1=SD-3** (Inlet Controls 0.90 cfs @ 2.01 fps)

Summary for Pond CB5:

Inflow Area = 61,737 sf, 47.94% Impervious, Inflow Depth = 1.91" for 2-Year event
Inflow = 2.36 cfs @ 12.13 hrs, Volume= 9,840 cf
Outflow = 2.36 cfs @ 12.13 hrs, Volume= 9,840 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.13 hrs, Volume= 9,840 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 245.34' @ 12.13 hrs
Flood Elev= 253.91'

Device	Routing	Invert	Outlet Devices
#1	Primary	244.45'	**15.0" Round Culvert** L= 80.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 244.45' / 242.75' S= 0.0211 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.25 cfs @ 12.13 hrs HW=245.31' TW=243.51' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.25 cfs @ 2.49 fps)

Summary for Pond CB6:

Inflow Area = 39,080 sf, 40.20% Impervious, Inflow Depth = 1.76" for 2-Year event
Inflow = 1.38 cfs @ 12.20 hrs, Volume= 5,726 cf
Outflow = 1.38 cfs @ 12.20 hrs, Volume= 5,726 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.38 cfs @ 12.20 hrs, Volume= 5,726 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 245.52' @ 12.17 hrs
Flood Elev= 253.91'

Device	Routing	Invert	Outlet Devices
#1	Primary	244.75'	**15.0" Round SD-7** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 244.75' / 244.55' S= 0.0133 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.37 cfs @ 12.20 hrs HW=245.51' TW=245.28' (Dynamic Tailwater)
↑—**1=SD-7** (Outlet Controls 1.37 cfs @ 2.53 fps)

Summary for Pond CB7:

Inflow Area = 39,080 sf, 40.20% Impervious, Inflow Depth = 1.76" for 2-Year event
Inflow = 1.38 cfs @ 12.20 hrs, Volume= 5,726 cf
Outflow = 1.38 cfs @ 12.20 hrs, Volume= 5,726 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.38 cfs @ 12.20 hrs, Volume= 5,726 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 245.97' @ 12.20 hrs
Flood Elev= 256.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	245.15'	**12.0" Round SD-8** L= 44.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 245.15' / 245.00' S= 0.0034 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.37 cfs @ 12.20 hrs HW=245.97' TW=245.51' (Dynamic Tailwater)
1=SD-8 (Barrel Controls 1.37 cfs @ 2.72 fps)

Summary for Pond CB8:

Inflow Area = 31,926 sf, 45.06% Impervious, Inflow Depth = 1.52" for 2-Year event
Inflow = 1.09 cfs @ 12.12 hrs, Volume= 4,039 cf
Outflow = 1.09 cfs @ 12.12 hrs, Volume= 4,039 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.09 cfs @ 12.12 hrs, Volume= 4,039 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 249.71' @ 15.27 hrs
Flood Elev= 252.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	248.80'	**15.0" Round SD-10** L= 16.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 248.80' / 248.70' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.04 cfs @ 12.12 hrs HW=249.40' TW=248.95' (Dynamic Tailwater)
1=SD-10 (Barrel Controls 1.04 cfs @ 2.58 fps)

Summary for Pond DB1:

Inflow Area = 33,952 sf, 46.11% Impervious, Inflow Depth = 1.88" for 2-Year event
Inflow = 1.31 cfs @ 12.11 hrs, Volume= 5,332 cf
Outflow = 0.46 cfs @ 12.47 hrs, Volume= 5,332 cf, Atten= 65%, Lag= 21.7 min
Primary = 0.46 cfs @ 12.47 hrs, Volume= 5,332 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= 0.10 hrs / 2

Peak Elev= 245.82' @ 12.47 hrs Surf.Area= 908 sf Storage= 1,220 cf

Plug-Flow detention time= 22.4 min calculated for 5,321 cf (100% of inflow)
Center-of-Mass det. time= 22.6 min (824.9 - 802.3)

Volume	Invert	Avail.Storage	Storage Description
#1	243.50'	2,617 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)
243.50	223	67.0	0	0	223
244.00	330	76.4	137	137	336
246.00	981	125.8	1,253	1,391	1,156
247.00	1,490	159.1	1,227	2,617	1,925

Device	Routing	Invert	Outlet Devices
#1	Primary	243.50'	**4.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 243.50' / 243.00' S= 0.0161 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#2	Secondary	246.25'	**10.0' 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=0.46 cfs @ 12.47 hrs HW=245.81' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.46 cfs @ 5.29 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=243.50' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1:

Inflow Area = 61,737 sf, 47.94% Impervious, Inflow Depth = 1.91" for 2-Year event
Inflow = 2.36 cfs @ 12.13 hrs, Volume= 9,840 cf
Outflow = 2.36 cfs @ 12.13 hrs, Volume= 9,840 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.13 hrs, Volume= 9,840 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 243.54' @ 12.13 hrs
Flood Elev= 246.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	242.65'	**15.0" Round SD-5** L= 52.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 242.65' / 242.00' S= 0.0123 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.25 cfs @ 12.13 hrs HW=243.51' TW=240.33' (Dynamic Tailwater)
↑—**1=SD-5** (Inlet Controls 2.25 cfs @ 2.49 fps)

Summary for Pond FB1:

Inflow Area = 57,053 sf, 45.15% Impervious, Inflow Depth = 1.46" for 2-Year event
Inflow = 1.74 cfs @ 12.15 hrs, Volume= 6,935 cf
Outflow = 0.13 cfs @ 14.58 hrs, Volume= 6,952 cf, Atten= 93%, Lag= 145.9 min
Primary = 0.13 cfs @ 14.58 hrs, Volume= 6,952 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= 0.10 hrs / 2
Peak Elev= 255.04' @ 14.58 hrs Surf.Area= 2,946 sf Storage= 3,221 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 258.8 min (1,088.7 - 829.9)

Volume	Invert	Avail.Storage	Storage Description
#1	253.75'	11,827 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	2,103	183.7	0	0	2,103
254.00	2,242	188.4	543	543	2,250
256.00	3,689	257.2	5,871	6,414	4,730
257.25	5,004	403.4	5,412	11,827	12,426

Device	Routing	Invert	Outlet Devices
#1	Primary	251.40'	**1.6" Vert. Underdrain restrictor plate** C= 0.600
#2	Device 1	251.58'	**4.0" Round Culvert** L= 36.2' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 251.58' / 251.40' S= 0.0050 '/' Cc= 0.900 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**
#4	Device 2	255.25'	**4.0" Horiz. Orifice/Grate-horizontal** C= 0.600 Limited to weir flow at low heads
#5	Secondary	256.40'	**7.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.13 cfs @ 14.58 hrs HW=255.04' TW=0.00' (Dynamic Tailwater)
└**1=Underdrain restrictor plate** (Orifice Controls 0.13 cfs @ 9.10 fps)
└**2=Culvert** (Passes 0.13 cfs of 0.49 cfs potential flow)
└**3=Exfiltration** (Passes 0.13 cfs of 0.16 cfs potential flow)
└**4=Orifice/Grate-horizontal** (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 = 50,654 sf, 30.29% Impervious, Inflow Depth = 1.67" for 2-Year event
Inflow = 1.69 cfs @ 12.15 hrs, Volume= 7,057 cf
Outflow = 0.38 cfs @ 12.70 hrs, Volume= 7,064 cf, Atten= 78%, Lag= 33.1 min
Primary = 0.38 cfs @ 12.70 hrs, Volume= 7,064 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= 0.10 hrs / 2
Peak Elev= 243.25' @ 12.70 hrs Surf.Area= 2,630 sf Storage= 2,624 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 112.9 min (936.1 - 823.3)

Volume	Invert	Avail.Storage	Storage Description
#1	242.00'	9,801 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)
242.00	1,621	267.7	0	0	1,621
244.00	3,357	308.3	4,874	4,874	3,569
245.25	4,557	331.9	4,927	9,801	4,836

Device	Routing	Invert	Outlet Devices
#1	Primary	239.83'	**4.0" Round Culvert** L= 30.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 239.83' / 239.25' S= 0.0191 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#2	Device 1	242.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 240.00'
#3	Device 1	243.10'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	244.20'	**6.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.38 cfs @ 12.70 hrs HW=243.25' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.38 cfs of 0.57 cfs potential flow)
↑—**2=Exfiltration** (Controls 0.22 cfs)
—**3=Orifice/Grate** (Orifice Controls 0.16 cfs @ 1.84 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=242.00' TW=0.00' (Dynamic Tailwater)
↑—**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond FB3:

Inflow Area = 78,619 sf, 40.02% Impervious, Inflow Depth = 1.84" for 2-Year event
Inflow = 2.99 cfs @ 12.13 hrs, Volume= 12,057 cf
Outflow = 0.89 cfs @ 12.58 hrs, Volume= 12,063 cf, Atten= 70%, Lag= 27.1 min
Primary = 0.89 cfs @ 12.58 hrs, Volume= 12,063 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= 0.10 hrs / 2
Peak Elev= 240.91' @ 12.58 hrs Surf.Area= 3,815 sf Storage= 4,473 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 161.4 min (976.2 - 814.8)

Volume	Invert	Avail.Storage	Storage Description
#1	239.50'	11,827 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)
239.50	2,525	298.5	0	0	2,525
240.00	2,980	307.9	1,375	1,375	3,003
242.00	4,941	345.6	7,839	9,213	5,070
242.50	5,520	362.7	2,614	11,827	6,050

Device	Routing	Invert	Outlet Devices
#1	Primary	237.33'	**8.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 237.33' / 236.90' S= 0.0139 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Device 1	239.50'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	240.70'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	241.80'	**10.0' 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=0.88 cfs @ 12.58 hrs HW=240.91' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.88 cfs of 2.88 cfs potential flow)
  - **2=Exfiltration** (Exfiltration Controls 0.21 cfs)
  - **3=Orifice/Grate** (Weir Controls 0.67 cfs @ 1.51 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=239.50' TW=0.00' (Dynamic Tailwater)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond FB4:

Inflow Area = 31,926 sf, 45.06% Impervious, Inflow Depth = 1.52" for 2-Year event
Inflow = 1.09 cfs @ 12.12 hrs, Volume= 4,039 cf
Outflow = 0.06 cfs @ 15.28 hrs, Volume= 4,040 cf, Atten= 94%, Lag= 189.3 min
Primary = 0.06 cfs @ 15.28 hrs, Volume= 4,040 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= 0.10 hrs / 2
Peak Elev= 249.71' @ 15.28 hrs Surf.Area= 1,944 sf Storage= 2,057 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 348.7 min (1,177.3 - 828.6)

Volume	Invert	Avail.Storage	Storage Description
#1	248.40'	6,378 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)
248.40	1,234	156.5	0	0	1,234
250.00	2,127	197.5	2,657	2,657	2,423
251.32	3,127	240.1	3,447	6,103	3,935
251.40	3,767	256.0	275	6,378	4,563

Device	Routing	Invert	Outlet Devices
#1	Primary	246.00'	**1.1" Vert. Orifice/Grate** C= 0.600
#2	Device 1	246.23'	**4.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 246.23' / 246.00' S= 0.0062 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#3	Device 2	248.40'	**2.410 in/hr Exfiltration over Surface area**
#4	Device 2	249.90'	**4.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	250.15'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	250.25'	**4.0' long x 7.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78

Primary OutFlow Max=0.06 cfs @ 15.28 hrs HW=249.71' TW=0.00' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 9.21 fps)
  - **2=Culvert** (Passes 0.06 cfs of 0.50 cfs potential flow)
    - **3=Exfiltration** (Passes 0.06 cfs of 0.11 cfs potential flow)
    - **4=Orifice/Grate** (Controls 0.00 cfs)
    - **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=248.40' TW=0.00' (Dynamic Tailwater)
- **6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond FT-1:

Inflow Area = 5,006 sf,100.00% Impervious, Inflow Depth = 2.89" for 2-Year event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,205 cf
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 1,205 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.09 hrs, Volume= 1,205 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 248.74' @ 12.10 hrs
Flood Elev= 250.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	246.90'	**4.0" Round Culvert** L= 52.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 246.90' / 246.50' S= 0.0076 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.32 cfs @ 12.09 hrs HW=248.68' TW=245.08' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.32 cfs @ 3.63 fps)

Summary for Pond FT-2:

Inflow Area = 19,975 sf, 52.62% Impervious, Inflow Depth = 1.96" for 2-Year event
Inflow = 0.85 cfs @ 12.14 hrs, Volume= 3,260 cf
Outflow = 0.85 cfs @ 12.14 hrs, Volume= 3,260 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 12.14 hrs, Volume= 3,260 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 253.42' @ 12.14 hrs
Flood Elev= 250.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	246.90'	**4.0" Round Culvert** L= 17.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 246.90' / 246.50' S= 0.0223 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.80 cfs @ 12.14 hrs HW=252.85' TW=245.26' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.80 cfs @ 9.15 fps)

Summary for Pond SD10:

Inflow Area = 8,643 sf, 42.12% Impervious, Inflow Depth = 1.52" for 2-Year event
Inflow = 0.32 cfs @ 12.10 hrs, Volume= 1,094 cf
Outflow = 0.32 cfs @ 12.10 hrs, Volume= 1,094 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.10 hrs, Volume= 1,094 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 249.71' @ 15.37 hrs
Flood Elev= 252.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	249.10'	**15.0" Round SD-22** L= 28.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.10' / 248.90' S= 0.0069 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.32 cfs @ 12.10 hrs HW=249.51' TW=249.42' (Dynamic Tailwater)
└**1=SD-22** (Outlet Controls 0.32 cfs @ 1.36 fps)

Summary for Pond SD9:

Inflow Area = 191,696 sf, 31.45% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 2.55 cfs @ 12.25 hrs, Volume= 18,738 cf
Outflow = 2.55 cfs @ 12.25 hrs, Volume= 18,738 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.55 cfs @ 12.25 hrs, Volume= 18,738 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 249.15' @ 12.25 hrs
Flood Elev= 252.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	248.30'	**18.0" Round SD-9** L= 50.7' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 248.30' / 246.80' S= 0.0296 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.46 cfs @ 12.25 hrs HW=249.13' TW=0.00' (Dynamic Tailwater)
↑**1=SD-9** (Inlet Controls 2.46 cfs @ 2.45 fps)

Summary for Link SP1:

Inflow Area = 81,943 sf, 41.26% Impervious, Inflow Depth = 1.37" for 2-Year event
Inflow = 0.56 cfs @ 12.30 hrs, Volume= 9,357 cf
Primary = 0.56 cfs @ 12.30 hrs, Volume= 9,357 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link SP2:

Inflow Area = 363,357 sf, 20.57% Impervious, Inflow Depth = 1.57" for 2-Year event
Inflow = 5.57 cfs @ 12.33 hrs, Volume= 47,686 cf
Primary = 5.57 cfs @ 12.33 hrs, Volume= 47,686 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link SP3:

Inflow Area = 223,622 sf, 33.39% Impervious, Inflow Depth = 1.22" for 2-Year event
Inflow = 2.61 cfs @ 12.25 hrs, Volume= 22,778 cf
Primary = 2.61 cfs @ 12.25 hrs, Volume= 22,778 cf, Atten= 0%, Lag= 0.0 min

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

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points x 2
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=15,330 sf 31.71% Impervious Runoff Depth=2.26"
Flow Length=114' Slope=0.0933 '/' Tc=8.7 min CN=73 Runoff=0.78 cfs 2,883 cf

Subcatchment 2: Runoff Area=121,178 sf 5.09% Impervious Runoff Depth=2.61"
Flow Length=334' Tc=20.8 min CN=78 Runoff=5.44 cfs 26,375 cf

Subcatchment 3: Runoff Area=109,753 sf 24.12% Impervious Runoff Depth=2.06"
Flow Length=542' Tc=16.5 min UI Adjusted CN=70 Runoff=4.21 cfs 18,818 cf

Subcatchment 4: Runoff Area=48,909 sf 1.79% Impervious Runoff Depth=2.61"
Flow Length=141' Tc=14.8 min CN=78 Runoff=2.50 cfs 10,645 cf

Subcatchment 10: Runoff Area=32,243 sf 60.97% Impervious Runoff Depth=3.08"
Flow Length=240' Tc=11.5 min CN=84 Runoff=2.03 cfs 8,274 cf

Subcatchment 11: Runoff Area=24,810 sf 24.58% Impervious Runoff Depth=2.12"
Flow Length=473' Tc=7.7 min CN=71 Runoff=1.23 cfs 4,389 cf

Subcatchment 12: Runoff Area=9,560 sf 33.39% Impervious Runoff Depth=2.26"
Flow Length=315' Tc=23.1 min CN=73 Runoff=0.36 cfs 1,798 cf

Subcatchment 20: Runoff Area=15,130 sf 52.74% Impervious Runoff Depth=3.33"
Flow Length=284' Tc=14.4 min CN=87 Runoff=0.99 cfs 4,201 cf

Subcatchment 21: Runoff Area=10,479 sf 40.61% Impervious Runoff Depth=3.08"
Flow Length=158' Tc=7.3 min CN=84 Runoff=0.77 cfs 2,689 cf

Subcatchment 22: Runoff Area=22,657 sf 61.29% Impervious Runoff Depth=3.60"
Flow Length=223' Tc=6.0 min CN=90 Runoff=1.95 cfs 6,794 cf

Subcatchment 23: Runoff Area=39,080 sf 40.20% Impervious Runoff Depth=3.08"
Flow Length=296' Tc=13.6 min CN=84 Runoff=2.40 cfs 10,028 cf

Subcatchment 24: Runoff Area=25,045 sf 12.40% Impervious Runoff Depth=2.69"
Flow Length=122' Tc=10.1 min UI Adjusted CN=79 Runoff=1.44 cfs 5,607 cf

Subcatchment 25: Runoff Area=16,882 sf 11.08% Impervious Runoff Depth=2.84"
Flow Length=107' Slope=0.1512 '/' Tc=6.8 min UI Adjusted CN=81 Runoff=1.16 cfs 3,995 cf

Subcatchment 30: Runoff Area=8,643 sf 42.12% Impervious Runoff Depth=2.76"
Flow Length=296' Tc=6.0 min CN=80 Runoff=0.59 cfs 1,990 cf

Subcatchment 31: Runoff Area=23,283 sf 46.15% Impervious Runoff Depth=2.76"
Flow Length=263' Tc=9.2 min CN=80 Runoff=1.42 cfs 5,360 cf

Subcatchment 40: Runoff Area=5,006 sf 100.00% Impervious Runoff Depth=4.38"
Flow Length=330' Tc=6.0 min CN=98 Runoff=0.48 cfs 1,829 cf

Subcatchment 41: Runoff Area=19,975 sf 52.62% Impervious Runoff Depth=3.33"
Flow Length=335' Tc=9.8 min CN=87 Runoff=1.43 cfs 5,546 cf

Subcatchment 42: TO FORESTED BUFFER Runoff Area=30,045 sf 17.47% Impervious Runoff Depth=2.47"
Flow Length=598' Tc=25.1 min UI Adjusted CN=76 Runoff=1.17 cfs 6,175 cf

Subcatchment 43: Runoff Area=8,971 sf 1.54% Impervious Runoff Depth=2.26"
Tc=0.0 min CN=73 Runoff=0.56 cfs 1,687 cf

Reach R1: Avg. Flow Depth=0.31' Max Vel=1.43 fps Inflow=1.07 cfs 17,358 cf
n=0.035 L=248.8' S=0.0141 '/' Capacity=158.90 cfs Outflow=1.09 cfs 17,358 cf

Pond BR1: Peak Elev=257.50' Storage=160 cf Inflow=0.36 cfs 1,798 cf
Primary=0.00 cfs 245 cf Secondary=0.35 cfs 1,553 cf Outflow=0.35 cfs 1,798 cf

Pond CB-2: Peak Elev=259.35' Inflow=2.03 cfs 8,274 cf
12.0" Round Culvert n=0.013 L=279.5' S=0.0147 '/' Outflow=2.03 cfs 8,274 cf

Pond CB1: Peak Elev=256.21' Inflow=2.03 cfs 8,274 cf
12.0" Round Culvert n=0.013 L=28.9' S=0.0069 '/' Outflow=2.03 cfs 8,274 cf

Pond CB3: Peak Elev=249.99' Inflow=0.77 cfs 2,689 cf
12.0" Round Culvert n=0.013 L=15.0' S=0.0133 '/' Outflow=0.77 cfs 2,689 cf

Pond CB4: Peak Elev=249.85' Inflow=1.62 cfs 6,890 cf
12.0" Round Culvert n=0.013 L=90.0' S=0.0117 '/' Outflow=1.62 cfs 6,890 cf

Pond CB5: Peak Elev=245.80' Inflow=4.00 cfs 16,822 cf
15.0" Round Culvert n=0.013 L=80.7' S=0.0211 '/' Outflow=4.00 cfs 16,822 cf

Pond CB6: Peak Elev=246.01' Inflow=2.40 cfs 10,028 cf
15.0" Round Culvert n=0.013 L=15.0' S=0.0133 '/' Outflow=2.40 cfs 10,028 cf

Pond CB7: Peak Elev=246.69' Inflow=2.40 cfs 10,028 cf
12.0" Round Culvert n=0.013 L=44.0' S=0.0034 '/' Outflow=2.40 cfs 10,028 cf

Pond CB8: Peak Elev=250.34' Inflow=2.00 cfs 7,340 cf
15.0" Round Culvert n=0.013 L=16.5' S=0.0061 '/' Outflow=2.00 cfs 7,340 cf

Pond DB1: Peak Elev=246.38' Storage=1,793 cf Inflow=2.19 cfs 9,062 cf
Primary=0.51 cfs 8,073 cf Secondary=1.11 cfs 989 cf Outflow=1.62 cfs 9,062 cf

Pond DMH1: Peak Elev=244.00' Inflow=4.00 cfs 16,822 cf
15.0" Round Culvert n=0.013 L=52.7' S=0.0123 '/' Outflow=4.00 cfs 16,822 cf

Pond FB1: Peak Elev=256.21' Storage=7,198 cf Inflow=3.20 cfs 12,663 cf
Primary=0.15 cfs 12,677 cf Secondary=0.00 cfs 0 cf Outflow=0.15 cfs 12,677 cf

Pond FB2: Peak Elev=244.00' Storage=4,868 cf Inflow=3.06 cfs 12,497 cf
Primary=0.62 cfs 12,497 cf Secondary=0.00 cfs 0 cf Outflow=0.62 cfs 12,497 cf

Pond FB3: Peak Elev=241.56' Storage=7,158 cf Inflow=5.14 cfs 20,817 cf
Primary=1.81 cfs 20,832 cf Secondary=0.00 cfs 0 cf Outflow=1.81 cfs 20,832 cf

Pond FB4: Peak Elev=250.34' Storage=3,421 cf Inflow=2.00 cfs 7,340 cf
Primary=0.07 cfs 6,027 cf Secondary=0.26 cfs 1,317 cf Outflow=0.33 cfs 7,344 cf

Pond FT-1: Peak Elev=251.09' Inflow=0.48 cfs 1,829 cf
4.0" Round Culvert n=0.013 L=52.4' S=0.0076 '/' Outflow=0.48 cfs 1,829 cf

Pond FT-2: Peak Elev=265.22' Inflow=1.43 cfs 5,546 cf
4.0" Round Culvert n=0.013 L=17.9' S=0.0223 '/' Outflow=1.43 cfs 5,546 cf

Pond SD10: Peak Elev=250.34' Inflow=0.59 cfs 1,990 cf
15.0" Round Culvert n=0.013 L=28.8' S=0.0069 '/' Outflow=0.59 cfs 1,981 cf

Pond SD9: Peak Elev=249.66' Inflow=5.29 cfs 36,176 cf
18.0" Round Culvert n=0.013 L=50.7' S=0.0296 '/' Outflow=5.29 cfs 36,176 cf

Link SP1: Inflow=1.07 cfs 17,358 cf
Primary=1.07 cfs 17,358 cf

Link SP2: Inflow=12.64 cfs 85,586 cf
Primary=12.64 cfs 85,586 cf

Link SP3: Inflow=5.35 cfs 43,520 cf
Primary=5.35 cfs 43,520 cf

Total Runoff Area = 586,979 sf Runoff Volume = 129,084 cf Average Runoff Depth = 2.64"
74.54% Pervious = 437,558 sf 25.46% Impervious = 149,421 sf

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points x 2
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=15,330 sf 31.71% Impervious Runoff Depth=3.23"
Flow Length=114' Slope=0.0933 '/' Tc=8.7 min CN=73 Runoff=1.12 cfs 4,126 cf

Subcatchment 2: Runoff Area=121,178 sf 5.09% Impervious Runoff Depth=3.65"
Flow Length=334' Tc=20.8 min CN=78 Runoff=7.60 cfs 36,873 cf

Subcatchment 3: Runoff Area=109,753 sf 24.12% Impervious Runoff Depth=2.99"
Flow Length=542' Tc=16.5 min UI Adjusted CN=70 Runoff=6.16 cfs 27,325 cf

Subcatchment 4: Runoff Area=48,909 sf 1.79% Impervious Runoff Depth=3.65"
Flow Length=141' Tc=14.8 min CN=78 Runoff=3.50 cfs 14,883 cf

Subcatchment 10: Runoff Area=32,243 sf 60.97% Impervious Runoff Depth=4.19"
Flow Length=240' Tc=11.5 min CN=84 Runoff=2.74 cfs 11,252 cf

Subcatchment 11: Runoff Area=24,810 sf 24.58% Impervious Runoff Depth=3.07"
Flow Length=473' Tc=7.7 min CN=71 Runoff=1.79 cfs 6,342 cf

Subcatchment 12: Runoff Area=9,560 sf 33.39% Impervious Runoff Depth=3.23"
Flow Length=315' Tc=23.1 min CN=73 Runoff=0.51 cfs 2,573 cf

Subcatchment 20: Runoff Area=15,130 sf 52.74% Impervious Runoff Depth=4.47"
Flow Length=284' Tc=14.4 min CN=87 Runoff=1.31 cfs 5,634 cf

Subcatchment 21: Runoff Area=10,479 sf 40.61% Impervious Runoff Depth=4.19"
Flow Length=158' Tc=7.3 min CN=84 Runoff=1.03 cfs 3,657 cf

Subcatchment 22: Runoff Area=22,657 sf 61.29% Impervious Runoff Depth=4.76"
Flow Length=223' Tc=6.0 min CN=90 Runoff=2.54 cfs 8,986 cf

Subcatchment 23: Runoff Area=39,080 sf 40.20% Impervious Runoff Depth=4.19"
Flow Length=296' Tc=13.6 min CN=84 Runoff=3.25 cfs 13,638 cf

Subcatchment 24: Runoff Area=25,045 sf 12.40% Impervious Runoff Depth=3.74"
Flow Length=122' Tc=10.1 min UI Adjusted CN=79 Runoff=2.00 cfs 7,803 cf

Subcatchment 25: Runoff Area=16,882 sf 11.08% Impervious Runoff Depth=3.92"
Flow Length=107' Slope=0.1512 '/' Tc=6.8 min UI Adjusted CN=81 Runoff=1.59 cfs 5,508 cf

Subcatchment 30: Runoff Area=8,643 sf 42.12% Impervious Runoff Depth=3.83"
Flow Length=296' Tc=6.0 min CN=80 Runoff=0.81 cfs 2,756 cf

Subcatchment 31: Runoff Area=23,283 sf 46.15% Impervious Runoff Depth=3.83"
Flow Length=263' Tc=9.2 min CN=80 Runoff=1.97 cfs 7,424 cf

Subcatchment 40: Runoff Area=5,006 sf 100.00% Impervious Runoff Depth=5.58"
Flow Length=330' Tc=6.0 min CN=98 Runoff=0.61 cfs 2,329 cf

Subcatchment 41: Runoff Area=19,975 sf 52.62% Impervious Runoff Depth=4.47"
Flow Length=335' Tc=9.8 min CN=87 Runoff=1.90 cfs 7,439 cf

Subcatchment 42: TO FORESTED BUFFER Runoff Area=30,045 sf 17.47% Impervious Runoff Depth=3.48"
Flow Length=598' Tc=25.1 min UI Adjusted CN=76 Runoff=1.67 cfs 8,714 cf

Subcatchment 43: Runoff Area=8,971 sf 1.54% Impervious Runoff Depth=3.23"
Tc=0.0 min CN=73 Runoff=0.80 cfs 2,415 cf

Reach R1: Avg. Flow Depth=0.35' Max Vel=1.56 fps Inflow=1.55 cfs 24,308 cf
n=0.035 L=248.8' S=0.0141 '/' Capacity=158.90 cfs Outflow=1.52 cfs 24,308 cf

Pond BR1: Peak Elev=257.52' Storage=170 cf Inflow=0.51 cfs 2,573 cf
Primary=0.00 cfs 252 cf Secondary=0.51 cfs 2,321 cf Outflow=0.51 cfs 2,574 cf

Pond CB-2: Peak Elev=259.74' Inflow=2.74 cfs 11,252 cf
12.0" Round Culvert n=0.013 L=279.5' S=0.0147 '/' Outflow=2.74 cfs 11,252 cf

Pond CB1: Peak Elev=256.55' Inflow=2.74 cfs 11,252 cf
12.0" Round Culvert n=0.013 L=28.9' S=0.0069 '/' Outflow=2.74 cfs 11,252 cf

Pond CB3: Peak Elev=250.20' Inflow=1.03 cfs 3,657 cf
12.0" Round Culvert n=0.013 L=15.0' S=0.0133 '/' Outflow=1.03 cfs 3,657 cf

Pond CB4: Peak Elev=250.06' Inflow=2.17 cfs 9,291 cf
12.0" Round Culvert n=0.013 L=90.0' S=0.0117 '/' Outflow=2.17 cfs 9,291 cf

Pond CB5: Peak Elev=246.37' Inflow=5.33 cfs 22,624 cf
15.0" Round Culvert n=0.013 L=80.7' S=0.0211 '/' Outflow=5.33 cfs 22,624 cf

Pond CB6: Peak Elev=246.76' Inflow=3.25 cfs 13,638 cf
15.0" Round Culvert n=0.013 L=15.0' S=0.0133 '/' Outflow=3.25 cfs 13,638 cf

Pond CB7: Peak Elev=248.00' Inflow=3.25 cfs 13,638 cf
12.0" Round Culvert n=0.013 L=44.0' S=0.0034 '/' Outflow=3.25 cfs 13,638 cf

Pond CB8: Peak Elev=250.60' Inflow=2.76 cfs 10,179 cf
15.0" Round Culvert n=0.013 L=16.5' S=0.0061 '/' Outflow=2.76 cfs 10,179 cf

Pond DB1: Peak Elev=246.46' Storage=1,896 cf Inflow=2.91 cfs 12,182 cf
Primary=0.52 cfs 9,814 cf Secondary=2.46 cfs 2,368 cf Outflow=2.97 cfs 12,182 cf

Pond DMH1: Peak Elev=244.57' Inflow=5.33 cfs 22,624 cf
15.0" Round Culvert n=0.013 L=52.7' S=0.0123 '/' Outflow=5.33 cfs 22,624 cf

Pond FB1: Peak Elev=256.51' Storage=8,422 cf Inflow=4.45 cfs 17,594 cf
Primary=0.15 cfs 14,563 cf Secondary=0.65 cfs 3,045 cf Outflow=0.80 cfs 17,608 cf

Pond FB2: Peak Elev=244.38' Storage=6,214 cf Inflow=4.17 cfs 17,094 cf
Primary=0.65 cfs 15,531 cf Secondary=1.18 cfs 1,566 cf Outflow=1.82 cfs 17,097 cf

Pond FB3: Peak Elev=241.96' Storage=9,017 cf Inflow=6.89 cfs 28,132 cf
Primary=2.16 cfs 26,617 cf Secondary=1.59 cfs 1,527 cf Outflow=3.75 cfs 28,145 cf

Pond FB4: Peak Elev=250.51' Storage=3,821 cf Inflow=2.76 cfs 10,179 cf
Primary=0.07 cfs 6,500 cf Secondary=1.25 cfs 3,685 cf Outflow=1.32 cfs 10,185 cf

Pond FT-1: Peak Elev=253.63' Inflow=0.61 cfs 2,329 cf
4.0" Round Culvert n=0.013 L=52.4' S=0.0076 '/' Outflow=0.61 cfs 2,329 cf

Pond FT-2: Peak Elev=279.20' Inflow=1.90 cfs 7,439 cf
4.0" Round Culvert n=0.013 L=17.9' S=0.0223 '/' Outflow=1.90 cfs 7,439 cf

Pond SD10: Peak Elev=250.57' Inflow=0.81 cfs 2,756 cf
15.0" Round Culvert n=0.013 L=28.8' S=0.0069 '/' Outflow=0.81 cfs 2,755 cf

Pond SD9: Peak Elev=250.35' Inflow=7.67 cfs 51,633 cf
18.0" Round Culvert n=0.013 L=50.7' S=0.0296 '/' Outflow=7.67 cfs 51,633 cf

Link SP1: Inflow=1.55 cfs 24,308 cf
Primary=1.55 cfs 24,308 cf

Link SP2: Inflow=18.02 cfs 117,893 cf
Primary=18.02 cfs 117,893 cf

Link SP3: Inflow=8.34 cfs 61,818 cf
Primary=8.34 cfs 61,818 cf

Total Runoff Area = 586,979 sf Runoff Volume = 179,676 cf Average Runoff Depth = 3.67"
74.54% Pervious = 437,558 sf 25.46% Impervious = 149,421 sf

ATTACHMENT 4

INSPECTION, MAINTENANCE & HOUSEKEEPING PLAN

DM ROMA
CONSULTING ENGINEERS

INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

(Prepared by Jayson Haskell, PE #13002)

WOODSIDE CONDOMINIUM 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 Town and Maine Department of Environmental Protection (MDEP) 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 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 generating more than 0.5 inch of rainfall over a 24-hour period 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 MDEP 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. **Storm Drains:** Inspect storm drains 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 storm drain's outlet.

   C. **Catch Basins and Outlet Control Structure:** Inspect and, if required, clean out structure 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 structure and inlet grate.

   D. **Underdrained Filter Basin and Bioretention Cell:** The filter basins are not intended to function as snow storage areas. Inspector to verify that winter plowing operations are not dumping or pushing snow into the basins. The basins shall also not be used for vehicle or heavy equipment storage. Basin should be inspected after several major storm events (0.5 inches rainfall over 24 hours) to determine drawdown time during the first year. Basins to be inspected every six months thereafter with at least one inspection after a major storm event. The basin should drain dry within 24 to 48 hours following a one-inch storm. 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.

E. **Emergency Spillway:** Spillways should be inspected semi-annually and following major storm events for the first year and every six months thereafter to remove any obstructions to flow. Any woody vegetation growing through riprap lining must be removed. Replace riprap on areas where any underlying filter fabric is showing through the stone or where stones have been dislodged.

F. **Buffers:** Wooded buffers must remain fully wooded and have no disturbance to the duff layer. Vegetation in non-wooded buffers may not be cut more than three times per year, and may not be cut shorter than six inches. Stormwater runoff should enter the buffer as sheet flow, and any observed channelization of flows or erosion should be corrected immediately. Activities that may result in disturbance of the duff layer are prohibited in a buffer.

G. **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.

H. **Filterra Bioretention Systems:** Once the site is fully stabilized, and paving complete the system can be activated. Once activated inspection should occur annually thereafter, and should be observed for debris, trash and sediment accumulation, as well as general health of the plants or trees installed within the media. Maintenance protocols from the manufacture shall be followed and are included in this Inspection, Maintenance and Housekeeping plan.

I. **Regular Maintenance:** Clear accumulations of winter sand along parking areas 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.

J. **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 and MDEP 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.

Re-certification

Submit a certification of the following to the MDEP within three months of the expiration of each five-year interval from the date of issuance of the permit.

(a) **Identification and repair of erosion problems**. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.

(b) **Inspection and repair of stormwater control system**. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.

(c) **Maintenance**. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the Department, and the maintenance log is being maintained.

Municipalities with separate storm sewer systems regulated under the Maine Pollutant Discharge Elimination System (MPDES) Program may report on all regulated systems under their control as part of their required annual reporting in lieu of separate certification of each system. Municipalities not regulated by the MPDES Program, but that are responsible for maintenance of permitted stormwater systems, may report on multiple stormwater systems in one report.

Duration of Maintenance

Perform maintenance as described.

INSPECTION AND MAINTENANCE LOG

WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY
WINDHAM, MAINE
(SHEET 1 OF 2)

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 and MDEP 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.			
Storm Drains	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 and Outlet Control Structures	Inspect to ensure that structure is properly draining.			
	Remove accumulated sediment semiannually.			
	Inspect grates/inlets and remove debris as needed.			
Emergency Spillway	Inspect and remove obstructions as necessary.			
	Remove woody vegetation.			
	Replace riprap as necessary.			
Buffers	Inspect for erosion and channelized flow semiannually.			
	Remove accumulated sediment semiannually.			
	Inspect vegetation cover and reestablish as needed.			
Regular Maintenance	Clear accumulation of winter sand in paved areas annually.			

INSPECTION AND MAINTENANCE LOG

WOODSIDE CONDOMINIUM RETIREMENT COMMUNITY
WINDHAM, MAINE
(SHEET 2 OF 2)

Maintenance Item	Maintenance Event	Date Performed	Responsible Personnel	Comments
Underdrained Filter Basins, Bioretention Cells 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.			
	Inspector to verify basin not utilized for snow storage			
	Inspector to verify basin not utilized for vehicle or heavy equipment storage.			

Filterra Owner's Manual

filterra®

Bioretention Systems

CONTECH®

ENGINEERED SOLUTIONS

filterra®
Bioretention Systems

Table of Contents

Enclosed

Local Area Filterra Plant List

CONTECH®
ENGINEERED SOLUTIONS

Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.ContechES.com.

Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

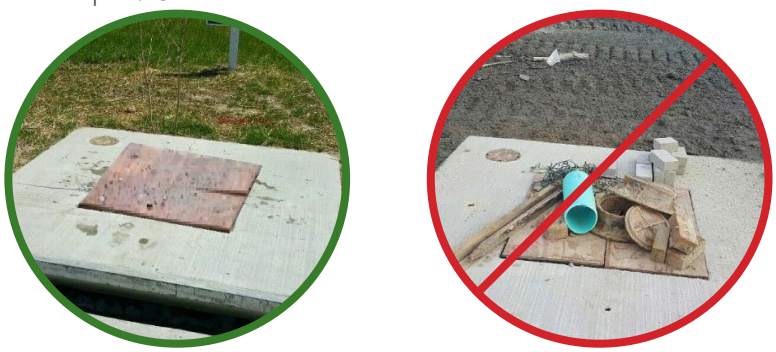
- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra systems.

Minimum Requirements

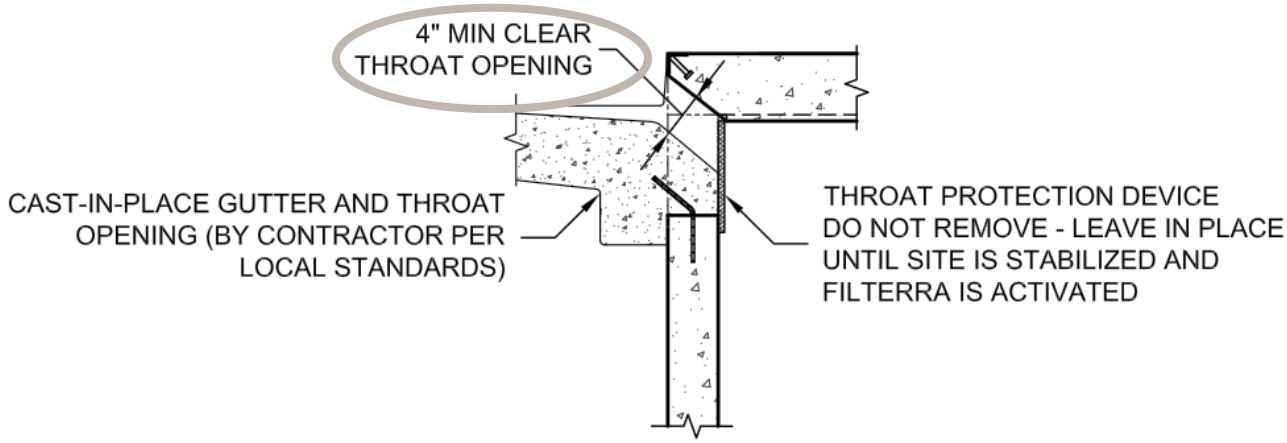
The minimum requirements for Filterra Activation are as follows:

1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.

3. Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra Plant Selection Overview

A Plant List has been enclosed with this packet highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra system.

The "Planting Requirements for Filterra Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.

Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft^2)	Volume at 3" (ft^3)	# of 2 ft^3 Mulch Bags
4	4	4	4	2
6	4	6	6	3
8	4	8	8	4
6	6	9	9	5
8	6	12	12	6
10	6	15	15	8
12	6	18	18	9
13	7	23	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
Buckets Removed	_____

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____

4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy | unhealthy
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

Filterra Inspection & Maintenance Log

Filterra System Size/Model:_____ **Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3″*	*Lowe's Premium Brown Mulch*	*4′*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

Appendix 1 – Filterra® Activation Checklist

CONTECH ENGINEERED SOLUTIONS

Project Name:________________________________ Company:________________________________

Site Contact Name: ________________________________ Site Contact Phone/Email: ____________________

Site Owner/End User Name:____________________ Site Owner/End User Phone/Email: ____________________

Preferred Activation Date: ____________________________(provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

Attach additional sheets as necessary.

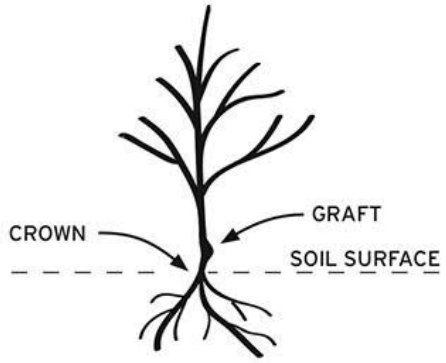
NOTE: A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

____ ________________________

Signature Date

Appendix 2 – Planting Requirements for Filterra® Systems

Plant Material Selection



- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25 feet.
- For standard 21" media depth, a 7 – 15 gallon container size shall be used. Media less than 21" (Filterra boxes only) will require smaller container plants.
- For precast Filterra systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts.

Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water Therefore for a 6' by 6' Filterra approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.

Notes

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