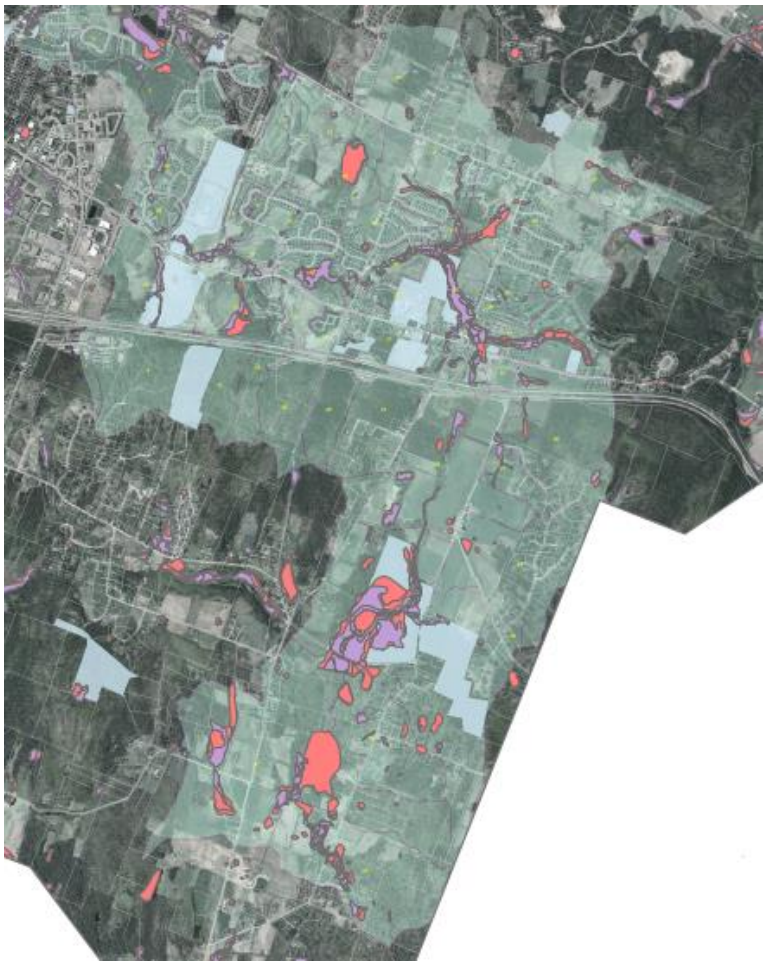
TOWN OF WILLISTON

ALLEN BROOK FLOW RESTORATION PLAN



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Rev. 11-10-16

Prepared for:

Williston VERMONT

VERMONT AGENCY OF TRANSPORTATION

Prepared by:

DuBois & King inc.

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I. INTRODUCTION

The State of Vermont Agency of Natural Resources Department of Environmental Conservation (VTDEC) has issued a National Pollutant Discharge Elimination System (NPDES) General Permit 3-9014 for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4). The permit requires MS4 communities, such as the Town of Williston, whose stormwater runoff drains to waters that are impaired to develop a Flow Restoration Plan (FRP) for these waters. Allen Brook is currently included on the Vermont Agency of Natural Resources (VANR) Stormwater Impaired List (EPA's approved 303(d) List). The Town of Williston and the Vermont Agency of Transportation (VTrans) have been working cooperatively to develop an Allen Brook FRP with the goal of identifying best management practices (BMP's) that will achieve compliance with the flow targets set forth in the VTDEC report, *Total Maximum Daily Load to Address Biological Impairment in Allen Brook* (September 2008).

II. BACKGROUND

The purpose of the FRP is to identify stormwater BMP's (including retrofits to existing practices) that will be recommended for implementation in an effort to achieve established EPA approved Total Maximum Daily Load (TMDL) Targets for Allen Brook and eventually allow Allen Brook to be removed from the State's Stormwater Impaired List.

In doing so, MS4 Permittees discharging to Allen Brook will be working towards compliance with the NPDES General Permit FRP requirements. The permit requirement states that all MS4 Permittees (Municipal and Non-Traditional MS4's) create an FRP for all stormwater impaired waters within their jurisdiction. The Allen Brook Impaired Watershed is located entirely within the Williston Municipal limits and is the only Stormwater Impaired Waterway needing an FRP in Williston.

Understanding that the Vermont Agency of Transportation (VTrans) has been designated a Non-Traditional MS4 and that VTrans Highway right-of-way (I-89, US 2 & US 2A) and facilities (I-89 Welcome Centers) comprise approximately 16% (63 acres) of the impervious surface within the Allen Brook Watershed, the development of this FRP includes coordination with VTrans as a partner in this FRP effort. In doing so, VTrans and the Town of Williston have entered into a Memorandum of Understanding to jointly develop and implement the Allen Brook FRP.

The Town of Williston has been focused on progressing improvements and maintenance of existing stormwater systems in support of the FRP targets over the last few years. This FRP and the Town's development of a Stormwater Management Program (SWMP) will intensify the process to educate and inform the community of the importance of water quality in the Allen Brook watershed as well as other important waterways throughout the Town.

The Vermont Department of Environmental Conservation (VTDEC) has EPA approved stormwater TMDL's for the Allen Brook impaired waters. This TMDL includes an aggregate waste load allocation (WLA) which applies to numerous watershed sources. No specific WLA's were specified in the MS4 General Permit. The flow targets were set forth in the *Total Maximum Daily Load to Address Biological Impairment in Allen Brook* (September 2008).

The flow targets were set based upon the exceedance flow where the percentage (%) designates the percentage (%) of time that stream flows are equal to or greater than the flow targets. For the Allen Brook watershed the high flow (Q0.3%) and low flow (Q95%) values were evaluated for the TMDL

targets. The TMDL incorporated a reduction FRP regulatory target for only the Q0.3 value. This was set in consultation with the EPA since it was determined that it was not appropriate to include low flow targets (Q95) as an actual allocation in the TMDL.

However, the restoration of base flows is important to the health of the biological communities and thus it is a VTDEC management objective to increase the low flow Q95. This management objective is not being addressed as part of the FRP, but the associated results have been included for use in future SWMP planning and updates to the expired permits. The use of infiltration and other BMP practices which improve the Q95 will be encouraged by the Town of Williston and VTrans during implementation of the FRP practices where practical. Additionally, the Town of Williston has enacted Planning & Zoning requirements unrelated to the FRP which provide for development practices which would improve these flows.

Table 1: Allen Brook TMDL Target Percentages

TMDL Target (Waste Load Allocation including future growth)	Q0.3	Q95
	-3.30%	7.40%

III. IDENTIFICATION OF REQUIRED CONTROLS

A. Stormwater Discharge Permit Sites

VTDEC provided a current listing of expired stormwater discharge permits that discharged to the impaired Allen Brook. These sites are comprised of a mix of residential and commercial developments throughout the watershed. As developed parcels, these locations have significant impervious areas and the potential to negatively contribute to the Allen Brook Q0.3 high flow volumes. Each of these sites was previously permitted under VTDEC stormwater discharge regulations, which required various BMP's to be implemented as conditions of construction. These BMP's, however, would not meet current 2002 Vermont Stormwater Manual requirements and in some cases were never built.

To bring these permits into compliance, these sites would need to meet current 2002 standards through the completion of a Town approved engineering feasibility analysis (EFA) or through the Residual Designation Authority of VTDEC. In either event, these expired permit sites are stormwater runoff contributors to Allen Brook and should be addressed as part of this FRP. The Town and VTrans agreed that these developments should bear the initial burden of their permit requirements. The ancillary benefit that these upgrades have on the FRP targets would then be reviewed, and any shortfall in meeting the targets would be addressed in the development of other BMP's by the Town or VTrans.

In conjunction with these individual stormwater permit owners, the Town of Williston has assisted with the implementation of EFA's to determine BMP upgrades and measures necessary to bring these permits up to date. The resulting designs for the BMP's were provided to the DEC's

Stormwater Analyst for inclusion in the State Hydrologic Analysis Model as well as their Allen Brook Best Management Practice Support System (BMPDSS) model to determine their affect in meeting the high flow TMDL target. These model runs are summarized in Section D.

Table 2 outlines the discharge permit sites in which BMP's were designed to meet current 2002 Vermont Stormwater Manual requirements. As the FRP is implemented, this listing of EFA and/or BMP upgrades will be reviewed annually to review their construction status and to determine if there are additional upgrades that should be incorporated. Any additional sites shall be identified in the SWMP annual report. The Town has reached agreements with the residential property/development owners from Table 2 to obtain responsibility of the new BMP's and stormwater permits once they are constructed and inspected. Incrementally, as these residential sites are adopted, they will be incorporated into the MS4 General Permit and identified in the SWMP. Once adopted, the expired permit holders for the residential sites will not be held to any additional requirements above what has been included in their individual agreements. All further improvements will be at the cost of the Town.

Table 2: Stormwater Discharge Permit Sites

Permit No	Permittee	Development Name	Location	Drainage Area (acre)
1-0513/ 1-1275	Taft Farms	Lots A-B	Talcott Rd	8.61
1-0513	Taft Farms	Condo Pond	Talcott Rd	4.72
1-0513	Taft Farms	Lots C-D	Talcott Rd	1.45
1-0513	Taft Farms	Lots F-G, Respite House Pond	Talcott Rd	4.36
1-0513	Taft Farms	Lot H	Talcott Rd	2.41
1-0664	South Ridge Homeowners Association	South Ridge Estates	South Ridge Rd	68.74
1-0792	Sterling Construction Inc.	Turtle Crossing	Brookside Dr	2.64
1-0963	Williston Elder Housing Inc.	Whitney Hill	Whitney Hill Rd	8.18
1-10521-1217	Retrovest Associates Indian Ridge	Williston Commons Indian Ridge	Commons RdIsham Circle	23.828.63
1-12171-1258	Taft Farms - Indian RidgeHeritage Meadows Homeowner Association	Indian RidgeHeritage Meadows	Isham CircleOld Stage Rd	8.6316.6916.79
1-12581-1272 s/n 2	Heritage Meadows Homeowner Association Brennan Woods	Heritage MeadowsBrennan Woods	Old Stage RdHanon Dr	16.7971.41
1-1272 s/n 21-1507	Brennan Woods Andre & Patricia Martel	Brennan Woods Coyote Run	Hanon DrCoyote La/Raven Circle	71.4120.5
1-15072-0231	Andre & Patricia Martel	Coyote RunPleasant	Coyote La/Raven	20.510.69

Permit No	Permittee	Development Name	Location	Drainage Area (acre)
	Leo Compagna & Thomas Blanchette	Acres	CirclePleasant Acres Dr	
2-02312-0954	Leo Compagna & Thomas Blanchette Allenbrook Meadows	Pleasant Acres Allenbrook Meadows	Pleasant Acres DrLeFebvre Lane	10.694.03
2-09542-1107	Allenbrook MeadowsMeadow Ridge Homeowners Association	Allenbrook MeadowsMeadow Ridge	LeFebvre LaneMeadow Ridge Rd	4.03219.93
2-11072-1146	Meadow Ridge Homeowners Association Hickock & Boardman Referral Services Inc.	Meadow RidgeOld Stage Estates	Meadow Ridge RdSouthfield Dr/Paddock Lane	219.9330.21
2-11462-1180	Hickock & Boardman Referral Services Inc. Ralph Goodrich	Old Stage Estates Golf Links	Southfield Dr/Paddock Lane Tamarack Dr/Hillcrest La	30.2157.23
2-11802-1190	Ralph Goodrich Meadowrun Homeowners Association	Golf Links Meadowrun-Forest Run	Tamarack Dr/Hillcrest La Meadowrun Rd	57.2317.65
2-11902-1191	Meadowrun Homeowners Association Sterling Construction	Meadowrun-Forest Run Turtle Pond	Meadowrun RdTurtle Pond Rd	17.6511.01
2-11911-1078	Sterling Construction Hillside East Commercial Park	Turtle Pond Lots 10, 11, 15	Turtle Pond RdHurricane Lane	11.012.42
1-10781-1205	Hillside East Commercial ParkHillside East Commercial Park	Lots 10, 11, 15Lot 7	Hurricane LaneHurricane Lane	2.422.1
1-12051-1245	Hillside East Commercial ParkHillside East Commercial Park	Lot 7Lots 16 & 17	Hurricane LaneHurricane Lane	2.15.41
1-12451-1301	Hillside East Commercial ParkHillside East Commercial Park	Lots 16 & 17Lots 12, 13, 13A	Hurricane LaneHurricane Lane	5.418.07
1-13012-1172	Hillside East Commercial ParkHillside East Commercial Park	Lots 12, 13, 13AAccess Road	Hurricane LaneHurricane Lane	8.072.23
2-1172	Hillside East Commercial Park	Access Road	Hurricane Lane	2.23

B. Town of Williston Parcel Best Management Practices

The Town of Williston, as the MS4 permittee for the Allen Brook watershed, has also identified parcels which would have the potential for the installation of stormwater best management practices. These parcels were chosen based upon the ownership of the property by the Town, location within Allen Brook subwatersheds, space available for a BMP practice, and ability to capture larger drainage areas.

The first location identified for a BMP was to the south of U.S. Route 2 behind the Town offices. This parcel location is currently undeveloped meadowland which is occasionally hayed. The proposed BMP practice is two separate retention ponds near the south side of the parcel where it abuts Interstate I-89. From this location the BMP's are situated to capture the drainage area of a portion of I-89 and the wooded areas to the south. The runoff from this drainage area enters the site via two I-89 culvert crossings.

Figure 1: Williston Parcel Behind Town Offices

The second location identified for a BMP was for a parcel located between U.S. Route 2 and Interstate I-89. This parcel location is currently undeveloped and for portions it is utilized as farmland. The BMP practice is intended to be installed near the south side of the parcel where it abuts Interstate I-89. From this location the BMP is situated to capture the drainage area of a portion of I-89, Hurricane Lane and the wooded areas to the south. The runoff from this drainage area enters the site via multiple I-89 culvert crossings. Implementation of this BMP would potentially require collaboration with VTrans for work within the Interstate Right-of-Way to direct stormwater flows to the practice.

This BMP location has been modeled as a detention/retention pond with a 2.40 acre-feet of storage at the 1 year 24-hour rainfall event flows.

Figure 2: Williston Parcel between US Route 2 and I-89

C. VTrans Interstate 89 Best Management Practices

VTrans as the non-traditional MS4 permittee in the Allen Brook watershed has chosen five sites to construct new BMP's and one site to upgrade an existing pond to meet VTDEC's 2002 Stormwater Manual requirements. These locations were chosen based upon being in the I-89

ROW, location within Allen Brook subwatersheds, space available for a BMP practice, and ability to capture larger drainage areas.

The proposed upgraded retention pond treats and retains stormwater from the Interstate I-89 Welcome Center, just west of the Town Offices parcel shown in Figure 1. This location was developed by the Vermont Department of Buildings and General Services under a land lease from VTrans. The development was covered by stormwater discharge general permit No. 1-1401 which had an expiration date of March 31, 2005.

The remaining median BMP locations that VTrans identified are located in Interstate I-89's median (between the northbound and southbound lanes).

The resulting designs for the BMP's were provided to the DEC's Stormwater Analyst for inclusion in the State Hydrologic Analysis Model as well as their Allen Brook Best Management Practice Support System (BMPDSS) model to determine their affect in meeting the high flow TMDL target. These model runs are summarized in Section D.

As the FRP is implemented and the VTrans BMP's are constructed they will be incorporated into the MS4 General Permit and identified in the SWMP. In addition to the six above VTrans sites included in the State's Hydrologic Analysis Model, seven additional BMP's are proposed to be implemented and added to the model at a later date.

Figure 3: VTrans BMP Locations

D. VTDEC BMP'S Watershed Model Runs

The flow targets for Allen Brook (Table 1) were set forth in the *Total Maximum Daily Load to Address Biological Impairment in Allen Brook* (September 2008). As described above the Allen Brook TMDL target for high flow is Q0.3 = -3.30%. The management objective for low flow Q95 = 7.40%.

TMDL targets are expressed in percent (%) change in flow. To assess the effects of various management options on watershed flow, the Vermont Department of Environmental Conservation (VTDEC) has developed a watershed model for the Allen Brook watershed using the Vermont Best Management Practice Decision Support System (BMPDSS). For modeling purposes, percent reductions in flow are compared to the flow under base conditions, which for the purpose of this exercise are considered to be the conditions of the watershed prior to the adoption of the 2002 Vermont Stormwater Management Manual. Therefore, any BMP's that were built prior to the adoption of the manual are included in the base scenario.

In addition to a "base scenario" model run, VTDEC has updated the Allen Brook watershed model to reflect development and BMP's that have been built since the adoption of the 2002 manual. The hydrologic benefits from these BMP's are counted as credit towards the TMDL target.

Dubois & King, Inc., representing the Town of Williston and VTrans, provided VTDEC with preliminary designs for upgraded and new BMP's. VTDEC then added these treatment practices to the BMPDSS to assess the change in flows (Table 3).

Table 3: VTDEC BMPDSS Model Results

Model Run	**Q0.3**		**Q95**	
	Cumulative% Change in flow	% of TMDL FRP target	Cumulative % Change in flow	% of TMDL management objective
Current Development	**-0.62%**	*18.8%*	**0.49%**	*6.6%*
Expired Permit Site Upgrades & Proposed BMP's for MS4 owned properties (VTrans & Town Parcels)*	**-3.67%**	*111.1%*	**0.00%**	*0%*

*Vermont VTDEC BMPDSS does not incorporate reduction of the Town Hall parcel BMP from three ponds to two.

Explanation of VTDEC Model Results:

- Current Development: This model scenario represents the current development of the watershed, based on best available information.

- Expired Permit Upgrades: This model iteration includes upgrades to expired permitted systems, as provided to the Town of Williston by the permit holder's consultants.
- Proposed BMP's for MS4 owned properties (VTrans & Town Parcels) – Proposed BMP's described above for the Town of Williston and VTrans properties. These were incorporated since the expired permit upgrades failed to meet the TMDL target.

The above VTDEC model results for the identified BMP's exceed the Q0.3 target of -3.30% by approximately 2.7%. This factor of safety has been utilized for this FRP to address unknowns at the identified BMP locations which may reduce the affect that they would have on the high flow Q0.3 model results once designed and fully implemented. With the current factor of safety, it may be necessary to identify additional potential sites through the annual FRP review process if constructed BMP's cannot meet modeled specifications.

As described previously, the above results for the low flow Q95 have been shown for SWMP planning purposes only since the current Allen Brook TMDL does not have a Q95 FRP target requirement.

IV. DESIGN, CONSTRUCTION & FRP INCORPORATION SCHEDULE

In accordance with the MS4 permit, an FRP requires a design and construction schedule for the identified BMP's. This schedule must provide for implementation of the BMP's as soon as possible, but longer than 20 years from the effective date (12/5/12) of the MS4 General Permit re-issuance. The permittees will implement the identified BMP's upon the schedule as set forth in the Final MS4 General Permit once issued.

The Town has reached agreements with the expired permit owners which are part of residential properties/developments to obtain responsibility of the new BMP's and stormwater permits as listed in Table 4. On an incremental basis, once the upgrades have been constructed and inspected, the FRP Incorporation Forms for these permits will be submitted to the VTDEC. The Stormwater Agreements for these residential properties are included as Appendix G.

Table 4: VTDEC Permit Status

Expired Permit Holders	Permit #	Permit Entity	Construct By Date	Permit Flow Restoration Plan Designation	
				To Be Incorporated into MS4 General Permit Upon Completion	Permit Retained by Permit Holder
Allen Brook School	1-1230	School	Pending		X
Allenbrook Meadows	2-0954	Residential	December, 2020	X	
Brennan Woods Neighborhood	1-1272	Residential	October, 2022	X	
Coyote Run	1-1507	Residential	September, 2021	X	
Golf Links Neighborhood	2-1180	Residential	December, 2021	X	

Expired Permit Holders	Permit #	Permit Entity	Construct By Date	Permit Flow Restoration Plan Designation	
				To Be Incorporated into MS4 General Permit Upon Completion	Permit Retained by Permit Holder
Hampton Direct (KBA-Planeta)	1-1078	Commercial	October, 2026		X
Heritage Meadows	1-1258	Residential	July, 2026	X	
Hillside East Lot 14	1-0754	Commercial	October, 2021		X
Hillside East Lot 16 17 (Industrial Park)	1-1245	Commercial	October, 2026		X
Hillside East Lot 5	1-0530	Commercial	October, 2026		X
Hillside East Lot 7 (Commercial Park)	1-1205	Commercial	October, 2026		X
Hillside East Lots 12 13 13A	1-1301	Commercial	October, 2026		X
Taft Farms - Indian Ridge	1-1217	Residential	June, 2023	X	
Meadow Run and Forest Run Neighborhood	2-1190	Residential	December, 2024	X	
Meadowridge Neighborhood	2-1107	Residential	October, 2026	X	
Old Stage Estates	2-1146	Residential	August, 2026	X	
Pleasant Acres	2-0231	Residential	December, 2019	X	
South Ridge Neighborhood	1-0664	Residential	October, 2026	X	
Tafts Farms Lots A & B	1-0513 & 1-1275	Commercial	Pending		X
Tafts Farms Lots - Condominiums	1-0513	Residential	June, 2023	X	
Tafts Farms Lots C & D	1-0513 1-0792	Commercial	October, 2026		X
Tafts Farms Lots F & G		Commercial	October, 2026		X
Tafts Farms Lot H		Commercial	October, 2021		X
Turtle Crossing		Residential	October, 2021	X	
Turtle Pond	2-1191	Residential	September, 2021	X	
Whitney Hill	1-0963	Residential	October, 2021	X	
Williston Central School	1-0932	School	Pending		X
Williston Commons	1-1052	Residential	October, 2026	X	
Town Hall Fields		Town Owned	October, 2021	X	
Mahan Farms		Town Owned	October, 2026	X	

V. FINANCIAL PLAN

In accordance with the MS4 permit, an FRP requires a financing plan that estimates the costs for implementing the FRP and describes a strategy for financing the plan.

The implementation costs for the proposed BMP's for the Allen Brook FRP have been calculated utilizing the VTDEC BMPDSS planning cost rates as outlined in a memorandum from Tetra Tech, Inc. dated October 30, 2007. These cost rates are at a base year 2000 and have been updated to account for inflation to year 2016 utilizing a 2.5% rate of inflation. This calculation incorporates the following for calculation of the construction costs for BMP's

Total Cost = Installation Cost [I] + Land Cost [L] + Fixed Cost [F]

Detention BMP
I = \$5 per ft^3 which inflated at 2.5% to year 2016 rates = \$7.42 per ft^3
I = \$323,325 per acre-foot

Infiltration BMP
I = \$6 per ft^3 which inflated at 2.5% to year 2016 rates = \$8.91 per ft^3
I = \$387,990 per acre-foot
L = \$0 for our BMP's since no property is anticipated to be purchased
F = \$2000 for design & permitting

Table 5: Projected BMP Implementation Costs

TOWN PARCELS			
Permit #	**BMP Location**	**Volume, Acre-ft**	**Installation Cost**
	Town Offices Fields	1.5	\$486,988
	North of I-89	2.4	\$777,980
TOTAL WILLISTON PARCEL BMP'S			**\$1,264,968**

The above construction cost estimates provide a planning level estimate for overall FRP planning Individual sites and BMP's will require additional review through design and engineering feasibility analysis to confirm if their costs are higher or lower than these. For instance, many of the expired permitted sites already have structural practices that may make implementation easier (or potentially harder). The MS4 SWMP annual report should look to update these costs periodically based on additional available information.

Funding for the implementation of the FRP will be addressed by the Town and VTrans for their individual identified BMP's only. For Town parcel BMP's, funding will be evaluated as part of the Williston Town General Fund. For VTrans I-89 BMP's, funding will be incorporated as part of the State Transportation budget, which also has the potential for Federal Aid Highway funding. As private entities, the controlling interests at the expired permit sites would primarily be responsible for funding their stormwater improvements. However, if grants become available, these will be utilized to provide funding for any of the above as able.

VI. REGULATORY ANALYSIS

In accordance with the MS4 permit, an FRP requires a regulatory analysis that identifies and describes what, if any, additional regulatory authorities, including authority to require low impact development BMP's, that the permittees (Williston and VTrans) will need to effectively implement the FRP.

Currently, stormwater runoff within the Allen Brook watershed is regulated primarily by the VTDEC, Town of Williston, and VTrans. VTDEC regulates new developments through issuance of Stormwater Discharge Permits with technical requirements as outlined in the 2002 Vermont Stormwater Manual. The Town of Williston requires improved stormwater practices and low impact development for new developments through the Town bylaws. VTrans regulates stormwater discharges to the state Right of Way through 19V.S.A.1111 "Permitted use of the right-of-way".

The implementation of the Allen Brook FRP does not require a modification to the above current regulatory framework. Since the Town and VTrans have identified BMP's for the expired permit sites, Town parcels, and VTrans I-89 locations which reduce Allen Brook flows beyond the TMDL target, no additional regulatory authority would be required as part of this FRP.

VII. IDENTIFICATION OF REGULATORY ASSISTANCE

In accordance with the MS4 permit, an FRP requires an identification of regulatory assistance the permittees (Williston and VTrans) will need in order to effectively implement the FRP (e.g. use of residual designation authority by the Secretary). Stormwater discharges that the permitting authority determines requires stormwater controls based on waste load allocations that are part of TMDL's that address the pollutants of concern is a discharge category that may be residually designated under 40 CFR 122.26 (a)(9)).

Since the Town and VTrans have identified BMP's for the stormwater permit sites, Town parcels, and VTrans I-89 locations which reduce Allen Brook flows beyond the TMDL reduction threshold, no additional regulatory assistance would be required as part of this FRP.

VIII. THIRD PARTY IMPLEMENTATION

In accordance with the MS4 permit, an FRP requires identification of the name of any party, other than the permittee, that is responsible for implementing any portion of the FRP.

The controlling interest for each of the above listed stormwater permit sites will need to implement the identified BMP practices to meet their current VTDEC permit requirements. This in turn, will address a component of the TMDL target reductions as described in this FRP. To ensure the compliance of these expired permit sites, the MS4 permittees request that the VTDEC utilize its current residual designation authority (RDA) to enforce these permit requirements.

Given the progress made in upgrading these expired permit sites, the MS4 will only request RDA if the agreed upon improvements are not implemented in accordance with agreements and EFA's.

The Town of Williston has come to agreement with the residential properties from the above listed permit sites that upon completion of construction and certification by a Vermont licensed professional engineer that the BMP was constructed as permitted and designed the Town will take on responsibility of the stormwater permit and all responsibilities associated with the permit, such as maintenance and future improvements.

IX. SUMMARY

The Town of Williston and VTrans as the MS4 permittees, have developed the foregoing Flow Restoration Plan for the impaired Allen Brook Watershed under a Memorandum of Understanding. This agreement was developed to provide for the development of a shared plan within the watershed. The resulting Best Management Practices that constitute the Allen Brook FRP are as follows:

- Update of above listed VTDEC expired stormwater discharge permit properties by the individual property controlling interests.

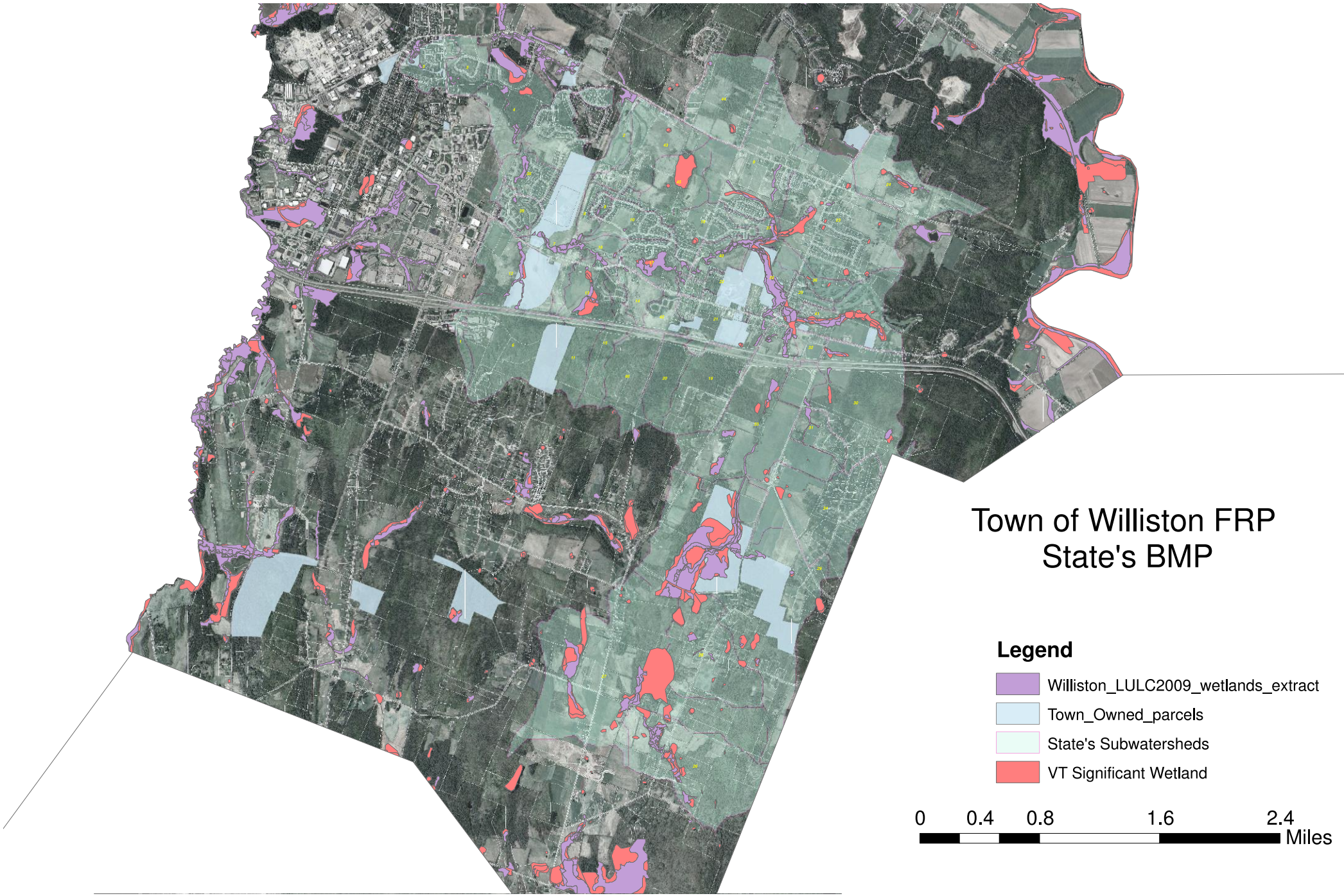
- Town of Williston to implement BMP practices at the following locations
    - Parcel between U.S. Route 2 & Interstate I-89
    - Parcel behind Town Offices

- VTrans to implement BMP practices within the Interstate I-89 corridor at the following locations
    - Williston Welcome Center
    - Five Median Areas

Upon approval by the Secretary, this Flow Restoration Plan shall be part of the permittee's SWMP. The permittee shall estimate and discuss in its annual report any progress towards meeting the flow restoration target from its MS4 in the previous year. The permittee shall base the estimate on quantifiable measures attributable to implementation of its FRP and its overall SWMP. The permitee shall submit to the Secretary the status of completion and implementation of stormwater BMP's identified in the FRP in the SWMP annual report.

APPENDIX A

ALLEN BROOK SUBWATERSHED MAP


Town of Williston FRP
State's BMP
Legend
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Town_Owned_parcels
State's Subwatersheds
VT Significant Wetland
0
0.4
0.8
1.6
2.4
Miles

APPENDIX B

EXPIRED STORMWATER DISCHARGE PERMITS

AERIAL MAPS AND CPv BMP MODELS

APPENDIX B – INDEX

VERMONT

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov

LEGEND

- Parcels (where available)
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

Back to Index

241.0 0 120.00 241.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 396 Ft. 1cm = 47 Meters

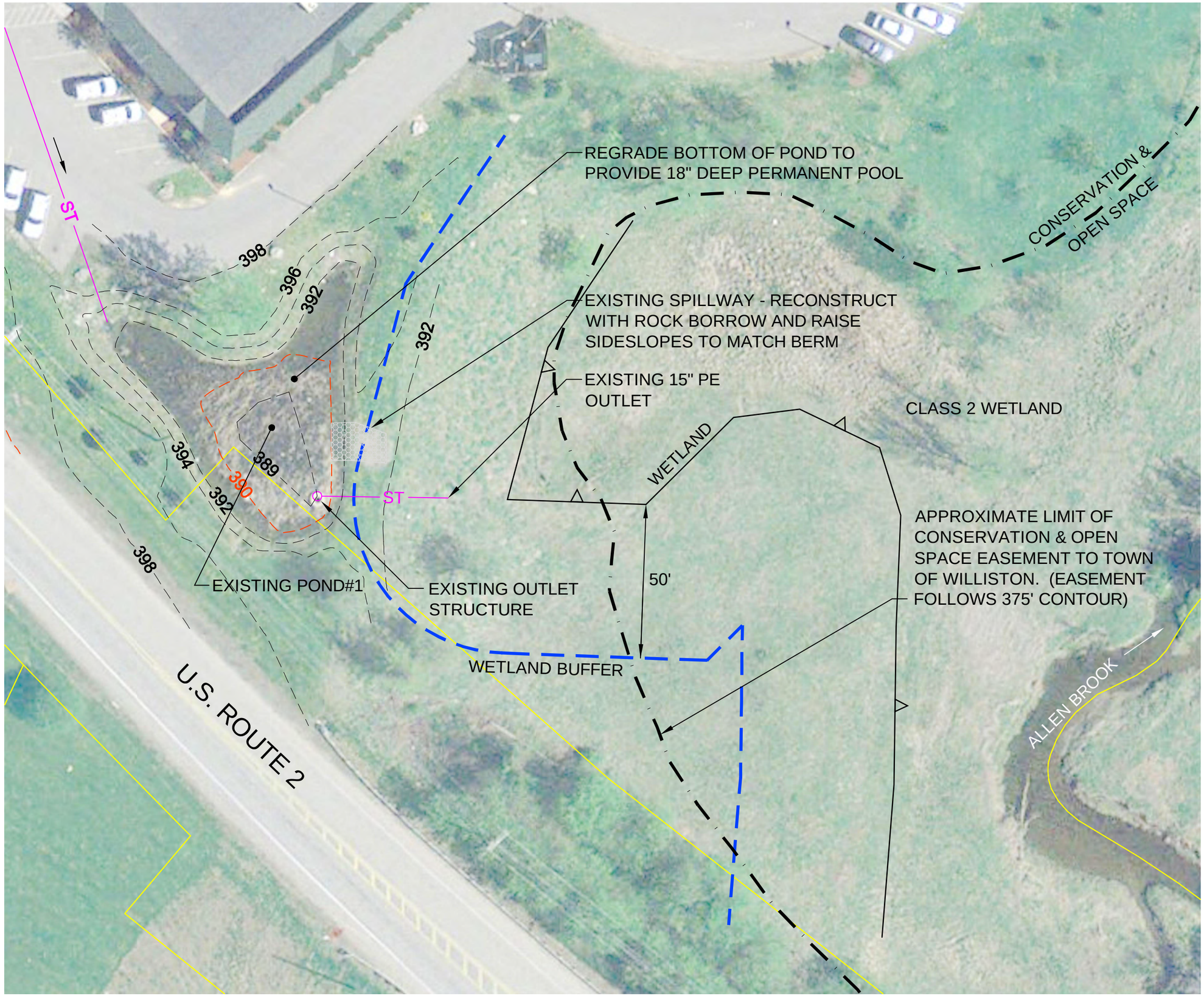
THIS MAP IS NOT TO BE USED FOR NAVIGATION

150 0 75 150 300

1 inch = 150 ft.

TAFT FARM LOTS A & B
POND SUBWATERSHEDS

NOVEMBER 2014



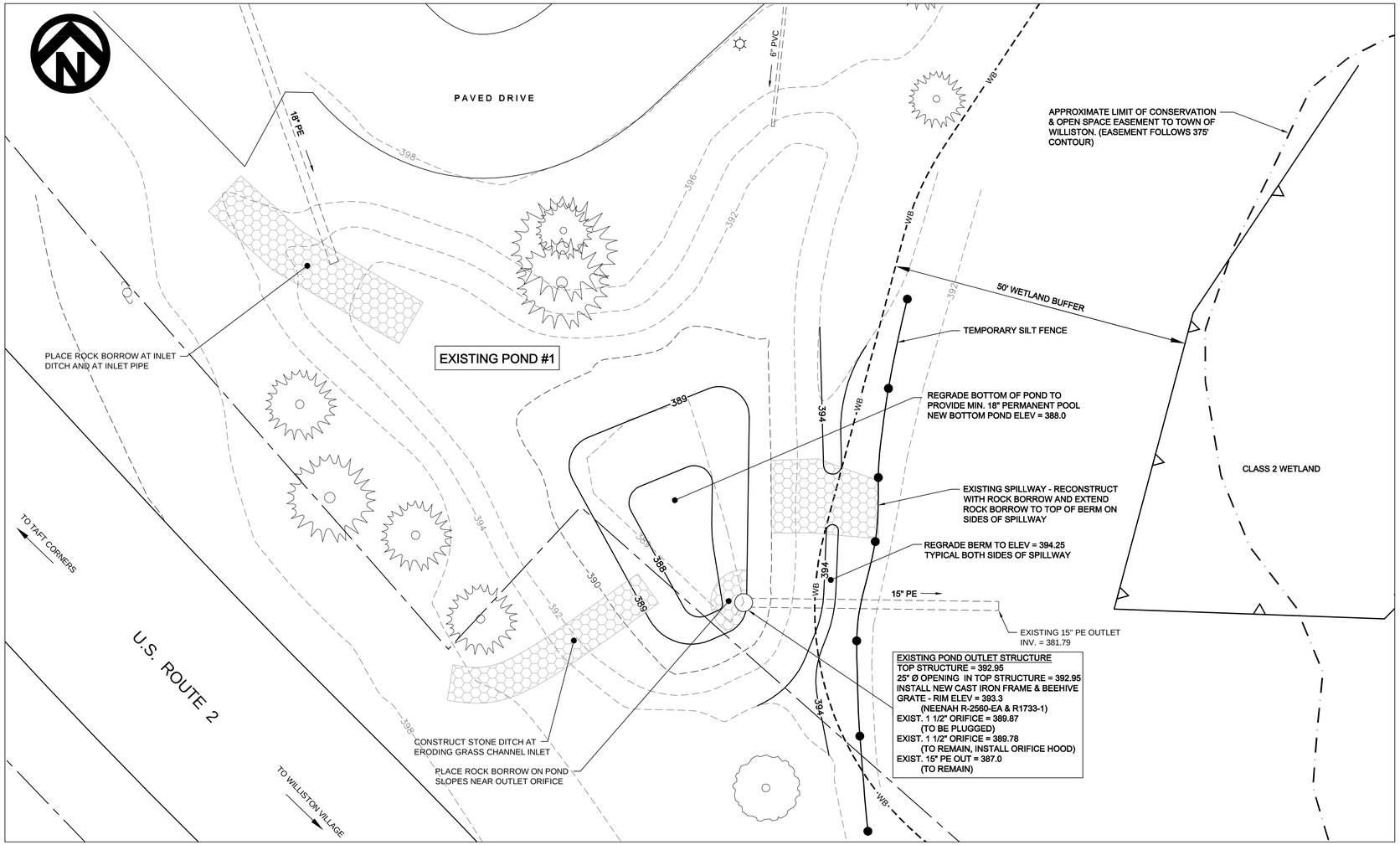
EXIST POND OUTLET STRUCTURE
TOP = 392.95
25" Ø TOP OPENING = 392.95
(ADD FRAME & GRATE)
1 1/2" ORIFICE = 389.87
(TO BE PLUGGED)
1 1/2" ORIFICE = 389.78
15" PE OUT = 387.0

POND 1 RECOMMENDATIONS
- MODIFY OUTLET STRUCTURE AS NOTED ABOVE
- REGRADE BOTTOM OF POND TO PROVIDE 18" DEEP PERMANENT POOL. ADD STONE FILL AS REQUIRED TO STABILIZE INLETS

30 0 15 30 60
1 inch = 30 ft.

TAFT FARM LOTS A & B
DISCHARGE 001
POND #1
CONCEPTUAL DESIGN

NOVEMBER 2014



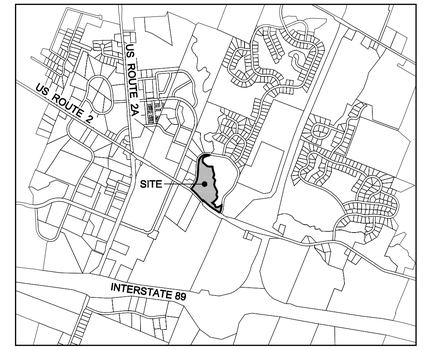
GRAPHIC SCALE

10 0 5 10 20 40

(in feet)

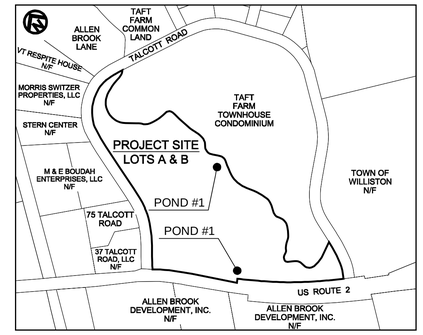
1 inch = 10 ft.

THE CONTRACTOR SHALL NOTIFY 'DIGSAFE' PRIOR TO ANY EXCAVATION



VICINITY MAP

NOT TO SCALE



75 TALCOTT ROAD
ALBEM, LLP
TALCOTT TWENTY, LLC
JACOB H PROPERTIES, LLC

ALLEN BROOK LANE
KAROUN HOLDINGS, LLC
MORRIS SWITZER PROPERTIES, , LLC
BLACK DOG HOLDINGS, LLC
MBF PROPERTIES, LLC
W. SPENCER & NANCY J. BAKER

PROJECT AND ABUTTING PARCELS

NOT TO SCALE

EROSION CONTROL NOTES

1. IT IS ANTICIPATED THAT LESS THAN 1 ACRE OF EARTH DISTURBANCE WILL OCCUR DURING PROJECT CONSTRUCTION. SHOULD THE CONTRACTOR'S OPERATIONS RESULT IN MORE THAN 1 ACRE OF EARTH DISTURBANCE, THE CONTRACTOR WILL BE RESPONSIBLE FOR ADDITIONAL PERMITTING WITH THE AGENCY OF NATURAL RESOURCES (ANR) VIA FILING A JOINT NOTICE OF INTENT WITH THE LANDOWNER FOR COVERAGE UNDER THE APPROPRIATE CONSTRUCTION GENERAL PERMIT (CGP 3-9020 OR INDIVIDUAL PERMIT) PRIOR TO SUCH DISTURBANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY NECESSARY EROSION PREVENTION AND SEDIMENT CONTROL MEASURES NEEDED TO SATISFY ANY SUCH PERMIT REQUIREMENTS. REGARDLESS OF PERMIT APPLICABILITY, THE CONTRACTOR IS ALWAYS RESPONSIBLE FOR ENSURING THAT PROPER EROSION PREVENTION AND SEDIMENT CONTROL TECHNIQUES ARE UTILIZED DURING CONSTRUCTION.
2. ANR'S "LOW RISK SITE HANDBOOK FOR EROSION PREVENTION AND SEDIMENT CONTROL" AND THE "VERMONT EROSION PREVENTION AND SEDIMENT CONTROL FIELD GUIDE" SHALL BE USED AS GUIDANCE DURING CONSTRUCTION.
3. THE AREA OF DISTURBED SOILS AND THE DURATION OF EXPOSURE OF THE DISTURBED SOILS SHALL BE MINIMIZED. TO ACCOMPLISH THIS, WORK EFFORT SHOULD BE FOCUSED ON THE COMPLETION AND STABILIZATION OF ONE TASK BEFORE PROCEEDING TO THE NEXT.
4. EROSION PREVENTION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED PRIOR TO AND FOLLOWING PRECIPITATION EVENTS, AND NOT LESS THAN ONCE EVERY SEVEN (7) DAYS. MAINTENANCE AND REPAIRS SHALL BE PROMPTLY COMPLETED.
5. TEMPORARY SOIL STOCKPILES SHALL BE MULCHED WITH HAY AND TEMPORARY SILT FENCE INSTALLED AROUND THE DOWNSLOPE PERIMETER OF THE PILES.
6. INLET PROTECTION SHALL BE INSTALLED AT ALL STORMWATER INLETS IN THE PROJECT WORK AREA.
7. THE CONTRACTOR SHALL SWEEP THE PAVEMENT AS NEEDED TO REMOVE ANY TRACKED SEDIMENT AND TO CONTROL DUST.
8. DISTURBED AREAS THAT ARE NOT BEING ACTIVELY WORKED SHALL BE STABILIZED WITH TEMPORARY SEED AND MULCH OR MATTING.
9. THE CONTRACTOR SHALL REMOVE ALL TEMPORARY EROSION PREVENTION AND SEDIMENT CONTROL MEASURES AFTER FINAL STABILIZATION AND PRIOR TO COMPLETION OF THE PROJECT.
10. PAYMENT FOR THE DISPOSAL OF UNSUITABLE OR EXCESS MATERIAL AT AN OFFSITE LOCATION INCLUDING TEMPORARY AND PERMANENT EROSION PREVENTION AND SEDIMENT CONTROL MEASURES, SHALL NOT BE PAID SEPARATELY, BUT SHALL BE INCIDENTAL TO THE VARIOUS ITEMS REQUIRED FOR COMPLETION OF THE WORK SHOWN ON THE PLANS.
11. PAYMENT FOR TEMPORARY STABILIZED BASE IN STAGING OR STORAGE AREAS OR TEMPORARY ACCESS ROADS SHALL NOT BE PAID SEPARATELY, BUT SHALL BE INCIDENTAL TO THE VARIOUS ITEMS REQUIRED FOR COMPLETION OF THE WORK SHOWN ON THE PLANS.

LEGEND

- PROPERTY BOUNDARY
- CONSEVATION BOUNDARY
- WB — WETLAND BUFFER
- 384 — EXISTING GROUND CONTOUR
- 388 — FINISH GRADE CONTOUR
- EXISTING STORMWATER PIPE & STRUCTURE
- WETLAND BOUNDARY
- EXISTING TREES
- TEMPORARY SILT FENCE

SHEET INDEX

NOTES:

1. THE PURPOSE OF THIS PLAN IS TO PRESENT THE PROPOSED IMPROVEMENTS TO THE EXISTING STORM POND. SEE OTHER PLANS FOR ADDITIONAL DESIGN INFORMATION AND CONSTRUCTION DETAILS.
2. BOUNDARY INFORMATION SHOWN IS BASED UPON TAX MAP PARCEL LINES.
3. EXISTING CONDITIONS SHOWN HEREON ARE BASED UPON A TOPOGRAPHIC SURVEY PERFORMED BY L&D IN SEPTEMBER 2014.
4. THE WETLAND DELINEATION WAS PERFORMED BY L&D IN NOVEMBER 2014.
5. THE SPECIAL FLOOD HAZARD ZONE IS BASED UPON THE FLOOD INSURANCE RATE MAP FOR CHITTENDEN COUNTY, PANEL 278 OF 500, MAP NUMBER 50007C0278D, WITH AN EFFECTIVE DATE OF JULY 18, 2011.

Date	Revision	By

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ■ Preliminary
- ☐ Final
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

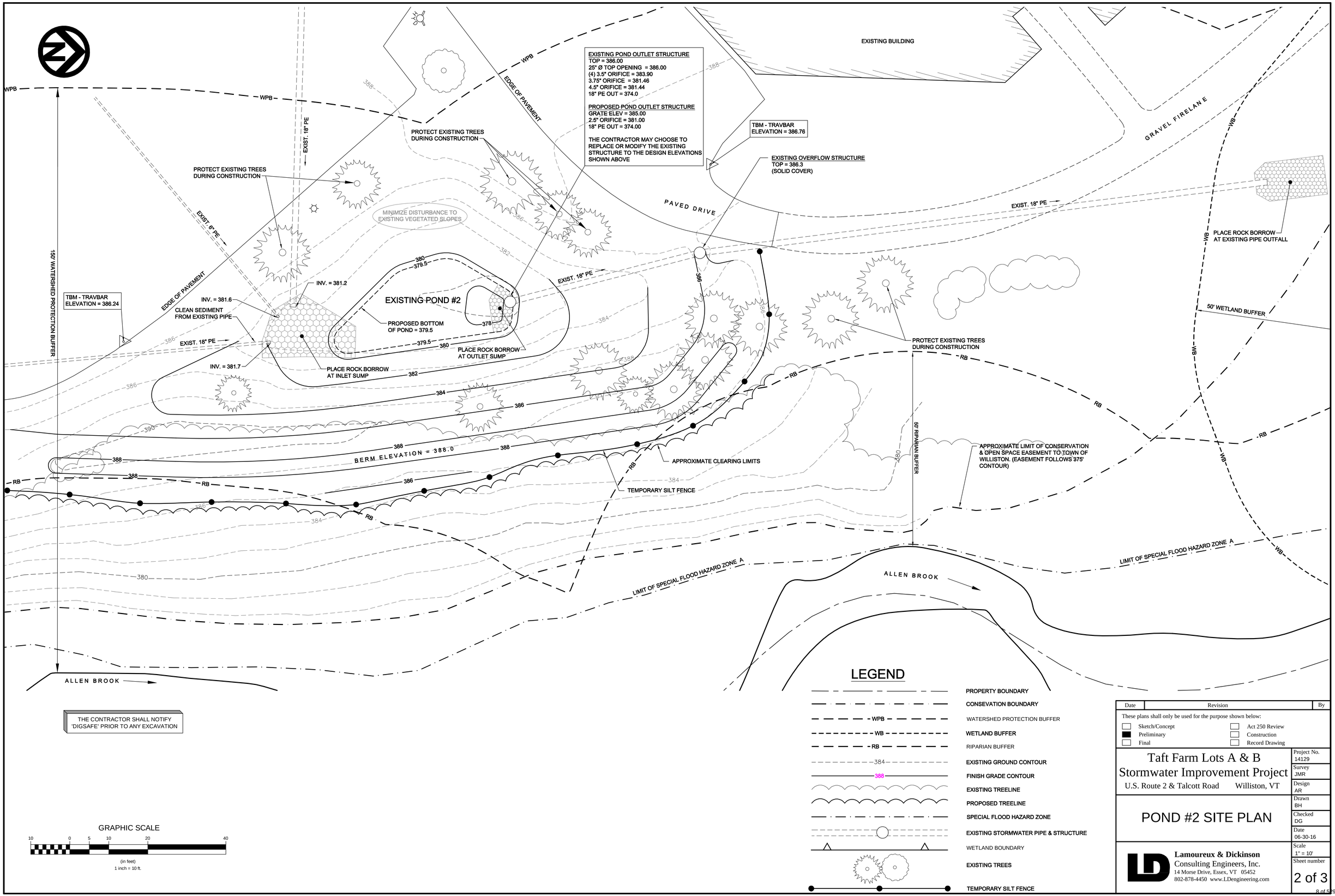
Taft Farm Lots A & B Stormwater Improvement Project

U.S. Route 2 & Talcott Road Williston, VT

POND #1 SITE PLAN

Project No.	14129
Survey	JMR
Design	AR
Drawn	BH
Checked	DG
Date	06-30-16
Scale	1" = 10'
Sheet number	1 of 3

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com



THE CONTRACTOR SHALL NOTIFY 'DIGSAFE' PRIOR TO ANY EXCAVATION

GRAPHIC SCALE

10 0 5 10 20 40

(in feet)
1 inch = 10 ft.

LEGEND

- PROPERTY BOUNDARY
- CONSEVATION BOUNDARY
- WPB — WATERSHED PROTECTION BUFFER
- WB — WETLAND BUFFER
- RB — RIPARIAN BUFFER
- 384 — EXISTING GROUND CONTOUR
- 388 — FINISH GRADE CONTOUR
- EXISTING TREELINE
- PROPOSED TREELINE
- SPECIAL FLOOD HAZARD ZONE
- EXISTING STORMWATER PIPE & STRUCTURE
- WETLAND BOUNDARY
- EXISTING TREES
- TEMPORARY SILT FENCE

Date	Revision	By

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ■ Preliminary
- ☐ Final
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

Taft Farm Lots A & B Stormwater Improvement Project

U.S. Route 2 & Talcott Road Williston, VT

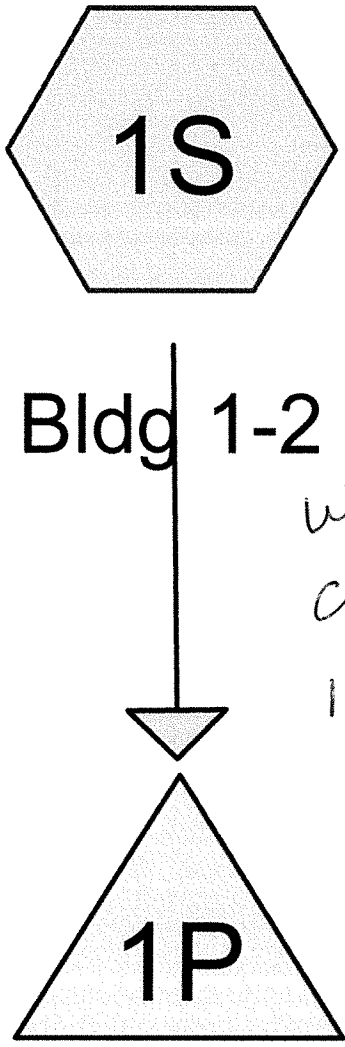
POND #2 SITE PLAN

Project No.	14129
Survey	JMR
Design	AR
Drawn	BH
Checked	DG
Date	06-30-16
Scale	1" = 10'
Sheet number	2 of 3

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com

POND 1

MODIFIED



	Q, CFS	ELEV
WQV	0.06	391.0
CPV	0.10	392.77
10YR	2.68	393.2

Exist Pond

PROPOSED MODIFICATIONS

- PLUG (1) 1½" ORIFICE
- ADD ORIFICE HOOD TO PREVENT CLOGGING

Subcat Reach Pond Link

Drainage Diagram for Exist Pond1
Prepared by Lamoureux & Dickinson, Printed 11/19/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.810	80	>75% Grass cover, Good, HSG D (1S)
0.340	98	Rt 2, Talcott, path (1S)
0.560	98	pavement & sidewalk (1S)
0.700	98	rooftop (1S)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.63 cfs @ 11.99 hrs, Volume= 0.096 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth = 0.48" for WQv event
Inflow = 1.63 cfs @ 11.99 hrs, Volume= 0.096 af
Outflow = 0.06 cfs @ 13.86 hrs, Volume= 0.095 af, Atten= 96%, Lag= 112.4 min
Primary = 0.06 cfs @ 13.86 hrs, Volume= 0.095 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 390.99' @ 13.86 hrs Surf.Area= 2,588 sf Storage= 3,191 cf (2,483 cf above start)

Plug-Flow detention time= 662.8 min calculated for 0.079 af (82% of inflow)
Center-of-Mass det. time= 474.1 min (1,272.0 - 797.9)

708 CF PERMANENT POOL

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 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)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads
#3	Secondary	393.30'	**10.0' 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=0.06 cfs @ 13.86 hrs HW=390.99' (Free Discharge)
└─**1=Orifice1** (Orifice Controls 0.06 cfs @ 5.16 fps)
└─**2=Top opening** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=389.78' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.85 cfs @ 11.99 hrs, Volume= 0.292 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth = 1.45" for 1 year event
Inflow = 4.85 cfs @ 11.99 hrs, Volume= 0.292 af
Outflow = 0.10 cfs @ 16.11 hrs, Volume= 0.237 af, Atten= 98%, Lag= 247.2 min
Primary = 0.10 cfs @ 16.11 hrs, Volume= 0.237 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 392.77' @ 16.11 hrs Surf.Area= 4,114 sf Storage= 9,280 cf (8,572 cf above start)

CPV

Plug-Flow detention time= 859.9 min calculated for 0.220 af (75% of inflow)
Center-of-Mass det. time= 700.8 min (1,480.3 - 779.6)

→ 11.7 HRS DETENTION.

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 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)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads
#3	Secondary	393.30'	**10.0' 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=0.10 cfs @ 16.11 hrs HW=392.77' (Free Discharge)
↑—**1=Orifice1** (Orifice Controls 0.10 cfs @ 8.24 fps)
└—**2=Top opening** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=389.78' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 7.80 cfs @ 11.99 hrs, Volume= 0.472 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.10"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth = 2.35" for 10 year event
Inflow = 7.80 cfs @ 11.99 hrs, Volume= 0.472 af
Outflow = 2.68 cfs @ 12.21 hrs, Volume= 0.396 af, Atten= 66%, Lag= 13.1 min
Primary = 2.68 cfs @ 12.21 hrs, Volume= 0.396 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 393.19' @ 12.21 hrs Surf.Area= 4,405 sf Storage= 11,078 cf (10,371 cf above start)

Plug-Flow detention time= 575.7 min calculated for 0.379 af (80% of inflow)
Center-of-Mass det. time= 462.4 min (1,234.7 - 772.3)

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 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)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads
#3	Secondary	393.30'	**10.0' 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=2.58 cfs @ 12.21 hrs HW=393.19' (Free Discharge)
↑—**1=Orifice1** (Orifice Controls 0.11 cfs @ 8.81 fps)
└—**2=Top opening** (Weir Controls 2.48 cfs @ 1.59 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=389.78' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 9.61 cfs @ 11.99 hrs, Volume= 0.583 af, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 25 year Rainfall=3.70"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth > 2.90" for 25 year event
Inflow = 9.61 cfs @ 11.99 hrs, Volume= 0.583 af
Outflow = 6.85 cfs @ 12.12 hrs, Volume= 0.503 af, Atten= 29%, Lag= 7.5 min
Primary = 6.26 cfs @ 12.12 hrs, Volume= 0.498 af
Secondary = 0.60 cfs @ 12.10 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 393.39' @ 12.12 hrs Surf.Area= 4,543 sf Storage= 11,949 cf (11,241 cf above start)

Plug-Flow detention time= 466.7 min calculated for 0.486 af (83% of inflow)
Center-of-Mass det. time= 370.6 min (1,139.7 - 769.1)

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 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)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads
#3	Secondary	393.30'	**10.0' 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=5.71 cfs @ 12.12 hrs HW=393.36' (Free Discharge)
↑—**1=Orifice1** (Orifice Controls 0.11 cfs @ 9.03 fps)
└—**2=Top opening** (Weir Controls 5.60 cfs @ 2.09 fps)

Secondary OutFlow Max=0.58 cfs @ 12.10 hrs HW=393.38' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Weir Controls 0.58 cfs @ 0.73 fps)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 11.44 cfs @ 11.99 hrs, Volume= 0.697 af, Depth> 3.47"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 100 year Rainfall=4.30"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth > 3.47" for 100 year event
Inflow = 11.44 cfs @ 11.99 hrs, Volume= 0.697 af
Outflow = 9.38 cfs @ 12.08 hrs, Volume= 0.615 af, Atten= 18%, Lag= 5.6 min
Primary = 7.83 cfs @ 12.08 hrs, Volume= 0.598 af
Secondary = 1.55 cfs @ 12.09 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 393.46' @ 12.08 hrs Surf.Area= 4,593 sf Storage= 12,266 cf (11,558 cf above start)

Plug-Flow detention time= 395.8 min calculated for 0.599 af (86% of inflow)
Center-of-Mass det. time= 309.9 min (1,076.4 - 766.5)

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 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)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

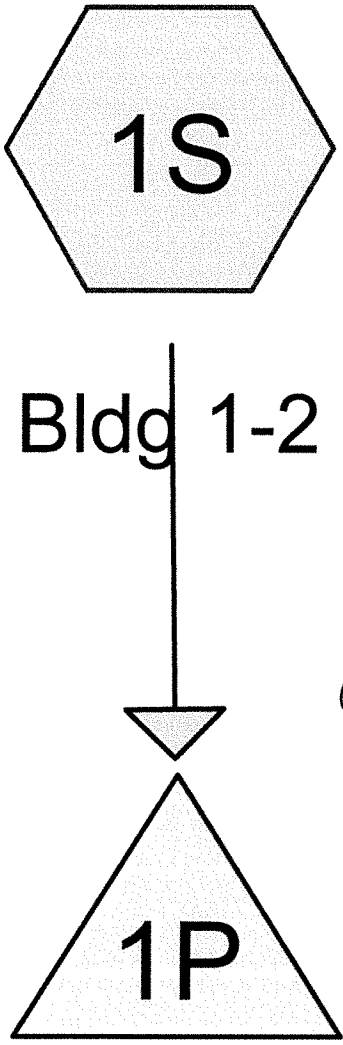
Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads
#3	Secondary	393.30'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 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=7.42 cfs @ 12.08 hrs HW=393.44' (Free Discharge)
└─**1=Orifice1** (Orifice Controls 0.11 cfs @ 9.13 fps)
└─**2=Top opening** (Weir Controls 7.31 cfs @ 2.29 fps)

Secondary OutFlow Max=1.40 cfs @ 12.09 hrs HW=393.44' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 1.40 cfs @ 0.97 fps)

POND 1

EXISTING



ROUTED

	Q, CFS	ELEV
WQV	0.12	390.87
CPV	0.19	392.45

Exist Pond

Subcat Reach Pond Link

Drainage Diagram for Exist Pond1
Prepared by Lamoureux & Dickinson, Printed 11/19/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.810	80	>75% Grass cover, Good, HSG D (1S)
0.340	98	Rt 2, Talcott, path (1S)
0.560	98	pavement & sidewalk (1S)
0.700	98	rooftop (1S)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.63 cfs @ 11.99 hrs, Volume= 0.096 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth = 0.48" for WQv event
Inflow = 1.63 cfs @ 11.99 hrs, Volume= 0.096 af
Outflow = 0.12 cfs @ 12.78 hrs, Volume= 0.096 af, Atten= 93%, Lag= 47.1 min
Primary = 0.12 cfs @ 12.78 hrs, Volume= 0.096 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 390.87' @ 12.78 hrs Surf.Area= 2,474 sf Storage= 2,875 cf (2,167 cf above start)

Plug-Flow detention time= 373.0 min calculated for 0.079 af (82% of inflow)
Center-of-Mass det. time= 231.9 min (1,029.8 - 797.9)

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 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)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	389.87'	**1.5" Vert. Orifice2** C= 0.600
#3	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 12.78 hrs HW=390.87' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.06 cfs @ 4.87 fps)
- **2=Orifice2** (Orifice Controls 0.06 cfs @ 4.65 fps)
- **3=Top opening** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.85 cfs @ 11.99 hrs, Volume= 0.292 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth = 1.45" for 1 year event
Inflow = 4.85 cfs @ 11.99 hrs, Volume= 0.292 af
Outflow = 0.19 cfs @ 13.77 hrs, Volume= 0.291 af, Atten= 96%, Lag= 106.8 min
Primary = 0.19 cfs @ 13.77 hrs, Volume= 0.291 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 392.45' @ 13.77 hrs Surf.Area= 3,900 sf Storage= 8,003 cf (7,295 cf above start)

Plug-Flow detention time= 521.2 min calculated for 0.275 af (94% of inflow)
Center-of-Mass det. time= 443.6 min (1,223.2 - 779.6)

→ 720 MIN DESIRED

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 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)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	389.87'	**1.5" Vert. Orifice2** C= 0.600
#3	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.19 cfs @ 13.77 hrs HW=392.45' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.10 cfs @ 7.78 fps)
- **2=Orifice2** (Orifice Controls 0.09 cfs @ 7.64 fps)
- **3=Top opening** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Bldg 1-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 7.80 cfs @ 11.99 hrs, Volume= 0.472 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.10"

	Area (ac)	CN	Description
*	0.340	98	Rt 2, Talcott, path
*	0.560	98	pavement & sidewalk
*	0.700	98	rooftop
	0.810	80	>75% Grass cover, Good, HSG D
	2.410	92	Weighted Average
	0.810	80	33.61% Pervious Area
	1.600	98	66.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.1500	0.21		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
2.9	300	0.0130	1.71		**Shallow Concentrated Flow, Swale** Grassed Waterway Kv= 15.0 fps
8.6	370	Total			

Summary for Pond 1P: Exist Pond

Inflow Area = 2.410 ac, 66.39% Impervious, Inflow Depth = 2.35" for 10 year event
Inflow = 7.80 cfs @ 11.99 hrs, Volume= 0.472 af
Outflow = 2.13 cfs @ 12.23 hrs, Volume= 0.469 af, Atten= 73%, Lag= 14.4 min
Primary = 2.13 cfs @ 12.23 hrs, Volume= 0.469 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 389.78' Surf.Area= 1,407 sf Storage= 708 cf
Peak Elev= 393.15' @ 12.24 hrs Surf.Area= 4,378 sf Storage= 10,905 cf (10,197 cf above start)

Plug-Flow detention time= 487.9 min calculated for 0.452 af (96% of inflow)
Center-of-Mass det. time= 436.0 min (1,208.3 - 772.3)

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	14,864 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

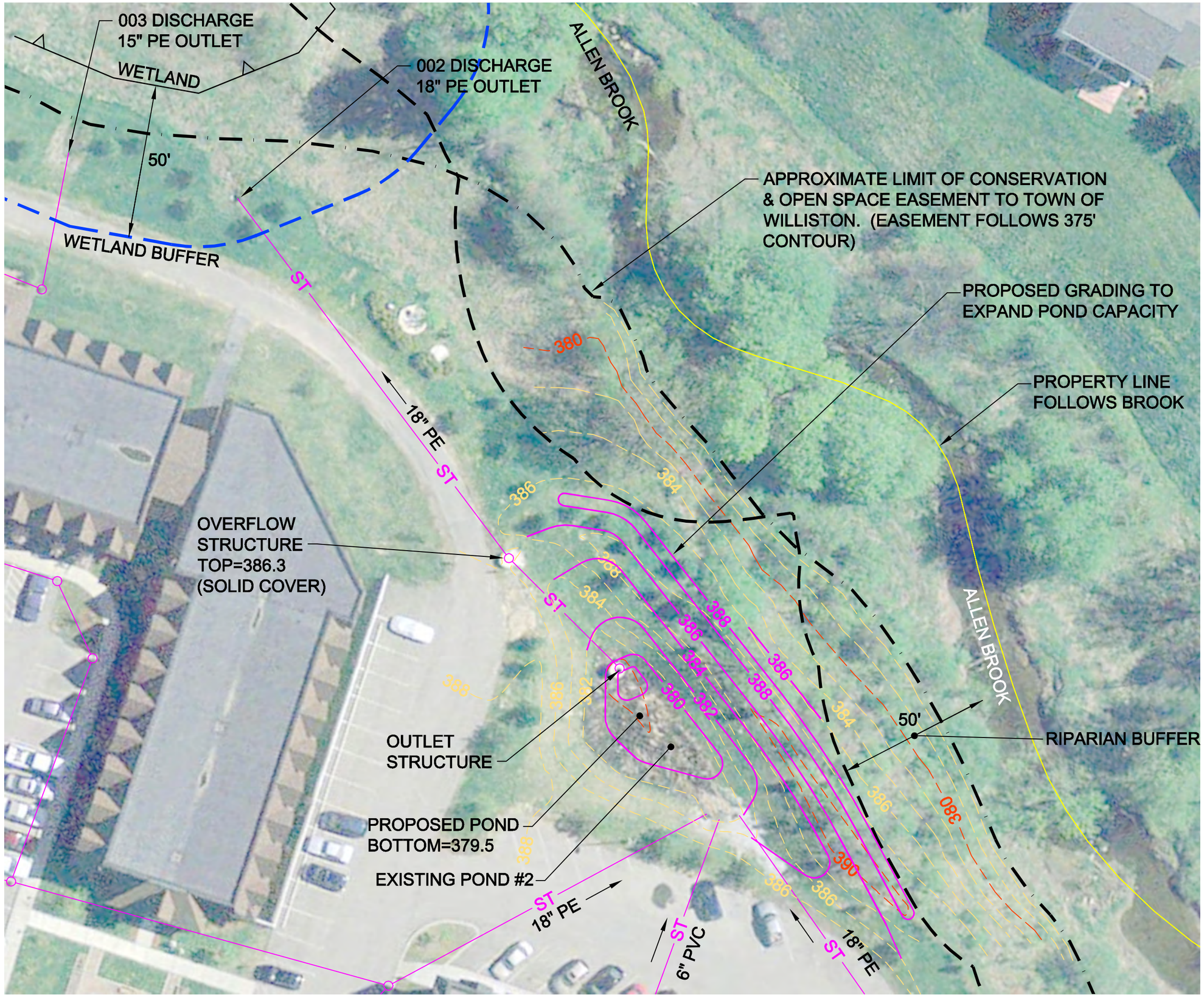
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
389.00	487	96.0	0	0	487
390.00	1,753	164.0	1,055	1,055	1,900
392.00	3,607	293.0	5,250	6,304	6,613
394.00	4,990	337.0	8,560	14,864	8,908

Device	Routing	Invert	Outlet Devices
#1	Primary	389.78'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	389.87'	**1.5" Vert. Orifice2** C= 0.600
#3	Primary	392.95'	**25.0" Horiz. Top opening** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.90 cfs @ 12.23 hrs HW=393.13' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.11 cfs @ 8.74 fps)
- **2=Orifice2** (Orifice Controls 0.11 cfs @ 8.61 fps)
- **3=Top opening** (Weir Controls 1.68 cfs @ 1.40 fps)

Attachment 6

Pond 1 Conceptual Design & HydroCad data



EXIST POND OUTLET STRUCTURE
TOP = 386.00
25" Ø TOP OPENING = 386.00
(4) 3.5" ORIFICE = 383.90
(2) 4.5" ORIFICE = 381.50
3.75" ORIFICE = 381.46
4.5" ORIFICE = 381.44

NEW OUTLET STRUCTURE
GRATE = 385.00
2.5" ORIFICE = 381.00
SPILLWAY = 385.40

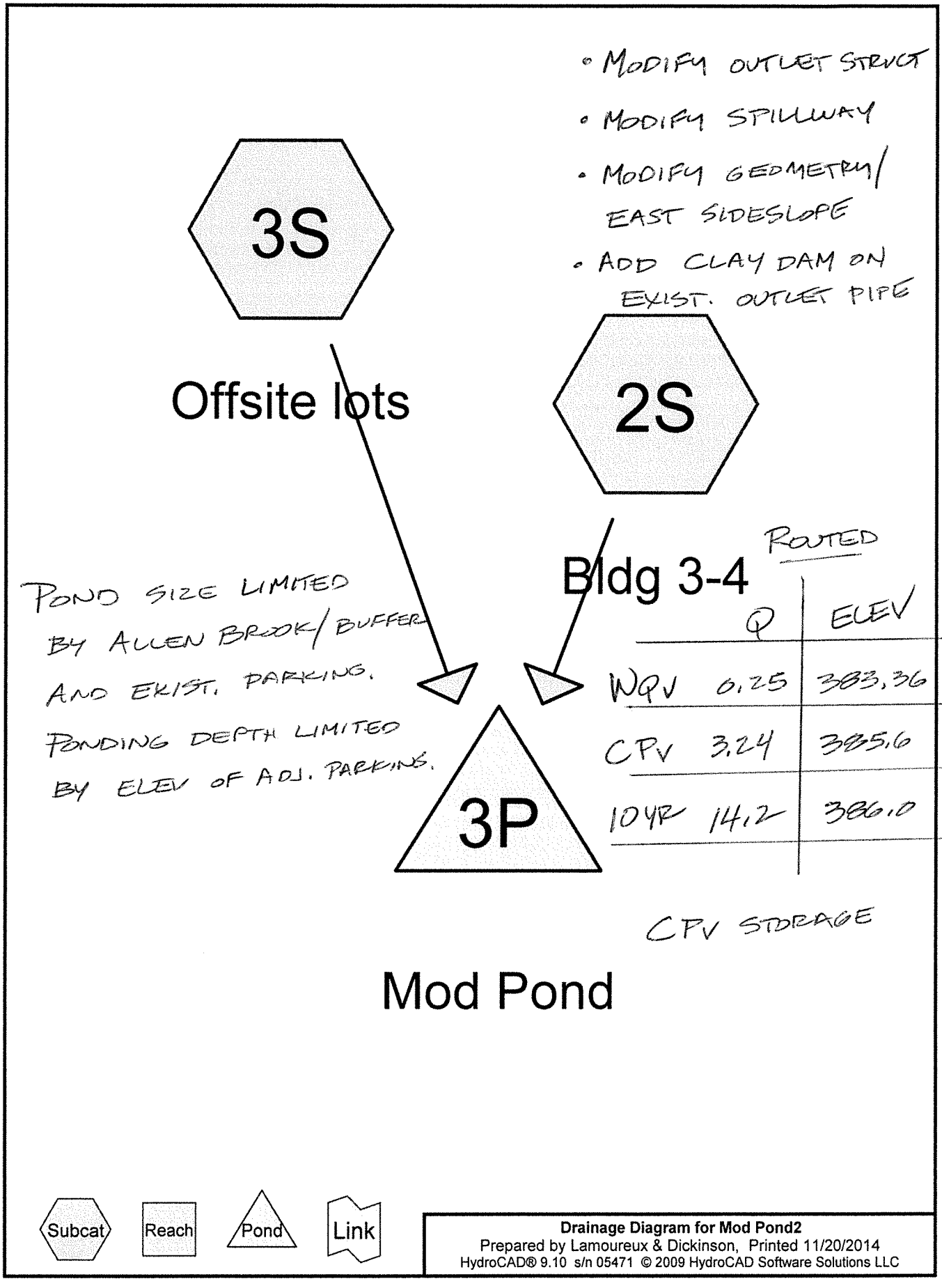
POND 2 RECOMMENDATIONS
- MODIFY OUTLET STRUCTURE AS NOTED ABOVE
- REGRADE BOTTOM OF POND TO PROVIDE 18" DEEP PERMANENT POOL. ADD STONE FILL AS REQUIRED TO STABILIZE INLETS
- CONSTRUCT NEW STONE SPILLWAY

30 0 15 30 60
1 inch = 30 ft.

TAFT FARM LOTS A & B
DISCHARGE 002
POND #2
CONCEPTUAL DESIGN

NOVEMBER 2014

MOD. POND 2



ROUTED

	Q	ELEV
WQV	0.25	383.36
CPV	3.24	385.6
10YR	14.2	386.0

CPV STORAGE

Drainage Diagram for Mod Pond2
Prepared by Lamoureux & Dickinson, Printed 11/20/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.200	80	>75% Grass cover, Good, HSG D (2S, 3S)
3.150	98	Pavement & walks (2S, 3S)
0.680	98	Rooftop (2S, 3S)
0.190	98	Talcott & path (2S)

Summary for Subcatchment 2S: Bldg 3-4

Runoff = 3.08 cfs @ 12.03 hrs, Volume= 0.194 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.190	98	Talcott & path
*	0.530	98	Rooftop
*	2.510	98	Pavement & walks
	1.490	80	>75% Grass cover, Good, HSG D
	4.720	92	Weighted Average
	1.490	80	31.57% Pervious Area
	3.230	98	68.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	90	0.0500	0.14		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.0	510	0.0200	8.41	14.86	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
11.7	600	Total			

Summary for Subcatchment 3S: Offsite lots

Runoff = 0.81 cfs @ 12.01 hrs, Volume= 0.049 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.150	98	Rooftop
*	0.640	98	Pavement & walks
	0.710	80	>75% Grass cover, Good, HSG D
	1.500	89	Weighted Average
	0.710	80	47.33% Pervious Area
	0.790	98	52.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1100	0.20		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.2	730	0.0300	10.30	18.19	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
9.7	830	Total			

Summary for Pond 3P: Mod Pond

Inflow Area = 6.220 ac, 64.63% Impervious, Inflow Depth = 0.47" for WQv event
Inflow = 3.86 cfs @ 12.03 hrs, Volume= 0.243 af
Outflow = 0.25 cfs @ 13.07 hrs, Volume= 0.259 af, Atten= 94%, Lag= 62.8 min
Primary = 0.25 cfs @ 13.07 hrs, Volume= 0.259 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Starting Elev= 381.44' Surf.Area= 1,720 sf Storage= 2,200 cf
Peak Elev= 383.36' @ 13.07 hrs Surf.Area= 3,367 sf Storage= 6,959 cf (4,760 cf above start)

Plug-Flow detention time= 386.6 min calculated for 0.208 af (86% of inflow)
Center-of-Mass det. time= 200.8 min (1,001.8 - 801.0)

Volume	Invert	Avail.Storage	Storage Description
#1	379.50'	19,949 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)
379.50	549	103.0	0	0	549
380.00	887	122.0	356	356	894
382.00	2,117	191.0	2,916	3,272	2,641
384.00	4,060	299.0	6,072	9,344	6,880
386.00	6,651	430.0	10,605	19,949	14,515

Device	Routing	Invert	Outlet Devices
#1	Primary	381.00'	**2.5" Vert. Orifice** C= 0.600
#2	Secondary	385.40'	**8.0' long x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Primary	385.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.25 cfs @ 13.07 hrs HW=383.36' (Free Discharge)
└**1=Orifice** (Orifice Controls 0.25 cfs @ 7.23 fps)
└**3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=381.44' (Free Discharge)
└**2=Spillway** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Bldg 3-4

Runoff = 9.05 cfs @ 12.03 hrs, Volume= 0.582 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.190	98	Talcott & path
*	0.530	98	Rooftop
*	2.510	98	Pavement & walks
	1.490	80	>75% Grass cover, Good, HSG D
	4.720	92	Weighted Average
	1.490	80	31.57% Pervious Area
	3.230	98	68.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	90	0.0500	0.14		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.0	510	0.0200	8.41	14.86	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
11.7	600	Total			

Summary for Subcatchment 3S: Offsite lots

Runoff = 2.67 cfs @ 12.01 hrs, Volume= 0.160 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.150	98	Rooftop
*	0.640	98	Pavement & walks
	0.710	80	>75% Grass cover, Good, HSG D
	1.500	89	Weighted Average
	0.710	80	47.33% Pervious Area
	0.790	98	52.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1100	0.20		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.2	730	0.0300	10.30	18.19	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
9.7	830	Total			

Summary for Pond 3P: Mod Pond

Inflow Area = 6.220 ac, 64.63% Impervious, Inflow Depth = 1.43" for 1 year event
Inflow = 11.66 cfs @ 12.03 hrs, Volume= 0.742 af
Outflow = 3.24 cfs @ 12.25 hrs, Volume= 0.758 af, Atten= 72%, Lag= 13.4 min
Primary = 3.24 cfs @ 12.25 hrs, Volume= 0.758 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Starting Elev= 381.44' Surf.Area= 1,720 sf Storage= 2,200 cf
Peak Elev= 385.36' @ 12.25 hrs Surf.Area= 5,757 sf Storage= 16,004 cf (13,804 cf above start)

Plug-Flow detention time= 412.9 min calculated for 0.708 af (95% of inflow)
Center-of-Mass det. time= 330.5 min (1,113.5 - 783.0) 5.5 HRS DETENTION

Volume	Invert	Avail.Storage	Storage Description
#1	379.50'	19,949 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)
379.50	549	103.0	0	0	549
380.00	887	122.0	356	356	894
382.00	2,117	191.0	2,916	3,272	2,641
384.00	4,060	299.0	6,072	9,344	6,880
386.00	6,651	430.0	10,605	19,949	14,515

Device	Routing	Invert	Outlet Devices
#1	Primary	381.00'	**2.5" Vert. Orifice** C= 0.600
#2	Secondary	385.40'	**8.0' long x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Primary	385.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.24 cfs @ 12.25 hrs HW=385.36' (Free Discharge)
└─**1=Orifice** (Orifice Controls 0.34 cfs @ 9.94 fps)
└─**3=Grate** (Orifice Controls 2.90 cfs @ 2.90 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=381.44' (Free Discharge)
└─**2=Spillway** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Bldg 3-4

Runoff = 14.47 cfs @ 12.03 hrs, Volume= 0.937 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.10"

	Area (ac)	CN	Description
*	0.190	98	Talcott & path
*	0.530	98	Rooftop
*	2.510	98	Pavement & walks
	1.490	80	>75% Grass cover, Good, HSG D
	4.720	92	Weighted Average
	1.490	80	31.57% Pervious Area
	3.230	98	68.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	90	0.0500	0.14		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.0	510	0.0200	8.41	14.86	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
11.7	600	Total			

Summary for Subcatchment 3S: Offsite lots

Runoff = 4.47 cfs @ 12.01 hrs, Volume= 0.267 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.10"

	Area (ac)	CN	Description
*	0.150	98	Rooftop
*	0.640	98	Pavement & walks
	0.710	80	>75% Grass cover, Good, HSG D
	1.500	89	Weighted Average
	0.710	80	47.33% Pervious Area
	0.790	98	52.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1100	0.20		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.2	730	0.0300	10.30	18.19	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
9.7	830	Total			

Summary for Pond 3P: Mod Pond

Inflow Area = 6.220 ac, 64.63% Impervious, Inflow Depth = 2.32" for 10 year event
Inflow = 18.80 cfs @ 12.02 hrs, Volume= 1.204 af
Outflow = 14.18 cfs @ 12.11 hrs, Volume= 1.220 af, Atten= 25%, Lag= 5.3 min
Primary = 5.09 cfs @ 12.11 hrs, Volume= 1.058 af
Secondary = 9.09 cfs @ 12.11 hrs, Volume= 0.162 af

Routing by Stor-Ind method, Time Span= 1.00-80.00 hrs, dt= 0.05 hrs
Starting Elev= 381.44' Surf.Area= 1,720 sf Storage= 2,200 cf
Peak Elev= 385.97' @ 12.11 hrs Surf.Area= 6,602 sf Storage= 19,726 cf (17,526 cf above start)

Plug-Flow detention time= 300.8 min calculated for 1.169 af (97% of inflow)
Center-of-Mass det. time= 251.8 min (1,027.6 - 775.8)

Volume	Invert	Avail.Storage	Storage Description
#1	379.50'	19,949 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

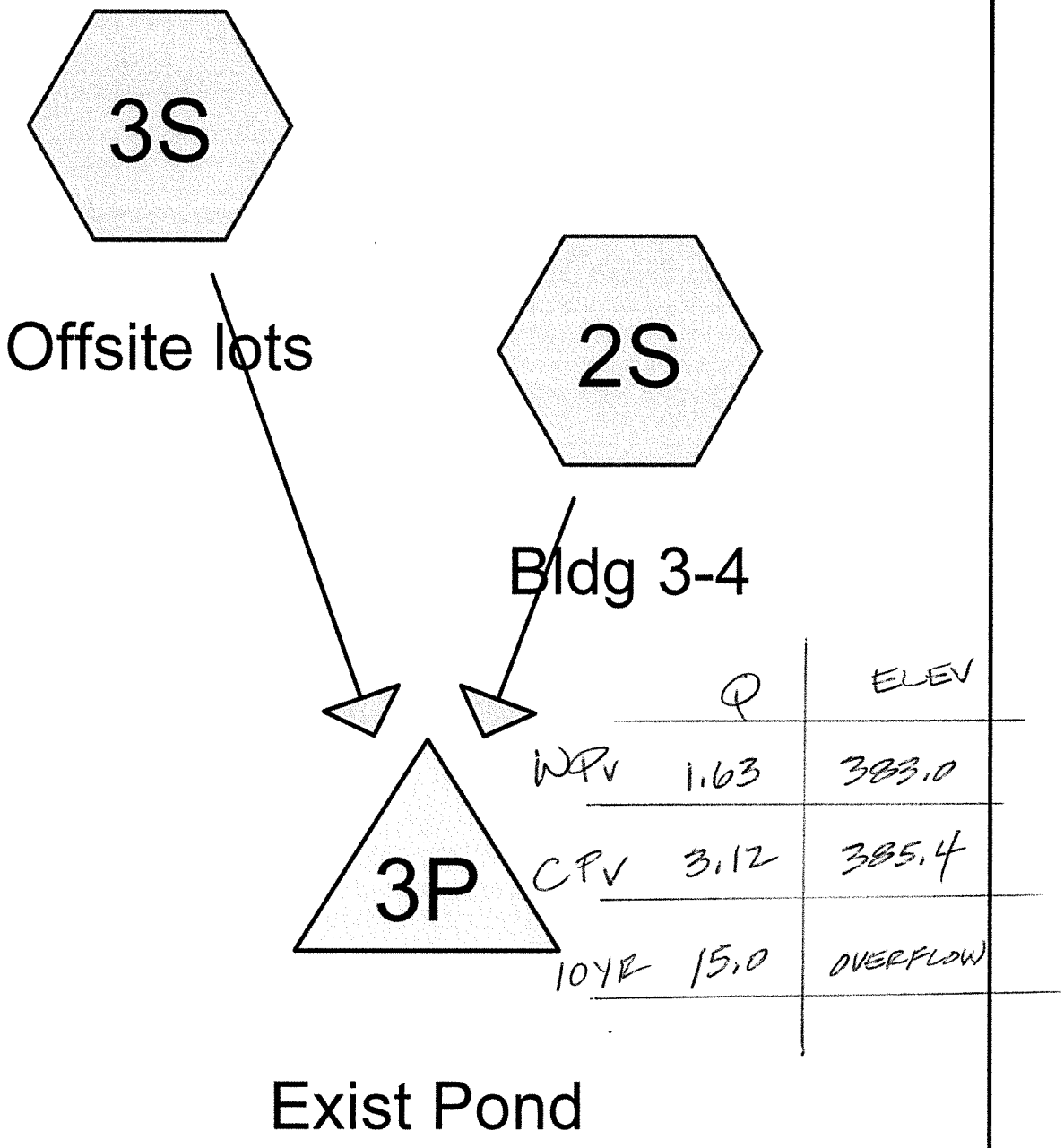
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
379.50	549	103.0	0	0	549
380.00	887	122.0	356	356	894
382.00	2,117	191.0	2,916	3,272	2,641
384.00	4,060	299.0	6,072	9,344	6,880
386.00	6,651	430.0	10,605	19,949	14,515

Device	Routing	Invert	Outlet Devices
#1	Primary	381.00'	**2.5" Vert. Orifice** C= 0.600
#2	Secondary	385.40'	**8.0' long x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Primary	385.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.06 cfs @ 12.11 hrs HW=385.95' (Free Discharge)
↑—**1=Orifice** (Orifice Controls 0.36 cfs @ 10.60 fps)
└—**3=Grate** (Orifice Controls 4.70 cfs @ 4.70 fps)

Secondary OutFlow Max=8.76 cfs @ 12.11 hrs HW=385.95' (Free Discharge)
↑—**2=Spillway** (Weir Controls 8.76 cfs @ 1.98 fps)

EXISTING POND 2



	Q	ELEV
WQV	1.63	383.0
CPV	3.12	385.4
10YR	15.0	OVERFLOW

Subcat Reach Pond Link

Drainage Diagram for Exist Pond2
Prepared by Lamoureux & Dickinson, Printed 11/20/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.200	80	>75% Grass cover, Good, HSG D (2S, 3S)
3.150	98	Pavement & walks (2S, 3S)
0.680	98	Rooftop (2S, 3S)
0.190	98	Talcott & path (2S)

Summary for Subcatchment 2S: Bldg 3-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.93 cfs @ 12.02 hrs, Volume= 0.194 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.190	98	Talcott & path
*	0.530	98	Rooftop
*	2.510	98	Pavement & walks
	1.490	80	>75% Grass cover, Good, HSG D
	4.720	92	Weighted Average
	1.490	80	31.57% Pervious Area
	3.230	98	68.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	90	0.0500	0.14		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.0	510	0.0200	8.41	14.86	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
11.7	600	Total			

Summary for Subcatchment 3S: Offsite lots

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.78 cfs @ 12.00 hrs, Volume= 0.049 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.150	98	Rooftop
*	0.640	98	Pavement & walks
	0.710	80	>75% Grass cover, Good, HSG D
	1.500	89	Weighted Average
	0.710	80	47.33% Pervious Area
	0.790	98	52.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1100	0.20		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.2	730	0.0300	10.30	18.19	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
9.7	830	Total			

Summary for Pond 3P: Exist Pond

Inflow Area = 6.220 ac, 64.63% Impervious, Inflow Depth = 0.47" for WQv event
Inflow = 3.70 cfs @ 12.02 hrs, Volume= 0.243 af
Outflow = 1.63 cfs @ 12.21 hrs, Volume= 0.243 af, Atten= 56%, Lag= 11.4 min
Primary = 1.63 cfs @ 12.21 hrs, Volume= 0.243 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 381.44' Surf.Area= 1,029 sf Storage= 824 cf
Peak Elev= 382.96' @ 12.21 hrs Surf.Area= 2,048 sf Storage= 3,264 cf (2,440 cf above start)

Plug-Flow detention time= 87.5 min calculated for 0.223 af (92% of inflow)
Center-of-Mass det. time= 23.6 min (824.5 - 801.0)

824 CF PERMANENT POOL
↳ MINIMAL DETENTION

Volume	Invert	Avail.Storage	Storage Description
#1	379.40'	12,925 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)
379.40	20	16.0	0	0	20
380.00	168	59.0	49	49	278
382.00	1,562	175.0	1,495	1,544	2,450
384.00	2,655	243.0	4,169	5,713	4,751
386.00	4,649	435.0	7,212	12,925	15,132

Device	Routing	Invert	Outlet Devices
#1	Primary	383.90'	**3.5" Vert. Orifice 3.5"x4** C= 0.600
#2	Primary	381.50'	**4.5" Vert. Orifice 4.5"x2** C= 0.600
#3	Primary	381.46'	**3.7" Vert. Orifice 3.75"** C= 0.600
#4	Primary	381.44'	**4.5" Vert. Orifice 4.5"** C= 0.600
#5	Primary	385.80'	**4.0' long x 6.0' breadth Grass overflow** 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=1.62 cfs @ 12.21 hrs HW=382.95' (Free Discharge)
- **1=Orifice 3.5"x4** (Controls 0.00 cfs)
- **2=Orifice 4.5"x2** (Orifice Controls 0.60 cfs @ 5.41 fps)
- **3=Orifice 3.75"** (Orifice Controls 0.42 cfs @ 5.56 fps)
- **4=Orifice 4.5"** (Orifice Controls 0.61 cfs @ 5.53 fps)
- **5=Grass overflow** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Bldg 3-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 8.62 cfs @ 12.02 hrs, Volume= 0.582 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.190	98	Talcott & path
*	0.530	98	Rooftop
*	2.510	98	Pavement & walks
	1.490	80	>75% Grass cover, Good, HSG D
	4.720	92	Weighted Average
	1.490	80	31.57% Pervious Area
	3.230	98	68.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	90	0.0500	0.14		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.0	510	0.0200	8.41	14.86	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
11.7	600	Total			

Summary for Subcatchment 3S: Offsite lots

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.58 cfs @ 12.00 hrs, Volume= 0.160 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.150	98	Rooftop
*	0.640	98	Pavement & walks
	0.710	80	>75% Grass cover, Good, HSG D
	1.500	89	Weighted Average
	0.710	80	47.33% Pervious Area
	0.790	98	52.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1100	0.20		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.2	730	0.0300	10.30	18.19	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
9.7	830	Total			

Summary for Pond 3P: Exist Pond

Inflow Area = 6.220 ac, 64.63% Impervious, Inflow Depth = 1.43" for 1 year event
Inflow = 11.17 cfs @ 12.02 hrs, Volume= 0.742 af
Outflow = 3.12 cfs @ 12.27 hrs, Volume= 0.742 af, Atten= 72%, Lag= 15.2 min
Primary = 3.12 cfs @ 12.27 hrs, Volume= 0.742 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 381.44' Surf.Area= 1,029 sf Storage= 824 cf
Peak Elev= 385.38' @ 12.27 hrs Surf.Area= 3,973 sf Storage= 10,262 cf (9,438 cf above start)

Plug-Flow detention time= 57.8 min calculated for 0.721 af (97% of inflow)
Center-of-Mass det. time= 29.4 min (812.5 - 783.0)

→ MINIMAL DETENTION

Volume	Invert	Avail.Storage	Storage Description
#1	379.40'	12,925 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)
379.40	20	16.0	0	0	20
380.00	168	59.0	49	49	278
382.00	1,562	175.0	1,495	1,544	2,450
384.00	2,655	243.0	4,169	5,713	4,751
386.00	4,649	435.0	7,212	12,925	15,132

Device	Routing	Invert	Outlet Devices
#1	Primary	383.90'	**3.5" Vert. Orifice 3.5"x4** C= 0.600
#2	Primary	381.50'	**4.5" Vert. Orifice 4.5"x2** C= 0.600
#3	Primary	381.46'	**3.7" Vert. Orifice 3.75"** C= 0.600
#4	Primary	381.44'	**4.5" Vert. Orifice 4.5"** C= 0.600
#5	Primary	385.80'	**4.0' long x 6.0' breadth Grass overflow** 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=3.12 cfs @ 12.27 hrs HW=385.37' (Free Discharge)
- **1=Orifice 3.5"x4** (Orifice Controls 0.37 cfs @ 5.54 fps)
- **2=Orifice 4.5"x2** (Orifice Controls 1.02 cfs @ 9.24 fps)
- **3=Orifice 3.75"** (Orifice Controls 0.70 cfs @ 9.33 fps)
- **4=Orifice 4.5"** (Orifice Controls 1.03 cfs @ 9.31 fps)
- **5=Grass overflow** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Bldg 3-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 13.80 cfs @ 12.02 hrs, Volume= 0.937 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.10"

	Area (ac)	CN	Description
*	0.190	98	Talcott & path
*	0.530	98	Rooftop
*	2.510	98	Pavement & walks
	1.490	80	>75% Grass cover, Good, HSG D
	4.720	92	Weighted Average
	1.490	80	31.57% Pervious Area
	3.230	98	68.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	90	0.0500	0.14		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.0	510	0.0200	8.41	14.86	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
11.7	600	Total			

Summary for Subcatchment 3S: Offsite lots

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.31 cfs @ 12.00 hrs, Volume= 0.267 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.10"

	Area (ac)	CN	Description
*	0.150	98	Rooftop
*	0.640	98	Pavement & walks
	0.710	80	>75% Grass cover, Good, HSG D
	1.500	89	Weighted Average
	0.710	80	47.33% Pervious Area
	0.790	98	52.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1100	0.20		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
1.2	730	0.0300	10.30	18.19	**Pipe Channel, Pipe (avg)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
9.7	830	Total			

Summary for Pond 3P: Exist Pond

[93] Warning: Storage range exceeded by 0.87'

Inflow Area = 6.220 ac, 64.63% Impervious, Inflow Depth = 2.32" for 10 year event
Inflow = 18.07 cfs @ 12.02 hrs, Volume= 1.204 af
Outflow = 15.00 cfs @ 12.11 hrs, Volume= 1.204 af, Atten= 17%, Lag= 5.6 min
Primary = 15.00 cfs @ 12.11 hrs, Volume= 1.204 af

Routing by Stor-Ind method, Time Span= 1.00-42.00 hrs, dt= 0.10 hrs
Starting Elev= 381.44' Surf.Area= 1,029 sf Storage= 824 cf
Peak Elev= 386.87' @ 12.12 hrs Surf.Area= 4,649 sf Storage= 12,925 cf (12,101 cf above start)

Plug-Flow detention time= 47.2 min calculated for 1.182 af (98% of inflow)
Center-of-Mass det. time= 28.2 min (804.0 - 775.8)

LIKELY OVERFLOW & PONDING IN PARKING LOTS

Volume	Invert	Avail.Storage	Storage Description
#1	379.40'	12,925 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)
379.40	20	16.0	0	0	20
380.00	168	59.0	49	49	278
382.00	1,562	175.0	1,495	1,544	2,450
384.00	2,655	243.0	4,169	5,713	4,751
386.00	4,649	435.0	7,212	12,925	15,132

Device	Routing	Invert	Outlet Devices
#1	Primary	383.90'	**3.5" Vert. Orifice 3.5"x4** C= 0.600
#2	Primary	381.50'	**4.5" Vert. Orifice 4.5"x2** C= 0.600
#3	Primary	381.46'	**3.7" Vert. Orifice 3.75"** C= 0.600
#4	Primary	381.44'	**4.5" Vert. Orifice 4.5"** C= 0.600
#5	Primary	385.80'	**4.0' long x 6.0' breadth Grass overflow** 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=14.16 cfs @ 12.11 hrs HW=386.78' (Free Discharge)
- **1=Orifice 3.5"x4** (Orifice Controls 0.53 cfs @ 7.96 fps)
- **2=Orifice 4.5"x2** (Orifice Controls 1.20 cfs @ 10.87 fps)
- **3=Orifice 3.75"** (Orifice Controls 0.82 cfs @ 10.94 fps)
- **4=Orifice 4.5"** (Orifice Controls 1.21 cfs @ 10.93 fps)
- **5=Grass overflow** (Weir Controls 10.40 cfs @ 2.65 fps)


Isham Cir
Talcott Rd
Simons Plaza
Seth Cir
Cornerstone Dr
Tyler Way
Williston Rd
2
Maple Tree Pl
Williston
© 2011 Google
©2010 Google
Imagery Date: 4/30/2004
44°26'49.96" N 73°06'00.84" W elev 393 ft
Eye alt 3602 ft


Source: USGS
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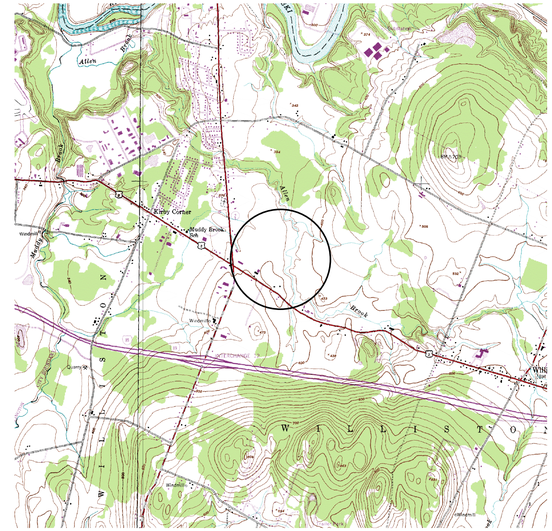


LOCATION

NTS

0' 150' 300' 600' 900'

Bar Scale 1" = 150'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 150'
Date	4/26/16
Project	14257.5

Overall Site Plan

TAFT FARMS Condominiums

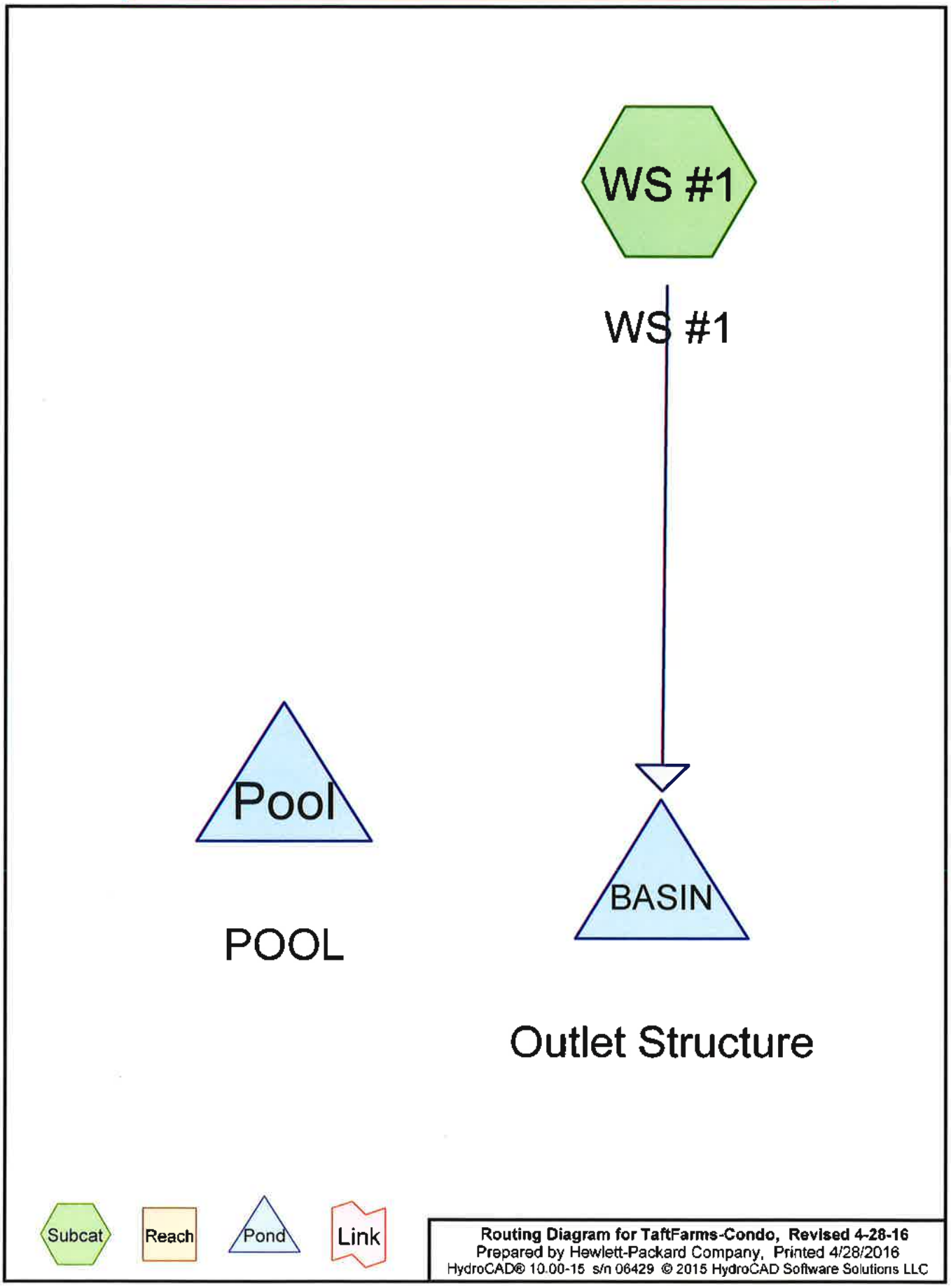
Route 2 — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 5800 2 overall overall site plan rev 1

Printing date: 4/26/16

OV-1


WS #1
WS #1
Pool
POOL
BASIN
Outlet Structure
Subcat
Reach
Pond
Link
Routing Diagram for TaftFarms-Condo, Revised 4-28-16
Prepared by Hewlett-Packard Company, Printed 4/28/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Taft Farms - Condominiums
Hydrologic Calculations

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.886	80	>75% Grass cover, Good, HSG D (WS #1)
0.891	98	Impervious - Roofs (WS #1)
0.880	98	Impervious-Pavement (WS #1)
4.657	**87**	**TOTAL AREA**

Time span=0.00-120.00 hrs, dt=0.03 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS #1: WS #1 Runoff Area=202,870 sf 38.03% Impervious Runoff Depth=1.10"
Flow Length=574' Tc=18.3 min CN=WQ Runoff=5.49 cfs 0.427 af

Pond BASIN: Outlet Structure Peak Elev=375.98' Storage=11,518 cf Inflow=5.49 cfs 0.427 af
Outflow=0.20 cfs 0.427 af

Pond Pool: POOL Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 4.657 ac Runoff Volume = 0.427 af Average Runoff Depth = 1.10"
61.97% Pervious = 2.886 ac 38.03% Impervious = 1.771 ac

Summary for Subcatchment WS #1: WS #1

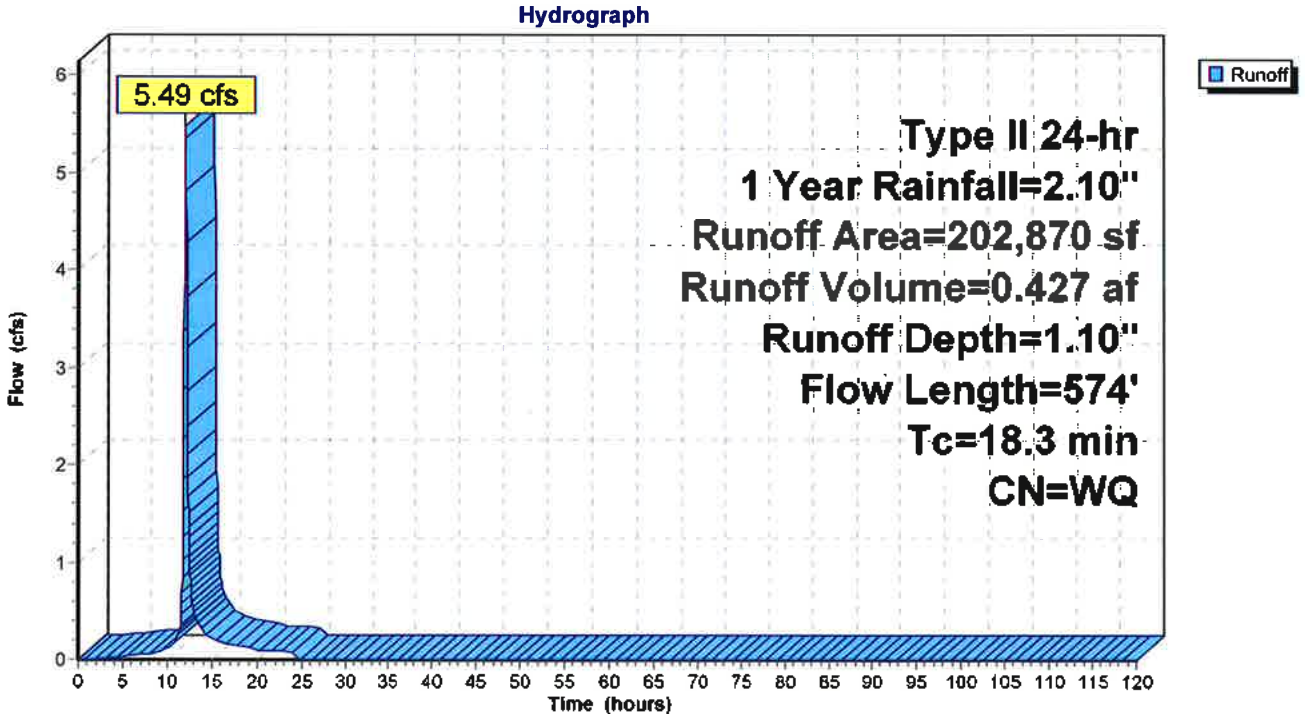
Runoff = 5.49 cfs @ 12.11 hrs, Volume= 0.427 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	38,340	98	Impervious-Pavement
*	38,820	98	Impervious - Roofs
	125,710	80	>75% Grass cover, Good, HSG D
	202,870		Weighted Average
	125,710		61.97% Pervious Area
	77,160		38.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	94	0.0210	0.10		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
2.6	480	0.0410	3.04		**Shallow Concentrated Flow, SC Lawn** Grassed Waterway Kv= 15.0 fps
18.3	574	Total			

Subcatchment WS #1: WS #1



Summary for Pond BASIN: Outlet Structure

Inflow Area = 4.657 ac, 38.03% Impervious, Inflow Depth = 1.10" for 1 Year event
Inflow = 5.49 cfs @ 12.11 hrs, Volume= 0.427 af
Outflow = 0.20 cfs @ 15.66 hrs, Volume= 0.427 af, Atten= 96%, Lag= 212.9 min
Primary = 0.20 cfs @ 15.66 hrs, Volume= 0.427 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Peak Elev= 375.98' @ 15.66 hrs Surf.Area= 5,151 sf Storage= 11,518 cf

Plug-Flow detention time= 712.1 min calculated for 0.427 af (100% of inflow)
Center-of-Mass det. time= 712.9 min (1,522.5 - 809.6) 11.9 hours

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	23,960 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

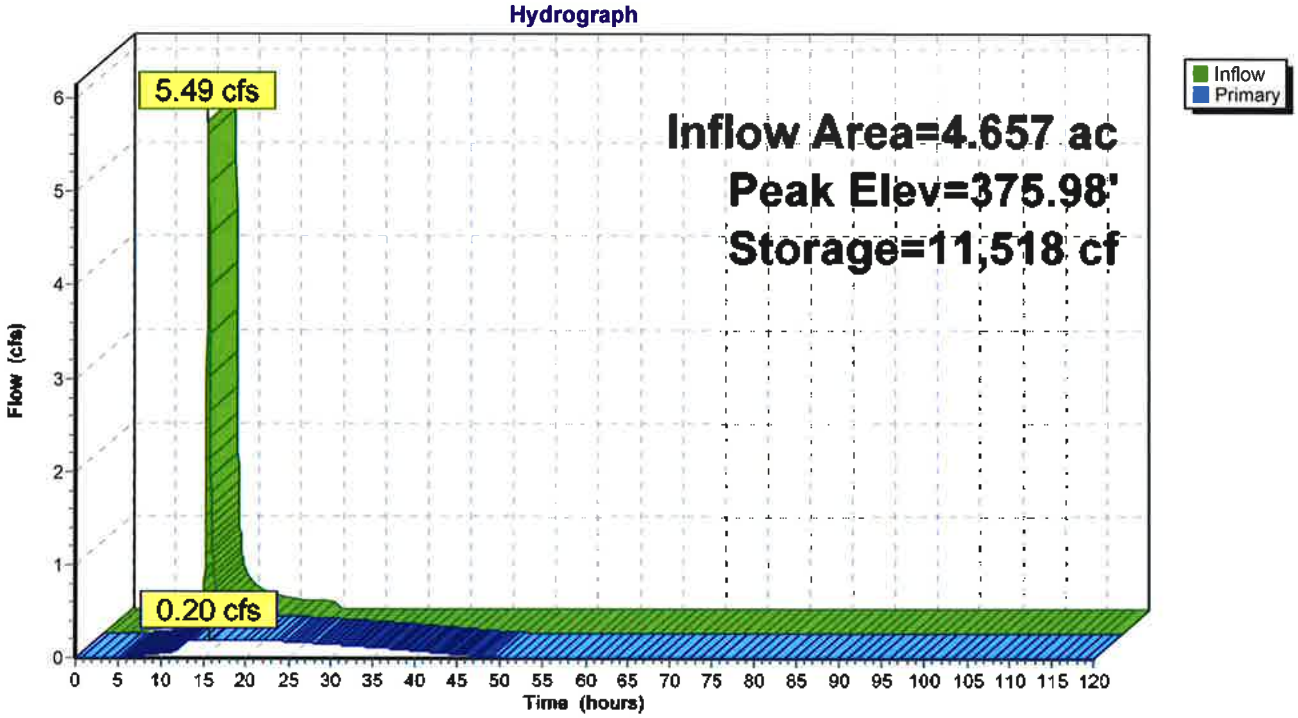
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	2,710	0	0
374.00	3,420	3,065	3,065
375.00	4,240	3,830	6,895
376.00	5,165	4,703	11,598
377.00	6,160	5,663	17,260
378.00	7,240	6,700	23,960

2.1" Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	373.00'	**2.1" Vert. Orifice/Grate** C= 0.600
#2	Primary	376.00'	**48.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	376.75'	**6.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.20 cfs @ 15.66 hrs HW=375.98' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.20 cfs @ 8.20 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Outlet Structure



Parcel COM.046b

N/F Snyder Taft Corners, LLC
Parcel 08.104.010.000a

Lot H Pond

Parcel COM.046b

Vermont State Plane Grid North (NAD83)

N/F Town of Williston
Parcel 08.104.050.000

PVT.045

PVT.046

N/F Snyder Taft Corners, LLC
Parcel 08.104.010.000f

PVT.040

ALLEN BROOK LANE

ISHAM CIRCLE

Respite House Pond

Recreation Area Pond

N/F JCST, LLC
Parcel 08.143.010.000b

Ken's Way

TALCOTT ROAD

Lot C-D Pond

N/F JCST, LLC
Parcel 08.143.010.000a

Condominium Pond

N/F Town of Williston
Parcel 08.087.095.000

N/F Sisters and Brothers Trust Fund
Parcel 08.104.030.000

Parcel COM.038

N/F Talcott Road, LLC
Parcel 08.104.032.000

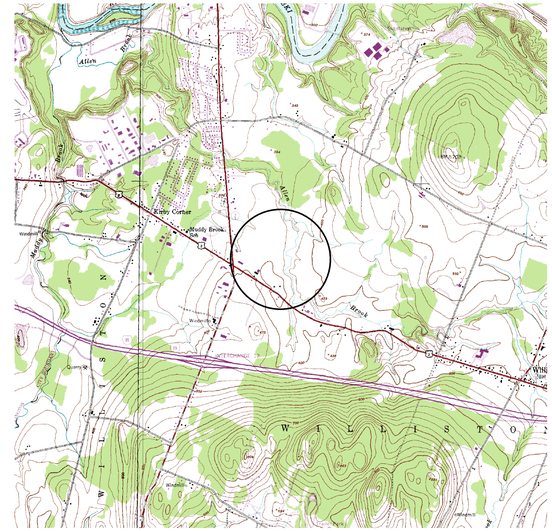
ROUTE 2

N/F Town of Williston
Parcel 08.104.050.000

N/F Allen Brook Development, Inc.
Parcel 08.104.011.000

N/F Allen Brook Development, Inc.
Parcel 08.104.019.000

N/F Allen Brook Development, Inc.
Parcel 08.104.029.000



LOCATION

NTS

0' 150' 300' 600' 900'

Bar Scale 1" = 150'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 150'
Date	4/26/16
Project	14257.2

Overall Site Plan

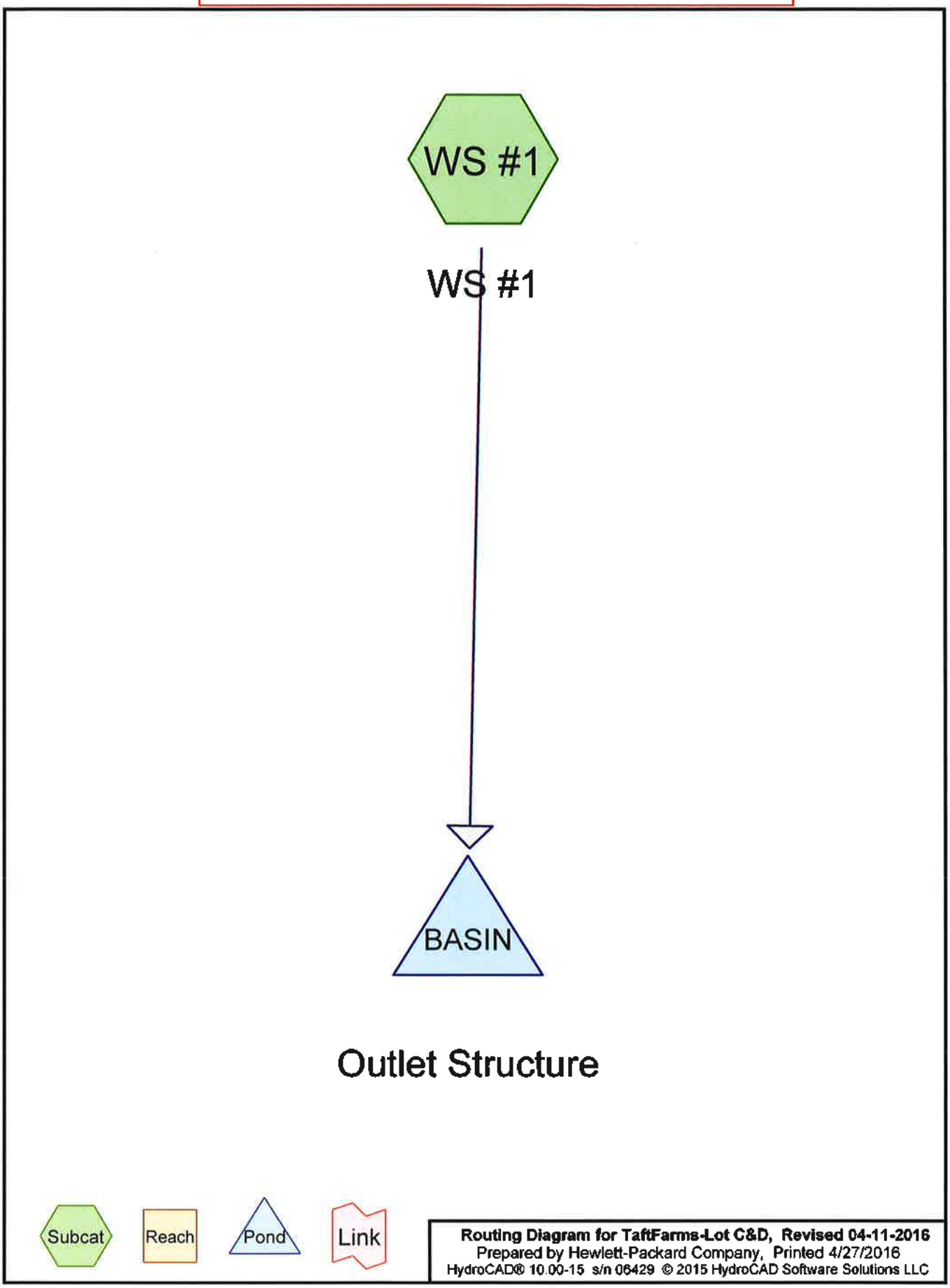
TAFT FARMS
Lots "C" & "D"

Route 2 — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 14257.2 ltr ltd overall site plan rev1
Printing date: 4/26/16

OV-1


WS #1
WS #1
BASIN
Outlet Structure
Subcat
Reach
Pond
Link
Routing Diagram for TaftFarms-Lot C&D, Revised 04-11-2016
Prepared by Hewlett-Packard Company, Printed 4/27/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Taft Farms Lot "C" and "D"

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.719	80	>75% Grass cover, Good, HSG D (WS #1)
0.129	98	Impervious - Roofs (WS #1)
0.180	98	Impervious-Pavement (WS #1)
2.027	**83**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment WS #1: WS #1 Runoff Area=88,316 sf 15.24% Impervious Runoff Depth=0.81"
Flow Length=280' Tc=17.8 min CN=WQ Runoff=1.81 cfs 0.138 af

Pond BASIN: Outlet Structure Peak Elev=396.17' Storage=3,585 cf Inflow=1.81 cfs 0.138 af
Outflow=0.06 cfs 0.138 af

Total Runoff Area = 2.027 ac Runoff Volume = 0.138 af Average Runoff Depth = 0.81"
84.76% Pervious = 1.719 ac 15.24% Impervious = 0.309 ac

Summary for Subcatchment WS #1: WS #1

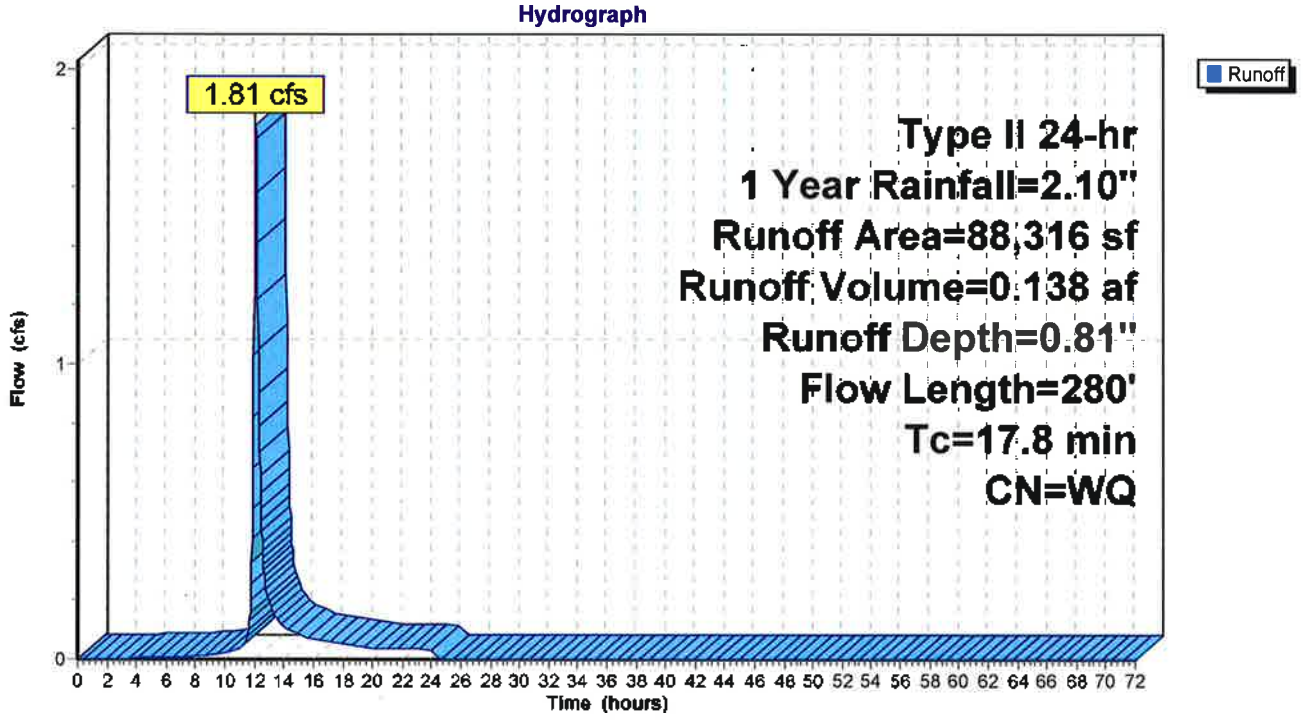
Runoff = 1.81 cfs @ 12.11 hrs, Volume= 0.138 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	7,840	98	Impervious-Pavement
*	5,616	98	Impervious - Roofs
	74,860	80	>75% Grass cover, Good, HSG D
	88,316		Weighted Average
	74,860		84.76% Pervious Area
	13,456		15.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0200	0.10		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
1.0	180	0.0330	2.92		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
17.8	280	Total			

Subcatchment WS #1: WS #1



Summary for Pond BASIN: Outlet Structure

Inflow Area = 2.027 ac, 15.24% Impervious, Inflow Depth = 0.81" for 1 Year event
Inflow = 1.81 cfs @ 12.11 hrs, Volume= 0.138 af
Outflow = 0.06 cfs @ 16.73 hrs, Volume= 0.138 af, Atten= 97%, Lag= 277.3 min
Primary = 0.06 cfs @ 16.73 hrs, Volume= 0.138 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 396.17' @ 16.73 hrs Surf.Area= 2,180 sf Storage= 3,585 cf

Plug-Flow detention time= 682.5 min calculated for 0.138 af (100% of inflow)
Center-of-Mass det. time= 682.9 min (1,522.3 - 839.4) 11.4 hours

Volume	Invert	Avail.Storage	Storage Description
#1	392.50'	4,527 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

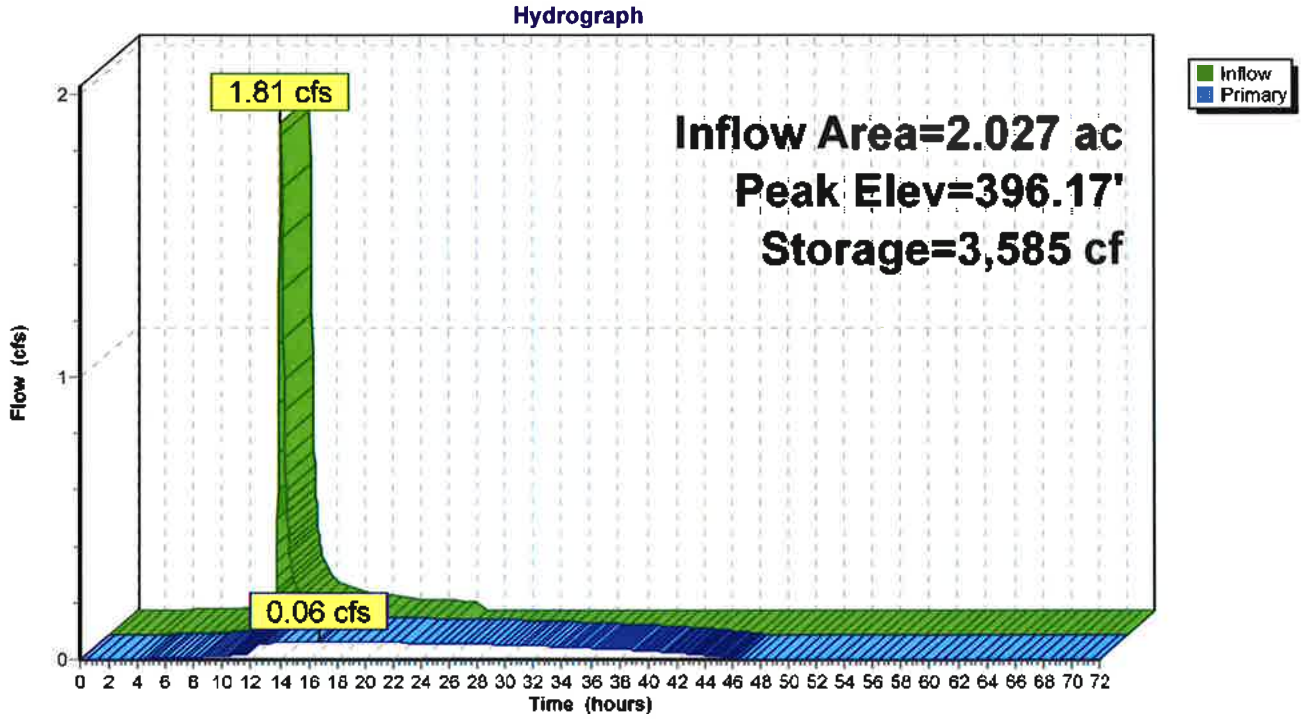
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
392.50	275	0	0
393.00	430	176	176
394.00	810	620	796
395.00	1,130	970	1,766
396.00	1,820	1,475	3,241
396.30	2,450	641	3,882
396.50	4,000	645	4,527

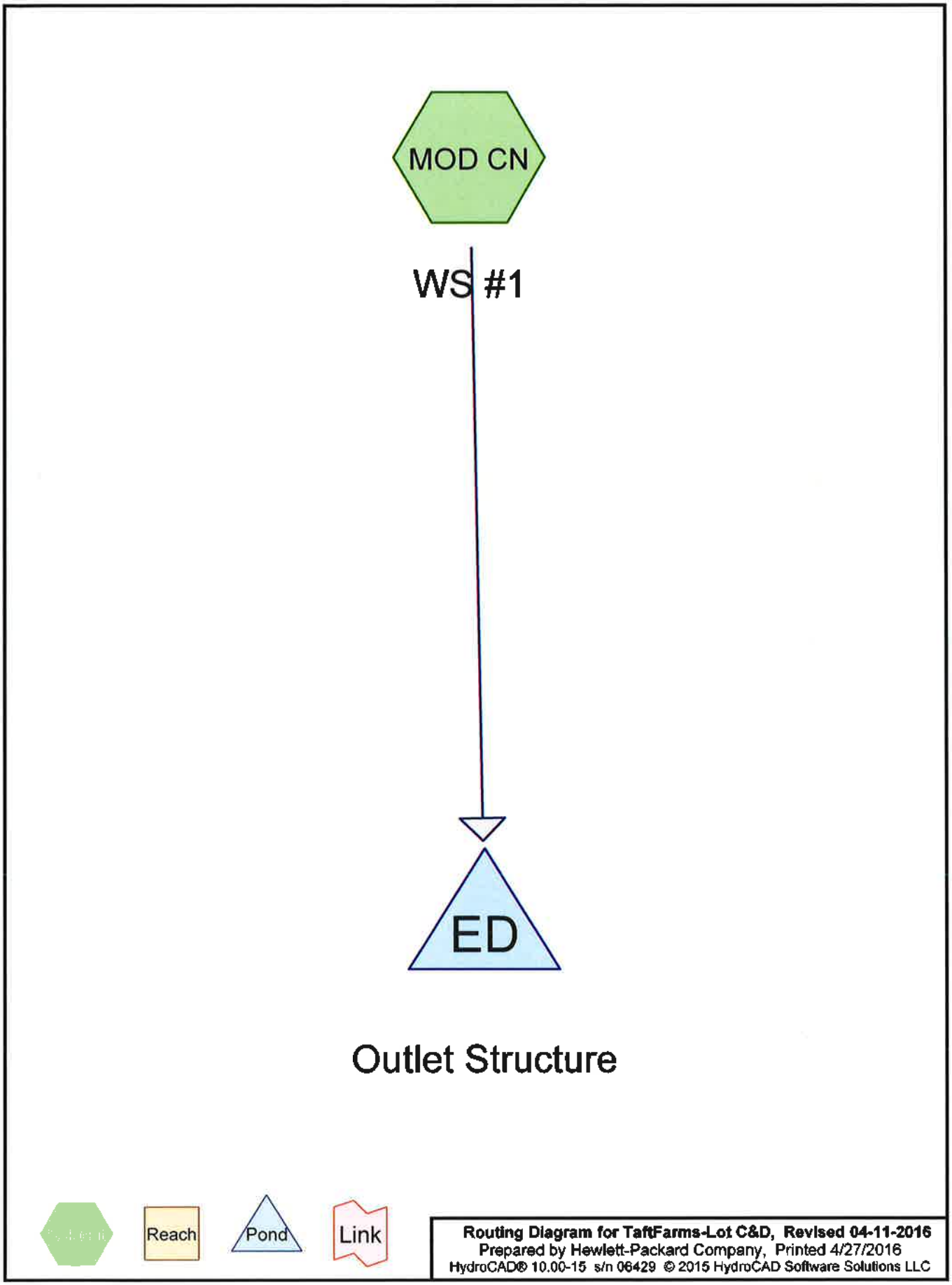
1.1" Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	392.50'	**1.1" Vert. Orifice/Grate** C= 0.600
#2	Primary	396.20'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	396.30'	**6.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.06 cfs @ 16.73 hrs HW=396.17' (Free Discharge)
- 1=**Orifice/Grate** (Orifice Controls 0.06 cfs @ 9.17 fps)
- 2=**Orifice/Grate** (Controls 0.00 cfs)
- 3=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Outlet Structure




MOD CN
WS #1
ED
Outlet Structure
Reach
Pond
Link
Routing Diagram for TaftFarms-Lot C&D, Revised 04-11-2016
Prepared by Hewlett-Packard Company, Printed 4/27/2016
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Project Notes

Taft Farms Lot "C" and "D"

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.719	88	>75% Grass cover, Good, HSG D (MOD CN)
0.129	88	Impervious - Roofs (MOD CN)
0.180	88	Impervious-Pavement (MOD CN)
2.027	**88**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentMOD CN: WS #1 Runoff Area=88,316 sf 0.00% Impervious Runoff Depth=0.20"
Flow Length=280' Tc=17.8 min CN=WQ Runoff=0.41 cfs 0.033 af

Pond ED: Outlet Structure Peak Elev=393.75' Storage=603 cf Inflow=0.41 cfs 0.033 af
Outflow=0.03 cfs 0.033 af

Total Runoff Area = 2.027 ac Runoff Volume = 0.033 af Average Runoff Depth = 0.20"
100.00% Pervious = 2.027 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment MOD CN: WS #1

Runoff = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af, Depth= 0.20"

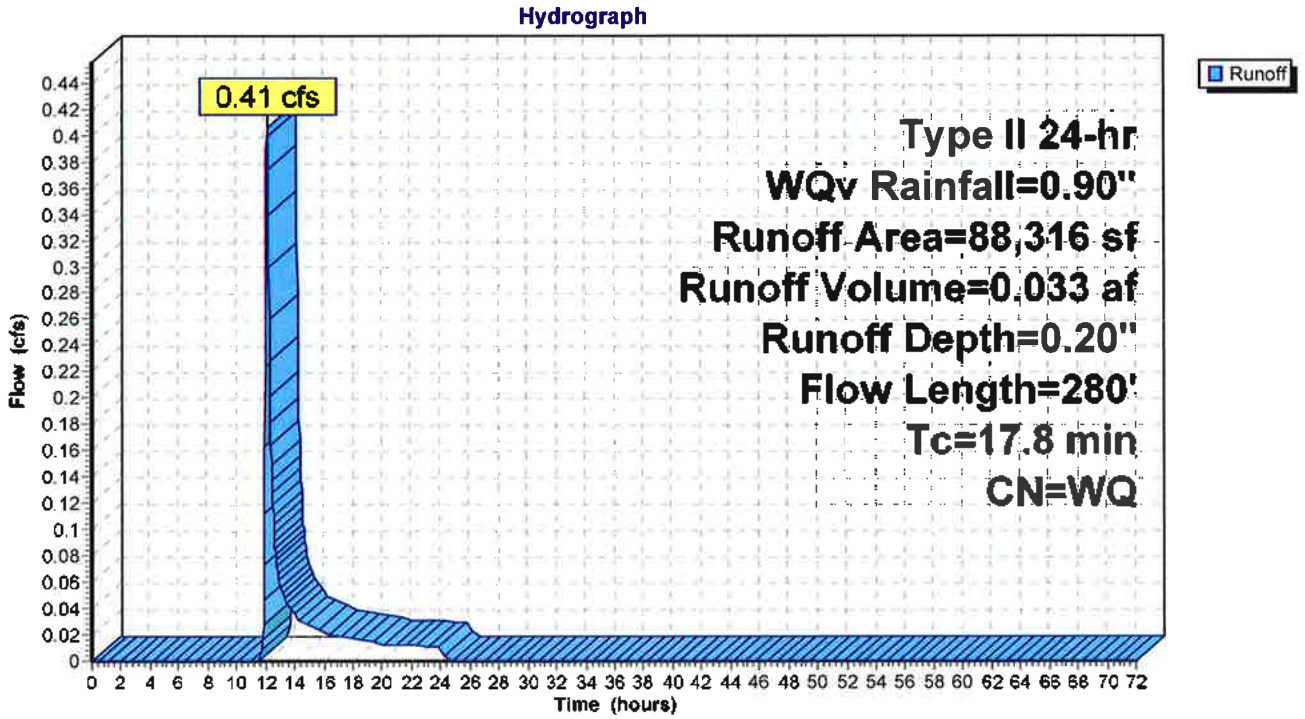
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Type II 24-hr WQv Rainfall=0.90"

Modified Curve Number

	Area (sf)	CN	Description
*	7,840	88	Impervious-Pavement
*	5,616	88	Impervious - Roofs
*	74,860	88	>75% Grass cover, Good, HSG D
	88,316		Weighted Average
	88,316		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0200	0.10		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
1.0	180	0.0330	2.92		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
17.8	280	Total			

Subcatchment MOD CN: WS #1



Hydrograph for Subcatchment MOD CN: WS #1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.50	0.01	0.00	0.00
3.00	0.03	0.00	0.00
4.50	0.05	0.00	0.00
6.00	0.07	0.00	0.00
7.50	0.10	0.00	0.00
9.00	0.13	0.00	0.00
10.50	0.18	0.00	0.00
12.00	0.60	0.06	**0.22**
13.50	0.72	0.11	**0.04**
15.00	0.77	0.13	0.03
16.50	0.80	0.15	0.02
18.00	0.83	0.16	0.02
19.50	0.85	0.17	0.01
21.00	0.87	0.18	0.01
22.50	0.88	0.19	0.01
24.00	**0.90**	**0.20**	0.01
25.50	0.90	0.20	0.00
27.00	0.90	0.20	0.00
28.50	0.90	0.20	0.00
30.00	0.90	0.20	0.00
31.50	0.90	0.20	0.00
33.00	0.90	0.20	0.00
34.50	0.90	0.20	0.00
36.00	0.90	0.20	0.00
37.50	0.90	0.20	0.00
39.00	0.90	0.20	0.00
40.50	0.90	0.20	0.00
42.00	0.90	0.20	0.00
43.50	0.90	0.20	0.00
45.00	0.90	0.20	0.00
46.50	0.90	0.20	0.00
48.00	0.90	0.20	0.00
49.50	0.90	0.20	0.00
51.00	0.90	0.20	0.00
52.50	0.90	0.20	0.00
54.00	0.90	0.20	0.00
55.50	0.90	0.20	0.00
57.00	0.90	0.20	0.00
58.50	0.90	0.20	0.00
60.00	0.90	0.20	0.00
61.50	0.90	0.20	0.00
63.00	0.90	0.20	0.00
64.50	0.90	0.20	0.00
66.00	0.90	0.20	0.00
67.50	0.90	0.20	0.00
69.00	0.90	0.20	0.00
70.50	0.90	0.20	0.00
72.00	0.90	0.20	0.00

Start time

12 hr Extended Detention with 1.1" orifice

End time

Summary for Pond ED: Outlet Structure

Inflow Area = 2.027 ac, 0.00% Impervious, Inflow Depth = 0.20" for WQv event
Inflow = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af
Outflow = 0.03 cfs @ 13.96 hrs, Volume= 0.033 af, Atten= 91%, Lag= 110.2 min
Primary = 0.03 cfs @ 13.96 hrs, Volume= 0.033 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 393.75' @ 13.96 hrs Surf.Area= 714 sf Storage= 603 cf

Plug-Flow detention time= 216.1 min calculated for 0.033 af (100% of inflow)
Center-of-Mass det. time= 216.3 min (1,110.1 - 893.8)

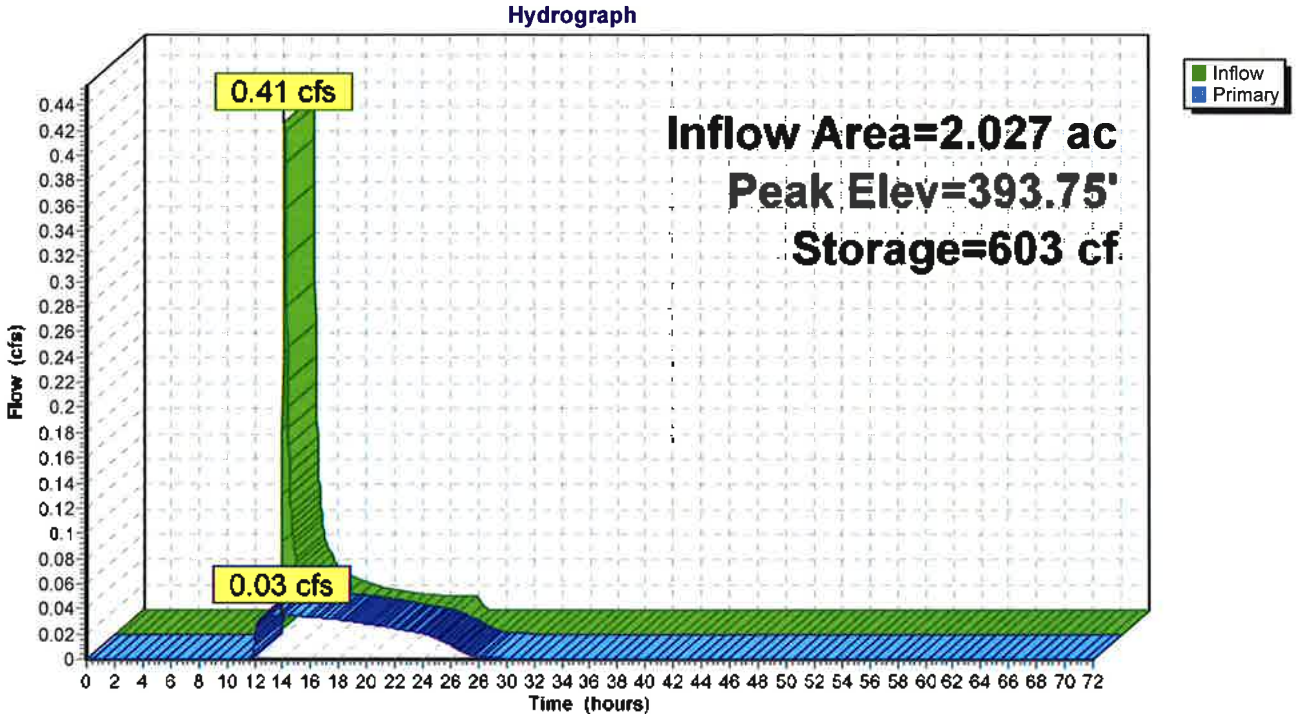
Volume	Invert	Avail.Storage	Storage Description
#1	392.50'	4,527 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
392.50	275	0	0
393.00	430	176	176
394.00	810	620	796
395.00	1,130	970	1,766
396.00	1,820	1,475	3,241
396.30	2,450	641	3,882
396.50	4,000	645	4,527

Device	Routing	Invert	Outlet Devices
#1	Primary	392.50'	**1.1" Vert. Orifice/Grate** C= 0.600
#2	Primary	396.20'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	396.30'	**6.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

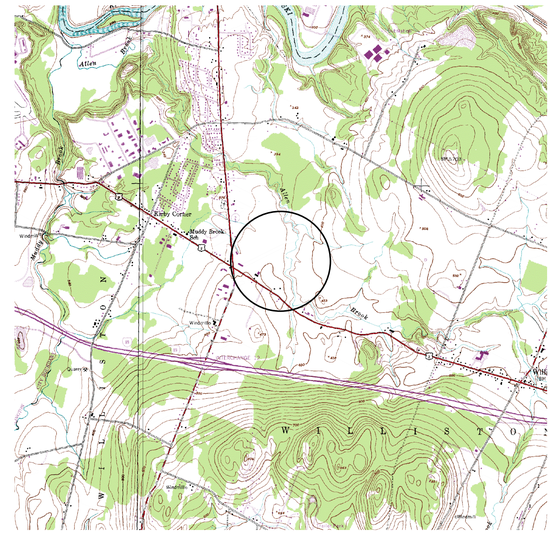
Primary OutFlow Max=0.03 cfs @ 13.96 hrs HW=393.75' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.28 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ED: Outlet Structure



Hydrograph for Pond ED: Outlet Structure

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	392.50	0.00
1.50	0.00	0	392.50	0.00
3.00	0.00	0	392.50	0.00
4.50	0.00	0	392.50	0.00
6.00	0.00	0	392.50	0.00
7.50	0.00	0	392.50	0.00
9.00	0.00	0	392.50	0.00
10.50	0.00	0	392.50	0.00
12.00	**0.22**	58	392.69	0.01
13.50	**0.04**	**597**	**393.74**	**0.03**
15.00	0.03	**585**	**393.72**	**0.03**
16.50	0.02	527	393.64	0.03
18.00	0.02	452	393.52	0.03
19.50	0.01	371	393.39	0.03
21.00	0.01	289	393.24	0.03
22.50	0.01	217	393.09	0.02
24.00	0.01	159	392.96	0.02
25.50	0.00	75	392.74	0.01
27.00	0.00	22	392.58	0.01
28.50	0.00	8	392.53	0.00
30.00	0.00	3	392.51	0.00
31.50	0.00	1	392.50	0.00
33.00	0.00	1	392.50	0.00
34.50	0.00	0	392.50	0.00
36.00	0.00	0	392.50	0.00
37.50	0.00	0	392.50	0.00
39.00	0.00	0	392.50	0.00
40.50	0.00	0	392.50	0.00
42.00	0.00	0	392.50	0.00
43.50	0.00	0	392.50	0.00
45.00	0.00	0	392.50	0.00
46.50	0.00	0	392.50	0.00
48.00	0.00	0	392.50	0.00
49.50	0.00	0	392.50	0.00
51.00	0.00	0	392.50	0.00
52.50	0.00	0	392.50	0.00
54.00	0.00	0	392.50	0.00
55.50	0.00	0	392.50	0.00
57.00	0.00	0	392.50	0.00
58.50	0.00	0	392.50	0.00
60.00	0.00	0	392.50	0.00
61.50	0.00	0	392.50	0.00
63.00	0.00	0	392.50	0.00
64.50	0.00	0	392.50	0.00
66.00	0.00	0	392.50	0.00
67.50	0.00	0	392.50	0.00
69.00	0.00	0	392.50	0.00
70.50	0.00	0	392.50	0.00
72.00	0.00	0	392.50	0.00



LOCATION

NTS

0' 150' 300' 600' 900'

Bar Scale 1" = 150'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 150'
Date	4/26/16
Project	14257.3

Overall Site Plan - Respite House

TAFT FARMS
Lots "F" & "G"

Route 2 — Williston, Vermont

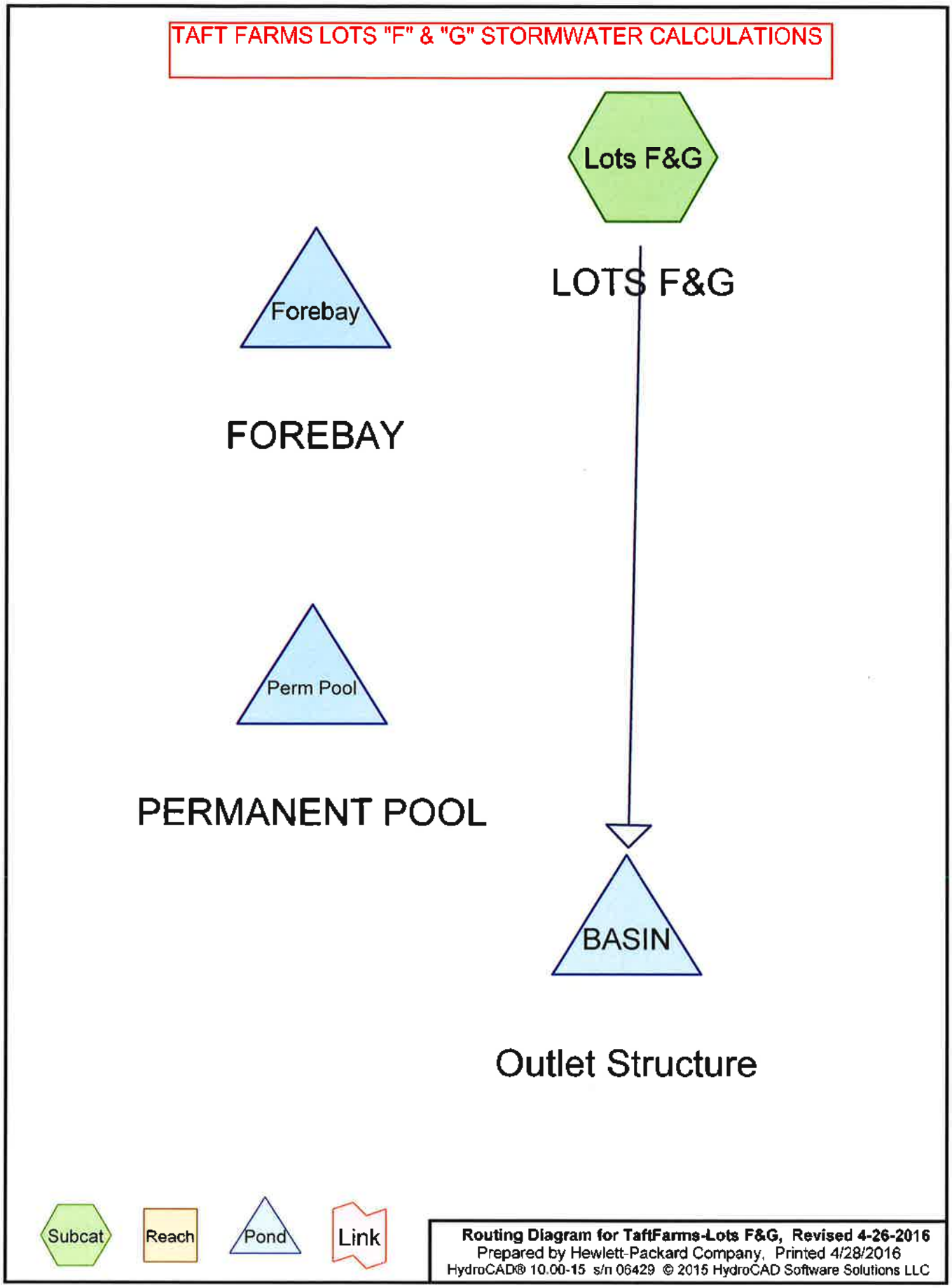
KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 14257.3 ltr fig overall site plan rev1

Printing date 4/26/16

OV-1

TAFT FARMS LOTS "F" & "G" STORMWATER CALCULATIONS



Routing Diagram for TaftFarms-Lots F&G, Revised 4-26-2016
Prepared by Hewlett-Packard Company, Printed 4/28/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Taft Farms Lots F & G
Hydrologic Model

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.347	80	>75% Grass cover, Good, HSG D (Lots F&G)
0.477	98	Impervious - Roofs (Lots F&G)
1.045	98	Impervious-Pavement (Lots F&G)
5.869	**85**	**TOTAL AREA**

Time span=0.00-120.00 hrs, dt=0.03 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentLots F&G: LOTS F&G Runoff Area=255,648 sf 25.93% Impervious Runoff Depth=0.95"
Flow Length=230' Tc=14.4 min CN=WQ Runoff=6.78 cfs 0.464 af

Pond BASIN: Outlet Structure Peak Elev=378.19' Storage=12,442 cf Inflow=6.78 cfs 0.464 af
Outflow=0.22 cfs 0.464 af

Pond Forebay: FOREBAY Peak Elev=0.00' Storage=0 cf

Pond Perm Pool: PERMANENT POOL Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 5.869 ac Runoff Volume = 0.464 af Average Runoff Depth = 0.95"
74.07% Pervious = 4.347 ac 25.93% Impervious = 1.522 ac

Summary for Subcatchment Lots F&G: LOTS F&G

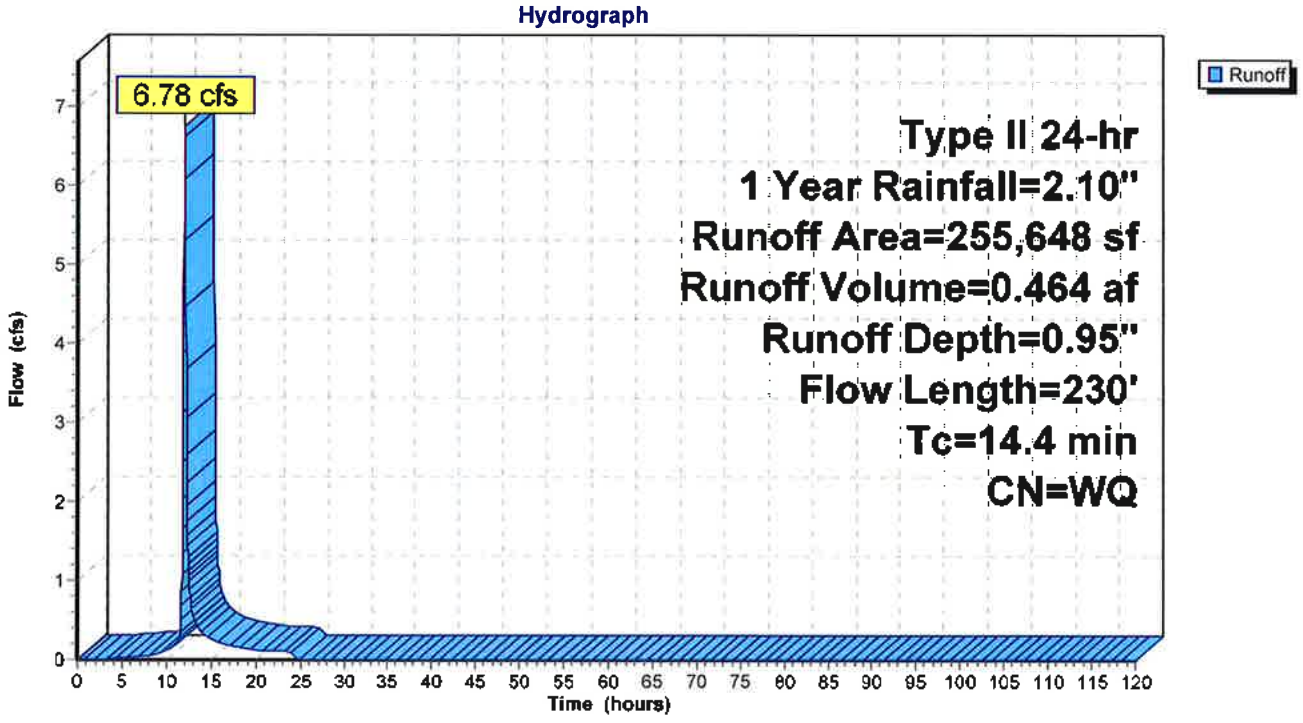
Runoff = 6.78 cfs @ 12.07 hrs, Volume= 0.464 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	45,500	98	Impervious-Pavement
*	20,790	98	Impervious - Roofs
	189,358	80	>75% Grass cover, Good, HSG D
	255,648		Weighted Average
	189,358		74.07% Pervious Area
	66,290		25.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	55	0.0110	0.07		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
1.1	175	0.0280	2.69		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
14.4	230	Total			

Subcatchment Lots F&G: LOTS F&G



Summary for Pond BASIN: Outlet Structure

Inflow Area = 5.869 ac, 25.93% Impervious, Inflow Depth = 0.95" for 1 Year event
Inflow = 6.78 cfs @ 12.07 hrs, Volume= 0.464 af
Outflow = 0.22 cfs @ 15.81 hrs, Volume= 0.464 af, Atten= 97%, Lag= 224.9 min
Primary = 0.22 cfs @ 15.81 hrs, Volume= 0.464 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Peak Elev= 378.19' @ 15.81 hrs Surf.Area= 7,291 sf Storage= 12,442 cf

Plug-Flow detention time= 718.4 min calculated for 0.464 af (100% of inflow)
Center-of-Mass det. time= 719.3 min (1,539.2 - 819.8) 11.98 hours

Volume	Invert	Avail.Storage	Storage Description
#1	376.00'	47,940 cf	**Pond (Prismatic)** Listed below (Recalc)

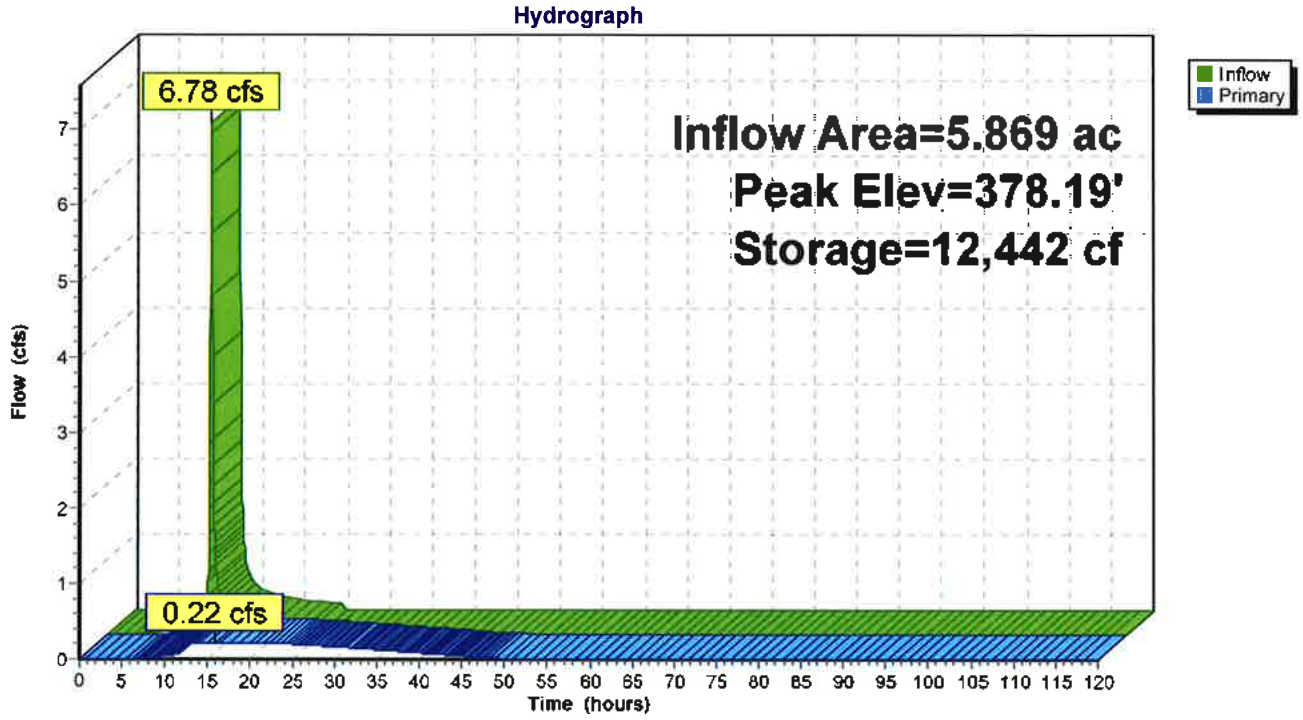
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
376.00	4,112	0	0
377.00	5,525	4,819	4,819
378.00	6,966	6,246	11,064
379.00	8,650	7,808	18,872
380.00	10,844	9,747	28,619
381.00	13,365	12,105	40,724
381.50	15,500	7,216	47,940

2.4" Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	376.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#2	Primary	378.30'	**36.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.22 cfs @ 15.81 hrs HW=378.19' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.22 cfs @ 6.97 fps)
└**2=Orifice/Grate** (Controls 0.00 cfs)

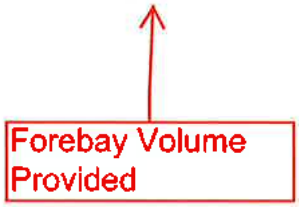
Pond BASIN: Outlet Structure



Summary for Pond Forebay: FOREBAY

Volume	Invert	Avail.Storage	Storage Description
#1	372.00'	3,320 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

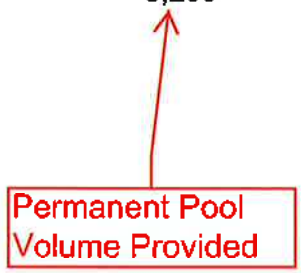
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.00	230	0	0
373.00	460	345	345
374.00	791	626	971
375.00	1,168	980	1,950
376.00	1,572	1,370	3,320



Summary for Pond Perm Pool: PERMANENT POOL

Volume	Invert	Avail.Storage	Storage Description
#1	372.00'	9,209 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.00	895	0	0
373.00	1,469	1,182	1,182
374.00	2,190	1,830	3,012
375.00	3,015	2,603	5,614
376.00	4,175	3,595	9,209



Parcel COM.046b

N/F Snyder Taft Corners, LLC
Parcel 08.104.010.000a

Lot H Pond

Parcel
COM.046b

Vermont State Plane
Grid North (NAD83)

N/F Town of Williston
Parcel 08.104.050.000

PVT.045

PVT.046

N/F Snyder Taft Corners, LLC
Parcel 08.104.010.000f

PVT.040

ALLEN BROOK LANE

ISHAM CIRCLE

Respite
House
Pond

Recreation Area Pond

N/F JCST, LLC
Parcel 08.143.010.000b

Ken's Way

TALCOTT ROAD

Lot C-D Pond

N/F JCST, LLC
Parcel 08.143.010.000a

Condominium Pond

N/F Town of Williston
Parcel 08.087.095.000

N/F Sisters and
Brothers Trust Fund
Parcel 08.104.030.000

Parcel COM.038

N/F Talcott Road, LLC
Parcel 08.104.032.000

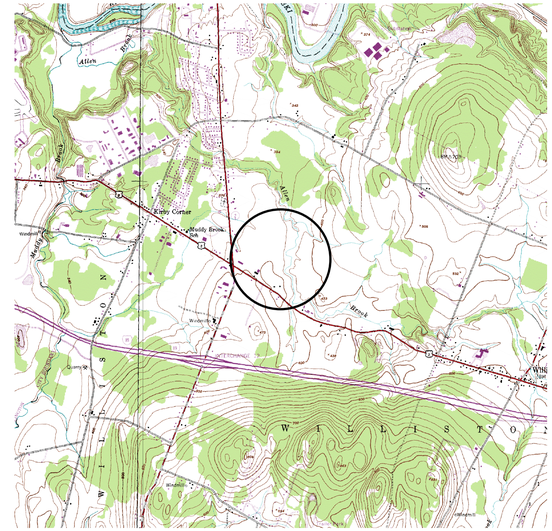
ROUTE 2

N/F Town of Williston
Parcel 08.104.050.000

N/F Allen Brook Development, Inc.
Parcel 08.104.011.000

N/F Allen Brook
Development, Inc.
Parcel 08.104.019.000

N/F Allen Brook
Development, Inc.
Parcel 08.104.029.000



LOCATION

NTS

0' 150' 300' 600' 900'

Bar Scale 1" = 150'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 150'
Date	4/26/16
Project	14257.4

Overall Site Plan

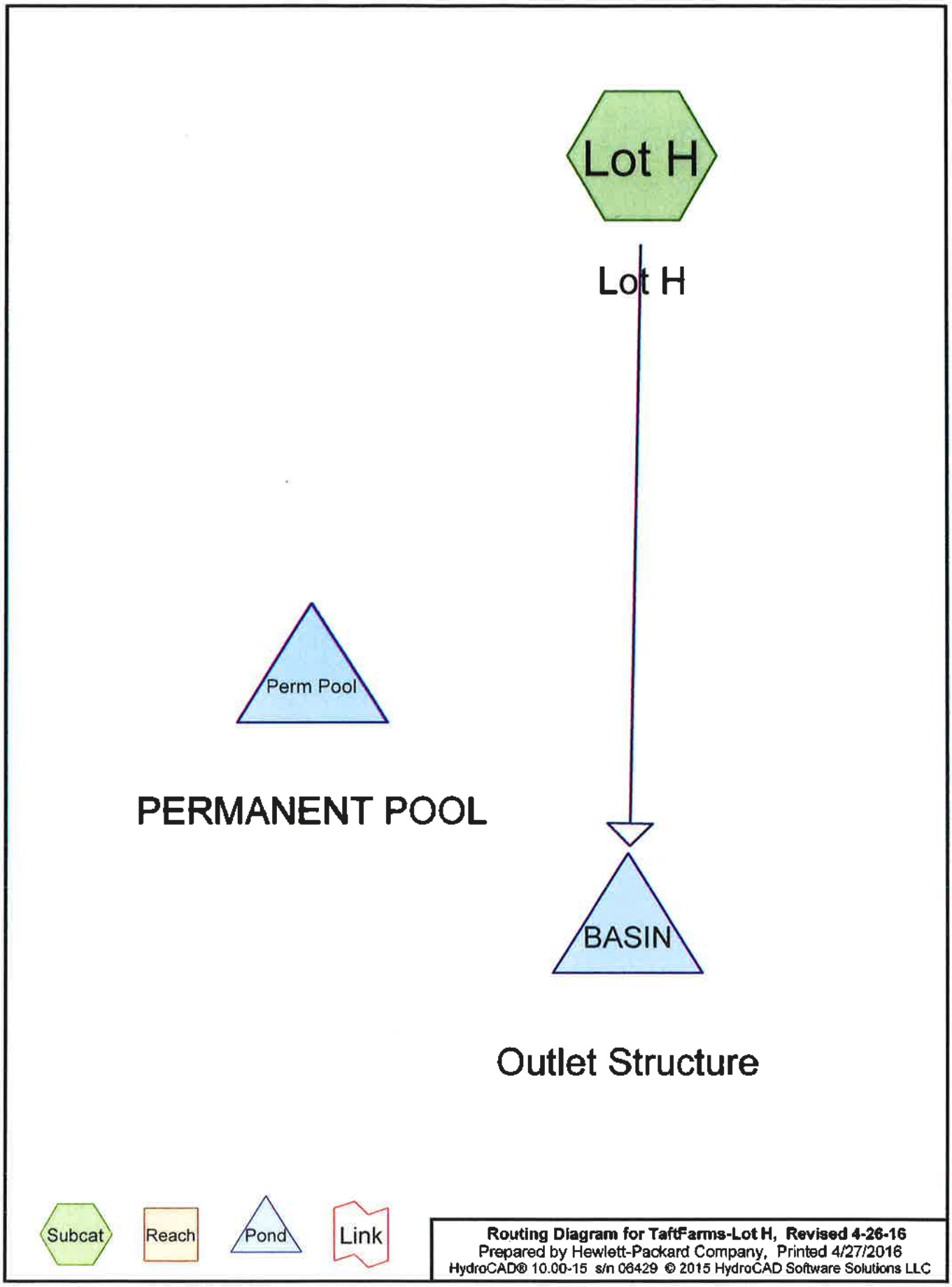
TAFT FARMS
Lot "H"

Route 2 — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 14257.4 ALT overall site plan rev 1
Printing date: 4/27/16

OV-1


Lot H
Lot H
Perm Pool
PERMANENT POOL
BASIN
Outlet Structure
Subcat
Reach
Pond
Link
Routing Diagram for TaftFarms-Lot H, Revised 4-26-16
Prepared by Hewlett-Packard Company, Printed 4/27/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Taft Farms - Lot "H"

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.687	80	>75% Grass cover, Good, HSG D (Lot H)
0.406	98	Impervious - Roofs (Lot H)
1.202	98	Impervious-Pavement (Lot H)
2.295	**93**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentLot H: Lot H Runoff Area=99,988 sf 70.08% Impervious Runoff Depth=1.50"
Flow Length=151' Slope=0.0200 '/' Tc=8.3 min CN=WQ Runoff=5.03 cfs 0.287 af

Pond BASIN: Outlet Structure Peak Elev=370.37' Storage=8,043 cf Inflow=5.03 cfs 0.287 af
Outflow=0.13 cfs 0.287 af

Pond Perm Pool: PERMANENT POOL Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 2.295 ac Runoff Volume = 0.287 af Average Runoff Depth = 1.50"
29.92% Pervious = 0.687 ac 70.08% Impervious = 1.609 ac

Summary for Subcatchment Lot H: Lot H

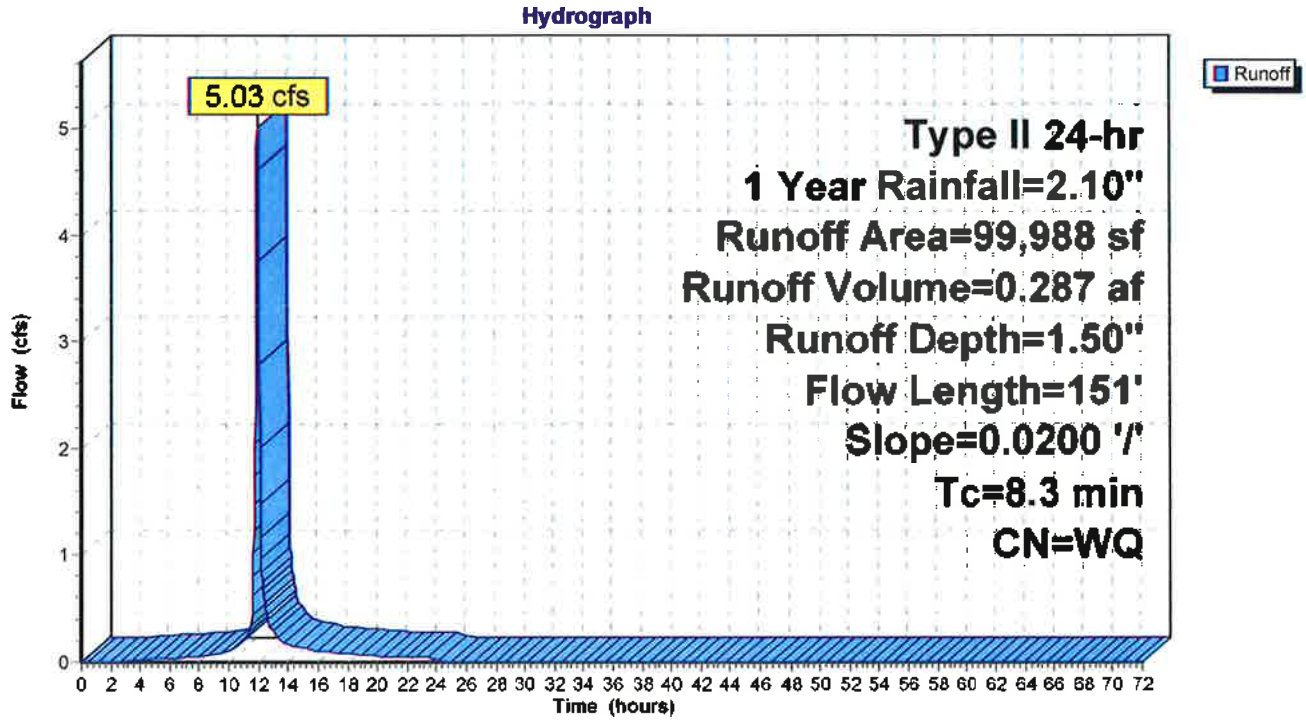
Runoff = 5.03 cfs @ 11.99 hrs, Volume= 0.287 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	52,380	98	Impervious-Pavement
*	17,690	98	Impervious - Roofs
*	29,918	80	>75% Grass cover, Good, HSG D
	99,988		Weighted Average
	29,918		29.92% Pervious Area
	70,070		70.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	37	0.0200	0.08		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
0.7	114	0.0200	2.87		**Shallow Concentrated Flow, SC - Pavement** Paved Kv= 20.3 fps
8.3	151	Total			

Subcatchment Lot H: Lot H



Summary for Pond BASIN: Outlet Structure

Inflow Area = 2.295 ac, 70.08% Impervious, Inflow Depth = 1.50" for 1 Year event
Inflow = 5.03 cfs @ 11.99 hrs, Volume= 0.287 af
Outflow = 0.13 cfs @ 15.02 hrs, Volume= 0.287 af, Atten= 97%, Lag= 181.5 min
Primary = 0.13 cfs @ 15.02 hrs, Volume= 0.287 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 370.37' @ 15.02 hrs Surf.Area= 4,260 sf Storage= 8,043 cf

Plug-Flow detention time= 756.4 min calculated for 0.287 af (100% of inflow)
Center-of-Mass det. time= 755.6 min (1,532.9 - 777.3) 12.6 hrs

Volume	Invert	Avail.Storage	Storage Description
#1	368.00'	25,508 cf	**Pond (Prismatic)**Listed below (Recalc)

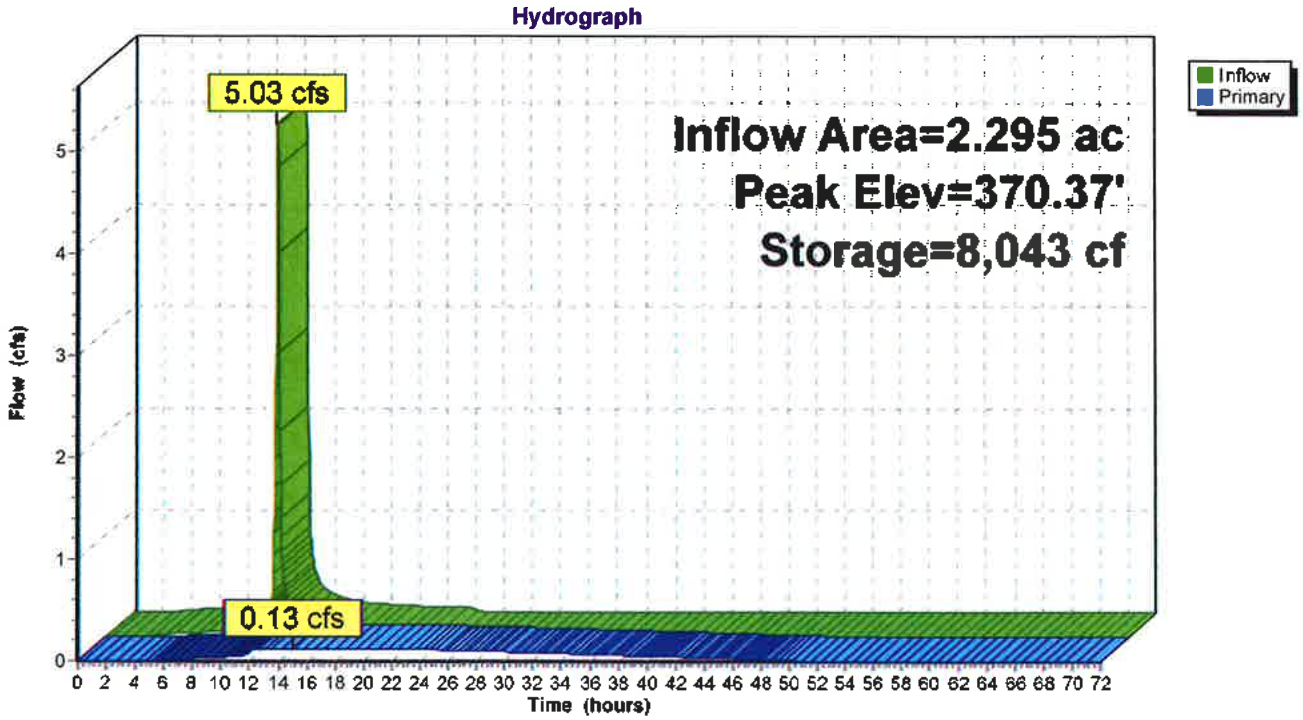
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
368.00	2,580	0	0
369.00	3,250	2,915	2,915
370.00	3,975	3,613	6,528
371.00	4,750	4,363	10,890
372.00	5,595	5,173	16,063
373.00	6,490	6,043	22,105
373.50	7,120	3,403	25,508

1.8" Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	368.00'	**1.8" Vert. Orifice/Grate** C= 0.600
#2	Primary	370.40'	**36.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	372.50'	**5.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.13 cfs @ 15.02 hrs HW=370.37' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.13 cfs @ 7.29 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Outlet Structure



Summary for Pond Perm Pool: PERMANENT POOL

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	5,088 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

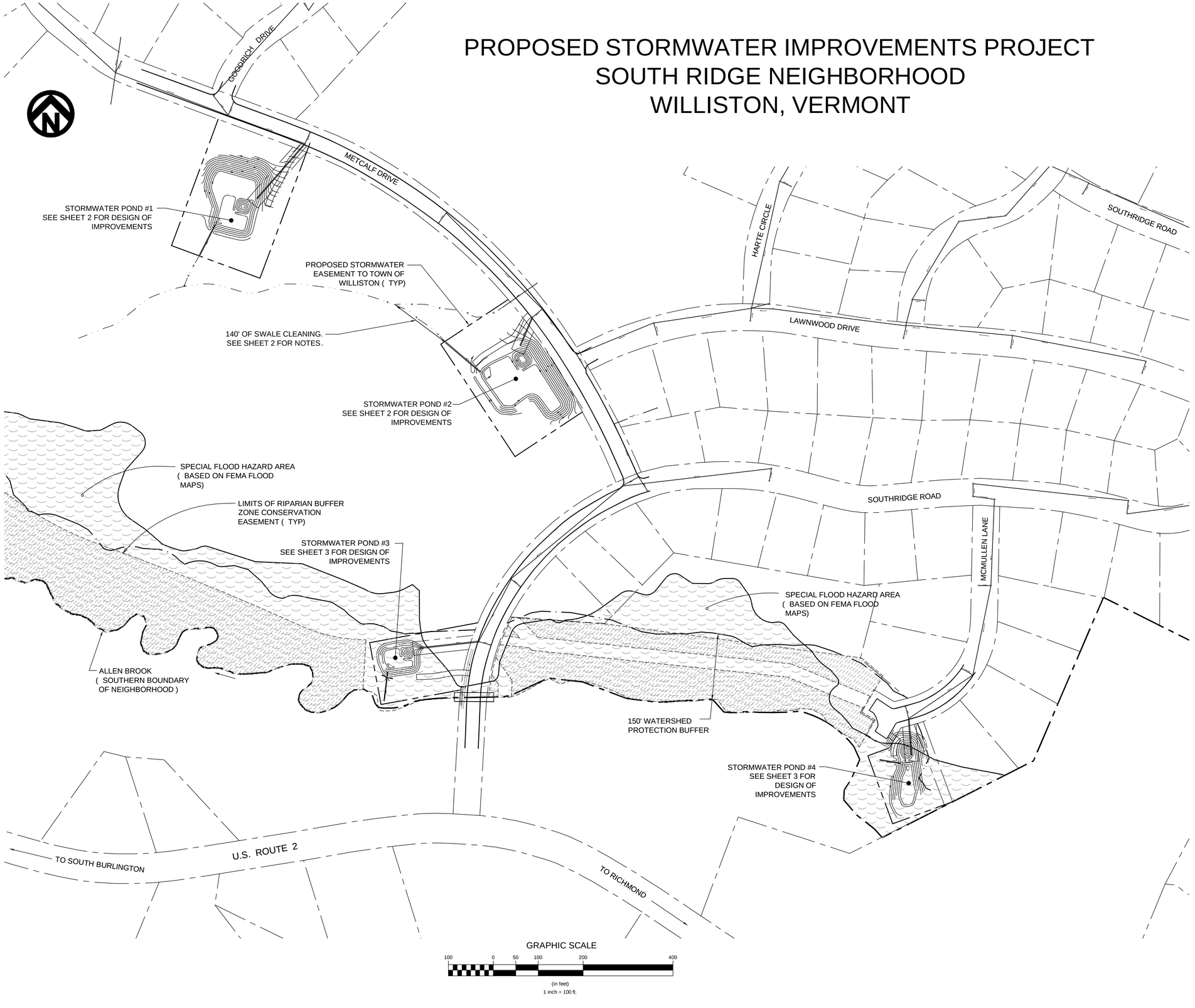
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	665	0	0
364.00	935	800	800
365.00	1,245	1,090	1,890
366.00	1,590	1,418	3,308
367.00	1,970	1,780	5,088

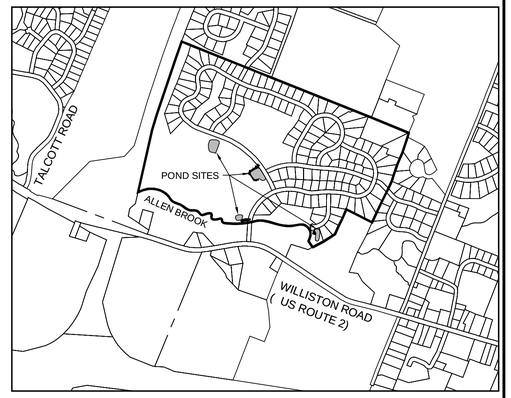
Required WQv = 5,110 cu.ft.
Provided WQv = 5,088 cu.ft.
- 99.6% WQv provided in permanent pool.

SOUTH RIDGE: PERMIT 1-0664


Source: USGS
Source: NASA, NGA, USGS
© 2008 Microsoft Corp.
124m
esri

PROPOSED STORMWATER IMPROVEMENTS PROJECT
SOUTH RIDGE NEIGHBORHOOD
WILLISTON, VERMONT





LOCATION PLAN
NTS

INDEX OF SHEETS

NOTES:

1. THE PURPOSE OF THESE PLANS ARE TO PRESENT THE PROPOSED IMPROVEMENTS TO THE EXISTING STORM PONDS. SEE OTHER PLANS FOR ADDITIONAL DESIGN INFORMATION AND CONSTRUCTION DETAILS.

2. BOUNDARY INFORMATION SHOWN IS BASED UPON FIELD EVIDENCE, TAX MAPS AND THE 'SOUTH RIDGE PROPERTY PLATS B-1 AND B-2' BY LAMOUREUX CONSULTING ENGINEER AND LAND SURVEYOR.

3. EXISTING CONDITIONS SHOWN HEREON ARE BASED UPON A TOPOGRAPHIC SURVEY PERFORMED BY L&D IN SEPTEMBER 2014.

4. THE WETLAND DELINEATION WAS PERFORMED BY L&D IN SEPTEMBER 2014.

TAX PARCEL COM.048

Date	Revision	By

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ☐ Preliminary
- ■ Final Local Review
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

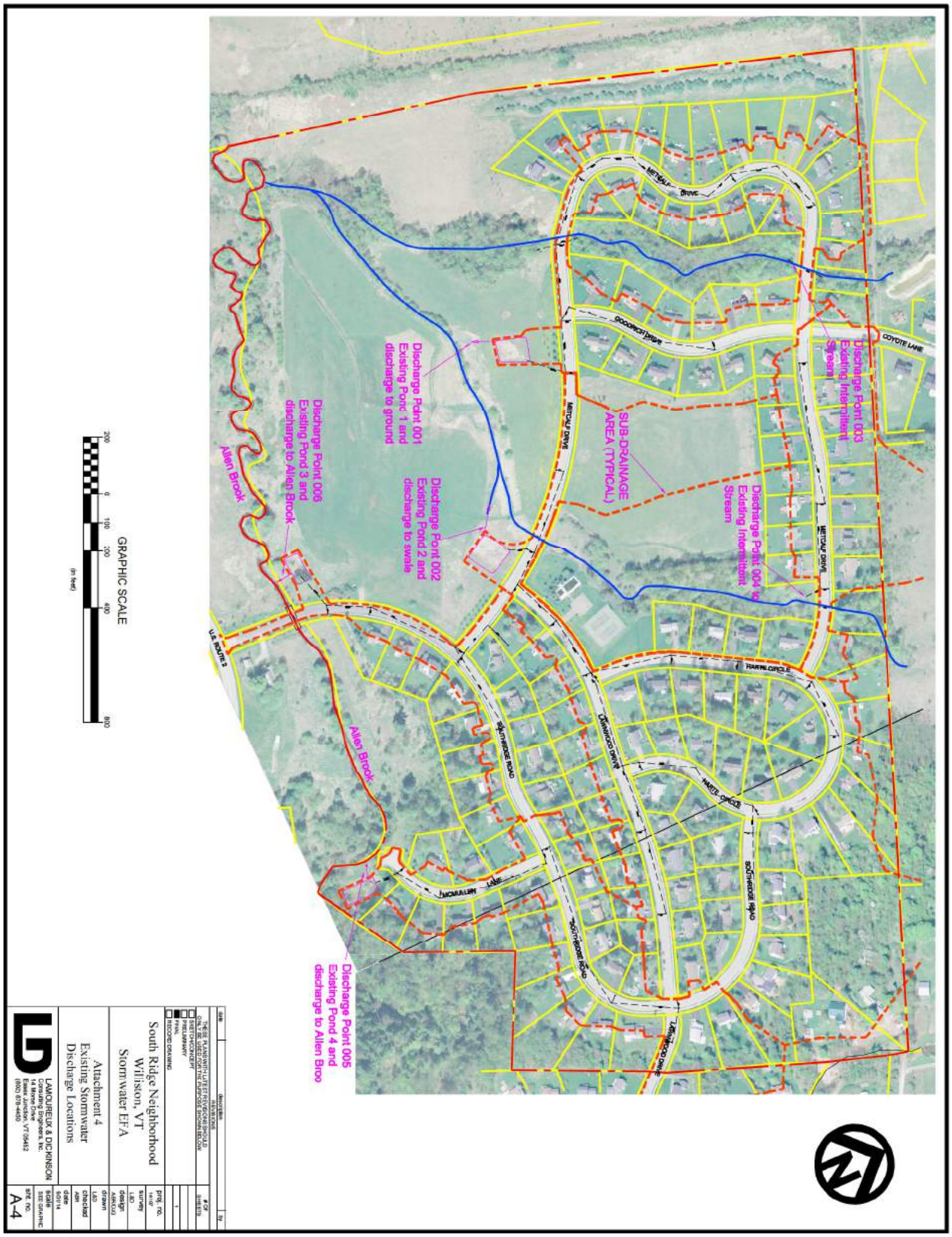
South Ridge Neighborhood Stormwater Improvement Project
US Route 2 Williston VT

Title Sheet & Overall Site Plan

Project No.	14107
Survey	L&D
Design	DG
Drawn	L&D
Checked	AR
Date	10-15-15
Scale	1" = 100'
Sheet number	1

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com

Attachment 4
Existing Stormwater Discharge Locations



	description	by
date		
	THESE PLANS WITH LATER REVISIONS SHOULD ONLY BE USED FOR THE PURPOSE SHOWN BELOW:	# OF SHEETS
	PRELIMINARY	
	FINAL	
	RECORD DRAWING	

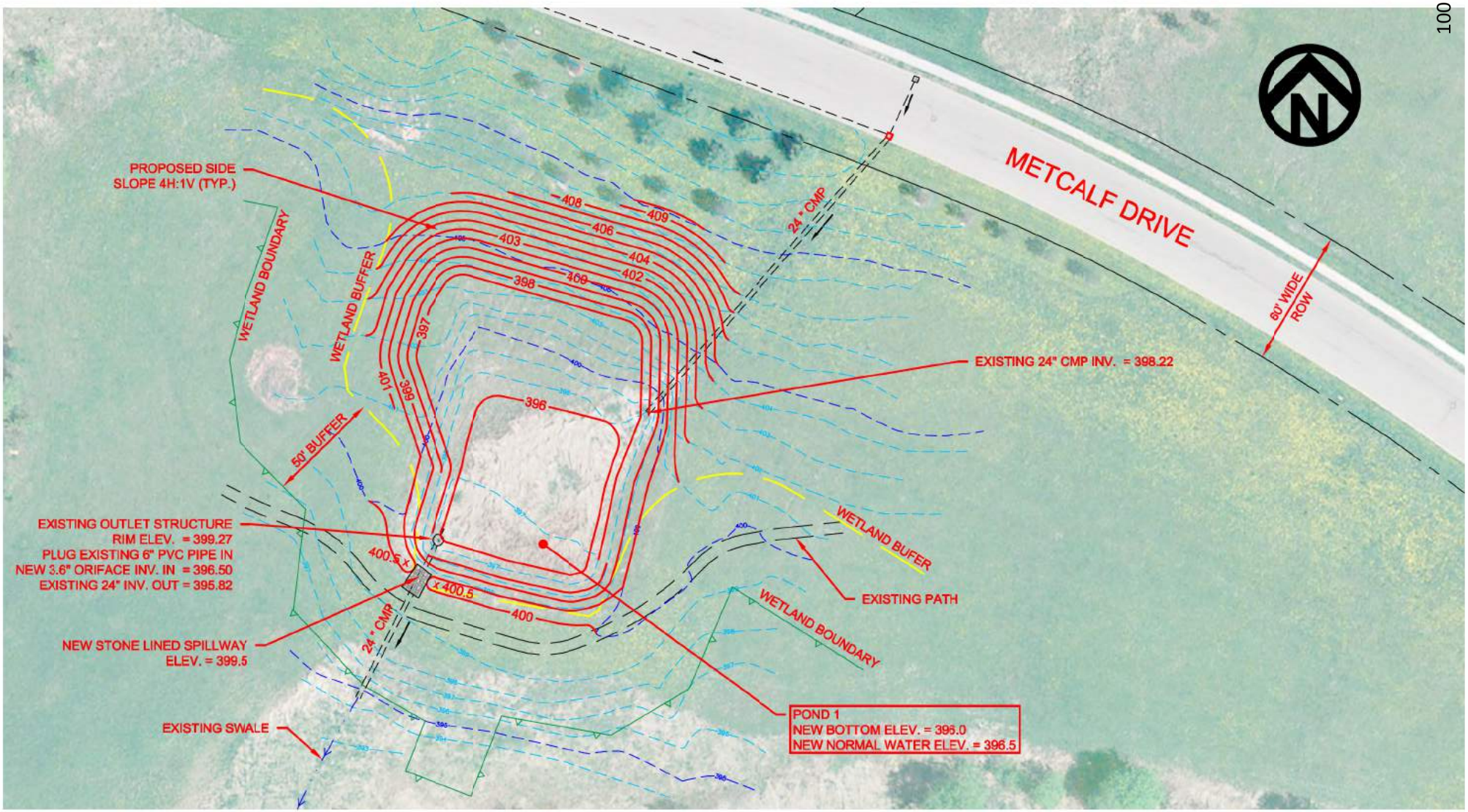
South Ridge Neighborhood
Williston, VT
Stormwater EFA

Attachment 4
Existing Stormwater
Discharge Locations

LAMOUREUX & DICKINSON
Consulting Engineers, Inc.
11 Kimball Ave.
Essex Junction, VT 05452
(802) 878-4460

proj. no.	14107
survey	
design	ARK/JJG
drawn	LAD
checked	ARK
date	9/2014
scale	SEE GRAPHIC
sht. no.	A-4

Attachment 5
Pond 1 (conceptual pond improvements design)



GRAPHIC SCALE

0 20 40 80 160

1 inch = 40 ft.

SOUTHRIDGE NEIGHBORHOOD

METCALF DRIVE WILLISTON, VT

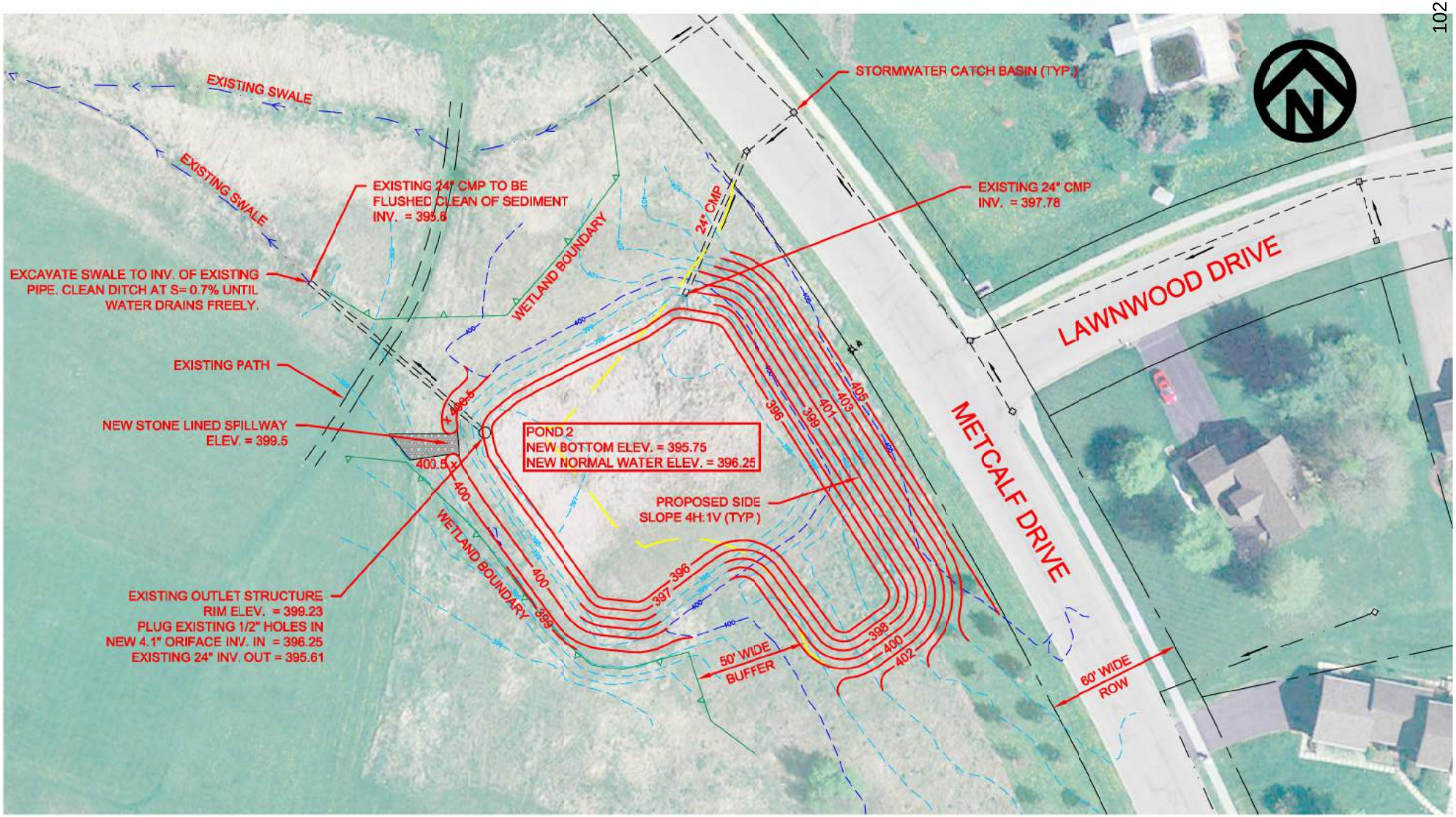
PROPOSED POND 1 MODIFICATIONS

LD

SEPTEMBER 2014

Attachment 6

Pond 2 (conceptual pond improvements design)



GRAPHIC SCALE

20 40 80 160

1 inch = 40 ft.

SOUTHRIDGE NEIGHBORHOOD

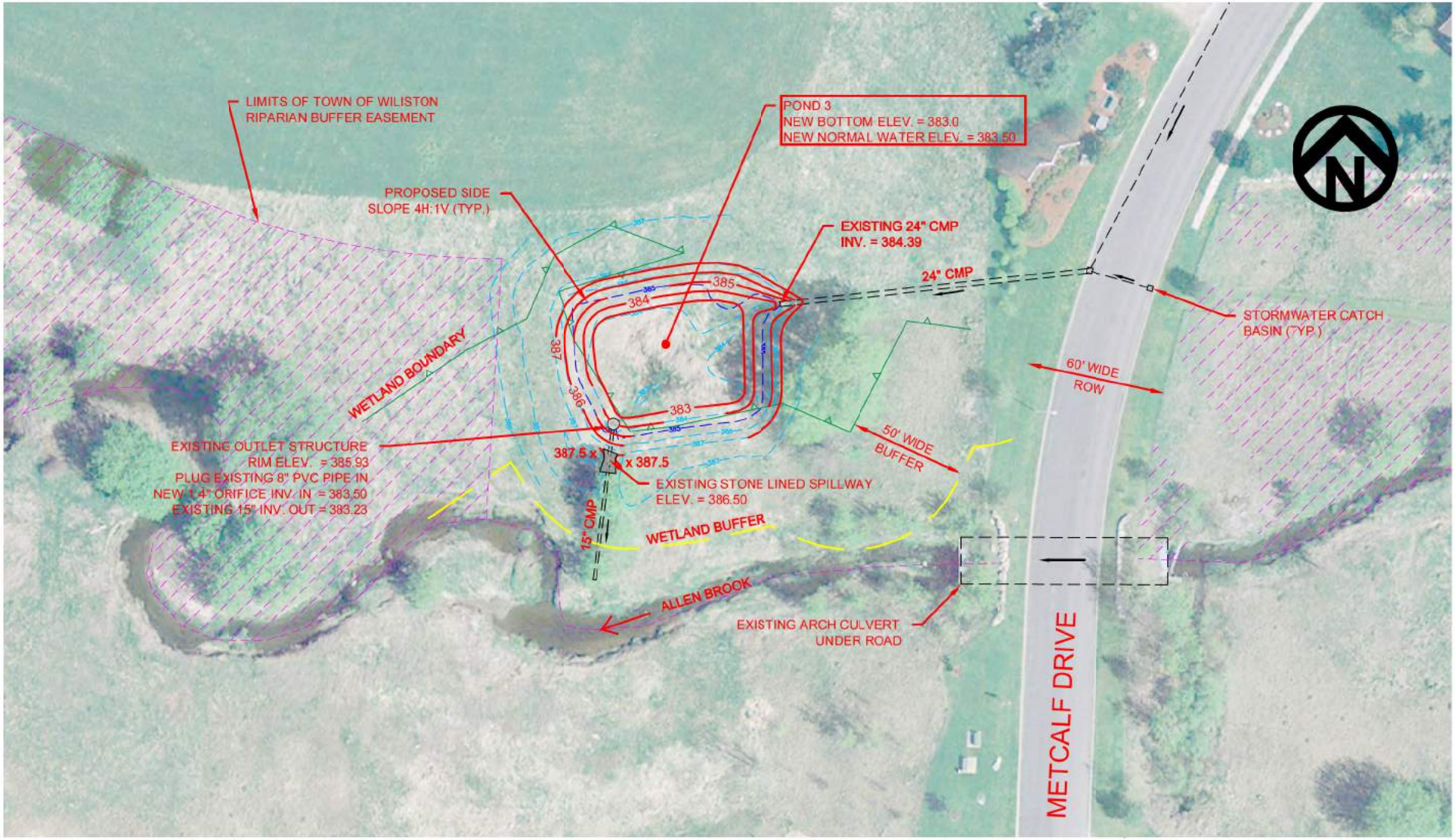
METCALF DRIVE WILLISTON, VT

PROPOSED POND 2 MODIFICATIONS

SEPTEMBER 2014

Attachment 7

Pond 3 (conceptual pond improvements design)



GRAPHIC SCALE

20 40 80 160

1 inch = 40 ft.

SOUTHRIDGE NEIGHBORHOOD

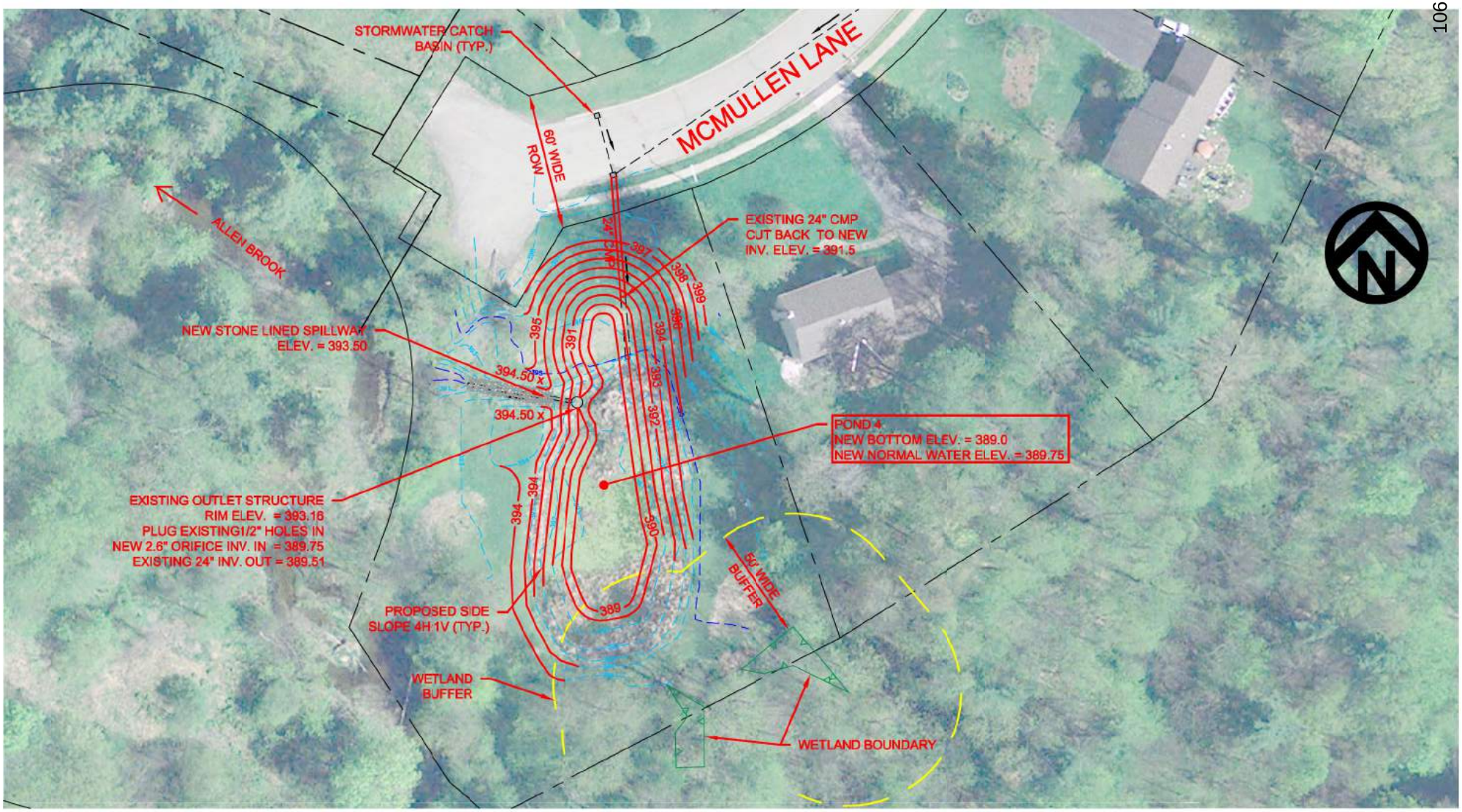
METCALF DRIVE WILLISTON, VT

PROPOSED POND 3 MODIFICATIONS

SEPTEMBER 2014

Attachment 8

Pond 4 (conceptual pond improvements design)



GRAPHIC SCALE

20 40 80 160

1 inch = 40ft.

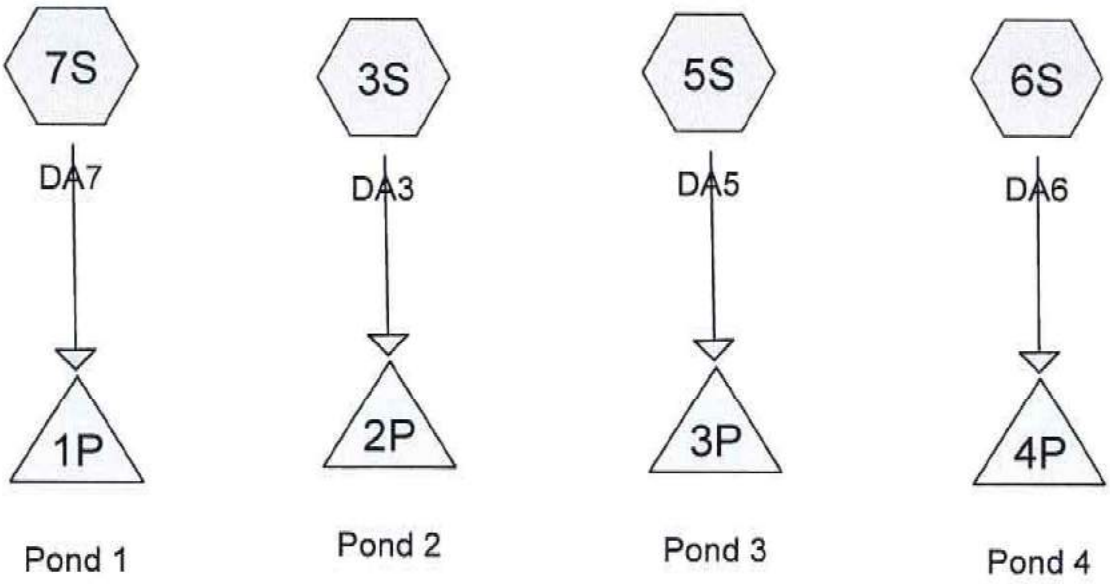
SOUTHRIDGE NEIGHBORHOOD

MCMULLEN LANE WILLISTON, VT

PROPOSED POND 4 MODIFICATIONS

SEPTEMBER 2014

Attachment 9
Hydrologic Calculations



Pond 1 Pond 2 Pond 3 Pond 4

Subcat Reach Pond Link

Drainage Diagram for 14107-proposed
Prepared by {enter your company name here}, Printed 9/26/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Summary for Subcatchment 3S: DA3

Runoff = 30.63 cfs @ 12.08 hrs, Volume= 2.239 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-100.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	3.490	98	Road
*	0.430	98	Sidewalk
*	1.770	98	Roof
*	1.160	98	Drive
	0.660	70	Woods, Good, HSG C
	7.420	74	>75% Grass cover, Good, HSG C
	4.578	77	Woods, Good, HSG D
	9.210	78	Meadow, non-grazed, HSG D
	6.050	80	>75% Grass cover, Good, HSG D
	34.768	81	Weighted Average
	27.918	77	80.30% Pervious Area
	6.850	98	19.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0610	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
4.8	500	0.0610	1.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.6	600	Total			

Summary for Subcatchment 5S: DA5

Runoff = 11.01 cfs @ 12.04 hrs, Volume= 0.710 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-100.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.240	98	Roadway
*	0.118	98	Sidewalk
*	0.550	98	Roof
*	0.350	98	Drive
	0.880	39	>75% Grass cover, Good, HSG A
	1.540	74	>75% Grass cover, Good, HSG C
	7.530	80	>75% Grass cover, Good, HSG D
	12.208	80	Weighted Average
	9.950	75	81.50% Pervious Area
	2.258	98	18.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
3.9	400	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	500	Total			

Summary for Subcatchment 6S: DA6

Runoff = 9.82 cfs @ 12.14 hrs, Volume= 0.839 af, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-100.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.630	98	Roadway
*	0.197	98	Sidewalk
*	0.710	98	Roof
*	0.670	98	Drives
	1.630	61	>75% Grass cover, Good, HSG B
	0.120	70	Woods, Good, HSG C
	0.940	74	>75% Grass cover, Good, HSG C
	6.030	80	>75% Grass cover, Good, HSG D
	11.927	82	Weighted Average
	8.720	76	73.11% Pervious Area
	3.207	98	26.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	100	0.0550	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.4	100	0.0550	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	200	0.0550	1.64		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.3	400	Total			

Summary for Subcatchment 7S: DA7

Runoff = 15.30 cfs @ 12.10 hrs, Volume= 1.159 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-100.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	2.090	98	Roads
*	0.261	98	Sidewalk
*	0.970	98	Roofs
*	0.970	98	Drives
	9.390	80	>75% Grass cover, Good, HSG D
	13.681	86	Weighted Average
	9.390	80	68.64% Pervious Area
	4.291	98	31.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
5.9	550	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.6	650	Total			

Summary for Pond 1P: Pond 1

Inflow Area = 13.681 ac, 31.36% Impervious, Inflow Depth = 1.02" for 1 year event
Inflow = 15.30 cfs @ 12.10 hrs, Volume= 1.159 af
Outflow = 0.55 cfs @ 15.71 hrs, Volume= 1.157 af, Atten= 96%, Lag= 216.7 min
Primary = 0.55 cfs @ 15.71 hrs, Volume= 1.157 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 396.50' Surf.Area= 7,008 sf Storage= 2,833 cf
Peak Elev= 399.24' @ 15.71 hrs Surf.Area= 13,993 sf Storage= 34,072 cf (31,240 cf above start)

Plug-Flow detention time= 805.9 min calculated for 1.092 af (94% of inflow)
Center-of-Mass det. time= 718.8 min (1,534.9 - 816.1)

Volume	Invert	Avail.Storage	Storage Description
#1	396.00'	37,795 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)
396.00	4,421	256.0	0	0	4,421
397.00	10,188	397.0	7,107	7,107	11,755
398.00	11,829	419.0	10,998	18,105	13,241
399.00	13,556	446.0	12,683	30,788	15,149
399.50	14,480	460.0	7,008	37,795	16,184

Device	Routing	Invert	Outlet Devices
#1	Primary	399.27'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600
#2	Primary	396.50'	**3.6" Vert. Orifice** C= 0.600
#3	Primary	399.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 0.50
			Width (feet) 2.00 4.00

Primary OutFlow Max=0.55 cfs @ 15.71 hrs HW=399.24' (Free Discharge)
- **1=Grate** (Controls 0.00 cfs)
- **2=Orifice** (Orifice Controls 0.55 cfs @ 7.75 fps)
- **3=Custom Weir/Orifice** (Controls 0.00 cfs)

Summary for Pond 2P: Pond 2

Inflow Area = 34.768 ac, 19.70% Impervious, Inflow Depth = 0.77" for 1 year event
Inflow = 30.63 cfs @ 12.08 hrs, Volume= 2.239 af
Outflow = 2.54 cfs @ 13.23 hrs, Volume= 2.232 af, Atten= 92%, Lag= 68.8 min
Primary = 2.54 cfs @ 13.23 hrs, Volume= 2.232 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 396.25' Surf.Area= 13,272 sf Storage= 6,384 cf
Peak Elev= 399.37' @ 13.23 hrs Surf.Area= 20,147 sf Storage= 58,219 cf (51,835 cf above start)

Plug-Flow detention time= 823.6 min calculated for 2.085 af (93% of inflow)
Center-of-Mass det. time= 725.0 min (1,556.4 - 831.4)

Volume	Invert	Avail.Storage	Storage Description
#1	395.75'	60,911 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)
395.75	12,266	367.0	0	0	12,266
396.00	12,769	384.0	3,129	3,129	13,286
397.00	14,841	411.0	13,792	16,921	15,040
398.00	17,014	438.0	15,915	32,836	16,913
399.00	19,287	452.0	18,139	50,975	18,000
399.50	20,462	466.0	9,936	60,911	19,048

Device	Routing	Invert	Outlet Devices
#1	Primary	399.23'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600
#2	Primary	396.25'	**4.1" Vert. Orifice** C= 0.600

Primary OutFlow Max=2.54 cfs @ 13.23 hrs HW=399.37' (Free Discharge)
↑—**1=Grate** (Orifice Controls 1.79 cfs @ 1.79 fps)
└—**2=Orifice** (Orifice Controls 0.76 cfs @ 8.27 fps)

Summary for Pond 3P: Pond 3

Inflow Area = 12.208 ac, 18.50% Impervious, Inflow Depth = 0.70" for 1 year event
Inflow = 11.01 cfs @ 12.04 hrs, Volume= 0.710 af
Outflow = 2.98 cfs @ 12.27 hrs, Volume= 0.708 af, Atten= 73%, Lag= 13.7 min
Primary = 2.98 cfs @ 12.27 hrs, Volume= 0.708 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 383.50' Surf.Area= 3,123 sf Storage= 1,452 cf
Peak Elev= 386.29' @ 12.27 hrs Surf.Area= 5,943 sf Storage= 13,965 cf (12,514 cf above start)

Plug-Flow detention time= 807.9 min calculated for 0.675 af (95% of inflow)
Center-of-Mass det. time= 734.6 min (1,564.7 - 830.2)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	15,224 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)
383.00	2,689	197.0	0	0	2,689
384.00	3,590	239.0	3,129	3,129	4,162
385.00	4,568	263.0	4,069	7,198	5,153
386.00	5,607	284.0	5,079	12,276	6,108
386.50	6,188	292.0	2,948	15,224	6,502

Device	Routing	Invert	Outlet Devices
#1	Primary	385.93'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	386.50'	**Custom Weir, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 Width (feet) 1.00 3.00
#3	Primary	383.50'	**1.4" Vert. Orifice** C= 0.600

Primary OutFlow Max=2.98 cfs @ 12.27 hrs HW=386.29' (Free Discharge)
- **1=Grate** (Orifice Controls 2.90 cfs @ 2.90 fps)
- **2=Custom Weir** (Controls 0.00 cfs)
- **3=Orifice** (Orifice Controls 0.09 cfs @ 7.96 fps)

Summary for Pond 4P: Pond 4

Inflow Area = 11.927 ac, 26.89% Impervious, Inflow Depth = 0.84" for 1 year event
Inflow = 9.82 cfs @ 12.14 hrs, Volume= 0.839 af
Outflow = 0.79 cfs @ 13.58 hrs, Volume= 0.839 af, Atten= 92%, Lag= 86.5 min
Primary = 0.79 cfs @ 13.58 hrs, Volume= 0.839 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 389.75' Surf.Area= 3,519 sf Storage= 2,307 cf
Peak Elev= 393.19' @ 13.58 hrs Surf.Area= 8,757 sf Storage= 23,008 cf (20,700 cf above start)

Plug-Flow detention time= 816.1 min calculated for 0.786 af (94% of inflow)
Center-of-Mass det. time= 717.4 min (1,541.5 - 824.1)

Volume	Invert	Avail.Storage	Storage Description
#1	389.00'	25,782 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)
389.00	2,654	311.0	0	0	2,654
390.00	3,835	302.0	3,226	3,226	3,189
391.00	5,156	334.0	4,479	7,706	4,840
392.00	6,883	387.0	5,999	13,704	7,902
393.00	8,446	403.0	7,651	21,356	8,983
393.50	9,266	415.0	4,426	25,782	9,790

Device	Routing	Invert	Outlet Devices
#1	Primary	393.16'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	389.75'	**2.6" Vert. Orifice** C= 0.600

Primary OutFlow Max=0.78 cfs @ 13.58 hrs HW=393.19' (Free Discharge)
└**1=Grate** (Weir Controls 0.45 cfs @ 0.59 fps)
└**2=Orifice** (Orifice Controls 0.32 cfs @ 8.79 fps)


Southfield Dr
Southridge Rd
McMullen Ln
Lawnwood Dr
Germaine Ct
Brookside Dr, Williston, VT 05495
Old Stage Rd
Village Grove
© 2011 Google
©2010 Google
Imagery Date: 4/30/2004
44°26'36.93" N 73°04'48.64" W elev 477 ft
Eye alt 2497 ft


Source: USGS
Source: NASA, NGA, USGS
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48m
esri

Attachment 7
HydroCad Data

Version: 9/06

For the area draining to*: Lawnwood Drive swale

Located in drainage area for S/N:

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.52	acres
2	Impervious area		0.20	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	38.46	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.396	
6	**WQ Volume (in watershed inches) Calculation =**(P * Rv) =		0.357	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	WQv =	0.357	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	WQv =	0.015	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	WQv =	673	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

CALCULATED WQV = 673 CF

SEE DRY SWALE (MOD CN) FOR MODEL RESULTS FOR WQV (DRY SWALE STORAGE / EXFILTRATION MEETS WQV)

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Lawnwood Drive swale

Located in drainage area for S/N:

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.357 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.5 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

$$CN = 1000/(10 + (5*P) + (10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^{0.5}))$$

CN = 92.6

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Brookside Dr swale

Located in drainage area for S/N:

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	2.03	acres
2	Impervious area		0.39	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	19.21	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.223	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.201	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	WQv =	0.201	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	WQv =	0.034	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	WQv =	1478	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

CALCULATED WQv 1478 CF

SEE DRY SWALE (MOD CN) FOR

MODEL RESULTS FOR WQv

(DRY SWALE STORAGE/EXFILTRATION

MEETS WQv)

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Brookside Dr swale

Located in drainage area for S/N:

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.201 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 2.0 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

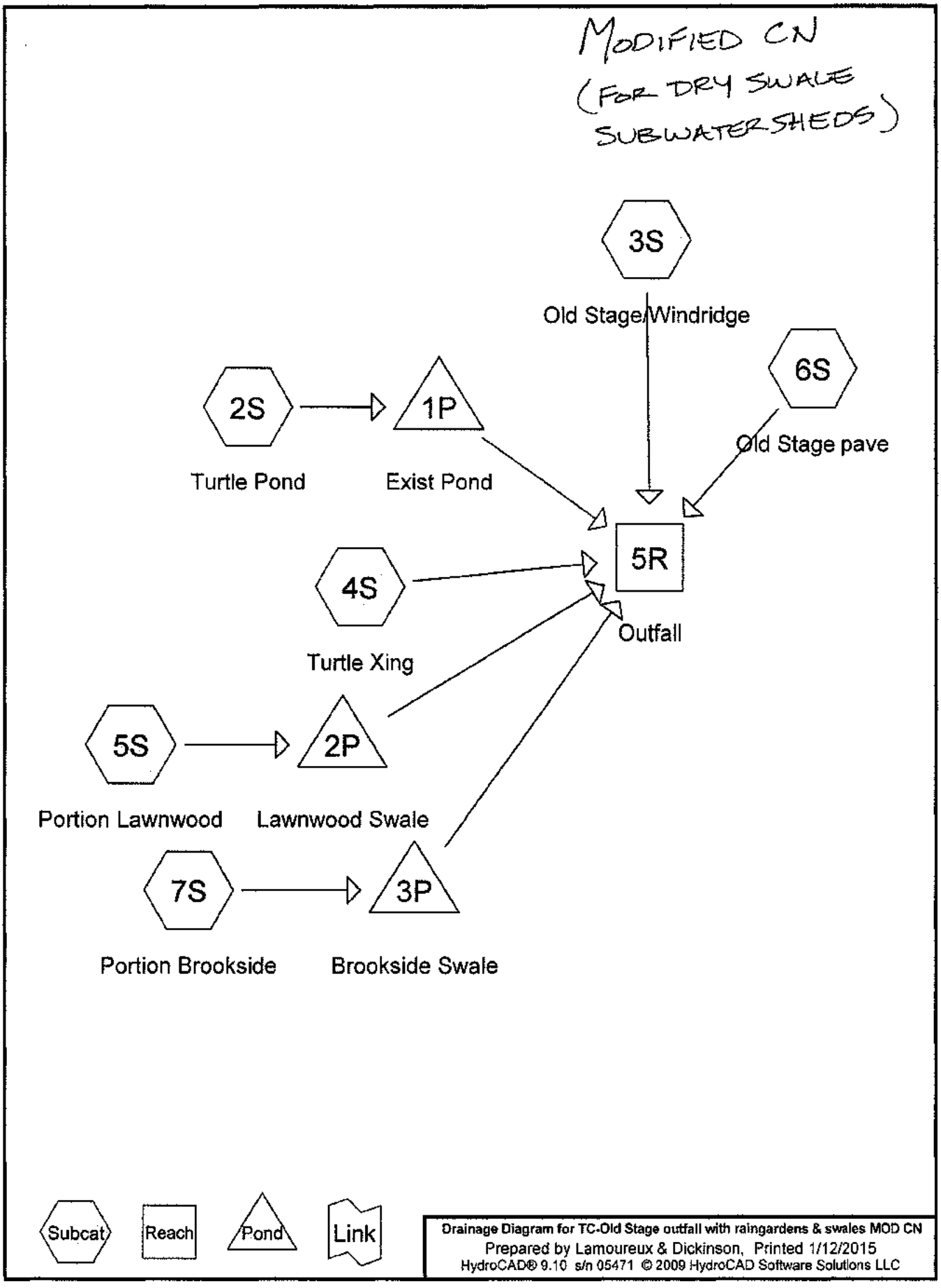
CN = 88.1

3. If you are using **hand hydrologic runoff calculations**, use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)


MODIFIED CN
(FOR DRY SWALE SUBWATERSHEDS)
3S
Old Stage/Windridge
6S
Old Stage pave
2S
Turtle Pond
1P
Exist Pond
5R
Outfall
4S
Turtle Xing
5S
Portion Lawnwood
2P
Lawnwood Swale
7S
Portion Brookside
3P
Brookside Swale
Subcat
Reach
Pond
Link
Drainage Diagram for TC-Old Stage outfall with raingardens & swales MOD CN
Prepared by Lamoureux & Dickinson, Printed 1/12/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.470	30	Meadow, non-grazed, HSG A (3S)
0.800	39	>75% Grass cover, Good, HSG A (4S)
1.700	61	>75% Grass cover, Good, HSG B (4S)
9.480	71	Meadow, non-grazed, HSG C (3S)
5.499	74	>75% Grass cover, Good, HSG C (2S, 4S)
1.225	77	Woods, Good, HSG D (2S)
12.880	78	Meadow, non-grazed, HSG D (3S)
4.700	80	>75% Grass cover, Good, HSG D (2S)
2.030	88	MOD CN (7S)
0.520	93	MOD CN (5S)
0.500	98	Drives (4S)
0.157	98	Gravel Drives (2S)
0.817	98	Paved Drives (2S)
0.617	98	Paved Road (2S)
0.516	98	Roofs (2S)
0.790	98	Rooftop (3S)
1.490	98	Street & sidewalk (6S)
0.980	98	Street & sidewalks (4S)
1.430	98	Street, drive & sidewalk (3S)

Summary for Subcatchment 2S: Turtle Pond

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.93 cfs @ 11.90 hrs, Volume= 0.149 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (sf)	CN	Description
	132,381	74	>75% Grass cover, Good, HSG C
*	22,465	98	Roofs
*	6,837	98	Gravel Drives
	204,723	80	>75% Grass cover, Good, HSG D
*	35,569	98	Paved Drives
*	26,894	98	Paved Road
	53,376	77	Woods, Good, HSG D
	482,245	81	Weighted Average
	390,480	78	80.97% Pervious Area
	91,765	98	19.03% Impervious Area

Summary for Subcatchment 3S: Old Stage/Windridge

Runoff = 1.11 cfs @ 12.34 hrs, Volume= 0.148 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.790	98	Rooftop
*	1.430	98	Street, drive & sidewalk
	12.880	78	Meadow, non-grazed, HSG D
	9.480	71	Meadow, non-grazed, HSG C
	0.470	30	Meadow, non-grazed, HSG A
	25.050	76	Weighted Average
	22.830	74	91.14% Pervious Area
	2.220	98	8.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.8	150	0.0200	0.11		**Sheet Flow, Overland/meadow** Grass: Dense n= 0.240 P2= 2.20"
11.9	1,620	0.0230	2.27		**Shallow Concentrated Flow, Meadow** Grassed Waterway Kv= 15.0 fps
2.0	500	0.0120	4.10	12.89	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
1.0	500	0.0500	8.37	26.30	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
38.7	2,770	Total			

Summary for Subcatchment 4S: Turtle Xing

Runoff = 1.26 cfs @ 12.07 hrs, Volume= 0.086 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
* 0.000	98	Rooftop to raingardens ← RAINGARDENS
* 0.500	98	Drives
* 0.980	98	Street & sidewalks
2.460	74	>75% Grass cover, Good, HSG C
0.800	39	>75% Grass cover, Good, HSG A
1.700	61	>75% Grass cover, Good, HSG B
6.440	72	Weighted Average
4.960	64	77.02% Pervious Area
1.480	98	22.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0300	0.11		**Sheet Flow, Overland/lawn** Grass: Dense n= 0.240 P2= 2.20"
0.4	80	0.0500	3.35		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
0.5	125	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
15.5	305	Total			

Summary for Subcatchment 5S: Portion Lawnwood

Runoff = 0.29 cfs @ 12.03 hrs, Volume= 0.016 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
* 0.520	93	MOD CN
0.520	93	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0200	0.08		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.20"
0.2	25	0.0200	2.12		**Shallow Concentrated Flow, Overland lawn** Grassed Waterway Kv= 15.0 fps
0.5	100	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
10.6	175	Total			

Summary for Subcatchment 6S: Old Stage pave

Runoff = 2.01 cfs @ 11.92 hrs, Volume= 0.086 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
* 1.490	98	Street & sidewalk
1.490	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	15	0.0250	0.85		**Sheet Flow, Street** Smooth surfaces n= 0.011 P2= 2.20"
1.0	200	0.0250	3.21		**Shallow Concentrated Flow, To gutter** Paved Kv= 20.3 fps
1.3	215	Total			

Summary for Subcatchment 7S: Portion Brookside

Runoff = 0.55 cfs @ 12.04 hrs, Volume= 0.033 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
* 2.030	88	MOD CN
2.030	88	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0200	0.08		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.20"
0.6	115	0.0430	3.11		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
10.5	165	Total			

Summary for Reach 5R: Outfall

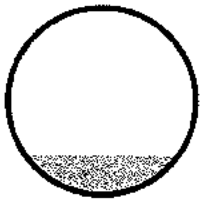
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 46.601 ac, 15.66% Impervious, Inflow Depth > 0.10" for WQv event
Inflow = 2.98 cfs @ 11.92 hrs, Volume= 0.408 af
Outflow = 2.96 cfs @ 11.93 hrs, Volume= 0.408 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.08 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 0.8 min

Peak Storage= 42 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 29.92 cfs

24.0" Round Pipe
n= 0.025 Corrugated metal
Length= 85.0' Slope= 0.0647 '/'
Inlet Invert= 450.50', Outlet Invert= 445.00'



Summary for Pond 1P: Exist Pond

Inflow Area = 11.071 ac, 19.03% Impervious, Inflow Depth = 0.16" for WQv event
Inflow = 2.93 cfs @ 11.90 hrs, Volume= 0.149 af
Outflow = 0.03 cfs @ 24.00 hrs, Volume= 0.087 af, Atten= 99%, Lag= 725.9 min
Primary = 0.03 cfs @ 24.00 hrs, Volume= 0.087 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Starting Elev= 485.48' Surf.Area= 19,918 sf Storage= 43,729 cf
Peak Elev= 485.74' @ 24.00 hrs Surf.Area= 20,944 sf Storage= 49,115 cf (5,386 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 1,219.4 min (2,043.1 - 823.7)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	119,483 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)
482.50	9,856	364.0	0	0	9,856
483.00	11,355	389.0	5,298	5,298	11,366
484.00	14,636	436.0	12,961	18,259	14,479
486.50	24,031	561.0	47,851	66,110	24,474
488.50	29,433	618.0	53,373	119,483	29,951

Device	Routing	Invert	Outlet Devices
#1	Primary	487.50'	**2.0" x 2.0" Horiz. Overflow Grate X 6.00 columns** X 6 rows C= 0.600 in 2.0" x 2.0" Grate Limited to weir flow at low heads
#2	Primary	485.48'	**1.5" Vert. Control Orifice** C= 0.600
#3	Secondary	486.60'	**Spillway, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 Width (feet) 1.00 3.00

Primary OutFlow Max=0.03 cfs @ 24.00 hrs HW=485.74' (Free Discharge)
1=Overflow Grate (Controls 0.00 cfs)
2=Control Orifice (Orifice Controls 0.03 cfs @ 2.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=485.48' (Free Discharge)
3=Spillway (Controls 0.00 cfs)

Summary for Pond 2P: Lawnwood Swale

DRY SWALE

Inflow Area = 0.520 ac, 0.00% Impervious, Inflow Depth = 0.37" for WQv event
Inflow = 0.29 cfs @ 12.03 hrs, Volume= 0.016 af
Outflow = 0.13 cfs @ 12.17 hrs, Volume= 0.016 af, Atten= 56%, Lag= 8.3 min
Discarded = 0.13 cfs @ 12.17 hrs, Volume= 0.016 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

ALL RUNOFF INFILTRATED

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 482.41' @ 12.17 hrs Surf.Area= 398 sf Storage= 128 cf

Plug-Flow detention time= 5.9 min calculated for 0.016 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (853.2 - 847.3)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	872 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)
482.00	236	124.0	0	0	236
483.00	711	146.0	452	452	728
483.50	977	157.0	420	872	1,003

Device	Routing	Invert	Outlet Devices
#1	Discarded	482.00'	**12.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 479.00'
#2	Primary	483.00'	**24.0" W x 7.0" H Vert. Overflow to gutter** C= 0.600

Discarded OutFlow Max=0.13 cfs @ 12.17 hrs HW=482.41' (Free Discharge)
1=Exfiltration (Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=482.00' (Free Discharge)
2=Overflow to gutter (Controls 0.00 cfs)

Summary for Pond 3P: Brookside Swale

DRY SWALE

Inflow Area = 2.030 ac, 0.00% Impervious, Inflow Depth = 0.20" for WQv event
Inflow = 0.55 cfs @ 12.04 hrs, Volume= 0.033 af
Outflow = 0.34 cfs @ 12.13 hrs, Volume= 0.033 af, Atten= 37%, Lag= 5.6 min
Discarded = 0.34 cfs @ 12.13 hrs, Volume= 0.033 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

ALL RUNOFF INFILTRATED

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 473.10' @ 12.13 hrs Surf.Area= 1,153 sf Storage= 108 cf

Plug-Flow detention time= 1.7 min calculated for 0.033 af (100% of inflow)
Center-of-Mass det. time= 1.7 min (888.7 - 887.0)

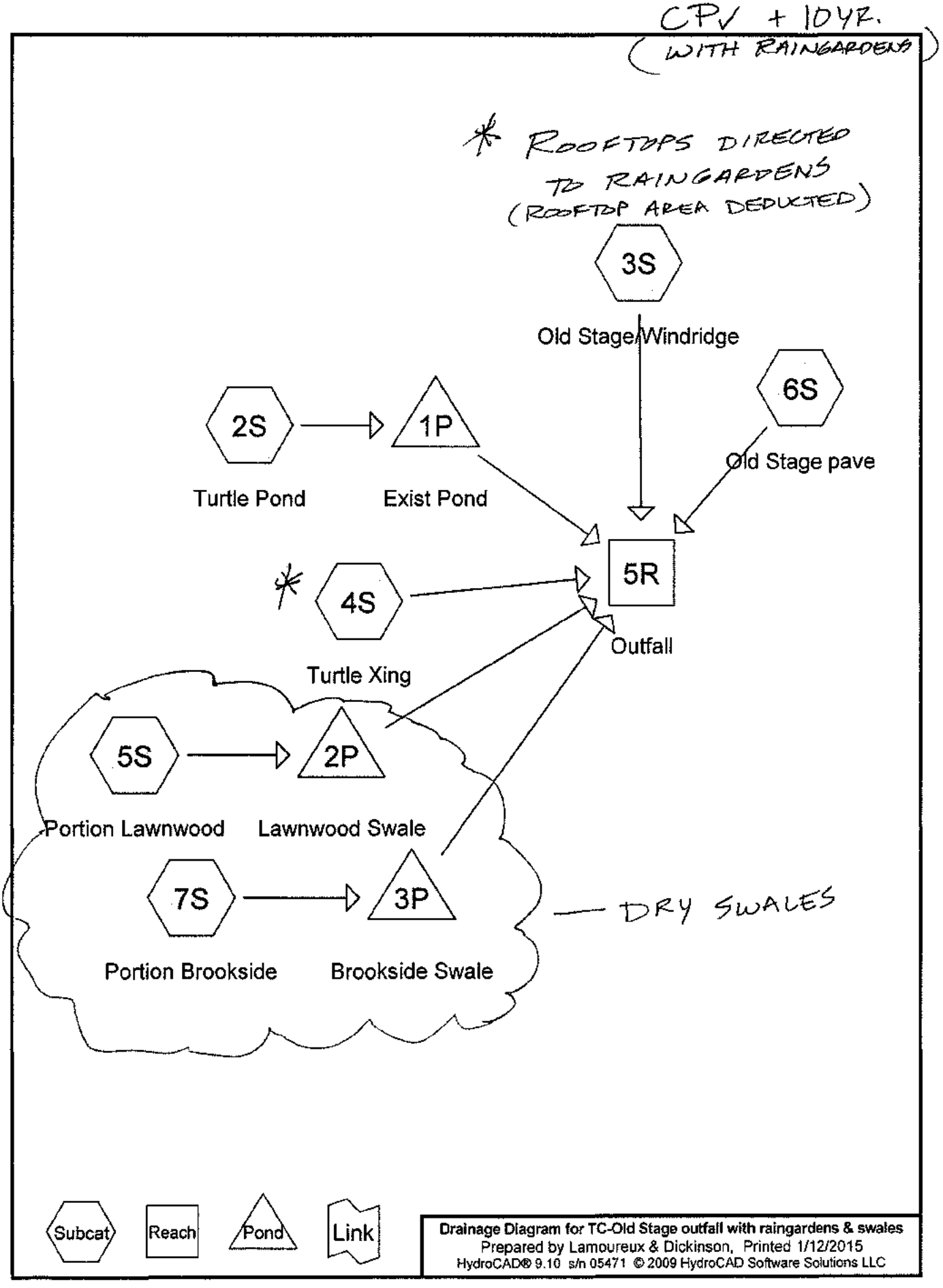
Volume	Invert	Avail.Storage	Storage Description
#1	473.00'	3,504 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
473.00	1,012	512.0	0	0	1,012
474.00	2,845	534.0	1,851	1,851	2,916
474.50	3,790	545.0	1,653	3,504	3,899

Device	Routing	Invert	Outlet Devices
#1	Discarded	473.00'	**12.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 470.00'
#2	Primary	474.00'	**24.0" W x 7.0" H Vert. Overflow to gutter** C= 0.600

Discarded OutFlow Max=0.34 cfs @ 12.13 hrs HW=473.10' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.34 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=473.00' (Free Discharge)
↑—**2=Overflow to gutter** (Controls 0.00 cfs)


CPV + 10YR.
(WITH RAINGARDENS)
* ROOFTOPS DIRECTED TO RAINGARDENS (ROOFTOP AREA DEDUCTED)
3S
Old Stage/Windridge
6S
Old Stage pave
2S
Turtle Pond
1P
Exist Pond
5R
Outfall
*
4S
Turtle Xing
5S
Portion Lawnwood
2P
Lawnwood Swale
7S
Portion Brookside
3P
Brookside Swale
DRY SWALES
Subcat
Reach
Pond
Link
Drainage Diagram for TC-Old Stage outfall with raingardens & swales
Prepared by Lamoureux & Dickinson, Printed 1/12/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.470	30	Meadow, non-grazed, HSG A (3S)
2.080	39	>75% Grass cover, Good, HSG A (4S, 5S, 7S)
2.380	61	>75% Grass cover, Good, HSG B (4S, 7S)
9.480	71	Meadow, non-grazed, HSG C (3S)
5.499	74	>75% Grass cover, Good, HSG C (2S, 4S)
1.225	77	Woods, Good, HSG D (2S)
12.880	78	Meadow, non-grazed, HSG D (3S)
4.700	80	>75% Grass cover, Good, HSG D (2S)
0.500	98	Drives (4S)
0.340	98	Drives/rooftop (5S, 7S)
0.157	98	Gravel Drives (2S)
0.817	98	Paved Drives (2S)
0.617	98	Paved Road (2S)
0.516	98	Roofs (2S)
0.790	98	Rooftop (3S)
0.250	98	Street (5S, 7S)
1.490	98	Street & sidewalk (6S)
0.980	98	Street & sidewalks (4S)
1.430	98	Street, drive & sidewalk (3S)

Summary for Subcatchment 2S: Turtle Pond

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 17.91 cfs @ 11.90 hrs, Volume= 0.733 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (sf)	CN	Description
	132,381	74	>75% Grass cover, Good, HSG C
*	22,465	98	Roofs
*	6,837	98	Gravel Drives
	204,723	80	>75% Grass cover, Good, HSG D
*	35,569	98	Paved Drives
*	26,894	98	Paved Road
	53,376	77	Woods, Good, HSG D
	482,245	81	Weighted Average
	390,480	78	80.97% Pervious Area
	91,765	98	19.03% Impervious Area

Summary for Subcatchment 3S: Old Stage/Windridge

Runoff = 7.75 cfs @ 12.39 hrs, Volume= 1.103 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.790	98	Rooftop
*	1.430	98	Street, drive & sidewalk
	12.880	78	Meadow, non-grazed, HSG D
	9.480	71	Meadow, non-grazed, HSG C
	0.470	30	Meadow, non-grazed, HSG A
	25.050	76	Weighted Average
	22.830	74	91.14% Pervious Area
	2.220	98	8.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.8	150	0.0200	0.11		**Sheet Flow, Overland/meadow** Grass: Dense n= 0.240 P2= 2.20"
11.9	1,620	0.0230	2.27		**Shallow Concentrated Flow, Meadow** Grassed Waterway Kv= 15.0 fps
2.0	500	0.0120	4.10	12.89	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
1.0	500	0.0500	8.37	26.30	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
38.7	2,770	Total			

Summary for Subcatchment 4S: Turtle Xing

Runoff = 3.41 cfs @ 12.07 hrs, Volume= 0.291 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.000	98	Rooftop to raingardens ← RAINGARDENS
*	0.500	98	Drives
*	0.980	98	Street & sidewalks
	2.460	74	>75% Grass cover, Good, HSG C
	0.800	39	>75% Grass cover, Good, HSG A
	1.700	61	>75% Grass cover, Good, HSG B
	6.440	72	Weighted Average
	4.960	64	77.02% Pervious Area
	1.480	98	22.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0300	0.11		**Sheet Flow, Overland/lawn** Grass: Dense n= 0.240 P2= 2.20"
0.4	80	0.0500	3.35		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
0.5	125	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
15.5	305	Total			

Summary for Subcatchment 5S: Portion Lawnwood

Runoff = 0.51 cfs @ 12.02 hrs, Volume= 0.031 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.080	98	Street
*	0.120	98	Drives/rooftop
	0.320	39	>75% Grass cover, Good, HSG A
	0.520	62	Weighted Average
	0.320	39	61.54% Pervious Area
	0.200	98	38.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0200	0.08		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.20"
0.2	25	0.0200	2.12		**Shallow Concentrated Flow, Overland lawn** Grassed Waterway Kv= 15.0 fps
0.5	100	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
10.6	175	Total			

Summary for Subcatchment 6S: Old Stage pave

Runoff = 5.03 cfs @ 11.91 hrs, Volume= 0.233 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.490	98	Street & sidewalk
	1.490	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	15	0.0250	0.85		**Sheet Flow, Street** Smooth surfaces n= 0.011 P2= 2.20"
1.0	200	0.0250	3.21		**Shallow Concentrated Flow, To gutter** Paved Kv= 20.3 fps
1.3	215	Total			

Summary for Subcatchment 7S: Portion Brookside

Runoff = 0.99 cfs @ 12.01 hrs, Volume= 0.061 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.170	98	Street
*	0.220	98	Drives/rooftop
	0.960	39	>75% Grass cover, Good, HSG A
	0.680	61	>75% Grass cover, Good, HSG B
	2.030	58	Weighted Average
	1.640	48	80.79% Pervious Area
	0.390	98	19.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0200	0.08		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.20"
0.6	115	0.0430	3.11		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
10.5	165	Total			

Summary for Reach 5R: Outfall

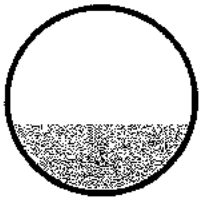
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 46.601 ac, 16.92% Impervious, Inflow Depth > 0.50" for 1 year event
Inflow = 9.20 cfs @ 12.34 hrs, Volume= 1.929 af
Outflow = 9.19 cfs @ 12.35 hrs, Volume= 1.929 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.38 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.58 fps, Avg. Travel Time= 0.5 min

Peak Storage= 93 cf @ 12.34 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 29.92 cfs

24.0" Round Pipe
n= 0.025 Corrugated metal
Length= 85.0' Slope= 0.0647 '/'
Inlet Invert= 450.50', Outlet Invert= 445.00'



Summary for Pond 1P: Exist Pond

Inflow Area = 11.071 ac, 19.03% Impervious, Inflow Depth = 0.79" for 1 year event
Inflow = 17.91 cfs @ 11.90 hrs, Volume= 0.733 af
Outflow = 0.17 cfs @ 23.94 hrs, Volume= 0.303 af, Atten= 99%, Lag= 722.5 min
Primary = 0.06 cfs @ 23.94 hrs, Volume= 0.236 af
Secondary = 0.11 cfs @ 23.94 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Starting Elev= 485.48' Surf.Area= 19,918 sf Storage= 43,729 cf
Peak Elev= 486.69' @ 23.94 hrs Surf.Area= 24,524 sf Storage= 70,758 cf (27,029 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 1,115.4 min (1,933.1 - 817.8)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	119,483 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)
482.50	9,856	364.0	0	0	9,856
483.00	11,355	389.0	5,298	5,298	11,366
484.00	14,636	436.0	12,961	18,259	14,479
486.50	24,031	561.0	47,851	66,110	24,474
488.50	29,433	618.0	53,373	119,483	29,951

Device	Routing	Invert	Outlet Devices
#1	Primary	487.50'	**2.0" x 2.0" Horiz. Overflow Grate X 6.00 columns** X 6 rows C= 0.600 in 2.0" x 2.0" Grate Limited to weir flow at low heads
#2	Primary	485.48'	**1.5" Vert. Control Orifice** C= 0.600
#3	Secondary	486.60'	**Spillway, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 Width (feet) 1.00 3.00

Primary OutFlow Max=0.06 cfs @ 23.94 hrs HW=486.69' (Free Discharge)
↑—**1=Overflow Grate** (Controls 0.00 cfs)
└—**2=Control Orifice** (Orifice Controls 0.06 cfs @ 5.16 fps)

Secondary OutFlow Max=0.10 cfs @ 23.94 hrs HW=486.69' (Free Discharge)
↑—**3=Spillway** (Weir Controls 0.10 cfs @ 0.96 fps)

Summary for Pond 2P: Lawnwood Swale

DRY SWALE

Inflow Area = 0.520 ac, 38.46% Impervious, Inflow Depth = 0.72" for 1 year event
Inflow = 0.51 cfs @ 12.02 hrs, Volume= 0.031 af
Outflow = 0.20 cfs @ 12.17 hrs, Volume= 0.031 af, Atten= 61%, Lag= 9.1 min
Discarded = 0.20 cfs @ 12.17 hrs, Volume= 0.031 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 482.77' @ 12.17 hrs Surf.Area= 580 sf Storage= 305 cf

Plug-Flow detention time= 9.9 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 9.9 min (776.6 - 766.8)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	872 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)
482.00	236	124.0	0	0	236
483.00	711	146.0	452	452	728
483.50	977	157.0	420	872	1,003

Device	Routing	Invert	Outlet Devices
#1	Discarded	482.00'	**12.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 479.00'
#2	Primary	483.00'	**24.0" W x 7.0" H Vert. Overflow to gutter** C= 0.600

Discarded OutFlow Max=0.20 cfs @ 12.17 hrs HW=482.77' (Free Discharge)
└**1=Exfiltration** (Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=482.00' (Free Discharge)
└**2=Overflow to gutter** (Controls 0.00 cfs)

Summary for Pond 3P: Brookside Swale

DRY SWALE

Inflow Area = 2.030 ac, 19.21% Impervious, Inflow Depth = 0.36" for 1 year event
Inflow = 0.99 cfs @ 12.01 hrs, Volume= 0.061 af
Outflow = 0.48 cfs @ 12.14 hrs, Volume= 0.061 af, Atten= 52%, Lag= 7.6 min
Discarded = 0.48 cfs @ 12.14 hrs, Volume= 0.061 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 473.33' @ 12.14 hrs Surf.Area= 1,515 sf Storage= 415 cf

Plug-Flow detention time= 4.6 min calculated for 0.061 af (100% of inflow)
Center-of-Mass det. time= 4.6 min (771.2 - 766.7)

Volume	Invert	Avail.Storage	Storage Description
#1	473.00'	3,504 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)
473.00	1,012	512.0	0	0	1,012
474.00	2,845	534.0	1,851	1,851	2,916
474.50	3,790	545.0	1,653	3,504	3,899

Device	Routing	Invert	Outlet Devices
#1	Discarded	473.00'	**12.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 470.00'
#2	Primary	474.00'	**24.0" W x 7.0" H Vert. Overflow to gutter** C= 0.600

Discarded OutFlow Max=0.48 cfs @ 12.14 hrs HW=473.33' (Free Discharge)
└**1=Exfiltration** (Controls 0.48 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=473.00' (Free Discharge)
└**2=Overflow to gutter** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Turtle Pond

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 36.65 cfs @ 11.90 hrs, Volume= 1.472 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (sf)	CN	Description
	132,381	74	>75% Grass cover, Good, HSG C
*	22,465	98	Roofs
*	6,837	98	Gravel Drives
	204,723	80	>75% Grass cover, Good, HSG D
*	35,569	98	Paved Drives
*	26,894	98	Paved Road
	53,376	77	Woods, Good, HSG D
	482,245	81	Weighted Average
	390,480	78	80.97% Pervious Area
	91,765	98	19.03% Impervious Area

Summary for Subcatchment 3S: Old Stage/Windridge

Runoff = 20.33 cfs @ 12.35 hrs, Volume= 2.523 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.790	98	Rooftop
*	1.430	98	Street, drive & sidewalk
	12.880	78	Meadow, non-grazed, HSG D
	9.480	71	Meadow, non-grazed, HSG C
	0.470	30	Meadow, non-grazed, HSG A
	25.050	76	Weighted Average
	22.830	74	91.14% Pervious Area
	2.220	98	8.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.8	150	0.0200	0.11		**Sheet Flow, Overland/meadow** Grass: Dense n= 0.240 P2= 2.20"
11.9	1,620	0.0230	2.27		**Shallow Concentrated Flow, Meadow** Grassed Waterway Kv= 15.0 fps
2.0	500	0.0120	4.10	12.89	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
1.0	500	0.0500	8.37	26.30	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
38.7	2,770	Total			

Summary for Subcatchment 4S: Turtle Xing

Runoff = 7.66 cfs @ 12.08 hrs, Volume= 0.597 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.000	98	Rooftop to raingardens
*	0.500	98	Drives
*	0.980	98	Street & sidewalks
	2.460	74	>75% Grass cover, Good, HSG C
	0.800	39	>75% Grass cover, Good, HSG A
	1.700	61	>75% Grass cover, Good, HSG B
	6.440	72	Weighted Average
	4.960	64	77.02% Pervious Area
	1.480	98	22.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0300	0.11		**Sheet Flow, Overland/lawn** Grass: Dense n= 0.240 P2= 2.20"
0.4	80	0.0500	3.35		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
0.5	125	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
15.5	305	Total			

Summary for Subcatchment 5S: Portion Lawnwood

Runoff = 0.78 cfs @ 12.02 hrs, Volume= 0.049 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.080	98	Street
*	0.120	98	Drives/rooftop
	0.320	39	>75% Grass cover, Good, HSG A
	0.520	62	Weighted Average
	0.320	39	61.54% Pervious Area
	0.200	98	38.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0200	0.08		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.20"
0.2	25	0.0200	2.12		**Shallow Concentrated Flow, Overland lawn** Grassed Waterway Kv= 15.0 fps
0.5	100	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
10.6	175	Total			

Summary for Subcatchment 6S: Old Stage pave

Runoff = 7.77 cfs @ 11.91 hrs, Volume= 0.368 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.490	98	Street & sidewalk
	1.490	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	15	0.0250	0.85		**Sheet Flow, Street** Smooth surfaces n= 0.011 P2= 2.20"
1.0	200	0.0250	3.21		**Shallow Concentrated Flow, To gutter** Paved Kv= 20.3 fps
1.3	215	Total			

Summary for Subcatchment 7S: Portion Brookside

Runoff = 1.53 cfs @ 12.01 hrs, Volume= 0.109 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.170	98	Street
*	0.220	98	Drives/rooftop
	0.960	39	>75% Grass cover, Good, HSG A
	0.680	61	>75% Grass cover, Good, HSG B
	2.030	58	Weighted Average
	1.640	48	80.79% Pervious Area
	0.390	98	19.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0200	0.08		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.20"
0.6	115	0.0430	3.11		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
10.5	165	Total			

Summary for Reach 5R: Outfall

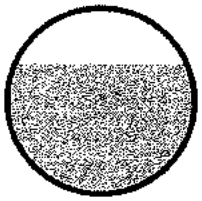
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 46.601 ac, 16.92% Impervious, Inflow Depth > 1.16" for 10 year event
Inflow = 25.04 cfs @ 12.34 hrs, Volume= 4.522 af
Outflow = 25.02 cfs @ 12.34 hrs, Volume= 4.522 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.66 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.98 fps, Avg. Travel Time= 0.5 min

Peak Storage= 200 cf @ 12.34 hrs
Average Depth at Peak Storage= 1.40'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 29.92 cfs

24.0" Round Pipe
n= 0.025 Corrugated metal
Length= 85.0' Slope= 0.0647 '/'
Inlet Invert= 450.50', Outlet Invert= 445.00'



Summary for Pond 1P: Exist Pond

Inflow Area = 11.071 ac, 19.03% Impervious, Inflow Depth = 1.60" for 10 year event
Inflow = 36.65 cfs @ 11.90 hrs, Volume= 1.472 af
Outflow = 1.80 cfs @ 12.80 hrs, Volume= 1.033 af, Atten= 95%, Lag= 54.2 min
Primary = 0.07 cfs @ 12.80 hrs, Volume= 0.249 af
Secondary = 1.72 cfs @ 12.80 hrs, Volume= 0.784 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Starting Elev= 485.48' Surf.Area= 19,918 sf Storage= 43,729 cf
Peak Elev= 487.05' @ 12.80 hrs Surf.Area= 25,469 sf Storage= 79,789 cf (36,060 cf above start)

Plug-Flow detention time= 3,102.7 min calculated for 0.029 af (2% of inflow)
Center-of-Mass det. time= 446.7 min (1,254.0 - 807.2)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	119,483 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)
482.50	9,856	364.0	0	0	9,856
483.00	11,355	389.0	5,298	5,298	11,366
484.00	14,636	436.0	12,961	18,259	14,479
486.50	24,031	561.0	47,851	66,110	24,474
488.50	29,433	618.0	53,373	119,483	29,951

Device	Routing	Invert	Outlet Devices
#1	Primary	487.50'	**2.0" x 2.0" Horiz. Overflow Grate X 6.00 columns** X 6 rows C= 0.600 in 2.0" x 2.0" Grate Limited to weir flow at low heads
#2	Primary	485.48'	**1.5" Vert. Control Orifice** C= 0.600
#3	Secondary	486.60'	**Spillway, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 Width (feet) 1.00 3.00

Primary OutFlow Max=0.07 cfs @ 12.80 hrs HW=487.05' (Free Discharge)
↑**1=Overflow Grate** (Controls 0.00 cfs)
└**2=Control Orifice** (Orifice Controls 0.07 cfs @ 5.92 fps)

Secondary OutFlow Max=1.72 cfs @ 12.80 hrs HW=487.05' (Free Discharge)
↑└**3=Spillway** (Weir Controls 1.72 cfs @ 1.99 fps)

Summary for Pond 2P: Lawnwood Swale

Inflow Area = 0.520 ac, 38.46% Impervious, Inflow Depth = 1.14" for 10 year event
Inflow = 0.78 cfs @ 12.02 hrs, Volume= 0.049 af
Outflow = 0.39 cfs @ 12.14 hrs, Volume= 0.049 af, Atten= 50%, Lag= 7.4 min
Discarded = 0.26 cfs @ 12.14 hrs, Volume= 0.048 af
Primary = 0.13 cfs @ 12.14 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 483.07' @ 12.14 hrs Surf.Area= 747 sf Storage= 505 cf

Plug-Flow detention time= 12.2 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 12.2 min (769.1 - 756.9)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	872 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)
482.00	236	124.0	0	0	236
483.00	711	146.0	452	452	728
483.50	977	157.0	420	872	1,003

Device	Routing	Invert	Outlet Devices
#1	Discarded	482.00'	**12.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 479.00'
#2	Primary	483.00'	**24.0" W x 7.0" H Vert. Overflow to gutter** C= 0.600

Discarded OutFlow Max=0.26 cfs @ 12.14 hrs HW=483.07' (Free Discharge)
↑**1=Exfiltration** (Controls 0.26 cfs)

Primary OutFlow Max=0.13 cfs @ 12.14 hrs HW=483.07' (Free Discharge)
↑**2=Overflow to gutter** (Orifice Controls 0.13 cfs @ 0.86 fps)

Summary for Pond 3P: Brookside Swale

Inflow Area = 2.030 ac, 19.21% Impervious, Inflow Depth = 0.64" for 10 year event
Inflow = 1.53 cfs @ 12.01 hrs, Volume= 0.109 af
Outflow = 0.64 cfs @ 12.16 hrs, Volume= 0.109 af, Atten= 58%, Lag= 8.6 min
Discarded = 0.64 cfs @ 12.16 hrs, Volume= 0.109 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 473.57' @ 12.16 hrs Surf.Area= 1,939 sf Storage= 823 cf

Plug-Flow detention time= 6.7 min calculated for 0.109 af (100% of inflow)
Center-of-Mass det. time= 6.7 min (797.1 - 790.3)

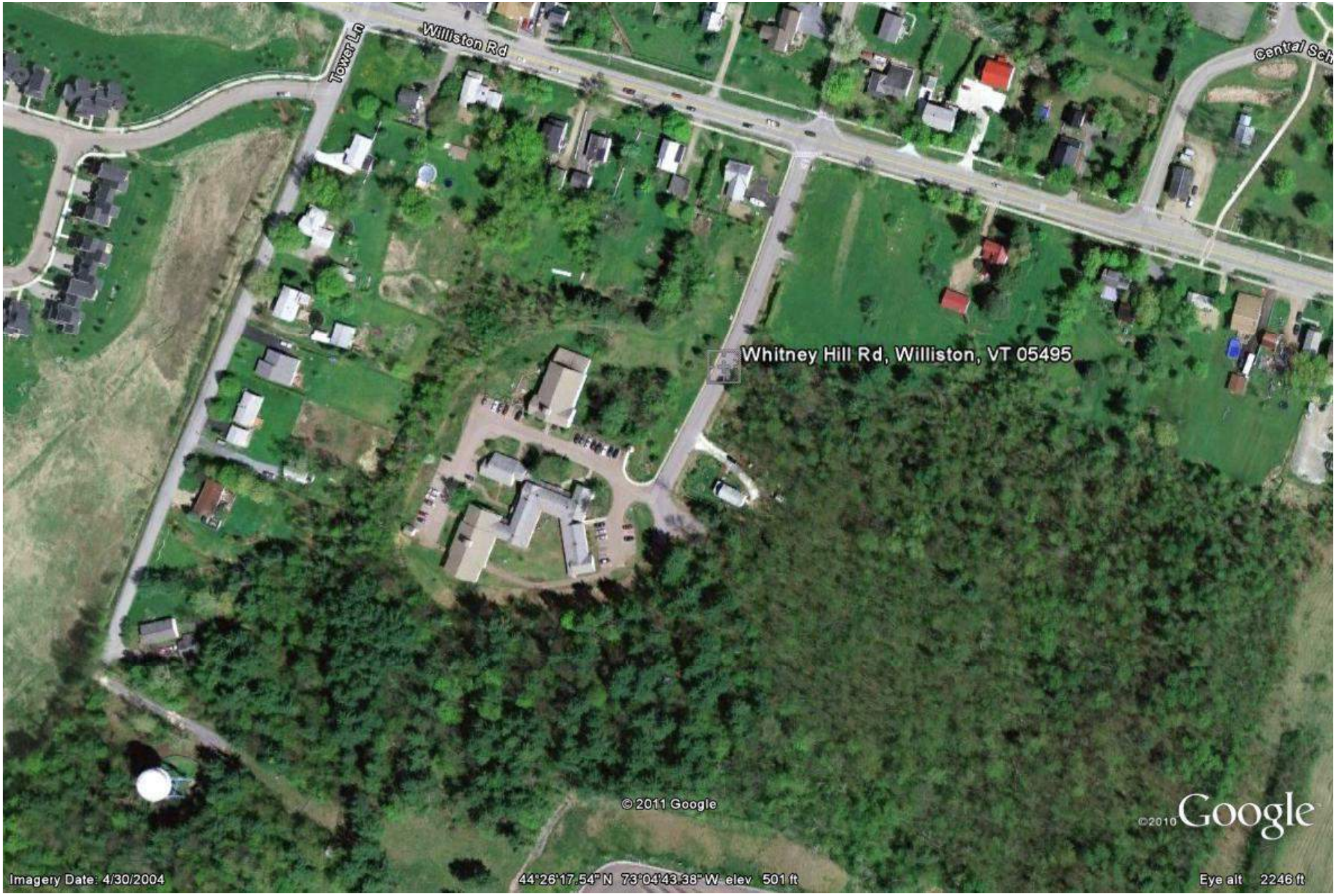
Volume	Invert	Avail.Storage	Storage Description
#1	473.00'	3,504 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
473.00	1,012	512.0	0	0	1,012
474.00	2,845	534.0	1,851	1,851	2,916
474.50	3,790	545.0	1,653	3,504	3,899

Device	Routing	Invert	Outlet Devices
#1	Discarded	473.00'	**12.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 470.00'
#2	Primary	474.00'	**24.0" W x 7.0" H Vert. Overflow to gutter** C= 0.600

Discarded OutFlow Max=0.64 cfs @ 12.16 hrs HW=473.57' (Free Discharge)
↑**1=Exfiltration** (Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=473.00' (Free Discharge)
↑**2=Overflow to gutter** (Controls 0.00 cfs)


Tower Ln
Williston Rd
Central Sch
Whitney Hill Rd, Williston, VT 05495
© 2011 Google
©2010 Google
Imagery Date: 4/30/2004
44°26'17.54" N 73°04'43.38" W elev 501 ft
Eye alt 2246 ft


Source: USGS
Source: NASA, NGA, USGS
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36m
esri®

TOWER ROAD

ROUTE 2

WHITNEY HILL ROAD

I - 89

N/F Carlson
Parcel 14.031.016.000

N/F Lafrance
Parcel 14.031.014.000

N/F Lafrance
Parcel 14.031.012.000

N/F Allen
Parcel 14.031.010.000

N/F Robitaille
Parcel 14.031.006.000

N/F Roth
Parcel 14.104.105.000

N/F White
Parcel 14.104.107.000

N/F Gojmerac
Parcel 14.104.109.000

N/F Rich
Parcel 14.104.111.000

N/F Town of Williston
Parcel 14.104.121.000

N/F Pecor
Parcel 14.104.127.000

N/F Leblanc
Parcel 14.104.129.001

N/F Kangas
Parcel 14.104.125.000

WS-A

WS-B

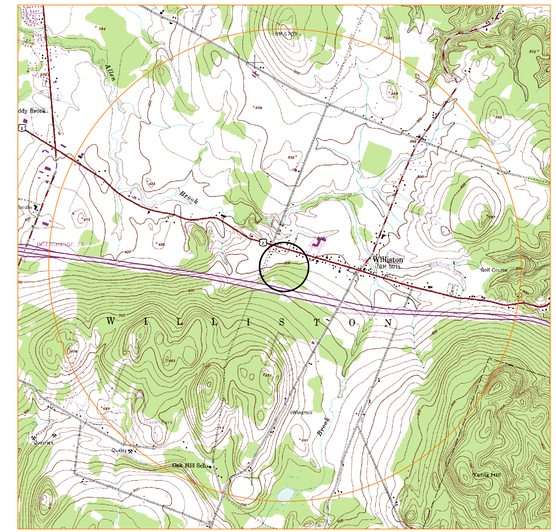
WS-C

WS-D

Area of vegetation to disconnect rooftop runoff

Area of rooftop to disconnect for groundwater recharge (1,192 s.f.)

Watershed limit



LOCATION

NTS

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM/TJB
Checked	
Scale	NTS
Date	4/26/16
Project	06229/14111

Overall Site Plan

Whitney Hill

Whitney Hill Road — Williston, Vermont

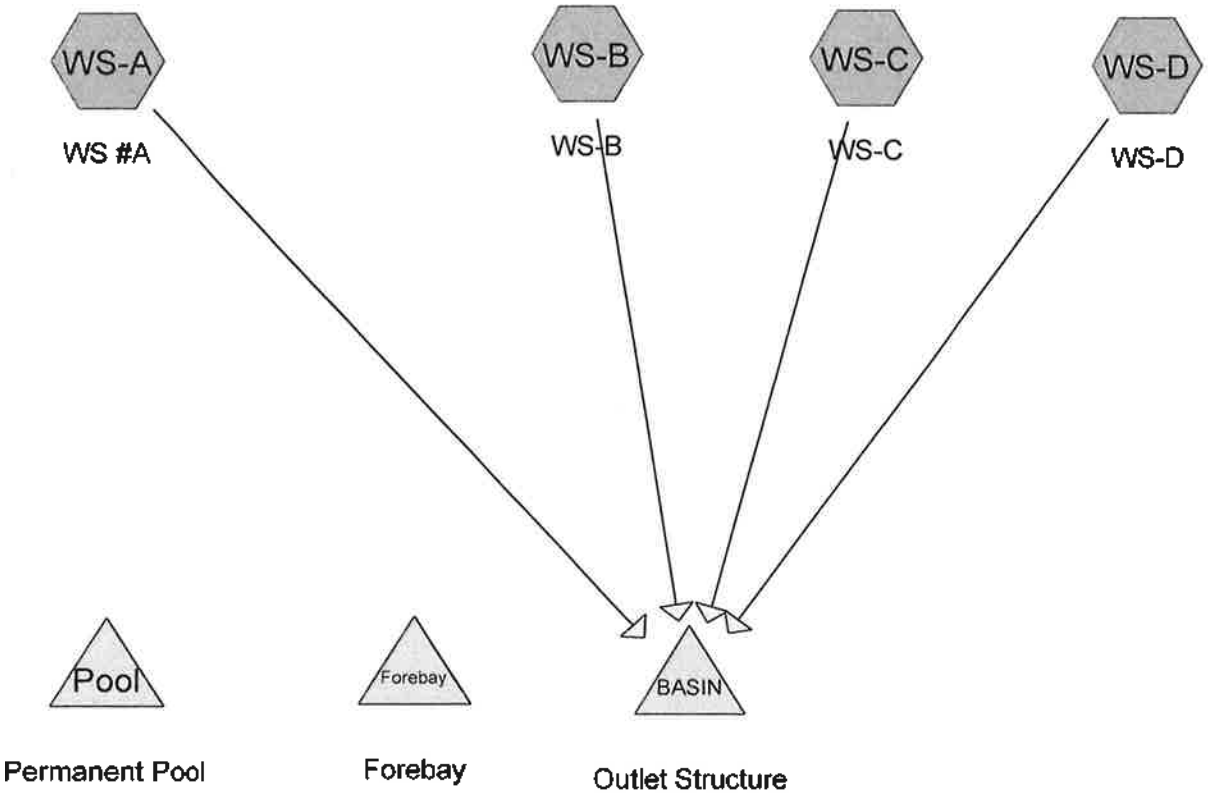
KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

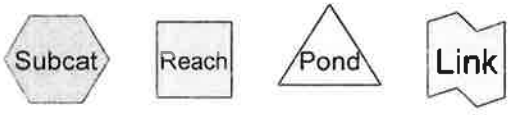
File name
14111 whit hill base 2015

Printing date
4/26/16

OV-1

Whitney Hill - Water Quality Hydrologic Model





Routing Diagram for Whitney Hill-ModCN, Revised 4/25/16
Prepared by Hewlett-Packard Company, Printed 4/26/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Whitney Hill - Stormwater Model

Hydrologic Model Water Quality Storm using Modified Curve Number

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.761	93	Mod CN (WS-A, WS-B, WS-C, WS-D)
3.761	**93**	**TOTAL AREA**

Time span=0.00-180.00 hrs, dt=0.05 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS-A: WS #A Runoff Area=2.007 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=120' Tc=9.5 min CN=93 Runoff=1.16 cfs 0.063 af

SubcatchmentWS-B: WS-B Runoff Area=0.557 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=820' Tc=20.4 min CN=93 Runoff=0.22 cfs 0.017 af

SubcatchmentWS-C: WS-C Runoff Area=0.646 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=1,060' Tc=14.0 min CN=93 Runoff=0.32 cfs 0.020 af

SubcatchmentWS-D: WS-D Runoff Area=0.551 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=350' Tc=7.5 min CN=93 Runoff=0.34 cfs 0.017 af

Pond BASIN: Outlet Structure Peak Elev=481.88' Storage=2,707 cf Inflow=1.93 cfs 0.117 af
Outflow=0.10 cfs 0.117 af

Pond Forebay: Forebay Peak Elev=0.00' Storage=0 cf

Pond Pool: PermanentPool Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 3.761 ac Runoff Volume = 0.117 af Average Runoff Depth = 0.37"
100.00% Pervious = 3.761 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment WS-A: WS #A

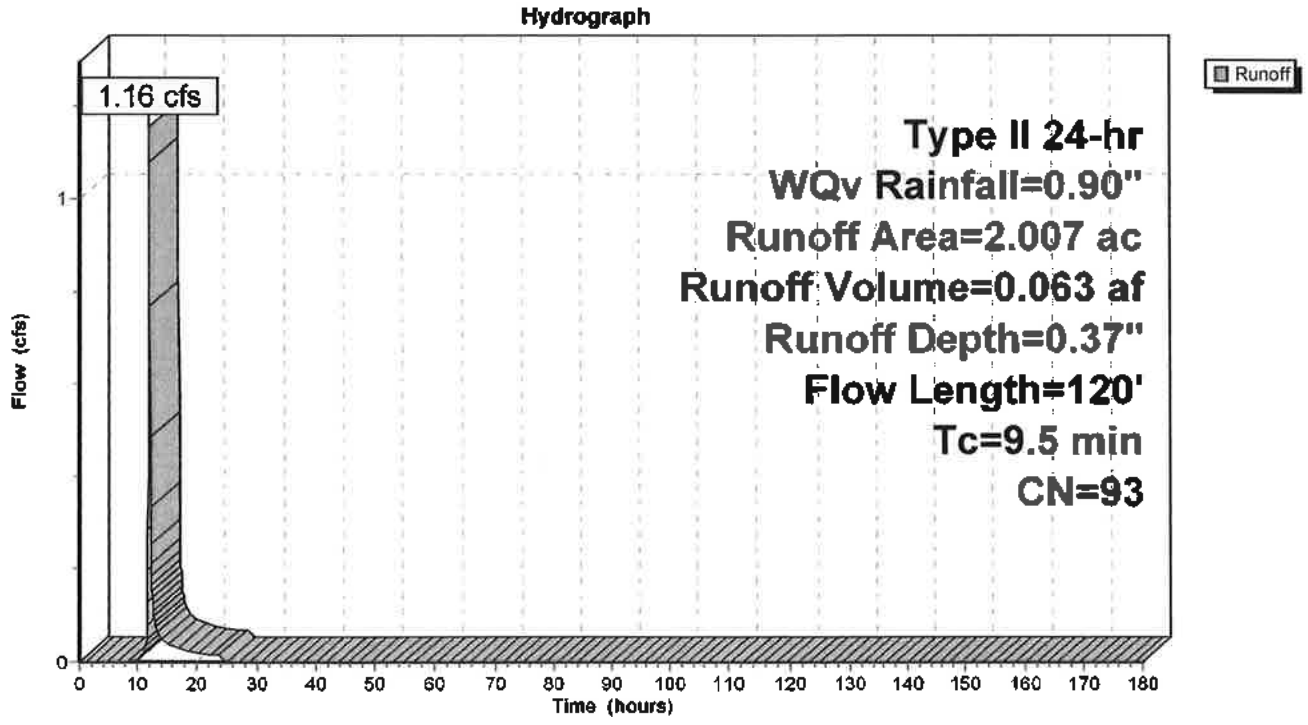
Runoff = 1.16 cfs @ 12.01 hrs, Volume= 0.063 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	2.007	93	Mod CN
	2.007		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	90	0.0700	0.16		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
0.1	30	0.0800	4.55		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
9.5	120	Total			

Subcatchment WS-A: WS #A



Summary for Subcatchment WS-B: WS-B

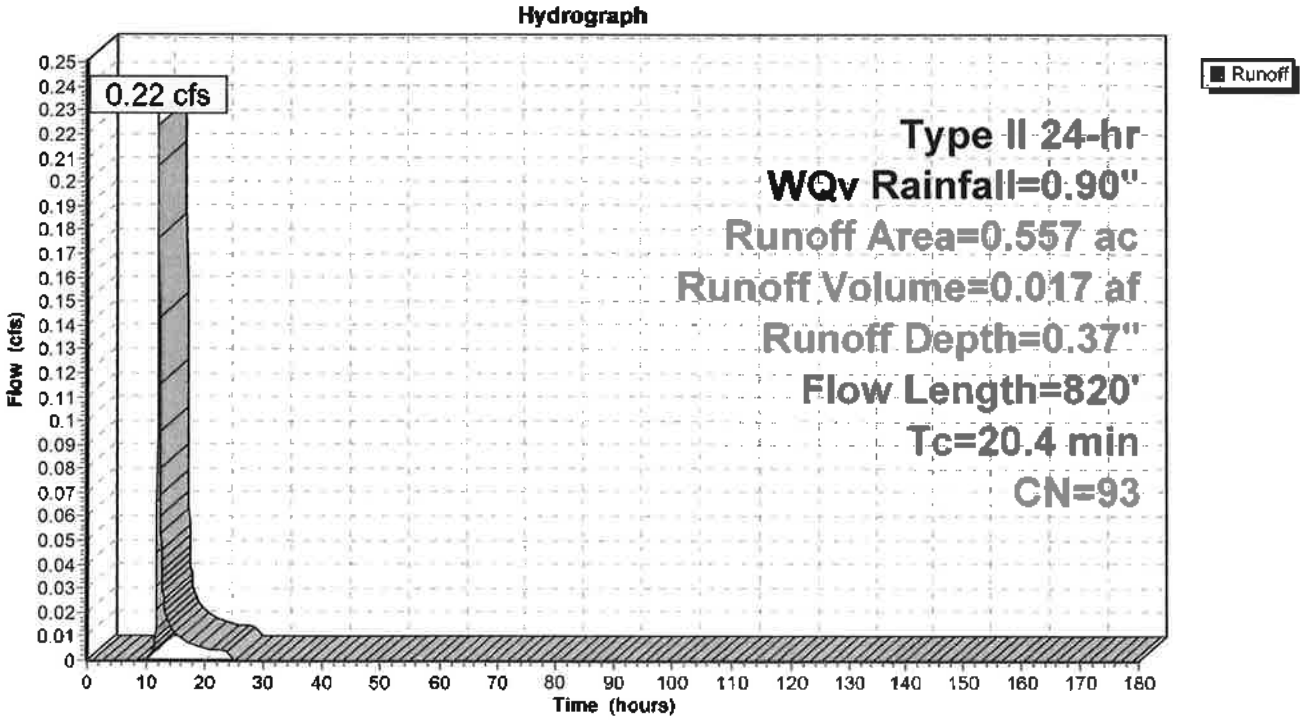
Runoff = 0.22 cfs @ 12.14 hrs, Volume= 0.017 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.557	93	Mod CN
	0.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0200	0.10		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
3.6	720	0.0420	3.30		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
20.4	820	Total			

Subcatchment WS-B: WS-B



Summary for Subcatchment WS-C: WS-C

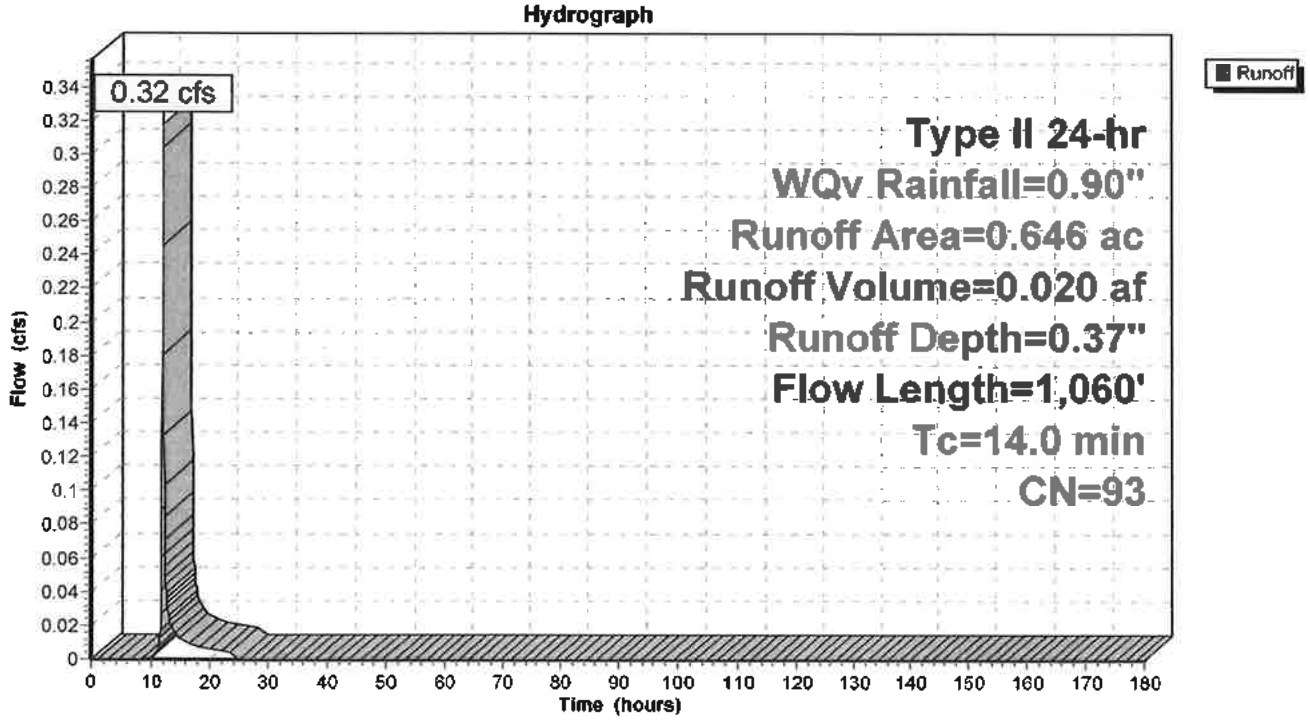
Runoff = 0.32 cfs @ 12.07 hrs, Volume= 0.020 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.646	93	Mod CN
	0.646		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0600	0.15		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
3.2	960	0.0940	4.94		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
14.0	1,060	Total			

Subcatchment WS-C: WS-C



Summary for Subcatchment WS-D: WS-D

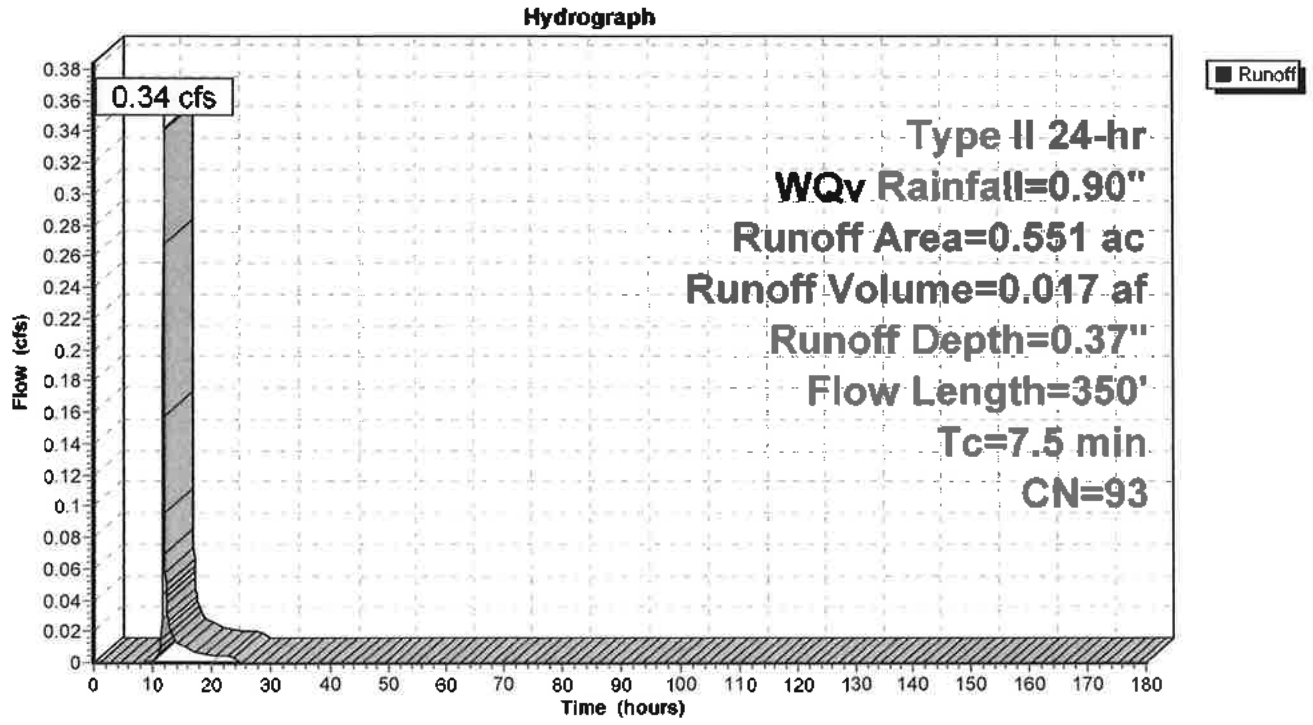
Runoff = 0.34 cfs @ 11.99 hrs, Volume= 0.017 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.551	93	Mod CN
	0.551		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	30	0.0270	0.09		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
0.7	70	0.0500	1.57		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.30"
1.1	250	0.0600	3.94		**Shallow Concentrated Flow, Gras Meadow** Unpaved Kv= 16.1 fps
7.5	350	Total			

Subcatchment WS-D: WS-D



Summary for Pond BASIN: Outlet Structure

Inflow Area = 3.761 ac, 0.00% Impervious, Inflow Depth = 0.37" for WQv event
Inflow = 1.93 cfs @ 12.02 hrs, Volume= 0.117 af
Outflow = 0.10 cfs @ 13.89 hrs, Volume= 0.117 af, Atten= 95%, Lag= 112.2 min
Primary = 0.10 cfs @ 13.89 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 481.88' @ 13.89 hrs Surf.Area= 3,080 sf Storage= 2,707 cf

Plug-Flow detention time= 351.2 min calculated for 0.117 af (100% of inflow)
Center-of-Mass det. time= 351.7 min (1,199.9 - 848.2)

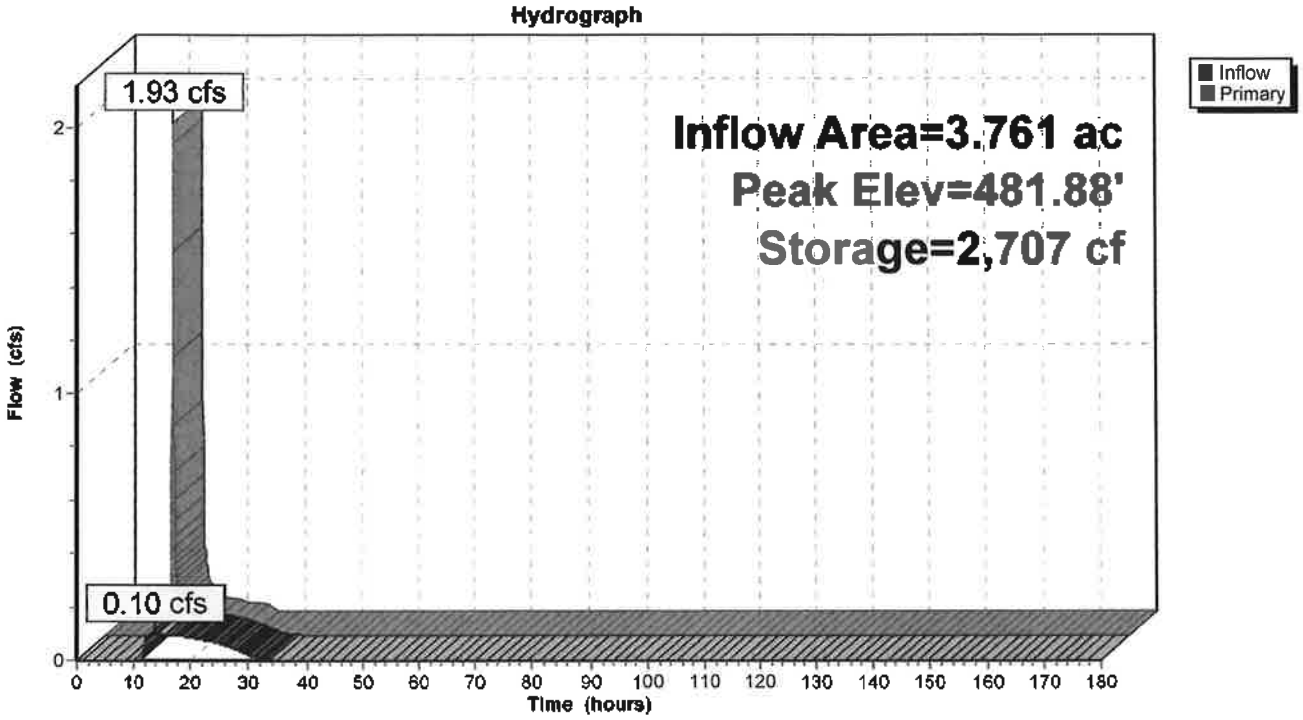
Volume	Invert	Avail.Storage	Storage Description
#1	480.70'	23,043 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
480.70	1,475	0	0
481.00	1,925	510	510
483.00	4,555	6,480	6,990
484.00	6,100	5,328	12,318
485.50	8,200	10,725	23,043

Device	Routing	Invert	Outlet Devices
#1	Primary	480.70'	**1.9" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.50'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	483.50'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#4	Primary	484.00'	**6.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.10 cfs @ 13.89 hrs HW=481.88' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.10 cfs @ 5.05 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Outlet Structure



Summary for Pond Forebay: Forebay

Volume	Invert	Avail.Storage	Storage Description
#1	478.60'	531 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
478.60	55	0	0
479.00	115	34	34
480.00	315	215	249
480.70	490	282	531

Forebay Volume = 0.012 ac-ft.

10% WQv = 479 cubic feet
Therefore 10% WQv provided in Forebay

Summary for Pond Pool: Permanent Pool

Volume	Invert	Avail.Storage	Storage Description
#1	477.00'	2,453 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

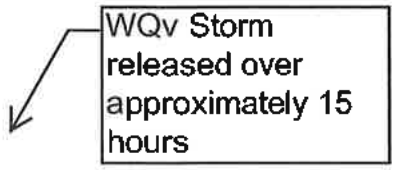
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
477.00	75	0	0
478.60	520	476	476
479.00	615	227	703
480.00	1,090	853	1,555
480.70	1,475	898	2,453

Permanent Pool Volume
0.056 ac-ft

Required WQv = 4,789 cubic feet.
Need to rely on Extended Detention

Hydrograph for Pond BASIN: Outlet Structure

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	480.70	0.00
5.00	0.00	0	480.70	0.00
10.00	**0.00**	**1**	**480.70**	**0.00**
15.00	**0.07**	**2,647**	**481.86**	**0.10**
20.00	0.03	1,871	481.59	0.09
25.00	0.00	972	481.22	0.06
30.00	0.00	200	480.83	0.02
35.00	0.00	57	480.74	0.00
40.00	0.00	22	480.71	0.00
45.00	0.00	9	480.71	0.00
50.00	0.00	3	480.70	0.00
55.00	0.00	1	480.70	0.00
60.00	0.00	1	480.70	0.00
65.00	0.00	0	480.70	0.00
70.00	0.00	0	480.70	0.00
75.00	0.00	0	480.70	0.00
80.00	0.00	0	480.70	0.00
85.00	0.00	0	480.70	0.00
90.00	0.00	0	480.70	0.00
95.00	0.00	0	480.70	0.00
100.00	0.00	0	480.70	0.00
105.00	0.00	0	480.70	0.00
110.00	0.00	0	480.70	0.00
115.00	0.00	0	480.70	0.00
120.00	0.00	0	480.70	0.00
125.00	0.00	0	480.70	0.00
130.00	0.00	0	480.70	0.00
135.00	0.00	0	480.70	0.00
140.00	0.00	0	480.70	0.00
145.00	0.00	0	480.70	0.00
150.00	0.00	0	480.70	0.00
155.00	0.00	0	480.70	0.00
160.00	0.00	0	480.70	0.00
165.00	0.00	0	480.70	0.00
170.00	0.00	0	480.70	0.00
175.00	0.00	0	480.70	0.00
180.00	0.00	0	480.70	0.00



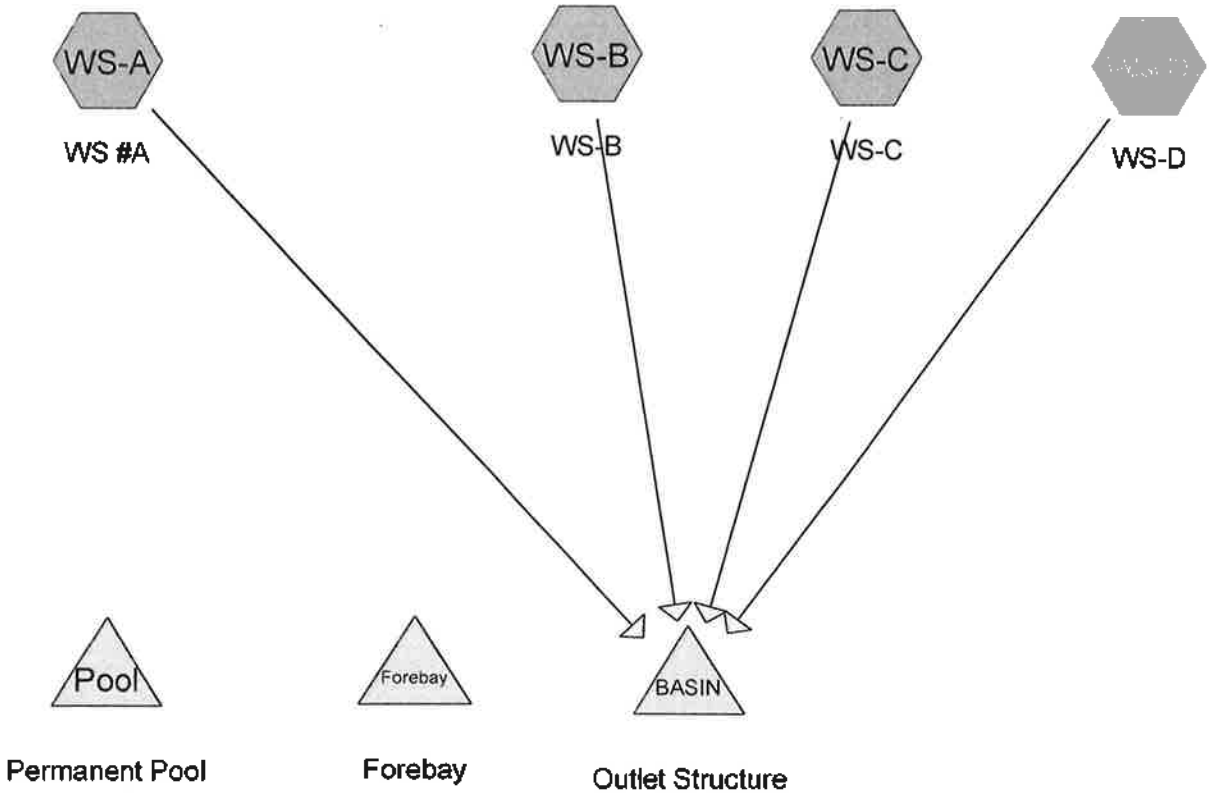
Appendix – Channel Protection Volume

WHITNEY HILL

Williston, Vermont

April 26, 2016

Whitney Hill - Channel Protection Volume Hydrologic Model



Subcat Reach Pond Link

Routing Diagram for Whitney Hill, Revised 4/25/16
Prepared by Microsoft, Printed 4/25/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Whitney Hill - Stormwater Model

Channel Protection Volume Calculations

Time span=0.00-180.00 hrs, dt=0.05 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS-A: WS #A Runoff Area=2.007 ac 35.48% Impervious Runoff Depth=1.05"
Flow Length=120' Tc=9.5 min CN=WQ Runoff=2.99 cfs 0.176 af

SubcatchmentWS-B: WS-B Runoff Area=0.557 ac 31.42% Impervious Runoff Depth=0.96"
Flow Length=820' Tc=20.4 min CN=WQ Runoff=0.53 cfs 0.045 af

SubcatchmentWS-C: WS-C Runoff Area=0.646 ac 47.52% Impervious Runoff Depth=1.22"
Flow Length=1,060' Tc=14.0 min CN=WQ Runoff=0.96 cfs 0.066 af

SubcatchmentWS-D: WS-D Runoff Area=0.551 ac 41.74% Impervious Runoff Depth=1.15"
Flow Length=350' Tc=7.5 min CN=WQ Runoff=0.95 cfs 0.053 af

Pond BASIN: Outlet Structure Peak Elev=483.42' Storage=9,033 cf Inflow=5.16 cfs 0.339 af
Outflow=0.15 cfs 0.339 af

Pond Forebay: Forebay Peak Elev=0.00' Storage=0 cf

Pond Pool: Permanent Pool Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 3.761 ac Runoff Volume = 0.339 af Average Runoff Depth = 1.08"
62.14% Pervious = 2.337 ac 37.86% Impervious = 1.424 ac

Summary for Subcatchment WS-A: WS #A

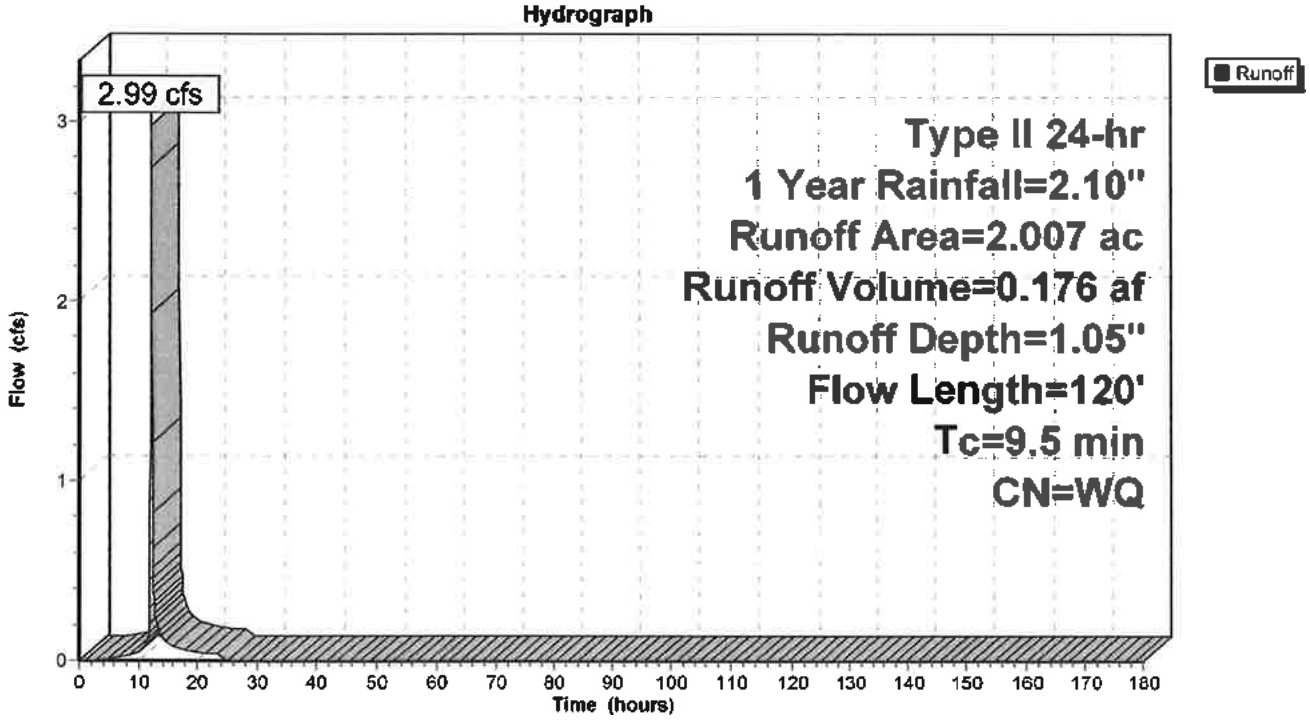
Runoff = 2.99 cfs @ 12.01 hrs, Volume= 0.176 af, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.712	98	Impervious
	1.088	80	>75% Grass cover, Good, HSG D
	0.207	77	Woods, Good, HSG D
	2.007		Weighted Average
	1.295		64.52% Pervious Area
	0.712		35.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	90	0.0700	0.16		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
0.1	30	0.0800	4.55		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
9.5	120	Total			

Subcatchment WS-A: WS #A



Summary for Subcatchment WS-B: WS-B

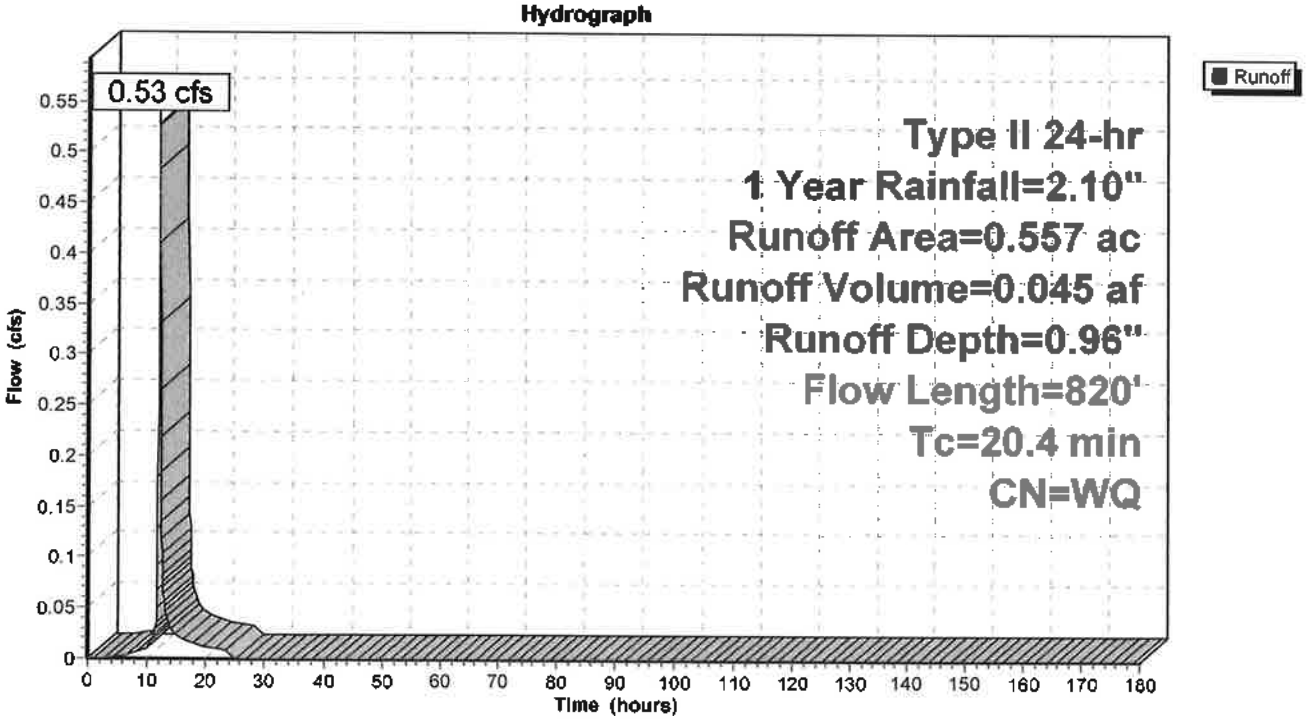
Runoff = 0.53 cfs @ 12.13 hrs, Volume= 0.045 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.175	98	Impervious Area
	0.137	74	>75% Grass cover, Good, HSG C
	0.245	80	>75% Grass cover, Good, HSG D
	0.557		Weighted Average
	0.382		68.58% Pervious Area
	0.175		31.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0200	0.10		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
3.6	720	0.0420	3.30		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
20.4	820	Total			

Subcatchment WS-B: WS-B



Summary for Subcatchment WS-C: WS-C

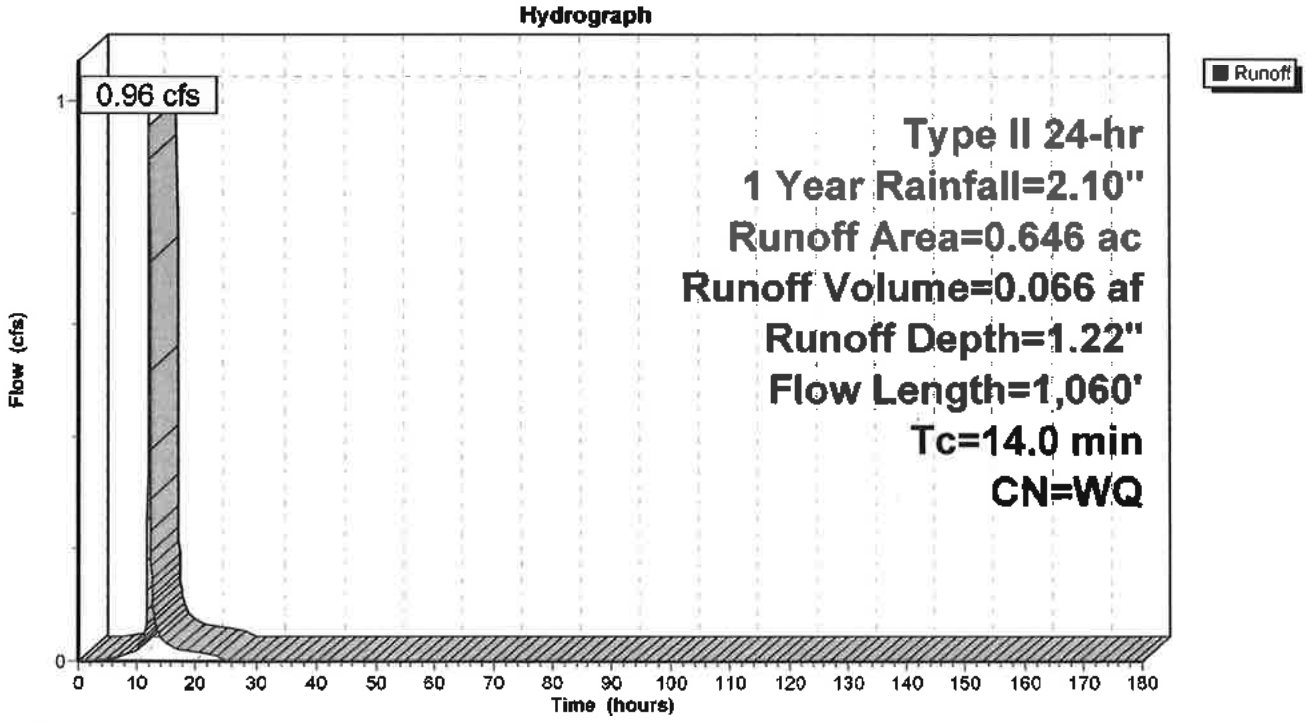
Runoff = 0.96 cfs @ 12.06 hrs, Volume= 0.066 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.307	98	Impervious Area
	0.339	80	>75% Grass cover, Good, HSG D
	0.646		Weighted Average
	0.339		52.48% Pervious Area
	0.307		47.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0600	0.15		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
3.2	960	0.0940	4.94		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
14.0	1,060	Total			

Subcatchment WS-C: WS-C



Summary for Subcatchment WS-D: WS-D

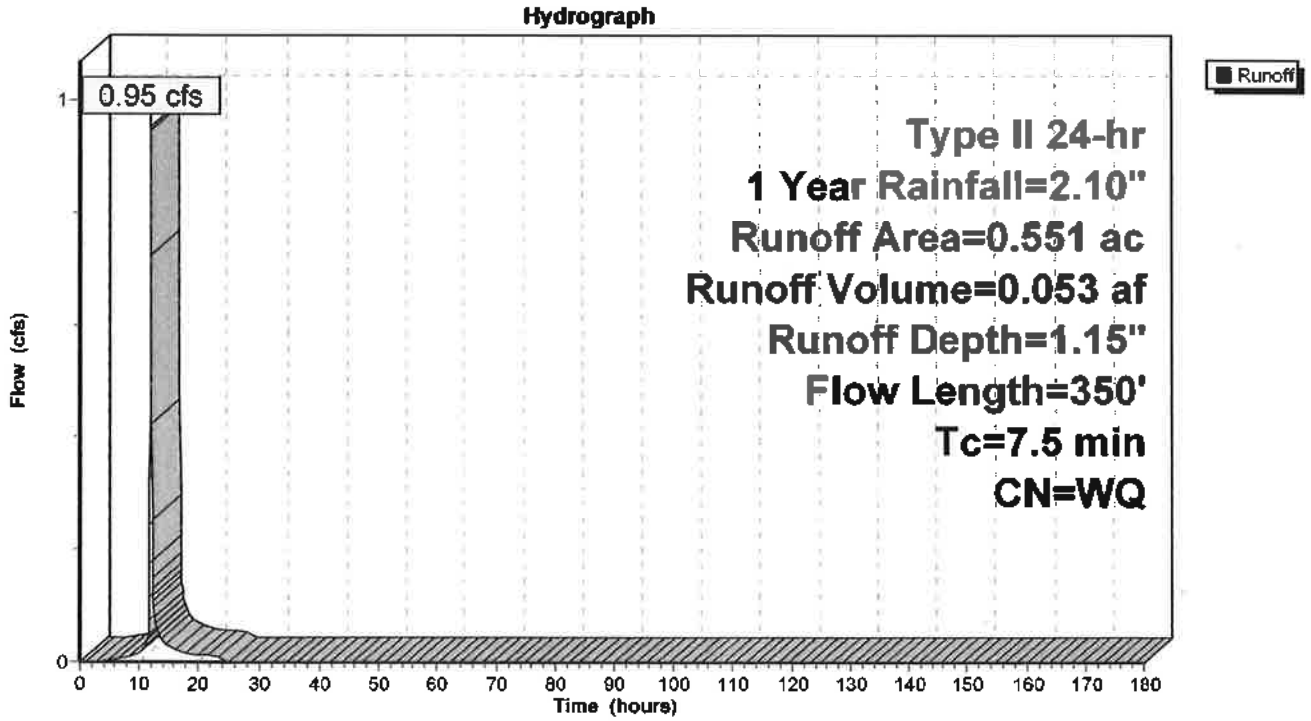
Runoff = 0.95 cfs @ 11.99 hrs, Volume= 0.053 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.230	98	Impervious Area
	0.321	80	>75% Grass cover, Good, HSG D
	0.551		Weighted Average
	0.321		58.26% Pervious Area
	0.230		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	30	0.0270	0.09		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
0.7	70	0.0500	1.57		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.30"
1.1	250	0.0600	3.94		**Shallow Concentrated Flow, Gras Meadow** Unpaved Kv= 16.1 fps
7.5	350	Total			

Subcatchment WS-D: WS-D



Summary for Pond BASIN: Outlet Structure

Inflow Area = 3.761 ac, 37.86% Impervious, Inflow Depth = 1.08" for 1 Year event
Inflow = 5.16 cfs @ 12.01 hrs, Volume= 0.339 af
Outflow = 0.15 cfs @ 15.63 hrs, Volume= 0.339 af, Atten= 97%, Lag= 216.8 min
Primary = 0.15 cfs @ 15.63 hrs, Volume= 0.339 af

Routing by Stor-Ind method, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 483.42' @ 15.63 hrs Surf.Area= 5,202 sf Storage= 9,033 cf

Plug-Flow detention time= 687.0 min calculated for 0.339 af (100% of inflow)
Center-of-Mass det. time= 686.2 min (1,489.5 - 803.3)

11.4 hours

Volume	Invert	Avail.Storage	Storage Description
#1	480.70'	23,043 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

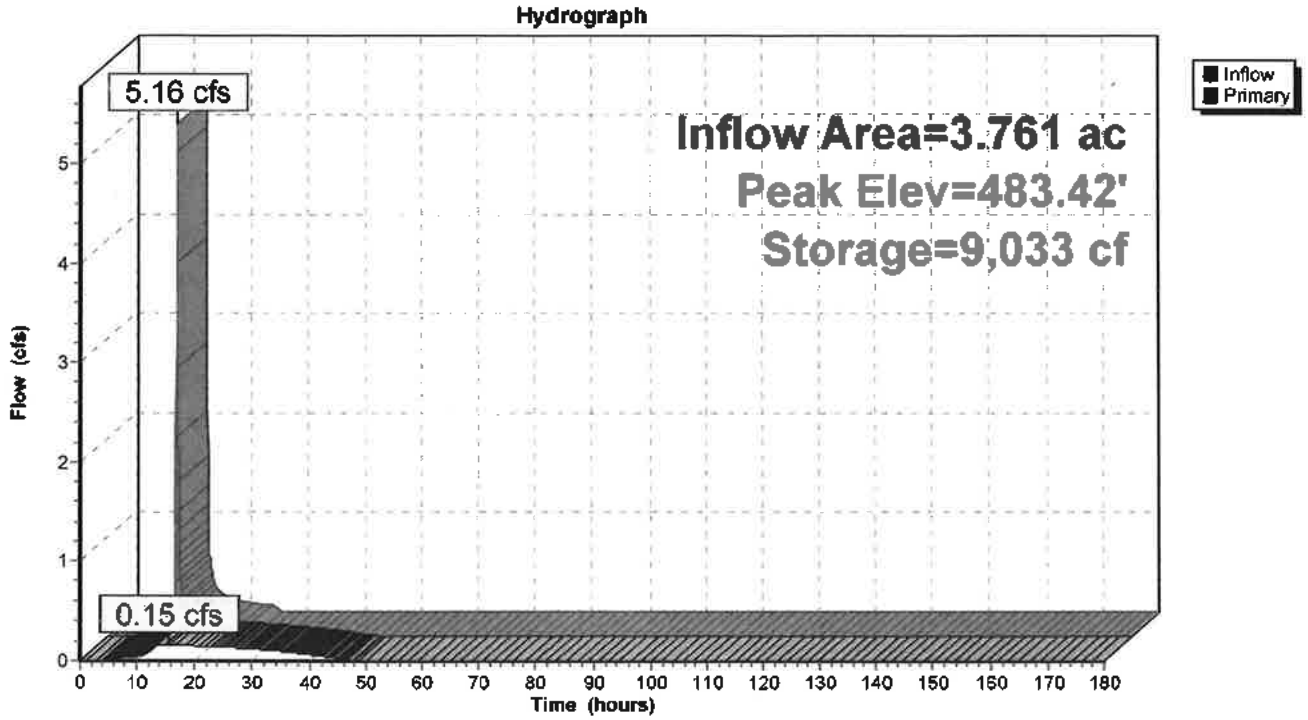
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
480.70	1,475	0	0
481.00	1,925	510	510
483.00	4,555	6,480	6,990
484.00	6,100	5,328	12,318
485.50	8,200	10,725	23,043

1.9" low flow orifice

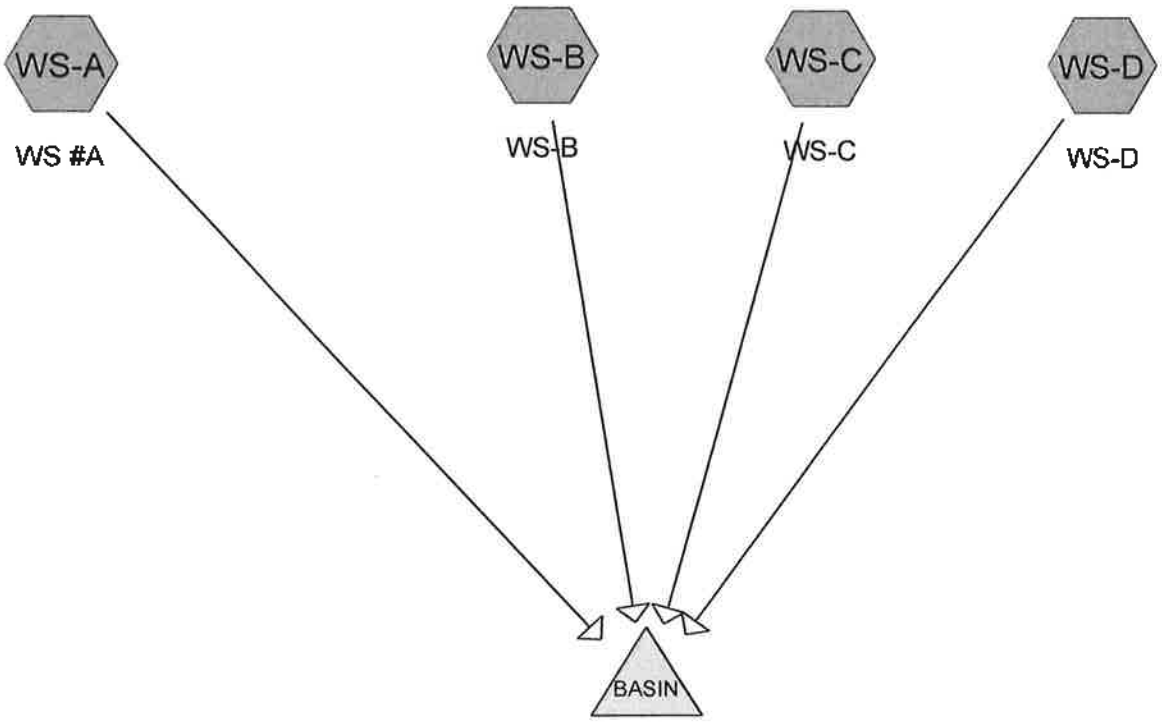
Device	Routing	Invert	Outlet Devices
#1	Primary	480.70'	**1.9" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.50'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	483.50'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#4	Primary	484.00'	**6.0' long x 6.0' breadth Broad-Crested Rectangular 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.15 cfs @ 15.63 hrs HW=483.42' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.15 cfs @ 7.82 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Outlet Structure



Qp10 - Post Development Hydrologic Model



Outlet Structure

Subcat Reach Pond Link

Routing Diagram for Whitney Hill, Revised 4/25/16
Prepared by Hewlett-Packard Company, Printed 4/26/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Whitney Hill - Stormwater Model

Overbank Flood Protection Treatment Standard Hydrologic Model

Time span=0.00-180.00 hrs, dt=0.05 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS-A: WS #A Runoff Area=2.007 ac 35.48% Impervious Runoff Depth=1.94"
Flow Length=120' Tc=9.5 min CN=WQ Runoff=5.58 cfs 0.324 af

SubcatchmentWS-B: WS-B Runoff Area=0.557 ac 31.42% Impervious Runoff Depth=1.80"
Flow Length=820' Tc=20.4 min CN=WQ Runoff=1.03 cfs 0.084 af

SubcatchmentWS-C: WS-C Runoff Area=0.646 ac 47.52% Impervious Runoff Depth=2.15"
Flow Length=1,060' Tc=14.0 min CN=WQ Runoff=1.70 cfs 0.116 af

SubcatchmentWS-D: WS-D Runoff Area=0.551 ac 41.74% Impervious Runoff Depth=2.06"
Flow Length=350' Tc=7.5 min CN=WQ Runoff=1.73 cfs 0.094 af

Pond BASIN: Outlet Structure Peak Elev=483.84' Storage=11,358 cf Inflow=9.54 cfs 0.618 af
Outflow=3.94 cfs 0.617 af

Summary for Subcatchment WS-A: WS #A

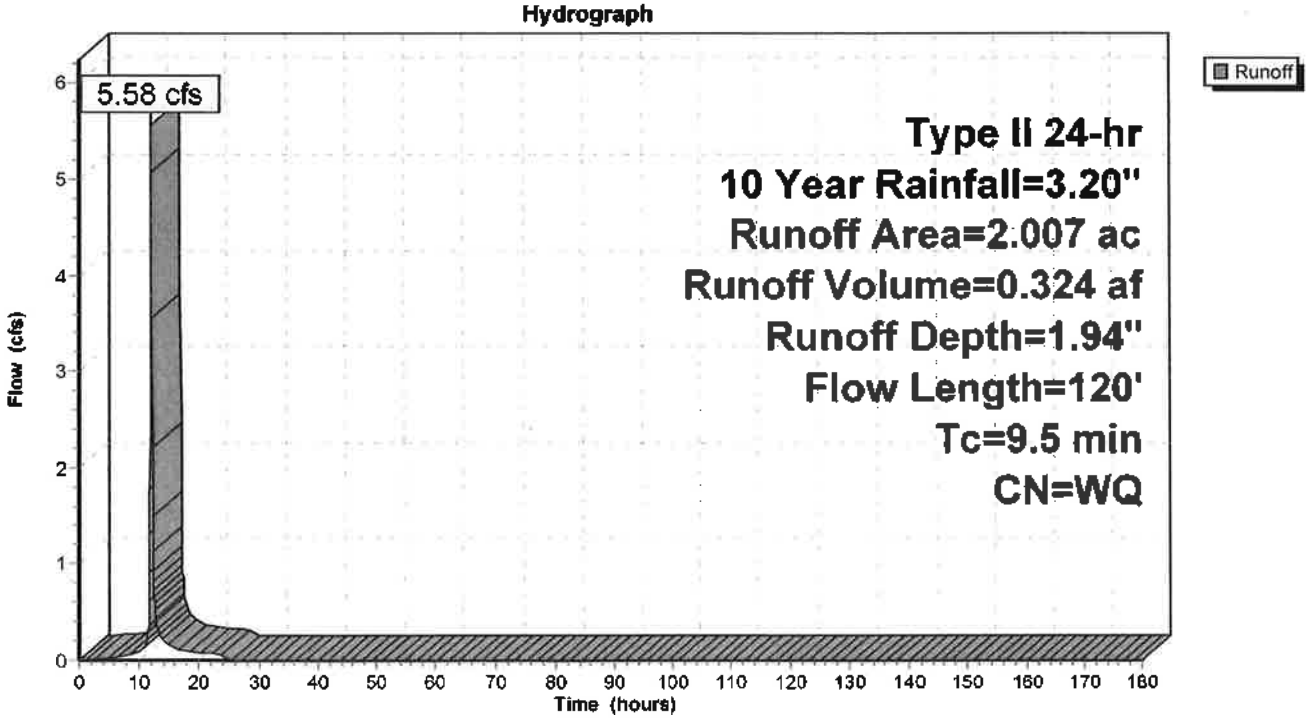
Runoff = 5.58 cfs @ 12.01 hrs, Volume= 0.324 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.712	98	Impervious
	1.088	80	>75% Grass cover, Good, HSG D
	0.207	77	Woods, Good, HSG D
	2.007		Weighted Average
	1.295		64.52% Pervious Area
	0.712		35.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	90	0.0700	0.16		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
0.1	30	0.0800	4.55		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
9.5	120	Total			

Subcatchment WS-A: WS #A



Summary for Subcatchment WS-B: WS-B

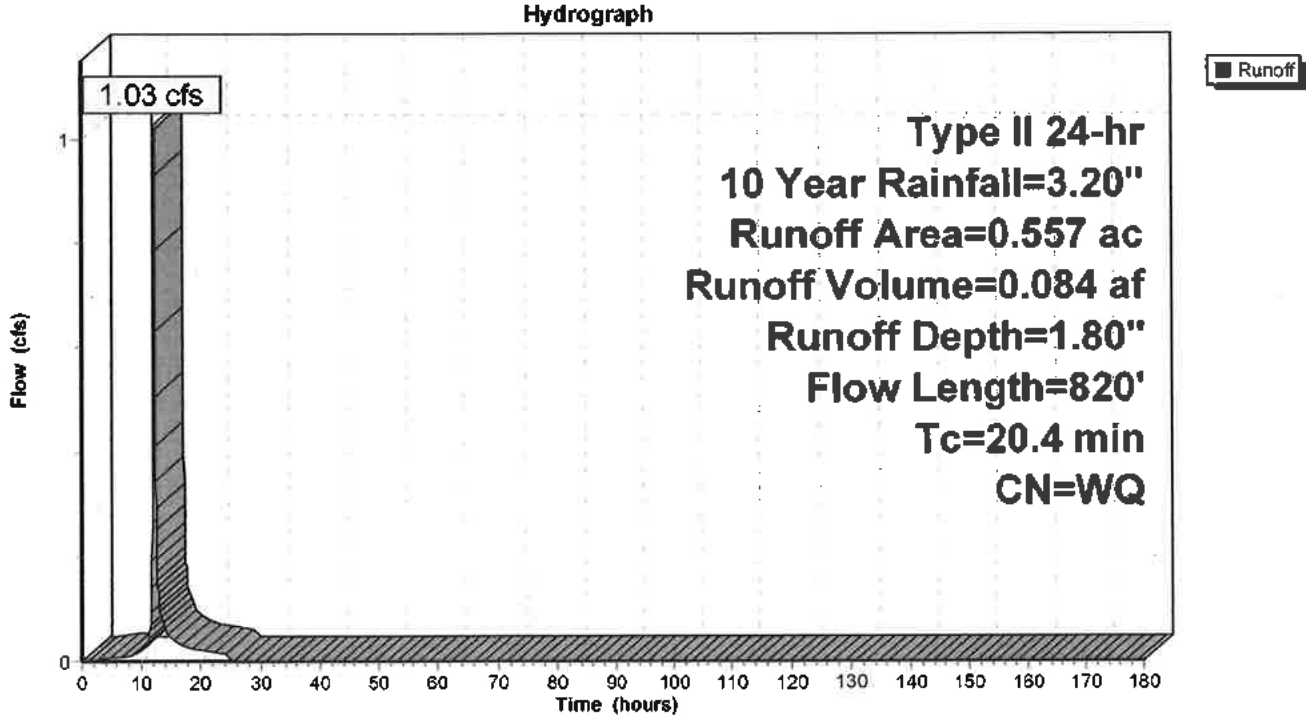
Runoff = 1.03 cfs @ 12.13 hrs, Volume= 0.084 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.175	98	Impervious Area
	0.137	74	>75% Grass cover, Good, HSG C
	0.245	80	>75% Grass cover, Good, HSG D
	0.557		Weighted Average
	0.382		68.58% Pervious Area
	0.175		31.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0200	0.10		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
3.6	720	0.0420	3.30		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
20.4	820	Total			

Subcatchment WS-B: WS-B



Summary for Subcatchment WS-C: WS-C

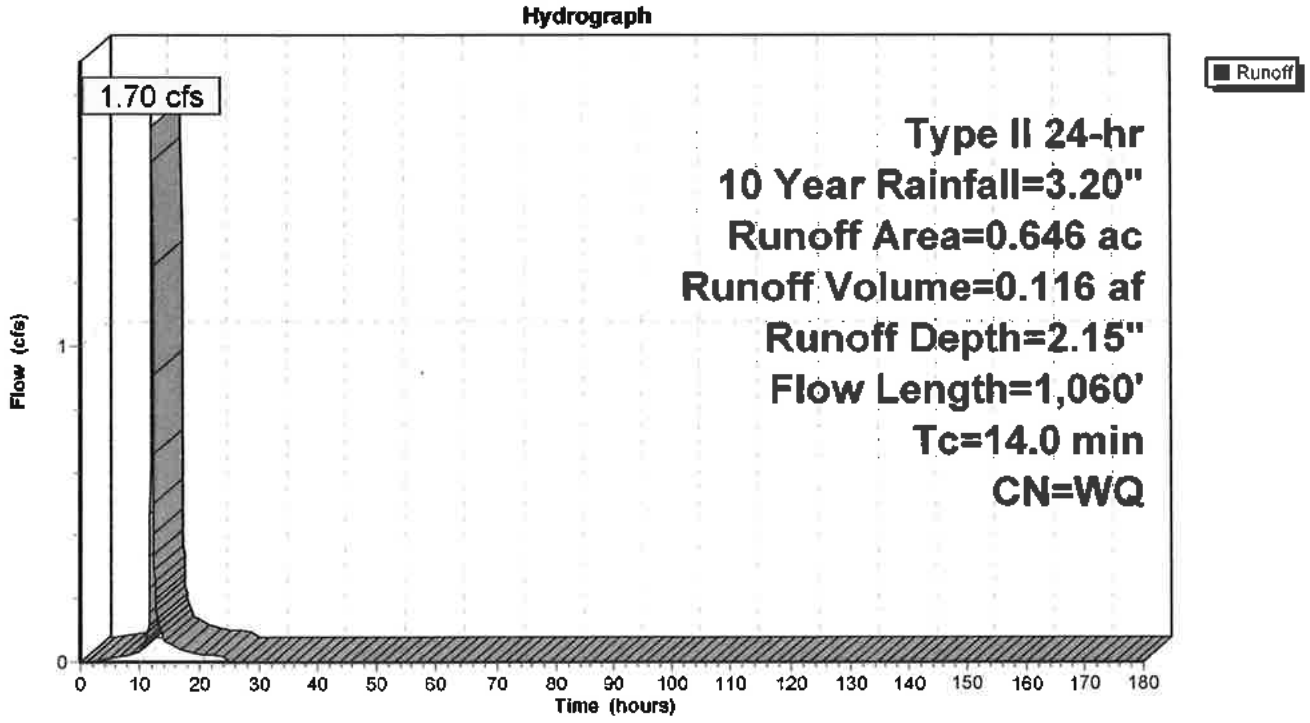
Runoff = 1.70 cfs @ 12.06 hrs, Volume= 0.116 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.307	98	Impervious Area
	0.339	80	>75% Grass cover, Good, HSG D
	0.646		Weighted Average
	0.339		52.48% Pervious Area
	0.307		47.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0600	0.15		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
3.2	960	0.0940	4.94		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
14.0	1,060	Total			

Subcatchment WS-C: WS-C



Summary for Subcatchment WS-D: WS-D

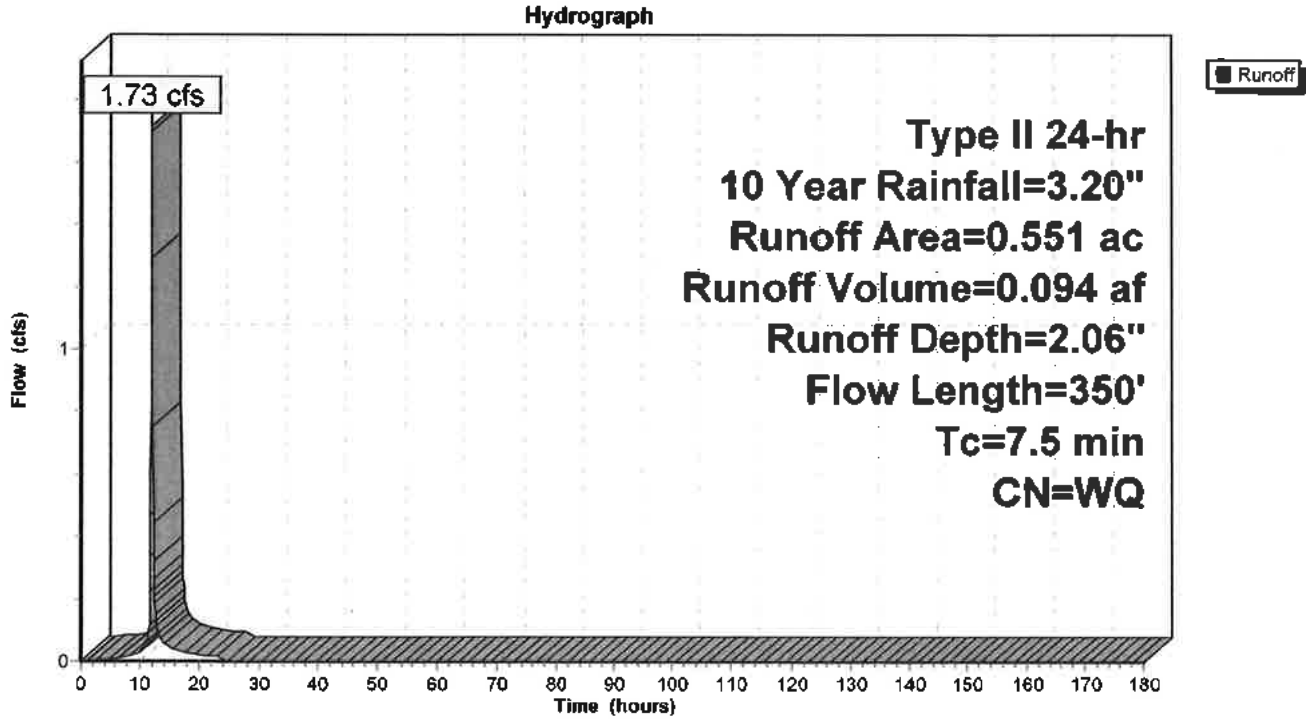
Runoff = 1.73 cfs @ 11.99 hrs, Volume= 0.094 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.230	98	Impervious Area
	0.321	80	>75% Grass cover, Good, HSG D
	0.551		Weighted Average
	0.321		58.26% Pervious Area
	0.230		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	30	0.0270	0.09		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
0.7	70	0.0500	1.57		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.30"
1.1	250	0.0600	3.94		**Shallow Concentrated Flow, Gras Meadow** Unpaved Kv= 16.1 fps
7.5	350	Total			

Subcatchment WS-D: WS-D



Post Development Peak Discharge

Summary for Pond BASIN: Outlet Structure

Inflow Area = 3.761 ac, 37.86% Impervious, Inflow Depth = 1.97" for 10 Year event
Inflow = 9.54 cfs @ 12.01 hrs, Volume= 0.618 af
Outflow = 3.94 cfs @ 12.20 hrs, Volume= 0.617 af, Atten= 59%, Lag= 11.0 min
Primary = 3.94 cfs @ 12.20 hrs, Volume= 0.617 af

Routing by Stor-Ind method, Time Span= 0.00-180.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 483.84' @ 12.20 hrs Surf.Area= 5,852 sf Storage= 11,358 cf

Plug-Flow detention time= 477.2 min calculated for 0.617 af (100% of inflow)
Center-of-Mass det. time= 476.0 min (1,271.7 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1	480.70'	23,043 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

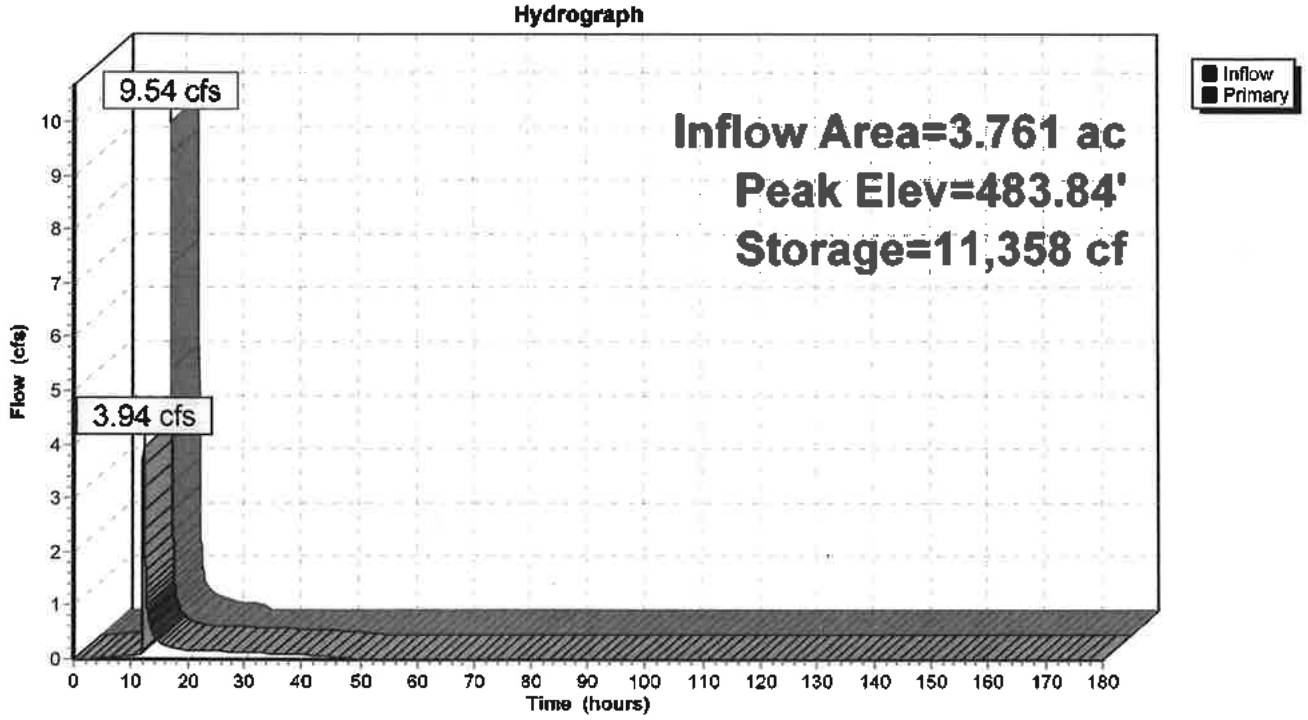
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
480.70	1,475	0	0
481.00	1,925	510	510
483.00	4,555	6,480	6,990
484.00	6,100	5,328	12,318
485.50	8,200	10,725	23,043

Device	Routing	Invert	Outlet Devices
#1	Primary	480.70'	**1.9" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.50'	**60.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	483.50'	**18.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	484.00'	**6.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=3.92 cfs @ 12.20 hrs HW=483.84' (Free Discharge)
- 1=**Orifice/Grate** (Orifice Controls 0.17 cfs @ 8.42 fps)
- 2=**Orifice/Grate** (Orifice Controls 3.16 cfs @ 1.87 fps)
- 3=**Orifice/Grate** (Orifice Controls 0.59 cfs @ 1.98 fps)
- 4=Broad-Crested **Rectangular Weir** (Controls 0.00 cfs)

3.94 cfs < 5.38 cfs

Pond BASIN: Outlet Structure



COMMONS: PERMIT 1-1052


Source: USGS
Source: NASA, NGA, USGS
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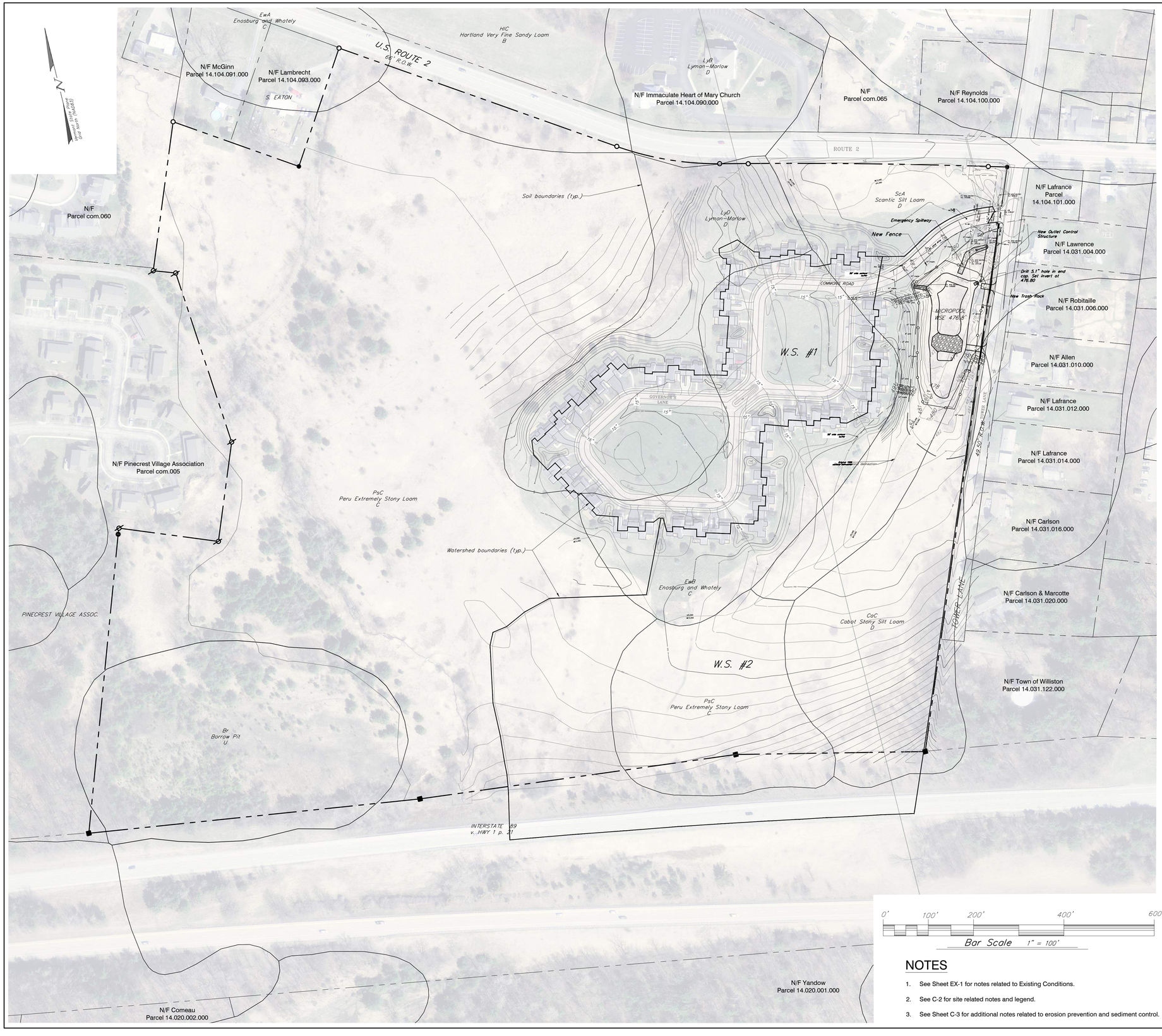
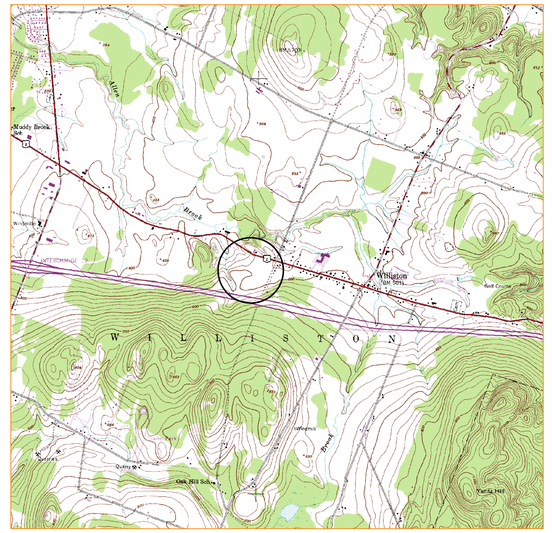




LOCATION

NTS

NOTES

1. See Sheet EX-1 for additional notes and legend related to Existing Conditions.
2. See Sheet C-3 for additional notes related to erosion prevention and sediment control.
3. The Contractor shall be responsible for repairing all disturbed areas back to original or better condition, including but not limited to curbing, sidewalks, road, parking areas, landscaping, site lighting, electrical, and etc. All asphalt shall be sawcut prior to paving.
4. All stumps, rock, and other non-approved trench backfill material discovered during construction is the exclusive property of the Contractor and shall be removed from the site and disposed of in a State approved disposal location.
5. Contractor shall be responsible for providing a passing sieve of the representative gravel delivered to the site for the construction of the stable vegetated access path.
6. The Contractor shall comply with the procedures outlined in the Low Risk Site Handbook for Erosion Prevention and Sediment Control. The Contractor shall be responsible for installing, maintaining and removing all erosion and sediment control devices shown on the plans or details and, to the maximum extent practical, to minimize potential contamination of stormwater runoff from the construction activities.
7. The Contractor shall be responsible for all construction barrier/safety fencing required for the project.
8. Contractor shall be responsible for importing topsoil as required to complete the project. Contractor shall test topsoil for approval.
9. The Contractor shall be responsible for all signage and fencing necessary to providing safe vehicular and pedestrian access through or around the site during construction.
10. All storm pipes shall be PVC SDR 35 unless otherwise noted. PVC pipe shall contain no recycled content.
11. Temporary groundwater dewatering and stormwater by-pass pumping and/or diversion is the responsibility of the Contractor. The Contractor is responsible for providing all necessary pumps and equipment to perform the work. Overnight pumping is not allowed.
12. Dewatering shall be accomplished by creating a sump pit filled with crushed stone and pumping to a sediment filter bag placed downslope of the disturbed soils. The pumpout water shall be monitored to ensure visibly discolored water does leave the project site.
13. This project is subject to all erosion prevention and sediment control measures including the monitoring, inspection, and reporting requirements of State of Vermont Construction Stormwater Discharge Permit. The Contractor shall be the Principal Operator for the project.
14. Removal of all erosion control matting and inlet protection is the responsibility of the Contractor.
15. Contractor shall use select soil for the construction of the pond earth embankment. Remove topsoil & organics. Place fill in 6" lifts. Permeability testing shall be performed on a minimum two stockpile soil samples prior to placing soil on earth embankment. Soil permeability shall be less than 0.003 mm/sec. and shall be approved by the Engineer. Soil shall be placed and compacted to 95% of the Standard Proctor. Topsoil, seed, and properly secure mulch all portions of the earth embankment above the proposed water surface elevation.
16. Area of wetland impact: 40,335 s.f.
17. Area of wetland buffer impact: 3,027 s.f.

0' 100' 200' 400' 600'

Bar Scale 1" = 100'

NOTES

1. See Sheet EX-1 for notes related to Existing Conditions.
2. See C-2 for site related notes and legend.
3. See Sheet C-3 for additional notes related to erosion prevention and sediment control.

Date revised	Description	Checked	Date

Design	WHN
Drawn	DMR/SLM
Checked	WHN
Scale	1" = 100'
Date	4/28/2016
Project	14114

Overall Site Plan

WILLISTON COMMONS
Stormwater EFA

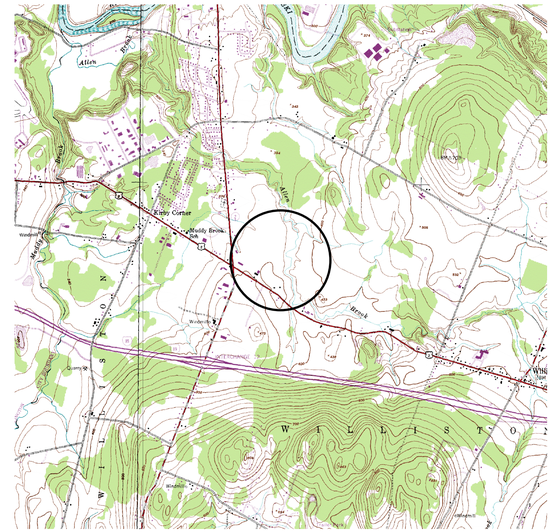
Commons Road — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 14114 will comm site plan base 042816

Plotting date: 4/28/16

C-1



LOCATION

NTS

0' 150' 300' 600' 900'

Bar Scale 1" = 150'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 150'
Date	4/26/16
Project	14257.1

Overall Site Plan

TAFT FARMS
Recreation Area

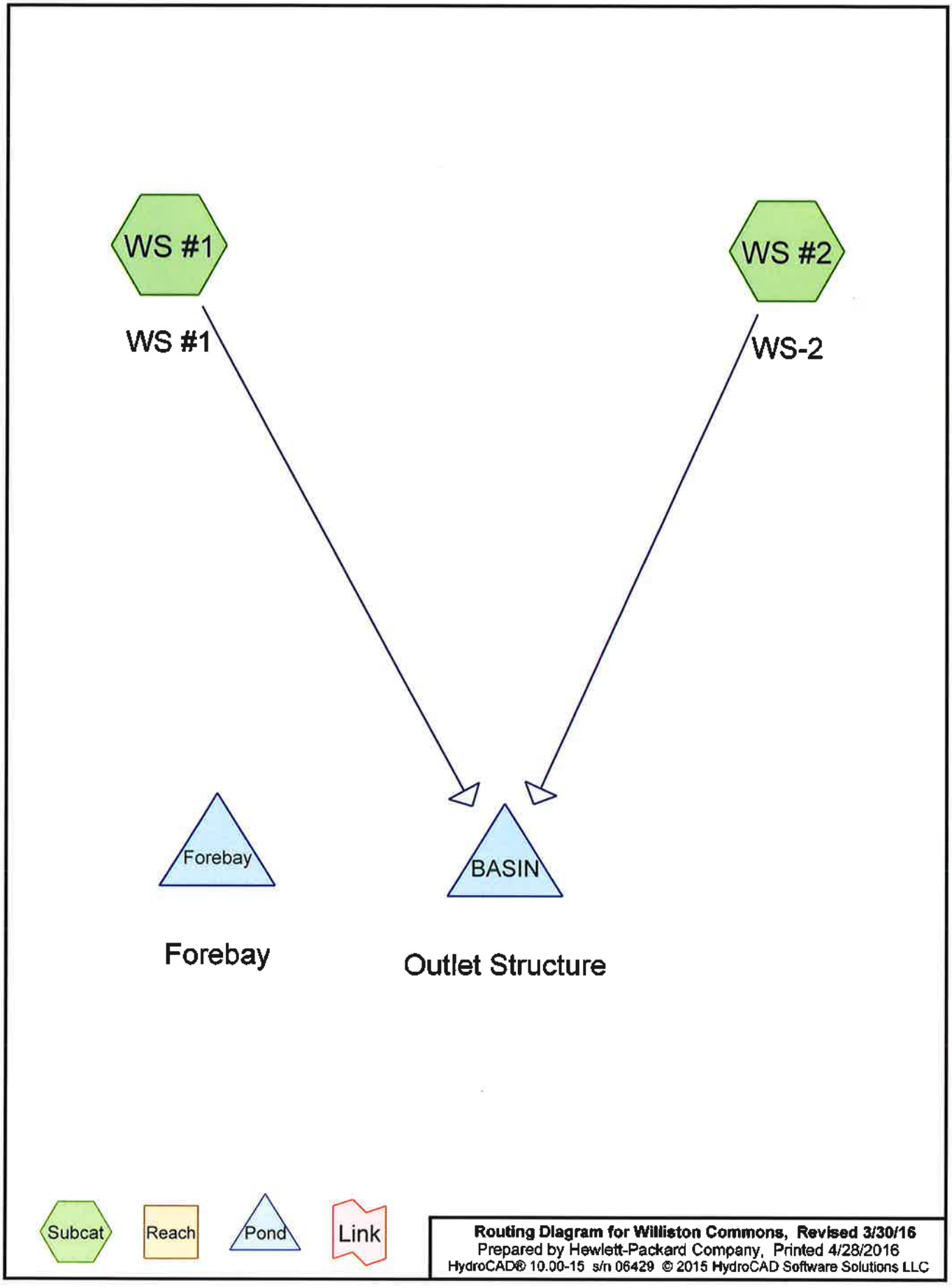
Route 2 — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 14257.1 recreation area overall site plan.dwn

Printing date: 4/27/16

OV-1


WS #1
WS #2
WS #1
WS-2
Forebay
BASIN
Forebay
Outlet Structure
Subcat
Reach
Pond
Link
Routing Diagram for Williston Commons, Revised 3/30/16
Prepared by Hewlett-Packard Company, Printed 4/28/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Williston Commons

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.612	74	>75% Grass cover, Good, HSG C (WS #1)
1.462	80	>75% Grass cover, Good, HSG D (WS #1)
2.883	98	Impervious (WS #1)
0.479	98	Impervious Area (WS #2)
6.469	74	Pasture/grassland/range, Good, HSG C (WS #2)
11.061	80	Pasture/grassland/range, Good, HSG D (WS #2)
23.966	**81**	**TOTAL AREA**

Time span=0.00-240.00 hrs, dt=0.10 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS #1: WS #1 Runoff Area=259,493 sf 48.39% Impervious Runoff Depth=1.17"
Flow Length=615' Tc=16.5 min CN=WQ Runoff=7.53 cfs 0.580 af

SubcatchmentWS #2: WS-2 Runoff Area=784,474 sf 2.66% Impervious Runoff Depth=0.58"
Flow Length=1,280' Tc=31.2 min CN=WQ Runoff=7.57 cfs 0.865 af

Pond BASIN: Outlet Structure Peak Elev=478.32' Storage=82,210 cf Inflow=12.49 cfs 1.444 af
Outflow=0.78 cfs 1.443 af

Pond Forebay: Forebay Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 23.966 ac Runoff Volume = 1.444 af Average Runoff Depth = 0.72"
85.97% Pervious = 20.604 ac 14.03% Impervious = 3.362 ac

Summary for Subcatchment WS #1: WS #1

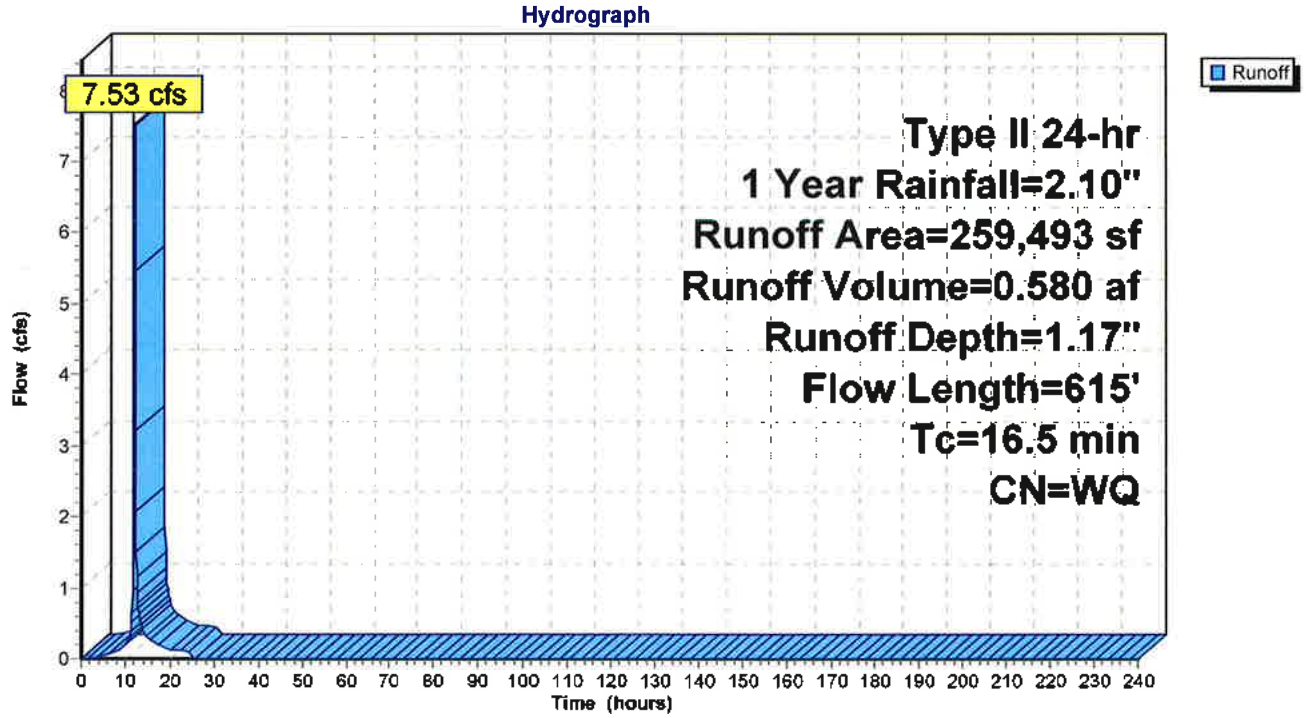
Runoff = 7.53 cfs @ 12.09 hrs, Volume= 0.580 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	125,581	98	Impervious
	63,688	80	>75% Grass cover, Good, HSG D
	70,224	74	>75% Grass cover, Good, HSG C
	259,493		Weighted Average
	133,912		51.61% Pervious Area
	125,581		48.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0350	0.12		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
0.5	115	0.0480	3.53		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
2.5	400	0.0325	2.70		**Shallow Concentrated Flow, SC Pipe outfall to pond** Grassed Waterway Kv= 15.0 fps
16.5	615	Total			

Subcatchment WS #1: WS #1



Summary for Subcatchment WS #2: WS-2

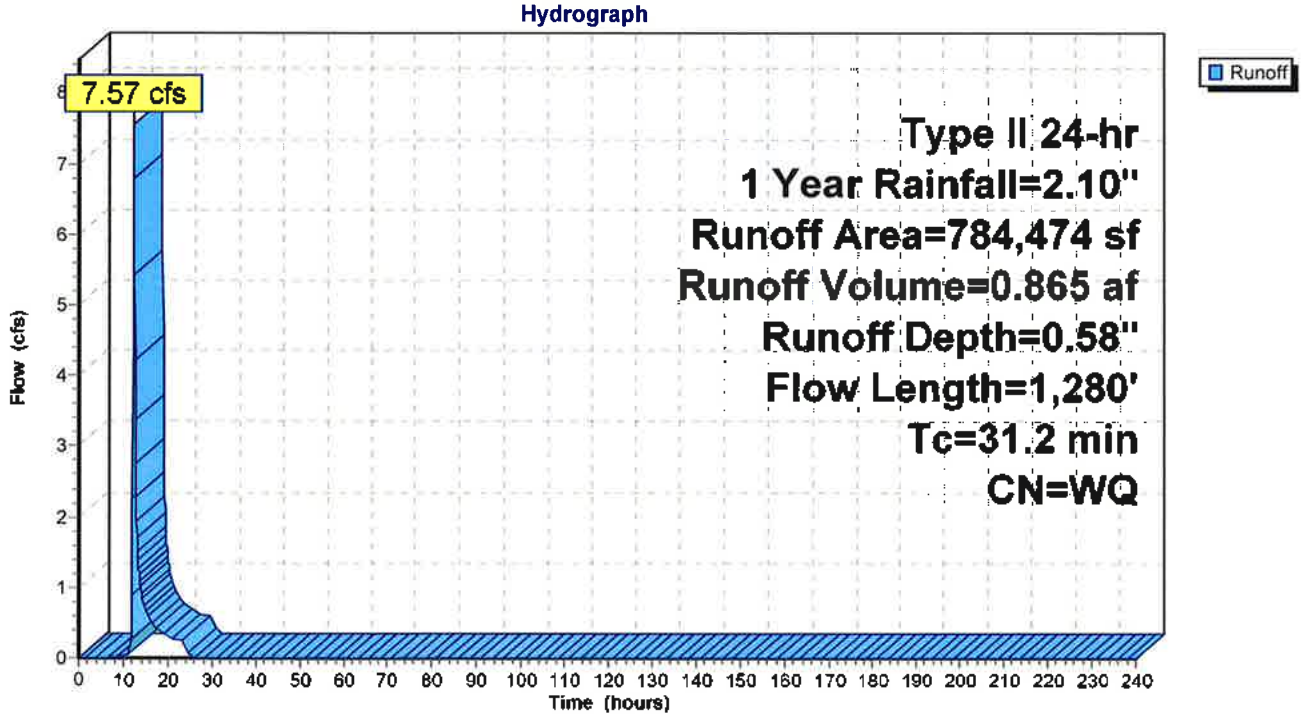
Runoff = 7.57 cfs @ 12.30 hrs, Volume= 0.865 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	20,874	98	Impervious Area
	281,773	74	Pasture/grassland/range, Good, HSG C
	481,827	80	Pasture/grassland/range, Good, HSG D
	784,474		Weighted Average
	763,600		97.34% Pervious Area
	20,874		2.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	150	0.0200	0.11		**Sheet Flow, Sheet Meadow** Grass: Dense n= 0.240 P2= 2.30"
7.9	1,130	0.0220	2.39		**Shallow Concentrated Flow, Gras Meadow** Unpaved Kv= 16.1 fps
31.2	1,280	Total			

Subcatchment WS #2: WS-2



Summary for Pond BASIN: Outlet Structure

Inflow Area = 23.966 ac, 14.03% Impervious, Inflow Depth = 0.72" for 1 Year event
Inflow = 12.49 cfs @ 12.16 hrs, Volume= 1.444 af
Outflow = 0.78 cfs @ 15.90 hrs, Volume= 1.443 af, Atten= 94%, Lag= 224.4 min
Primary = 0.78 cfs @ 15.90 hrs, Volume= 1.443 af

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 476.80' Surf.Area= 20,120 sf Storage= 44,970 cf
Peak Elev= 478.32' @ 15.90 hrs Surf.Area= 28,470 sf Storage= 82,210 cf (37,240 cf above start)

Plug-Flow detention time= 1,806.8 min calculated for 0.411 af (28% of inflow)
Center-of-Mass det. time= 725.7 min (1,576.0 - 850.3) 12.1 hours

Volume	Invert	Avail.Storage	Storage Description
#1	472.80'	134,897 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
472.80	6,390	0	0
474.00	8,620	9,006	9,006
475.00	10,880	9,750	18,756
476.00	14,140	12,510	31,266
476.80	20,120	13,704	44,970
477.00	20,900	4,102	49,072
478.00	27,330	24,115	73,187
480.00	34,380	61,710	134,897

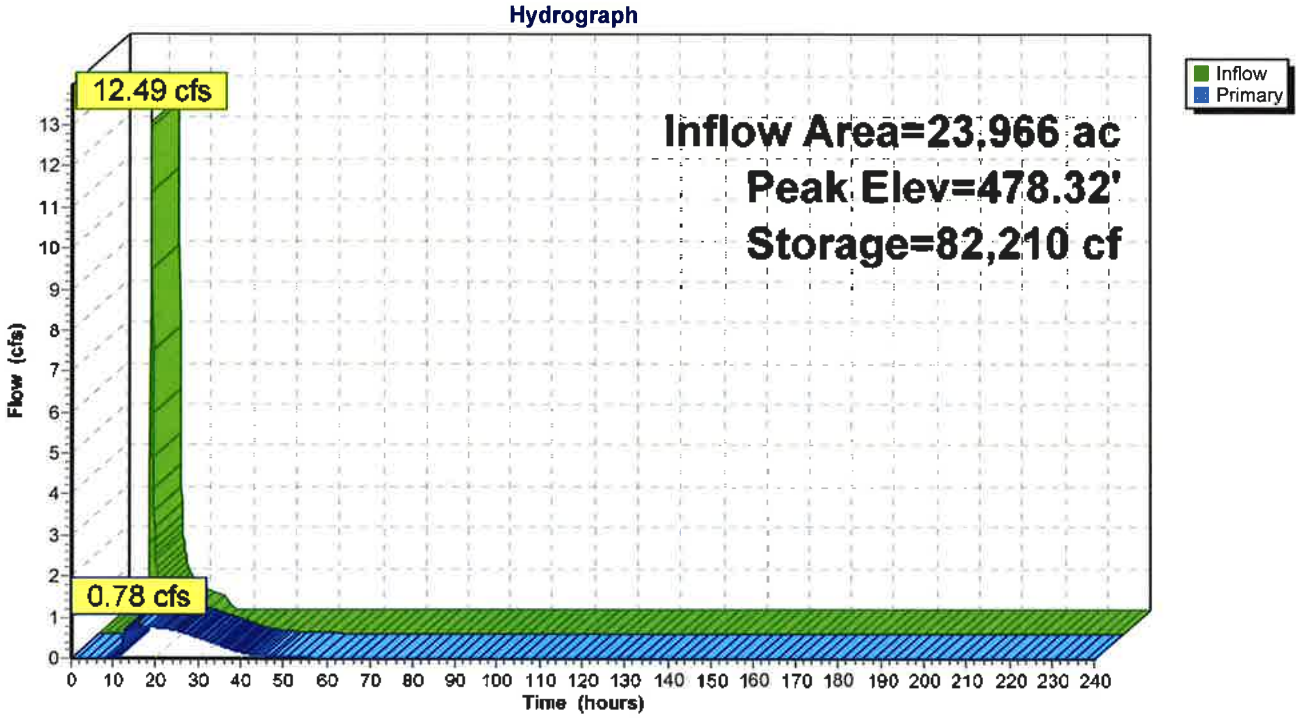
Permanent Pool Volume

5.1" Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	476.80'	**5.1" Vert. Orifice/Grate** C= 0.600
#2	Primary	478.40'	**48.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	479.00'	**6.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.78 cfs @ 15.90 hrs HW=478.32' (Free Discharge)
- 1=**Orifice/Grate** (Orifice Controls 0.78 cfs @ 5.51 fps)
- 2=**Orifice/Grate** (Controls 0.00 cfs)
- 3=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

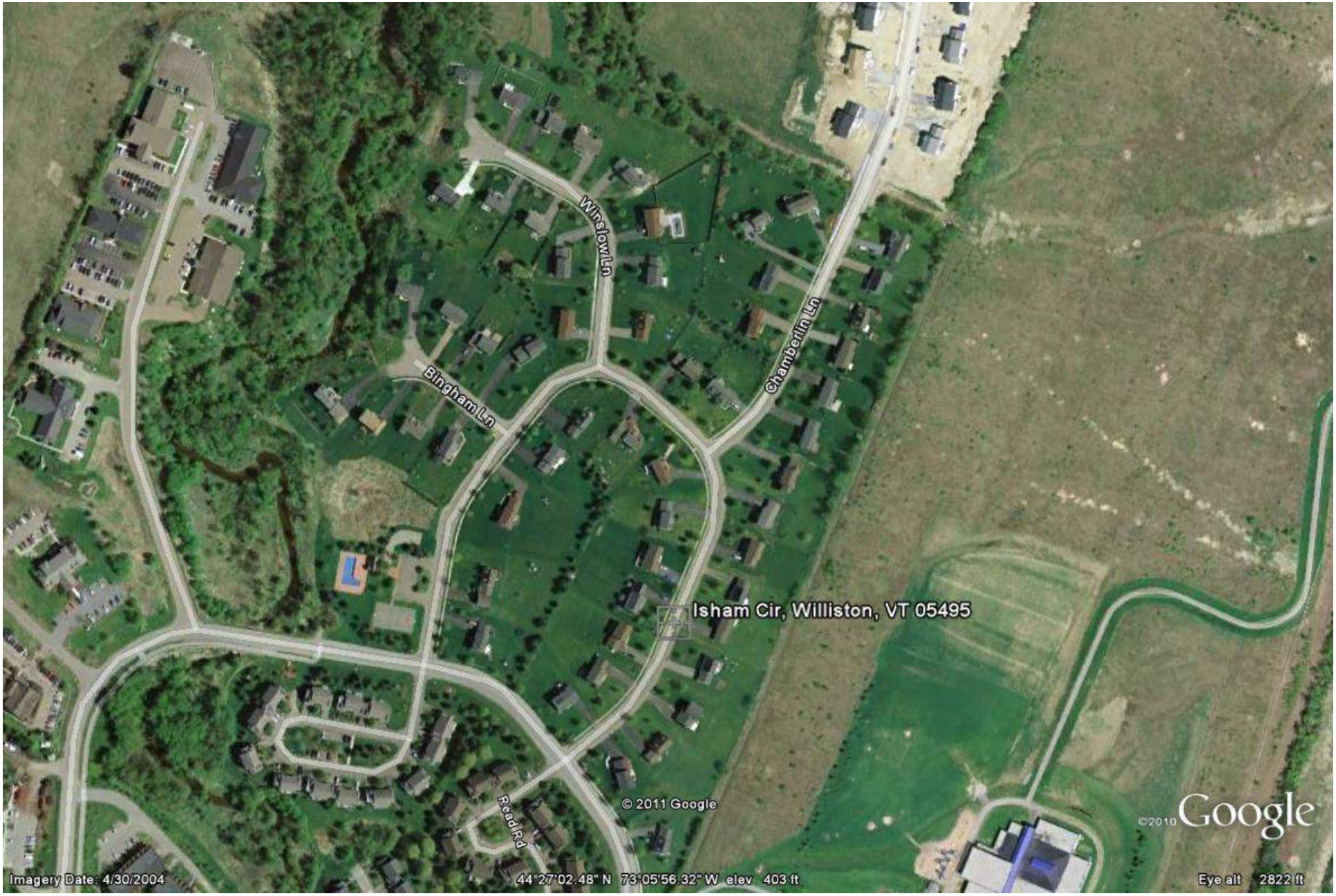
Pond BASIN: Outlet Structure



Summary for Pond Forebay: Forebay

Volume	Invert	Avail.Storage	Storage Description
#1	472.80'	7,630 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
472.80	700	0	0
474.00	1,280	1,188	1,188
475.00	1,980	1,630	2,818
476.00	2,735	2,358	5,175
476.80	3,400	2,454	7,630



ISHAM CIRCLE: PERMIT 1-1217


Source: USGS
Source: NASA, NGA, USGS
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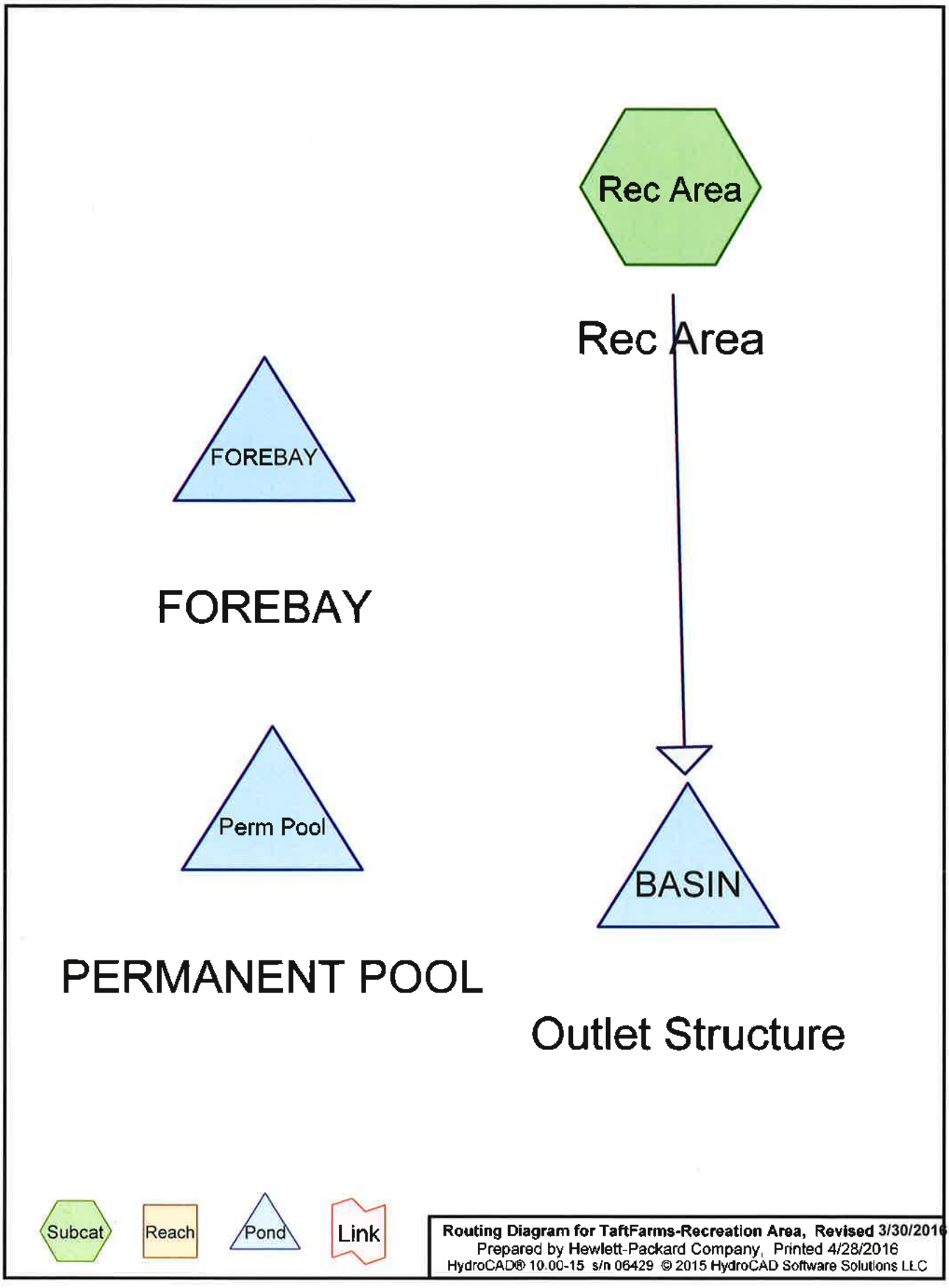

Rec Area
Rec Area
FOREBAY
FOREBAY
Perm Pool
BASIN
PERMANENT POOL
Outlet Structure
Subcat
Reach
Pond
Link
Routing Diagram for TaftFarms-Recreation Area, Revised 3/30/2016
Prepared by Hewlett-Packard Company, Printed 4/28/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Taft Farms
Recreation Area
14257.1

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12.939	80	>75% Grass cover, Good, HSG D (Rec Area)
1.272	98	Impervious - Roofs (Rec Area)
3.319	98	Impervious-Pavement (Rec Area)
17.530	**85**	**TOTAL AREA**

Time span=0.00-120.00 hrs, dt=0.03 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Rec Area: Rec Area Runoff Area=763,607 sf 26.19% Impervious Runoff Depth=0.95"
Flow Length=400' Tc=27.3 min CN=WQ Runoff=14.11 cfs 1.390 af

Pond BASIN: Outlet Structure Peak Elev=375.40' Storage=37,307 cf Inflow=14.11 cfs 1.390 af
Outflow=0.62 cfs 1.390 af

Pond FOREBAY: FOREBAY Peak Elev=0.00' Storage=0 cf

Pond Perm Pool: PERMANENT POOL Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 17.530 ac Runoff Volume = 1.390 af Average Runoff Depth = 0.95"
73.81% Pervious = 12.939 ac 26.19% Impervious = 4.591 ac

Summary for Subcatchment Rec Area: Rec Area

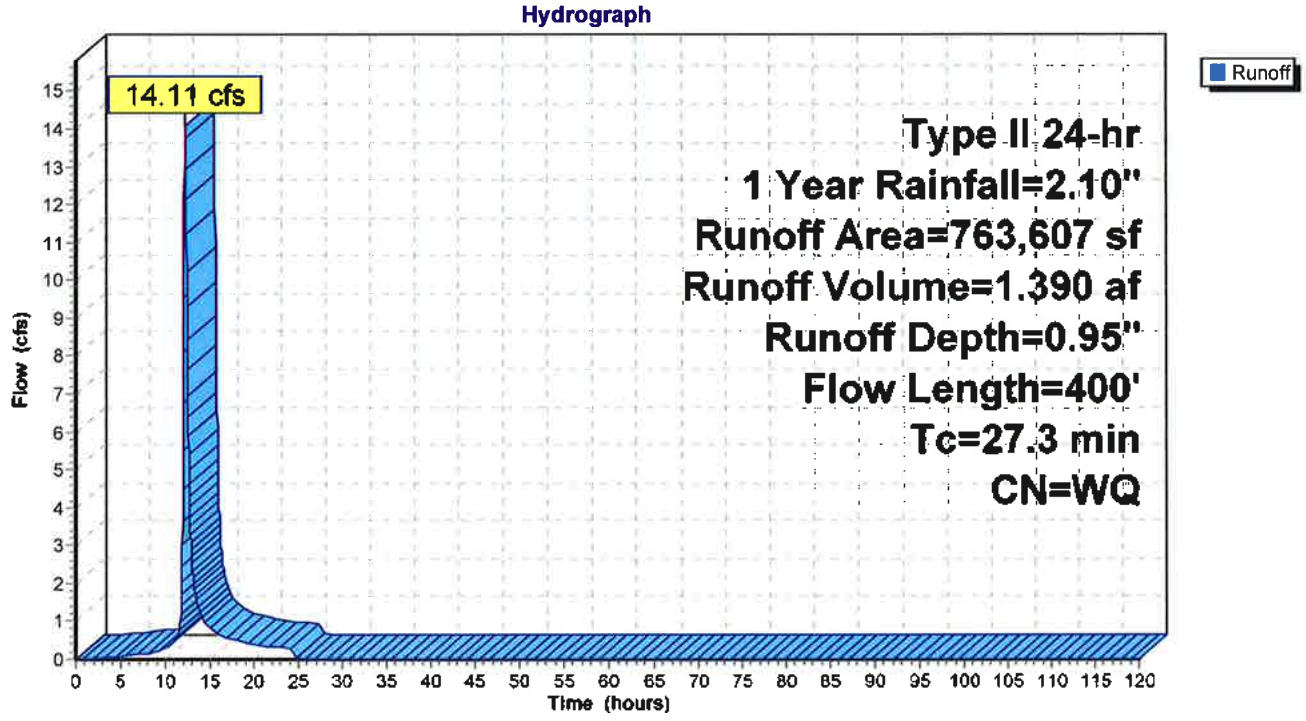
Runoff = 14.11 cfs @ 12.22 hrs, Volume= 1.390 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	144,576	98	Impervious-Pavement
*	55,408	98	Impervious - Roofs
*	563,623	80	>75% Grass cover, Good, HSG D
	763,607		Weighted Average
	563,623		73.81% Pervious Area
	199,984		26.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.3	100	0.0080	0.07		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"
3.0	300	0.0110	1.69		**Shallow Concentrated Flow, SC Lawn** Unpaved Kv= 16.1 fps
27.3	400	Total			

Subcatchment Rec Area: Rec Area



Summary for Pond BASIN: Outlet Structure

Inflow Area = 17.530 ac, 26.19% Impervious, Inflow Depth = 0.95" for 1 Year event
Inflow = 14.11 cfs @ 12.22 hrs, Volume= 1.390 af
Outflow = 0.62 cfs @ 16.24 hrs, Volume= 1.390 af, Atten= 96%, Lag= 241.6 min
Primary = 0.62 cfs @ 16.24 hrs, Volume= 1.390 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Peak Elev= 375.40' @ 16.24 hrs Surf.Area= 9,675 sf Storage= 37,307 cf

Plug-Flow detention time= 732.5 min calculated for 1.390 af (100% of inflow)
Center-of-Mass det. time= 732.3 min (1,563.7 - 831.4) 12.2 hours

Volume	Invert	Avail.Storage	Storage Description
#1	370.00'	72,971 cf	**Pond (Prismatic)**Listed below (Recalc)

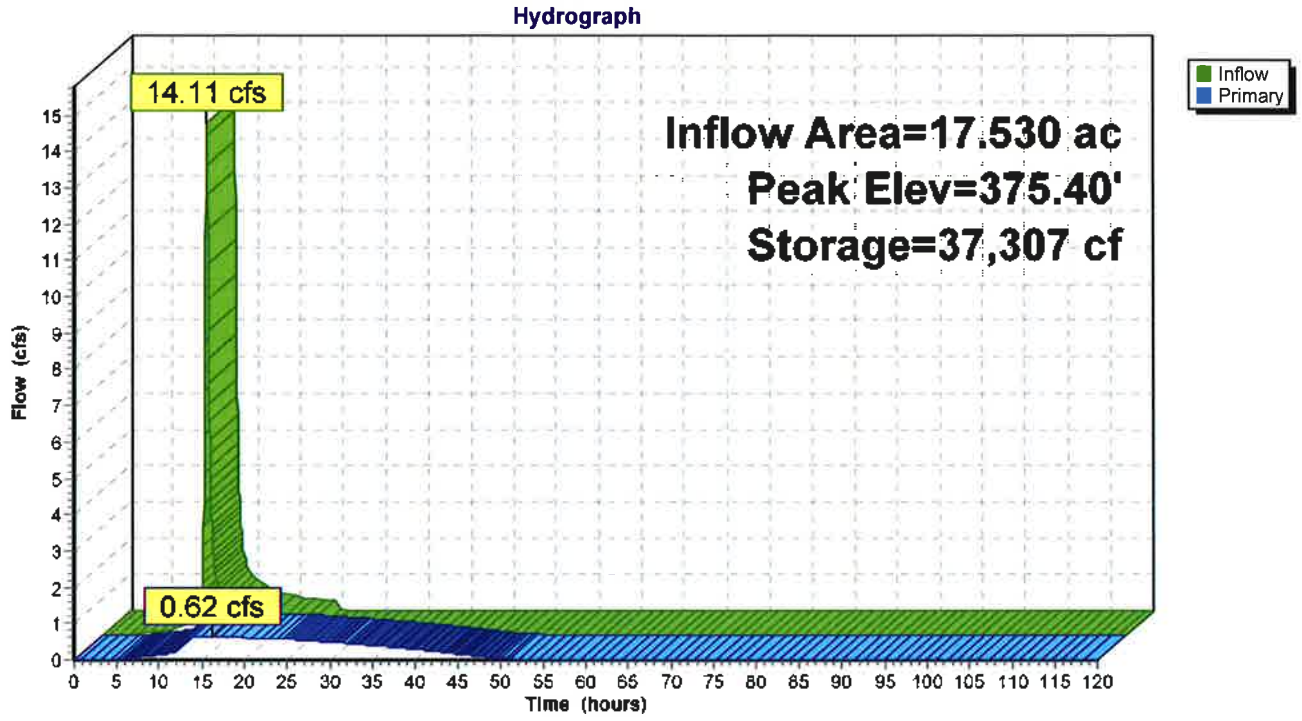
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
370.00	4,335	0	0
371.00	5,297	4,816	4,816
372.00	6,184	5,741	10,557
373.00	7,119	6,652	17,208
374.00	8,154	7,637	24,845
375.00	9,220	8,687	33,532
376.00	10,359	9,790	43,321
377.00	11,518	10,939	54,260
378.00	12,754	12,136	66,396
378.50	13,549	6,576	72,971

3.2" Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	370.00'	**3.2" Vert. Orifice/Grate** C= 0.600
#2	Primary	375.50'	**48.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	377.50'	**5.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.62 cfs @ 16.24 hrs HW=375.40' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.62 cfs @ 11.05 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

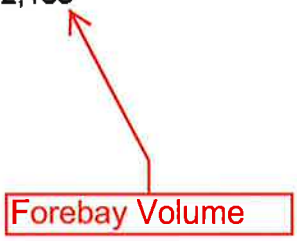
Pond BASIN: Outlet Structure



Summary for Pond FOREBAY: FOREBAY

Volume	Invert	Avail.Storage	Storage Description
#1	366.00'	2,183 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

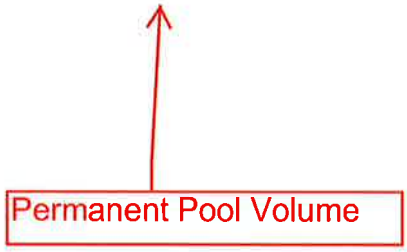
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.00	238	0	0
367.00	364	301	301
368.00	516	440	741
369.00	693	605	1,346
370.00	981	837	2,183



Summary for Pond Perm Pool: PERMANENT POOL

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	17,597 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	1,051	0	0
364.00	1,290	1,171	1,171
365.00	1,551	1,421	2,591
366.00	2,072	1,812	4,403
367.00	3,503	2,788	7,190
368.00	2,981	3,242	10,432
369.00	3,507	3,244	13,676
370.00	4,335	3,921	17,597



HERITAGE MEADOWS: PERMIT 1-1258


Source: USGS
Source: NASA, NGA, USGS
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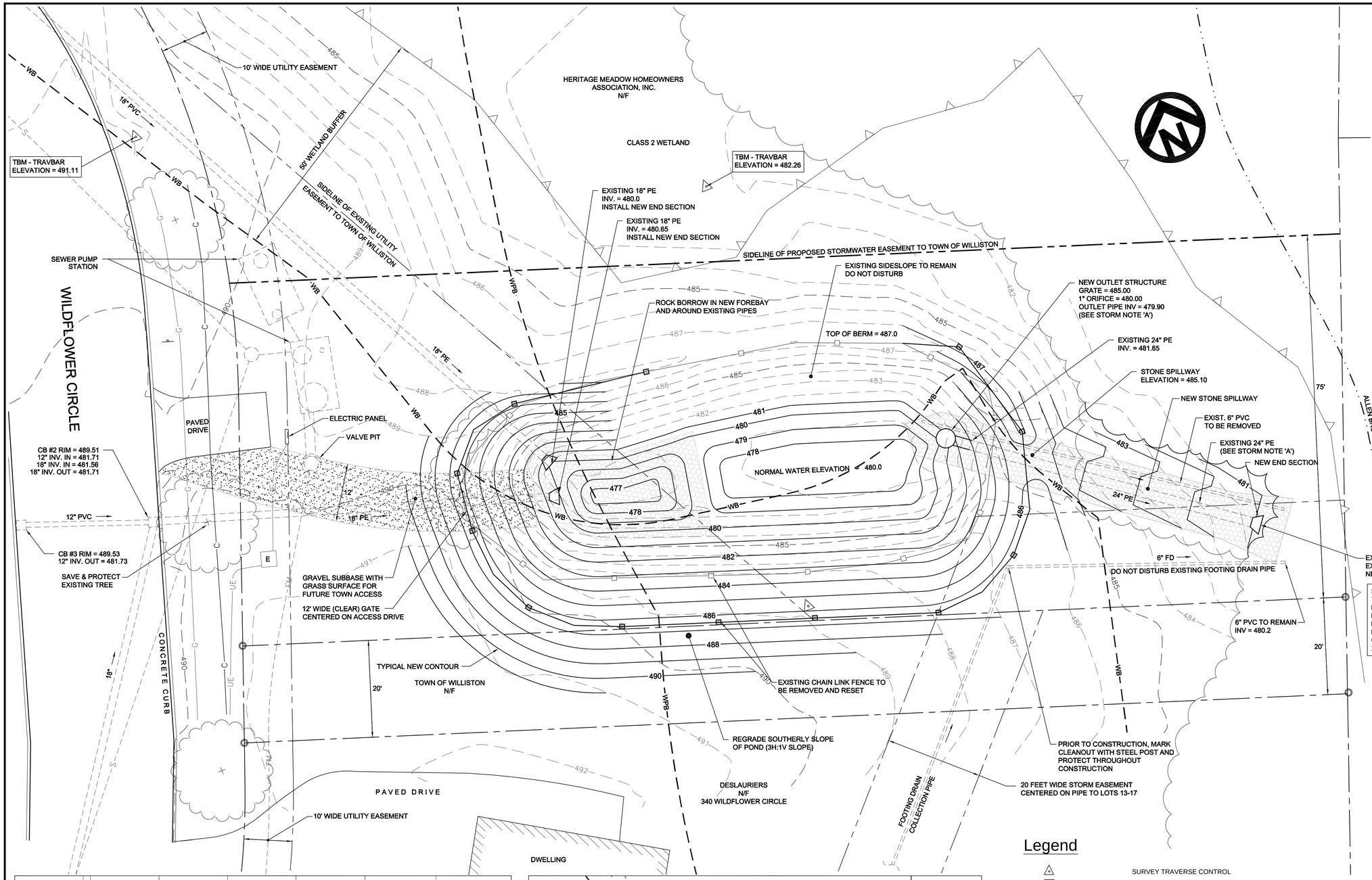
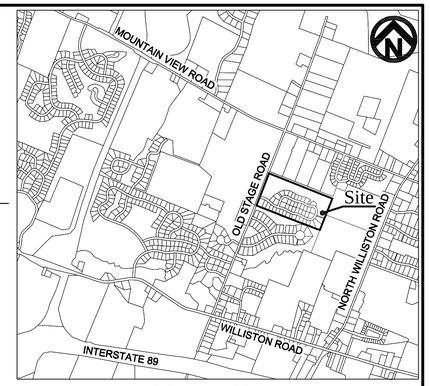
esri®





Vicinity Map

NOT TO SCALE

NOTES:

1. THE PURPOSE OF THIS PLAN IS TO PRESENT THE PROPOSED IMPROVEMENTS TO THE EXISTING STORM POND. SEE OTHER PLANS FOR ADDITIONAL DESIGN INFORMATION AND CONSTRUCTION DETAILS.
2. BOUNDARY INFORMATION SHOWN IS BASED UPON FIELD EVIDENCE AND THE 'HERITAGE MEADOWS PROPERTY PLAT' BY LAMOUREUX, STONE & O'LEARY LAST REVISED ON 05-31-1996 AND RECORDED IN SLIDE ____ OF THE WILLISTON LAND RECORDS.
3. EXISTING CONDITIONS SHOWN HEREON ARE BASED UPON A TOPOGRAPHIC SURVEY PERFORMED BY L&D IN SEPTEMBER 2014. EXISTING UTILITIES ARE BASED UPON THE TOPOGRAPHIC SURVEY AND DIGSAFE MARKINGS FROM OCTOBER 2015.
4. THE WETLAND DELINEATION WAS PERFORMED BY L&D IN SEPTEMBER 2014.
5. THE EXISTING 4' HIGH BLACK VINYL COATED CHAIN LINK FENCE SHALL BE REMOVED AND SALVAGED WHERE IT CONFLICTS WITH THE PROPOSED WORK. THE SALVAGED FENCE, PLUS AN ADDITIONAL QUANTITY OF NEW FENCE AND 12' WIDE GATE, SHALL BE INSTALLED IN THE NEW LOCATION SHOWN ON THE PLAN.

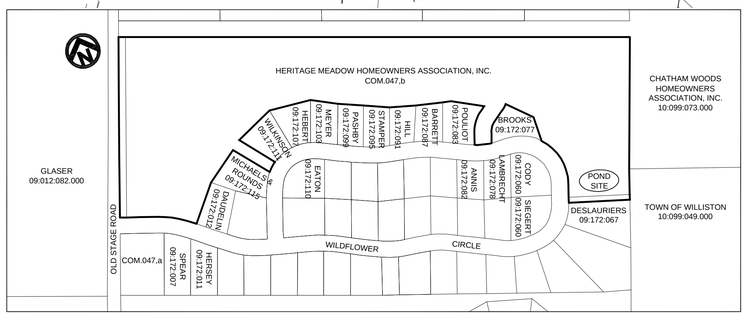
STORM NOTE 'A':
THE EXISTING 24" PE AND END SECTION SHALL BE REMOVED. IF REMOVED WITHOUT BEING DAMAGED, THE CONTRACTOR MAY RE-USE THE EXISTING 24" PE PIPE AND END SECTION AT THE NEW ELEVATIONS SHOWN. ALTERNATELY, THE CONTRACTOR MAY CHOOSE TO INSTALL A NEW 18" HDPE(SL) PIPE AND END SECTION.

SHEET INDEX

GRAPHIC SCALE

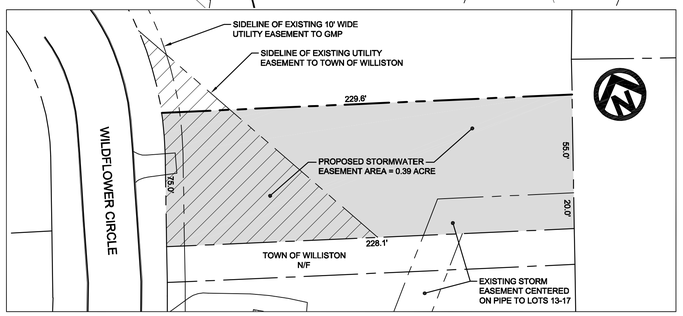
10 0 5 10 20 40

(in feet)
1 inch = 10 ft.



PROJECT AND ABUTTING PARCELS

NOT TO SCALE



EXISTING & PROPOSED EASEMENT AREAS

SCALE: 1"=40'

Legend

	SURVEY TRAVERSE CONTROL
	EXISTING CATCH BASIN
	PROPERTY CORNER PIPE
	EXISTING CHAIN LINK FENCE
	PROPOSED CHAIN LINK FENCE
WB	WETLAND BUFFER
WPB	WATERSHED PROTECTION BUFFER
	WETLAND BOUNDARY
490	FINISH GRADE CONTOUR
490	EXISTING GROUND CONTOUR
	EXISTING STORMWATER PIPE
	PROPERTY BOUNDARY
	SIDELINE OF EXISTING EASEMENT
	SIDELINE OF PROPOSED EASEMENT
G	EXISTING GAS LINE
C	EXISTING UNDERGROUND COMMUNICATION LINES
S	EXISTING SEWER LINE
FM	EXISTING FORCEMAIN
UE	EXISTING UNDERGROUND ELECTRIC

Date	Revision	By

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ☐ Preliminary
- ■ Final Local Review
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

TAX PARCEL # COM.047.b DP ---

Heritage Meadow Neighborhood Stormwater Improvement Project

Wildflower Circle Williston VT

SITE PLAN

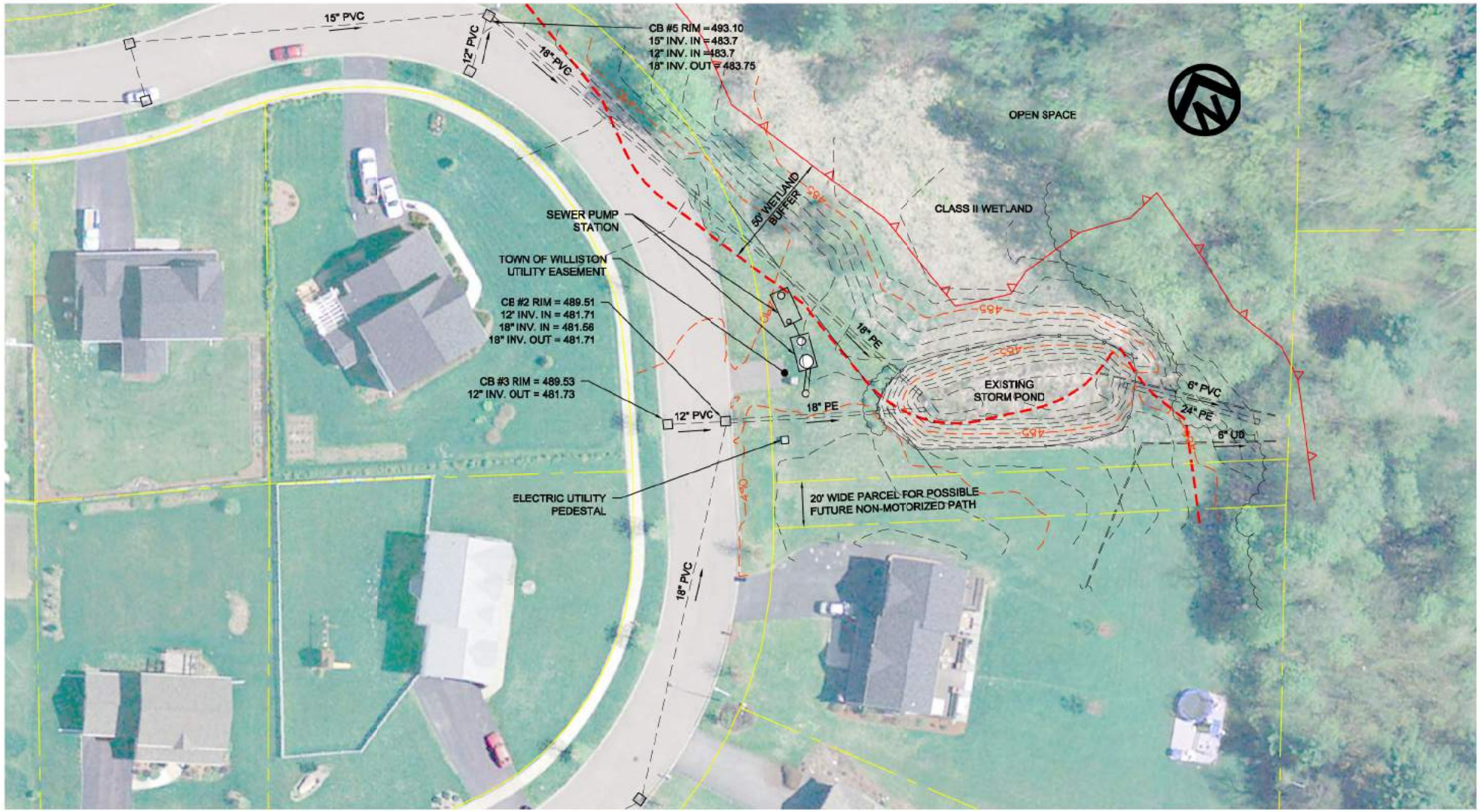
Project No.	9504a
Survey	L&D
Design	AR
Drawn	L&D
Checked	DG
Date	10-21-15
Scale	1" = 10'
Sheet number	1

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com

P:\DP\9504a\dwg\9504A-01.dwg, 6/21/2016 10:17:19 AM, PDF Complete,

Attachment 5

Existing pond overall plan &
Existing storm pond modifications



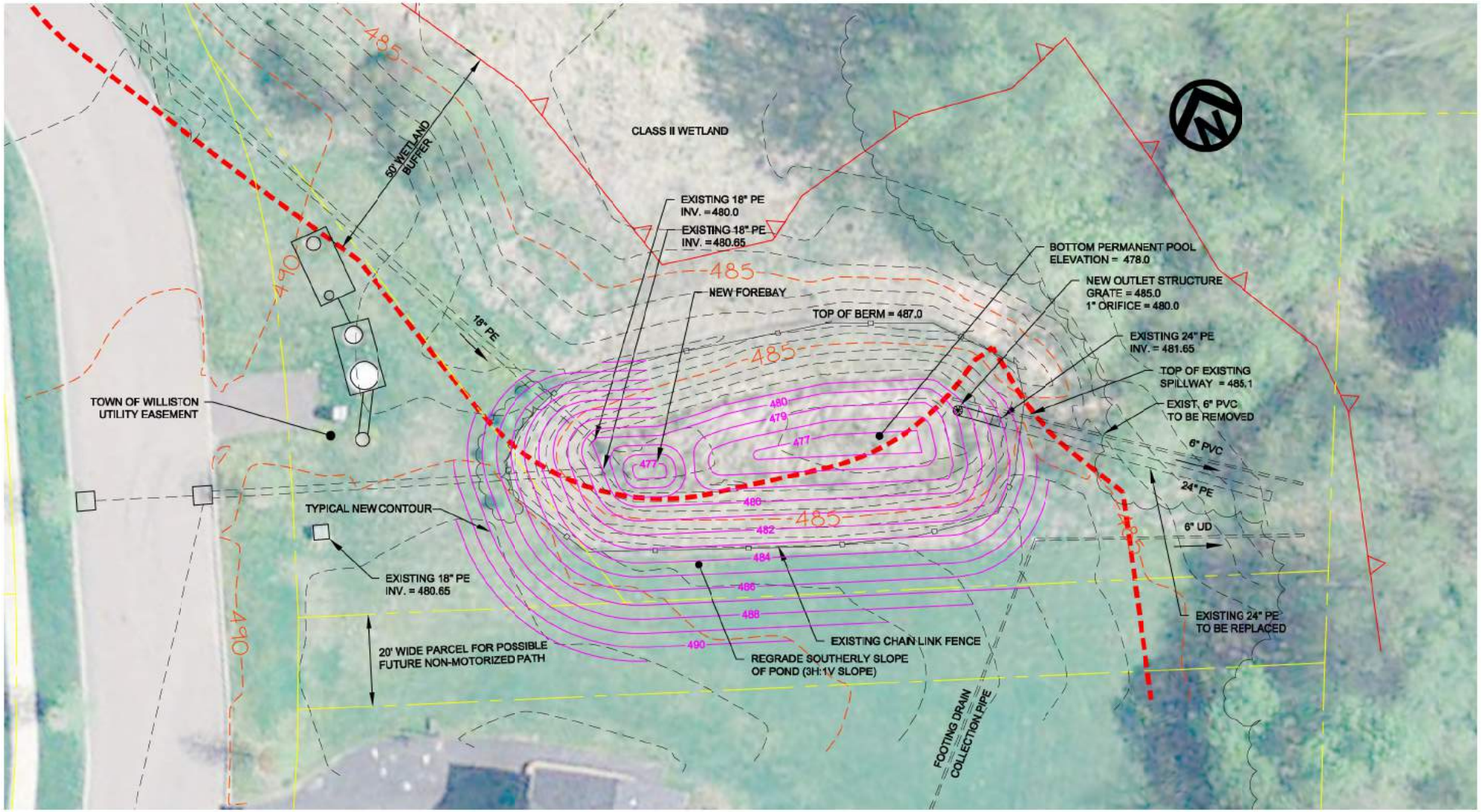
GRAPHIC SCALE

0 20 40 80 160

(in feet)
1 inch = 40 ft

HERITAGE MEADOW
EXISTING POND
OVERALL PLAN

OCTOBER 2014



GRAPHIC SCALE

20 0 10 20 40 80

(in feet)

1 inch = 20 ft

SUMMARY OF POND MODIFICATION MEASURES

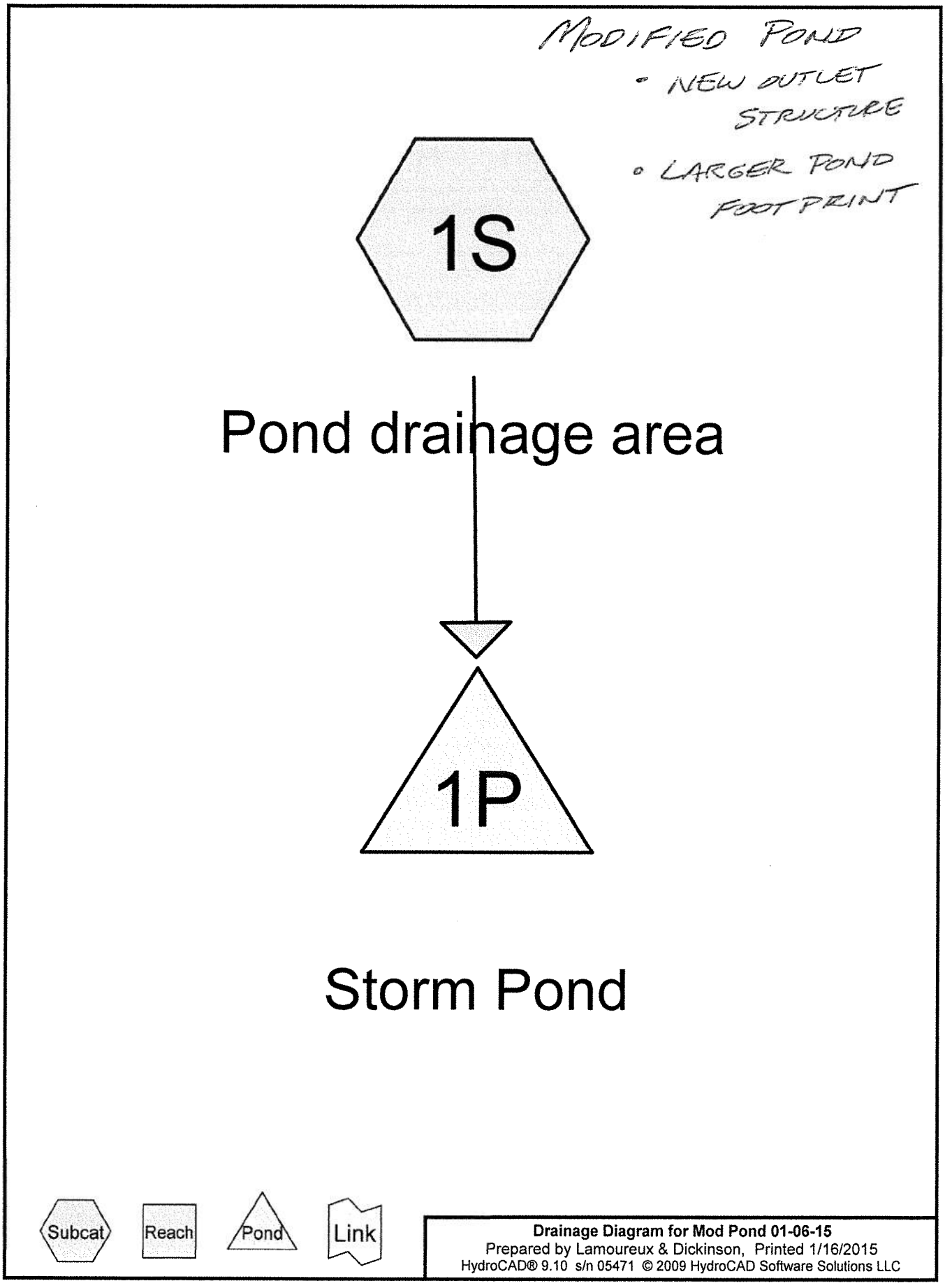
- REMOVE SEDIMENT IN BOTTOM OF POND
- CONSTRUCT FOREBAY AT INLET PIPES
- ENLARGE POND / REGRADE SOUTH SLOPE OF POND
- REMOVE EXISTING OUTLET PIPES, REPLACE WITH NEW 24" OUTLET PIPE
- INSTALL NEW OUTLET STRUCTURE

HERITAGE MEADOW
EXISTING STORM POND MODIFICATIONS

JANUARY 2015

Attachment 6
Hydrologic Calculations

MODIFIED POND
- NEW OUTLET STRUCTURE
- LARGER POND FOOTPRINT



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.560	61	>75% Grass cover, Good, HSG B (1S)
2.150	74	>75% Grass cover, Good, HSG C (1S)
9.070	80	>75% Grass cover, Good, HSG D (1S)
1.330	98	Drives (1S)
2.380	98	Roadway (1S)
1.160	98	Roofs (1S)
0.350	98	Sidewalk (1S)

Summary for Subcatchment 1S: Pond drainage area

Runoff = 19.14 cfs @ 12.05 hrs, Volume= 1.155 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
	0.560	61	>75% Grass cover, Good, HSG B
	2.150	74	>75% Grass cover, Good, HSG C
	9.070	80	>75% Grass cover, Good, HSG D
*	2.380	98	Roadway
*	0.350	98	Sidewalk
*	1.330	98	Drives
*	1.160	98	Roofs
	17.000	84	Weighted Average
	11.780		69.29% Pervious Area
	5.220		30.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
4.2	250	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.8	350	Total			

Summary for Pond 1P: Storm Pond

Inflow Area = 17.000 ac, 30.71% Impervious, Inflow Depth = 0.82" for 1 year event
Inflow = 19.14 cfs @ 12.05 hrs, Volume= 1.155 af TOTAL INFLOW VOL = 50,312 CF
Outflow = 9.56 cfs @ 12.19 hrs, Volume= 1.155 af, Atten= 50%, Lag= 8.5 min
Primary = 3.95 cfs @ 12.19 hrs, Volume= 1.035 af
Secondary = 5.61 cfs @ 12.19 hrs, Volume= 0.120 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 485.60' @ 12.19 hrs Surf.Area= 4,872 sf Storage= 17,182 cf ← STORAGE VOLUME
POND OVERFLOWING THRU SPILLWAY
Plug-Flow detention time= 503.4 min calculated for 1.155 af (100% of inflow)
Center-of-Mass det. time= 503.5 min (1,357.2 - 853.7)
→ 8.4 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	480.00'	24,704 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)
480.00	1,502	185.0	0	0	1,502
481.00	1,995	201.0	1,743	1,743	2,030
482.00	2,538	218.0	2,261	4,004	2,634
483.00	3,128	235.0	2,828	6,832	3,288
484.00	3,763	253.0	3,441	10,272	4,028
485.00	4,442	270.0	4,098	14,370	4,782
486.00	5,165	287.0	4,799	19,169	5,586
487.00	5,914	323.0	5,535	24,704	7,360

Device	Routing	Invert	Outlet Devices
#1	Secondary	485.10'	**6.0' long x 6.0' breadth Spillway** 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Primary	480.00'	**1.0" Vert. Orifice1** X 4 rows with 12.0" cc spacing C= 0.600 — MIN ORIFICE SIZE.
#3	Primary	485.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.95 cfs @ 12.19 hrs HW=485.60' (Free Discharge)
└─**2=Orifice1** (Orifice Controls 0.21 cfs @ 9.61 fps)
└─**3=Grate** (Orifice Controls 3.74 cfs @ 3.74 fps)

Secondary OutFlow Max=5.59 cfs @ 12.19 hrs HW=485.60' (Free Discharge)
└─**1=Spillway** (Weir Controls 5.59 cfs @ 1.85 fps)

Summary for Subcatchment 1S: Pond drainage area

Runoff = 1.72 cfs @ 12.08 hrs, Volume= 0.157 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
	0.560	61	>75% Grass cover, Good, HSG B
	2.150	74	>75% Grass cover, Good, HSG C
	9.070	80	>75% Grass cover, Good, HSG D
*	2.380	98	Roadway
*	0.350	98	Sidewalk
*	1.330	98	Drives
*	1.160	98	Roofs
	17.000	84	Weighted Average
	11.780		69.29% Pervious Area
	5.220		30.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
4.2	250	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.8	350	Total			

Summary for Pond 1P: Storm Pond

Inflow Area = 17.000 ac, 30.71% Impervious, Inflow Depth = 0.11" for WQv event
Inflow = 1.72 cfs @ 12.08 hrs, Volume= 0.157 af
Outflow = 0.07 cfs @ 21.98 hrs, Volume= 0.157 af, Atten= 96%, Lag= 593.7 min
Primary = 0.07 cfs @ 21.98 hrs, Volume= 0.157 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 482.08' @ 21.98 hrs Surf.Area= 2,584 sf Storage= 4,212 cf — STORAGE VOLUME
└ 2.08' PONDING DEPTH
Plug-Flow detention time= 942.4 min calculated for 0.157 af (100% of inflow)
Center-of-Mass det. time= 942.3 min (1,870.2 - 927.9)
↳ 15.7 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	480.00'	24,704 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)
480.00	1,502	185.0	0	0	1,502
481.00	1,995	201.0	1,743	1,743	2,030
482.00	2,538	218.0	2,261	4,004	2,634
483.00	3,128	235.0	2,828	6,832	3,288
484.00	3,763	253.0	3,441	10,272	4,028
485.00	4,442	270.0	4,098	14,370	4,782
486.00	5,165	287.0	4,799	19,169	5,586
487.00	5,914	323.0	5,535	24,704	7,360

Device	Routing	Invert	Outlet Devices
#1	Secondary	485.10'	**6.0' long x 6.0' breadth Spillway** 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Primary	480.00'	**1.0" Vert. Orifice1** X 4 rows with 12.0" cc spacing C= 0.600
#3	Primary	485.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 21.98 hrs HW=482.08' (Free Discharge)
└─**2=Orifice1** (Orifice Controls 0.07 cfs @ 4.26 fps)
└─**3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=480.00' (Free Discharge)
└─**1=Spillway** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Pond drainage area

Runoff = 39.94 cfs @ 12.05 hrs, Volume= 2.383 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
	0.560	61	>75% Grass cover, Good, HSG B
	2.150	74	>75% Grass cover, Good, HSG C
	9.070	80	>75% Grass cover, Good, HSG D
*	2.380	98	Roadway
*	0.350	98	Sidewalk
*	1.330	98	Drives
*	1.160	98	Roofs
	17.000	84	Weighted Average
	11.780		69.29% Pervious Area
	5.220		30.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.40"
4.2	250	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.8	350	Total			

Summary for Pond 1P: Storm Pond

Inflow Area = 17.000 ac, 30.71% Impervious, Inflow Depth = 1.68" for 10 year event
Inflow = 39.94 cfs @ 12.05 hrs, Volume= 2.383 af
Outflow = 36.04 cfs @ 12.10 hrs, Volume= 2.383 af, Atten= 10%, Lag= 2.9 min
Primary = 6.36 cfs @ 12.10 hrs, Volume= 1.583 af
Secondary = 29.69 cfs @ 12.10 hrs, Volume= 0.800 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 486.62' @ 12.10 hrs Surf.Area= 5,620 sf Storage= 22,490 cf

Plug-Flow detention time= 251.2 min calculated for 2.383 af (100% of inflow)
Center-of-Mass det. time= 251.0 min (1,083.8 - 832.7)

Volume	Invert	Avail.Storage	Storage Description
#1	480.00'	24,704 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)
480.00	1,502	185.0	0	0	1,502
481.00	1,995	201.0	1,743	1,743	2,030
482.00	2,538	218.0	2,261	4,004	2,634
483.00	3,128	235.0	2,828	6,832	3,288
484.00	3,763	253.0	3,441	10,272	4,028
485.00	4,442	270.0	4,098	14,370	4,782
486.00	5,165	287.0	4,799	19,169	5,586
487.00	5,914	323.0	5,535	24,704	7,360

Device	Routing	Invert	Outlet Devices
#1	Secondary	485.10'	**6.0' long x 6.0' breadth Spillway** 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Primary	480.00'	**1.0" Vert. Orifice1** X 4 rows with 12.0" cc spacing C= 0.600
#3	Primary	485.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.35 cfs @ 12.10 hrs HW=486.61' (Free Discharge)
├─**2=Orifice1** (Orifice Controls 0.24 cfs @ 10.78 fps)
└─**3=Grate** (Orifice Controls 6.12 cfs @ 6.12 fps)

Secondary OutFlow Max=29.65 cfs @ 12.10 hrs HW=486.61' (Free Discharge)
└─**1=Spillway** (Weir Controls 29.65 cfs @ 3.26 fps)

Heritage Meadow

Stormwater Pond Modeling Results - modified stormwater pond
(Pond capacity enlarged by expanding south into 20' wide bike path parcel)
January 2015

Orifice size	Water Quality Volume			Channel Protection Volume		
	Peak Q (cfs)	Peak elev. (feet)	Detention (hrs)	Peak Q (cfs)	Peak elev. (feet)	Detention (hrs)
1"	0.07	482.08	15.7	9.57	485.60	8.4
1.5"	0.12	481.59	6.8	9.40	485.58	5.3
2"	0.17	481.32	4.1	9.19	485.56	3.5
3"	0.24	481.06	1.8	8.66	485.48	1.7
4"	0.35	480.86	1.1	8.05	485.36	1.1
6"	0.60	480.65	0.7	6.65	484.95	0.5

Notes:
- Detention is the center of mass detention time

Outlet Summary
Orifice invert 480.00
Grate 485.00
Spillway 485.10

P:\1995\9504A\STORM WATER\Modified pond CPv results.wpd

BRENNAN WOODS: PERMIT 1-1272 S/N 2


Source: USGS
Source: NASA, NGA, USGS
© 2008 Microsoft Corp.
115m
esri®

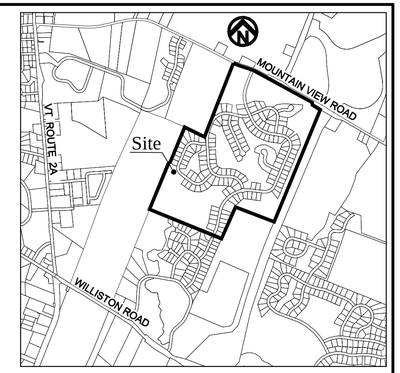
NOTES:
1. THE PURPOSE OF THIS PLAN IS TO PRESENT THE PROPOSED IMPROVEMENTS TO THE EXISTING STORM POND. SEE OTHER PLANS FOR ADDITIONAL DESIGN INFORMATION AND CONSTRUCTION DETAILS.

2. BOUNDARY INFORMATION SHOWN IS BASED UPON FIELD EVIDENCE AND THE 'BRENNAN WOODS, REVISED PROPERTY PLAT SOUTH', BY LAMOUREUX & DICKINSON LAST REVISED ON 01/22/2004 AND RECORDED IN SLIDE 668A OF THE WILLISTON LAND RECORDS.

3. EXISTING CONDITIONS SHOWN HEREON ARE BASED UPON A TOPOGRAPHIC SURVEY PERFORMED BY L&D IN SEPTEMBER 2014.

4. THE WETLAND DELINEATION WAS PERFORMED BY L&D IN SEPTEMBER 2014.

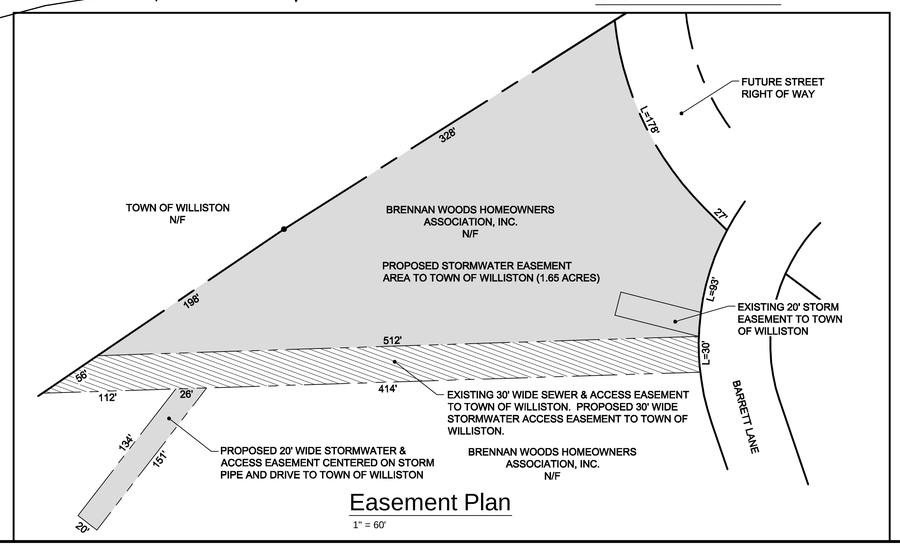
THE CONTRACTOR SHALL NOTIFY DIG SAFE® AT 811 PRIOR TO ANY EXCAVATION.



Vicinity Map
NOT TO SCALE

150' WATERSHED PROTECTION BUFFER
WPB
IRON PIPE
APPROXIMATE CLEARING LIMITS
WB
50' BUFFER
WETLAND BUFFER
PROPOSED BERM FOR PLACEMENT OF MATERIAL FROM POND EXPANSION
POSSIBLE FUTURE STREET RIGHT OF WAY
10' WIDE BENCH WITH 10% MAX. SLOPE
NEW 3H:1V SIDESLOPE
NEW BOTTOM OF SLOPE
EXISTING BOTTOM OF SLOPE
NEW BOTTOM POND ELEV = 369.0
NEW NORMAL WATER ELEV = 369.5
SEE POND CROSS SECTION ON SHEET 3
NEW FOREBAY LINED WITH ROCK BORROW
NEW OUTLET POOL LINED WITH ROCK BORROW
EXIST. DROP INLET
TOP / GRATE = 373.90
THROAT IN = 372.3
18" PVC IN = 368.10
36" CMP OUT = 367.55
EXIST. OUTLET STRUCTURE
TOP / GRATE = 375.87
EXIST. 24" W X 12" H WEIR INV = 374.14
EXIST. 1" Ø HOLES TO BE PLUGGED
NEW 5.5" Ø ORIFICE = 369.50
EXIST. 18" PVC OUT = 369.24
ROCK BORROW SPILLWAY INV = 374.10
REMOVE TREES AND SHRUBS ON EXISTING SLOPES TO REMAIN
EXIST. 36" CMP INV = 371.08
CONCRETE SIDEWALK
36" CMP
EXIST. CB
RIM = 378.45
36" OUT = 371.6
TBM - TRAVBAR
ELEVATION = 379.2
TOWN OF WILLISTON LAND
BRENNAN WOODS OPEN SPACE
EXIST. WATER SERVICE
EXISTING GRAVEL DRIVE
8" SEWER MAIN
GRAVEL DRIVE TO SEWER PUMP STATION
WETLAND BUFFER
TYPICAL EXIST. SEWER MANHOLE
EXIST. WATER SERVICE TO SEWER PUMP STATION
EXISTING GRAVEL DRIVE SHALL BE RESTORED FOLLOWING COMPLETION OF CONSTRUCTION (MINIMUM 12' WIDE)
EXISTING GATE
REMOVE 15 LF EXISTING CONCRETE SIDEWALK AND CONSTRUCT 15 LF NEW 8" THICK CONCRETE SIDEWALK
BARRETT LANE
NEW 12' WIDE GRAVEL ACCESS DRIVE FOR FUTURE TOWN MAINTENANCE (SEE DETAIL ON SHEET 3) FINISH GRADE OF GRAVEL TO FOLLOW EXISTING GRADE
36" CMP
PROPOSED CLEARING LIMITS ALONG ACCESS DRIVE
EDGE WETLAND
TO ALLEN BROOK
EXISTING STONE OUTFALL

Stormwater Pond



Easement Plan
1" = 60'

Legend

○	PROPERTY CORNER FOUND
△	SURVEY CONTROL POINT
WPB	WATERSHED PROTECTION BUFFER
WB	WETLAND BUFFER
	WETLAND BOUNDARY
370	FINISH GRADE CONTOUR
370	EXISTING GROUND CONTOUR
ST	EXISTING STORMWATER PIPE & CATCH BASIN
	PROPERTY BOUNDARY
W	EXISTING WATER LINE
S	EXISTING WATER LINE
	PROPOSED NEW EDGE OF WOODS
	EXISTING EDGE OF WOODS

GRAPHIC SCALE
20 0 10 20 40 80
(in feet)
1 inch = 20 ft.

SHEET INDEX

Date	Revision	By

These plans shall only be used for the purpose shown below:
- ☐ Sketch/Concept
- ☐ Preliminary
- ■ Final Local Review
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

Brennan Woods Neighborhood Stormwater Improvement Project

Barrett Lane Williston VT

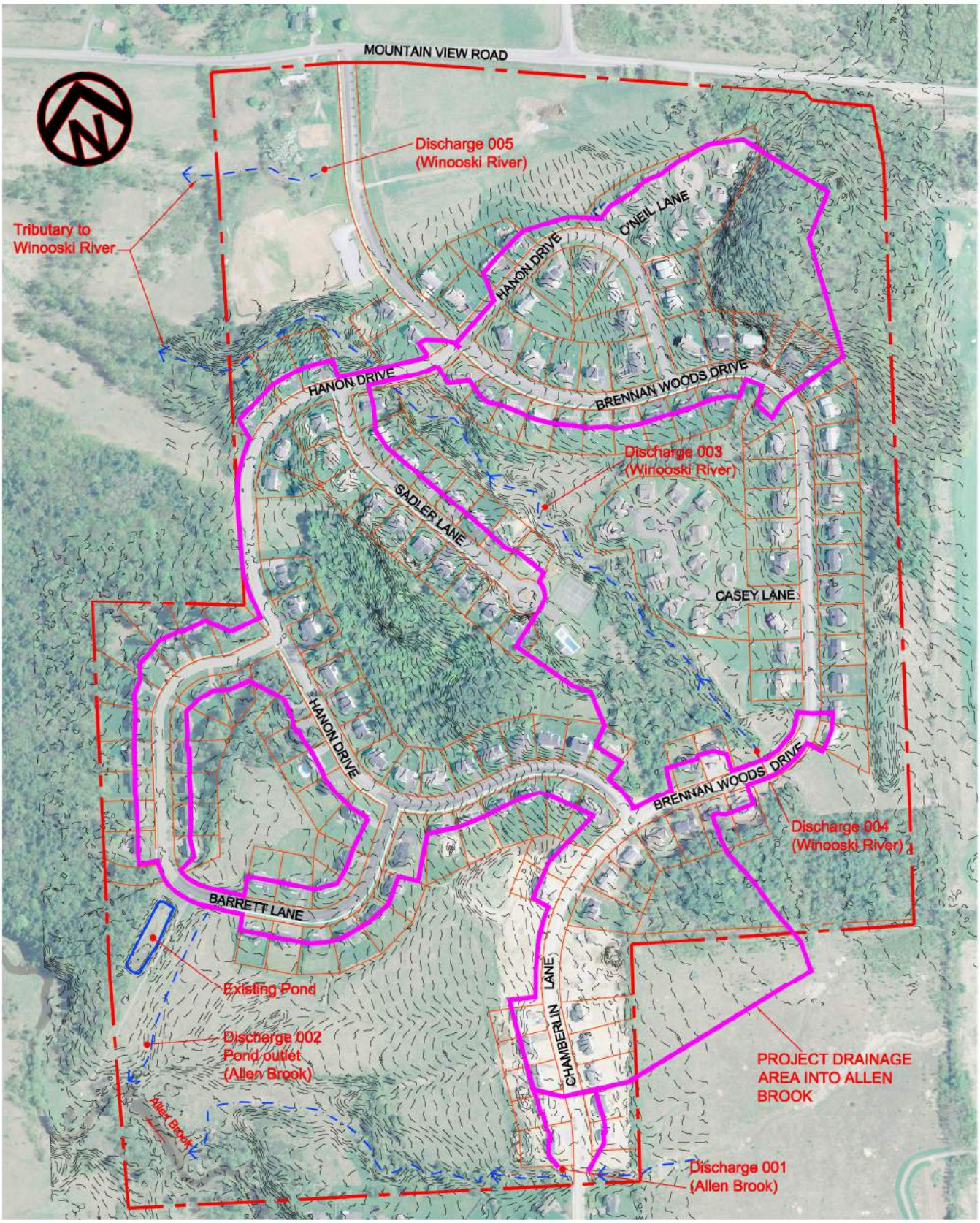
Stormwater Pond Site Plan

TAX PARCEL # COM.046 DP# -

Project No.	98061C
Survey	L&D
Design	AR
Drawn	L&D
Checked	DG
Date	01-05-16
Scale	1" = 20'
Sheet number	1

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com

Attachment 5
Existing Stormwater Discharge Location



BRENNAN WOODS NEIGHBORHOOD
WILLISTON, VT

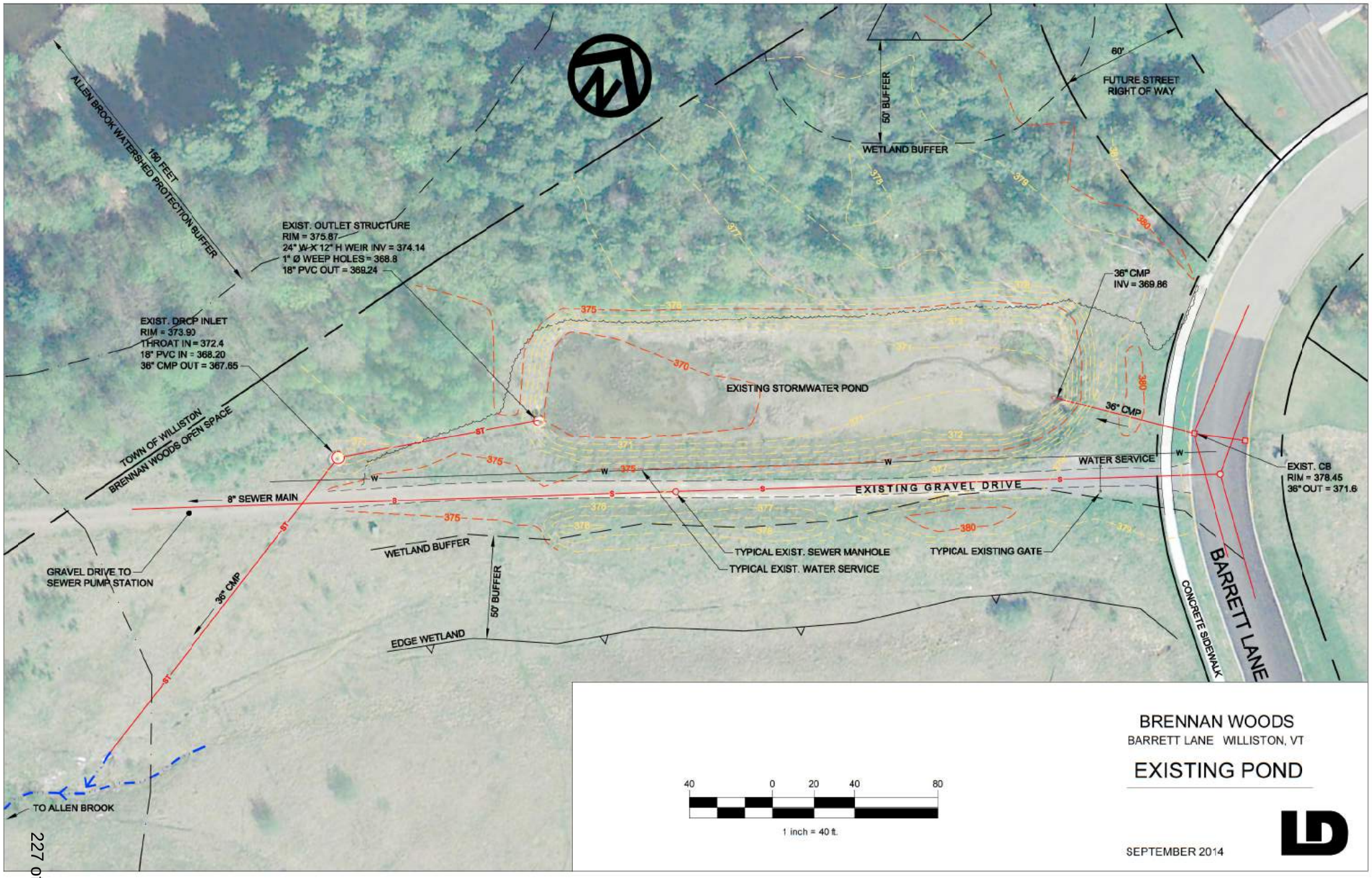
WATERSHED DISCHARGE MAP

300 0 150 300 600

1 inch = 300 ft.

SEPTEMBER 2014

Attachment 6
Existing Pond & Conceptual Design

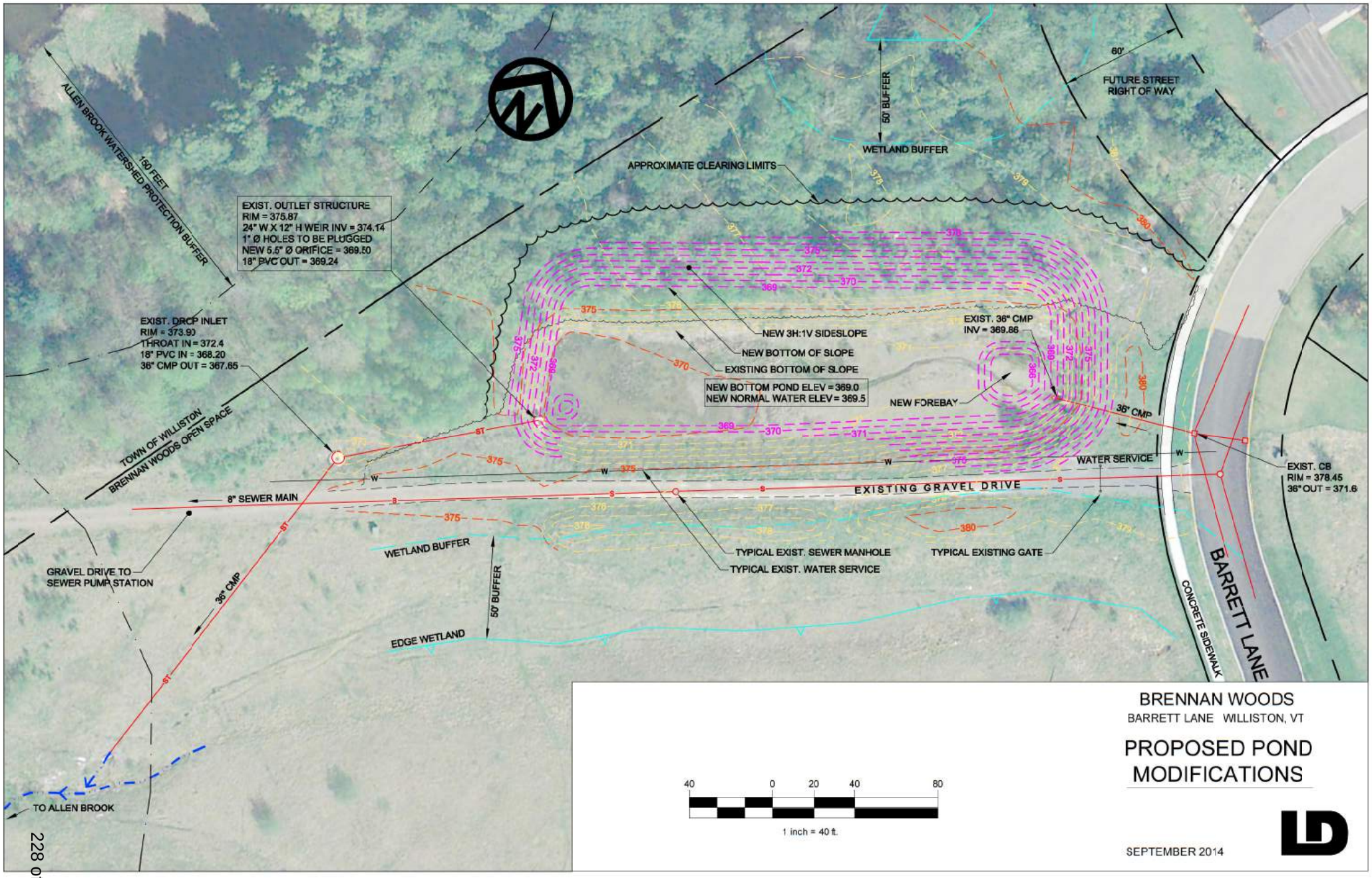


BRENNAN WOODS

BARRETT LANE WILLISTON, VT

EXISTING POND

SEPTEMBER 2014



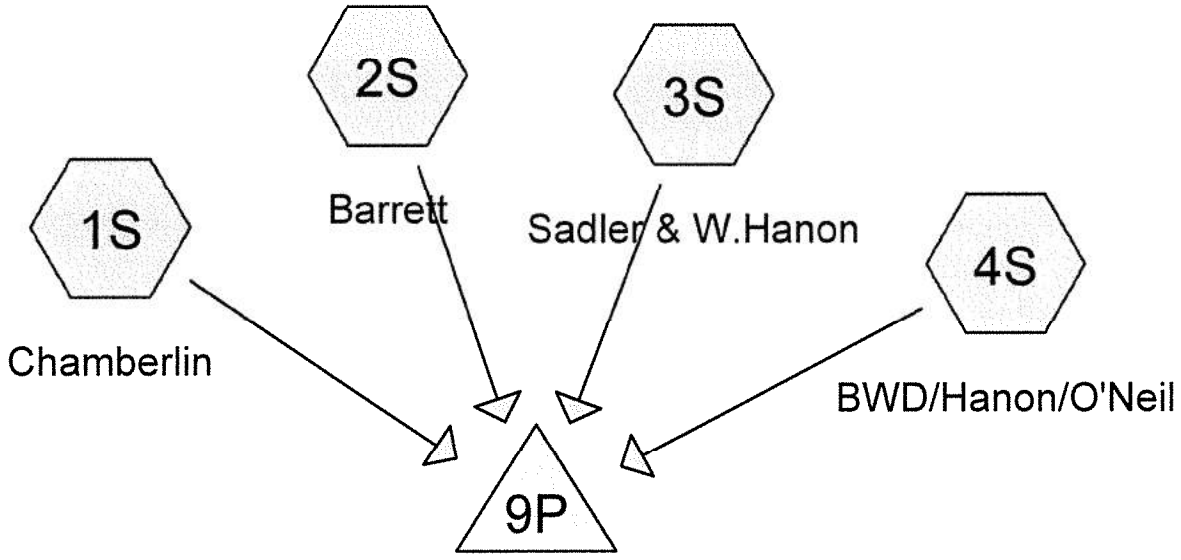
BRENNAN WOODS

BARRETT LANE WILLISTON, VT

PROPOSED POND MODIFICATIONS

SEPTEMBER 2014

Attachment 7
Hydrologic Calculations



Subcat Reach Pond Link

Drainage Diagram for Proposed pond
Prepared by Lamoureux & Dickinson, Printed 9/21/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.390	30	Woods, Good, HSG A (1S)
4.750	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S)
2.120	61	>75% Grass cover, Good, HSG B (4S)
0.440	70	Woods, Good, HSG C (4S)
3.420	74	>75% Grass cover, Good, HSG C (3S, 4S)
10.630	77	Woods, Good, HSG D (3S, 4S)
1.050	79	Woods/grass comb., Good, HSG D (1S)
29.740	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S)
1.070	98	O'Neil drives & roof (4S)
1.400	98	Roof and Drive (2S)
5.930	98	Roof and drive (1S, 3S, 4S)
1.120	98	Sidewalk (1S, 2S, 3S, 4S)
6.690	98	Street (1S, 2S, 3S, 4S)

16.21 AC IMPERVIOUS

69.75 AC TOTAL AREA

Summary for Subcatchment 1S: Chamberlin

Runoff = 4.29 cfs @ 12.35 hrs, Volume= 0.565 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.200	98	Street
*	0.190	98	Sidewalk
*	1.090	98	Roof and drive
	1.390	30	Woods, Good, HSG A
	1.050	79	Woods/grass comb., Good, HSG D
	1.110	39	>75% Grass cover, Good, HSG A
	9.710	80	>75% Grass cover, Good, HSG D
	15.740	75	Weighted Average
	13.260		84.24% Pervious Area
	2.480		15.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.3	100	0.0200	0.07		**Sheet Flow, Open space** Woods: Light underbrush n= 0.400 P2= 2.30"
8.3	635	0.0330	1.27		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
33.6	735	Total			

Summary for Subcatchment 2S: Barrett

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.78 cfs @ 12.02 hrs, Volume= 0.198 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.240	98	Street
*	0.240	98	Sidewalk
*	1.400	98	Roof and Drive
	2.920	39	>75% Grass cover, Good, HSG A
	1.930	80	>75% Grass cover, Good, HSG D
	7.730	71	Weighted Average
	4.850		62.74% Pervious Area
	2.880		37.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	70	0.0300	0.16		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 2.30"
0.8	100	0.0100	2.03		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
8.2	170	Total			

Summary for Subcatchment 3S: Sadler & W.Hanon

Runoff = 20.55 cfs @ 12.13 hrs, Volume= 1.609 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	2.740	98	Street
*	0.450	98	Sidewalk
*	3.010	98	Roof and drive
	6.670	77	Woods, Good, HSG D
	0.720	39	>75% Grass cover, Good, HSG A
	1.740	74	>75% Grass cover, Good, HSG C
	11.650	80	>75% Grass cover, Good, HSG D
	26.980	82	Weighted Average
	20.780		77.02% Pervious Area
	6.200		22.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
5.9	560	0.1000	1.58		**Shallow Concentrated Flow, Thru open space** Woodland Kv= 5.0 fps
0.5	60	0.0100	2.03		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
19.2	720	Total			

Summary for Subcatchment 4S: BWD/Hanon/O'Neil

Runoff = 16.05 cfs @ 12.06 hrs, Volume= 1.076 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.510	98	Street
*	0.240	98	Sidewalk
*	1.830	98	Roof and drive
*	1.070	98	O'Neil drives & roof
*	0.440	70	Woods, Good, HSG C
	3.960	77	Woods, Good, HSG D
	2.120	61	>75% Grass cover, Good, HSG B
	1.680	74	>75% Grass cover, Good, HSG C
	6.450	80	>75% Grass cover, Good, HSG D
	19.300	81	Weighted Average
	14.650		75.91% Pervious Area
	4.650		24.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0500	0.14		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.8	180	0.0670	3.88		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
0.3	80	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
12.8	360	Total			

Summary for Pond 9P: Mod. pond

Inflow Area = 69.750 ac, 23.24% Impervious, Inflow Depth = 0.59" for 1 year event
Inflow = 39.53 cfs @ 12.10 hrs, Volume= 3.447 af
Outflow = 1.63 cfs @ 17.70 hrs, Volume= 3.434 af, Atten= 96%, Lag= 336.0 min
Primary = 1.63 cfs @ 17.70 hrs, Volume= 3.434 af

→ NORMAL WATER ELEV = 369.50

Routing by Stor-Ind method, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 369.50' Surf.Area= 16,195 sf Storage= 7,877 cf
Peak Elev= 373.94' @ 17.70 hrs Surf.Area= 24,664 sf Storage= 98,166 cf (90,289 cf above start)

→ PONDING DEPTH = 373.94 - 369.50 = 4.44 FEET

Plug-Flow detention time= 798.7 min calculated for 3.249 af (94% of inflow)
Center-of-Mass det. time= 724.5 min (1,601.7 - 877.2)

→ 12 HOURS

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	139,425 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)	
369.00	15,317	584.0	0	0	15,317	← NORMAL WATER = 369.50
370.00	17,098	603.0	16,199	16,199	17,207	
371.00	18,936	621.0	18,009	34,209	19,064	
372.00	20,830	640.0	19,875	54,084	21,072	
373.00	22,781	659.0	21,798	75,882	23,141	
374.00	24,788	678.0	23,777	99,660	25,270	← OVERFLOW + SPILLWAY = 374.1
375.00	26,852	697.0	25,813	125,473	27,460	
375.50	28,972	716.0	13,953	139,425	29,625	

Device	Routing	Invert	Outlet Devices
#1	Primary	369.50'	**5.5" Vert. Orifice** C= 0.600 – NEW
#2	Primary	374.10'	**24.0" W x 12.0" H Vert. Orifice 12"x24"** C= 0.600 NO CHANGE
#3	Primary	374.10'	**33.0 deg x 6.0' long x 1.50' rise Sharp-Crested Vee/Trap Weir** C= 2.60 SPILLWAY

Primary OutFlow Max=1.63 cfs @ 17.70 hrs HW=373.94' (Free Discharge)
└**1=Orifice** (Orifice Controls 1.63 cfs @ 9.88 fps)
└**2=Orifice 12"x24"** (Controls 0.00 cfs)
└**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

OUTLET STRUCTURE

24" W x 12" H OPENING = 374.10 (NO CHANGE)

5.5" ϕ ORIFICE INV = 369.50 (NEW)

(9) 1" DIAMETER WEEP HOLES → PLUG

Summary for Subcatchment 1S: Chamberlin

Runoff = 12.92 cfs @ 12.32 hrs, Volume= 1.435 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.200	98	Street
*	0.190	98	Sidewalk
*	1.090	98	Roof and drive
	1.390	30	Woods, Good, HSG A
	1.050	79	Woods/grass comb., Good, HSG D
	1.110	39	>75% Grass cover, Good, HSG A
	9.710	80	>75% Grass cover, Good, HSG D
	15.740	75	Weighted Average
	13.260		84.24% Pervious Area
	2.480		15.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.3	100	0.0200	0.07		**Sheet Flow, Open space** Woods: Light underbrush n= 0.400 P2= 2.30"
8.3	635	0.0330	1.27		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
33.6	735	Total			

Summary for Subcatchment 2S: Barrett

[49] Hint: Tc<2dt may require smaller dt

Runoff = 10.07 cfs @ 12.00 hrs, Volume= 0.566 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.240	98	Street
*	0.240	98	Sidewalk
*	1.400	98	Roof and Drive
	2.920	39	>75% Grass cover, Good, HSG A
	1.930	80	>75% Grass cover, Good, HSG D
	7.730	71	Weighted Average
	4.850		62.74% Pervious Area
	2.880		37.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	70	0.0300	0.16		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 2.30"
0.8	100	0.0100	2.03		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
8.2	170	Total			

Summary for Subcatchment 3S: Sadler & W.Hanon

Runoff = 46.04 cfs @ 12.12 hrs, Volume= 3.458 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	2.740	98	Street
*	0.450	98	Sidewalk
*	3.010	98	Roof and drive
	6.670	77	Woods, Good, HSG D
	0.720	39	>75% Grass cover, Good, HSG A
	1.740	74	>75% Grass cover, Good, HSG C
	11.650	80	>75% Grass cover, Good, HSG D
	26.980	82	Weighted Average
	20.780		77.02% Pervious Area
	6.200		22.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
5.9	560	0.1000	1.58		**Shallow Concentrated Flow, Thru open space** Woodland Kv= 5.0 fps
0.5	60	0.0100	2.03		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
19.2	720	Total			

Summary for Subcatchment 4S: BWD/Hanon/O'Neil

Runoff = 36.43 cfs @ 12.05 hrs, Volume= 2.363 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.510	98	Street
*	0.240	98	Sidewalk
*	1.830	98	Roof and drive
*	1.070	98	O'Neil drives & roof
*	0.440	70	Woods, Good, HSG C
	3.960	77	Woods, Good, HSG D
	2.120	61	>75% Grass cover, Good, HSG B
	1.680	74	>75% Grass cover, Good, HSG C
	6.450	80	>75% Grass cover, Good, HSG D
	19.300	81	Weighted Average
	14.650		75.91% Pervious Area
	4.650		24.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0500	0.14		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.8	180	0.0670	3.88		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
0.3	80	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
12.8	360	Total			

Summary for Pond 9P: Mod. pond

Inflow Area = 69.750 ac, 23.24% Impervious, Inflow Depth = 1.35" for 10 year event
Inflow = 94.00 cfs @ 12.09 hrs, Volume= 7.821 af
Outflow = 37.69 cfs @ 12.43 hrs, Volume= 7.815 af, Atten= 60%, Lag= 20.3 min
Primary = 37.69 cfs @ 12.43 hrs, Volume= 7.815 af

Routing by Stor-Ind method, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 369.50' Surf.Area= 16,195 sf Storage= 7,877 cf
Peak Elev= 375.33' @ 12.43 hrs Surf.Area= 28,228 sf Storage= 134,472 cf (126,595 cf above start)

Plug-Flow detention time= 417.9 min calculated for 7.624 af (97% of inflow)
Center-of-Mass det. time= 394.3 min (1,247.2 - 852.9)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	139,425 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)
369.00	15,317	584.0	0	0	15,317
370.00	17,098	603.0	16,199	16,199	17,207
371.00	18,936	621.0	18,009	34,209	19,064
372.00	20,830	640.0	19,875	54,084	21,072
373.00	22,781	659.0	21,798	75,882	23,141
374.00	24,788	678.0	23,777	99,660	25,270
375.00	26,852	697.0	25,813	125,473	27,460
375.50	28,972	716.0	13,953	139,425	29,625

Device	Routing	Invert	Outlet Devices
#1	Primary	369.50'	**5.5" Vert. Orifice** C= 0.600
#2	Primary	374.10'	**24.0" W x 12.0" H Vert. Orifice 12"x24"** C= 0.600
#3	Primary	374.10'	**33.0 deg x 6.0' long x 1.50' rise Sharp-Crested Vee/Trap Weir** C= 2.60

Primary OutFlow Max=36.99 cfs @ 12.43 hrs HW=375.31' (Free Discharge)
- **1=Orifice** (Orifice Controls 1.88 cfs @ 11.37 fps)
- **2=Orifice 12"x24"** (Orifice Controls 7.93 cfs @ 3.96 fps)
- **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 27.19 cfs @ 3.53 fps)

Summary for Subcatchment 1S: Chamberlin

Runoff = 0.02 cfs @ 15.64 hrs, Volume= 0.020 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	1.200	98	Street
*	0.190	98	Sidewalk
*	1.090	98	Roof and drive
	1.390	30	Woods, Good, HSG A
	1.050	79	Woods/grass comb., Good, HSG D
	1.110	39	>75% Grass cover, Good, HSG A
	9.710	80	>75% Grass cover, Good, HSG D
	15.740	75	Weighted Average
	13.260		84.24% Pervious Area
	2.480		15.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.3	100	0.0200	0.07		**Sheet Flow, Open space** Woods: Light underbrush n= 0.400 P2= 2.30"
8.3	635	0.0330	1.27		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
33.6	735	Total			

Summary for Subcatchment 2S: Barrett

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	1.240	98	Street
*	0.240	98	Sidewalk
*	1.400	98	Roof and Drive
	2.920	39	>75% Grass cover, Good, HSG A
	1.930	80	>75% Grass cover, Good, HSG D
	7.730	71	Weighted Average
	4.850		62.74% Pervious Area
	2.880		37.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	70	0.0300	0.16		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 2.30"
0.8	100	0.0100	2.03		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
8.2	170	Total			

Summary for Subcatchment 3S: Sadler & W.Hanon

Runoff = 1.07 cfs @ 12.22 hrs, Volume= 0.180 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	2.740	98	Street
*	0.450	98	Sidewalk
*	3.010	98	Roof and drive
	6.670	77	Woods, Good, HSG D
	0.720	39	>75% Grass cover, Good, HSG A
	1.740	74	>75% Grass cover, Good, HSG C
	11.650	80	>75% Grass cover, Good, HSG D
	26.980	82	Weighted Average
	20.780		77.02% Pervious Area
	6.200		22.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
5.9	560	0.1000	1.58		**Shallow Concentrated Flow, Thru open space** Woodland Kv= 5.0 fps
0.5	60	0.0100	2.03		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
19.2	720	Total			

Summary for Subcatchment 4S: BWD/Hanon/O'Neil

Runoff = 0.65 cfs @ 12.13 hrs, Volume= 0.108 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	1.510	98	Street
*	0.240	98	Sidewalk
*	1.830	98	Roof and drive
*	1.070	98	O'Neil drives & roof
*	0.440	70	Woods, Good, HSG C
	3.960	77	Woods, Good, HSG D
	2.120	61	>75% Grass cover, Good, HSG B
	1.680	74	>75% Grass cover, Good, HSG C
	6.450	80	>75% Grass cover, Good, HSG D
	19.300	81	Weighted Average
	14.650		75.91% Pervious Area
	4.650		24.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0500	0.14		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.8	180	0.0670	3.88		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
0.3	80	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
12.8	360	Total			

Summary for Pond 9P: Mod. pond

Inflow Area = 69.750 ac, 23.24% Impervious, Inflow Depth = 0.05" for WQv event
Inflow = 1.59 cfs @ 12.19 hrs, Volume= 0.309 af
Outflow = 0.24 cfs @ 17.46 hrs, Volume= 0.300 af, Atten= 85%, Lag= 315.9 min
Primary = 0.24 cfs @ 17.46 hrs, Volume= 0.300 af

Routing by Stor-Ind method, Time Span= 1.00-80.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 369.50' Surf.Area= 16,195 sf Storage= 7,877 cf
Peak Elev= 369.82' @ 17.46 hrs Surf.Area= 16,776 sf Storage= 13,209 cf (5,332 cf above start)

Plug-Flow detention time= 1,143.4 min calculated for 0.120 af (39% of inflow)
Center-of-Mass det. time= 434.1 min (1,407.8 - 973.7)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	139,425 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)
369.00	15,317	584.0	0	0	15,317
370.00	17,098	603.0	16,199	16,199	17,207
371.00	18,936	621.0	18,009	34,209	19,064
372.00	20,830	640.0	19,875	54,084	21,072
373.00	22,781	659.0	21,798	75,882	23,141
374.00	24,788	678.0	23,777	99,660	25,270
375.00	26,852	697.0	25,813	125,473	27,460
375.50	28,972	716.0	13,953	139,425	29,625

Device	Routing	Invert	Outlet Devices
#1	Primary	369.50'	**5.5" Vert. Orifice** C= 0.600
#2	Primary	374.10'	**24.0" W x 12.0" H Vert. Orifice 12"x24"** C= 0.600
#3	Primary	374.10'	**33.0 deg x 6.0' long x 1.50' rise Sharp-Crested Vee/Trap Weir** C= 2.60

Primary OutFlow Max=0.24 cfs @ 17.46 hrs HW=369.82' (Free Discharge)
- **1=Orifice** (Orifice Controls 0.24 cfs @ 1.94 fps)
- **2=Orifice 12"x24"** (Controls 0.00 cfs)
- **3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

COYOTE RUN: PERMIT 1-1507


Source: USGS
Source: NASA, NGA, USGS
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Vermont State Plane Grid North (NAD83)

CONSTRUCTION NOTES

1. See Sheet C-2 for additional notes related to erosion prevention and sediment control.
2. The Contractor shall be responsible for repairing all disturbed areas back to original or better condition, including but not limited to curbing, sidewalks, road, parking areas, landscaping, site lighting, electrical, and etc. All asphalt shall be sawcut prior to paving.
3. All stumps, rock, and other non-approved trench backfill material discovered during construction is the exclusive property of the Contractor and shall be removed from the site and disposed of in a State approved disposal location.
4. Contractor shall be responsible for providing a passing sieve of the representative gravel delivered to the site for the construction of the stable vegetated access paths.
5. The Contractor shall comply with the procedures outlined in the Low Risk Site Handbook for Erosion Prevention and Sediment Control. The Contractor shall be responsible for installing, maintaining and removing all erosion and sediment control devices shown on the plans or details and, to the maximum extent practical, to minimize potential contamination of stormwater runoff from the construction activities.
6. The Contractor shall be responsible for all construction barrier/safety fencing required for the project.
7. Contractor shall be responsible for importing topsoil as required to complete the project. Contractor shall test topsoil for approval.
8. The Contractor shall be responsible for all signage and fencing necessary to providing safe vehicular and pedestrian access through or around the site during construction.
9. All storm pipes shall be PVC SDR 35 unless otherwise noted. PVC pipe shall contain no recycled content.
10. Temporary groundwater dewatering and stormwater by-pass pumping and/or diversion is the responsibility of the Contractor. The Contractor is responsible for providing all necessary pumps and equipment to perform the work. Overnight pumping is not allowed.
11. This project is subject to all erosion prevention and sediment control measures including the monitoring, inspection, and reporting requirements of State of Vermont Construction Stormwater Discharge Permit. The Contractor shall be the Principal Operator for the project.
12. Removal of all erosion control matting and inlet protection is the responsibility of the Contractor.

Legend

- st — Existing Storm Line/Manhole/Basin
- 153 — Finish Grade existing pond
- 150 — Finish Grade proposed pond
- Sub Watershed delineation
- S.C.S. Soils delineation
- Approximate Property Line
- (23) Lot number

Notes:

1. This plan is in no way a boundary survey. Property lines are based on Town of Williston tax maps.
2. Underground utilities are approximate and not warranted to be exact or complete. Dig Safe shall be contacted prior to any excavation.
3. Elevations are based on the NAVD 88 vertical datum.
4. Project Horizontal Coordinates derived from GPS observation using reference frame NAD83 (2011) 2010.00 epoch. Project vertical datum based on NAVD 88 (Geoid 12A).

New Area of Disturbance Summary:

Stabilized Vegetated Path to Pond 1 Outlet – 450 s.f.

Stabilized Vegetated Path to Pond 1 Outlet – 300 s.f.

Refurbished Stabilized Vegetated Path to Pond 1 Inlet – 150 s.f.

Total New Disturbance = 900 s.f.

0' 100' 200' 400' 800'

Bar Scale 1" = 100'

Date revised	Description	Checked	Date

Design SWH
Drawn SWH
Checked
Scale 1" = 100'
Date April 26, 2016
Project 03120.

Overall Site Plan – Stormwater EFA

Coyote Run

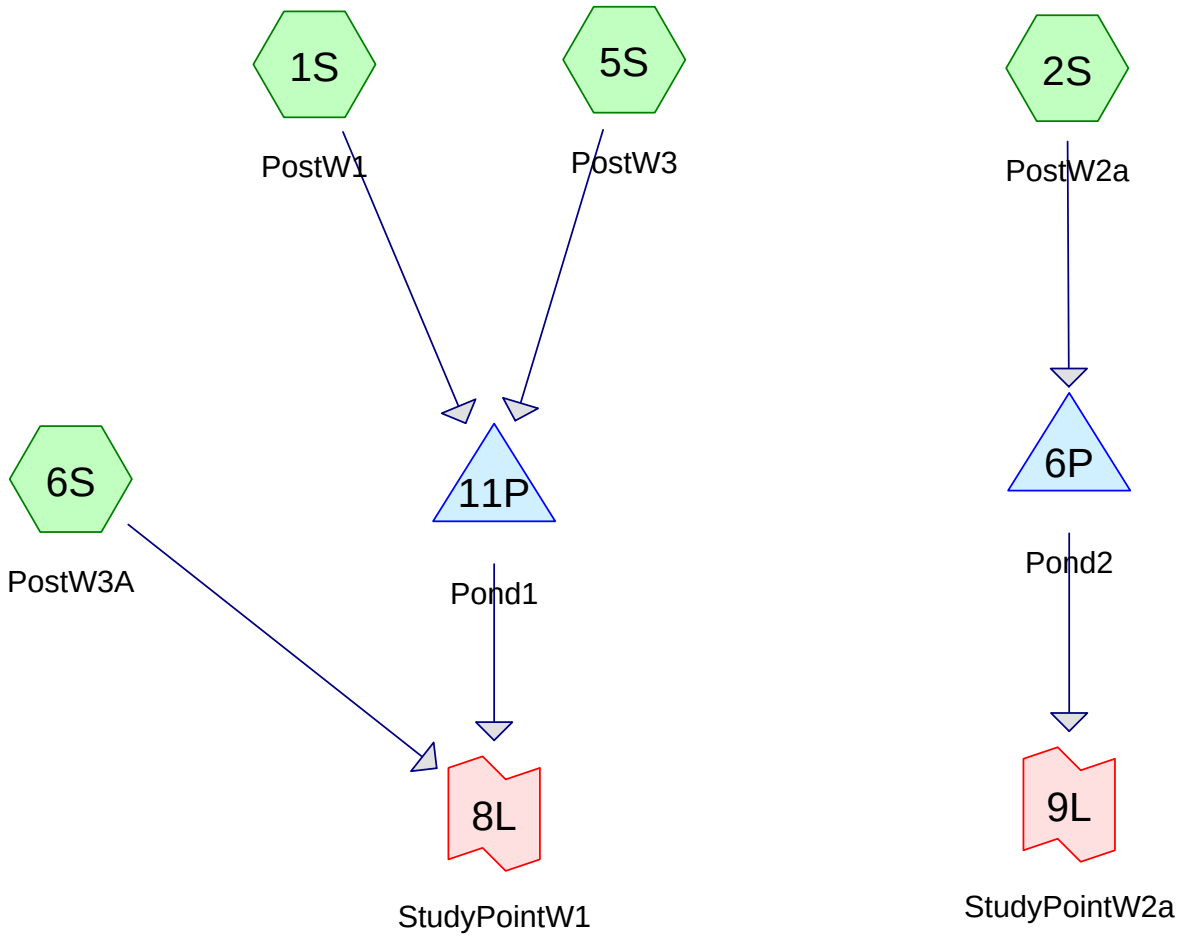
Coyote Lane & Raven Circle — Williston, Vermont

STATE OF VERMONT SCOTT W. HOWES No. 1619 CIVIL LICENSED PROFESSIONAL ENGINEER

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: charlie-overall-2016.dwg
Printing date

C-1



Subcat Reach Pond Link

Routing Diagram for coytoerun-efa-ph2, Revised 4-13-16
Prepared by Microsoft, Printed 4/13/2016

Project Notes

Coyote Run EFA
Phase 2

Summary for Subcatchment 1S: PostW1

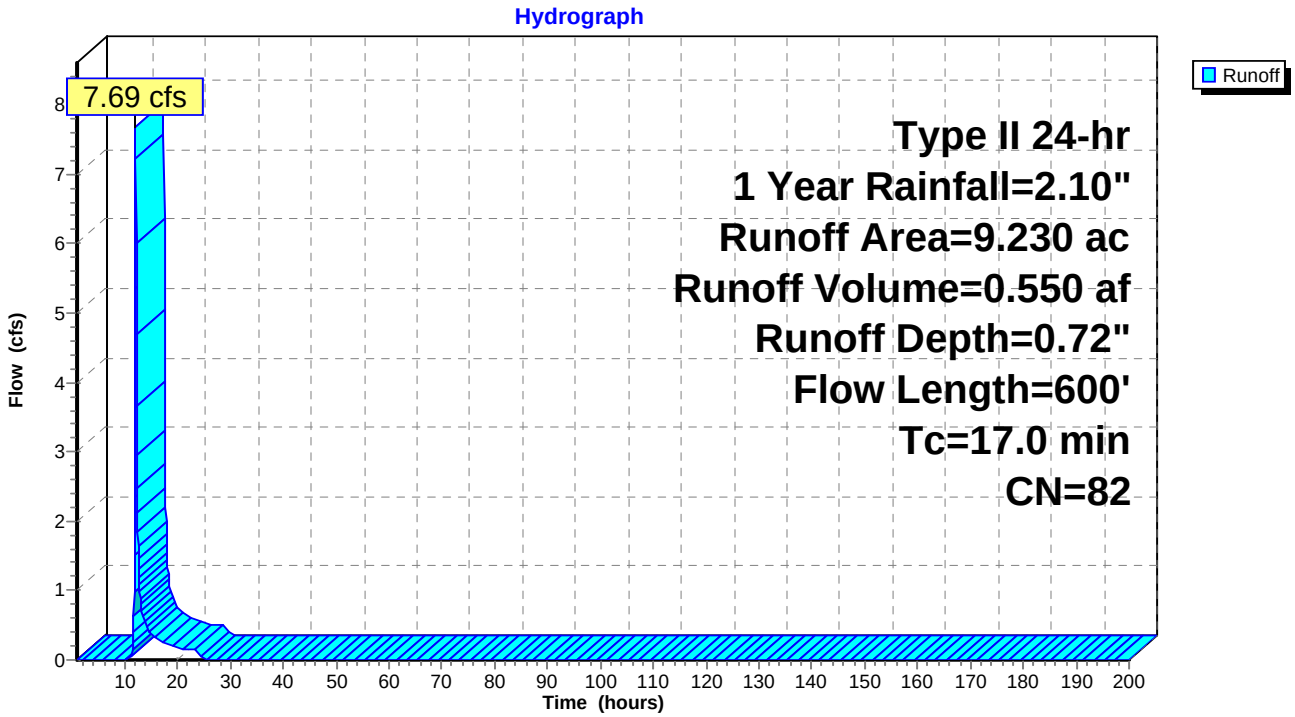
Runoff = 7.69 cfs @ 12.11 hrs, Volume= 0.550 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
	1.490	98	Paved parking, HSG D
	0.510	98	Roofs, HSG D
*	7.230	78	Open C/D
	9.230	82	Weighted Average
	7.230		78.33% Pervious Area
	2.000		21.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
4.2	500	0.0150	1.97		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
17.0	600	Total			

Subcatchment 1S: PostW1



Summary for Subcatchment 2S: PostW2a

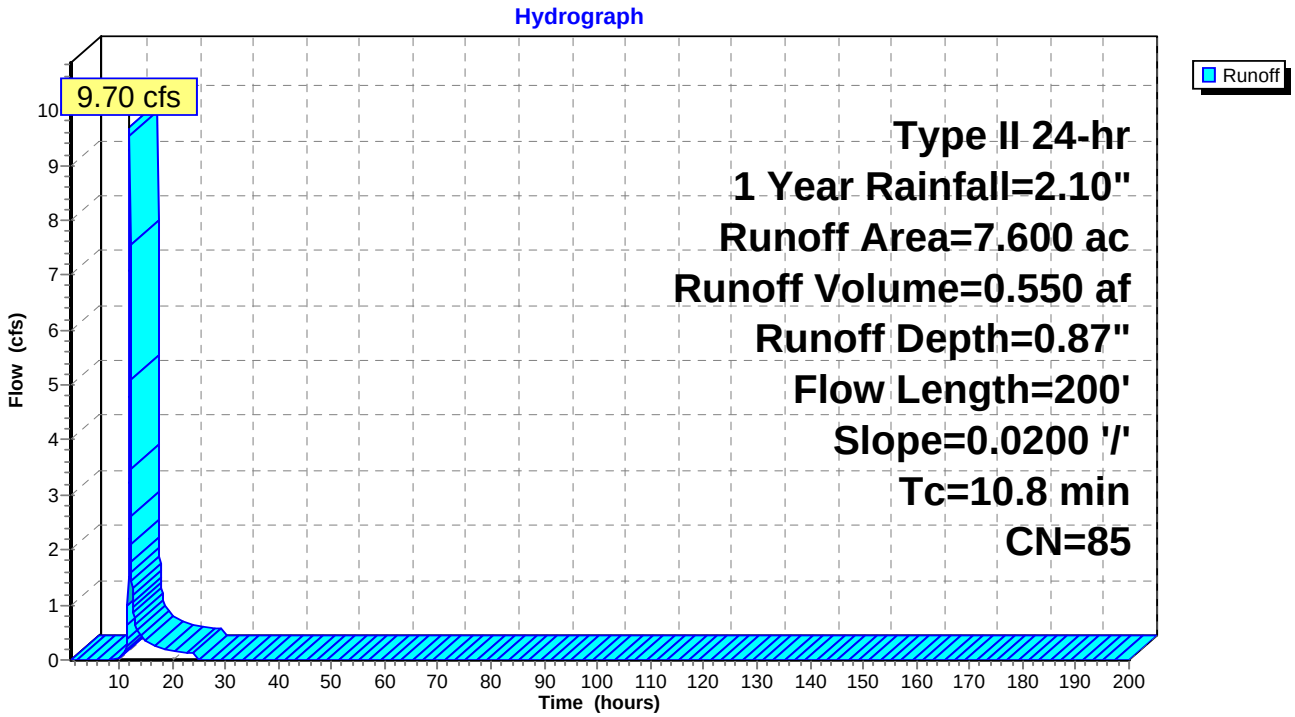
Runoff = 9.70 cfs @ 12.03 hrs, Volume= 0.550 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
	1.870	98	Paved parking, HSG D
	0.710	98	Roofs, HSG D
*	5.020	78	Open C/D
	7.600	85	Weighted Average
	5.020		66.05% Pervious Area
	2.580		33.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0200	0.09		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
1.1	150	0.0200	2.28		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
10.8	200	Total			

Subcatchment 2S: PostW2a



Summary for Subcatchment 5S: PostW3

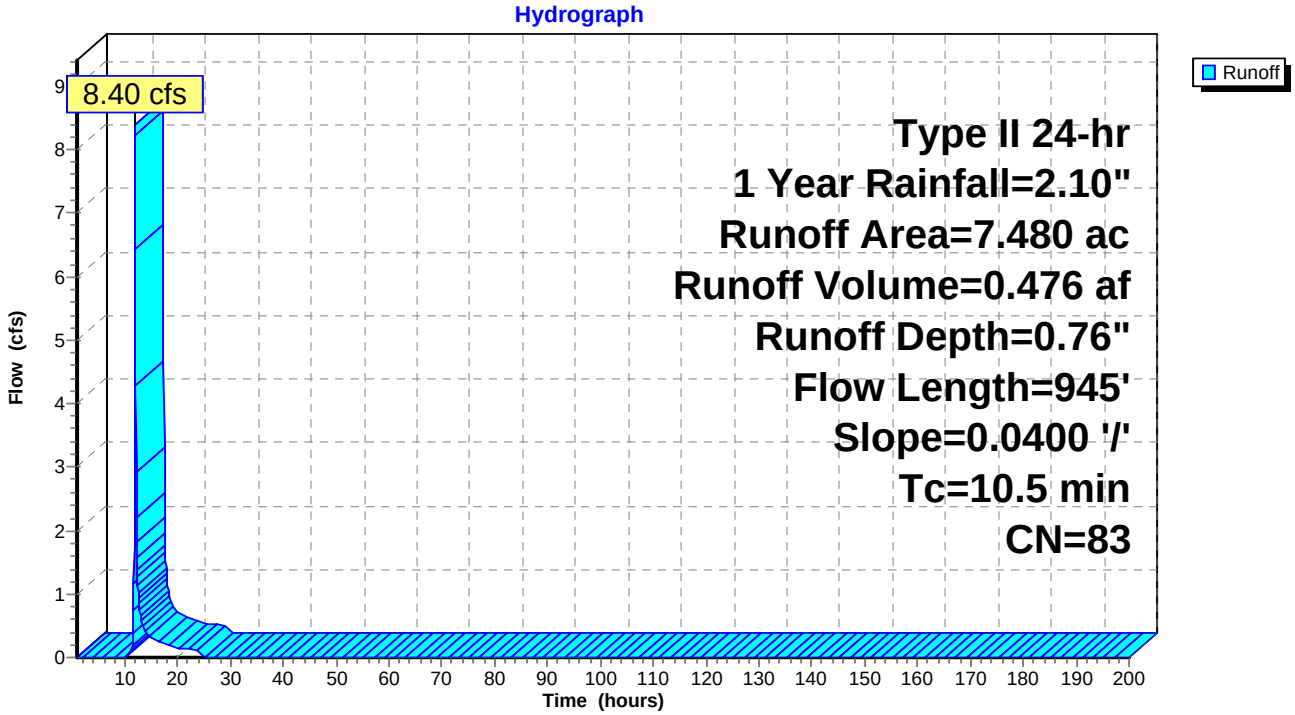
Runoff = 8.40 cfs @ 12.03 hrs, Volume= 0.476 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
	1.360	98	Paved parking, HSG D
	0.390	98	Roofs, HSG D
*	5.730	78	Open C/D
	7.480	83	Weighted Average
	5.730		76.60% Pervious Area
	1.750		23.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0400	0.11		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
0.6	120	0.0400	3.22		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
2.6	775		5.00		**Direct Entry, Piped**
10.5	945	Total			

Subcatchment 5S: PostW3



Summary for Subcatchment 6S: PostW3A

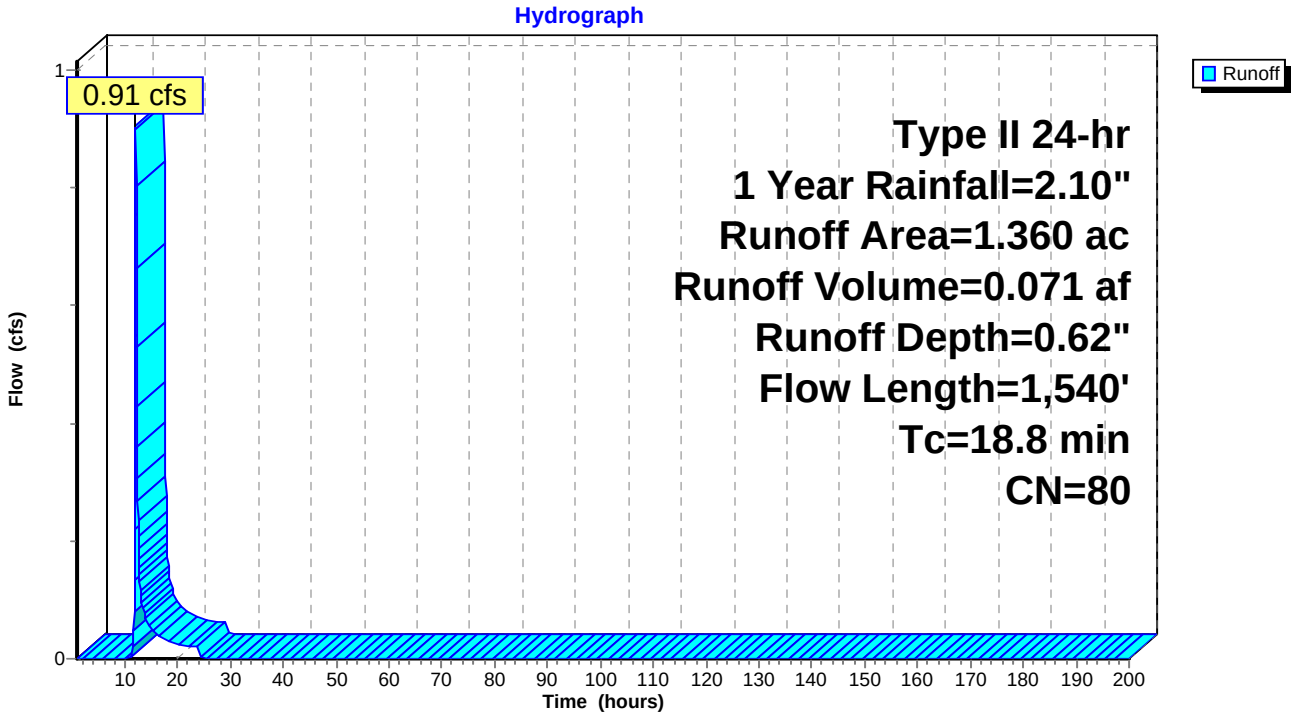
Runoff = 0.91 cfs @ 12.13 hrs, Volume= 0.071 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (ac)	CN	Description
	0.130	98	Paved parking, HSG D
*	1.230	78	Open C/D
	1.360	80	Weighted Average
	1.230		90.44% Pervious Area
	0.130		9.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
1.1	130	0.0140	1.90		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
4.9	1,310	0.0190	4.41	35.30	**Channel Flow, tributary** Area= 8.0 sf Perim= 10.0' r= 0.80' n= 0.040 Winding stream, pools & shoals
18.8	1,540	Total			

Subcatchment 6S: PostW3A



Summary for Pond 6P: Pond2

Inflow Area = 7.600 ac, 33.95% Impervious, Inflow Depth = 0.87" for 1 Year event
Inflow = 9.70 cfs @ 12.03 hrs, Volume= 0.550 af
Outflow = 0.26 cfs @ 16.28 hrs, Volume= 0.550 af, Atten= 97%, Lag= 255.1 min
Primary = 0.26 cfs @ 16.28 hrs, Volume= 0.550 af

Routing by Stor-Ind method, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 438.50' Surf.Area= 5,252 sf Storage= 8,312 cf
Peak Elev= 440.74' @ 16.28 hrs Surf.Area= 8,106 sf Storage= 23,360 cf (15,048 cf above start)

Plug-Flow detention time= 1,208.3 min calculated for 0.360 af (65% of inflow)
Center-of-Mass det. time= 762.1 min (1,609.8 - 847.7)

762.1 min. = 12.7 hours detention for CPv .

Volume	Invert	Avail.Storage	Storage Description
#1	435.50'	57,605 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

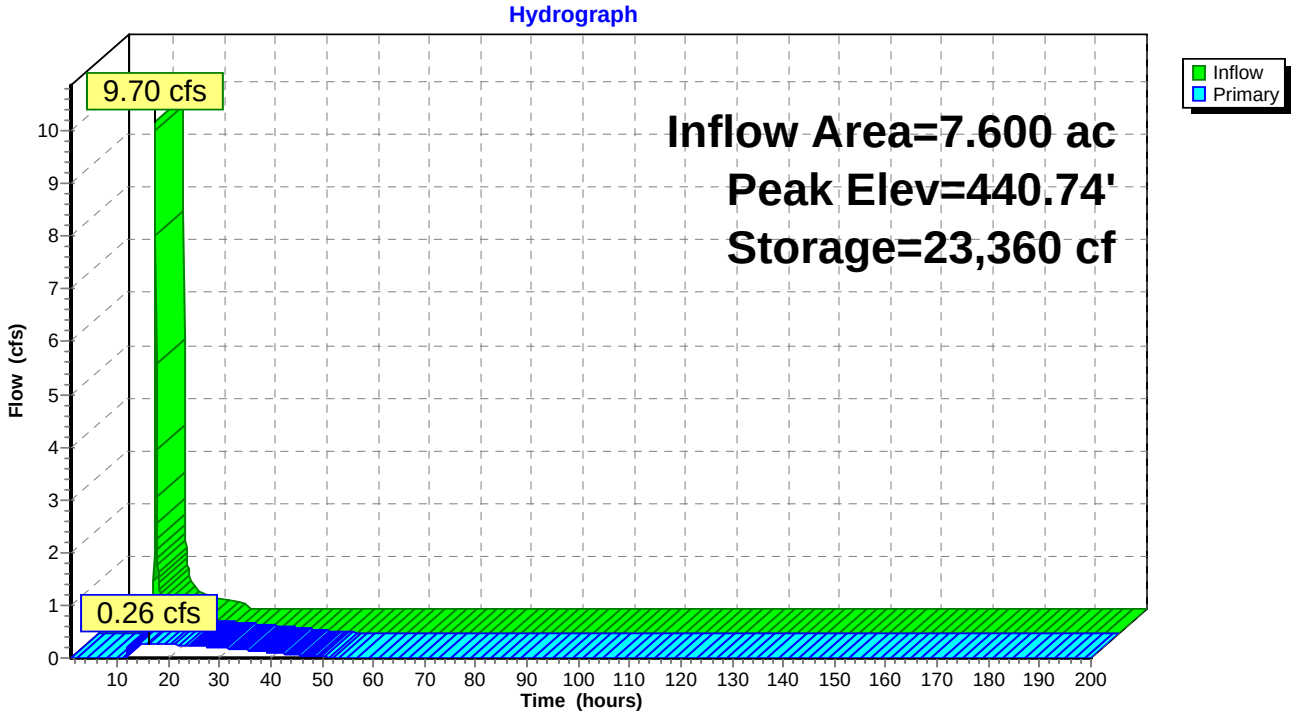
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
435.50	585	0	0
436.00	1,310	474	474
437.00	2,480	1,895	2,369
438.00	4,520	3,500	5,869
439.00	5,984	5,252	11,121
440.00	7,196	6,590	17,711
441.00	8,429	7,813	25,523
442.00	9,871	9,150	34,673
443.00	11,474	10,673	45,346
444.00	13,044	12,259	57,605

Volume of Permanent Pool at 438.50 = 8,312 c.f.
8,312 c.f. of permanent pool volume > 7,504 c.f of WQv required

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**15.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 438.50' / 438.00' S= 0.0063 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	438.50'	**2.6" Vert. Orifice/Grate** C= 0.600
#3	Device 1	440.75'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	442.25'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.26 cfs @ 16.28 hrs HW=440.74' (Free Discharge)
└**1=Culvert** (Passes 0.26 cfs of 5.93 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.26 cfs @ 7.03 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Pond2



Summary for Pond 11P: Pond1

Inflow Area = 16.710 ac, 22.44% Impervious, Inflow Depth = 0.74" for 1 Year event
Inflow = 15.23 cfs @ 12.06 hrs, Volume= 1.027 af
Outflow = 0.51 cfs @ 16.55 hrs, Volume= 1.025 af, Atten= 97%, Lag= 269.5 min
Primary = 0.51 cfs @ 16.55 hrs, Volume= 1.025 af

Routing by Stor-Ind method, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 437.00' Surf.Area= 12,242 sf Storage= 11,924 cf
Peak Elev= 438.61' @ 16.55 hrs Surf.Area= 20,573 sf Storage= 39,144 cf (27,220 cf above start)

Plug-Flow detention time= 1,097.0 min calculated for 0.751 af (73% of inflow)
Center-of-Mass det. time= 744.4 min (1,605.5 - 861.1)

744.4 min. = 12.4 hours detention for CPv

Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	97,442 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

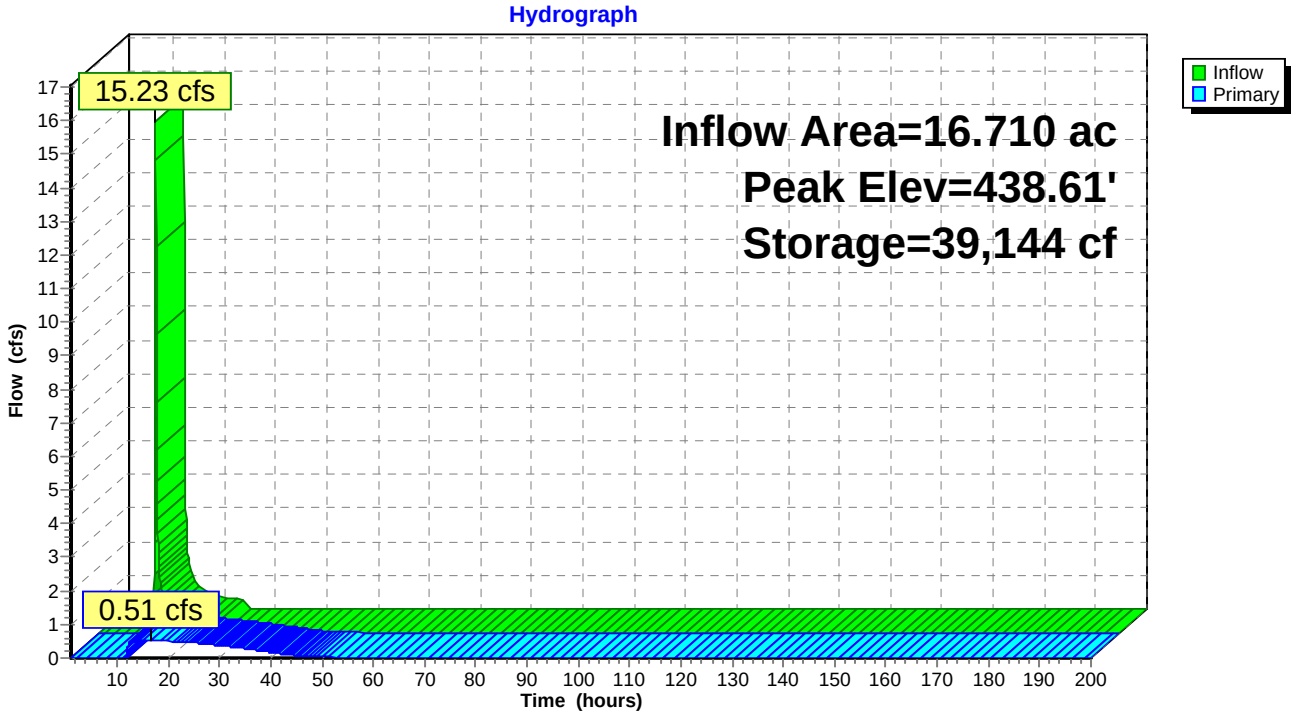
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
434.00	1,218	0	0
435.00	2,089	1,654	1,654
436.00	3,105	2,597	4,251
437.00	12,242	7,674	11,924
438.00	18,352	15,297	27,221
439.00	21,977	20,165	47,386
440.00	25,022	23,500	70,885
441.00	28,091	26,557	97,442

11,924 c.f. of permanent pool volume > 11,550 c.f of WQv required

Device	Routing	Invert	Outlet Devices
#1	Primary	436.60'	**15.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 436.60' / 436.20' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	437.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	438.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	439.50'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.51 cfs @ 16.55 hrs HW=438.61' (Free Discharge)
- **1=Culvert** (Passes 0.51 cfs of 5.50 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.51 cfs @ 5.79 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: Pond1

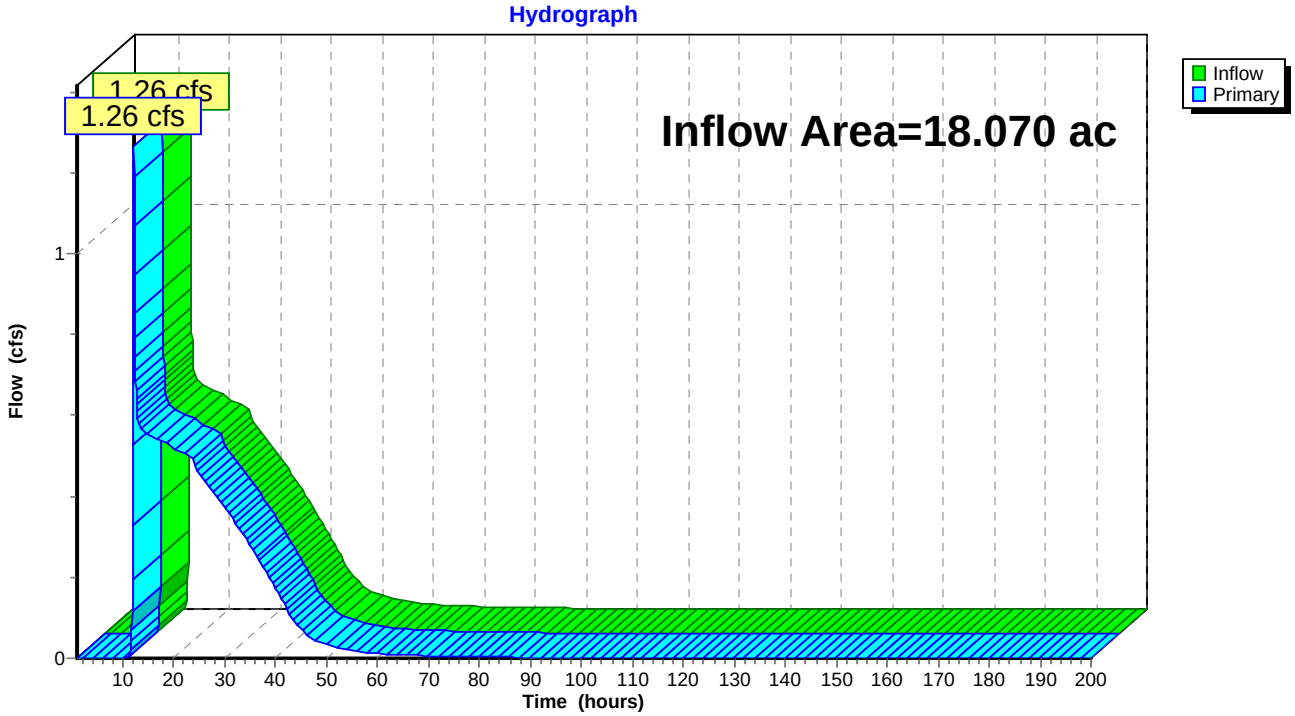


Summary for Link 8L: StudyPointW1

Inflow Area = 18.070 ac, 21.47% Impervious, Inflow Depth > 0.73" for 1 Year event
Inflow = 1.26 cfs @ 12.14 hrs, Volume= 1.096 af
Primary = 1.26 cfs @ 12.14 hrs, Volume= 1.096 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs

Link 8L: StudyPointW1

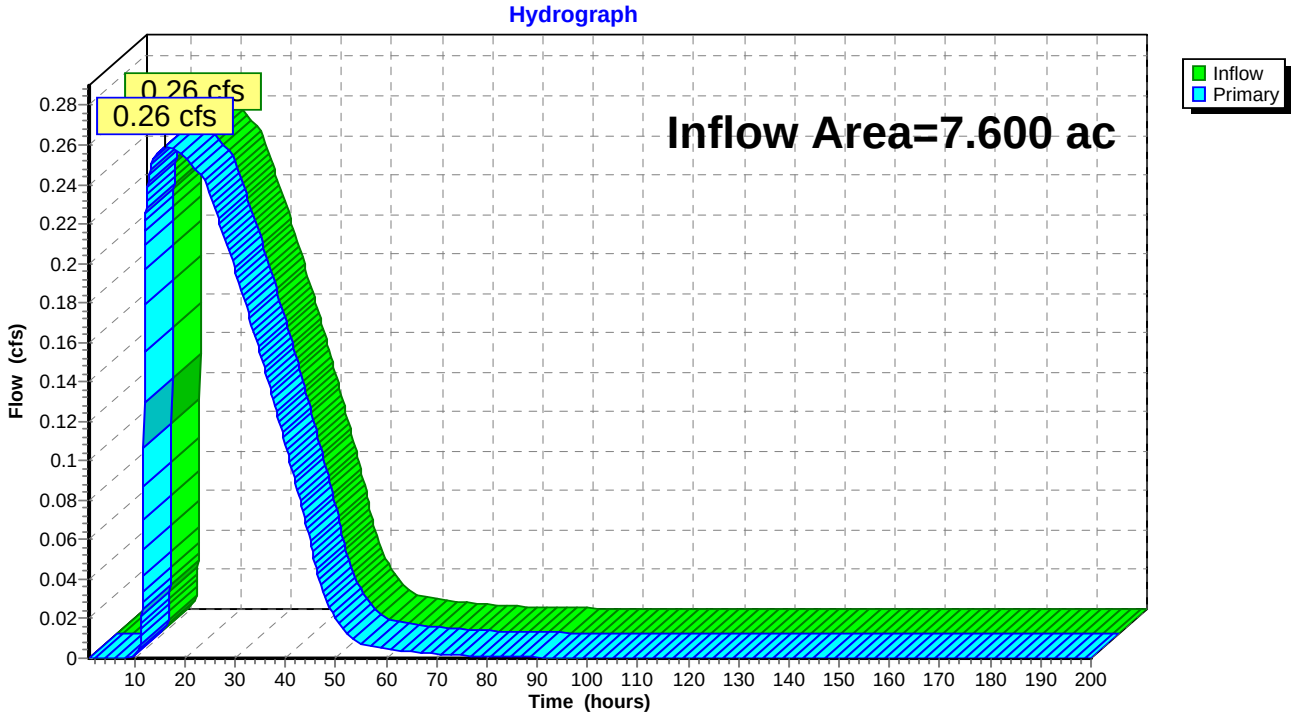


Summary for Link 9L: StudyPointW2a

Inflow Area = 7.600 ac, 33.95% Impervious, Inflow Depth = 0.87" for 1 Year event
Inflow = 0.26 cfs @ 16.28 hrs, Volume= 0.550 af
Primary = 0.26 cfs @ 16.28 hrs, Volume= 0.550 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs

Link 9L: StudyPointW2a



Summary for Subcatchment 1S: PostW1

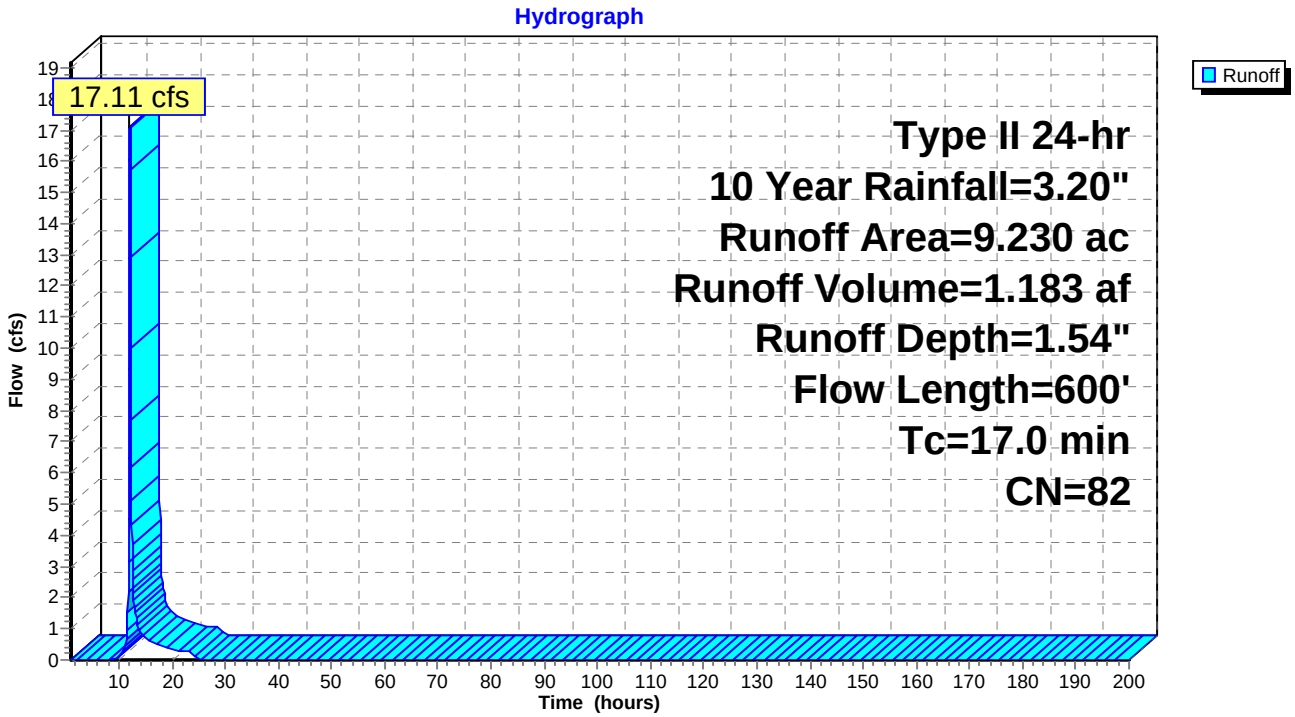
Runoff = 17.11 cfs @ 12.10 hrs, Volume= 1.183 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
	1.490	98	Paved parking, HSG D
	0.510	98	Roofs, HSG D
*	7.230	78	Open C/D
	9.230	82	Weighted Average
	7.230		78.33% Pervious Area
	2.000		21.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
4.2	500	0.0150	1.97		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
17.0	600	Total			

Subcatchment 1S: PostW1



Summary for Subcatchment 2S: PostW2a

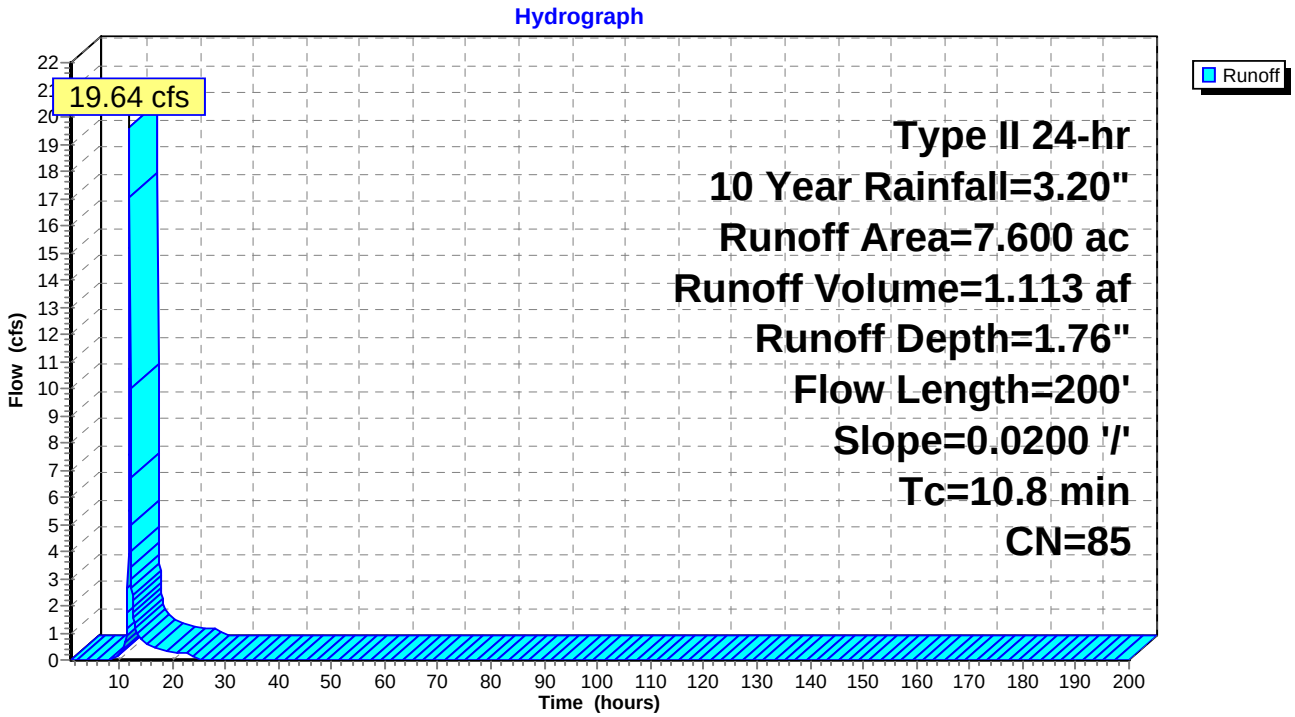
Runoff = 19.64 cfs @ 12.03 hrs, Volume= 1.113 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
	1.870	98	Paved parking, HSG D
	0.710	98	Roofs, HSG D
*	5.020	78	Open C/D
	7.600	85	Weighted Average
	5.020		66.05% Pervious Area
	2.580		33.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0200	0.09		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
1.1	150	0.0200	2.28		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
10.8	200	Total			

Subcatchment 2S: PostW2a



Summary for Subcatchment 5S: PostW3

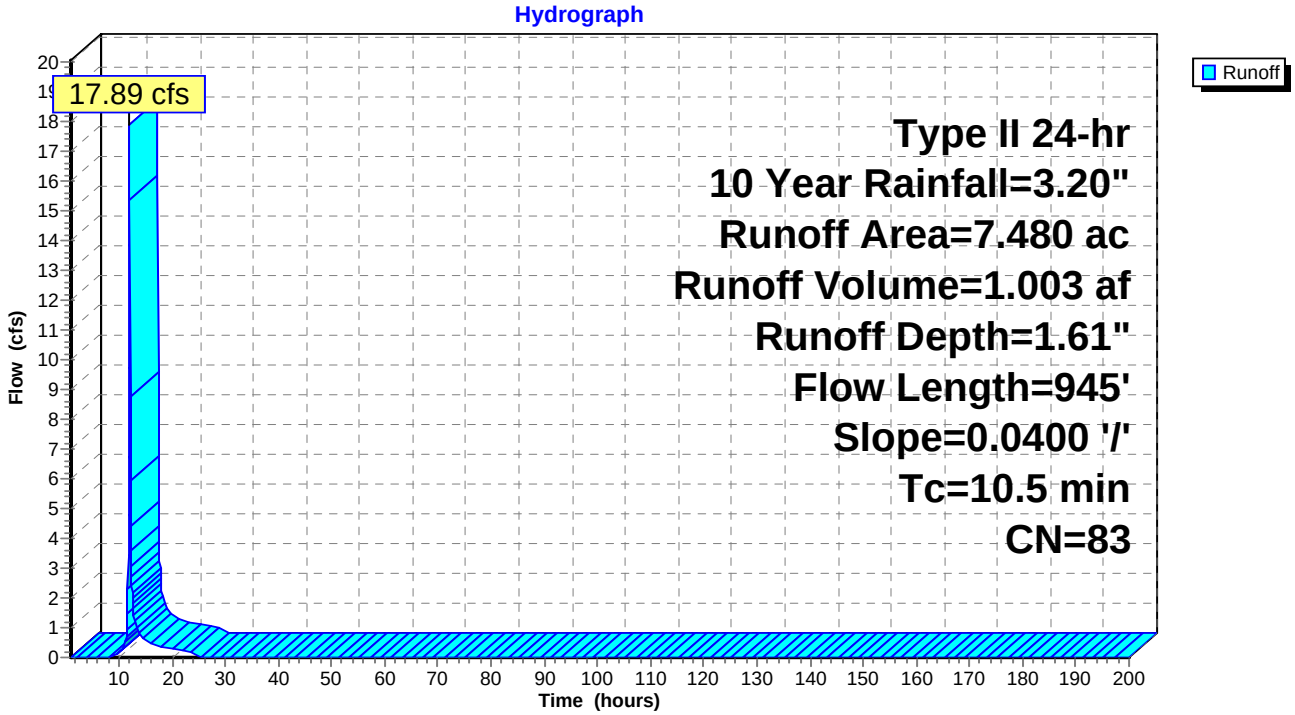
Runoff = 17.89 cfs @ 12.02 hrs, Volume= 1.003 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
	1.360	98	Paved parking, HSG D
	0.390	98	Roofs, HSG D
*	5.730	78	Open C/D
	7.480	83	Weighted Average
	5.730		76.60% Pervious Area
	1.750		23.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0400	0.11		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
0.6	120	0.0400	3.22		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
2.6	775		5.00		**Direct Entry, Piped**
10.5	945	Total			

Subcatchment 5S: PostW3



Summary for Subcatchment 6S: PostW3A

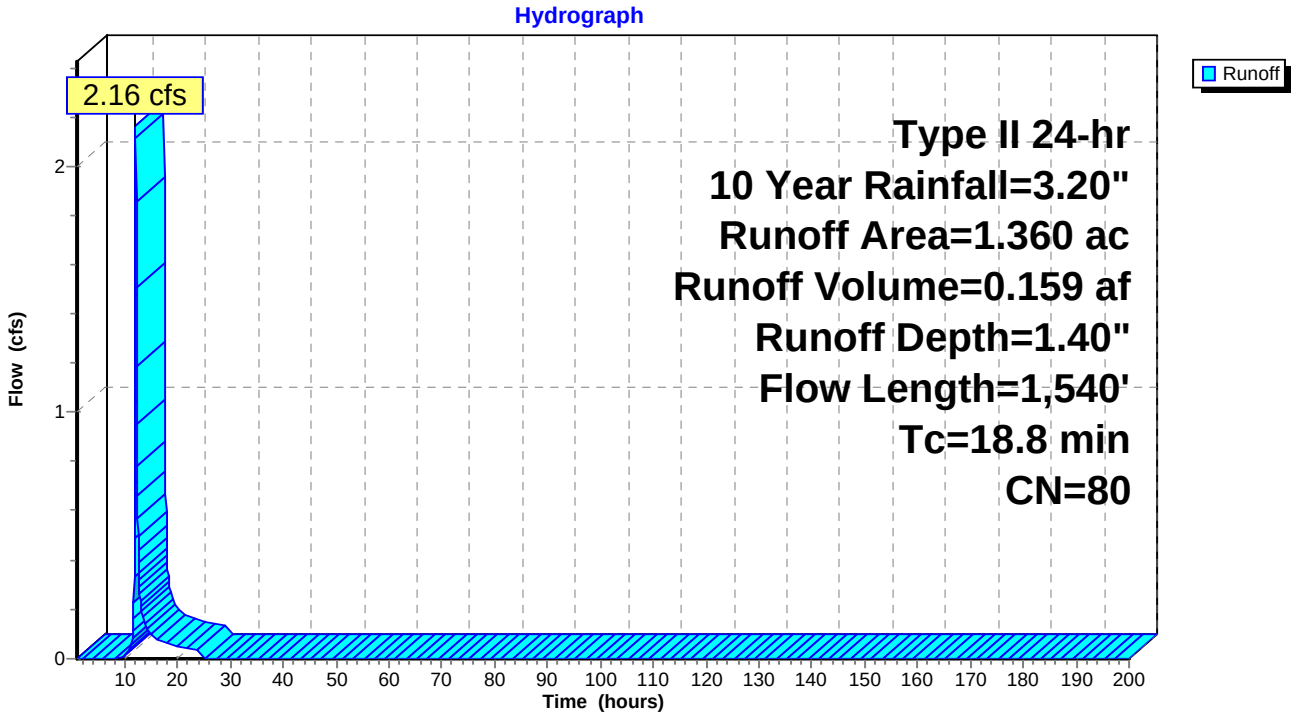
Runoff = 2.16 cfs @ 12.12 hrs, Volume= 0.159 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.130	98	Paved parking, HSG D
*	1.230	78	Open C/D
	1.360	80	Weighted Average
	1.230		90.44% Pervious Area
	0.130		9.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
1.1	130	0.0140	1.90		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
4.9	1,310	0.0190	4.41	35.30	**Channel Flow, tributary** Area= 8.0 sf Perim= 10.0' r= 0.80' n= 0.040 Winding stream, pools & shoals
18.8	1,540	Total			

Subcatchment 6S: PostW3A



Summary for Pond 6P: Pond2

Inflow Area = 7.600 ac, 33.95% Impervious, Inflow Depth = 1.76" for 10 Year event
Inflow = 19.64 cfs @ 12.03 hrs, Volume= 1.113 af
Outflow = 1.28 cfs @ 13.08 hrs, Volume= 1.113 af, Atten= 94%, Lag= 63.1 min
Primary = 1.28 cfs @ 13.08 hrs, Volume= 1.113 af

Routing by Stor-Ind method, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 438.50' Surf.Area= 5,252 sf Storage= 8,312 cf
Peak Elev= 442.01' @ 13.08 hrs Surf.Area= 9,884 sf Storage= 34,751 cf (26,439 cf above start)

Plug-Flow detention time= 726.3 min calculated for 0.922 af (83% of inflow)
Center-of-Mass det. time= 528.6 min (1,356.0 - 827.4)

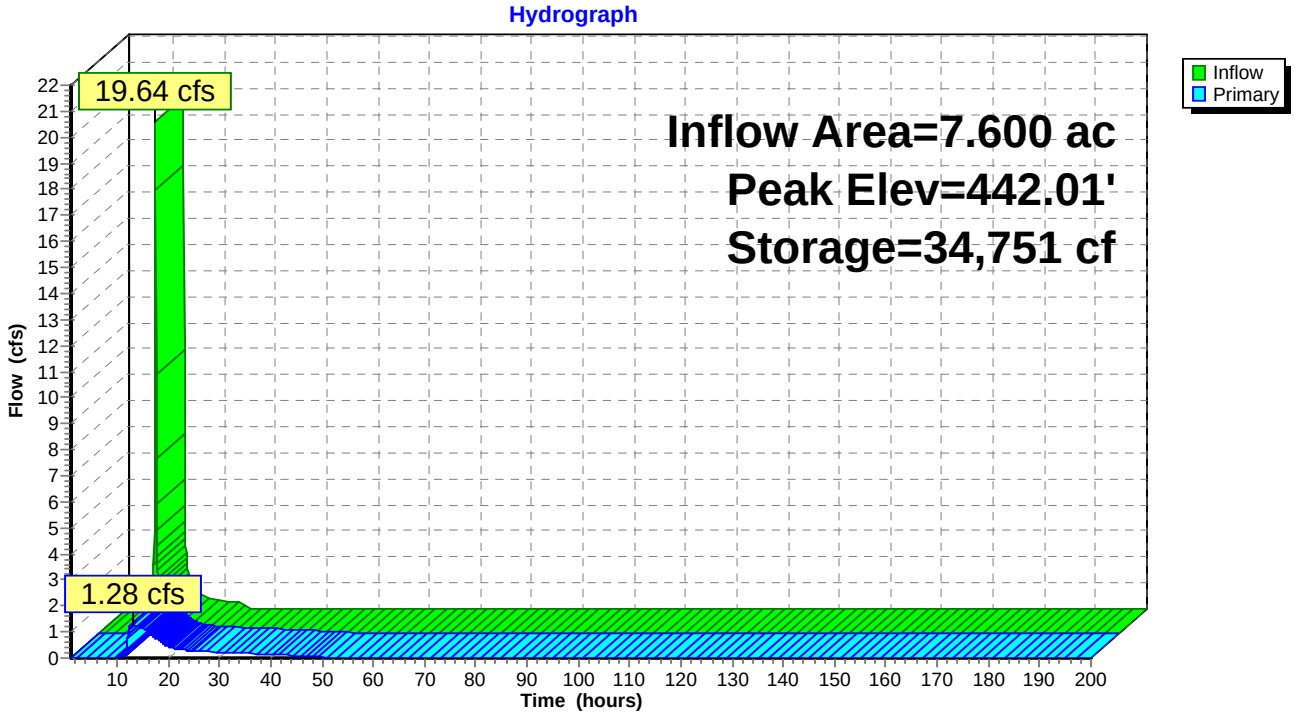
Volume	Invert	Avail.Storage	Storage Description
#1	435.50'	57,605 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
435.50	585	0	0
436.00	1,310	474	474
437.00	2,480	1,895	2,369
438.00	4,520	3,500	5,869
439.00	5,984	5,252	11,121
440.00	7,196	6,590	17,711
441.00	8,429	7,813	25,523
442.00	9,871	9,150	34,673
443.00	11,474	10,673	45,346
444.00	13,044	12,259	57,605

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**15.0" Round Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 438.50' / 438.00' S= 0.0063 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	438.50'	**2.6" Vert. Orifice/Grate** C= 0.600
#3	Device 1	440.75'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	442.25'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.28 cfs @ 13.08 hrs HW=442.01' (Free Discharge)
└**1=Culvert** (Passes 1.28 cfs of 7.92 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.33 cfs @ 8.88 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.95 cfs @ 4.83 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Pond2



Summary for Pond 11P: Pond1

Inflow Area = 16.710 ac, 22.44% Impervious, Inflow Depth = 1.57" for 10 Year event
Inflow = 33.35 cfs @ 12.05 hrs, Volume= 2.186 af
Outflow = 6.73 cfs @ 12.45 hrs, Volume= 2.184 af, Atten= 80%, Lag= 24.3 min
Primary = 6.73 cfs @ 12.45 hrs, Volume= 2.184 af

Routing by Stor-Ind method, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 437.00' Surf.Area= 12,242 sf Storage= 11,924 cf
Peak Elev= 439.31' @ 12.45 hrs Surf.Area= 22,910 sf Storage= 54,260 cf (42,336 cf above start)

Plug-Flow detention time= 607.3 min calculated for 1.910 af (87% of inflow)
Center-of-Mass det. time= 467.0 min (1,306.0 - 839.0)

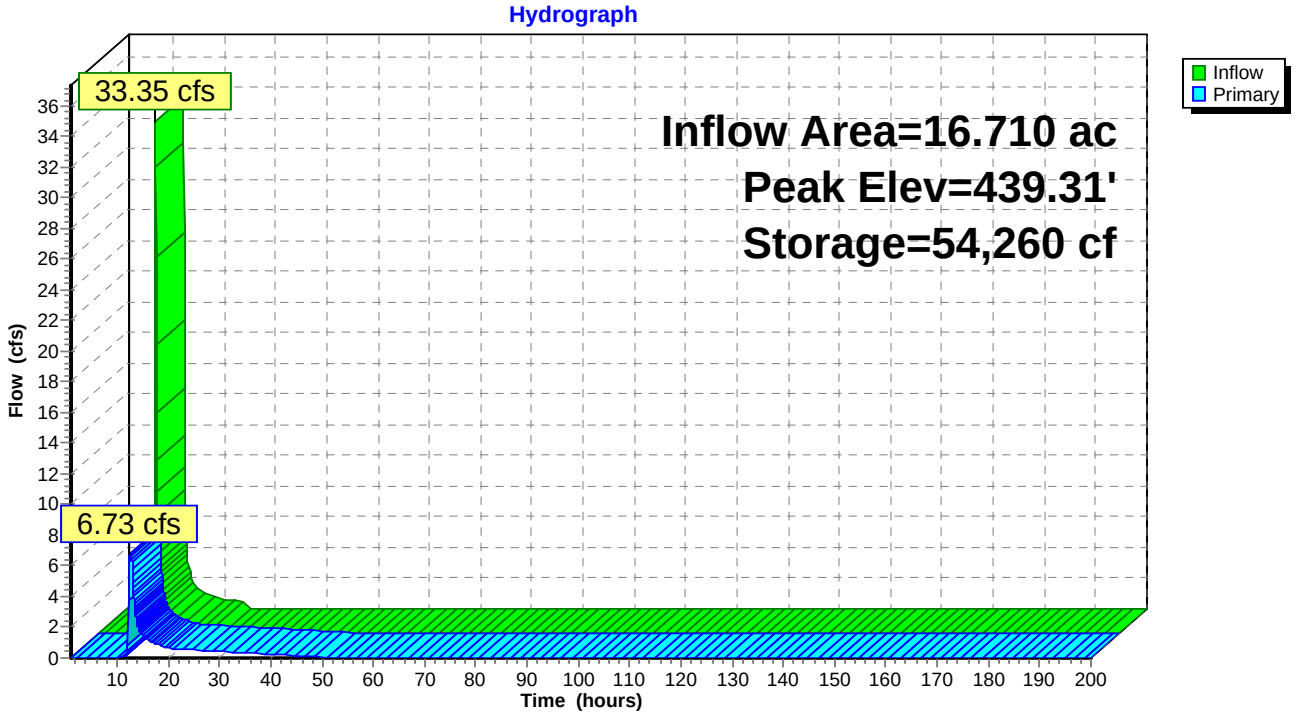
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	97,442 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
434.00	1,218	0	0
435.00	2,089	1,654	1,654
436.00	3,105	2,597	4,251
437.00	12,242	7,674	11,924
438.00	18,352	15,297	27,221
439.00	21,977	20,165	47,386
440.00	25,022	23,500	70,885
441.00	28,091	26,557	97,442

Device	Routing	Invert	Outlet Devices
#1	Primary	436.60'	**15.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 436.60' / 436.20' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	437.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	438.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	439.50'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=6.73 cfs @ 12.45 hrs HW=439.31' (Free Discharge)
- **1=Culvert** (Inlet Controls 6.73 cfs @ 5.48 fps)
  - **2=Orifice/Grate** (Passes < 0.61 cfs potential flow)
  - **3=Orifice/Grate** (Passes < 10.85 cfs potential flow)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: Pond1

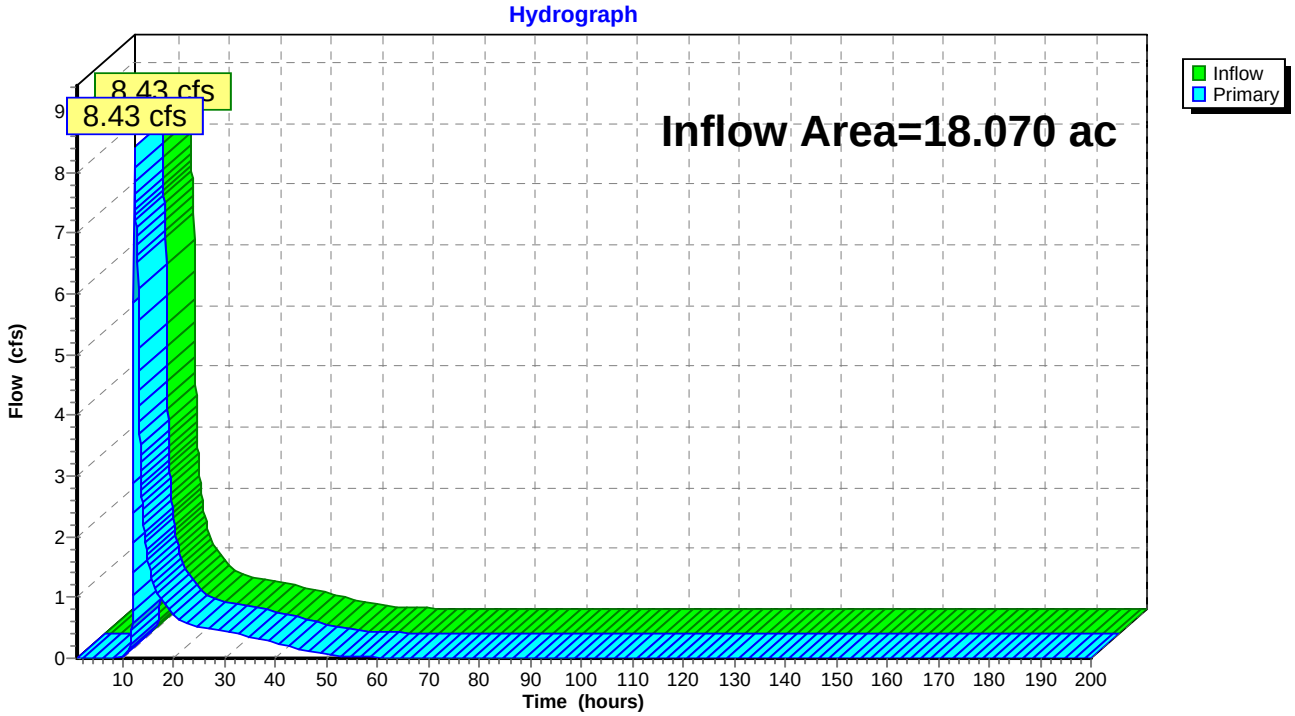


Summary for Link 8L: StudyPointW1

Inflow Area = 18.070 ac, 21.47% Impervious, Inflow Depth = 1.56" for 10 Year event
Inflow = 8.43 cfs @ 12.22 hrs, Volume= 2.343 af
Primary = 8.43 cfs @ 12.22 hrs, Volume= 2.343 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs

Link 8L: StudyPointW1

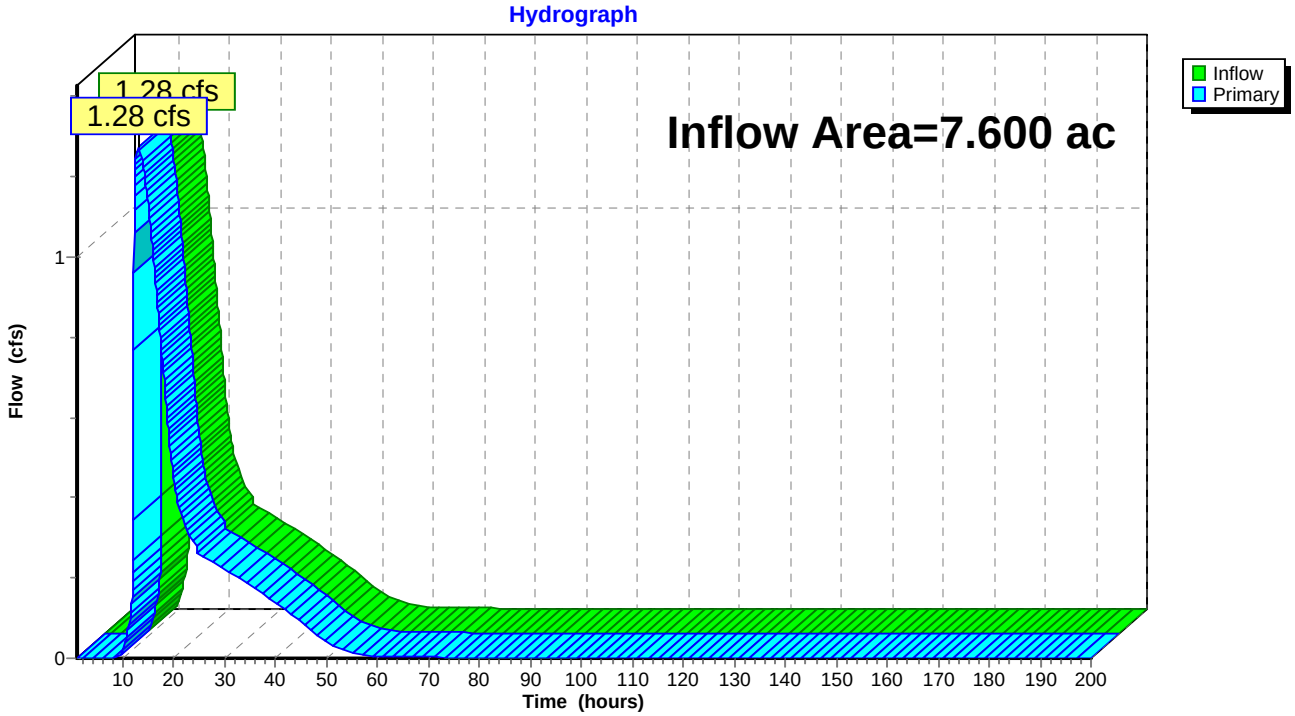


Summary for Link 9L: StudyPointW2a

Inflow Area = 7.600 ac, 33.95% Impervious, Inflow Depth = 1.76" for 10 Year event
Inflow = 1.28 cfs @ 13.08 hrs, Volume= 1.113 af
Primary = 1.28 cfs @ 13.08 hrs, Volume= 1.113 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-200.00 hrs, dt= 0.05 hrs

Link 9L: StudyPointW2a



PLEASANT ACRES: PERMIT 2-0231


Source: USGS
Source: NASA, NGA, USGS
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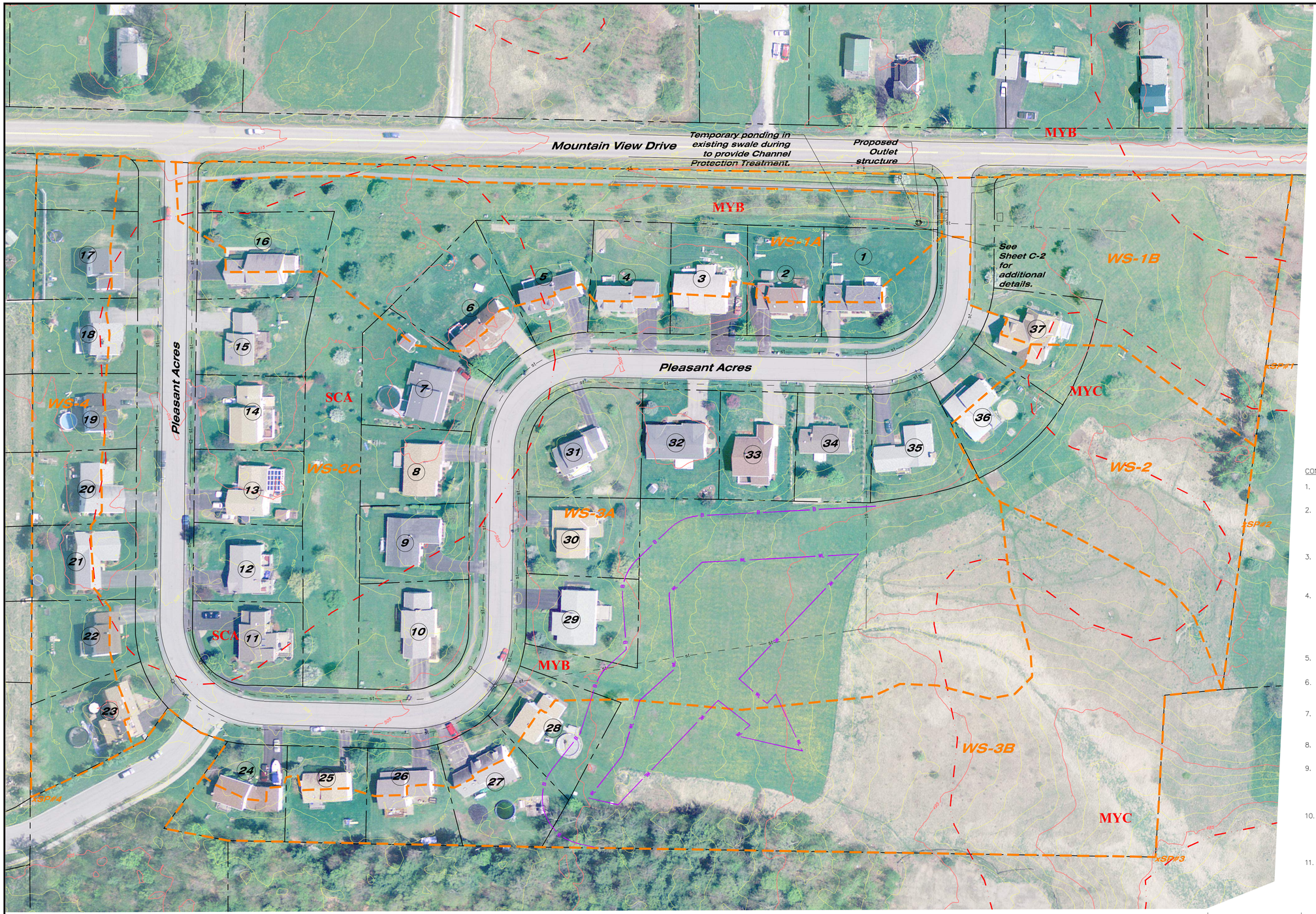


Design Drawing (NAD83) State Plane (US Feet)

Legend

- Existing Storm Line/Manhole/Basin
- Existing 5-foot Contour Interval
- Existing 1-foot Contour Interval
- Finish Grade 5-foot Contour Interval
- Finish Grade 1-foot Contour Interval
- Sub Watershed delineation
- S.C.S. Soils delineation
- Approximate Property Line
- WL — Existing Wetland
- B — 50' wetland buffer

CONSTRUCTION NOTES

1. See Sheet C-2 for additional notes related to erosion prevention and sediment control.
2. The Contractor shall be responsible for repairing all disturbed areas back to original or better condition, including but not limited to curbing, sidewalks, road, parking areas, landscaping, site lighting, electrical, and etc. All asphalt shall be sawcut prior to paving.
3. All stumps, rock, and other non-approved trench backfill material discovered during construction is the exclusive property of the Contractor and shall be removed from the site and disposed of in a State approved disposal location.
4. The Contractor shall comply with the procedures outlined in the Low Risk Site Handbook for Erosion Prevention and Sediment Control. The Contractor shall be responsible for installing, maintaining and removing all erosion and sediment control devices shown on the plans or details and, to the maximum extent practical, to minimize potential contamination of stormwater runoff from the construction activities.
5. The Contractor shall be responsible for all construction barrier/safety fencing required for the project.
6. Contractor shall be responsible for importing topsoil as required to complete the project. Contractor shall test topsoil for approval.
7. The Contractor shall be responsible for all signage and fencing necessary to providing safe vehicular and pedestrian access through or around the site during construction.
8. All storm pipes shall be PVC SDR 35 unless otherwise noted. PVC pipe shall contain no recycled content.
9. Temporary groundwater dewatering and stormwater by-pass pumping and/or diversion is the responsibility of the Contractor. The Contractor is responsible for providing all necessary pumps and equipment to perform the work. Overnight pumping is not allowed.
10. This project is subject to all erosion prevention and sediment control measures including the monitoring, inspection, and reporting requirements of State of Vermont Construction Stormwater Discharge Permit. The Contractor shall be the Principal Operator for the project.
11. Removal of all erosion control matting and inlet protection is the responsibility of the Contractor.

Notes:

1. This plan is in no way a boundary survey. Property lines are based on Town of Williston tax maps.
2. Underground utilities are approximate and not warranted to be exact or complete. Dig Safe shall be contacted prior to any excavation.
3. Elevations are based on the NAVD 88 vertical datum.
4. Project Horizontal Coordinates derived from GPS observation using reference frame NAD83 (2011) 2010.00 epoch. Project vertical datum based on NAVD 88 (Geoid 12A).

0' 50' 100' 200' 400'

Bar Scale 1" = 50'

Stormwater System Maintenance Schedule

1. The stormwater system is comprised of any portion of the site that directs or conveys water.
2. The trash racks for the pond should be inspected biweekly to ensure they are clear of debris. In addition, the trash rack should be inspected after any rainfall of 0.5 inches or greater.
3. The stormwater system must be inspected regularly and repaired as required. Special attention must be given to winter time ice conditions.
4. Twice a year the Stormwater System for the site shall be reviewed including catch basins, forebays, micropools, treatment ponds, swales, vegetation, pavements, etc. and repairs or cleaning will be performed as necessary.
5. In the spring all paved surfaces shall be swept. All collected debris shall be disposed of in an upland area and immediately stabilized or disposed as approved by the Owner.
6. Catch basin sumps shall be cleaned as required.

STATE OF VERMONT — SCOTT W. HOWES — No. 033.0021 — Civil — LICENSED PROFESSIONAL ENGINEER

Date revised	Description	Checked	Date

Design	SWH
Drawn	SWH
Checked	
Scale	1" = 50'
Date	April 26, 2016
Project	14220

Overall Site Plan – Stormwater EFA

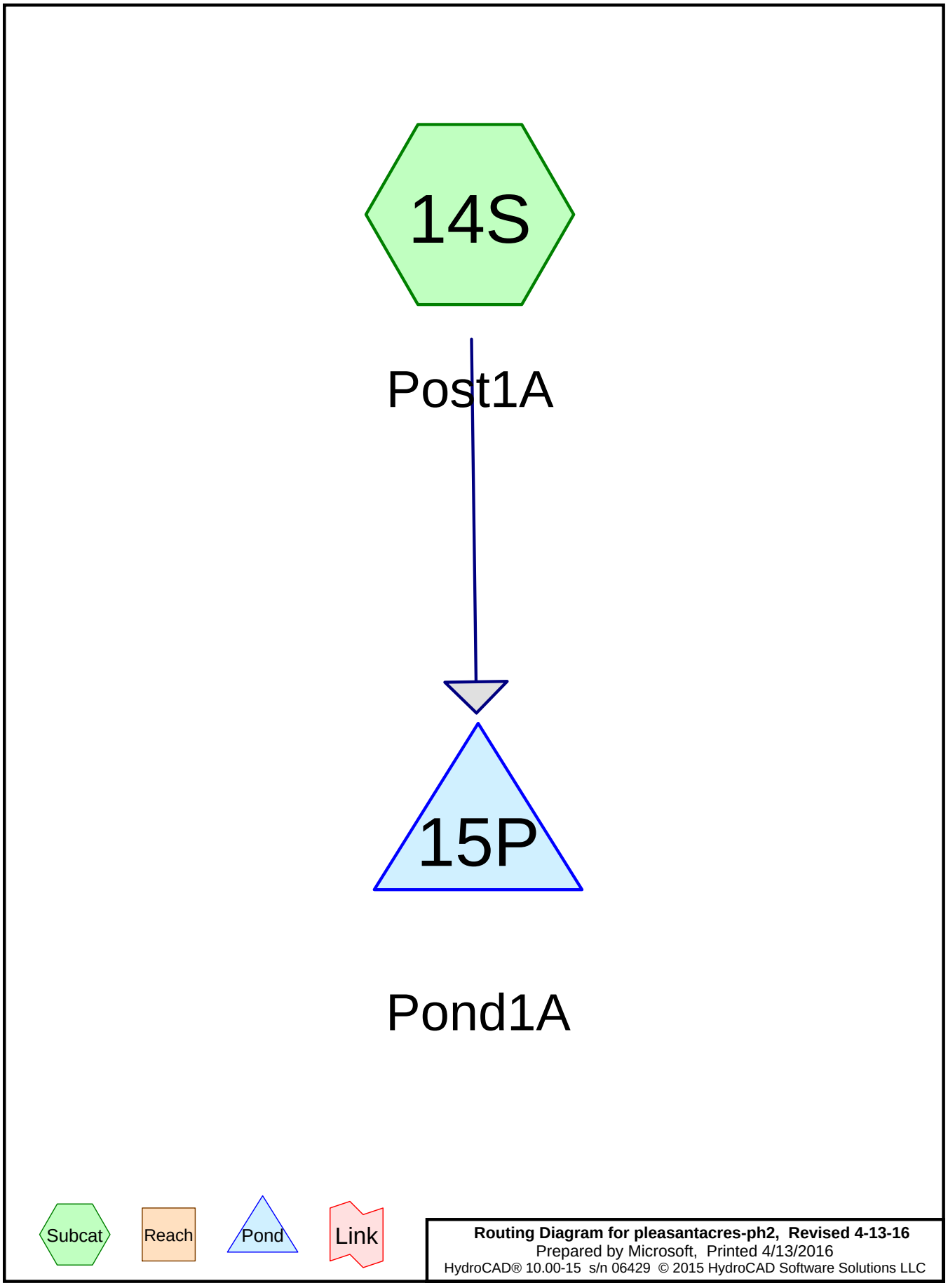
Pleasant Acres

Pleasant Acres/Mountain View Drive — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: pleasantacres.dwg
Printing date:

C-1



Routing Diagram for pleasantacres-ph2, Revised 4-13-16
Prepared by Microsoft, Printed 4/13/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Pleasant Acres EFA
Phase 2

Summary for Subcatchment 14S: Post1A

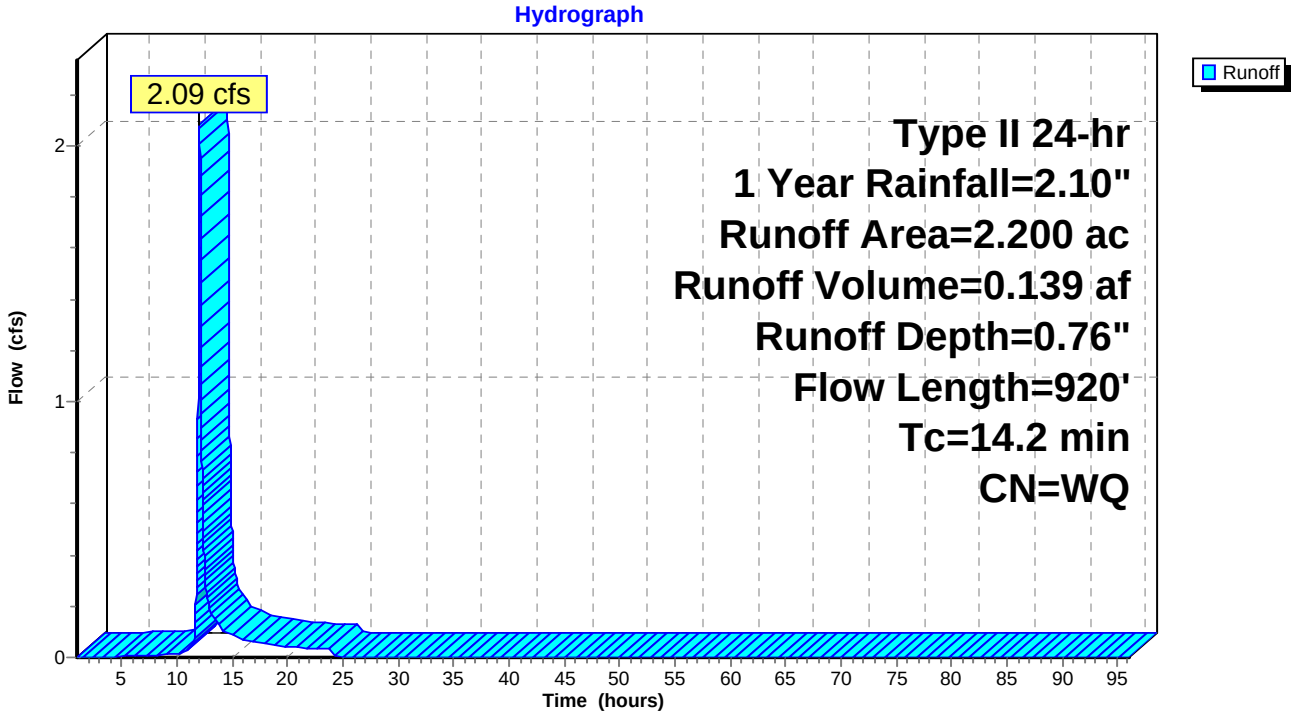
Runoff = 2.09 cfs @ 12.07 hrs, Volume= 0.139 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 Year Rainfall=2.10"

Area (ac)	CN	Description
0.240	98	Roofs, HSG D
1.960	80	>75% Grass cover, Good, HSG D
2.200		Weighted Average
1.960		89.09% Pervious Area
0.240		10.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0400	0.11		**Sheet Flow, open** Grass: Dense n= 0.240 P2= 2.30"
6.9	870	0.0170	2.10		**Shallow Concentrated Flow, grassed** Unpaved Kv= 16.1 fps
14.2	920	Total			

Subcatchment 14S: Post1A



Summary for Pond 15P: Pond1A

Inflow Area = 2.200 ac, 10.91% Impervious, Inflow Depth = 0.76" for 1 Year event
Inflow = 2.09 cfs @ 12.07 hrs, Volume= 0.139 af
Outflow = 0.13 cfs @ 13.68 hrs, Volume= 0.139 af, Atten= 94%, Lag= 96.6 min
Primary = 0.13 cfs @ 13.68 hrs, Volume= 0.139 af

Routing by Stor-Ind method, Time Span= 1.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 501.63' @ 13.68 hrs Surf.Area= 4,278 sf Storage= 3,268 cf

Plug-Flow detention time= 709.2 min calculated for 0.139 af (100% of inflow)
Center-of-Mass det. time= 708.0 min (1,552.3 - 844.4)

708 min. = 11.8 hours detention time for CPv

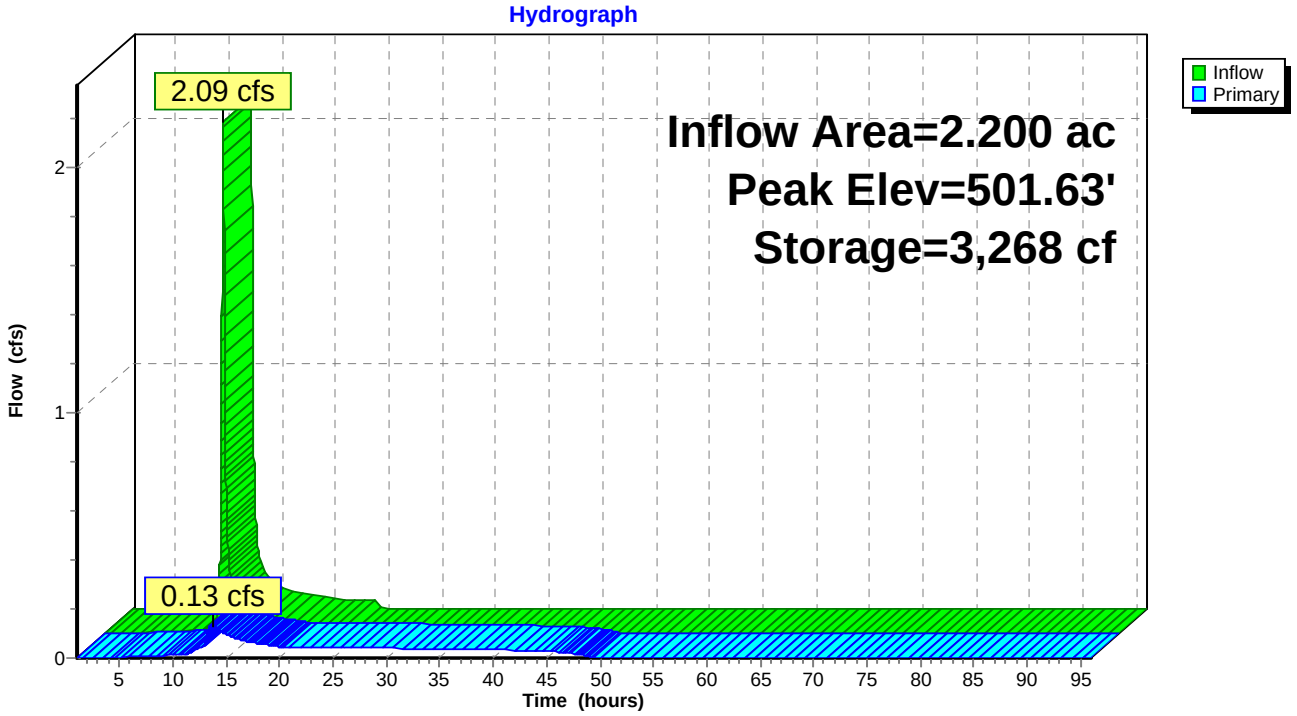
Volume	Invert	Avail.Storage	Storage Description
#1	498.75'	6,567 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
498.75	37	0	0
499.00	60	12	12
500.00	352	206	218
501.00	1,856	1,104	1,322
502.00	5,674	3,765	5,087
502.25	6,165	1,480	6,567

Device	Routing	Invert	Outlet Devices
#1	Primary	498.20'	**12.0" Round Culvert** L= 220.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 498.20' / 496.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	499.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	501.60'	**48.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.12 cfs @ 13.68 hrs HW=501.63' (Free Discharge)
└**1=Culvert** (Passes 0.12 cfs of 4.57 cfs potential flow)
  └**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 7.75 fps)
  └**3=Orifice/Grate** (Orifice Controls 0.08 cfs @ 0.60 fps)

Pond 15P: Pond1A



ALLENBROOK MEADOWS: PERMIT 2-0954


Source: USGS
Source: NASA, NGA, USGS
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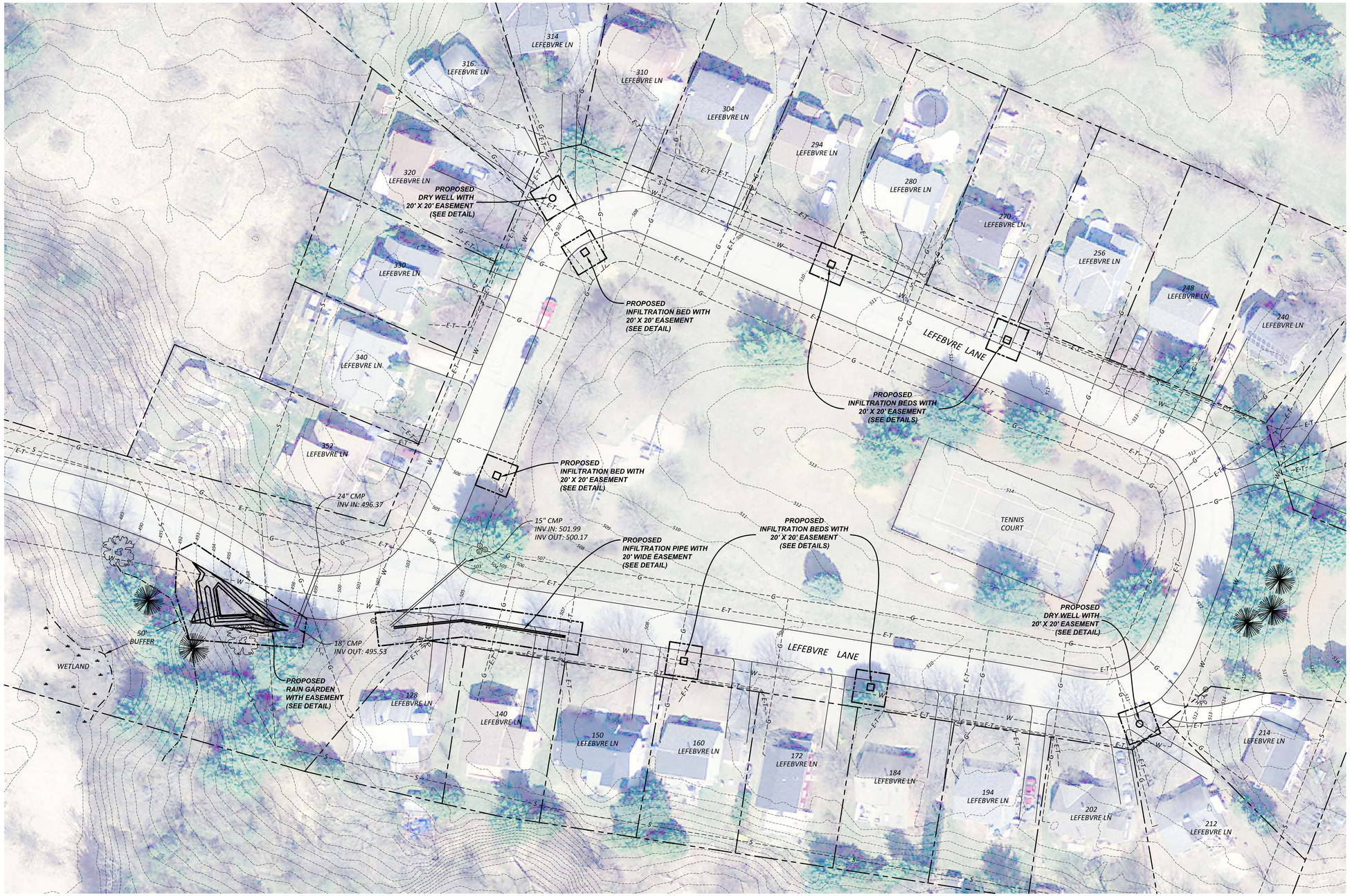


SITE LOCATION
NTS

LEGEND

- EXISTING CONTOUR
- PROPERTY BOUNDARY
- PROPOSED EASEMENT
- SANITARY SEWER LINE
- WATER LINE
- GAS LINE
- UNDERGROUND ELECTRIC/TELE
- ELECTRIC/TELE RISER
- HYDRANT

NOTES

1. THIS IS NOT A BOUNDARY SURVEY. BOUNDARY LINES ARE APPROXIMATED FROM HISTORIC PLANS AND TAX MAPS.

2. EXISTING TOPOGRAPHY AND STORMWATER INFRASTRUCTURE ELEVATIONS ARE FROM TOTAL STATION SURVEY CONDUCTED BY THIS OFFICE ON 4/24/14. SUPPLEMENTAL EXISTING TOPOGRAPHIC INFORMATION GENERATED FROM CHITTENDEN COUNTY LiDAR DATA.

3. UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE FROM VARIOUS SOURCES AND MUST BE VERIFIED PRIOR TO FINAL DESIGN AND BEGINNING CONSTRUCTION.

30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

ALLEN BROOK MEADOWS

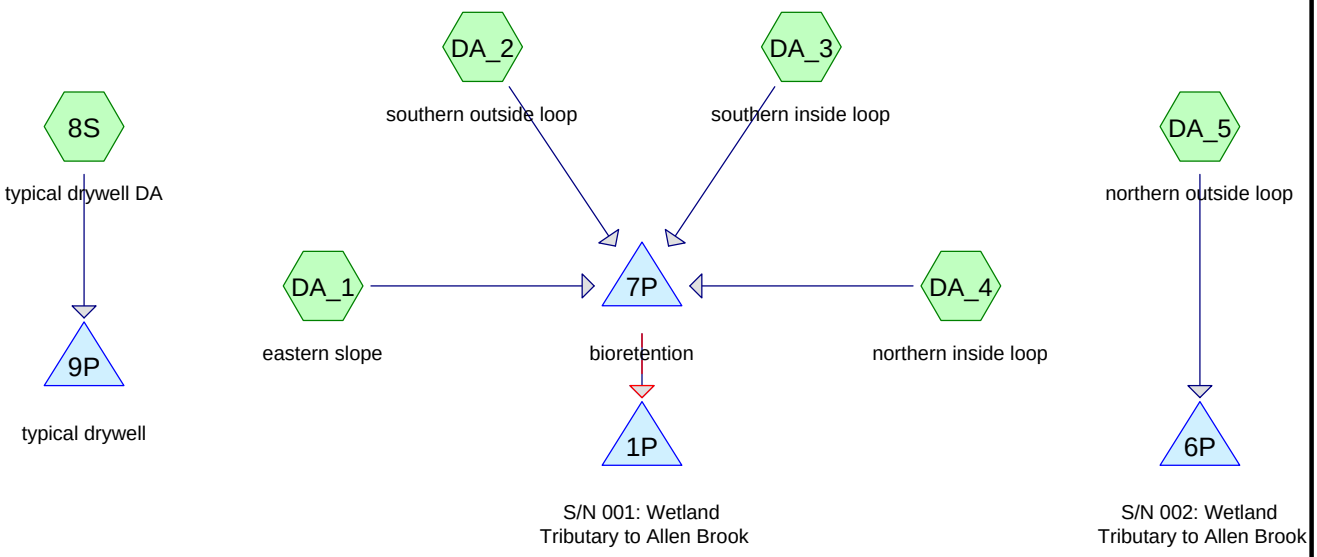
LEFEBVRE LANE - WILLISTON, VERMONT

STORMWATER IMPROVEMENTS - OVERALL SITE PLAN

VERMONT WATERSHED CONSULTING ASSOCIATES, LLC
Stormwater Management | Water Quality | Erosion Control
430 Shelburne Road P.O. Box 4413
Burlington, VT 05406
Mobile: 802.922.4871 | Main: 802.497.2367
www.watershedca.com

APPROVED BY:	AT	DRAWN BY:	SMS	SCALE:	NOTED
DATE:	4-28-16	CHECKED BY:	AT	SHEET:	1 OF 2

P:\ALLEN BROOK MEADOWS.dwg



Subcat Reach Pond Link

Routing Diagram for ABM
Prepared by Watershed Consulting Associates, LLC, Printed 10/15/2014
HydroCAD® 10.00-12 s/n 03593 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.069	98	(8S)
3.702	39	>75% Grass cover, Good, HSG A (8S, DA_1, DA_2, DA_3, DA_4, DA_5)
0.022	61	>75% Grass cover, Good, HSG B (DA_2, DA_5)
1.861	98	Paved Parking, HSG A (DA_1, DA_2, DA_3, DA_4, DA_5)
0.017	98	Paved Parking, HSG B (DA_2, DA_5)
5.671	**59**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.563	HSG A	8S, DA_1, DA_2, DA_3, DA_4, DA_5
0.039	HSG B	DA_2, DA_5
0.000	HSG C	
0.000	HSG D	
0.069	Other	8S
5.671		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.069	0.069		8S
3.702	0.022	0.000	0.000	0.000	3.724	>75% Grass cover, Good	8S, DA_1, DA_2, DA_3, DA_4, DA_5
1.861	0.017	0.000	0.000	0.000	1.878	Paved Parking	DA_1, DA_2, DA_3, DA_4, DA_5
5.563	**0.039**	**0.000**	**0.000**	**0.069**	**5.671**	**TOTAL AREA**	

Time span=0.00-200.00 hrs, dt=0.05 hrs, 4001 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 8S: typical drywell DA Runoff Area=7,000 sf 42.86% Impervious Runoff Depth=0.11"
Tc=15.0 min CN=64 Runoff=0.00 cfs 0.001 af

Subcatchment DA_1: eastern slope Runoff Area=0.652 ac 20.71% Impervious Runoff Depth=0.00"
Flow Length=227' Tc=13.8 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment DA_2: southern outside loop Runoff Area=1.296 ac 47.22% Impervious Runoff Depth=0.16"
Flow Length=606' Tc=11.5 min CN=67 Runoff=0.14 cfs 0.018 af

Subcatchment DA_3: southern inside loop Runoff Area=1.304 ac 26.61% Impervious Runoff Depth=0.01"
Flow Length=428' Tc=20.5 min CN=55 Runoff=0.00 cfs 0.001 af

Subcatchment DA_4: northern inside loop Runoff Area=0.768 ac 23.05% Impervious Runoff Depth=0.00"
Flow Length=407' Tc=37.4 min CN=53 Runoff=0.00 cfs 0.000 af

Subcatchment DA_5: northern outside loop Runoff Area=1.490 ac 40.74% Impervious Runoff Depth=0.09"
Flow Length=732' Tc=18.4 min CN=63 Runoff=0.03 cfs 0.012 af

Pond 1P: S/N 001: Wetland Tributary to Allen Brook Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond 6P: S/N 002: Wetland Tributary to Allen Brook Inflow=0.03 cfs 0.012 af
Primary=0.03 cfs 0.012 af

Pond 7P: bioretention Peak Elev=100.83' Storage=356 cf Inflow=0.14 cfs 0.019 af
Discarded=0.01 cfs 0.019 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.019 af

Pond 9P: typical drywell Peak Elev=1.80' Storage=0.000 af Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Total Runoff Area = 5.671 ac Runoff Volume = 0.033 af Average Runoff Depth = 0.07"
65.67% Pervious = 3.724 ac 34.33% Impervious = 1.947 ac

Summary for Subcatchment 8S: typical drywell DA

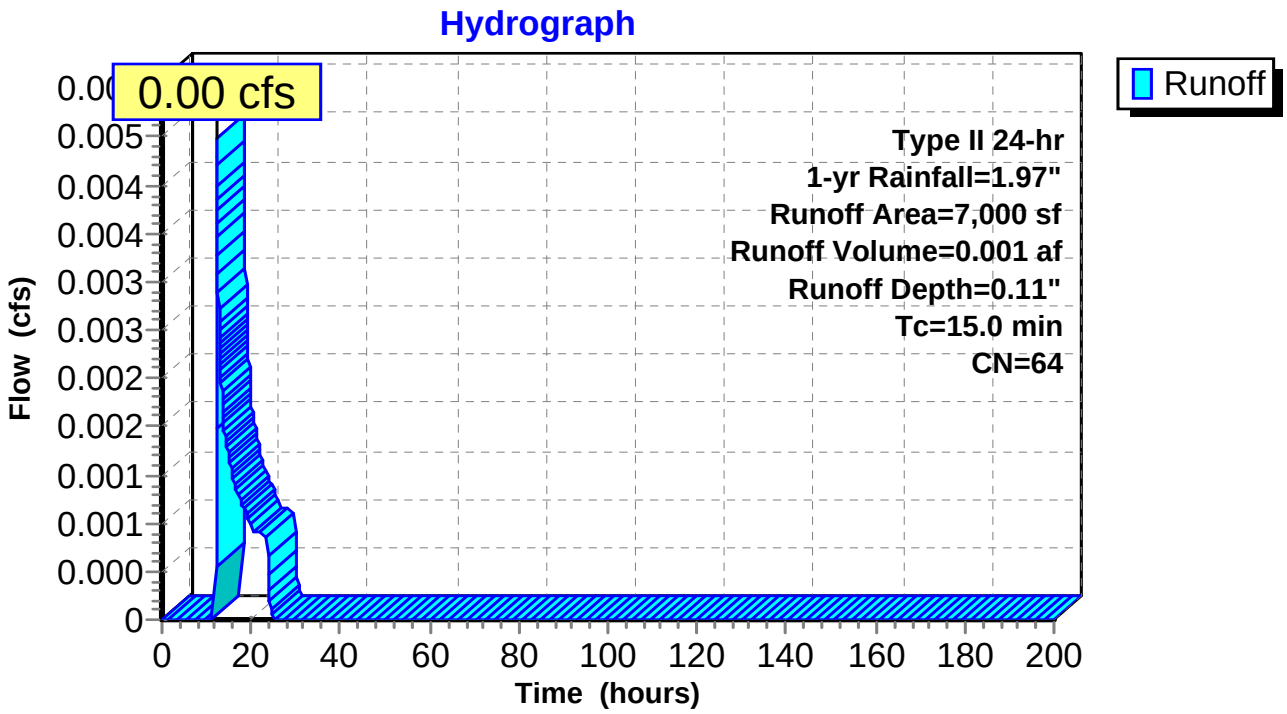
Runoff = 0.00 cfs @ 12.20 hrs, Volume= 0.001 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=1.97"

	Area (sf)	CN	Description
	4,000	39	>75% Grass cover, Good, HSG A
*	3,000	98	
	7,000	64	Weighted Average
	4,000		57.14% Pervious Area
	3,000		42.86% Impervious Area

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

Subcatchment 8S: typical drywell DA



Summary for Subcatchment DA_1: eastern slope

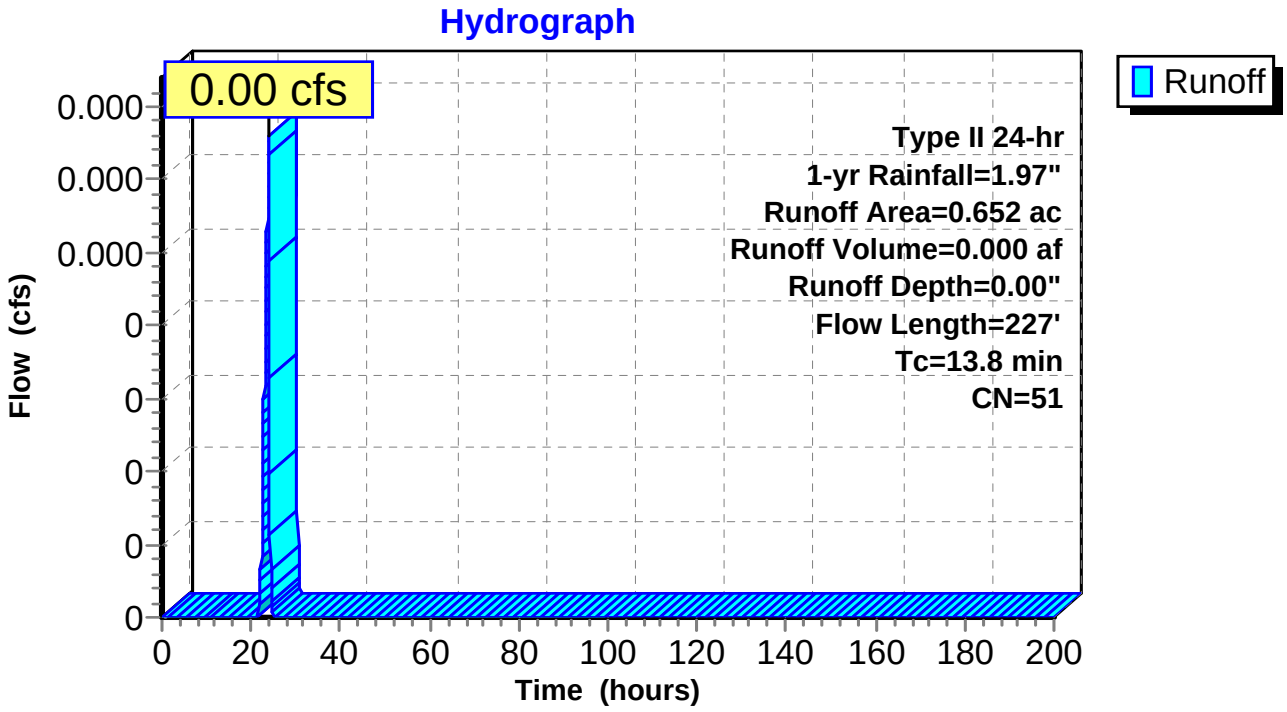
Runoff = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=1.97"

Area (ac)	CN	Description
0.517	39	>75% Grass cover, Good, HSG A
0.135	98	Paved Parking, HSG A
0.652	51	Weighted Average
0.517		79.29% Pervious Area
0.135		20.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0500	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 1.97"
1.2	127	0.0668	1.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.8	227	Total			

Subcatchment DA_1: eastern slope



Summary for Subcatchment DA_2: southern outside loop

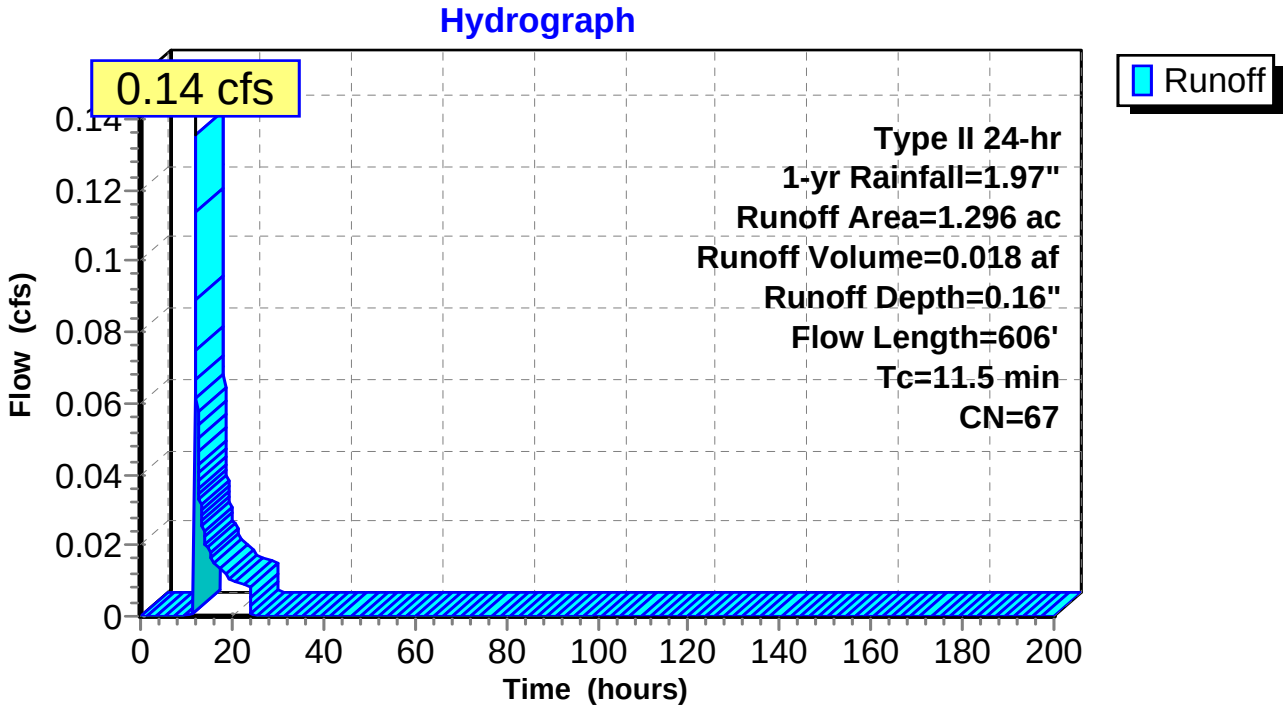
Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.018 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=1.97"

Area (ac)	CN	Description
0.665	39	>75% Grass cover, Good, HSG A
0.019	61	>75% Grass cover, Good, HSG B
0.606	98	Paved Parking, HSG A
0.006	98	Paved Parking, HSG B
1.296	67	Weighted Average
0.684		52.78% Pervious Area
0.612		47.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	62	0.0802	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 1.97"
0.2	16	0.0617	1.18		**Sheet Flow,** Smooth Surfaces n= 0.011 P2= 1.97"
0.4	21	0.0234	0.84		**Sheet Flow,** Smooth Surfaces n= 0.011 P2= 1.97"
2.8	403	0.0137	2.37		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	103	0.0680	1.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	606	Total			

Subcatchment DA_2: southern outside loop



Summary for Subcatchment DA_3: southern inside loop

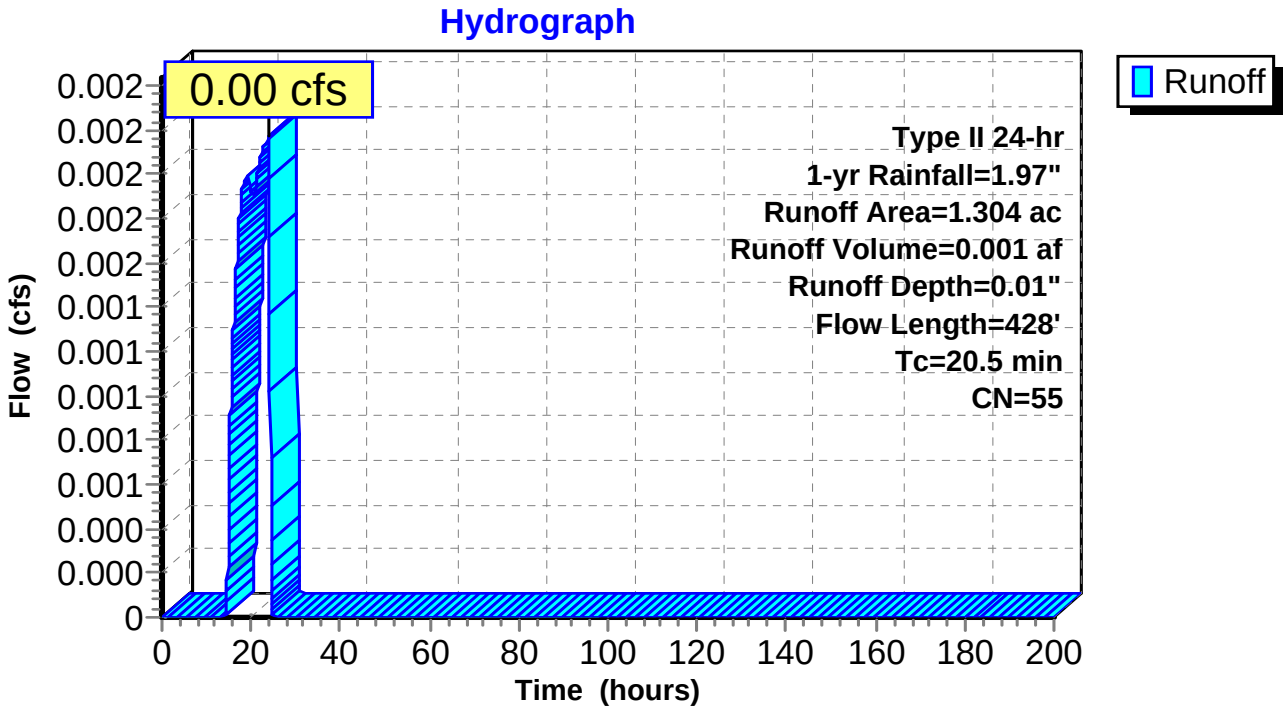
Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=1.97"

Area (ac)	CN	Description
0.957	39	>75% Grass cover, Good, HSG A
0.347	98	Paved Parking, HSG A
1.304	55	Weighted Average
0.957		73.39% Pervious Area
0.347		26.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	100	0.0300	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 1.97"
5.0	328	0.0244	1.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.5	428	Total			

Subcatchment DA_3: southern inside loop



Summary for Subcatchment DA_4: northern inside loop

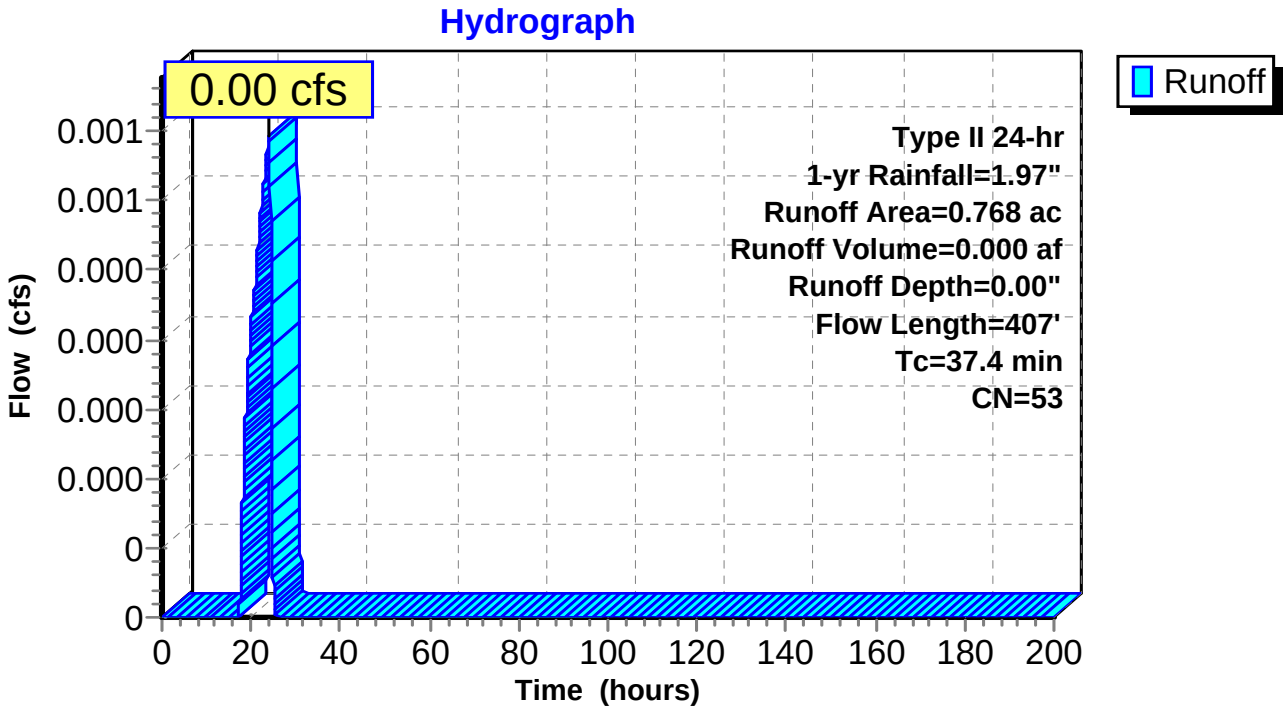
Runoff = 0.00 cfs @ 24.07 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=1.97"

Area (ac)	CN	Description
0.591	39	>75% Grass cover, Good, HSG A
0.177	98	Paved Parking, HSG A
0.768	53	Weighted Average
0.591		76.95% Pervious Area
0.177		23.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7	100	0.0050	0.05		**Sheet Flow,** Grass: Dense n= 0.240 P2= 1.97"
5.7	307	0.0163	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
37.4	407	Total			

Subcatchment DA_4: northern inside loop



Summary for Subcatchment DA_5: northern outside loop

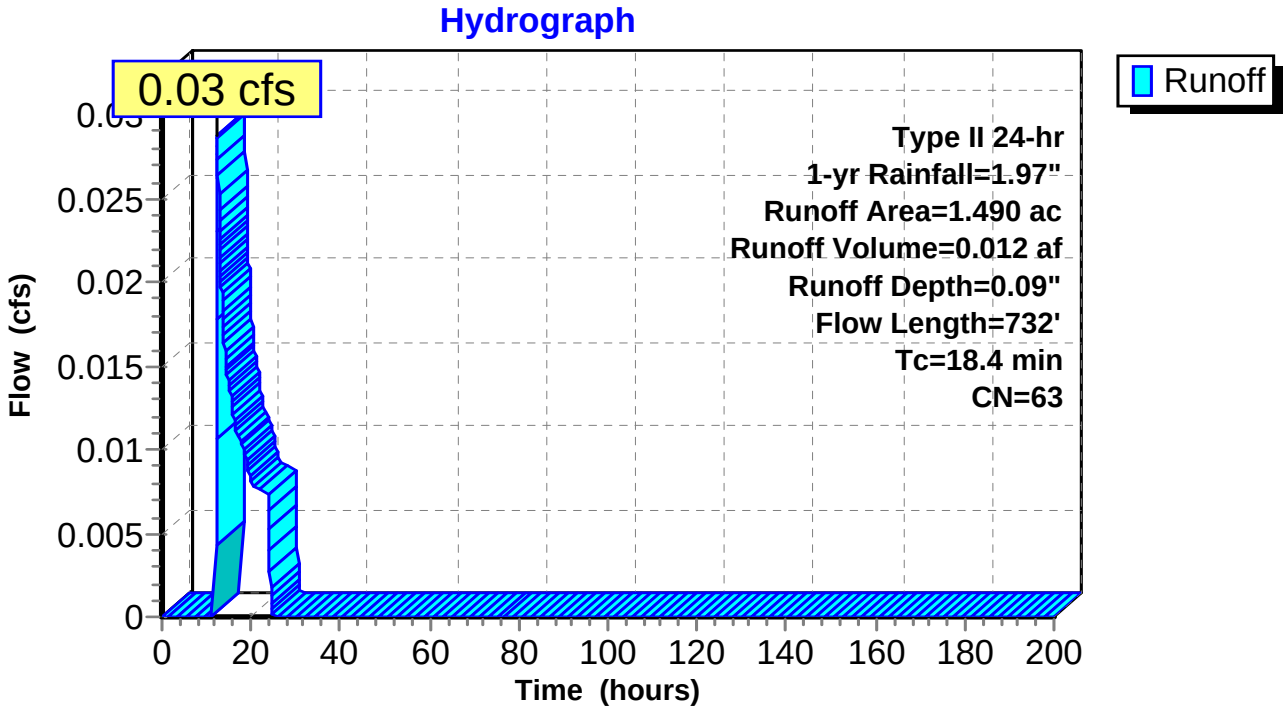
Runoff = 0.03 cfs @ 12.45 hrs, Volume= 0.012 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=1.97"

Area (ac)	CN	Description
0.880	39	>75% Grass cover, Good, HSG A
0.003	61	>75% Grass cover, Good, HSG B
0.596	98	Paved Parking, HSG A
0.011	98	Paved Parking, HSG B
1.490	63	Weighted Average
0.883		59.26% Pervious Area
0.607		40.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0500	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 1.97"
2.2	181	0.0386	1.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	400	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	50	0.0198	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.4	732	Total			

Subcatchment DA_5: northern outside loop



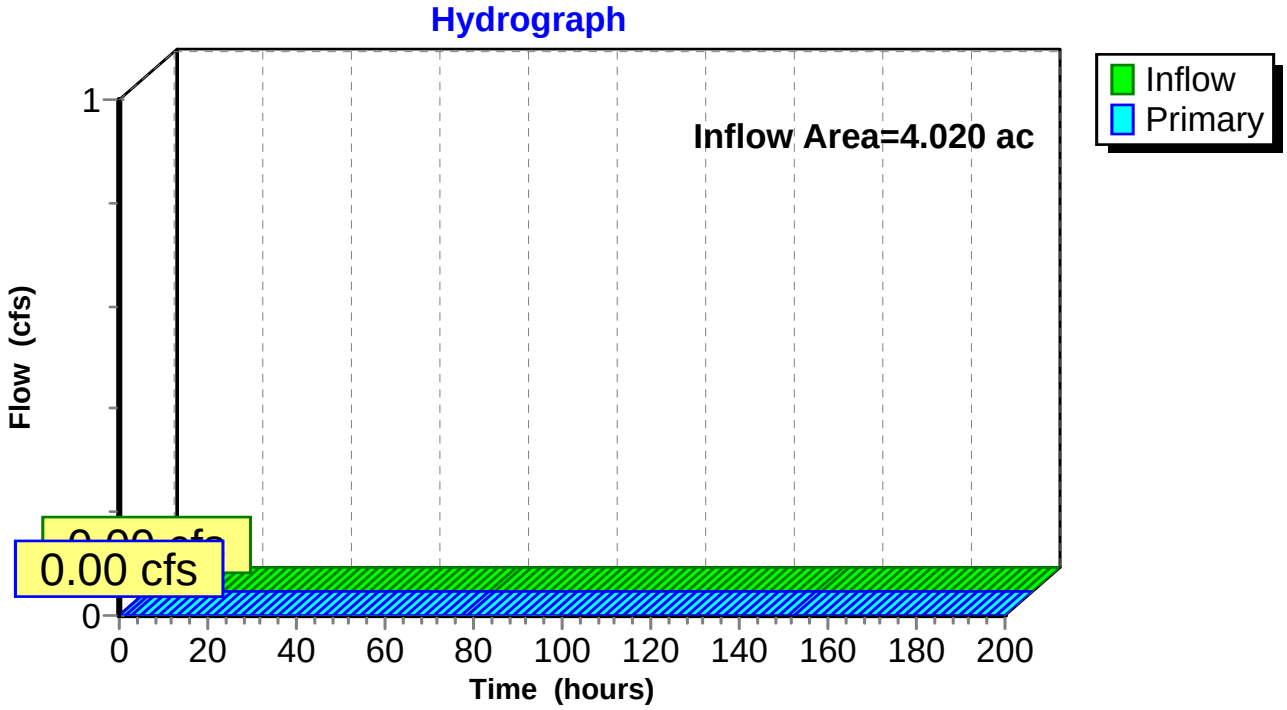
Summary for Pond 1P: S/N 001: Wetland Tributary to Allen Brook

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.020 ac, 31.62% Impervious, Inflow Depth = 0.00" for 1-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs / 2

Pond 1P: S/N 001: Wetland Tributary to Allen Brook



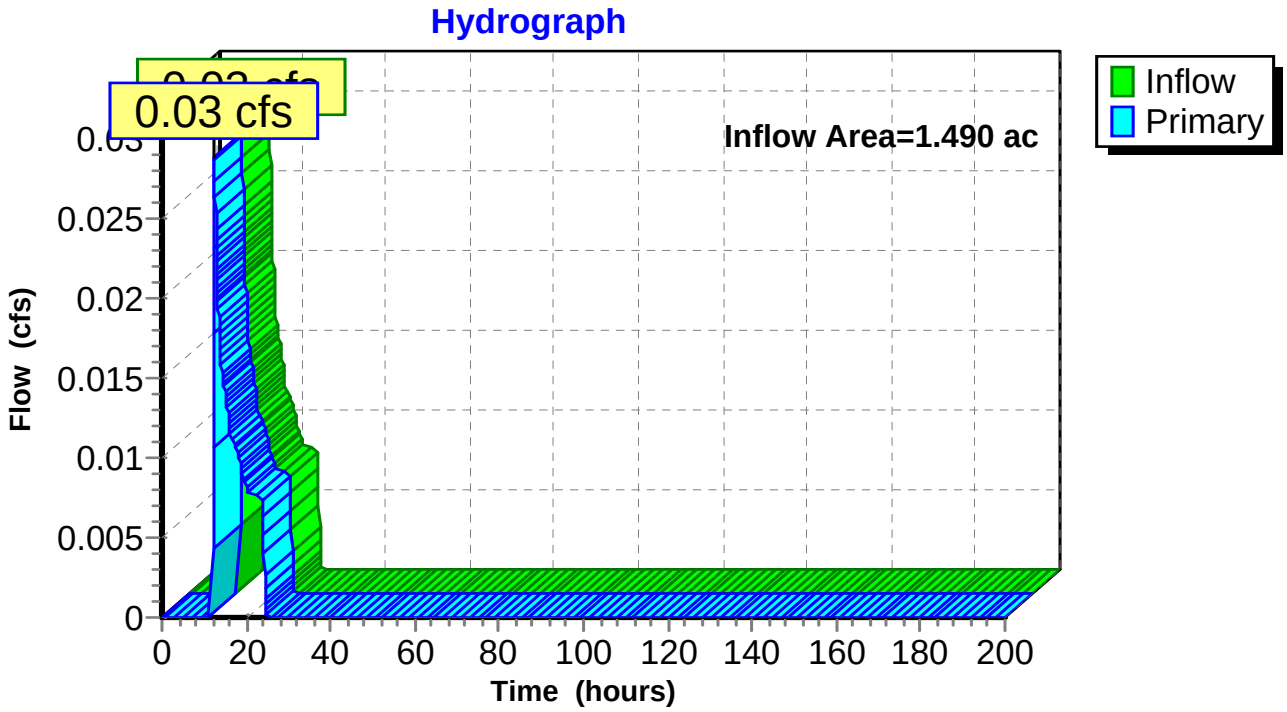
Summary for Pond 6P: S/N 002: Wetland Tributary to Allen Brook

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.490 ac, 40.74% Impervious, Inflow Depth = 0.09" for 1-yr event
Inflow = 0.03 cfs @ 12.45 hrs, Volume= 0.012 af
Primary = 0.03 cfs @ 12.45 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs / 2

Pond 6P: S/N 002: Wetland Tributary to Allen Brook



Summary for Pond 7P: bioretention

Inflow Area = 4.020 ac, 31.62% Impervious, Inflow Depth = 0.06" for 1-yr event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.019 af
Outflow = 0.01 cfs @ 20.04 hrs, Volume= 0.019 af, Atten= 91%, Lag= 477.0 min
Discarded = 0.01 cfs @ 20.04 hrs, Volume= 0.019 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 100.83' @ 20.04 hrs Surf.Area= 519 sf Storage= 356 cf

Plug-Flow detention time= 417.9 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 418.0 min (1,398.0 - 980.1)

Volume	Invert	Avail.Storage	Storage Description
#1	98.00'	144 cf	**12.00'W x 15.00'L x 2.00'H Prismatoid** 360 cf Overall x 40.0% Voids
#2	100.00'	493 cf	**12.00'W x 15.00'L x 1.50'H Prismatoid Z=3.0**
		637 cf	Total Available Storage

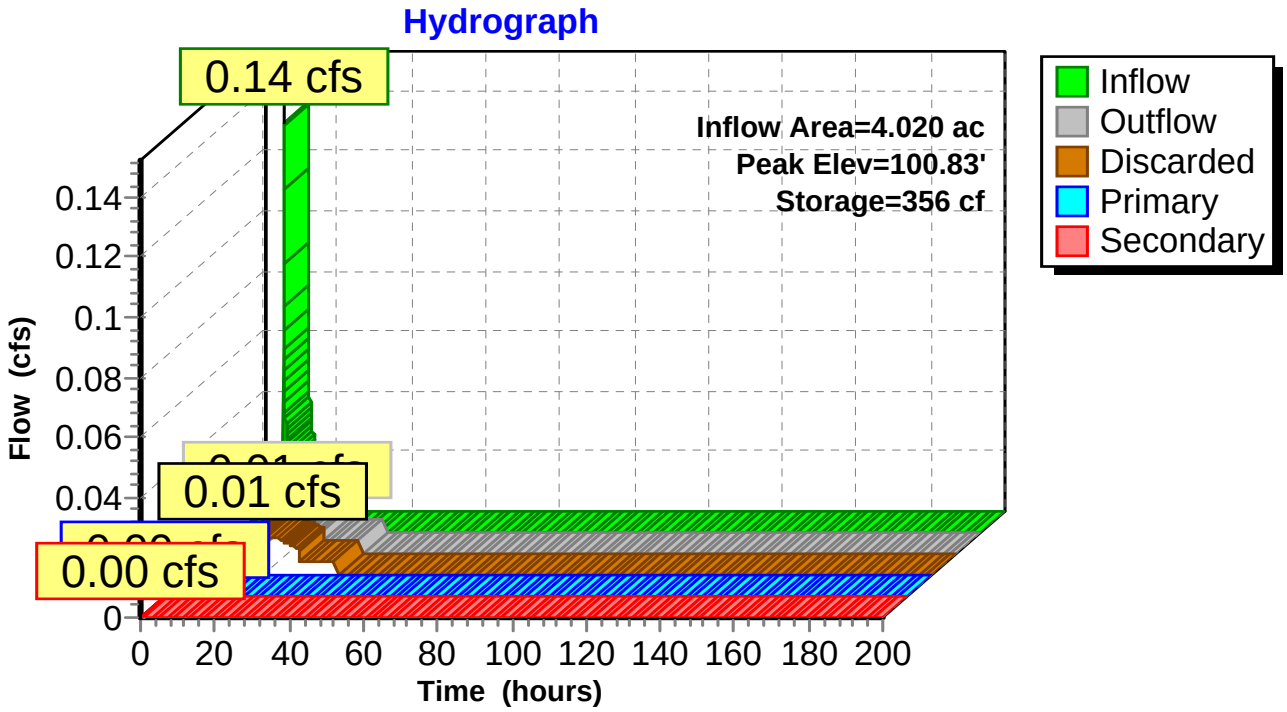
Device	Routing	Invert	Outlet Devices
#1	Primary	101.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	98.00'	**1.000 in/hr Exfiltration over Surface area**
#3	Secondary	101.20'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 20.04 hrs HW=100.83' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.00' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.00' TW=0.00' (Dynamic Tailwater)
└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: bioretention



Summary for Pond 9P: typical drywell

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=42)

Inflow Area = 0.161 ac, 42.86% Impervious, Inflow Depth = 0.11" for 1-yr event
Inflow = 0.00 cfs @ 12.20 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 12.10 hrs, Volume= 0.001 af, Atten= 65%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 1.80' @ 14.74 hrs Surf.Area= 0.000 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 46.3 min (1,039.7 - 993.4)

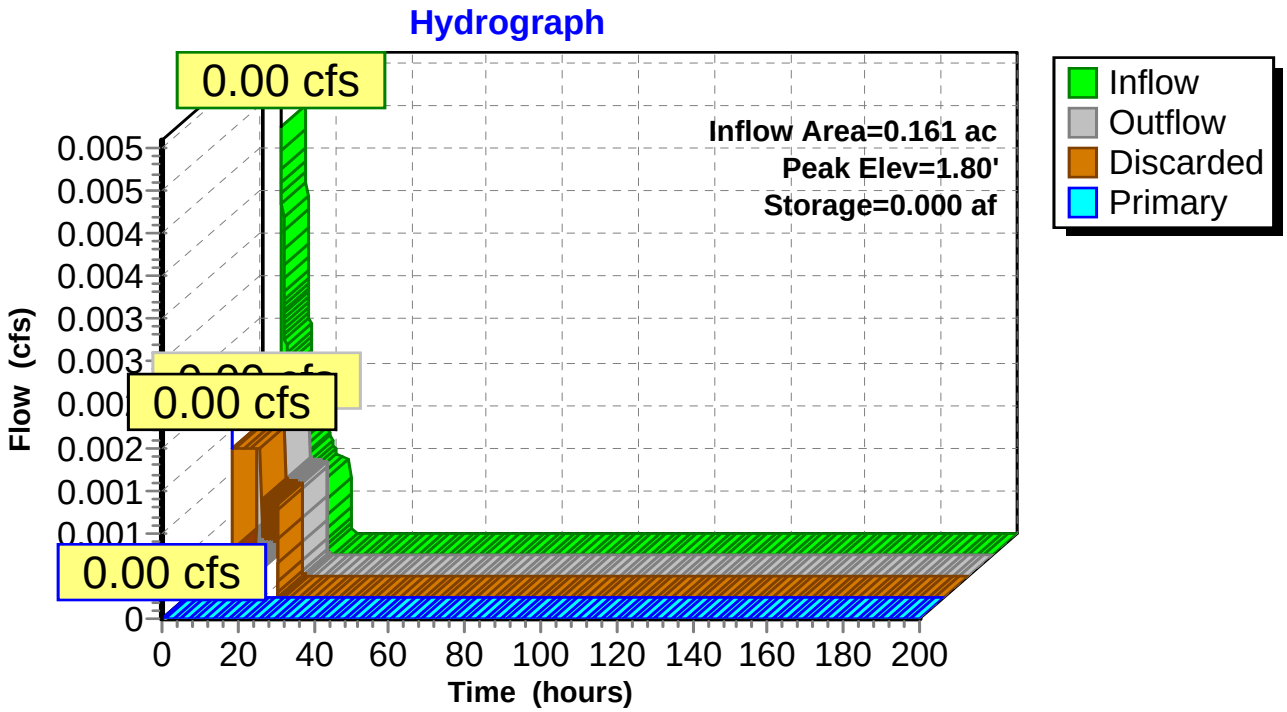
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.000 af	**4.00'D x 4.00'H Vertical Cone/Cylinder** 0.001 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**6.000 in/hr Exfiltration over Surface area**
#2	Primary	4.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=0.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

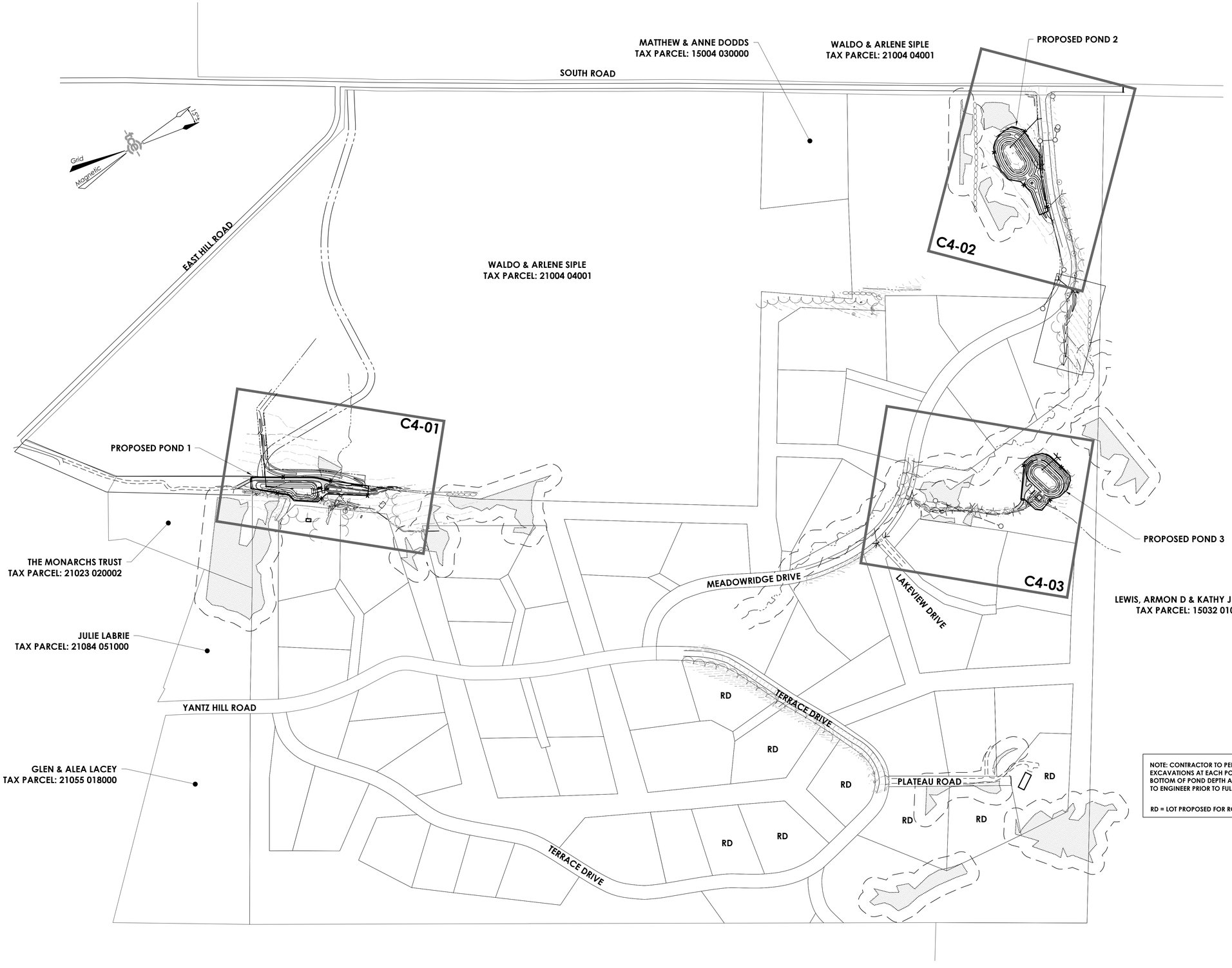
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

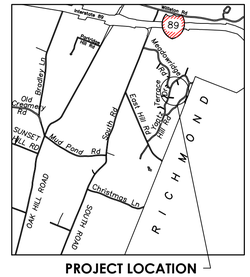
Pond 9P: typical drywell



MEADOW RIDGE: PERMIT 2-1107


Source: USGS
Source: NASA, NGA, USGS
© 2008 Microsoft Corp.
215m
esri





PROJECT LOCATION

TAX PARCEL: COM.050,E
COM.050,F

Project Reference:

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
802 879 6331 | WWW.TCEVT.COM

Revisions

No.	Description	Date	By
1	Application Submissions	02/29/16	JMM

Use of These Drawings

1. Unless otherwise noted, these Drawings are intended for preliminary planning, coordination with other disciplines or utilities, and/or approval from the regulatory authorities. They are not intended as construction drawings unless noted as such or marked approved by a regulatory authority.

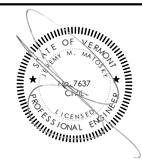
2. By use of these drawings for construction of the Project, the Owner represents that they have reviewed, approved, and accepted the drawings, obtained all necessary permits, and have met with all applicable parties/disciplines, including but not limited to, the Engineer and the Architect, to insure these plans are properly coordinated including, but not limited to, contract documents, specifications, owner/contractor agreements, building and mechanical plans, private and public utilities, and other pertinent permits for construction.

3. Owner and Architect, are responsible for final design and location of buildings shown, including an area measured a minimum five (5) feet around any building and coordinating final utility connections shown on these plans.

4. Prior to using these plans for construction layout, the user shall contact TCE to ensure the plan contains the most current revisions.

5. These Drawings are specific to the Project and are not transferable. As instruments of service, these drawings, and copies thereof, furnished by TCE are its exclusive property. Changes to the drawings may only be made by TCE. If errors or omissions are discovered, they shall be brought to the attention of TCE immediately.

6. It is the User's responsibility to ensure this copy contains the most current revisions. If unsure, please contact TCE.



Project Title

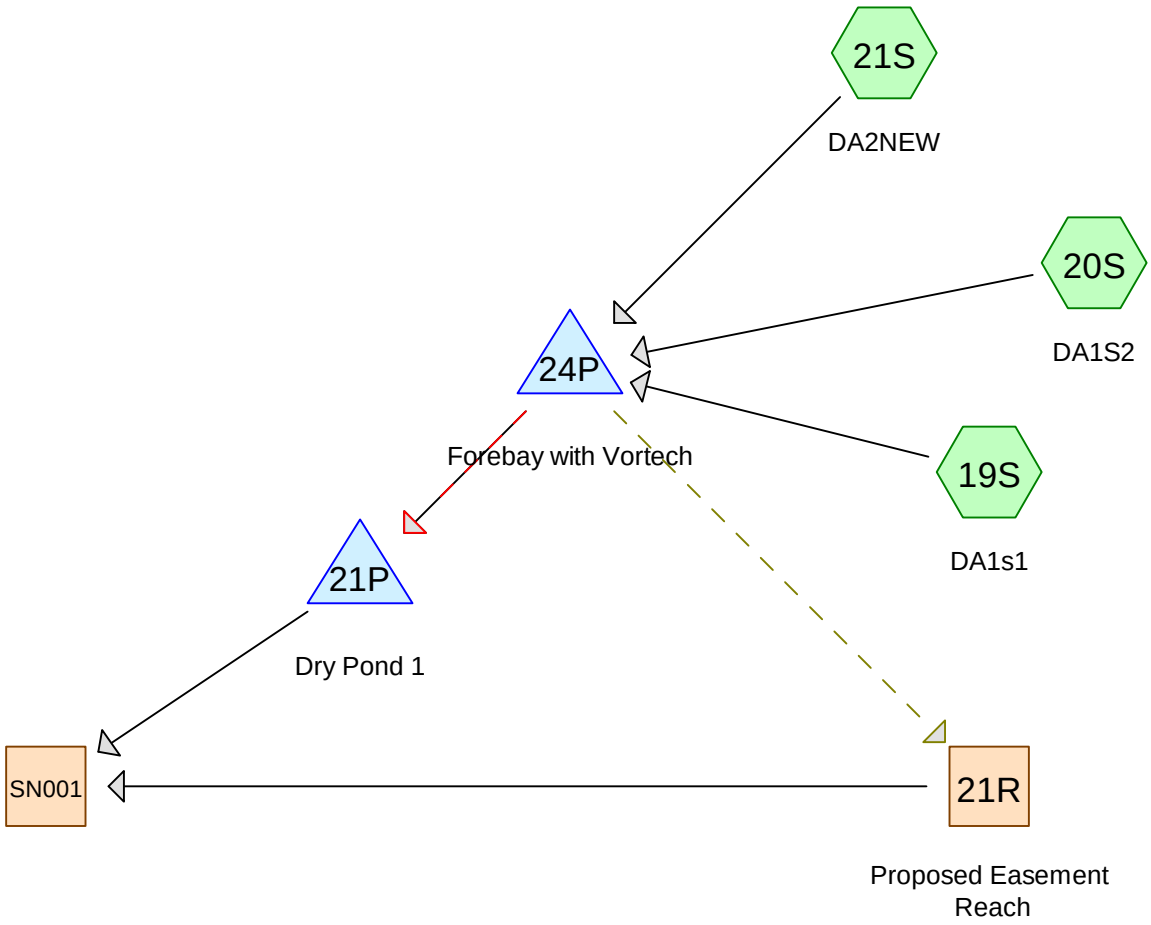
Meadowridge Community Association
Williston, Vermont

Sheet Title

Overall Site Plan

Date:	12/16/15
Scale:	1" = 200'
Project Number:	14-129
Drawn By:	NPC
Project Engineer:	JMM
Approved By:	
Field Book:	306

C2-01



Subcat Reach Pond Link

Routing Diagram for 14-129 - 2016 Model
Prepared by Microsoft, Printed 4/29/2016

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.920	74.0	>75% Grass cover, Good, HSG C (19S, 20S, 21S)
4.070	80.0	>75% Grass cover, Good, HSG D (19S, 20S, 21S)
4.430	98.0	Paved parking, HSG C (19S, 20S, 21S)
4.280	98.0	Paved parking, HSG D (19S, 20S, 21S)
30.040	70.0	Woods, Good, HSG C (19S, 20S, 21S)
31.690	77.0	Woods, Good, HSG D (19S, 20S, 21S)
78.430	**76.7**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
38.390	HSG C	19S, 20S, 21S
40.040	HSG D	19S, 20S, 21S
0.000	Other	
78.430		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	3.920	4.070	0.000	7.990	>75% Grass cover, Good	19S, 20S, 21S
0.000	0.000	4.430	4.280	0.000	8.710	Paved parking	19S, 20S, 21S
0.000	0.000	30.040	31.690	0.000	61.730	Woods, Good	19S, 20S, 21S
0.000	**0.000**	**38.390**	**40.040**	**0.000**	**78.430**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	21P	752.00	750.00	30.0	0.0667	0.013	36.0	0.0	0.0
2	24P	755.20	754.58	25.0	0.0248	0.013	12.0	0.0	0.0
3	24P	756.00	755.20	32.0	0.0250	0.013	12.0	0.0	0.0
4	24P	755.30	755.00	60.0	0.0050	0.013	36.0	0.0	0.0

Time span=0.00-500.00 hrs, dt=0.01 hrs, 50001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 19S: DA1s1 Runoff Area=4.610 ac 18.00% Impervious Runoff Depth=0.71"
Flow Length=1,250' Tc=30.4 min CN=79.5 Runoff=2.45 cfs 0.274 af

Subcatchment 20S: DA1S2 Runoff Area=52.650 ac 10.83% Impervious Runoff Depth=0.58"
Flow Length=3,575' Tc=46.9 min CN=77.0 Runoff=16.15 cfs 2.547 af

Subcatchment 21S: DA2NEW Runoff Area=21.170 ac 10.30% Impervious Runoff Depth=0.51"
Flow Length=2,425' Tc=49.1 min CN=75.1 Runoff=5.34 cfs 0.908 af

Reach 21R: Proposed Easement Reach Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.120 L=600.0' S=0.0100 '/' Capacity=110.62 cfs Outflow=0.00 cfs 0.000 af

Reach SN001: Inflow=17.75 cfs 3.728 af
Outflow=17.75 cfs 3.728 af

Pond 21P: Dry Pond 1 Peak Elev=759.57' Storage=40,497 cf Inflow=22.80 cfs 3.728 af
Outflow=17.75 cfs 3.728 af

Pond 24P: Forebay with Vortech Peak Elev=760.15' Storage=10,693 cf Inflow=23.14 cfs 3.729 af
Primary=5.69 cfs 2.274 af Secondary=18.89 cfs 1.453 af Tertiary=0.00 cfs 0.000 af Outflow=22.80 cfs 3.728 af

Total Runoff Area = 78.430 ac Runoff Volume = 3.729 af Average Runoff Depth = 0.57"
88.89% Pervious = 69.720 ac 11.11% Impervious = 8.710 ac

Summary for Subcatchment 19S: DA1s1

Runoff = 2.45 cfs @ 12.26 hrs, Volume= 0.274 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

Area (ac)	CN	Description
0.140	98.0	Paved parking, HSG C
1.060	70.0	Woods, Good, HSG C
0.220	74.0	>75% Grass cover, Good, HSG C
0.690	98.0	Paved parking, HSG D
1.760	77.0	Woods, Good, HSG D
0.740	80.0	>75% Grass cover, Good, HSG D
4.610	79.5	Weighted Average
3.780		82.00% Pervious Area
0.830		18.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.2000	0.09		**Sheet Flow, 0 - 100' Woods** Woods: Dense underbrush n= 0.800 P2= 2.30"
12.8	1,150	0.0900	1.50		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
30.4	1,250	Total			

Summary for Subcatchment 20S: DA1S2

Runoff = 16.15 cfs @ 12.46 hrs, Volume= 2.547 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

Area (ac)	CN	Description
2.830	98.0	Paved parking, HSG C
17.170	70.0	Woods, Good, HSG C
2.240	74.0	>75% Grass cover, Good, HSG C
2.870	98.0	Paved parking, HSG D
24.690	77.0	Woods, Good, HSG D
2.850	80.0	>75% Grass cover, Good, HSG D
52.650	77.0	Weighted Average
46.950		89.17% Pervious Area
5.700		10.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.6	100	0.0500	0.05		**Sheet Flow, 0 - 100' Woods**
					Woods: Dense underbrush n= 0.800 P2= 2.30"
11.3	1,265	0.1400	1.87		**Shallow Concentrated Flow, Woods**
					Woodland Kv= 5.0 fps
1.7	760	0.0530	7.34	117.40	**Channel Flow, Grass swale**
					Area= 16.0 sf Perim= 31.0' r= 0.52'
					n= 0.030 Earth, grassed & winding
3.2	1,400	0.0960	7.41	118.50	**Channel Flow, Rocky swale**
					Area= 16.0 sf Perim= 31.0' r= 0.52'
					n= 0.040 Earth, cobble bottom, clean sides
0.1	50	0.0500	7.13	114.03	**Channel Flow, Grass swale to pond**
					Area= 16.0 sf Perim= 31.0' r= 0.52'
					n= 0.030 Earth, grassed & winding
46.9	3,575	Total			

Summary for Subcatchment 21S: DA2NEW

Runoff = 5.34 cfs @ 12.50 hrs, Volume= 0.908 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.460	98.0	Paved parking, HSG C
*	11.810	70.0	Woods, Good, HSG C
*	1.460	74.0	>75% Grass cover, Good, HSG C
*	0.720	98.0	Paved parking, HSG D
*	5.240	77.0	Woods, Good, HSG D
*	0.480	80.0	>75% Grass cover, Good, HSG D
	21.170	75.1	Weighted Average
	18.990		89.70% Pervious Area
	2.180		10.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.6	100	0.0500	0.05		**Sheet Flow, Woods Sheet Flow**
					Woods: Dense underbrush n= 0.800 P2= 2.30"
15.5	1,525	0.1080	1.64		**Shallow Concentrated Flow, Woods Shallow Concentrated**
					Woodland Kv= 5.0 fps
3.0	800	0.0190	4.39	70.29	**Channel Flow, Channel Flow to Pond**
					Area= 16.0 sf Perim= 31.0' r= 0.52'
					n= 0.030 Stream, clean & straight
49.1	2,425	Total			

Summary for Reach 21R: Proposed Easement Reach

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.50' Flow Area= 52.5 sf, Capacity= 110.62 cfs

8.00' x 3.50' deep channel, n= 0.120 Earth, long dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 22.00'
Length= 600.0' Slope= 0.0100 '/'
Inlet Invert= 755.00', Outlet Invert= 749.00'

Summary for Reach SN001:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 78.430 ac, 11.11% Impervious, Inflow Depth = 0.57" for 1-year event
Inflow = 17.75 cfs @ 12.78 hrs, Volume= 3.728 af
Outflow = 17.75 cfs @ 12.78 hrs, Volume= 3.728 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs

Summary for Pond 21P: Dry Pond 1

Inflow Area = 78.430 ac, 11.11% Impervious, Inflow Depth = 0.57" for 1-year event
Inflow = 22.80 cfs @ 12.50 hrs, Volume= 3.728 af
Outflow = 17.75 cfs @ 12.78 hrs, Volume= 3.728 af, Atten= 22%, Lag= 17.1 min
Primary = 17.75 cfs @ 12.78 hrs, Volume= 3.728 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Peak Elev= 759.57' @ 12.78 hrs Surf.Area= 13,337 sf Storage= 40,497 cf

Plug-Flow detention time= 738.8 min calculated for 3.728 af (100% of inflow)
Center-of-Mass det. time= 738.5 min (1,739.3 - 1,000.7)

Volume	Invert	Avail.Storage	Storage Description
#1	754.00'	62,321 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
754.00	2,281	0	0
756.00	5,381	7,662	7,662
758.00	9,528	14,909	22,571
760.00	14,387	23,915	46,486
761.00	17,282	15,835	62,321

Device	Routing	Invert	Outlet Devices
#1	Primary	752.00'	**36.0" Round Culvert** L= 30.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 752.00' / 750.00' S= 0.0667 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#2	Device 1	754.00'	**1.6" Vert. Orifice/Grate** C= 0.600
#3	Device 1	759.00'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=17.74 cfs @ 12.78 hrs HW=759.57' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 17.74 cfs of 73.98 cfs potential flow)
├**2=Orifice/Grate** (Orifice Controls 0.16 cfs @ 11.29 fps)
└**3=Orifice/Grate** (Weir Controls 17.58 cfs @ 2.46 fps)

Summary for Pond 24P: Forebay with Vortech

Inflow Area = 78.430 ac, 11.11% Impervious, Inflow Depth = 0.57" for 1-year event
Inflow = 23.14 cfs @ 12.46 hrs, Volume= 3.729 af
Outflow = 22.80 cfs @ 12.50 hrs, Volume= 3.728 af, Atten= 1%, Lag= 2.3 min
Primary = 5.69 cfs @ 12.30 hrs, Volume= 2.274 af
Secondary = 18.89 cfs @ 12.57 hrs, Volume= 1.453 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Peak Elev= 760.15' @ 12.57 hrs Surf.Area= 4,631 sf Storage= 10,693 cf

Plug-Flow detention time= 120.9 min calculated for 3.727 af (100% of inflow)
Center-of-Mass det. time= 120.8 min (1,000.7 - 879.9)

Volume	Invert	Avail.Storage	Storage Description
#1	755.20'	370 cf	**7.00'W x 11.00'L x 4.80'H Vortechs 5000**
#2	756.00'	19,875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		20,245 cf	Total Available Storage

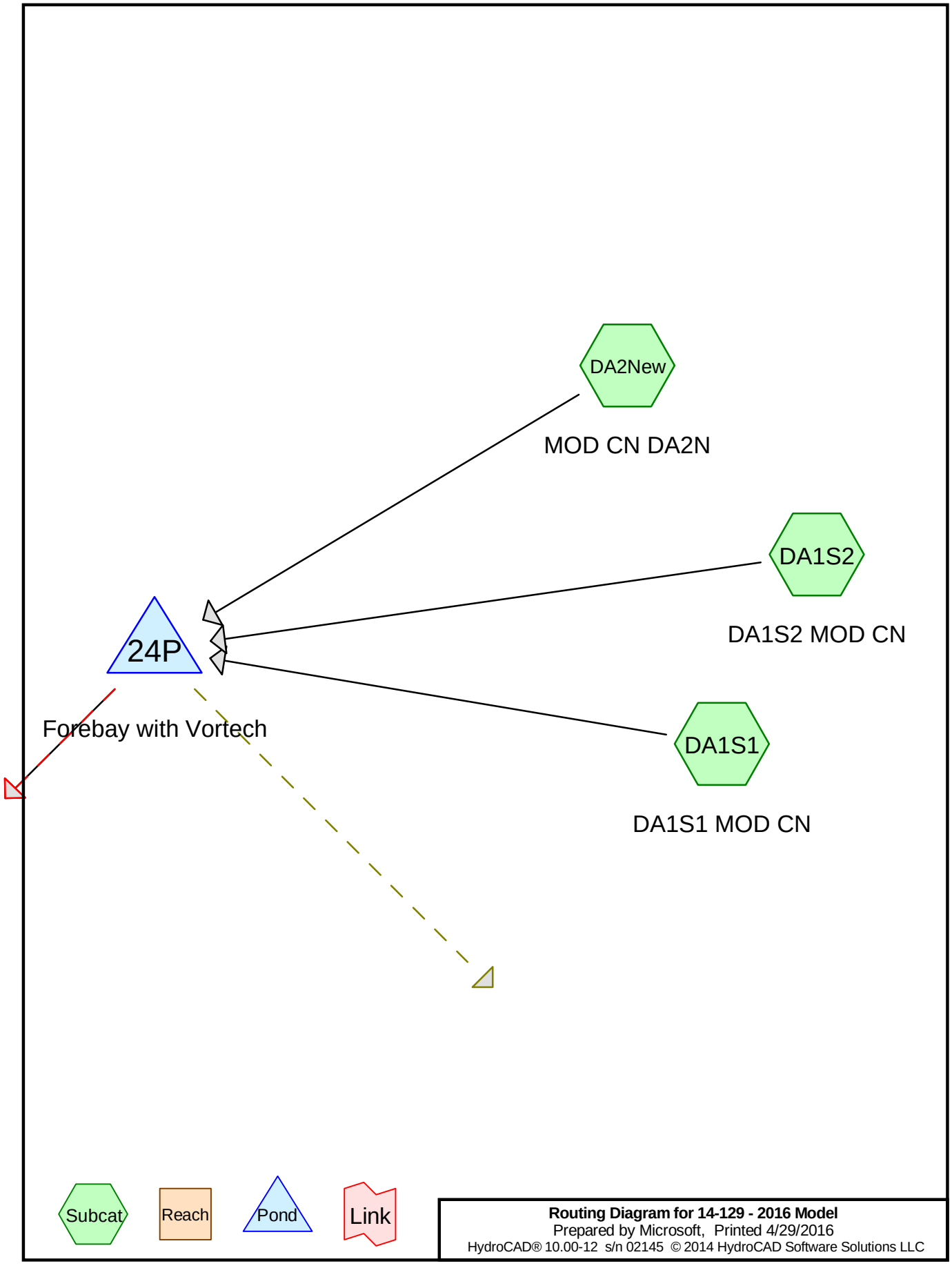
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
756.00	1,500	0	0
758.00	2,100	3,600	3,600
760.00	4,000	6,100	9,700
761.00	7,800	5,900	15,600
761.50	9,300	4,275	19,875

Device	Routing	Invert	Outlet Devices
#1	Primary	755.20'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 755.20' / 754.58' S= 0.0248 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	755.28'	**Vortechs Control Wall, Cv= 3.37 (C= 4.21)** Head (feet) 0.00 0.42 0.42 1.09 1.09 2.16 2.16 Width (feet) 0.83 1.04 0.00 0.00 0.50 1.58 0.00
#3	Device 2	756.00'	**12.0" Round Culvert** L= 32.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 756.00' / 755.20' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Secondary	755.30'	**36.0" Round Culvert** L= 60.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 755.30' / 755.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#5	Device 4	759.55'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Tertiary	760.33'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.63 cfs @ 12.30 hrs HW=759.88' TW=757.04' (Dynamic Tailwater)
↑**1=Culvert** (Passes 5.63 cfs of 6.38 cfs potential flow)
↑**2=Vortechs Control Wall** (Passes 5.63 cfs of 15.82 cfs potential flow)
↑**3=Culvert** (Inlet Controls 5.63 cfs @ 7.17 fps)

Secondary OutFlow Max=18.89 cfs @ 12.57 hrs HW=760.15' TW=759.09' (Dynamic Tailwater)
↑**4=Culvert** (Passes 18.89 cfs of 30.89 cfs potential flow)
↑**5=Orifice/Grate** (Weir Controls 18.89 cfs @ 2.52 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=755.20' TW=755.00' (Dynamic Tailwater)
↑**6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)


DA2New
MOD CN DA2N
DA1S2
DA1S2 MOD CN
24P
Forebay with Vortech
DA1S1
DA1S1 MOD CN
Subcat
Reach
Pond
Link
Routing Diagram for 14-129 - 2016 Model
Prepared by Microsoft, Printed 4/29/2016
HydroCAD® 10.00-12 s/n 02145 © 2014 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
21.170	88.0	(DA2New)
57.260	88.0	modified curve number (DA1S1, DA1S2)
78.430	**88.0**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
78.430	Other	DA1S1, DA1S2, DA2New
78.430		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	21.170	21.170		DA2New
0.000	0.000	0.000	0.000	57.260	57.260	modified curve number	DA1S1, DA1S2
0.000	**0.000**	**0.000**	**0.000**	**78.430**	**78.430**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	24P	755.20	754.58	25.0	0.0248	0.013	12.0	0.0	0.0
2	24P	756.00	755.20	32.0	0.0250	0.013	12.0	0.0	0.0
3	24P	755.30	755.00	60.0	0.0050	0.013	36.0	0.0	0.0

Time span=0.00-500.00 hrs, dt=0.01 hrs, 50001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA1S1: DA1S1 MOD CN Runoff Area=4.610 ac 0.00% Impervious Runoff Depth=0.20"
Flow Length=1,250' Tc=30.4 min CN=88.0 Runoff=0.64 cfs 0.076 af

Subcatchment DA1S2: DA1S2 MOD CN Runoff Area=52.650 ac 0.00% Impervious Runoff Depth=0.20"
Flow Length=3,575' Tc=46.9 min CN=88.0 Runoff=5.35 cfs 0.867 af

Subcatchment DA2New: MOD CN DA2N Runoff Area=21.170 ac 0.00% Impervious Runoff Depth=0.20"
Flow Length=2,425' Tc=49.1 min CN=88.0 Runoff=2.08 cfs 0.349 af

Pond 24P: Forebay with Vortech Peak Elev=759.18' Storage=7,030 cf Inflow=7.84 cfs 1.292 af
Primary=5.46 cfs 1.290 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=5.46 cfs 1.290 af

Total Runoff Area = 78.430 ac Runoff Volume = 1.292 af Average Runoff Depth = 0.20"
100.00% Pervious = 78.430 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment DA1S1: DA1S1 MOD CN

Runoff = 0.64 cfs @ 12.29 hrs, Volume= 0.076 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr WQ Rainfall=0.90"

	Area (ac)	CN	Description
*	4.610	88.0	modified curve number
	4.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	100	0.2000	0.09		**Sheet Flow, 0 - 100' Woods** Woods: Dense underbrush n= 0.800 P2= 2.30"
12.8	1,150	0.0900	1.50		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
30.4	1,250	Total			

Summary for Subcatchment DA1S2: DA1S2 MOD CN

Runoff = 5.35 cfs @ 12.55 hrs, Volume= 0.867 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr WQ Rainfall=0.90"

	Area (ac)	CN	Description
*	52.650	88.0	modified curve number
	52.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.6	100	0.0500	0.05		**Sheet Flow, 0 - 100' Woods** Woods: Dense underbrush n= 0.800 P2= 2.30"
11.3	1,265	0.1400	1.87		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
1.7	760	0.0530	7.34	117.40	**Channel Flow, Grass swale** Area= 16.0 sf Perim= 31.0' r= 0.52' n= 0.030 Earth, grassed & winding
3.2	1,400	0.0960	7.41	118.50	**Channel Flow, Rocky swale** Area= 16.0 sf Perim= 31.0' r= 0.52' n= 0.040 Earth, cobble bottom, clean sides
0.1	50	0.0500	7.13	114.03	**Channel Flow, Grass swale to pond** Area= 16.0 sf Perim= 31.0' r= 0.52' n= 0.030 Earth, grassed & winding
46.9	3,575	Total			

Summary for Subcatchment DA2New: MOD CN DA2N

Runoff = 2.08 cfs @ 12.55 hrs, Volume= 0.349 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr WQ Rainfall=0.90"

	Area (ac)	CN	Description
*	21.170	88.0	
	21.170		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.6	100	0.0500	0.05		**Sheet Flow, Woods Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 2.30"
15.5	1,525	0.1080	1.64		**Shallow Concentrated Flow, Woods Shallow Concentrated** Woodland Kv= 5.0 fps
3.0	800	0.0190	4.39	70.29	**Channel Flow, Channel Flow to Pond** Area= 16.0 sf Perim= 31.0' r= 0.52' n= 0.030 Stream, clean & straight
49.1	2,425	Total			

Summary for Pond 24P: Forebay with Vortech

Inflow Area = 78.430 ac, 0.00% Impervious, Inflow Depth = 0.20" for WQ event
Inflow = 7.84 cfs @ 12.51 hrs, Volume= 1.292 af
Outflow = 5.46 cfs @ 12.86 hrs, Volume= 1.290 af, Atten= 30%, Lag= 21.1 min
Primary = 5.46 cfs @ 12.86 hrs, Volume= 1.290 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Peak Elev= 759.18' @ 12.86 hrs Surf.Area= 3,294 sf Storage= 7,030 cf

Plug-Flow detention time= 319.5 min calculated for 1.290 af (100% of inflow)
Center-of-Mass det. time= 318.7 min (1,239.2 - 920.4)

Volume	Invert	Avail.Storage	Storage Description
#1	755.20'	370 cf	**7.00'W x 11.00'L x 4.80'H Vortechs 5000**
#2	756.00'	19,875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		20,245 cf	Total Available Storage

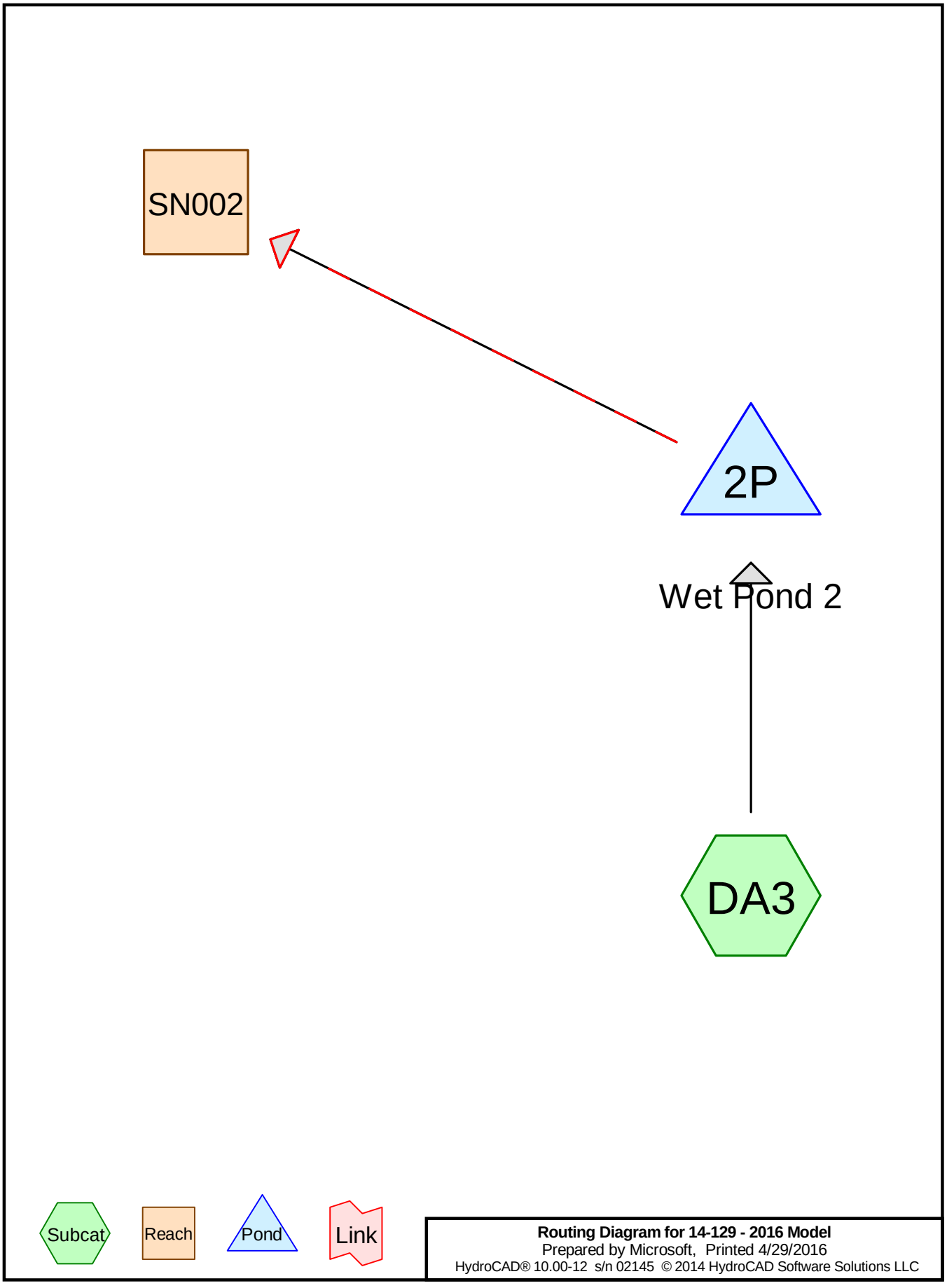
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
756.00	1,500	0	0
758.00	2,100	3,600	3,600
760.00	4,000	6,100	9,700
761.00	7,800	5,900	15,600
761.50	9,300	4,275	19,875

Device	Routing	Invert	Outlet Devices
#1	Primary	755.20'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 755.20' / 754.58' S= 0.0248 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	755.28'	**Vortechs Control Wall, Cv= 3.37 (C= 4.21)** Head (feet) 0.00 0.42 0.42 1.09 1.09 2.16 2.16 Width (feet) 0.83 1.04 0.00 0.00 0.50 1.58 0.00
#3	Device 2	756.00'	**12.0" Round Culvert** L= 32.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 756.00' / 755.20' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Secondary	755.30'	**36.0" Round Culvert** L= 60.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 755.30' / 755.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#5	Device 4	759.55'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Tertiary	760.33'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.46 cfs @ 12.86 hrs HW=759.18' TW=756.49' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 5.46 cfs of 6.20 cfs potential flow)
↑—**2=Vortechs Control Wall** (Passes 5.46 cfs of 14.41 cfs potential flow)
↑—**3=Culvert** (Inlet Controls 5.46 cfs @ 6.95 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=755.20' TW=754.00' (Dynamic Tailwater)
↑—**4=Culvert** (Controls 0.00 cfs)
↑—**5=Orifice/Grate** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=755.20' TW=755.00' (Dynamic Tailwater)
↑—**6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)


SN002
2P
Wet Pond 2
DA3
Subcat
Reach
Pond
Link
Routing Diagram for 14-129 - 2016 Model
Prepared by Microsoft, Printed 4/29/2016
HydroCAD® 10.00-12 s/n 02145 © 2014 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
11.499	74.0	>75% Grass cover, Good, HSG C (DA3)
1.232	80.0	>75% Grass cover, Good, HSG D (DA3)
2.629	98.0	Paved parking, HSG C (DA3)
0.054	98.0	Paved parking, HSG D (DA3)
11.859	70.0	Woods, Good, HSG C (DA3)
2.896	77.0	Woods, Good, HSG D (DA3)
30.169	**75.1**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
25.987	HSG C	DA3
4.182	HSG D	DA3
0.000	Other	
30.169		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	11.499	1.232	0.000	12.731	>75% Grass cover, Good	DA3
0.000	0.000	2.629	0.054	0.000	2.683	Paved parking	DA3
0.000	0.000	11.859	2.896	0.000	14.755	Woods, Good	DA3
0.000	**0.000**	**25.987**	**4.182**	**0.000**	**30.169**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	610.40	607.00	167.0	0.0204	0.013	24.0	0.0	0.0

Time span=0.00-500.00 hrs, dt=0.01 hrs, 50001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA3: Runoff Area=30.169 ac 8.89% Impervious Runoff Depth=0.50"
Flow Length=2,510' Tc=48.2 min CN=75.1 Runoff=7.46 cfs 1.261 af

Reach SN002: Inflow=0.74 cfs 1.261 af
Outflow=0.74 cfs 1.261 af

Pond 2P: Wet Pond 2 Peak Elev=618.13' Storage=53,619 cf Inflow=7.46 cfs 1.261 af
Primary=0.74 cfs 1.261 af Secondary=0.00 cfs 0.000 af Outflow=0.74 cfs 1.261 af

Total Runoff Area = 30.169 ac Runoff Volume = 1.261 af Average Runoff Depth = 0.50"
91.11% Pervious = 27.486 ac 8.89% Impervious = 2.683 ac

Summary for Subcatchment DA3:

Runoff = 7.46 cfs @ 12.53 hrs, Volume= 1.261 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
*	2.629	98.0	Paved parking, HSG C
*	11.859	70.0	Woods, Good, HSG C
*	11.499	74.0	>75% Grass cover, Good, HSG C
*	0.054	98.0	Paved parking, HSG D
*	2.896	77.0	Woods, Good, HSG D
*	1.232	80.0	>75% Grass cover, Good, HSG D
	30.169	75.1	Weighted Average
	27.486		91.11% Pervious Area
	2.683		8.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.2	100	0.1000	0.07		**Sheet Flow, Woods Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 2.30"
2.9	195	0.0510	1.13		**Shallow Concentrated Flow, Woods near top of DA** Woodland Kv= 5.0 fps
2.5	260	0.0600	1.71		**Shallow Concentrated Flow, Grass near top of DA** Short Grass Pasture Kv= 7.0 fps
4.3	450	0.1200	1.73		**Shallow Concentrated Flow, Woods Shallow Concentrated** Woodland Kv= 5.0 fps
3.4	330	0.0550	1.64		**Shallow Concentrated Flow, Yards** Short Grass Pasture Kv= 7.0 fps
1.6	130	0.0770	1.39		**Shallow Concentrated Flow, Woods between yards** Woodland Kv= 5.0 fps
0.8	105	0.0950	2.16		**Shallow Concentrated Flow, Yard** Short Grass Pasture Kv= 7.0 fps
9.2	790	0.0820	1.43		**Shallow Concentrated Flow, Long wooded section** Woodland Kv= 5.0 fps
0.3	150	0.0700	8.43	134.92	**Channel Flow, Roadside swale** Area= 16.0 sf Perim= 31.0' r= 0.52' n= 0.030 Earth, grassed & winding
48.2	2,510	Total			

Summary for Reach SN002:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 30.169 ac, 8.89% Impervious, Inflow Depth = 0.50" for 1-year event
Inflow = 0.74 cfs @ 16.36 hrs, Volume= 1.261 af
Outflow = 0.74 cfs @ 16.36 hrs, Volume= 1.261 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs

Summary for Pond 2P: Wet Pond 2

Inflow Area = 30.169 ac, 8.89% Impervious, Inflow Depth = 0.50" for 1-year event
Inflow = 7.46 cfs @ 12.53 hrs, Volume= 1.261 af
Outflow = 0.74 cfs @ 16.36 hrs, Volume= 1.261 af, Atten= 90%, Lag= 229.9 min
Primary = 0.74 cfs @ 16.36 hrs, Volume= 1.261 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Starting Elev= 615.50' Surf.Area= 18,384 sf Storage= 21,939 cf
Peak Elev= 618.13' @ 16.36 hrs Surf.Area= 24,366 sf Storage= 53,619 cf (31,680 cf above start)
Flood Elev= 622.40' Surf.Area= 36,567 sf Storage= 133,971 cf (112,032 cf above start)

Plug-Flow detention time= 1,344.6 min calculated for 0.757 af (60% of inflow)
Center-of-Mass det. time= 777.8 min (1,668.5 - 890.7)

Volume	Invert	Avail.Storage	Storage Description
#1	615.40'	16,438 cf	**Forebay (Prismatic)** Listed below (Recalc)
#2	612.40'	21,936 cf	**ED Pool (Prismatic)** Listed below (Recalc)
#3	615.50'	95,598 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		133,971 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
615.40	25	0	0
616.00	90	35	35
620.00	3,239	6,658	6,693
622.00	6,506	9,745	16,438

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
612.40	5,113	0	0
614.00	7,074	9,750	9,750
615.50	9,174	12,186	21,936

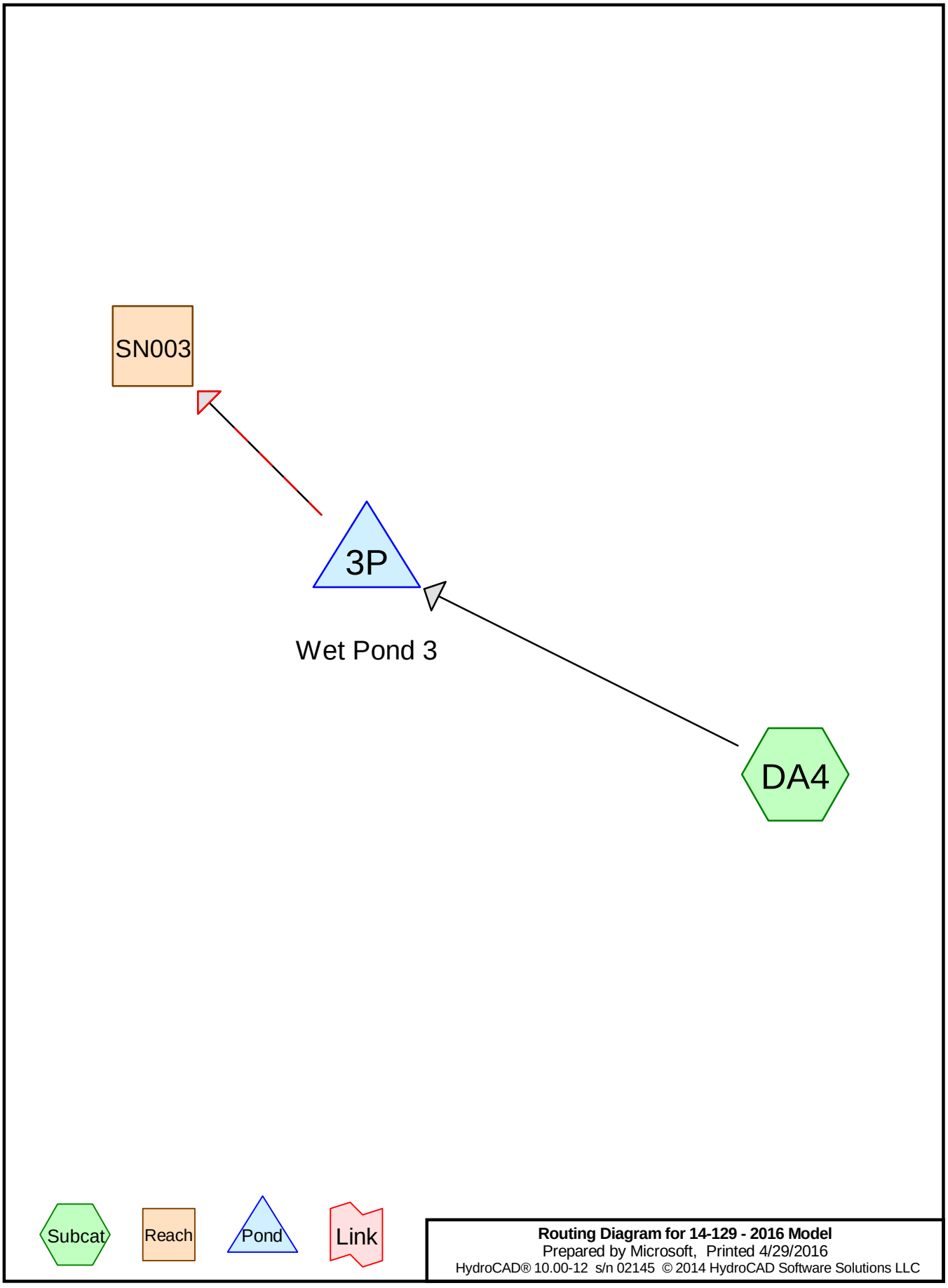
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
615.50	9,174	0	0
616.00	9,924	4,775	4,775
618.00	13,176	23,100	27,875
620.00	16,830	30,006	57,881
622.00	20,887	37,717	95,598

Device	Routing	Invert	Outlet Devices
#1	Primary	610.40'	**24.0" Round Culvert** L= 167.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 610.40' / 607.00' S= 0.0204 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	615.50'	**3.5" Vert. CPv Orifice** C= 0.600

#3	Device 1	618.00'	**18.0" W x 6.0" H Vert. Qp Orifice** C= 0.600
#4	Device 1	619.50'	**24.0" Horiz. Overflow Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	621.00'	**17.0' long x 7.0' breadth Overflow Spillway** 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=0.74 cfs @ 16.36 hrs HW=618.13' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.74 cfs of 34.64 cfs potential flow)
  ├─**2=CPv Orifice** (Orifice Controls 0.51 cfs @ 7.60 fps)
  ├─**3=Qp Orifice** (Orifice Controls 0.24 cfs @ 1.18 fps)
  └─**4=Overflow Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=615.50' TW=0.00' (Dynamic Tailwater)
└─**5=Overflow Spillway** (Controls 0.00 cfs)


SN003
3P
Wet Pond 3
DA4
Subcat
Reach
Pond
Link
Routing Diagram for 14-129 - 2016 Model
Prepared by Microsoft, Printed 4/29/2016
HydroCAD® 10.00-12 s/n 02145 © 2014 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.589	74.0	>75% Grass cover, Good, HSG C (DA4)
0.124	80.0	>75% Grass cover, Good, HSG D (DA4)
2.201	98.0	Paved parking, HSG C (DA4)
23.759	70.0	Woods, Good, HSG C (DA4)
0.143	77.0	Woods, Good, HSG D (DA4)
28.816	**72.6**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
28.549	HSG C	DA4
0.267	HSG D	DA4
0.000	Other	
28.816		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	2.589	0.124	0.000	2.713	>75% Grass cover, Good	DA4
0.000	0.000	2.201	0.000	0.000	2.201	Paved parking	DA4
0.000	0.000	23.759	0.143	0.000	23.902	Woods, Good	DA4
0.000	**0.000**	**28.549**	**0.267**	**0.000**	**28.816**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	676.00	674.00	80.5	0.0248	0.013	30.0	0.0	0.0

Time span=0.00-500.00 hrs, dt=0.01 hrs, 50001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA4: Runoff Area=28.816 ac 7.64% Impervious Runoff Depth=0.41"
Flow Length=1,570' Tc=31.9 min CN=72.6 Runoff=7.21 cfs 0.995 af

Reach SN003: Inflow=1.60 cfs 0.994 af
Outflow=1.60 cfs 0.994 af

Pond 3P: Wet Pond 3 Peak Elev=682.95' Storage=39,186 cf Inflow=7.21 cfs 0.995 af
Primary=1.60 cfs 0.994 af Secondary=0.00 cfs 0.000 af Outflow=1.60 cfs 0.994 af

Total Runoff Area = 28.816 ac Runoff Volume = 0.995 af Average Runoff Depth = 0.41"
92.36% Pervious = 26.615 ac 7.64% Impervious = 2.201 ac

Summary for Subcatchment DA4:

Runoff = 7.21 cfs @ 12.30 hrs, Volume= 0.995 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
*	2.201	98.0	Paved parking, HSG C
*	23.759	70.0	Woods, Good, HSG C
*	2.589	74.0	>75% Grass cover, Good, HSG C
	0.143	77.0	Woods, Good, HSG D
	0.124	80.0	>75% Grass cover, Good, HSG D
	28.816	72.6	Weighted Average
	26.615		92.36% Pervious Area
	2.201		7.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.4	100	0.1370	0.08		**Sheet Flow, Woods Sheet** Woods: Dense underbrush n= 0.800 P2= 2.30"
10.9	1,210	0.1370	1.85		**Shallow Concentrated Flow, Woods Shallow Concentrated** Woodland Kv= 5.0 fps
0.6	260	0.0500	7.13	114.03	**Channel Flow, Channel Flow to Pond** Area= 16.0 sf Perim= 31.0' r= 0.52' n= 0.030 Earth, grassed & winding
31.9	1,570	Total			

Summary for Reach SN003:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 28.816 ac, 7.64% Impervious, Inflow Depth = 0.41" for 1-year event
Inflow = 1.60 cfs @ 13.28 hrs, Volume= 0.994 af
Outflow = 1.60 cfs @ 13.28 hrs, Volume= 0.994 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs

Summary for Pond 3P: Wet Pond 3

Inflow Area = 28.816 ac, 7.64% Impervious, Inflow Depth = 0.41" for 1-year event
Inflow = 7.21 cfs @ 12.30 hrs, Volume= 0.995 af
Outflow = 1.60 cfs @ 13.28 hrs, Volume= 0.994 af, Atten= 78%, Lag= 58.8 min
Primary = 1.60 cfs @ 13.28 hrs, Volume= 0.994 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.01 hrs
Starting Elev= 681.16' Surf.Area= 17,522 sf Storage= 21,009 cf
Peak Elev= 682.95' @ 13.28 hrs Surf.Area= 20,348 sf Storage= 39,186 cf (18,177 cf above start)
Flood Elev= 686.50' Surf.Area= 27,225 sf Storage= 84,745 cf (63,736 cf above start)

Plug-Flow detention time= 1,565.5 min calculated for 0.512 af (51% of inflow)
Center-of-Mass det. time= 730.0 min (1,614.6 - 884.6)

Volume	Invert	Avail.Storage	Storage Description
#1	683.00'	2,219 cf	**Forebay (Prismatic)** Listed below (Recalc)
#2	678.00'	21,009 cf	**ED pool (Prismatic)** Listed below (Recalc)
#3	681.16'	61,517 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		84,745 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
683.00	169	0	0
684.00	438	304	304
686.00	1,477	1,915	2,219

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
678.00	4,653	0	0
680.00	7,136	11,789	11,789
681.16	8,761	9,220	21,009

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
681.16	8,761	0	0
682.00	10,023	7,889	7,889
684.00	13,309	23,332	31,221
686.00	16,987	30,296	61,517

Device	Routing	Invert	Outlet Devices
#1	Primary	676.00'	**30.0" Round Culvert** L= 80.5' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 676.00' / 674.00' S= 0.0248 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	681.16'	**2.0" Vert. CPv Orifice** C= 0.600
#3	Device 1	682.50'	**18.0" W x 6.0" H Vert. Qp Orifice** C= 0.600
#4	Device 1	684.50'	**24.0" Horiz. Overflow Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	685.00'	**17.0' long x 7.0' breadth Overflow Spillway** 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=1.60 cfs @ 13.28 hrs HW=682.95' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.60 cfs of 49.80 cfs potential flow)
  ├**2=CPv Orifice** (Orifice Controls 0.14 cfs @ 6.29 fps)
  ├**3=Qp Orifice** (Orifice Controls 1.46 cfs @ 2.16 fps)
  └**4=Overflow Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=681.16' TW=0.00' (Dynamic Tailwater)
└**5=Overflow Spillway** (Controls 0.00 cfs)

OLD STAGE ESTATES: PERMIT 2-1146


Source: USGS
Source: NASA, NGA, USGS
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esri®

THE CONTRACTOR SHALL NOTIFY
'DIGSAFE' PRIOR TO ANY EXCAVATION

PADDOCK LANE

SOUTHFIELD DRIVE

SULLIVAN N/F

MCDONALD N/F

ESPING N/F

MORRIS N/F

ALBERTSON N/F

PETRILLO N/F

GUTWIN N/F

HALLER N/F

STEELE N/F

EXISTING 20' WIDE COMMON LAND AREA

EXISTING 10' WIDE STORMWATER EASEMENT

EXISTING 15' WIDE DRAINAGE EASEMENT

REMOVE TREES LOCATED IN NEW DRIVE CORRIDOR

LIMIT OF SPECIAL FLOOD HAZARD AREA

STORMWATER POND EAST

GARDEN

ACCESS DRIVE

260'

25'

50' BUFFER

OPEN SPACE

STORMWATER POND WEST

NEW RE-LOCATED TRAIL LOCATION FROM NEW DRIVE TO EXISTING TRAIL

CLASS 2 WETLAND

LIMIT OF SPECIAL FLOOD HAZARD AREA

PROPOSED STORMWATER EASEMENT AREA TO THE TOWN OF WILLISTON

HOA COMMON LAND

EXISTING SEWER FORCEMAIN

150' WATERSHED PROTECTION BUFFER

EXISTING TRAIL

OLD STAGE ESTATES COMMON LAND

ALLEN BROOK

CLASS 2 WETLAND

PROPOSED STORMWATER EASEMENT AREA TO THE TOWN OF WILLISTON

Stormwater Ponds

GRAPHIC SCALE

30 0 15 30 60 120

(in feet)

1 inch = 30 ft.

Legend

- NEW STORMWATER PIPE & STRUCTURE
- EXISTING STORMWATER PIPE
- PROPERTY BOUNDARY
- SIDELINE OF EASEMENT
- 490 EXISTING GROUND CONTOUR
- SPECIAL FLOOD HAZARD AREA (100 YR)
- 490 FINISH GRADE CONTOUR
- WB WETLAND BUFFER
- WPB WATERSHED PROTECTION BUFFER
- WETLAND BOUNDARY

Date	Revision	By
7.25.16	REVISE ACCESS DRIVE	ABR
4.25.16	REVISED NEW ACCESS DRIVE ALIGNMENT BEHIND ESPING	ABR
4.12.16	REVISED NEW ACCESS DRIVE ALIGNMENT	DJG

These plans shall only be used for the purpose shown below:

- [ ] Sketch/Concept
- [ ] Preliminary
- [x] Final Local Review
- [ ] Act 250 Review
- [ ] Construction
- [ ] Record Drawing

Old Stage Estates Neighborhood Stormwater Improvement Project

Southfield Drive Williston VT

OVERALL SITE PLAN

TAX PARCEL: COM.049.b DP #____-____

Project No.	14065
Survey	L&D
Design	AR
Drawn	L&D
Checked	DG
Date	2-23-16
Scale	1" = 30'
Sheet number	1

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com

THE CONTRACTOR SHALL NOTIFY 'DIGSAFE' PRIOR TO ANY EXCAVATION

EXISTING 8" PVC CULVERT UNDER FOOTPATH

NEW CATCHBASIN TO BE INSTALLED ON END OF EXSTING 24" PIPE
RIM = 477.0
24" IN (EXISTING) = 474.5
NEW 24" PE OUT = 469.5

SULLIVAN PROPERTY N/F

STEELE PROPERTY N/F

EXISTING 24" PE

NEW 15" PVC
INV = 475.0

NEW 24" PE

NEW 24" PE OUT = 468.5
AND STONE OUTFALL

NEW FOREBAY BOTTOM
ELEV.= 463.0

EXISTING 4" PVC

EXISTING 4" PVC
INV. = 470.77

NEW BOTTOM ELEV.= 467.0
NORMAL WATER ELEVATION = 468.0

CUT EXISTING 4" PVC AT INTERSECTION WITH NEW POND SIDESLOPE

EXISTING 6" FORCEMAIN
(APPROX. LOCATION ONLY)
SEE NOTE 'A' BELOW

SIDELINE OF PROPOSD NEW PERMANENT STORMWATER EASEMENT TO THE TOWN OF WILLISTON

NEW OUTLET STRUCTURE
GRATE = 471.50
6"(H) X 18"(W) WEIR = 470.50
3" ORIFICE = 468.0
24" PE INV. OUT = 468.0

NEW 24" PE

NEW SPILLWAY ELEV. = 470.5

APPROXIMATE CLEARING LIMITS

NEW STORM OUTFALL AND
24" PE OUTLET INV. = 467.0

COORDINATE WITH HOA ON TREE REMOVAL FOR ACCESS DRIVE

CLEARING LIMITS (TYP)

NEW 12' WIDE ACCESS DRIVE FOR CONSTRUCTION AND MAINTENANCE ACCESS TO POND WEST AND POND EAST THROUGH OPEN SPACE

EXISTING PEDESTRIAN PATH TO BE RELOCATED AROUND POND.

EXISTING PATH

SURVEY CONTROL POINT
TOP OF REBAR PIPE
ELEV. = 471.64
N 709575.948
E 1490706.563

EXISTING 12" STRUCTURE TO BE REMOVED

EXISTING 12" CMP TO BE REMOVED

EXISTING 12" CMP TO BE REMOVED
INV. = 464.22

SURVEY CONTROL POINT
TOP OF REBAR PIPE
ELEV. = 467.11
N 709513.696
E 1490643.805

50' WETLAND BUFFER

LIMIT OF SPECIAL FLOOD HAZARD AREA (100 YR FLOOD)

WB

FM

10'

12'

FORCEMAIN NOTE 'A'
PRIOR TO CONSTRUCTING THE POND IMPROVEMENTS, THE CONTRACTOR SHALL LOCATE THE EXISTING FORCEMAIN IN THE VICINITY OF THE POND TO DETERMINE THE EXACT LOCATION AND ELEVATION, AND IF ADEQUATE SOIL COVER WILL EXIST WITH PROPOSED GRADING.

THE CONTRACTOR SHALL PROVIDE THE HORIZONTAL AND VERTICAL DATA ON THE FORCEMAIN TO THE ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION.

IF THE EXISTING FORCEMAIN CONFLICTS WITH THE POND IMPROVEMENTS SHOWN, THE CONTRACTOR SHALL INSTALL NEW 6" SDR26 PVC FORCEMAIN TO ALLEVIATE THE CONFLICT. THE NEW FORCEMAIN SHALL BE PRESSURE AND LEAKAGE TESTED IN ACCORDANCE WITH THE VT ENVIRONMENTAL PROTECTION RULES PRIOR TO CONNECTING TO THE EXISTING FORCEMAIN. THE CONTRACTOR SHALL TAKE TIES TO ALL NEW BENDS AND FITTINGS.

Legend

- WB — WETLAND BUFFER
- WETLAND BOUNDARY
- 470 — FINISH GRADE CONTOUR
- 470 — EXISTING GROUND CONTOUR
- EXISTING STORMWATER PIPE
- PROPERTY BOUNDARY
- STONE LINED SURFACE
- NEW STRUCTURE & STORM PIPE

GRAPHIC SCALE

10 0 5 10 20 40

(in feet)
1 inch = 10 ft.

Date	Revision	By
7.25.16	REVISE ACCESS DRIVE WIDTH AND ORIGIN	ABR
4.25.16	REVISE NEW ACCESS DRIVE BEHIND ESPING LOT	ABR
4.12.16	REVISE NEW ACCESS DRIVE ALIGNMENT	DJG

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ☐ Preliminary
- ■ Final Local Review
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

Old Stage Estates Neighborhood Stormwater Improvement Project

Southfield Drive Williston VT

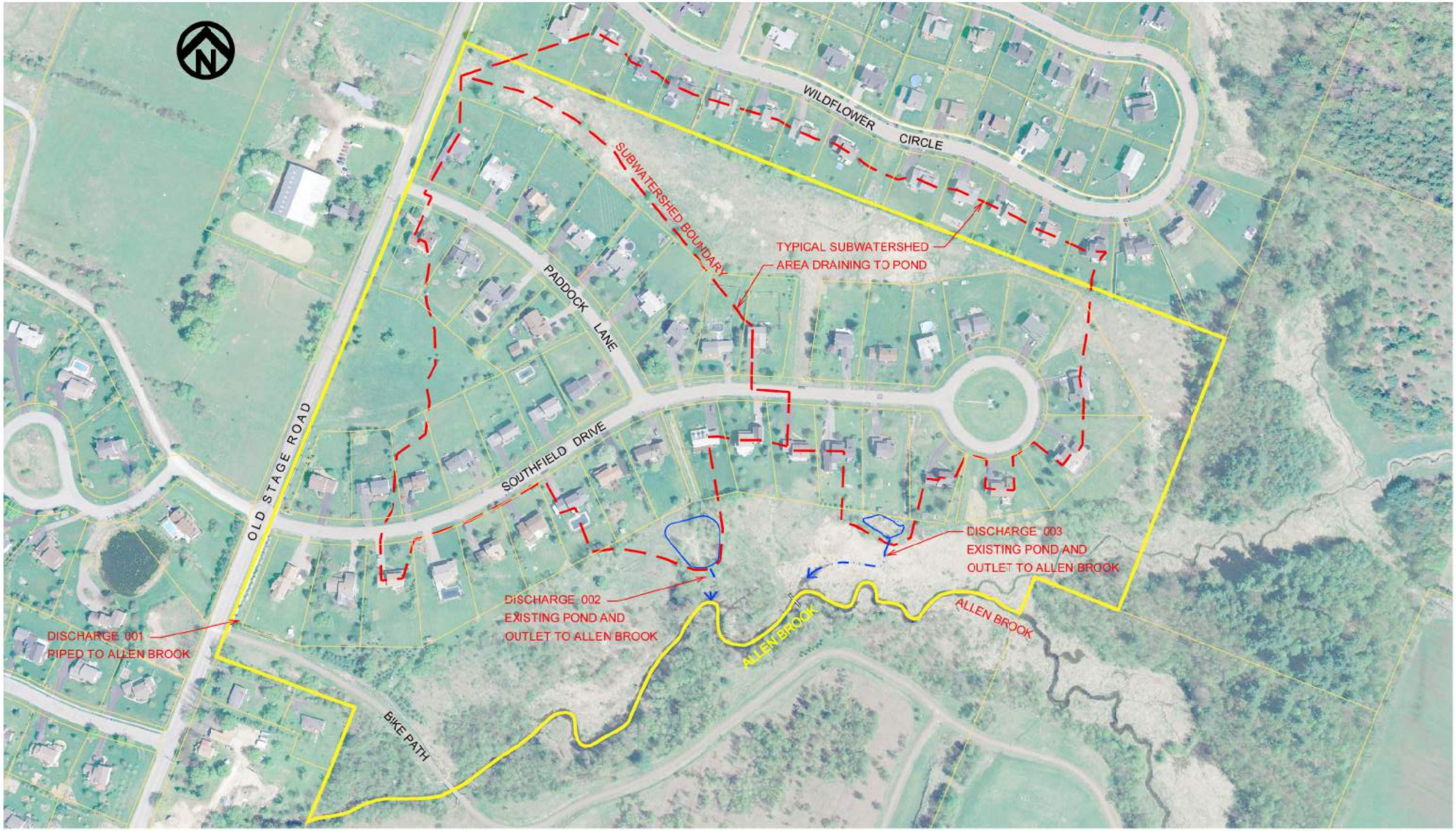
Stormwater Pond West

Project No.	14065
Survey	L&D
Design	AR
Drawn	L&D
Checked	DG
Date	2-23-16
Scale	1" = 10'
Sheet number	2

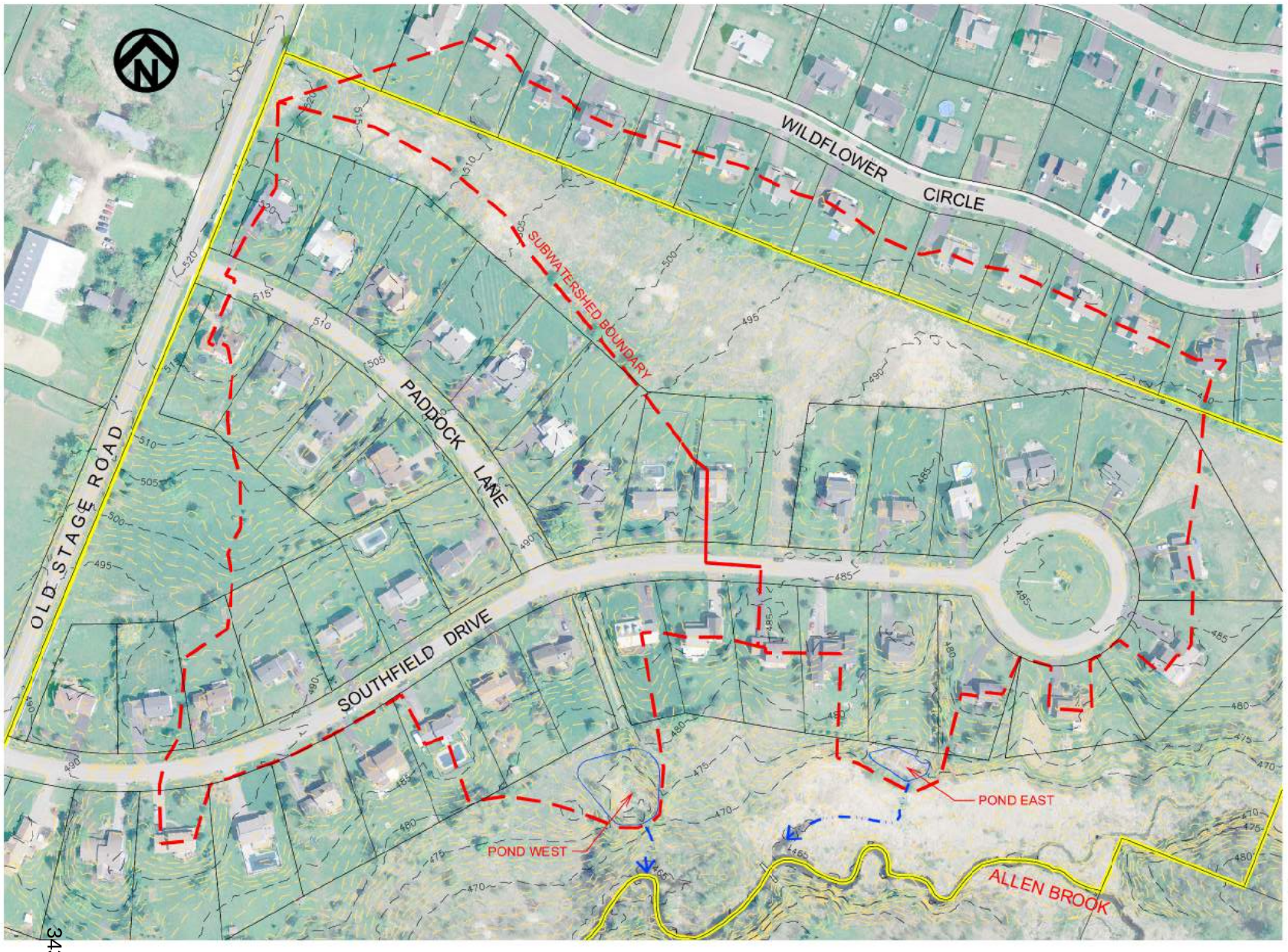
Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com

TAX PARCEL: COM.049.b DP # ____

Stormwater Pond West



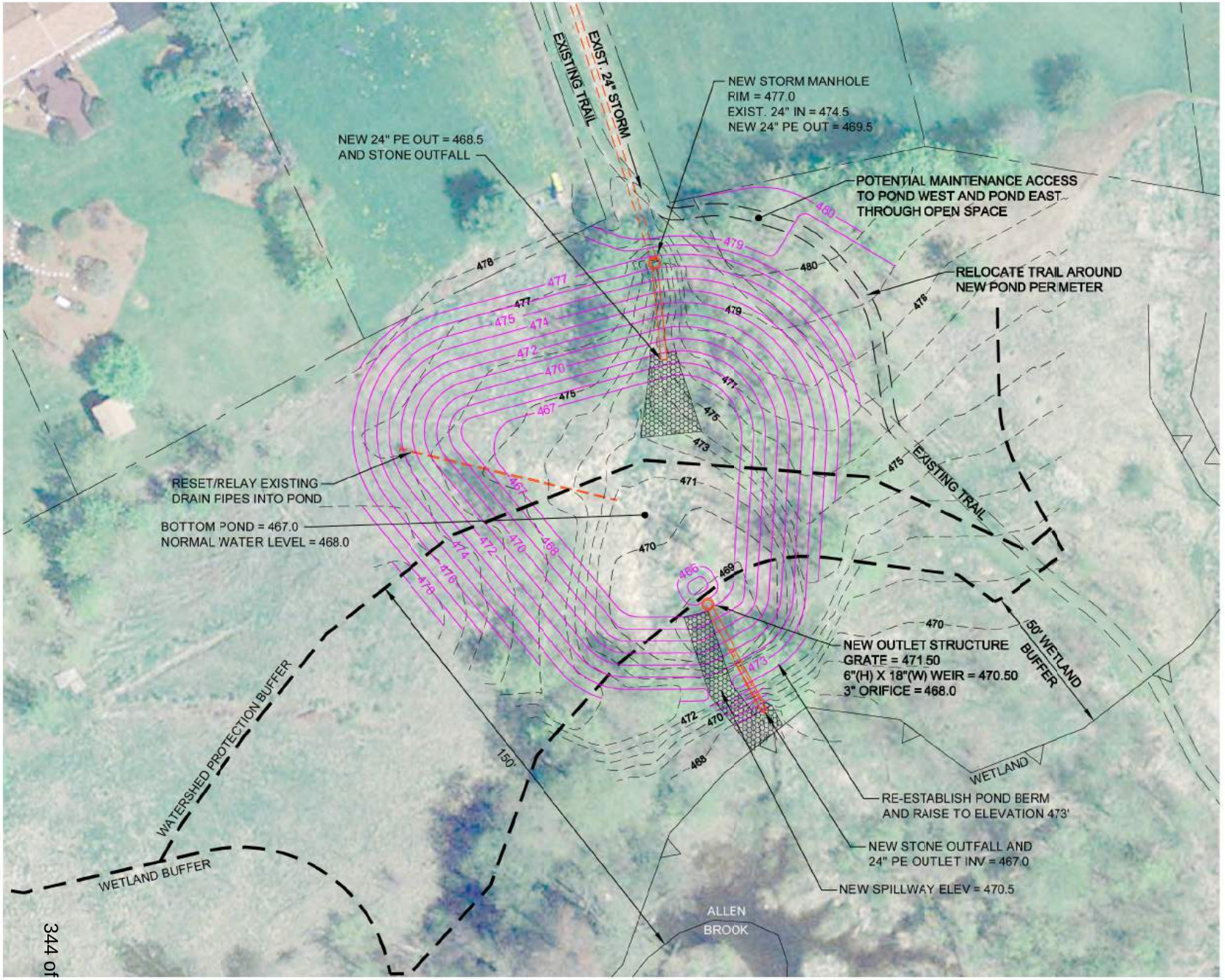
OLD STAGE ESTATES
EXISTING STORMWATER
DISCHARGE LOCATIONS
JULY 2014



150 0 75 150 300

1 inch = 150 ft.

OLD STAGE ESTATES
POND SUBWATERSHEDS
JULY 2014



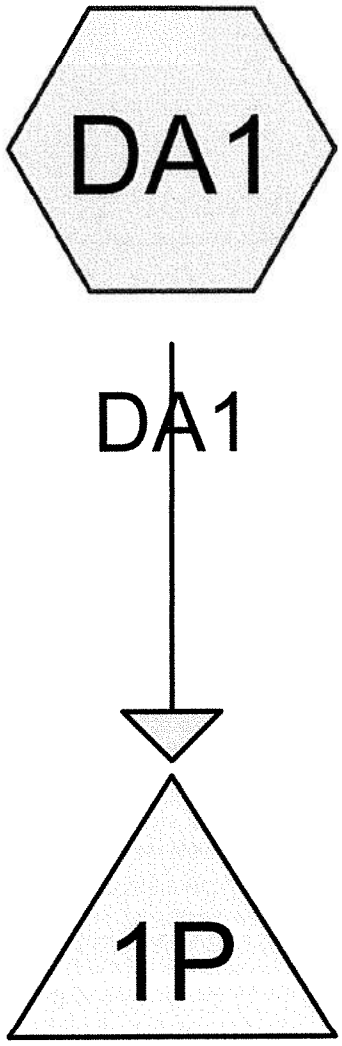
OLD STAGE ESTATES
DISCHARGE 002
POND WEST
CONCEPTUAL DESIGN

JANUARY 2015

POND WEST

REV JAN 2015

- SPILLWAY ELEVATION LOWERED



Pond west

Subcat Reach Pond Link

Drainage Diagram for pond west
Prepared by Lamoureux & Dickinson, Printed 1/21/2015
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.340	71	Meadow, HSG C (DA1)
9.210	74	Lawn, HSG C (DA1)
0.910	78	Meadow, HSG D (DA1)
1.860	80	Lawn, HSG D (DA1)
0.640	98	Drives (DA1)
0.880	98	Paved Roadway (DA1)
0.960	98	Roof (DA1)

Summary for Subcatchment DA1: DA1

Runoff = 11.65 cfs @ 12.05 hrs, Volume= 0.718 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.960	98	Roof
*	0.640	98	Drives
*	9.210	74	Lawn, HSG C
*	1.860	80	Lawn, HSG D
*	0.880	98	Paved Roadway
*	0.340	71	Meadow, HSG C
*	0.910	78	Meadow, HSG D
	14.800	79	Weighted Average
	12.320	75	83.24% Pervious Area
	2.480	98	16.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0400	0.19		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 2.30"
3.0	600	0.0500	3.35		**Shallow Concentrated Flow, Lawn/vegetated swale** Grassed Waterway Kv= 15.0 fps
11.8	700	Total			

Summary for Pond 1P: Pond west

Inflow Area = 14.800 ac, 16.76% Impervious, Inflow Depth = 0.58" for 1 year event
Inflow = 11.65 cfs @ 12.05 hrs, Volume= 0.718 af
Outflow = 0.36 cfs @ 17.20 hrs, Volume= 0.715 af, Atten= 97%, Lag= 309.2 min
Primary = 0.36 cfs @ 17.20 hrs, Volume= 0.715 af
Secondary = 0.00 cfs @ 4.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 4.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 468.00' Surf.Area= 5,899 sf Storage= 5,318 cf
Peak Elev= 470.46' @ 17.20 hrs Surf.Area= 9,127 sf Storage= 23,640 cf (18,322 cf above start)

Plug-Flow detention time= 887.8 min calculated for 0.593 af (83% of inflow)
Center-of-Mass det. time= 666.3 min (1,540.1 - 873.8)

Volume	Invert	Avail.Storage	Storage Description
#1	467.00'	51,800 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)
467.00	4,757	272.0	0	0	4,757
468.00	5,899	298.0	5,318	5,318	5,970
469.00	7,141	323.0	6,510	11,828	7,244
470.00	8,484	348.0	7,803	19,631	8,621
471.00	9,927	373.0	9,196	28,827	10,100
472.00	11,471	398.0	10,690	39,517	11,681
473.00	13,115	423.0	12,284	51,800	13,365

Device	Routing	Invert	Outlet Devices
#1	Primary	468.00'	**3.0" Vert. Orifice1** C= 0.600
#2	Primary	470.50'	**18.0" x 6.0" Horiz. Orifice Box** C= 0.600 Limited to weir flow at low heads
#3	Primary	471.50'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#4	Secondary	470.50'	**6.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.36 cfs @ 17.20 hrs HW=470.46' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.36 cfs @ 7.35 fps)
- **2=Orifice Box** (Controls 0.00 cfs)
- **3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 4.00 hrs HW=468.00' (Free Discharge)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment DA1: DA1

Runoff = 62.67 cfs @ 12.04 hrs, Volume= 3.669 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 year Rainfall=5.20"

	Area (ac)	CN	Description
*	0.960	98	Roof
*	0.640	98	Drives
*	9.210	74	Lawn, HSG C
*	1.860	80	Lawn, HSG D
*	0.880	98	Paved Roadway
*	0.340	71	Meadow, HSG C
*	0.910	78	Meadow, HSG D
	14.800	79	Weighted Average
	12.320	75	83.24% Pervious Area
	2.480	98	16.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0400	0.19		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 2.30"
3.0	600	0.0500	3.35		**Shallow Concentrated Flow, Lawn/vegetated swale** Grassed Waterway Kv= 15.0 fps
11.8	700	Total			

Summary for Pond 1P: Pond west

Inflow Area = 14.800 ac, 16.76% Impervious, Inflow Depth = 2.97" for 100 year event
Inflow = 62.67 cfs @ 12.04 hrs, Volume= 3.669 af
Outflow = 50.59 cfs @ 12.11 hrs, Volume= 3.666 af, Atten= 19%, Lag= 4.3 min
Primary = 9.92 cfs @ 12.11 hrs, Volume= 1.750 af
Secondary = 40.67 cfs @ 12.11 hrs, Volume= 1.915 af

Routing by Stor-Ind method, Time Span= 4.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 468.00' Surf.Area= 5,899 sf Storage= 5,318 cf
Peak Elev= 472.37' @ 12.11 hrs Surf.Area= 12,067 sf Storage= 43,873 cf (38,556 cf above start)

Plug-Flow detention time= 198.5 min calculated for 3.544 af (97% of inflow)
Center-of-Mass det. time= 168.0 min (993.1 - 825.0)

Volume	Invert	Avail.Storage	Storage Description
#1	467.00'	51,800 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)
467.00	4,757	272.0	0	0	4,757
468.00	5,899	298.0	5,318	5,318	5,970
469.00	7,141	323.0	6,510	11,828	7,244
470.00	8,484	348.0	7,803	19,631	8,621
471.00	9,927	373.0	9,196	28,827	10,100
472.00	11,471	398.0	10,690	39,517	11,681
473.00	13,115	423.0	12,284	51,800	13,365

Device	Routing	Invert	Outlet Devices
#1	Primary	468.00'	**3.0" Vert. Orifice1** C= 0.600
#2	Primary	470.50'	**18.0" x 6.0" Horiz. Orifice Box** C= 0.600 Limited to weir flow at low heads
#3	Primary	471.50'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#4	Secondary	470.50'	**6.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=9.87 cfs @ 12.11 hrs HW=472.36' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.49 cfs @ 9.91 fps)
- **2=Orifice Box** (Orifice Controls 4.92 cfs @ 6.56 fps)
- **3=Grate** (Orifice Controls 4.46 cfs @ 4.46 fps)

Secondary OutFlow Max=40.25 cfs @ 12.11 hrs HW=472.36' (Free Discharge)
- **4=Broad-Crested Rectangular Weir** (Weir Controls 40.25 cfs @ 3.61 fps)

Summary for Subcatchment DA1: DA1

Runoff = 0.16 cfs @ 12.16 hrs, Volume= 0.055 af, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.960	98	Roof
*	0.640	98	Drives
*	9.210	74	Lawn, HSG C
*	1.860	80	Lawn, HSG D
*	0.880	98	Paved Roadway
*	0.340	71	Meadow, HSG C
*	0.910	78	Meadow, HSG D
	14.800	79	Weighted Average
	12.320	75	83.24% Pervious Area
	2.480	98	16.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0400	0.19		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 2.30"
3.0	600	0.0500	3.35		**Shallow Concentrated Flow, Lawn/vegetated swale** Grassed Waterway Kv= 15.0 fps
11.8	700	Total			

Summary for Pond 1P: Pond west

Inflow Area = 14.800 ac, 16.76% Impervious, Inflow Depth = 0.04" for WQv event
Inflow = 0.16 cfs @ 12.16 hrs, Volume= 0.055 af
Outflow = 0.04 cfs @ 18.58 hrs, Volume= 0.054 af, Atten= 72%, Lag= 385.0 min
Primary = 0.04 cfs @ 18.58 hrs, Volume= 0.054 af
Secondary = 0.00 cfs @ 4.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 4.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 468.00' Surf.Area= 5,899 sf Storage= 5,318 cf
Peak Elev= 468.16' @ 18.58 hrs Surf.Area= 6,087 sf Storage= 6,264 cf (946 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 407.5 min (1,408.5 - 1,001.0)

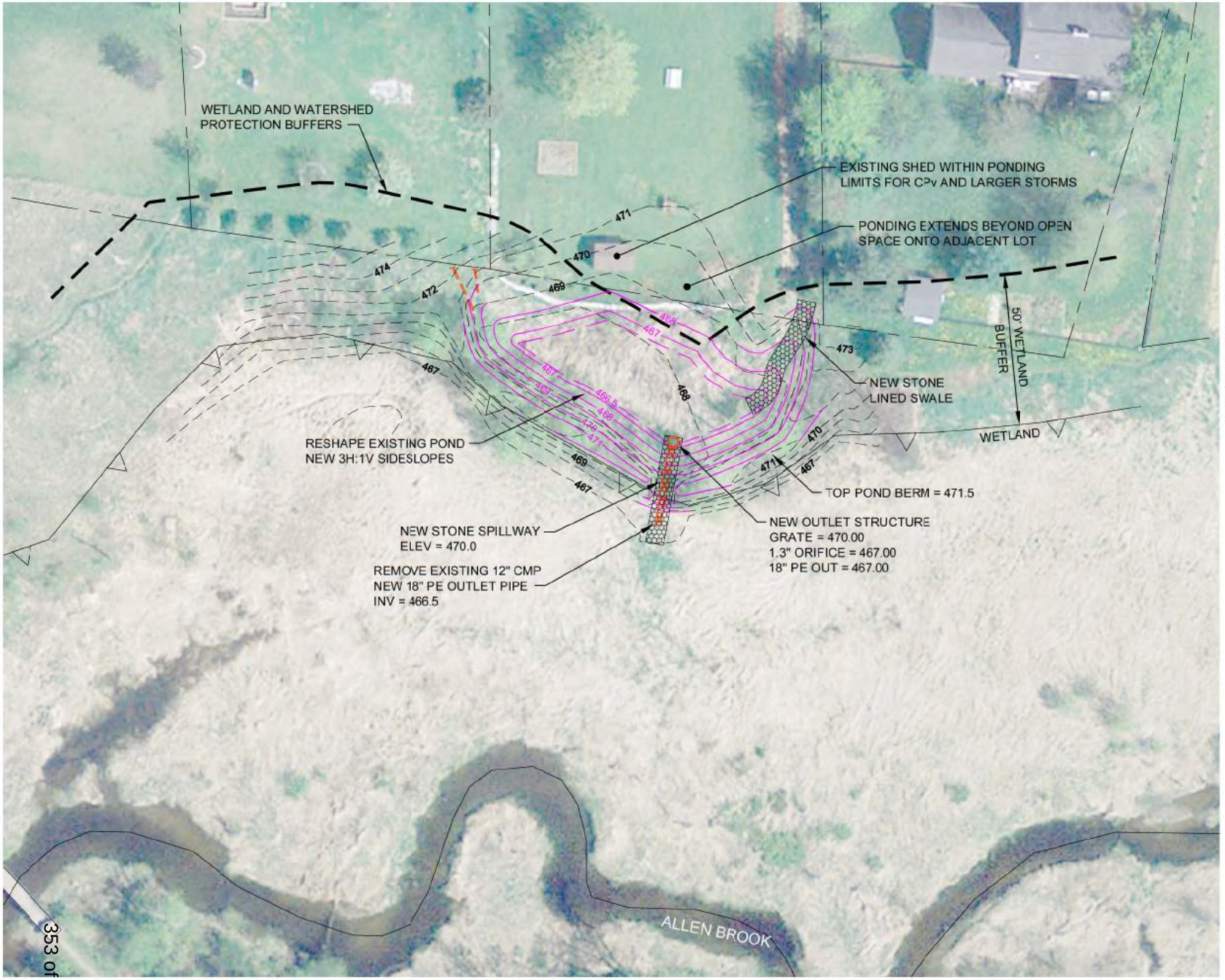
Volume	Invert	Avail.Storage	Storage Description
#1	467.00'	51,800 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
467.00	4,757	272.0	0	0	4,757
468.00	5,899	298.0	5,318	5,318	5,970
469.00	7,141	323.0	6,510	11,828	7,244
470.00	8,484	348.0	7,803	19,631	8,621
471.00	9,927	373.0	9,196	28,827	10,100
472.00	11,471	398.0	10,690	39,517	11,681
473.00	13,115	423.0	12,284	51,800	13,365

Device	Routing	Invert	Outlet Devices
#1	Primary	468.00'	**3.0" Vert. Orifice1** C= 0.600
#2	Primary	470.50'	**18.0" x 6.0" Horiz. Orifice Box** C= 0.600 Limited to weir flow at low heads
#3	Primary	471.50'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#4	Secondary	470.50'	**6.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.04 cfs @ 18.58 hrs HW=468.16' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.04 cfs @ 1.35 fps)
- **2=Orifice Box** (Controls 0.00 cfs)
- **3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 4.00 hrs HW=468.00' (Free Discharge)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



NOTE:
THIS PLAN WAS REVISED IN JANUARY 2015 IN RESPONSE TO TOWN REVIEW COMMENTS. AS RECOMMENDED BY THE REVIEW COMMENTS AND SUPPORTED BY THE ORIGINAL DESIGN PLANS FOR THE NEIGHBORHOOD, THE RECONSTRUCTED BERM AND OUTLET ARE PROPOSED TO RESULT IN PONDING THAT IS ESTIMATED TO BE SIMILAR TO THE CONDITIONS AT THE INITIAL CONSTRUCTION OF THE STORMWATER POND. THIS WILL RESULT IN PONDING THAT EXTENDS ONTO THE LAWN OF THE ADJACENT LOT.

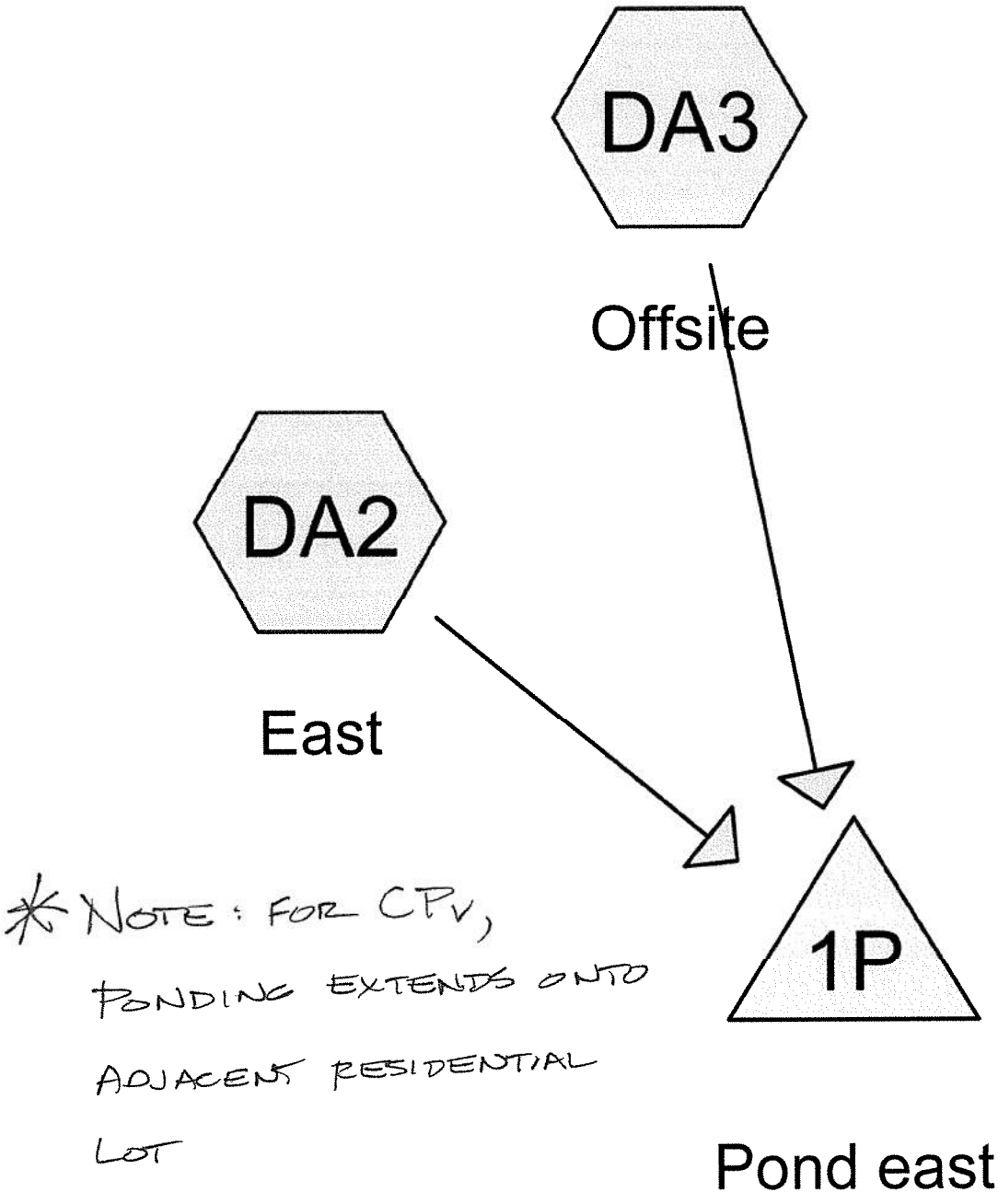
30 0 15 30 60

1 inch = 30 ft.

OLD STAGE ESTATES
DISCHARGE 003
POND EAST
CONCEPTUAL DESIGN

JANUARY 2015

REVISED JAN 2015



* NOTE: FOR CPv, PONDING EXTENDS ONTO ADJACENT RESIDENTIAL LOT

Subcat Reach Pond Link

Drainage Diagram for pond east Jan2015
Prepared by Lamoureux & Dickinson, Printed 1/20/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.360	71	Meadow, HSG C (DA2)
1.132	71	Meadow, non-grazed, HSG C (DA3)
2.020	74	Lawn, HSG C (DA2)
4.730	78	Meadow, HSG D (DA2)
1.383	78	Meadow, non-grazed, HSG D (DA3)
4.210	80	Lawn, HSG D (DA2)
0.370	98	Drives (DA2)
0.570	98	Paved Roadway (DA2)
0.791	98	Unconnected roofs (DA2, DA3)

Summary for Subcatchment DA2: East

Runoff = 6.39 cfs @ 12.27 hrs, Volume= 0.662 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.460	98	Unconnected roofs
*	0.370	98	Drives
*	2.020	74	Lawn, HSG C
*	4.210	80	Lawn, HSG D
*	0.570	98	Paved Roadway
*	0.360	71	Meadow, HSG C
*	4.730	78	Meadow, HSG D
	12.720	80	Weighted Average
	11.320	78	88.99% Pervious Area
	1.400	98	11.01% Impervious Area
	0.460		32.86% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Overland meadow** Grass: Dense n= 0.240 P2= 2.30"
14.5	1,000	0.0270	1.15		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
2.0	250	0.0200	2.12		**Shallow Concentrated Flow, Thru lawn to DI** Grassed Waterway Kv= 15.0 fps
29.3	1,350	Total			

Summary for Subcatchment DA3: Offsite

Runoff = 0.84 cfs @ 12.38 hrs, Volume= 0.111 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (sf)	CN	Description
*	14,400	98	Unconnected roofs
	49,298	71	Meadow, non-grazed, HSG C
	60,253	78	Meadow, non-grazed, HSG D
	123,951	78	Weighted Average, UI Adjusted CN = 76
	109,551	75	88.38% Pervious Area
	14,400	98	11.62% Impervious Area
	14,400		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	150	0.0300	0.13		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
13.8	950	0.0270	1.15		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
2.0	250	0.0200	2.12		**Shallow Concentrated Flow, Thru yard to DI** Grassed Waterway Kv= 15.0 fps
35.6	1,350	Total			

Summary for Pond 1P: Pond east

Inflow Area = 15.566 ac, 11.12% Impervious, Inflow Depth = 0.60" for 1 year event
Inflow = 7.16 cfs @ 12.27 hrs, Volume= 0.772 af
Outflow = 3.35 cfs @ 12.64 hrs, Volume= 0.772 af, Atten= 53%, Lag= 22.4 min
Primary = 2.04 cfs @ 12.64 hrs, Volume= 0.665 af
Secondary = 1.31 cfs @ 12.64 hrs, Volume= 0.108 af

Routing by Stor-Ind method, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 467.00' Surf.Area= 1,898 sf Storage= 840 cf
Peak Elev= 470.17' @ 12.64 hrs Surf.Area= 5,744 sf Storage= 12,258 cf (11,418 cf above start)
→ ABOVE SPILLWAY
Plug-Flow detention time= 710.8 min calculated for 0.753 af (98% of inflow)
Center-of-Mass det. time= 675.8 min (1,564.9 - 889.1)
→ 11.3 HOURS

Volume	Invert	Avail.Storage	Storage Description
#1	466.50'	21,323 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)
466.50	1,471	183.0	0	0	1,471
467.00	1,898	198.0	840	840	1,936
468.00	2,861	231.0	2,363	3,203	3,082
469.00	3,964	265.0	3,398	6,601	4,447
470.00	5,509	304.0	4,715	11,316	6,236
471.00	6,987	333.0	6,233	17,549	7,740
471.50	8,120	350.0	3,773	21,323	8,680

Device	Routing	Invert	Outlet Devices
#1	Primary	467.00'	**1.3" Vert. Orifice1** C= 0.600
#2	Primary	470.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Secondary	470.00'	**8.0' long x 6.0' breadth Spillway / Broad-Crested Rect 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=2.05 cfs @ 12.64 hrs HW=470.17' (Free Discharge)
└─**1=Orifice1** (Orifice Controls 0.08 cfs @ 8.50 fps)
└─**2=Grate** (Orifice Controls 1.97 cfs @ 1.97 fps)

Secondary OutFlow Max=1.30 cfs @ 12.64 hrs HW=470.17' (Free Discharge)
└─**3=Spillway / Broad-Crested Rect Weir** (Weir Controls 1.30 cfs @ 0.97 fps)

Hydrograph for Pond 1P: Pond east

FOR 1.3" ORIFICE

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
1.00	0.00	840	467.00	0.00	0.00	0.00
1.50	0.00	840	467.00	0.00	0.00	0.00
2.00	0.00	840	467.00	0.00	0.00	0.00
2.50	0.00	840	467.00	0.00	0.00	0.00
3.00	0.00	840	467.00	0.00	0.00	0.00
3.50	0.00	840	467.00	0.00	0.00	0.00
4.00	0.00	840	467.00	0.00	0.00	0.00
4.50	0.00	840	467.00	0.00	0.00	0.00
5.00	0.00	840	467.00	0.00	0.00	0.00
5.50	0.00	840	467.00	0.00	0.00	0.00
6.00	0.00	840	467.00	0.00	0.00	0.00
6.50	0.00	840	467.00	0.00	0.00	0.00
7.00	0.00	840	467.00	0.00	0.00	0.00
7.50	0.00	840	467.00	0.00	0.00	0.00
8.00	0.00	840	467.00	0.00	0.00	0.00
8.50	0.00	840	467.00	0.00	0.00	0.00
9.00	0.00	840	467.00	0.00	0.00	0.00
9.50	0.00	840	467.00	0.00	0.00	0.00
10.00	0.00	840	467.00	0.00	0.00	0.00
10.50	0.00	840	467.00	0.00	0.00	0.00
11.00	0.00	840	467.00	0.00	0.00	0.00
11.50	0.03	850	467.01	0.00	0.00	0.00
12.00	**2.23**	1,666	467.40	0.03	0.03	0.00
12.50	**4.74**	**11,675**	**470.06**	**1.47**	**1.14**	**0.32**
13.00	1.72	**11,817**	**470.09**	**1.99**	**1.47**	**0.52**
13.50	1.05	11,581	470.05	1.12	0.91	0.20
14.00	0.80	11,509	470.03	0.83	0.69	0.15
14.50	0.66	11,468	470.03	0.68	0.56	0.12
15.00	0.59	11,449	470.02	0.60	0.50	0.10
15.50	0.54	11,435	470.02	0.55	0.45	0.09
16.00	0.48	11,421	470.02	0.49	0.41	0.08
16.50	0.43	11,407	470.02	0.43	0.36	0.07
17.00	0.40	11,400	470.02	0.41	0.34	0.06
17.50	0.38	11,395	470.01	0.39	0.33	0.06
18.00	0.36	11,390	470.01	0.37	0.31	0.06
18.50	0.34	11,384	470.01	0.34	0.29	0.05
19.00	0.32	11,379	470.01	0.32	0.28	0.05
19.50	0.30	11,373	470.01	0.30	0.26	0.04
20.00	0.27	11,367	470.01	0.28	0.24	0.04
20.50	0.26	11,362	470.01	0.26	0.22	0.04
21.00	0.25	11,360	470.01	0.25	0.22	0.03
21.50	0.25	11,359	470.01	0.25	0.21	0.03
22.00	0.24	11,358	470.01	0.24	0.21	0.03
22.50	0.24	11,357	470.01	0.24	0.21	0.03
23.00	0.23	11,356	470.01	0.23	0.20	0.03
23.50	0.23	11,355	470.01	0.23	0.20	0.03
24.00	0.23	11,354	470.01	0.23	0.20	0.03
24.50	0.08	11,325	470.00	0.11	0.10	0.01
25.00	0.01	11,237	469.99	0.08	0.08	0.00
25.50	0.00	11,105	469.96	0.08	0.08	0.00
26.00	0.00	10,969	469.94	0.08	0.08	0.00
26.50	0.00	10,834	469.91	0.08	0.08	0.00

Hydrograph for Pond 1P: Pond east (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
27.00	0.00	10,699	469.89	0.07	0.07	0.00
27.50	0.00	10,565	469.86	0.07	0.07	0.00
28.00	0.00	10,432	469.84	0.07	0.07	0.00
28.50	0.00	10,299	469.81	0.07	0.07	0.00
29.00	0.00	10,166	469.78	0.07	0.07	0.00
29.50	0.00	10,035	469.76	0.07	0.07	0.00
30.00	0.00	9,904	469.73	0.07	0.07	0.00
30.50	0.00	9,773	469.71	0.07	0.07	0.00
31.00	0.00	9,643	469.68	0.07	0.07	0.00
31.50	0.00	9,514	469.66	0.07	0.07	0.00
32.00	0.00	9,386	469.63	0.07	0.07	0.00
32.50	0.00	9,258	469.60	0.07	0.07	0.00
33.00	0.00	9,131	469.58	0.07	0.07	0.00
33.50	0.00	9,004	469.55	0.07	0.07	0.00
34.00	0.00	8,878	469.52	0.07	0.07	0.00
34.50	0.00	8,753	469.50	0.07	0.07	0.00
35.00	0.00	8,629	469.47	0.07	0.07	0.00
35.50	0.00	8,505	469.44	0.07	0.07	0.00
36.00	0.00	8,382	469.42	0.07	0.07	0.00
36.50	0.00	8,259	469.39	0.07	0.07	0.00
37.00	0.00	8,137	469.36	0.07	0.07	0.00
37.50	0.00	8,016	469.34	0.07	0.07	0.00
38.00	0.00	7,896	469.31	0.07	0.07	0.00
38.50	0.00	7,776	469.28	0.07	0.07	0.00
39.00	0.00	7,657	469.25	0.07	0.07	0.00
39.50	0.00	7,539	469.23	0.07	0.07	0.00
40.00	0.00	7,422	469.20	0.07	0.07	0.00
40.50	0.00	7,305	469.17	0.06	0.06	0.00
41.00	0.00	7,189	469.14	0.06	0.06	0.00
41.50	0.00	7,074	469.12	0.06	0.06	0.00
42.00	0.00	6,960	469.09	0.06	0.06	0.00
42.50	0.00	6,846	469.06	0.06	0.06	0.00
43.00	0.00	6,734	469.03	0.06	0.06	0.00
43.50	0.00	6,622	469.01	0.06	0.06	0.00
44.00	0.00	6,510	468.98	0.06	0.06	0.00
44.50	0.00	6,400	468.95	0.06	0.06	0.00
45.00	0.00	6,290	468.92	0.06	0.06	0.00
45.50	0.00	6,182	468.89	0.06	0.06	0.00
46.00	0.00	6,074	468.86	0.06	0.06	0.00
46.50	0.00	5,967	468.84	0.06	0.06	0.00
47.00	0.00	5,861	468.81	0.06	0.06	0.00
47.50	0.00	5,755	468.78	0.06	0.06	0.00
48.00	0.00	5,651	468.75	0.06	0.06	0.00
48.50	0.00	5,547	468.72	0.06	0.06	0.00
49.00	0.00	5,444	468.69	0.06	0.06	0.00
49.50	0.00	5,342	468.67	0.06	0.06	0.00
50.00	0.00	5,241	468.64	0.06	0.06	0.00
50.50	0.00	5,141	468.61	0.06	0.06	0.00
51.00	0.00	5,042	468.58	0.05	0.05	0.00
51.50	0.00	4,944	468.55	0.05	0.05	0.00
52.00	0.00	4,847	468.52	0.05	0.05	0.00
52.50	0.00	4,750	468.50	0.05	0.05	0.00

Hydrograph for Pond 1P: Pond east (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
53.00	0.00	4,655	468.47	0.05	0.05	0.00
53.50	0.00	4,560	468.44	0.05	0.05	0.00
54.00	0.00	4,467	468.41	0.05	0.05	0.00
54.50	0.00	4,374	468.38	0.05	0.05	0.00
55.00	0.00	4,283	468.35	0.05	0.05	0.00
55.50	0.00	4,192	468.33	0.05	0.05	0.00
56.00	0.00	4,102	468.30	0.05	0.05	0.00
56.50	0.00	4,014	468.27	0.05	0.05	0.00
57.00	0.00	3,926	468.24	0.05	0.05	0.00
57.50	0.00	3,840	468.21	0.05	0.05	0.00
58.00	0.00	3,754	468.19	0.05	0.05	0.00
58.50	0.00	3,670	468.16	0.05	0.05	0.00
59.00	0.00	3,586	468.13	0.05	0.05	0.00
59.50	0.00	3,504	468.10	0.05	0.05	0.00
60.00	0.00	3,423	468.08	0.04	0.04	0.00
60.50	0.00	3,342	468.05	0.04	0.04	0.00
61.00	0.00	3,263	468.02	0.04	0.04	0.00
61.50	0.00	3,185	467.99	0.04	0.04	0.00
62.00	0.00	3,109	467.97	0.04	0.04	0.00
62.50	0.00	3,033	467.94	0.04	0.04	0.00
63.00	0.00	2,958	467.91	0.04	0.04	0.00
63.50	0.00	2,885	467.89	0.04	0.04	0.00
64.00	0.00	2,812	467.86	0.04	0.04	0.00
64.50	0.00	2,741	467.83	0.04	0.04	0.00
65.00	0.00	2,671	467.81	0.04	0.04	0.00
65.50	0.00	2,603	467.78	0.04	0.04	0.00
66.00	0.00	2,535	467.76	0.04	0.04	0.00
66.50	0.00	2,469	467.73	0.04	0.04	0.00
67.00	0.00	2,404	467.70	0.04	0.04	0.00
67.50	0.00	2,340	467.68	0.04	0.04	0.00
68.00	0.00	2,278	467.65	0.03	0.03	0.00
68.50	0.00	2,216	467.63	0.03	0.03	0.00
69.00	0.00	2,156	467.61	0.03	0.03	0.00
69.50	0.00	2,098	467.58	0.03	0.03	0.00
70.00	0.00	2,040	467.56	0.03	0.03	0.00
70.50	0.00	1,984	467.53	0.03	0.03	0.00
71.00	0.00	1,929	467.51	0.03	0.03	0.00
71.50	0.00	1,876	467.49	0.03	0.03	0.00
72.00	0.00	1,824	467.47	0.03	0.03	0.00
72.50	0.00	1,773	467.45	0.03	0.03	0.00
73.00	0.00	1,724	467.42	0.03	0.03	0.00
73.50	0.00	1,676	467.40	0.03	0.03	0.00
74.00	0.00	1,630	467.38	0.03	0.03	0.00
74.50	0.00	1,585	467.36	0.02	0.02	0.00
75.00	0.00	1,541	467.34	0.02	0.02	0.00
75.50	0.00	1,499	467.32	0.02	0.02	0.00
76.00	0.00	1,459	467.30	0.02	0.02	0.00
76.50	0.00	1,419	467.29	0.02	0.02	0.00
77.00	0.00	1,382	467.27	0.02	0.02	0.00
77.50	0.00	1,346	467.25	0.02	0.02	0.00
78.00	0.00	1,311	467.24	0.02	0.02	0.00
78.50	0.00	1,278	467.22	0.02	0.02	0.00

Hydrograph for Pond 1P: Pond east (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
79.00	0.00	1,246	467.20	0.02	0.02	0.00
79.50	0.00	1,216	467.19	0.02	0.02	0.00
80.00	0.00	1,187	467.18	0.02	0.02	0.00
80.50	0.00	1,160	467.16	0.01	0.01	0.00
81.00	0.00	1,135	467.15	0.01	0.01	0.00
81.50	0.00	1,111	467.14	0.01	0.01	0.00
82.00	0.00	1,089	467.13	0.01	0.01	0.00
82.50	0.00	1,068	467.12	0.01	0.01	0.00
83.00	0.00	1,049	467.11	0.01	0.01	0.00
83.50	0.00	1,032	467.10	0.01	0.01	0.00
84.00	0.00	1,016	467.09	0.01	0.01	0.00
84.50	0.00	1,001	467.08	0.01	0.01	0.00
85.00	0.00	989	467.08	0.01	0.01	0.00
85.50	0.00	978	467.07	0.01	0.01	0.00
86.00	0.00	968	467.07	0.01	0.01	0.00
86.50	0.00	959	467.06	0.00	0.00	0.00
87.00	0.00	951	467.06	0.00	0.00	0.00
87.50	0.00	944	467.05	0.00	0.00	0.00
88.00	0.00	938	467.05	0.00	0.00	0.00
88.50	0.00	932	467.05	0.00	0.00	0.00
89.00	0.00	927	467.05	0.00	0.00	0.00
89.50	0.00	922	467.04	0.00	0.00	0.00
90.00	0.00	917	467.04	0.00	0.00	0.00
90.50	0.00	912	467.04	0.00	0.00	0.00
91.00	0.00	908	467.04	0.00	0.00	0.00
91.50	0.00	904	467.03	0.00	0.00	0.00
92.00	0.00	901	467.03	0.00	0.00	0.00
92.50	0.00	897	467.03	0.00	0.00	0.00
93.00	0.00	894	467.03	0.00	0.00	0.00
93.50	0.00	891	467.03	0.00	0.00	0.00
94.00	0.00	888	467.02	0.00	0.00	0.00
94.50	0.00	885	467.02	0.00	0.00	0.00
95.00	0.00	882	467.02	0.00	0.00	0.00
95.50	0.00	880	467.02	0.00	0.00	0.00
96.00	0.00	878	467.02	0.00	0.00	0.00
96.50	0.00	876	467.02	0.00	0.00	0.00
97.00	0.00	874	467.02	0.00	0.00	0.00
97.50	0.00	872	467.02	0.00	0.00	0.00
98.00	0.00	870	467.02	0.00	0.00	0.00
98.50	0.00	868	467.01	0.00	0.00	0.00
99.00	0.00	866	467.01	0.00	0.00	0.00
99.50	0.00	865	467.01	0.00	0.00	0.00
100.00	0.00	863	467.01	0.00	0.00	0.00
100.50	0.00	862	467.01	0.00	0.00	0.00
101.00	0.00	861	467.01	0.00	0.00	0.00
101.50	0.00	860	467.01	0.00	0.00	0.00
102.00	0.00	858	467.01	0.00	0.00	0.00
102.50	0.00	857	467.01	0.00	0.00	0.00
103.00	0.00	856	467.01	0.00	0.00	0.00
103.50	0.00	855	467.01	0.00	0.00	0.00
104.00	0.00	855	467.01	0.00	0.00	0.00
104.50	0.00	854	467.01	0.00	0.00	0.00

Hydrograph for Pond 1P: Pond east (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
105.00	0.00	853	467.01	0.00	0.00	0.00
105.50	0.00	852	467.01	0.00	0.00	0.00
106.00	0.00	852	467.01	0.00	0.00	0.00
106.50	0.00	851	467.01	0.00	0.00	0.00
107.00	0.00	850	467.01	0.00	0.00	0.00
107.50	0.00	850	467.01	0.00	0.00	0.00
108.00	0.00	849	467.00	0.00	0.00	0.00
108.50	0.00	849	467.00	0.00	0.00	0.00
109.00	0.00	848	467.00	0.00	0.00	0.00
109.50	0.00	848	467.00	0.00	0.00	0.00
110.00	0.00	847	467.00	0.00	0.00	0.00
110.50	0.00	847	467.00	0.00	0.00	0.00
111.00	0.00	846	467.00	0.00	0.00	0.00
111.50	0.00	846	467.00	0.00	0.00	0.00
112.00	0.00	846	467.00	0.00	0.00	0.00
112.50	0.00	845	467.00	0.00	0.00	0.00
113.00	0.00	845	467.00	0.00	0.00	0.00
113.50	0.00	845	467.00	0.00	0.00	0.00
114.00	0.00	844	467.00	0.00	0.00	0.00
114.50	0.00	844	467.00	0.00	0.00	0.00
115.00	0.00	844	467.00	0.00	0.00	0.00
115.50	0.00	844	467.00	0.00	0.00	0.00
116.00	0.00	843	467.00	0.00	0.00	0.00
116.50	0.00	843	467.00	0.00	0.00	0.00
117.00	0.00	843	467.00	0.00	0.00	0.00
117.50	0.00	843	467.00	0.00	0.00	0.00
118.00	0.00	843	467.00	0.00	0.00	0.00
118.50	0.00	843	467.00	0.00	0.00	0.00
119.00	0.00	842	467.00	0.00	0.00	0.00
119.50	0.00	842	467.00	0.00	0.00	0.00
120.00	0.00	842	467.00	0.00	0.00	0.00

Summary for Subcatchment DA2: East

Runoff = 34.40 cfs @ 12.24 hrs, Volume= 3.252 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 year Rainfall=5.20"

	Area (ac)	CN	Description
*	0.460	98	Unconnected roofs
*	0.370	98	Drives
*	2.020	74	Lawn, HSG C
*	4.210	80	Lawn, HSG D
*	0.570	98	Paved Roadway
*	0.360	71	Meadow, HSG C
*	4.730	78	Meadow, HSG D
	12.720	80	Weighted Average
	11.320	78	88.99% Pervious Area
	1.400	98	11.01% Impervious Area
	0.460		32.86% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Overland meadow** Grass: Dense n= 0.240 P2= 2.30"
14.5	1,000	0.0270	1.15		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
2.0	250	0.0200	2.12		**Shallow Concentrated Flow, Thru lawn to DI** Grassed Waterway Kv= 15.0 fps
29.3	1,350	Total			

Summary for Subcatchment DA3: Offsite

Runoff = 5.93 cfs @ 12.30 hrs, Volume= 0.641 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 year Rainfall=5.20"

	Area (sf)	CN	Description
*	14,400	98	Unconnected roofs
	49,298	71	Meadow, non-grazed, HSG C
	60,253	78	Meadow, non-grazed, HSG D
	123,951	78	Weighted Average, UI Adjusted CN = 76
	109,551	75	88.38% Pervious Area
	14,400	98	11.62% Impervious Area
	14,400		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	150	0.0300	0.13		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
13.8	950	0.0270	1.15		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
2.0	250	0.0200	2.12		**Shallow Concentrated Flow, Thru yard to DI** Grassed Waterway Kv= 15.0 fps
35.6	1,350	Total			

Summary for Pond 1P: Pond east

Inflow Area = 15.566 ac, 11.12% Impervious, Inflow Depth = 3.00" for 100 year event
Inflow = 39.99 cfs @ 12.24 hrs, Volume= 3.893 af
Outflow = 38.62 cfs @ 12.30 hrs, Volume= 3.893 af, Atten= 3%, Lag= 3.5 min
Primary = 5.67 cfs @ 12.30 hrs, Volume= 1.789 af
Secondary = 32.95 cfs @ 12.30 hrs, Volume= 2.104 af

Routing by Stor-Ind method, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 467.00' Surf.Area= 1,898 sf Storage= 840 cf
Peak Elev= 471.34' @ 12.30 hrs Surf.Area= 7,748 sf Storage= 20,052 cf (19,212 cf above start)

Plug-Flow detention time= 148.4 min calculated for 3.873 af (99% of inflow)
Center-of-Mass det. time= 144.0 min (985.3 - 841.3)

Volume	Invert	Avail.Storage	Storage Description
#1	466.50'	21,323 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)
466.50	1,471	183.0	0	0	1,471
467.00	1,898	198.0	840	840	1,936
468.00	2,861	231.0	2,363	3,203	3,082
469.00	3,964	265.0	3,398	6,601	4,447
470.00	5,509	304.0	4,715	11,316	6,236
471.00	6,987	333.0	6,233	17,549	7,740
471.50	8,120	350.0	3,773	21,323	8,680

Device	Routing	Invert	Outlet Devices
#1	Primary	467.00'	**1.3" Vert. Orifice1** C= 0.600
#2	Primary	470.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Secondary	470.00'	**8.0' long x 6.0' breadth Spillway / Broad-Crested Rect 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=5.67 cfs @ 12.30 hrs HW=471.34' (Free Discharge)
└─**1=Orifice1** (Orifice Controls 0.09 cfs @ 9.97 fps)
└─**2=Grate** (Orifice Controls 5.57 cfs @ 5.57 fps)

Secondary OutFlow Max=32.95 cfs @ 12.30 hrs HW=471.34' (Free Discharge)
└─**3=Spillway / Broad-Crested Rect Weir** (Weir Controls 32.95 cfs @ 3.07 fps)

Summary for Subcatchment DA2: East

Runoff = 0.18 cfs @ 12.46 hrs, Volume= 0.058 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.460	98	Unconnected roofs
*	0.370	98	Drives
*	2.020	74	Lawn, HSG C
*	4.210	80	Lawn, HSG D
*	0.570	98	Paved Roadway
*	0.360	71	Meadow, HSG C
*	4.730	78	Meadow, HSG D
	12.720	80	Weighted Average
	11.320	78	88.99% Pervious Area
	1.400	98	11.01% Impervious Area
	0.460		32.86% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Overland meadow** Grass: Dense n= 0.240 P2= 2.30"
14.5	1,000	0.0270	1.15		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
2.0	250	0.0200	2.12		**Shallow Concentrated Flow, Thru lawn to DI** Grassed Waterway Kv= 15.0 fps
29.3	1,350	Total			

Summary for Subcatchment DA3: Offsite

Runoff = 0.01 cfs @ 14.04 hrs, Volume= 0.005 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (sf)	CN	Description
*	14,400	98	Unconnected roofs
	49,298	71	Meadow, non-grazed, HSG C
	60,253	78	Meadow, non-grazed, HSG D
	123,951	78	Weighted Average, UI Adjusted CN = 76
	109,551	75	88.38% Pervious Area
	14,400	98	11.62% Impervious Area
	14,400		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	150	0.0300	0.13		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"
13.8	950	0.0270	1.15		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
2.0	250	0.0200	2.12		**Shallow Concentrated Flow, Thru yard to DI** Grassed Waterway Kv= 15.0 fps
35.6	1,350	Total			

Summary for Pond 1P: Pond east

Inflow Area = 15.566 ac, 11.12% Impervious, Inflow Depth = 0.05" for WQv event
Inflow = 0.18 cfs @ 12.46 hrs, Volume= 0.063 af
Outflow = 0.03 cfs @ 24.20 hrs, Volume= 0.063 af, Atten= 80%, Lag= 704.2 min
Primary = 0.03 cfs @ 24.20 hrs, Volume= 0.063 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-120.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 467.00' Surf.Area= 1,898 sf Storage= 840 cf
Peak Elev= 467.66' @ 24.20 hrs Surf.Area= 2,508 sf Storage= 2,283 cf (1,443 cf above start)

Plug-Flow detention time= 939.7 min calculated for 0.044 af (70% of inflow)
Center-of-Mass det. time= 571.2 min (1,577.6 - 1,006.4)

Volume	Invert	Avail.Storage	Storage Description
#1	466.50'	21,323 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)
466.50	1,471	183.0	0	0	1,471
467.00	1,898	198.0	840	840	1,936
468.00	2,861	231.0	2,363	3,203	3,082
469.00	3,964	265.0	3,398	6,601	4,447
470.00	5,509	304.0	4,715	11,316	6,236
471.00	6,987	333.0	6,233	17,549	7,740
471.50	8,120	350.0	3,773	21,323	8,680

Device	Routing	Invert	Outlet Devices
#1	Primary	467.00'	**1.3" Vert. Orifice1** C= 0.600
#2	Primary	470.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Secondary	470.00'	**8.0' long x 6.0' breadth Spillway / Broad-Crested Rect 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.03 cfs @ 24.20 hrs HW=467.66' (Free Discharge)
└─**1=Orifice1** (Orifice Controls 0.03 cfs @ 3.74 fps)
└─**2=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=467.00' (Free Discharge)
└─**3=Spillway / Broad-Crested Rect Weir** (Controls 0.00 cfs)

Old Stage Estates

Stormwater Pond East Modeling Results - modified stormwater pond
January 2015

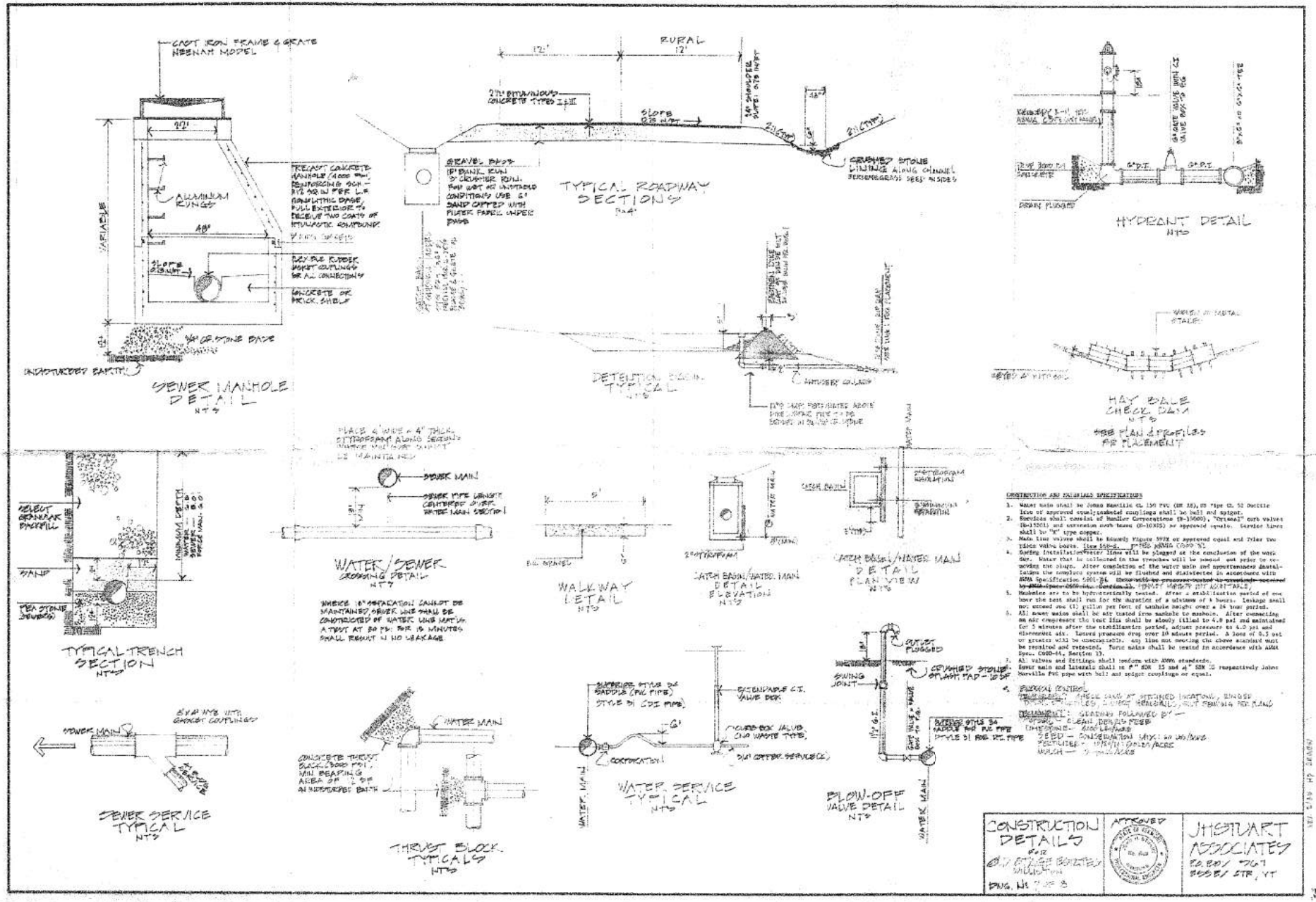
Orifice size	Channel Protection Volume			
	Routed Peak Q (cfs)	Peak elev. (feet)	Detention (hrs)	Pond drain duration (hr)
1"	3.37	470.17	15.5	< 120
1.3"	3.35	470.17	11.3	83.5
1.5"	3.34	470.17	9.4	69.0
2"	3.31	470.16	7.0	50.5
3"	3.22	470.14	4.5	35.0
4"	3.09	470.11	2.7	28.0
6"	2.49	470.04	1.2	26.0
7"	2.08	469.90	0.9	25.50

Notes:
- Detention is the center of mass detention time
- Pond drain duration is the time in hours for the ponding depth to be less than 0.1' above the lowest outlet

Outlet Summary
Orifice invert 467.00
Grate 470.00
Spillway 470.00

P:\2014\14065\Stormwater\Pond East CPv results.wpd

JHSTUART
P.O. BOX 967
SHREX CENTER, VT 05461
OLD STAGE ESTATES
WILLISTON
HIGH SCHOOL REFERRAL SERVICES
SEPTEMBER 1985
SEPTEMBER 1985
LOCATION MAP
TYPICAL LOT
LEGEND
LAND USE SUMMARY
LANDSCAPING (PER LOT)
OLD STAGE ROAD
ALLEN BROOK
WILLISTON CENTRAL SCHOOL
N. WORTHEIM
R. EASTMAN
E. HEMSTEAD
GERMAIN


SEWER MANHOLE DETAIL
NTS
TYPICAL ROADWAY SECTIONS
DETENTION BASIN TYPICAL
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HYDRANT DETAIL
NTS
HAY BALE CHECK DAM
NTS
SEE PLAN & PROFILES FOR PLACEMENT
TYPICAL TRENCH SECTION
NTS
WATER/SEWER CROSSING DETAIL
NTS
WALKWAY DETAIL
NTS
CATCH BASIN/WATER MAIN DETAIL ELEVATION
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CATCH BASIN/WATER MAIN DETAIL PLAN VIEW
NTS
SEWER SERVICE TYPICAL
NTS
THRUST BLOCK TYPICALS
NTS
WATER SERVICE TYPICAL
NTS
BLOW-OFF VALVE DETAIL
NTS
CONSTRUCTION AND MATERIALS SPECIFICATIONS
CONSTRUCTION DETAILS
J.H. STUART ASSOCIATES

GOLF LINKS: PERMIT 2-1180


Source: USGS
Source: NASA, NGA, USGS
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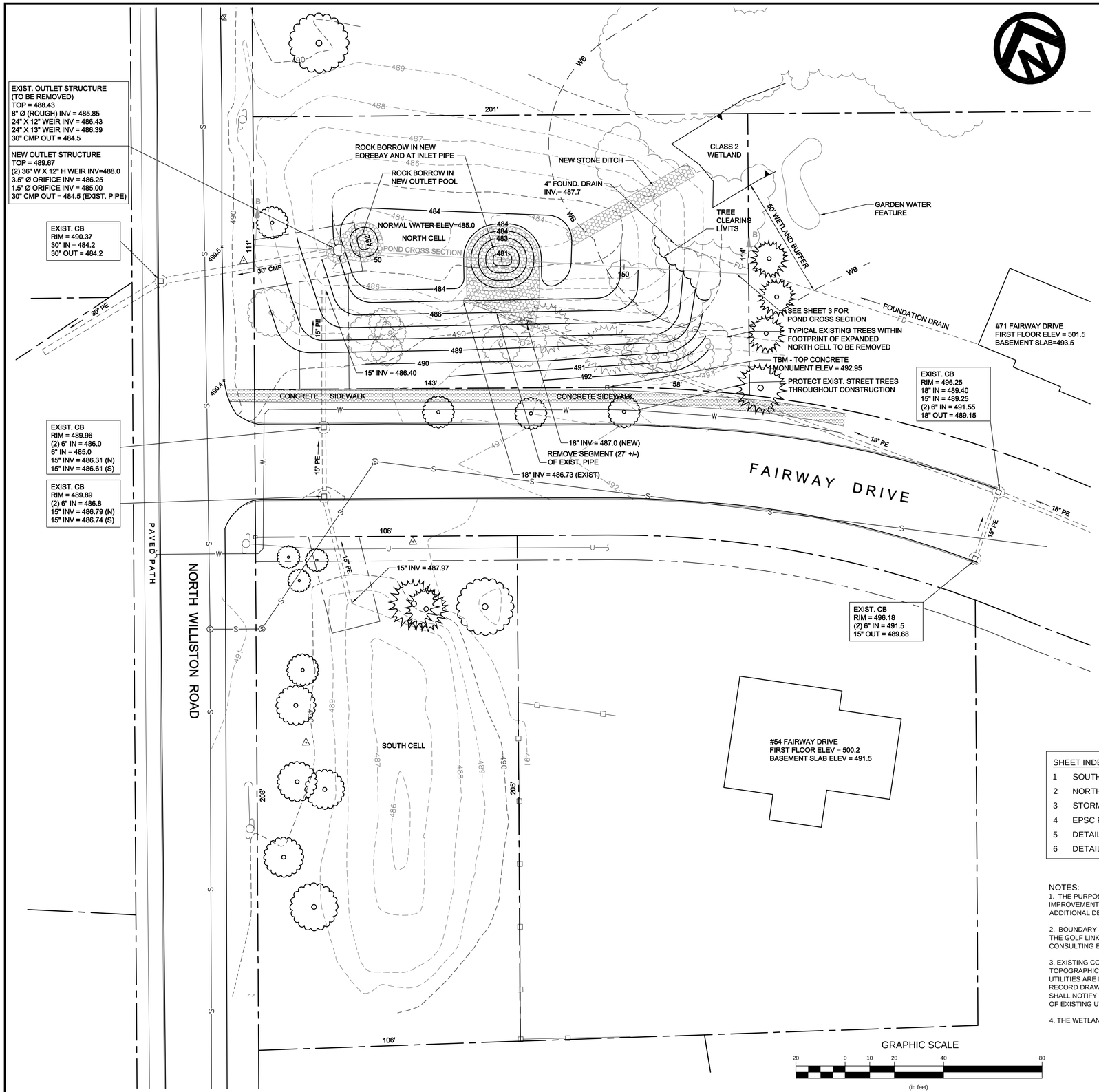
76m
esri®

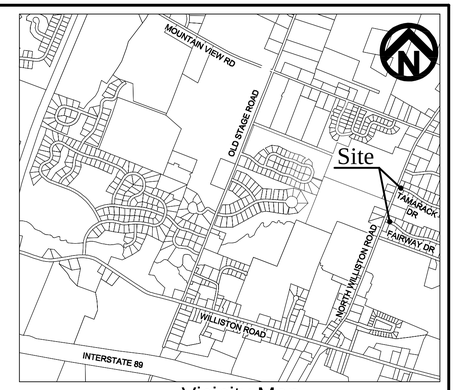


Stormwater Pond - South

Scale: 1"=20'

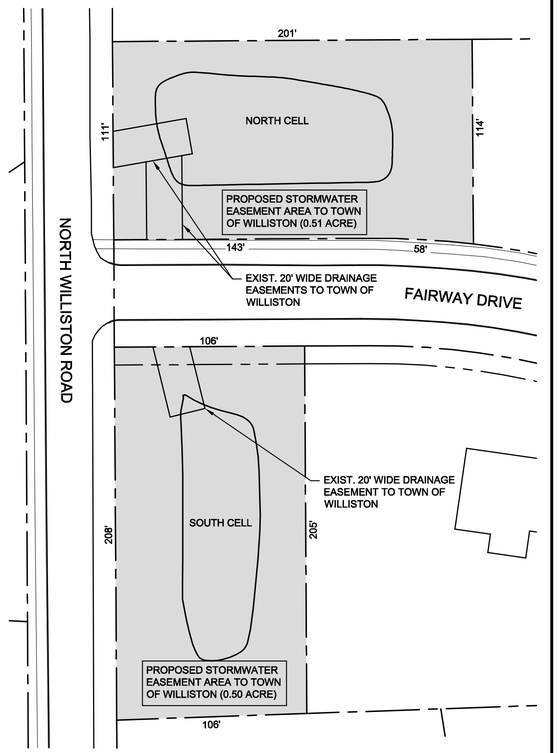
Legend

- SURVEY TRAVERSE CONTROL
- EXISTING CATCH BASIN
- PROPERTY CORNER PIPE
- EXISTING WOOD RAIL FENCE
- WETLAND BUFFER
- EXISTING WATERMAIN
- WETLAND BOUNDARY
- FINISH GRADE CONTOUR
- EXISTING GROUND CONTOUR
- EXISTING STORMWATER PIPE
- PROPERTY BOUNDARY
- SIDELINE OF EXISTING EASEMENT



Vicinity Map

NOT TO SCALE



Proposed Stormwater Easements

Scale: 1"=40'

SHEET INDEX

NOTES:

1. THE PURPOSE OF THIS PLAN IS TO PRESENT THE PROPOSED IMPROVEMENTS TO THE EXISTING STORM POND. SEE OTHER PLANS FOR ADDITIONAL DESIGN INFORMATION AND CONSTRUCTION DETAILS.

2. BOUNDARY INFORMATION SHOWN IS BASED UPON FIELD EVIDENCE AND THE GOLF LINKS PROPERTY PLAT PREPARED BY LAMOUREUX & STONE CONSULTING ENGINEERS, INC. LAST REVISED 09-30-99.

3. EXISTING CONDITIONS SHOWN HEREON ARE BASED UPON A TOPOGRAPHIC SURVEY PERFORMED BY L&D IN JULY 2014. EXISTING UTILITIES ARE BASED UPON THE TOPOGRAPHIC SURVEY AND AVAILABLE RECORD DRAWINGS. NOT ALL UTILITIES ARE SHOWN. THE CONTRACTOR SHALL NOTIFY DIGSAFE AND THE TOWN OF WILLISTON FOR IDENTIFICATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

4. THE WETLAND DELINEATION WAS PERFORMED BY L&D IN JULY 2014.

PARCELS: COM.051, a, b, f, & g DP # ____

Date	Revision	By

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ☐ Preliminary
- ■ Final Local Review
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

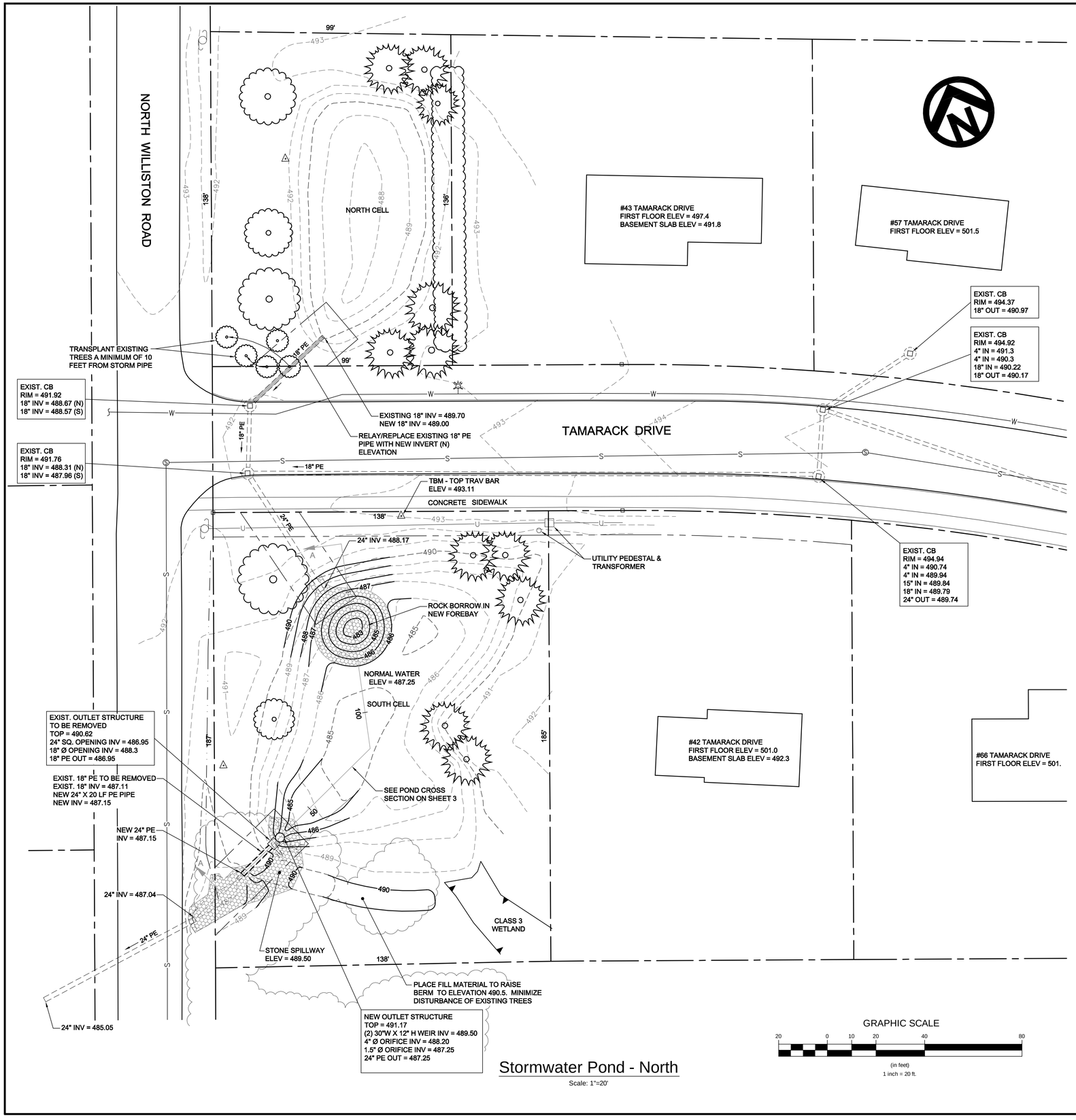
Golf Links Neighborhood Stormwater Improvement Project

Tamarack Drive, Fairway Drive &
North Williston Road Williston VT

South Pond Site Plan

Project No.	09025A
Survey	L&D
Design	AR
Drawn	L&D
Checked	DG
Date	1-10-16
Scale	1" = 20'
Sheet number	1

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com



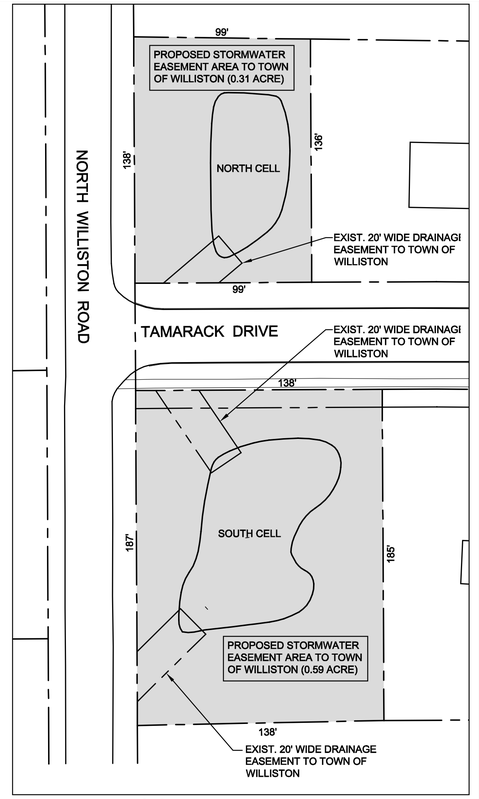
Stormwater Pond - North

Scale: 1"=20'

GRAPHIC SCALE

20 0 10 20 40 80

(in feet)
1 inch = 20 ft.



Proposed Stormwater Easements

Scale: 1"=40'

Legend

- SURVEY TRAVERSE CONTROL
- EXISTING CATCH BASIN
- PROPERTY CORNER PIPE
- EXISTING WOOD RAIL FENCE
- WETLAND BUFFER (WB)
- WETLAND BOUNDARY
- FINISH GRADE CONTOUR (490)
- EXISTING GROUND CONTOUR (490)
- EXISTING STORMWATER PIPE
- PROPERTY BOUNDARY
- SIDELINE OF EXISTING EASEMENT

NOTES:

1. THE PURPOSE OF THIS PLAN IS TO PRESENT THE PROPOSED IMPROVEMENTS TO THE EXISTING STORM POND. SEE OTHER PLANS FOR ADDITIONAL DESIGN INFORMATION AND CONSTRUCTION DETAILS.

2. BOUNDARY INFORMATION SHOWN IS BASED UPON FIELD EVIDENCE AND THE GOLF LINKS PROPERTY PLAT PREPARED BY LAMOUREUX & STONE CONSULTING ENGINEERS, INC. LAST REVISED 09-30-99 AND RECORDED IN SLIDE ___ OF THE WILLISTON LAND RECORDS.

3. EXISTING CONDITIONS SHOWN HEREON ARE BASED UPON A TOPOGRAPHIC SURVEY PERFORMED BY L&D IN JULY 2014. EXISTING UTILITIES ARE BASED UPON THE TOPOGRAPHIC SURVEY AND AVAILABLE RECORD DRAWINGS. NOT ALL UTILITIES ARE SHOWN. THE CONTRACTOR SHALL NOTIFY DIGSAFE AND THE TOWN OF WILLISTON FOR IDENTIFICATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

4. THE WETLAND DELINEATION WAS PERFORMED BY L&D IN JULY 2014.

PARCELS: COM.051, a, b, f, & g DP # ___

Date	Revision	By

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ☐ Preliminary
- ■ Final Local Review
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

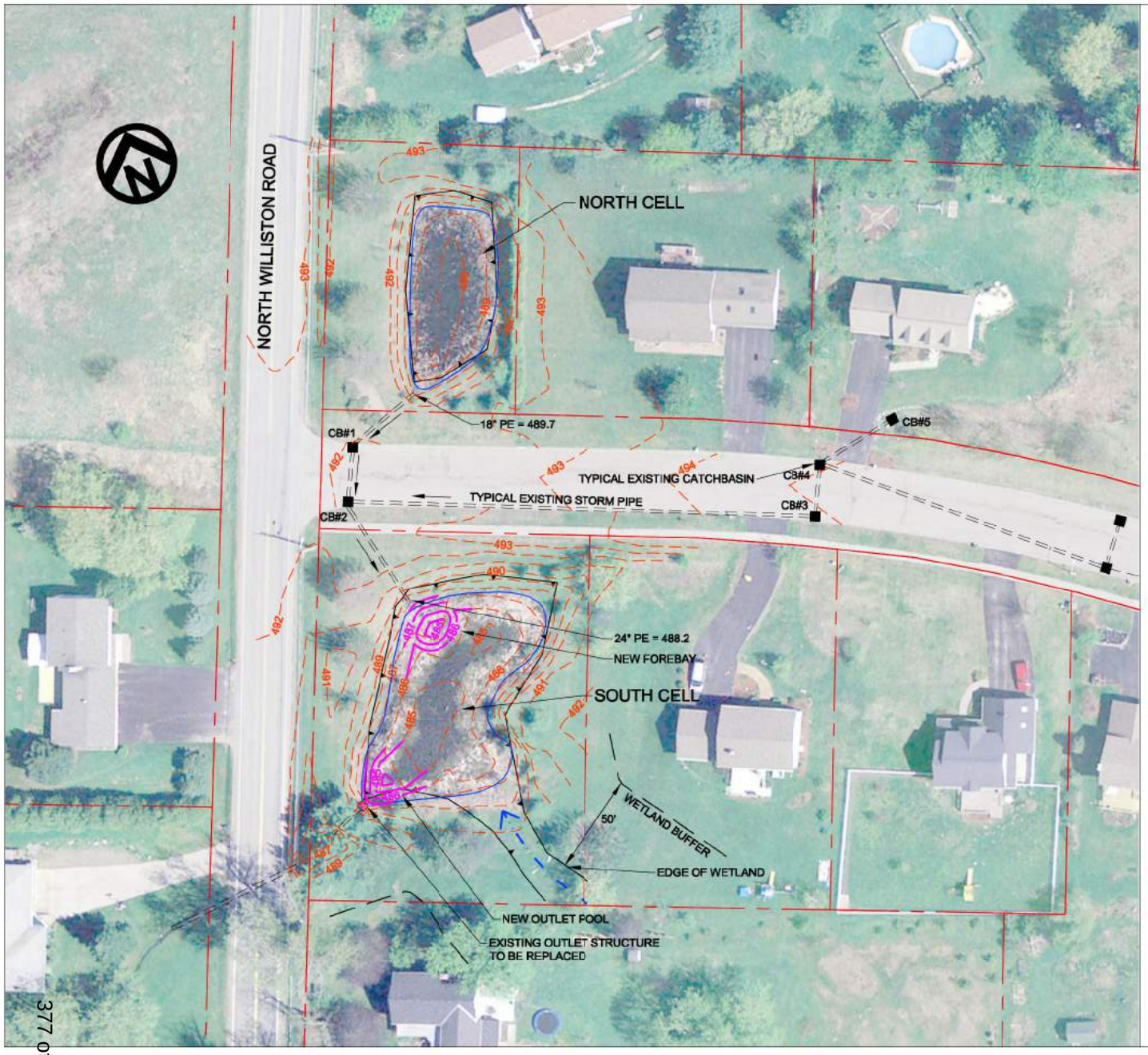
Golf Links Neighborhood Stormwater Improvement Project

Tamarack Drive, Fairway Drive &
North Williston Road Williston VT

North Pond Site Plan

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com

Project No.	09025A
Survey	L&D
Design	AR
Drawn	L&D
Checked	DG
Date	1-10-16
Scale	1" = 20'
Sheet number	2



CB#1
RIM=491.92
18" IN=488.67 (POND)
18" OUT=488.50 (CB#2)

CB#2
RIM=491.76
18" IN=488.1 (CB#1)
18" IN=488.0 (CB#3)
24" OUT=487.84 (POND)

CB#3
RIM=494.89
18" IN = 489.9
18" OUT = 489.8
4" UD IN=489.9

CB#4
RIM=494.87
18" IN = 490.2
18" OUT = 490.2
4" UD IN=490.2

CB#5
RIM=494.37
18" OUT=491.0

EXISTING OUTLET STRUCTURE
TOP = 490.62
24"SQ. OPENING
BOTTOM ELEV = 486.95
(PARTIALLY COVERED WITH
MIRADRAIN)
SIDE 18" Ø OPENING WITH HOOD

PROPOSED OUTLET STRUCTURE
TOP = 491.67
2X 36" (W) X 12" (H) WEIR INV = 490.00
2 X 24" (W) X 12" (H) WEIR INV = 489.50
4" Ø ORIFICE = 487.95
1.5" Ø ORIFICE = 486.95

50 0 25 50 100

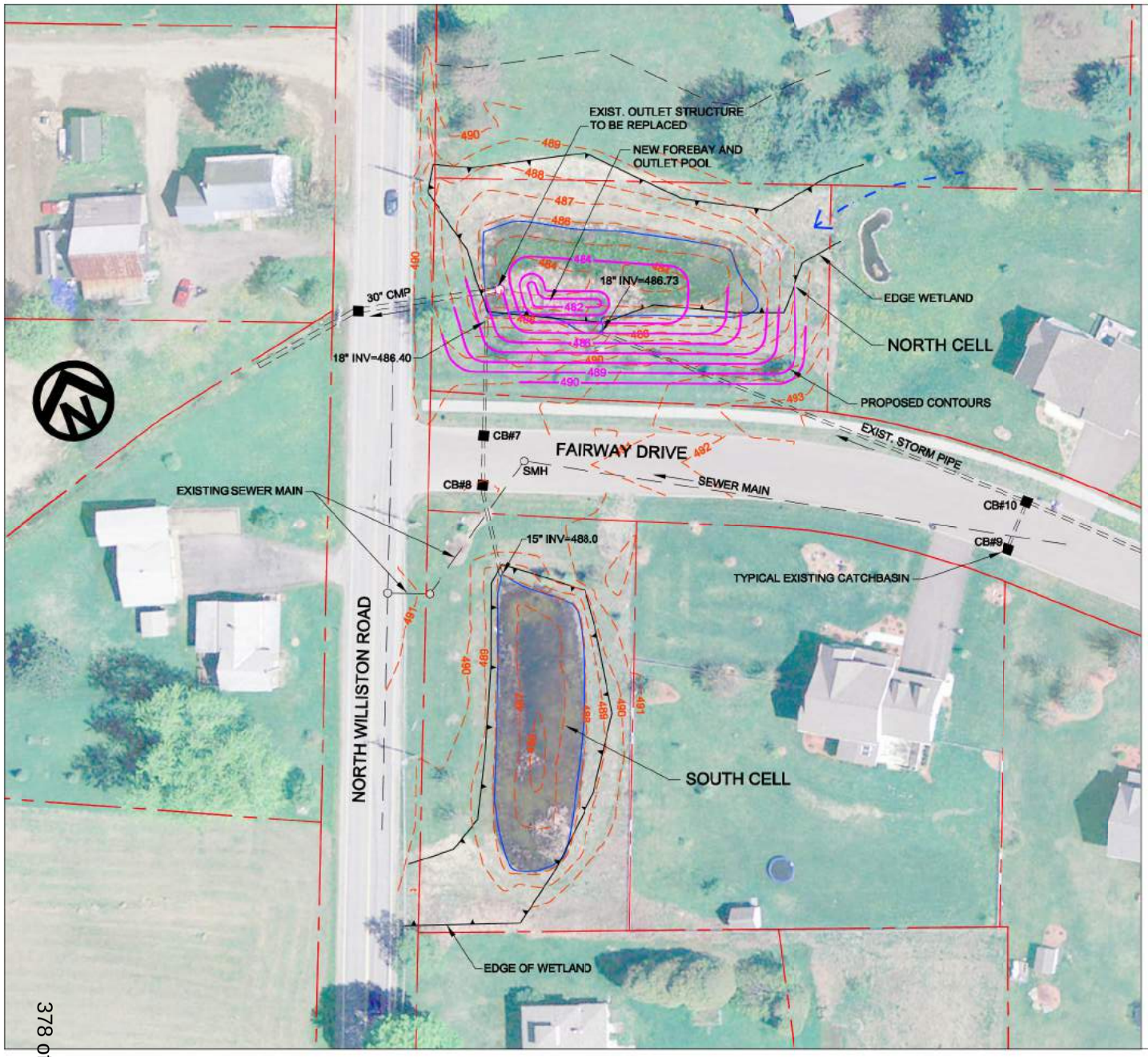
1 inch = 50 ft.

GOLF LINKS NEIGHBORHOOD

FAIRWAY DRIVE, TAMARACK DRIVE &
HILLCREST LANE WILLISTON, VT

POND - NORTH

AUGUST 2014, REVISED JANUARY 2015



CB#7
RIM=489.96
18" IN = 486.25
18" OUT = 485.8 (CB#7)
4" UD IN = 485.0

CB#8
RIM=489.89
18" IN = 486.8 (CB#7)
15" OUT = 486.7
4" UD IN = 486.8

CB#10
RIM=496.25
15" IN = 489.2 (CB#9)
18" IN = 489.3
18" OUT = 489.2
4" UD IN = 491.3

CB#9
RIM=496.18
15" OUT = 489.7
4" UD IN = 491.5

EXISTING OUTLET STRUCTURE
TOP = 488.43
8" Ø (ROUGH) OPENING = 485.85
24" X 12" OPENING INV = 486.43
24" X 13" OPENING INV = 486.39

PROPOSED OUTLET STRUCTURE
TOP = 490.67
2 X 36" (W) X 12" (H) WEIR INV = 488.0
3.5" Ø ORIFICE = 486.25
1.5" Ø ORIFICE = 485.00

50 0 25 50 100

1 inch = 50 ft.

GOLF LINKS NEIGHBORHOOD

FAIRWAY DRIVE, TAMARACK DRIVE &
HILLCREST LANE WILLISTON, VT

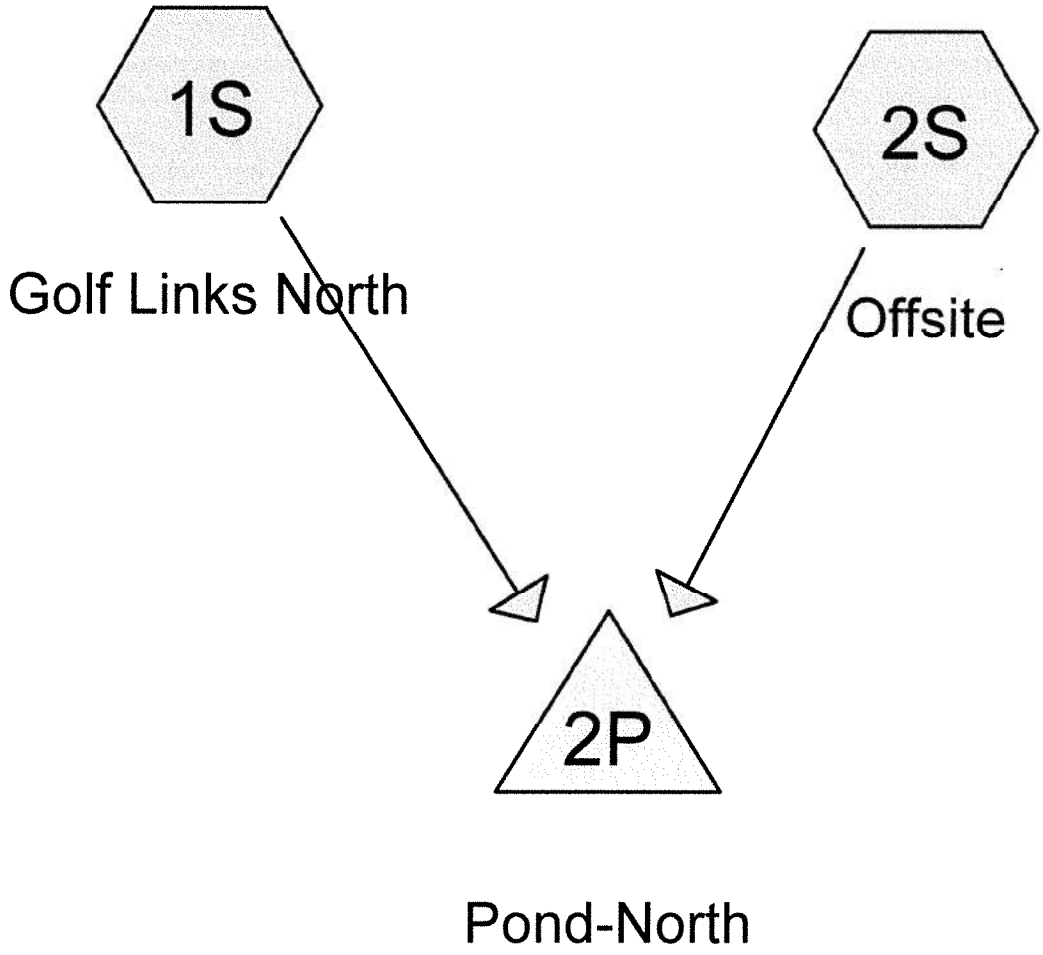
POND - SOUTH

AUGUST 2014, REVISED JANUARY 2015

Attachment 7
Pond North - HydroCad calculations

Lamoureux & Dickinson
Consulting Engineers, Inc.

REVISED JAN 2015



Subcat Reach Pond Link

Drainage Diagram for North PROPOSED pond2015
Prepared by Lamoureux & Dickinson, Printed 1/30/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.330	30	Meadow, non-grazed, HSG A (2S)
1.030	58	Meadow, non-grazed, HSG B (2S)
1.380	70	Woods, Good, HSG C (1S)
2.880	71	Meadow, non-grazed, HSG C (2S)
10.880	74	>75% Grass cover, Good, HSG C (1S)
0.850	98	Drives (1S)
1.020	98	Rooftop (1S)
1.590	98	Streets (1S)

Version: 9/06

For the area draining to*: North Pond

Located in drainage area for S/N: North Pond

WQ Volume Calculation for Volume-Based Practice

Use this worksheet to calculate the water quality volume draining to your volume based STP if you are not using any of the site design credits in section 3 of the 2002 VSWMM. ***Do not use*** *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice). See the worksheet "Water Quality Volume and Modified Curve Number Calculation for Water Quality Treatment in a Flow-Based Practice"*

Water Quality Volume Calculations

Line			value/calculation	units
1	Site Area (impervious + disturbed pervious)	A=	15.72	acres
2	Impervious area		3.46	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	22.01	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.248	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.223	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.223	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.293	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	12741	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

WQv TREATMENT ONLY REQ'D FOR ONSITE RUNOFF

(NOT REQ'D FOR OFFSITE RUNOFF)

WQv = 12,741 CF

PERMANENT POOL VOL = 7324 CF

$\frac{7324\ CF}{12,741\ CF}$ = 57% OF WQv

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Summary for Subcatchment 1S: Golf Links North

Runoff = 2.57 cfs @ 12.12 hrs, Volume= 0.211 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	1.590	98	Streets
*	0.850	98	Drives
*	1.020	98	Rooftop
	1.380	70	Woods, Good, HSG C
	10.880	74	>75% Grass cover, Good, HSG C
	15.720	79	Weighted Average
	12.260	74	77.99% Pervious Area
	3.460	98	22.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
4.7	1,120	0.0700	3.97		**Shallow Concentrated Flow, Thru yards** Grassed Waterway Kv= 15.0 fps
2.1	330	0.0300	2.60		**Shallow Concentrated Flow, To pond** Grassed Waterway Kv= 15.0 fps
19.6	1,550	Total			

Summary for Subcatchment 2S: Offsite

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
0.330	30	Meadow, non-grazed, HSG A
1.030	58	Meadow, non-grazed, HSG B
2.880	71	Meadow, non-grazed, HSG C
4.240	65	Weighted Average
4.240	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
0.8	200	0.0800	4.24		**Shallow Concentrated Flow, To street** Grassed Waterway Kv= 15.0 fps
28.5	1,470	Total			

Summary for Pond 2P: Pond-North

Inflow Area = 19.960 ac, 17.33% Impervious, Inflow Depth = 0.13" for WQv event
Inflow = 2.57 cfs @ 12.12 hrs, Volume= 0.211 af
Outflow = 0.06 cfs @ 19.74 hrs, Volume= 0.206 af, Atten= 98%, Lag= 457.4 min
Primary = 0.06 cfs @ 19.74 hrs, Volume= 0.206 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 486.95' Surf.Area= 5,766 sf Storage= 7,324 cf
Peak Elev= 487.91' @ 19.74 hrs Surf.Area= 8,233 sf Storage= 14,050 cf (6,726 cf above start)

Plug-Flow detention time= 3,399.5 min calculated for 0.038 af (18% of inflow)
Center-of-Mass det. time= 1,443.6 min (2,262.2 - 818.6)

14,050 CF
6,726 CF
7,324 CF PERM. POOL

→ 24 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	487.00'	9,292 cf	**North cell (Irregular)** Listed below (Recalc)
#2	485.00'	34,884 cf	**South cell (Irregular)** Listed below (Recalc)
		44,176 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
487.00	125	78.0	0	0	125
488.00	616	141.0	339	339	1,228
489.00	2,470	205.0	1,440	1,779	2,999
489.70	3,461	235.0	2,066	3,845	4,061
490.00	3,886	248.0	1,101	4,947	4,566
491.00	4,821	268.0	4,345	9,292	5,426

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
485.00	1,150	184.0	0	0	1,150
486.00	4,302	296.0	2,559	2,559	5,435
487.00	5,849	332.0	5,056	7,614	7,261
488.00	7,865	376.0	6,832	14,447	9,765
489.00	9,847	421.0	8,837	23,284	12,647
490.00	13,446	539.0	11,600	34,884	21,674

Device	Routing	Invert	Outlet Devices
#1	Primary	486.95'	**1.5" Vert. Orifice** C= 0.600
#2	Primary	487.95'	**4.0" Vert. Orifice** C= 0.600
#3	Primary	489.50'	**24.0" W x 12.0" H Vert. Orifice X 2.00** C= 0.600
#4	Primary	490.00'	**36.0" W x 12.0" H Vert. Orifice Overflow X 2.00** C= 0.600

Primary OutFlow Max=0.06 cfs @ 19.74 hrs HW=487.91' (Free Discharge)
- **1=Orifice** (Orifice Controls 0.06 cfs @ 4.57 fps)
- **2=Orifice** (Controls 0.00 cfs)
- **3=Orifice** (Controls 0.00 cfs)
- **4=Orifice Overflow** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Golf Links North

Runoff = 10.67 cfs @ 12.13 hrs, Volume= 0.946 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.590	98	Streets
*	0.850	98	Drives
*	1.020	98	Rooftop
	1.380	70	Woods, Good, HSG C
	10.880	74	>75% Grass cover, Good, HSG C
	15.720	79	Weighted Average
	12.260	74	77.99% Pervious Area
	3.460	98	22.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
4.7	1,120	0.0700	3.97		**Shallow Concentrated Flow, Thru yards** Grassed Waterway Kv= 15.0 fps
2.1	330	0.0300	2.60		**Shallow Concentrated Flow, To pond** Grassed Waterway Kv= 15.0 fps
19.6	1,550	Total			

Summary for Subcatchment 2S: Offsite

Runoff = 0.23 cfs @ 12.39 hrs, Volume= 0.058 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.330	30	Meadow, non-grazed, HSG A
1.030	58	Meadow, non-grazed, HSG B
2.880	71	Meadow, non-grazed, HSG C
4.240	65	Weighted Average
4.240	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
0.8	200	0.0800	4.24		**Shallow Concentrated Flow, To street** Grassed Waterway Kv= 15.0 fps
28.5	1,470	Total			

Summary for Pond 2P: Pond-North

Inflow Area = 19.960 ac, 17.33% Impervious, Inflow Depth = 0.60" for 1 year event
Inflow = 10.77 cfs @ 12.14 hrs, Volume= 1.004 af
Outflow = 0.69 cfs @ 14.63 hrs, Volume= 0.995 af, Atten= 94%, Lag= 149.4 min
Primary = 0.69 cfs @ 14.63 hrs, Volume= 0.995 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 486.95' Surf.Area= 5,766 sf Storage= 7,324 cf
Peak Elev= 489.53' @ 14.63 hrs Surf.Area= 14,886 sf Storage= 32,252 cf (24,928 cf above start)

Plug-Flow detention time= 1,022.7 min calculated for 0.827 af (82% of inflow)
Center-of-Mass det. time= 774.6 min (1,613.9 - 839.3)
→ 12.9 HR

Volume	Invert	Avail.Storage	Storage Description
#1	487.00'	9,292 cf	**North cell (Irregular)** Listed below (Recalc)
#2	485.00'	34,884 cf	**South cell (Irregular)** Listed below (Recalc)
		44,176 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
487.00	125	78.0	0	0	125
488.00	616	141.0	339	339	1,228
489.00	2,470	205.0	1,440	1,779	2,999
489.70	3,461	235.0	2,066	3,845	4,061
490.00	3,886	248.0	1,101	4,947	4,566
491.00	4,821	268.0	4,345	9,292	5,426

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
485.00	1,150	184.0	0	0	1,150
486.00	4,302	296.0	2,559	2,559	5,435
487.00	5,849	332.0	5,056	7,614	7,261
488.00	7,865	376.0	6,832	14,447	9,765
489.00	9,847	421.0	8,837	23,284	12,647
490.00	13,446	539.0	11,600	34,884	21,674

Device	Routing	Invert	Outlet Devices
#1	Primary	486.95'	**1.5" Vert. Orifice** C= 0.600
#2	Primary	487.95'	**4.0" Vert. Orifice** C= 0.600
#3	Primary	489.50'	**24.0" W x 12.0" H Vert. Orifice X 2.00** C= 0.600
#4	Primary	490.00'	**36.0" W x 12.0" H Vert. Orifice Overflow X 2.00** C= 0.600

Primary OutFlow Max=0.66 cfs @ 14.63 hrs HW=489.53' (Free Discharge)
- **1=Orifice** (Orifice Controls 0.09 cfs @ 7.64 fps)
- **2=Orifice** (Orifice Controls 0.50 cfs @ 5.72 fps)
- **3=Orifice** (Orifice Controls 0.06 cfs @ 0.55 fps)
- **4=Orifice Overflow** (Controls 0.00 cfs)

Hydrograph for Pond 2P: Pond-North

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	7,324	486.95	0.00
0.50	0.00	7,324	486.95	0.00
1.00	0.00	7,324	486.95	0.00
1.50	0.00	7,324	486.95	0.00
2.00	0.00	7,324	486.95	0.00
2.50	0.01	7,331	486.95	0.00
3.00	0.02	7,355	486.96	0.00
3.50	0.03	7,395	486.96	0.00
4.00	0.04	7,451	486.97	0.00
4.50	0.05	7,522	486.98	0.00
5.00	0.06	7,608	487.00	0.00
5.50	0.07	7,708	487.02	0.01
6.00	0.08	7,822	487.03	0.01
6.50	0.09	7,949	487.06	0.01
7.00	0.10	8,089	487.08	0.01
7.50	0.11	8,242	487.10	0.02
8.00	0.12	8,408	487.13	0.02
8.50	0.14	8,593	487.16	0.02
9.00	0.17	8,824	487.20	0.03
9.50	0.19	9,106	487.24	0.03
10.00	0.22	9,415	487.29	0.03
10.50	0.29	9,805	487.34	0.03
11.00	0.39	10,341	487.42	0.04
11.50	0.61	11,141	487.54	0.04
12.00	**6.94**	14,845	488.01	0.07
12.50	**3.45**	27,382	489.18	0.63
13.00	1.44	30,039	489.38	0.68
13.50	1.05	30,976	489.44	0.70
14.00	0.83	31,387	489.47	0.71
14.50	0.70	**31,473**	**489.48**	**0.71**
15.00	0.64	31,406	489.47	0.71
15.50	0.58	31,232	489.46	0.70
16.00	0.51	30,953	489.44	0.70
16.50	0.47	30,577	489.41	0.69
17.00	0.44	30,155	489.38	0.68
17.50	0.42	29,707	489.35	0.68
18.00	0.40	29,234	489.32	0.67
18.50	0.37	28,736	489.28	0.66
19.00	0.35	28,212	489.24	0.65
19.50	0.33	27,664	489.20	0.64
20.00	0.30	27,091	489.16	0.62
20.50	0.28	26,500	489.11	0.61
21.00	0.28	25,916	489.07	0.60
21.50	0.27	25,349	489.02	0.58
22.00	0.27	24,798	488.98	0.57
22.50	0.26	24,265	488.93	0.56
23.00	0.26	23,748	488.89	0.54
23.50	0.26	23,249	488.85	0.53
24.00	0.25	22,767	488.81	0.51
24.50	0.03	22,129	488.75	0.49
25.00	0.00	21,281	488.67	0.47
25.50	0.00	20,470	488.60	0.44

Hydrograph for Pond 2P: Pond-North (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
26.00	0.00	19,715	488.53	0.40
26.50	0.00	19,016	488.46	0.37
27.00	0.00	18,377	488.39	0.34
27.50	0.00	17,800	488.33	0.30
28.00	0.00	17,285	488.28	0.27
28.50	0.00	16,842	488.23	0.23
29.00	0.00	16,468	488.19	0.19
29.50	0.00	16,154	488.16	0.16
30.00	0.00	15,888	488.13	0.14
30.50	0.00	15,660	488.10	0.12
31.00	0.00	15,461	488.08	0.10
31.50	0.00	15,288	488.06	0.09
32.00	0.00	15,132	488.04	0.08
32.50	0.00	14,990	488.02	0.08
33.00	0.00	14,860	488.01	0.07
33.50	0.00	14,741	487.99	0.06
34.00	0.00	14,627	487.98	0.06
34.50	0.00	14,516	487.97	0.06
35.00	0.00	14,410	487.96	0.06
35.50	0.00	14,307	487.94	0.06
36.00	0.00	14,205	487.93	0.06
36.50	0.00	14,103	487.92	0.06
37.00	0.00	14,002	487.91	0.06
37.50	0.00	13,902	487.89	0.06
38.00	0.00	13,802	487.88	0.06
38.50	0.00	13,704	487.87	0.05
39.00	0.00	13,606	487.86	0.05
39.50	0.00	13,508	487.85	0.05
40.00	0.00	13,411	487.83	0.05
40.50	0.00	13,315	487.82	0.05
41.00	0.00	13,220	487.81	0.05
41.50	0.00	13,126	487.80	0.05
42.00	0.00	13,032	487.79	0.05
42.50	0.00	12,939	487.77	0.05
43.00	0.00	12,846	487.76	0.05
43.50	0.00	12,754	487.75	0.05
44.00	0.00	12,664	487.74	0.05
44.50	0.00	12,573	487.73	0.05
45.00	0.00	12,484	487.72	0.05
45.50	0.00	12,395	487.70	0.05
46.00	0.00	12,307	487.69	0.05
46.50	0.00	12,220	487.68	0.05
47.00	0.00	12,133	487.67	0.05
47.50	0.00	12,047	487.66	0.05
48.00	0.00	11,962	487.65	0.05
48.50	0.00	11,878	487.64	0.05
49.00	0.00	11,794	487.62	0.05
49.50	0.00	11,712	487.61	0.05
50.00	0.00	11,630	487.60	0.05
50.50	0.00	11,548	487.59	0.04
51.00	0.00	11,468	487.58	0.04
51.50	0.00	11,388	487.57	0.04

Hydrograph for Pond 2P: Pond-North (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
52.00	0.00	11,309	487.56	0.04
52.50	0.00	11,231	487.55	0.04
53.00	0.00	11,154	487.54	0.04
53.50	0.00	11,077	487.53	0.04
54.00	0.00	11,001	487.52	0.04
54.50	0.00	10,926	487.51	0.04
55.00	0.00	10,852	487.49	0.04
55.50	0.00	10,778	487.48	0.04
56.00	0.00	10,706	487.47	0.04
56.50	0.00	10,634	487.46	0.04
57.00	0.00	10,563	487.45	0.04
57.50	0.00	10,493	487.44	0.04
58.00	0.00	10,423	487.43	0.04
58.50	0.00	10,355	487.42	0.04
59.00	0.00	10,287	487.41	0.04
59.50	0.00	10,220	487.40	0.04
60.00	0.00	10,153	487.40	0.04
60.50	0.00	10,088	487.39	0.04
61.00	0.00	10,024	487.38	0.04
61.50	0.00	9,960	487.37	0.04
62.00	0.00	9,897	487.36	0.03
62.50	0.00	9,835	487.35	0.03
63.00	0.00	9,774	487.34	0.03
63.50	0.00	9,713	487.33	0.03
64.00	0.00	9,654	487.32	0.03
64.50	0.00	9,595	487.31	0.03
65.00	0.00	9,537	487.30	0.03
65.50	0.00	9,480	487.30	0.03
66.00	0.00	9,424	487.29	0.03
66.50	0.00	9,369	487.28	0.03
67.00	0.00	9,314	487.27	0.03
67.50	0.00	9,261	487.26	0.03
68.00	0.00	9,208	487.25	0.03
68.50	0.00	9,156	487.25	0.03
69.00	0.00	9,106	487.24	0.03
69.50	0.00	9,055	487.23	0.03
70.00	0.00	9,006	487.22	0.03
70.50	0.00	8,958	487.22	0.03
71.00	0.00	8,910	487.21	0.03
71.50	0.00	8,864	487.20	0.03
72.00	0.00	8,818	487.19	0.03
72.50	0.00	8,773	487.19	0.02
73.00	0.00	8,729	487.18	0.02
73.50	0.00	8,686	487.17	0.02
74.00	0.00	8,644	487.17	0.02
74.50	0.00	8,603	487.16	0.02
75.00	0.00	8,562	487.15	0.02
75.50	0.00	8,523	487.15	0.02
76.00	0.00	8,485	487.14	0.02
76.50	0.00	8,447	487.14	0.02
77.00	0.00	8,410	487.13	0.02
77.50	0.00	8,375	487.12	0.02

Hydrograph for Pond 2P: Pond-North (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
78.00	0.00	8,340	487.12	0.02
78.50	0.00	8,306	487.11	0.02
79.00	0.00	8,273	487.11	0.02
79.50	0.00	8,241	487.10	0.02
80.00	0.00	8,209	487.10	0.02
80.50	0.00	8,179	487.09	0.02
81.00	0.00	8,149	487.09	0.02
81.50	0.00	8,121	487.08	0.02
82.00	0.00	8,094	487.08	0.01
82.50	0.00	8,068	487.07	0.01
83.00	0.00	8,043	487.07	0.01
83.50	0.00	8,019	487.07	0.01
84.00	0.00	7,996	487.06	0.01
84.50	0.00	7,974	487.06	0.01
85.00	0.00	7,952	487.06	0.01
85.50	0.00	7,931	487.05	0.01
86.00	0.00	7,911	487.05	0.01
86.50	0.00	7,892	487.05	0.01
87.00	0.00	7,874	487.04	0.01
87.50	0.00	7,856	487.04	0.01
88.00	0.00	7,839	487.04	0.01
88.50	0.00	7,823	487.03	0.01
89.00	0.00	7,807	487.03	0.01
89.50	0.00	7,792	487.03	0.01
90.00	0.00	7,778	487.03	0.01
90.50	0.00	7,765	487.02	0.01
91.00	0.00	7,752	487.02	0.01
91.50	0.00	7,739	487.02	0.01
92.00	0.00	7,728	487.02	0.01
92.50	0.00	7,716	487.02	0.01
93.00	0.00	7,706	487.02	0.01
93.50	0.00	7,695	487.01	0.01
94.00	0.00	7,686	487.01	0.01
94.50	0.00	7,676	487.01	0.01
95.00	0.00	7,667	487.01	0.00
95.50	0.00	7,659	487.01	0.00
96.00	0.00	7,651	487.01	0.00

Summary for Subcatchment 1S: Golf Links North

Runoff = 23.34 cfs @ 12.13 hrs, Volume= 1.916 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.590	98	Streets
*	0.850	98	Drives
*	1.020	98	Rooftop
	1.380	70	Woods, Good, HSG C
	10.880	74	>75% Grass cover, Good, HSG C
	15.720	79	Weighted Average
	12.260	74	77.99% Pervious Area
	3.460	98	22.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
4.7	1,120	0.0700	3.97		**Shallow Concentrated Flow, Thru yards** Grassed Waterway Kv= 15.0 fps
2.1	330	0.0300	2.60		**Shallow Concentrated Flow, To pond** Grassed Waterway Kv= 15.0 fps
19.6	1,550	Total			

Summary for Subcatchment 2S: Offsite

Runoff = 1.72 cfs @ 12.29 hrs, Volume= 0.212 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr 10 year Rainfall=3.20"

Area (ac)	CN	Description
0.330	30	Meadow, non-grazed, HSG A
1.030	58	Meadow, non-grazed, HSG B
2.880	71	Meadow, non-grazed, HSG C
4.240	65	Weighted Average
4.240	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
0.8	200	0.0800	4.24		**Shallow Concentrated Flow, To street** Grassed Waterway Kv= 15.0 fps
28.5	1,470	Total			

Summary for Pond 2P: Pond-North

Inflow Area = 19.960 ac, 17.33% Impervious, Inflow Depth = 1.28" for 10 year event
Inflow = 24.51 cfs @ 12.13 hrs, Volume= 2.128 af
Outflow = 16.27 cfs @ 12.33 hrs, Volume= 2.127 af, Atten= 34%, Lag= 11.7 min
Primary = 16.27 cfs @ 12.33 hrs, Volume= 2.127 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 486.95' Surf.Area= 5,766 sf Storage= 7,324 cf
Peak Elev= 490.41' @ 12.33 hrs Surf.Area= 17,702 sf Storage= 41,493 cf (34,169 cf above start)

Plug-Flow detention time= 527.9 min calculated for 1.959 af (92% of inflow)
Center-of-Mass det. time= 436.3 min (1,269.2 - 832.9)

Volume	Invert	Avail.Storage	Storage Description
#1	487.00'	9,292 cf	**North cell (Irregular)** Listed below (Recalc)
#2	485.00'	34,884 cf	**South cell (Irregular)** Listed below (Recalc)
		44,176 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
487.00	125	78.0	0	0	125
488.00	616	141.0	339	339	1,228
489.00	2,470	205.0	1,440	1,779	2,999
489.70	3,461	235.0	2,066	3,845	4,061
490.00	3,886	248.0	1,101	4,947	4,566
491.00	4,821	268.0	4,345	9,292	5,426

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
485.00	1,150	184.0	0	0	1,150
486.00	4,302	296.0	2,559	2,559	5,435
487.00	5,849	332.0	5,056	7,614	7,261
488.00	7,865	376.0	6,832	14,447	9,765
489.00	9,847	421.0	8,837	23,284	12,647
490.00	13,446	539.0	11,600	34,884	21,674

Device	Routing	Invert	Outlet Devices
#1	Primary	486.95'	**1.5" Vert. Orifice** C= 0.600
#2	Primary	487.95'	**4.0" Vert. Orifice** C= 0.600
#3	Primary	489.50'	**24.0" W x 12.0" H Vert. Orifice X 2.00** C= 0.600
#4	Primary	490.00'	**36.0" W x 12.0" H Vert. Orifice Overflow X 2.00** C= 0.600

Primary OutFlow Max=14.65 cfs @ 12.33 hrs HW=490.35' (Free Discharge)
- **1=Orifice** (Orifice Controls 0.11 cfs @ 8.79 fps)
- **2=Orifice** (Orifice Controls 0.63 cfs @ 7.19 fps)
- **3=Orifice** (Orifice Controls 9.99 cfs @ 2.95 fps)
- **4=Orifice Overflow** (Orifice Controls 3.92 cfs @ 1.89 fps)

Summary for Subcatchment 1S: Golf Links North

Runoff = 37.89 cfs @ 12.12 hrs, Volume= 3.031 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr 100 year Rainfall=4.30"

	Area (ac)	CN	Description
*	1.590	98	Streets
*	0.850	98	Drives
*	1.020	98	Rooftop
	1.380	70	Woods, Good, HSG C
	10.880	74	>75% Grass cover, Good, HSG C
	15.720	79	Weighted Average
	12.260	74	77.99% Pervious Area
	3.460	98	22.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
4.7	1,120	0.0700	3.97		**Shallow Concentrated Flow, Thru yards** Grassed Waterway Kv= 15.0 fps
2.1	330	0.0300	2.60		**Shallow Concentrated Flow, To pond** Grassed Waterway Kv= 15.0 fps
19.6	1,550	Total			

Summary for Subcatchment 2S: Offsite

Runoff = 4.04 cfs @ 12.26 hrs, Volume= 0.426 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Type II 24-hr 100 year Rainfall=4.30"

Area (ac)	CN	Description
0.330	30	Meadow, non-grazed, HSG A
1.030	58	Meadow, non-grazed, HSG B
2.880	71	Meadow, non-grazed, HSG C
4.240	65	Weighted Average
4.240	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
0.8	200	0.0800	4.24		**Shallow Concentrated Flow, To street** Grassed Waterway Kv= 15.0 fps
28.5	1,470	Total			

Summary for Pond 2P: Pond-North

Inflow Area = 19.960 ac, 17.33% Impervious, Inflow Depth = 2.08" for 100 year event
Inflow = 41.04 cfs @ 12.13 hrs, Volume= 3.458 af
Outflow = 38.19 cfs @ 12.21 hrs, Volume= 3.465 af, Atten= 7%, Lag= 4.7 min
Primary = 38.19 cfs @ 12.21 hrs, Volume= 3.465 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 486.95' Surf.Area= 5,766 sf Storage= 7,324 cf
Peak Elev= 490.98' @ 12.21 hrs Surf.Area= 18,243 sf Storage= 44,059 cf (36,735 cf above start)

Plug-Flow detention time= 334.5 min calculated for 3.297 af (95% of inflow)
Center-of-Mass det. time= 285.6 min (1,112.0 - 826.3)

Volume	Invert	Avail.Storage	Storage Description
#1	487.00'	9,292 cf	**North cell (Irregular)** Listed below (Recalc)
#2	485.00'	34,884 cf	**South cell (Irregular)** Listed below (Recalc)
		44,176 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
487.00	125	78.0	0	0	125
488.00	616	141.0	339	339	1,228
489.00	2,470	205.0	1,440	1,779	2,999
489.70	3,461	235.0	2,066	3,845	4,061
490.00	3,886	248.0	1,101	4,947	4,566
491.00	4,821	268.0	4,345	9,292	5,426

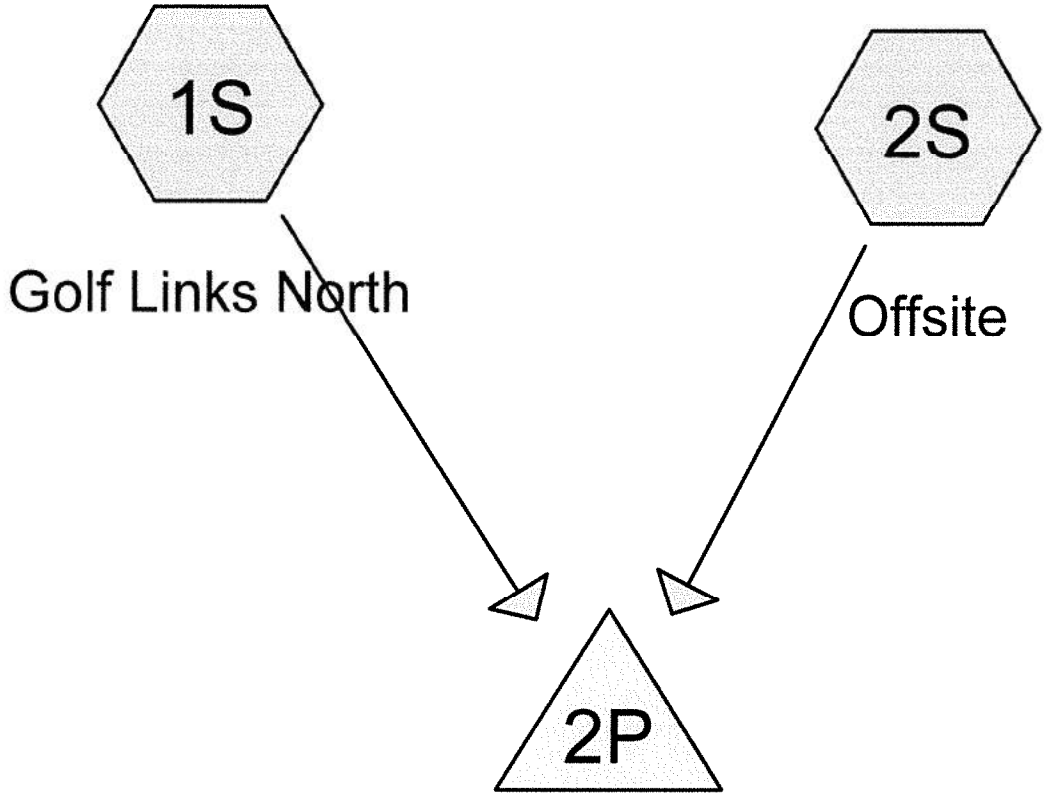
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
485.00	1,150	184.0	0	0	1,150
486.00	4,302	296.0	2,559	2,559	5,435
487.00	5,849	332.0	5,056	7,614	7,261
488.00	7,865	376.0	6,832	14,447	9,765
489.00	9,847	421.0	8,837	23,284	12,647
490.00	13,446	539.0	11,600	34,884	21,674

Device	Routing	Invert	Outlet Devices
#1	Primary	486.95'	**1.5" Vert. Orifice** C= 0.600
#2	Primary	487.95'	**4.0" Vert. Orifice** C= 0.600
#3	Primary	489.50'	**24.0" W x 12.0" H Vert. Orifice X 2.00** C= 0.600
#4	Primary	490.00'	**36.0" W x 12.0" H Vert. Orifice Overflow X 2.00** C= 0.600

Primary OutFlow Max=37.28 cfs @ 12.21 hrs HW=490.95' (Free Discharge)
- **1=Orifice** (Orifice Controls 0.12 cfs @ 9.56 fps)
- **2=Orifice** (Orifice Controls 0.71 cfs @ 8.11 fps)
- **3=Orifice** (Orifice Controls 18.56 cfs @ 4.64 fps)
- **4=Orifice Overflow** (Orifice Controls 17.89 cfs @ 3.13 fps)

EXISTING

NORTH POND



	Q	PEAK EL
WQV	0.11 CFS	487.0'
CPV	5.9 CFS	487.9'
10YR	17.0 CFS	488.9'

(POND START ELEV = 486.95')

Subcat Reach Pond Link

Drainage Diagram for North existing pond
Prepared by Lamoureux & Dickinson, Printed 8/15/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.330	30	Meadow, non-grazed, HSG A (2S)
1.030	58	Meadow, non-grazed, HSG B (2S)
1.380	70	Woods, Good, HSG C (1S)
2.880	71	Meadow, non-grazed, HSG C (2S)
10.880	74	>75% Grass cover, Good, HSG C (1S)
0.850	98	Drives (1S)
1.020	98	Rooftop (1S)
1.590	98	Streets (1S)

Summary for Subcatchment 1S: Golf Links North

Runoff = 9.37 cfs @ 12.14 hrs, Volume= 0.762 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.590	98	Streets
*	0.850	98	Drives
*	1.020	98	Rooftop
	1.380	70	Woods, Good, HSG C
	10.880	74	>75% Grass cover, Good, HSG C
	15.720	79	Weighted Average
	12.260		77.99% Pervious Area
	3.460		22.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
4.7	1,120	0.0700	3.97		**Shallow Concentrated Flow, Thru yards** Grassed Waterway Kv= 15.0 fps
2.1	330	0.0300	2.60		**Shallow Concentrated Flow, To pond** Grassed Waterway Kv= 15.0 fps
19.6	1,550	Total			

Summary for Subcatchment 2S: Offsite

Runoff = 0.23 cfs @ 12.38 hrs, Volume= 0.058 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.330	30	Meadow, non-grazed, HSG A
1.030	58	Meadow, non-grazed, HSG B
2.880	71	Meadow, non-grazed, HSG C
4.240	65	Weighted Average
4.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
0.8	200	0.0800	4.24		**Shallow Concentrated Flow, To street** Grassed Waterway Kv= 15.0 fps
28.5	1,470	Total			

Summary for Subcatchment 1S: Golf Links North

Runoff = 0.15 cfs @ 12.45 hrs, Volume= 0.059 af, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	1.590	98	Streets
*	0.850	98	Drives
*	1.020	98	Rooftop
	1.380	70	Woods, Good, HSG C
	10.880	74	>75% Grass cover, Good, HSG C
	15.720	79	Weighted Average
	12.260		77.99% Pervious Area
	3.460		22.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
4.7	1,120	0.0700	3.97		**Shallow Concentrated Flow, Thru yards** Grassed Waterway Kv= 15.0 fps
2.1	330	0.0300	2.60		**Shallow Concentrated Flow, To pond** Grassed Waterway Kv= 15.0 fps
19.6	1,550	Total			

Summary for Subcatchment 2S: Offsite

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
0.330	30	Meadow, non-grazed, HSG A
1.030	58	Meadow, non-grazed, HSG B
2.880	71	Meadow, non-grazed, HSG C
4.240	65	Weighted Average
4.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
0.8	200	0.0800	4.24		**Shallow Concentrated Flow, To street** Grassed Waterway Kv= 15.0 fps
28.5	1,470	Total			

Summary for Pond 2P: Pond-North

Inflow Area = 19.960 ac, 17.33% Impervious, Inflow Depth = 0.04" for WQv event
Inflow = 0.15 cfs @ 12.45 hrs, Volume= 0.059 af
Outflow = 0.09 cfs @ 13.67 hrs, Volume= 0.059 af, Atten= 40%, Lag= 73.5 min
Primary = 0.09 cfs @ 13.67 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Starting Elev= 486.95' Surf.Area= 5,713 sf Storage= 6,483 cf
Peak Elev= 487.01' @ 13.67 hrs Surf.Area= 5,862 sf Storage= 6,812 cf (330 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 72.8 min (1,081.0 - 1,008.2)

Volume	Invert	Avail.Storage	Storage Description
#1	489.70'	5,447 cf	**North cell (Irregular)** Listed below (Recalc)
#2	485.00'	34,041 cf	**South cell (Irregular)** Listed below (Recalc)
		39,488 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
489.70	3,461	235.0	0	0	3,461
490.00	3,886	248.0	1,101	1,101	3,966
491.00	4,821	268.0	4,345	5,447	4,827

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
485.00	1,150	184.0	0	0	1,150
486.00	3,427	280.0	2,187	2,187	4,702
487.00	5,849	332.0	4,584	6,772	7,253
488.00	7,865	376.0	6,832	13,604	9,757
489.00	9,847	421.0	8,837	22,441	12,639
490.00	13,446	539.0	11,600	34,041	21,666

Device	Routing	Invert	Outlet Devices
#1	Primary	486.95'	**24.0" W x 24.0" H Vert. 24"SQ Orifice** C= 0.600

Primary OutFlow Max=0.09 cfs @ 13.67 hrs HW=487.01' (Free Discharge)
↑—**1=24"SQ Orifice** (Orifice Controls 0.09 cfs @ 0.77 fps)

Summary for Pond 2P: Pond-North

Inflow Area = 19.960 ac, 17.33% Impervious, Inflow Depth = 0.49" for 1 year event
Inflow = 9.48 cfs @ 12.15 hrs, Volume= 0.820 af
Outflow = 5.85 cfs @ 12.32 hrs, Volume= 0.820 af, Atten= 38%, Lag= 10.4 min
Primary = 5.85 cfs @ 12.32 hrs, Volume= 0.820 af

Routing by Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Starting Elev= 486.95' Surf.Area= 5,713 sf Storage= 6,483 cf
→ Peak Elev= 487.89' @ 12.32 hrs Surf.Area= 7,629 sf Storage= 12,753 cf (6,270 cf above start)

Plug-Flow detention time= 153.6 min calculated for 0.671 af (82% of inflow)
Center-of-Mass det. time= 29.2 min (917.0 - 887.8) EXIST. DETENTION

Volume	Invert	Avail.Storage	Storage Description
#1	489.70'	5,447 cf	**North cell (Irregular)** Listed below (Recalc)
#2	485.00'	34,041 cf	**South cell (Irregular)** Listed below (Recalc)
		39,488 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
489.70	3,461	235.0	0	0	3,461
490.00	3,886	248.0	1,101	1,101	3,966
491.00	4,821	268.0	4,345	5,447	4,827

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
485.00	1,150	184.0	0	0	1,150
486.00	3,427	280.0	2,187	2,187	4,702
487.00	5,849	332.0	4,584	6,772	7,253
488.00	7,865	376.0	6,832	13,604	9,757
489.00	9,847	421.0	8,837	22,441	12,639
490.00	13,446	539.0	11,600	34,041	21,666

Device	Routing	Invert	Outlet Devices
#1	Primary	486.95'	**24.0" W x 24.0" H Vert. 24"SQ Orifice** C= 0.600

Primary OutFlow Max=5.82 cfs @ 12.32 hrs HW=487.89' (Free Discharge)
↑—**1=24"SQ Orifice** (Orifice Controls 5.82 cfs @ 3.11 fps)

Summary for Subcatchment 1S: Golf Links North

Runoff = 23.13 cfs @ 12.13 hrs, Volume= 1.751 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.590	98	Streets
*	0.850	98	Drives
*	1.020	98	Rooftop
	1.380	70	Woods, Good, HSG C
	10.880	74	>75% Grass cover, Good, HSG C
	15.720	79	Weighted Average
	12.260		77.99% Pervious Area
	3.460		22.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0400	0.13		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
4.7	1,120	0.0700	3.97		**Shallow Concentrated Flow, Thru yards** Grassed Waterway Kv= 15.0 fps
2.1	330	0.0300	2.60		**Shallow Concentrated Flow, To pond** Grassed Waterway Kv= 15.0 fps
19.6	1,550	Total			

Summary for Subcatchment 2S: Offsite

Runoff = 1.74 cfs @ 12.28 hrs, Volume= 0.212 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.20"

Area (ac)	CN	Description
0.330	30	Meadow, non-grazed, HSG A
1.030	58	Meadow, non-grazed, HSG B
2.880	71	Meadow, non-grazed, HSG C
4.240	65	Weighted Average
4.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
0.8	200	0.0800	4.24		**Shallow Concentrated Flow, To street** Grassed Waterway Kv= 15.0 fps
28.5	1,470	Total			

Summary for Pond 2P: Pond-North

Inflow Area = 19.960 ac, 17.33% Impervious, Inflow Depth = 1.18" for 10 year event
Inflow = 24.36 cfs @ 12.14 hrs, Volume= 1.963 af
Outflow = 16.99 cfs @ 12.28 hrs, Volume= 1.963 af, Atten= 30%, Lag= 8.7 min
Primary = 16.99 cfs @ 12.28 hrs, Volume= 1.963 af

Routing by Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Starting Elev= 486.95' Surf.Area= 5,713 sf Storage= 6,483 cf
Peak Elev= 488.86' @ 12.28 hrs Surf.Area= 9,563 sf Storage= 21,117 cf (14,634 cf above start)

Plug-Flow detention time= 76.8 min calculated for 1.813 af (92% of inflow)
Center-of-Mass det. time= 22.5 min (884.1 - 861.6)

Volume	Invert	Avail.Storage	Storage Description
#1	489.70'	5,447 cf	**North cell (Irregular)** Listed below (Recalc)
#2	485.00'	34,041 cf	**South cell (Irregular)** Listed below (Recalc)
		39,488 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
489.70	3,461	235.0	0	0	3,461
490.00	3,886	248.0	1,101	1,101	3,966
491.00	4,821	268.0	4,345	5,447	4,827

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
485.00	1,150	184.0	0	0	1,150
486.00	3,427	280.0	2,187	2,187	4,702
487.00	5,849	332.0	4,584	6,772	7,253
488.00	7,865	376.0	6,832	13,604	9,757
489.00	9,847	421.0	8,837	22,441	12,639
490.00	13,446	539.0	11,600	34,041	21,666

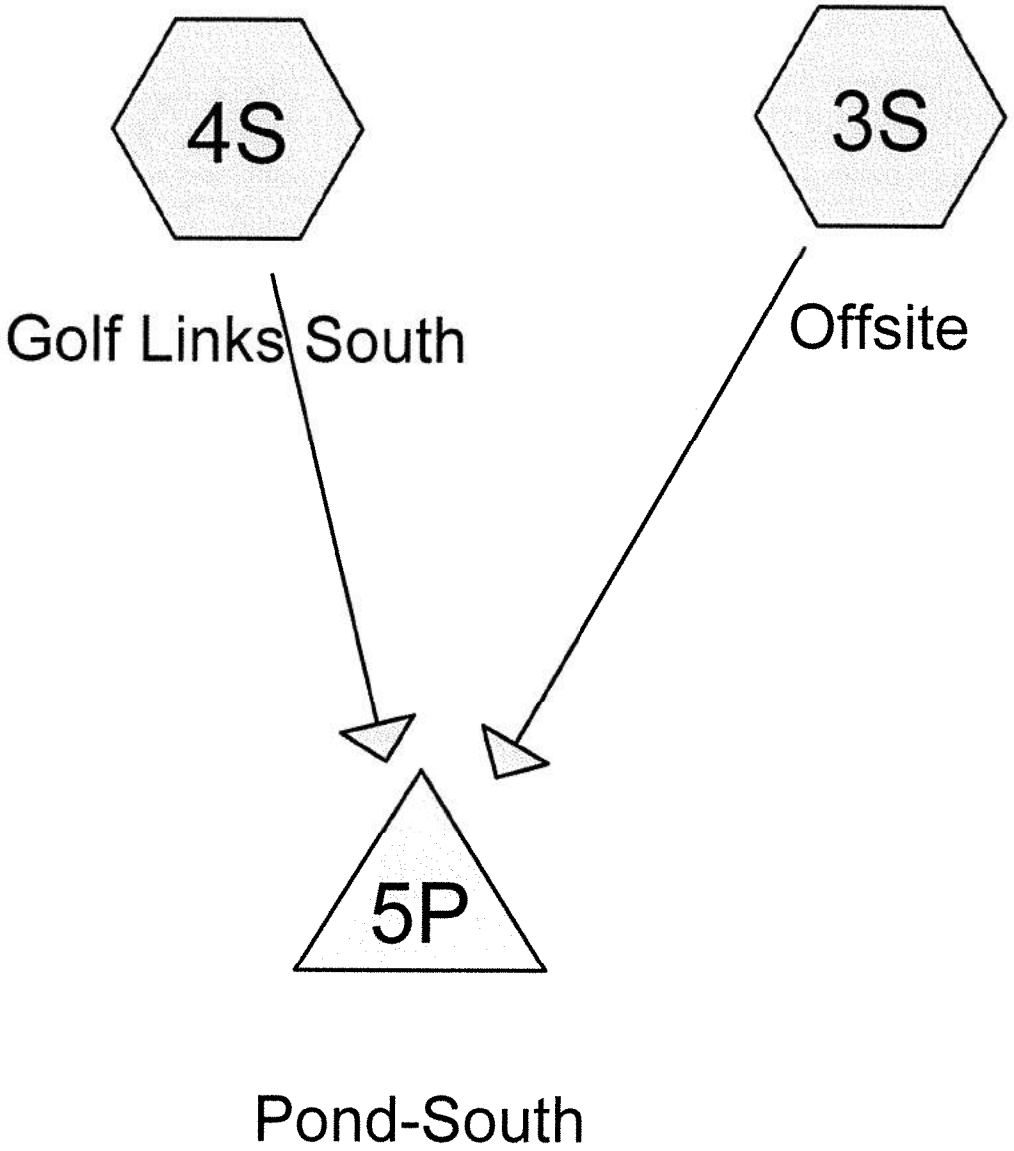
Device	Routing	Invert	Outlet Devices
#1	Primary	486.95'	**24.0" W x 24.0" H Vert. 24"SQ Orifice** C= 0.600

Primary OutFlow Max=16.91 cfs @ 12.28 hrs HW=488.86' (Free Discharge)
↑—**1=24"SQ Orifice** (Orifice Controls 16.91 cfs @ 4.43 fps)

Attachment 8
Pond South - HydroCad calculations

Lamoureux & Dickinson
Consulting Engineers, Inc.

REV JAN 2015



Subcat Reach Pond Link

Drainage Diagram for South PROPOSED pond 2015
Prepared by Lamoureux & Dickinson, Printed 1/30/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.070	30	Meadow, non-grazed, HSG A (3S)
0.580	58	Meadow, non-grazed, HSG B (3S)
2.000	70	Woods, Good, HSG C (3S)
9.170	71	Meadow, non-grazed, HSG C (3S)
18.740	74	>75% Grass cover, Good, HSG C (3S, 4S)
0.260	77	Woods, Good, HSG D (3S)
1.310	80	>75% Grass cover, Good, HSG D (3S)
0.080	98	Drive & rooftop (3S)
0.870	98	Drives (4S)
1.360	98	Rooftop (4S)
1.760	98	Streets (4S)

Version: 9/06

For the area draining to*: South Pond

Located in drainage area for S/N: South Pond

WQ Volume Calculation for Volume-Based Practice

Use this worksheet to calculate the water quality volume draining to your volume based STP if you are not using any of the site design credits in section 3 of the 2002 VSWMM. ***Do not use*** *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice). See the worksheet "Water Quality Volume and Modified Curve Number Calculation for Water Quality Treatment in a Flow-Based Practice"*

Water Quality Volume Calculations

Line			value/calculation	units
1	Site Area (impervious + disturbed pervious)	A=	21.00	acres
2	Impervious area		3.99	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	19.00	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.221	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.199	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	WQv =	0.200	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	WQv =	0.350	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	WQv =	15246	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

PERMANENT POOL = 8750 CF

NORTH CELL = 3704 CF

SOUTH CELL = 5046 CF

TOTAL = 8750 CF

$$\frac{8750 \text{ CF}}{15,246 \text{ CF}} = 57\%$$

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Summary for Subcatchment 3S: Offsite

Runoff = 0.04 cfs @ 12.32 hrs, Volume= 0.005 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
	2.070	30	Meadow, non-grazed, HSG A
	0.580	58	Meadow, non-grazed, HSG B
	9.170	71	Meadow, non-grazed, HSG C
	2.000	70	Woods, Good, HSG C
	0.260	77	Woods, Good, HSG D
	1.310	80	>75% Grass cover, Good, HSG D
	1.730	74	>75% Grass cover, Good, HSG C
*	0.080	98	Drive & rooftop
	17.200	67	Weighted Average
	17.120	67	99.53% Pervious Area
	0.080	98	0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
9.3	530	0.0040	0.95		**Shallow Concentrated Flow, Diversion** Grassed Waterway Kv= 15.0 fps
37.0	1,800	Total			

Summary for Subcatchment 4S: Golf Links South

Runoff = 3.78 cfs @ 12.03 hrs, Volume= 0.246 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	1.760	98	Streets
*	0.870	98	Drives
*	1.360	98	Rooftop
	17.010	74	>75% Grass cover, Good, HSG C
	21.000	79	Weighted Average
	17.010	74	81.00% Pervious Area
	3.990	98	19.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	100	0.0550	0.15		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.5	130	0.0850	4.37		**Shallow Concentrated Flow, Lawn to street** Grassed Waterway Kv= 15.0 fps
11.7	230	Total			

Summary for Pond 5P: Pond-South

Inflow Area = 38.200 ac, 10.65% Impervious, Inflow Depth = 0.08" for WQv event
Inflow = 3.80 cfs @ 12.03 hrs, Volume= 0.250 af
Outflow = 0.06 cfs @ 20.02 hrs, Volume= 0.247 af, Atten= 98%, Lag= 479.6 min
Primary = 0.06 cfs @ 20.02 hrs, Volume= 0.247 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Starting Elev= 485.00' Surf.Area= 4,867 sf Storage= 3,704 cf
Peak Elev= 486.25' @ 20.02 hrs Surf.Area= 8,081 sf Storage= 11,690 cf (7,985 cf above start)

Plug-Flow detention time= 2,195.2 min calculated for 0.162 af (65% of inflow)
Center-of-Mass det. time= 1,478.2 min (2,292.9 - 814.7)

24HRS

Volume	Invert	Avail.Storage	Storage Description
#1	484.00'	67,866 cf	**North cell (Irregular)** Listed below (Recalc)
#2	488.00'	18,693 cf	**South cell (Irregular)** Listed below (Recalc)
		86,559 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
484.00	2,653	221.0	0	0	2,653
485.00	4,867	298.0	3,704	3,704	5,844
486.00	7,347	360.0	6,065	9,769	9,107
487.00	10,506	416.0	8,880	18,649	12,587
488.00	14,060	480.0	12,240	30,889	17,172
489.00	18,271	577.0	16,120	47,008	25,348
490.00	23,556	682.0	20,858	67,866	35,887

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
488.00	6,002	352.0	0	0	6,002
489.00	8,554	399.0	7,240	7,240	8,836
490.00	14,621	520.0	11,453	18,693	17,697

Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**1.5" Vert. WQv Orifice** C= 0.600
#2	Primary	486.25'	**3.5" Vert. CPv Orifice** C= 0.600
#3	Primary	488.00'	**36.0" W x 12.0" H Vert. Overflow X 2.00** C= 0.600

Primary OutFlow Max=0.06 cfs @ 20.02 hrs HW=486.25' (Free Discharge)
- **1=WQv Orifice** (Orifice Controls 0.06 cfs @ 5.24 fps)
- **2=CPv Orifice** (Controls 0.00 cfs)
- **3=Overflow** (Controls 0.00 cfs)

Summary for Subcatchment 3S: Offsite

Runoff = 1.38 cfs @ 12.47 hrs, Volume= 0.306 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
	2.070	30	Meadow, non-grazed, HSG A
	0.580	58	Meadow, non-grazed, HSG B
	9.170	71	Meadow, non-grazed, HSG C
	2.000	70	Woods, Good, HSG C
	0.260	77	Woods, Good, HSG D
	1.310	80	>75% Grass cover, Good, HSG D
	1.730	74	>75% Grass cover, Good, HSG C
*	0.080	98	Drive & rooftop
	17.200	67	Weighted Average
	17.120	67	99.53% Pervious Area
	0.080	98	0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
9.3	530	0.0040	0.95		**Shallow Concentrated Flow, Diversion** Grassed Waterway Kv= 15.0 fps
37.0	1,800	Total			

Summary for Subcatchment 4S: Golf Links South

Runoff = 17.64 cfs @ 12.04 hrs, Volume= 1.187 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.760	98	Streets
*	0.870	98	Drives
*	1.360	98	Rooftop
	17.010	74	>75% Grass cover, Good, HSG C
	21.000	79	Weighted Average
	17.010	74	81.00% Pervious Area
	3.990	98	19.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	100	0.0550	0.15		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.5	130	0.0850	4.37		**Shallow Concentrated Flow, Lawn to street** Grassed Waterway Kv= 15.0 fps
11.7	230	Total			

Summary for Pond 5P: Pond-South

Inflow Area = 38.200 ac, 10.65% Impervious, Inflow Depth = 0.47" for 1 year event
Inflow = 17.80 cfs @ 12.05 hrs, Volume= 1.493 af
Outflow = 1.95 cfs @ 13.23 hrs, Volume= 1.482 af, Atten= 89%, Lag= 71.4 min
Primary = 1.95 cfs @ 13.23 hrs, Volume= 1.482 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Starting Elev= 485.00' Surf.Area= 4,867 sf Storage= 3,704 cf
Peak Elev= 488.17' @ 13.23 hrs Surf.Area= 21,168 sf Storage= 34,480 cf (30,776 cf above start)

Plug-Flow detention time= 806.1 min calculated for 1.397 af (94% of inflow)
Center-of-Mass det. time= 717.8 min (1,574.2 - 856.3)

12 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	484.00'	67,866 cf	**North cell (Irregular)** Listed below (Recalc)
#2	488.00'	18,693 cf	**South cell (Irregular)** Listed below (Recalc)
		86,559 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
484.00	2,653	221.0	0	0	2,653
485.00	4,867	298.0	3,704	3,704	5,844
486.00	7,347	360.0	6,065	9,769	9,107
487.00	10,506	416.0	8,880	18,649	12,587
488.00	14,060	480.0	12,240	30,889	17,172
489.00	18,271	577.0	16,120	47,008	25,348
490.00	23,556	682.0	20,858	67,866	35,887

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
488.00	6,002	352.0	0	0	6,002
489.00	8,554	399.0	7,240	7,240	8,836
490.00	14,621	520.0	11,453	18,693	17,697

Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**1.5" Vert. WQv Orifice** C= 0.600
#2	Primary	486.25'	**3.5" Vert. CPv Orifice** C= 0.600
#3	Primary	488.00'	**36.0" W x 12.0" H Vert. Overflow X 2.00** C= 0.600

Primary OutFlow Max=1.93 cfs @ 13.23 hrs HW=488.17' (Free Discharge)
- **1=WQv Orifice** (Orifice Controls 0.10 cfs @ 8.49 fps)
- **2=CPv Orifice** (Orifice Controls 0.43 cfs @ 6.42 fps)
- **3=Overflow** (Orifice Controls 1.40 cfs @ 1.34 fps)

Hydrograph for Pond 5P: Pond-South

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	3,704	485.00	0.00
0.50	0.00	3,704	485.00	0.00
1.00	0.00	3,704	485.00	0.00
1.50	0.00	3,704	485.00	0.00
2.00	0.00	3,705	485.00	0.00
2.50	0.01	3,717	485.00	0.00
3.00	0.02	3,750	485.01	0.00
3.50	0.03	3,802	485.02	0.00
4.00	0.04	3,871	485.03	0.00
4.50	0.06	3,955	485.05	0.00
5.00	0.07	4,056	485.07	0.01
5.50	0.08	4,174	485.09	0.01
6.00	0.09	4,307	485.12	0.01
6.50	0.10	4,454	485.15	0.02
7.00	0.12	4,618	485.18	0.02
7.50	0.13	4,799	485.21	0.02
8.00	0.14	4,995	485.25	0.03
8.50	0.17	5,219	485.29	0.03
9.00	0.21	5,504	485.34	0.03
9.50	0.23	5,844	485.40	0.03
10.00	0.27	6,219	485.47	0.04
10.50	0.36	6,708	485.55	0.04
11.00	0.50	7,388	485.65	0.05
11.50	0.81	8,436	485.81	0.05
12.00	**16.12**	16,206	486.76	0.27
12.50	**4.06**	31,408	488.03	0.60
13.00	2.31	**34,322**	**488.17**	**1.86** ← PEAK Q/ELEV
13.50	1.69	**34,374**	**488.17**	**1.89**
14.00	1.34	33,908	488.15	1.62
14.50	1.15	33,428	488.12	1.38
15.00	1.05	33,069	488.11	1.22
15.50	0.95	32,795	488.09	1.09
16.00	0.84	32,554	488.08	0.97
16.50	0.77	32,323	488.07	0.90
17.00	0.74	32,127	488.06	0.83
17.50	0.70	31,967	488.05	0.78
18.00	0.66	31,826	488.05	0.74
18.50	0.62	31,695	488.04	0.70
19.00	0.58	31,568	488.03	0.65
19.50	0.54	31,442	488.03	0.61
20.00	0.50	31,314	488.02	0.57
20.50	0.48	31,181	488.01	0.55
21.00	0.47	31,056	488.01	0.53
21.50	0.46	30,947	488.00	0.52
22.00	0.45	30,850	488.00	0.51
22.50	0.45	30,747	487.99	0.51
23.00	0.44	30,634	487.98	0.51
23.50	0.43	30,509	487.97	0.50
24.00	0.43	30,374	487.96	0.50
24.50	0.08	29,872	487.93	0.50
25.00	0.01	29,043	487.87	0.49
25.50	0.00	28,179	487.80	0.48

Hydrograph for Pond 5P: Pond-South (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
26.00	0.00	27,327	487.74	0.47
26.50	0.00	26,491	487.67	0.46
27.00	0.00	25,674	487.61	0.45
27.50	0.00	24,876	487.54	0.44
28.00	0.00	24,098	487.48	0.43
28.50	0.00	23,339	487.42	0.42
29.00	0.00	22,601	487.36	0.40
29.50	0.00	21,883	487.29	0.39
30.00	0.00	21,185	487.23	0.38
30.50	0.00	20,510	487.17	0.37
31.00	0.00	19,856	487.11	0.36
31.50	0.00	19,225	487.05	0.34
32.00	0.00	18,617	487.00	0.33
32.50	0.00	18,032	486.94	0.32
33.00	0.00	17,471	486.89	0.30
33.50	0.00	16,934	486.83	0.29
34.00	0.00	16,423	486.78	0.28
34.50	0.00	15,938	486.73	0.26
35.00	0.00	15,480	486.68	0.25
35.50	0.00	15,049	486.64	0.23
36.00	0.00	14,646	486.59	0.22
36.50	0.00	14,273	486.55	0.20
37.00	0.00	13,930	486.51	0.18
37.50	0.00	13,623	486.48	0.16
38.00	0.00	13,350	486.45	0.14
38.50	0.00	13,109	486.42	0.13
39.00	0.00	12,897	486.39	0.11
39.50	0.00	12,706	486.37	0.10
40.00	0.00	12,535	486.35	0.09
40.50	0.00	12,380	486.33	0.08
41.00	0.00	12,236	486.32	0.08
41.50	0.00	12,100	486.30	0.07
42.00	0.00	11,973	486.28	0.07
42.50	0.00	11,852	486.27	0.07
43.00	0.00	11,734	486.25	0.06
43.50	0.00	11,619	486.24	0.06
44.00	0.00	11,504	486.23	0.06
44.50	0.00	11,389	486.21	0.06
45.00	0.00	11,276	486.20	0.06
45.50	0.00	11,163	486.18	0.06
46.00	0.00	11,050	486.17	0.06
46.50	0.00	10,939	486.15	0.06
47.00	0.00	10,828	486.14	0.06
47.50	0.00	10,718	486.13	0.06
48.00	0.00	10,609	486.11	0.06
48.50	0.00	10,500	486.10	0.06
49.00	0.00	10,392	486.08	0.06
49.50	0.00	10,285	486.07	0.06
50.00	0.00	10,179	486.06	0.06
50.50	0.00	10,073	486.04	0.06
51.00	0.00	9,969	486.03	0.06
51.50	0.00	9,864	486.01	0.06

Hydrograph for Pond 5P: Pond-South (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
52.00	0.00	9,761	486.00	0.06
52.50	0.00	9,659	485.98	0.06
53.00	0.00	9,557	485.97	0.06
53.50	0.00	9,456	485.96	0.06
54.00	0.00	9,356	485.94	0.06
54.50	0.00	9,256	485.93	0.06
55.00	0.00	9,158	485.92	0.05
55.50	0.00	9,060	485.90	0.05
56.00	0.00	8,963	485.89	0.05
56.50	0.00	8,867	485.87	0.05
57.00	0.00	8,771	485.86	0.05
57.50	0.00	8,677	485.85	0.05
58.00	0.00	8,583	485.83	0.05
58.50	0.00	8,490	485.82	0.05
59.00	0.00	8,398	485.81	0.05
59.50	0.00	8,307	485.79	0.05
60.00	0.00	8,216	485.78	0.05
60.50	0.00	8,126	485.77	0.05
61.00	0.00	8,038	485.75	0.05
61.50	0.00	7,950	485.74	0.05
62.00	0.00	7,863	485.73	0.05
62.50	0.00	7,776	485.71	0.05
63.00	0.00	7,691	485.70	0.05
63.50	0.00	7,606	485.69	0.05
64.00	0.00	7,523	485.67	0.05
64.50	0.00	7,440	485.66	0.05
65.00	0.00	7,358	485.65	0.05
65.50	0.00	7,277	485.64	0.04
66.00	0.00	7,197	485.62	0.04
66.50	0.00	7,118	485.61	0.04
67.00	0.00	7,039	485.60	0.04
67.50	0.00	6,962	485.59	0.04
68.00	0.00	6,885	485.57	0.04
68.50	0.00	6,810	485.56	0.04
69.00	0.00	6,735	485.55	0.04
69.50	0.00	6,661	485.54	0.04
70.00	0.00	6,588	485.53	0.04
70.50	0.00	6,516	485.51	0.04
71.00	0.00	6,445	485.50	0.04
71.50	0.00	6,375	485.49	0.04
72.00	0.00	6,306	485.48	0.04
72.50	0.00	6,238	485.47	0.04
73.00	0.00	6,171	485.46	0.04
73.50	0.00	6,104	485.45	0.04
74.00	0.00	6,039	485.43	0.04
74.50	0.00	5,975	485.42	0.04
75.00	0.00	5,911	485.41	0.03
75.50	0.00	5,849	485.40	0.03
76.00	0.00	5,787	485.39	0.03
76.50	0.00	5,727	485.38	0.03
77.00	0.00	5,667	485.37	0.03
77.50	0.00	5,609	485.36	0.03

Hydrograph for Pond 5P: Pond-South (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
78.00	0.00	5,551	485.35	0.03
78.50	0.00	5,495	485.34	0.03
79.00	0.00	5,439	485.33	0.03
79.50	0.00	5,385	485.32	0.03
80.00	0.00	5,331	485.31	0.03
80.50	0.00	5,279	485.30	0.03
81.00	0.00	5,227	485.29	0.03
81.50	0.00	5,177	485.28	0.03
82.00	0.00	5,127	485.27	0.03
82.50	0.00	5,079	485.27	0.03
83.00	0.00	5,032	485.26	0.03
83.50	0.00	4,985	485.25	0.03
84.00	0.00	4,940	485.24	0.02
84.50	0.00	4,896	485.23	0.02
85.00	0.00	4,853	485.22	0.02
85.50	0.00	4,811	485.22	0.02
86.00	0.00	4,770	485.21	0.02
86.50	0.00	4,730	485.20	0.02
87.00	0.00	4,691	485.19	0.02
87.50	0.00	4,653	485.19	0.02
88.00	0.00	4,616	485.18	0.02
88.50	0.00	4,580	485.17	0.02
89.00	0.00	4,546	485.17	0.02
89.50	0.00	4,513	485.16	0.02
90.00	0.00	4,480	485.15	0.02
90.50	0.00	4,449	485.15	0.02
91.00	0.00	4,418	485.14	0.02
91.50	0.00	4,389	485.14	0.02
92.00	0.00	4,361	485.13	0.02
92.50	0.00	4,334	485.13	0.01
93.00	0.00	4,309	485.12	0.01
93.50	0.00	4,285	485.12	0.01
94.00	0.00	4,262	485.11	0.01
94.50	0.00	4,240	485.11	0.01
95.00	0.00	4,220	485.10	0.01
95.50	0.00	4,200	485.10	0.01
96.00	0.00	4,181	485.10	0.01

Summary for Subcatchment 3S: Offsite

Runoff = 7.25 cfs @ 12.39 hrs, Volume= 1.000 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
	2.070	30	Meadow, non-grazed, HSG A
	0.580	58	Meadow, non-grazed, HSG B
	9.170	71	Meadow, non-grazed, HSG C
	2.000	70	Woods, Good, HSG C
	0.260	77	Woods, Good, HSG D
	1.310	80	>75% Grass cover, Good, HSG D
	1.730	74	>75% Grass cover, Good, HSG C
*	0.080	98	Drive & rooftop
	17.200	67	Weighted Average
	17.120	67	99.53% Pervious Area
	0.080	98	0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
9.3	530	0.0040	0.95		**Shallow Concentrated Flow, Diversion** Grassed Waterway Kv= 15.0 fps
37.0	1,800	Total			

Summary for Subcatchment 4S: Golf Links South

Runoff = 39.34 cfs @ 12.04 hrs, Volume= 2.457 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.760	98	Streets
*	0.870	98	Drives
*	1.360	98	Rooftop
	17.010	74	>75% Grass cover, Good, HSG C
	21.000	79	Weighted Average
	17.010	74	81.00% Pervious Area
	3.990	98	19.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	100	0.0550	0.15		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.5	130	0.0850	4.37		**Shallow Concentrated Flow, Lawn to street** Grassed Waterway Kv= 15.0 fps
11.7	230	Total			

Summary for Pond 5P: Pond-South

Inflow Area = 38.200 ac, 10.65% Impervious, Inflow Depth = 1.09" for 10 year event
Inflow = 41.00 cfs @ 12.04 hrs, Volume= 3.457 af
Outflow = 15.81 cfs @ 12.32 hrs, Volume= 3.446 af, Atten= 61%, Lag= 16.6 min
Primary = 15.81 cfs @ 12.32 hrs, Volume= 3.446 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Starting Elev= 485.00' Surf.Area= 4,867 sf Storage= 3,704 cf
Peak Elev= 488.85' @ 12.32 hrs Surf.Area= 25,772 sf Storage= 50,397 cf (46,693 cf above start)

Plug-Flow detention time= 368.5 min calculated for 3.359 af (97% of inflow)
Center-of-Mass det. time= 340.7 min (1,187.9 - 847.1)

Volume	Invert	Avail.Storage	Storage Description
#1	484.00'	67,866 cf	**North cell (Irregular)** Listed below (Recalc)
#2	488.00'	18,693 cf	**South cell (Irregular)** Listed below (Recalc)
		86,559 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
484.00	2,653	221.0	0	0	2,653
485.00	4,867	298.0	3,704	3,704	5,844
486.00	7,347	360.0	6,065	9,769	9,107
487.00	10,506	416.0	8,880	18,649	12,587
488.00	14,060	480.0	12,240	30,889	17,172
489.00	18,271	577.0	16,120	47,008	25,348
490.00	23,556	682.0	20,858	67,866	35,887

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
488.00	6,002	352.0	0	0	6,002
489.00	8,554	399.0	7,240	7,240	8,836
490.00	14,621	520.0	11,453	18,693	17,697

Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**1.5" Vert. WQv Orifice** C= 0.600
#2	Primary	486.25'	**3.5" Vert. CPv Orifice** C= 0.600
#3	Primary	488.00'	**36.0" W x 12.0" H Vert. Overflow X 2.00** C= 0.600

Primary OutFlow Max=15.77 cfs @ 12.32 hrs HW=488.85' (Free Discharge)
- **1=WQv Orifice** (Orifice Controls 0.12 cfs @ 9.37 fps)
- **2=CPv Orifice** (Orifice Controls 0.50 cfs @ 7.55 fps)
- **3=Overflow** (Orifice Controls 15.15 cfs @ 2.96 fps)

Summary for Subcatchment 3S: Offsite

Runoff = 15.92 cfs @ 12.36 hrs, Volume= 1.930 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 year Rainfall=4.30"

	Area (ac)	CN	Description
	2.070	30	Meadow, non-grazed, HSG A
	0.580	58	Meadow, non-grazed, HSG B
	9.170	71	Meadow, non-grazed, HSG C
	2.000	70	Woods, Good, HSG C
	0.260	77	Woods, Good, HSG D
	1.310	80	>75% Grass cover, Good, HSG D
	1.730	74	>75% Grass cover, Good, HSG C
*	0.080	98	Drive & rooftop
	17.200	67	Weighted Average
	17.120	67	99.53% Pervious Area
	0.080	98	0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
9.3	530	0.0040	0.95		**Shallow Concentrated Flow, Diversion** Grassed Waterway Kv= 15.0 fps
37.0	1,800	Total			

Summary for Subcatchment 4S: Golf Links South

Runoff = 64.22 cfs @ 12.04 hrs, Volume= 3.931 af, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 year Rainfall=4.30"

	Area (ac)	CN	Description
*	1.760	98	Streets
*	0.870	98	Drives
*	1.360	98	Rooftop
	17.010	74	>75% Grass cover, Good, HSG C
	21.000	79	Weighted Average
	17.010	74	81.00% Pervious Area
	3.990	98	19.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	100	0.0550	0.15		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.5	130	0.0850	4.37		**Shallow Concentrated Flow, Lawn to street** Grassed Waterway Kv= 15.0 fps
11.7	230	Total			

Summary for Pond 5P: Pond-South

Inflow Area = 38.200 ac, 10.65% Impervious, Inflow Depth = 1.84" for 100 year event
Inflow = 69.38 cfs @ 12.04 hrs, Volume= 5.861 af
Outflow = 31.15 cfs @ 12.29 hrs, Volume= 5.849 af, Atten= 55%, Lag= 14.6 min
Primary = 31.15 cfs @ 12.29 hrs, Volume= 5.849 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Starting Elev= 485.00' Surf.Area= 4,867 sf Storage= 3,704 cf
Peak Elev= 489.63' @ 12.29 hrs Surf.Area= 33,712 sf Storage= 73,273 cf (69,569 cf above start)

Plug-Flow detention time= 232.4 min calculated for 5.764 af (98% of inflow)
Center-of-Mass det. time= 215.9 min (1,054.7 - 838.8)

Volume	Invert	Avail.Storage	Storage Description
#1	484.00'	67,866 cf	**North cell (Irregular)** Listed below (Recalc)
#2	488.00'	18,693 cf	**South cell (Irregular)** Listed below (Recalc)
		86,559 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
484.00	2,653	221.0	0	0	2,653
485.00	4,867	298.0	3,704	3,704	5,844
486.00	7,347	360.0	6,065	9,769	9,107
487.00	10,506	416.0	8,880	18,649	12,587
488.00	14,060	480.0	12,240	30,889	17,172
489.00	18,271	577.0	16,120	47,008	25,348
490.00	23,556	682.0	20,858	67,866	35,887

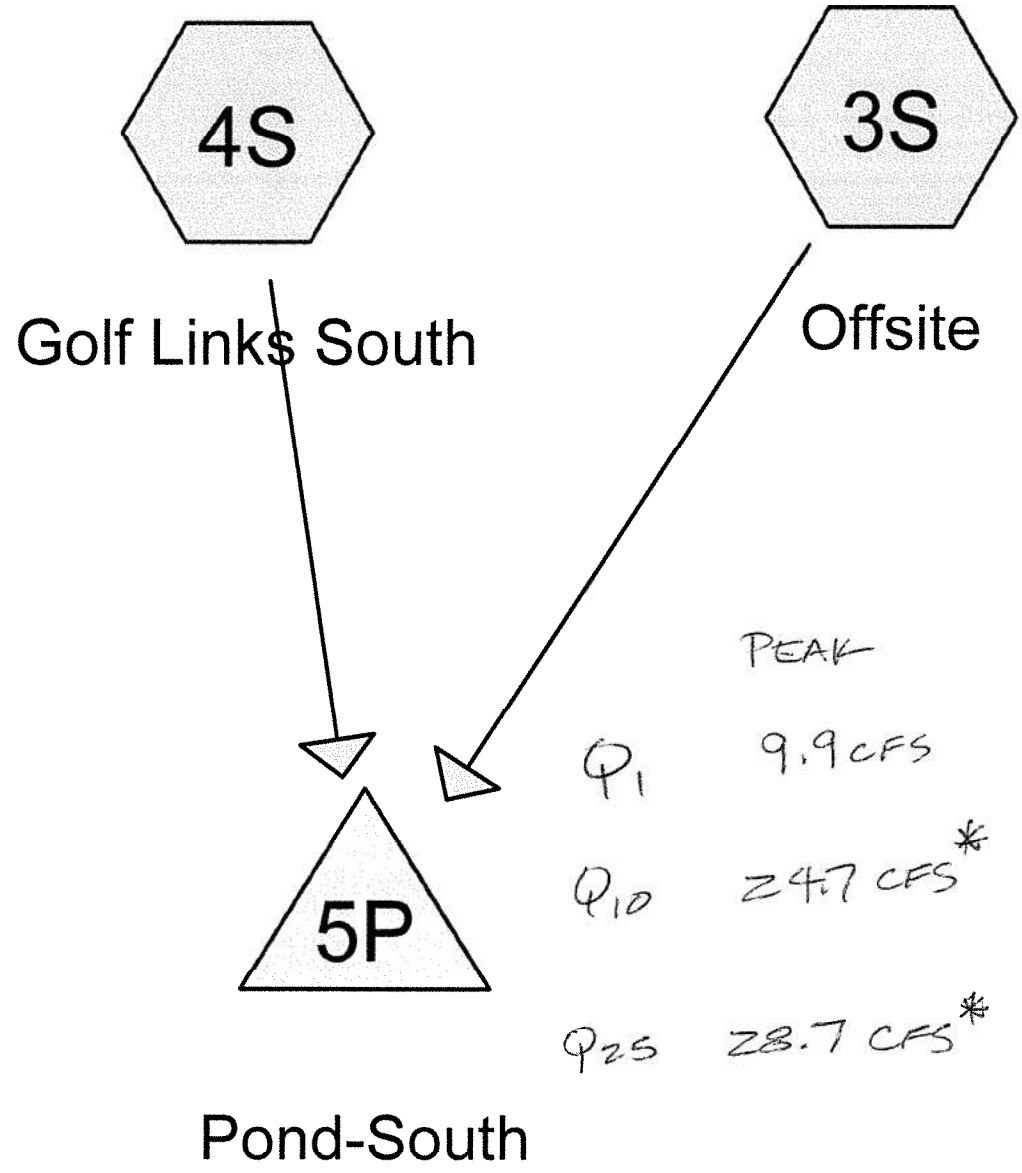
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
488.00	6,002	352.0	0	0	6,002
489.00	8,554	399.0	7,240	7,240	8,836
490.00	14,621	520.0	11,453	18,693	17,697

Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**1.5" Vert. WQv Orifice** C= 0.600
#2	Primary	486.25'	**3.5" Vert. CPv Orifice** C= 0.600
#3	Primary	488.00'	**36.0" W x 12.0" H Vert. Overflow X 2.00** C= 0.600

Primary OutFlow Max=31.14 cfs @ 12.29 hrs HW=489.63' (Free Discharge)
- **1=WQv Orifice** (Orifice Controls 0.13 cfs @ 10.29 fps)
- **2=CPv Orifice** (Orifice Controls 0.58 cfs @ 8.66 fps)
- **3=Overflow** (Orifice Controls 30.43 cfs @ 5.07 fps)

EXISTING

SOUTH POND



	PEAK	ELEV
Q_1	9.9 CFS	487.15'
Q_{10}	24.7 CFS*	488.2'
Q_{25}	28.7 CFS*	488.6'

* POND INFLOW LIKELY LIMITED BY STORM SYSTEM PIPE CAPACITY

Subcat Reach Pond Link

Drainage Diagram for South existing pond
Prepared by Lamoureux & Dickinson, Printed 8/14/2014
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.070	30	Meadow, non-grazed, HSG A (3S)
0.580	58	Meadow, non-grazed, HSG B (3S)
2.000	70	Woods, Good, HSG C (3S)
9.170	71	Meadow, non-grazed, HSG C (3S)
18.740	74	>75% Grass cover, Good, HSG C (3S, 4S)
0.260	77	Woods, Good, HSG D (3S)
1.310	80	>75% Grass cover, Good, HSG D (3S)
0.080	98	Drive & rooftop (3S)
0.870	98	Drives (4S)
1.360	98	Rooftop (4S)
1.760	98	Streets (4S)

Summary for Subcatchment 3S: Offsite

Runoff = 1.30 cfs @ 12.48 hrs, Volume= 0.295 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
	2.070	30	Meadow, non-grazed, HSG A
	0.580	58	Meadow, non-grazed, HSG B
	9.170	71	Meadow, non-grazed, HSG C
	2.000	70	Woods, Good, HSG C
	0.260	77	Woods, Good, HSG D
	1.310	80	>75% Grass cover, Good, HSG D
	1.730	74	>75% Grass cover, Good, HSG C
*	0.080	98	Drive & rooftop
	17.200	67	Weighted Average
	17.120		99.53% Pervious Area
	0.080		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
9.3	530	0.0040	0.95		**Shallow Concentrated Flow, Diversion** Grassed Waterway Kv= 15.0 fps
37.0	1,800	Total			

Summary for Subcatchment 4S: Golf Links South

Runoff = 16.59 cfs @ 12.05 hrs, Volume= 1.018 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.760	98	Streets
*	0.870	98	Drives
*	1.360	98	Rooftop
	17.010	74	>75% Grass cover, Good, HSG C
	21.000	79	Weighted Average
	17.010		81.00% Pervious Area
	3.990		19.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	100	0.0550	0.15		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.5	130	0.0850	4.37		**Shallow Concentrated Flow, Lawn to street** Grassed Waterway Kv= 15.0 fps
11.7	230	Total			

Summary for Pond 5P: Pond-South

Inflow Area = 38.200 ac, 10.65% Impervious, Inflow Depth = 0.41" for 1 year event
Inflow = 16.71 cfs @ 12.05 hrs, Volume= 1.313 af
Outflow = 9.92 cfs @ 12.17 hrs, Volume= 1.313 af, Atten= 41%, Lag= 7.2 min
Primary = 9.92 cfs @ 12.17 hrs, Volume= 1.313 af

Routing by Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Starting Elev= 485.85' Surf.Area= 5,573 sf Storage= 6,075 cf
Peak Elev= 487.15' @ 12.17 hrs Surf.Area= 9,248 sf Storage= 15,646 cf (9,571 cf above start)

Plug-Flow detention time= 135.7 min calculated for 1.174 af (89% of inflow)
Center-of-Mass det. time= 55.1 min (949.8 - 894.8)

<1 HR DETENTION TIME

Volume	Invert	Avail.Storage	Storage Description
#1	484.00'	38,692 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
#2	488.00'	7,240 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		45,933 cf	Total Available Storage

NORTH CELL

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
484.00	1,203	197.0	0	0	1,203
485.00	3,502	286.0	2,253	2,253	4,632
486.00	5,988	352.0	4,690	6,942	7,998
487.00	8,790	399.0	7,344	14,287	10,832
488.00	12,046	459.0	10,375	24,662	14,951
489.00	16,113	564.0	14,030	38,692	23,514

SOUTH CELL

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
488.00	6,002	352.0	0	0	6,002
489.00	8,554	399.0	7,240	7,240	8,836

Device	Routing	Invert	Outlet Devices
#1	Primary	485.85'	**8.0" Vert. Orifice** C= 0.600
#2	Primary	486.43'	**24.0" W x 12.0" H Vert. Orifice 24"x12"** C= 0.600
#3	Primary	486.38'	**24.0" W x 13.0" H Vert. Orifice 24"x13"** C= 0.600

EXIST. OUTLET STRUCTURE

Primary OutFlow Max=9.76 cfs @ 12.17 hrs HW=487.14' (Free Discharge)
- **1=Orifice** (Orifice Controls 1.65 cfs @ 4.71 fps)
- **2=Orifice 24"x12"** (Orifice Controls 3.85 cfs @ 2.71 fps)
- **3=Orifice 24"x13"** (Orifice Controls 4.27 cfs @ 2.80 fps)

Summary for Subcatchment 3S: Offsite

Runoff = 7.13 cfs @ 12.39 hrs, Volume= 0.985 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
	2.070	30	Meadow, non-grazed, HSG A
	0.580	58	Meadow, non-grazed, HSG B
	9.170	71	Meadow, non-grazed, HSG C
	2.000	70	Woods, Good, HSG C
	0.260	77	Woods, Good, HSG D
	1.310	80	>75% Grass cover, Good, HSG D
	1.730	74	>75% Grass cover, Good, HSG C
*	0.080	98	Drive & rooftop
	17.200	67	Weighted Average
	17.120		99.53% Pervious Area
	0.080		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
9.3	530	0.0040	0.95		**Shallow Concentrated Flow, Diversion** Grassed Waterway Kv= 15.0 fps
37.0	1,800	Total			

Summary for Subcatchment 4S: Golf Links South

Runoff = 40.06 cfs @ 12.04 hrs, Volume= 2.339 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.760	98	Streets
*	0.870	98	Drives
*	1.360	98	Rooftop
	17.010	74	>75% Grass cover, Good, HSG C
	21.000	79	Weighted Average
	17.010		81.00% Pervious Area
	3.990		19.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	100	0.0550	0.15		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.5	130	0.0850	4.37		**Shallow Concentrated Flow, Lawn to street** Grassed Waterway Kv= 15.0 fps
11.7	230	Total			

Summary for Pond 5P: Pond-South

Inflow Area = 38.200 ac, 10.65% Impervious, Inflow Depth = 1.04" for 10 year event
Inflow = 41.66 cfs @ 12.05 hrs, Volume= 3.324 af
Outflow = 24.68 cfs @ 12.18 hrs, Volume= 3.324 af, Atten= 41%, Lag= 7.8 min
Primary = 24.68 cfs @ 12.18 hrs, Volume= 3.324 af

Routing by Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Starting Elev= 485.85' Surf.Area= 5,573 sf Storage= 6,075 cf
Peak Elev= 488.18' @ 12.18 hrs Surf.Area= 19,165 sf Storage= 28,019 cf (21,944 cf above start)

Plug-Flow detention time= 63.7 min calculated for 3.183 af (96% of inflow)
Center-of-Mass det. time= 32.6 min (899.9 - 867.2)

Volume	Invert	Avail.Storage	Storage Description
#1	484.00'	38,692 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
#2	488.00'	7,240 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		45,933 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
484.00	1,203	197.0	0	0	1,203
485.00	3,502	286.0	2,253	2,253	4,632
486.00	5,988	352.0	4,690	6,942	7,998
487.00	8,790	399.0	7,344	14,287	10,832
488.00	12,046	459.0	10,375	24,662	14,951
489.00	16,113	564.0	14,030	38,692	23,514

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
488.00	6,002	352.0	0	0	6,002
489.00	8,554	399.0	7,240	7,240	8,836

Device	Routing	Invert	Outlet Devices
#1	Primary	485.85'	**8.0" Vert. Orifice** C= 0.600
#2	Primary	486.43'	**24.0" W x 12.0" H Vert. Orifice 24"x12"** C= 0.600
#3	Primary	486.38'	**24.0" W x 13.0" H Vert. Orifice 24"x13"** C= 0.600

Primary OutFlow Max=24.63 cfs @ 12.18 hrs HW=488.18' (Free Discharge)
- **1=Orifice** (Orifice Controls 2.37 cfs @ 6.80 fps)
- **2=Orifice 24"x12"** (Orifice Controls 10.67 cfs @ 5.34 fps)
- **3=Orifice 24"x13"** (Orifice Controls 11.59 cfs @ 5.35 fps)

Summary for Subcatchment 3S: Offsite

Runoff = 10.82 cfs @ 12.37 hrs, Volume= 1.383 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 year Rainfall=3.70"

	Area (ac)	CN	Description
	2.070	30	Meadow, non-grazed, HSG A
	0.580	58	Meadow, non-grazed, HSG B
	9.170	71	Meadow, non-grazed, HSG C
	2.000	70	Woods, Good, HSG C
	0.260	77	Woods, Good, HSG D
	1.310	80	>75% Grass cover, Good, HSG D
	1.730	74	>75% Grass cover, Good, HSG C
*	0.080	98	Drive & rooftop
	17.200	67	Weighted Average
	17.120		99.53% Pervious Area
	0.080		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	150	0.0400	0.14		**Sheet Flow, Thru meadow** Grass: Dense n= 0.240 P2= 2.30"
10.1	1,120	0.0700	1.85		**Shallow Concentrated Flow, Thru meadow** Short Grass Pasture Kv= 7.0 fps
9.3	530	0.0040	0.95		**Shallow Concentrated Flow, Diversion** Grassed Waterway Kv= 15.0 fps
37.0	1,800	Total			

Summary for Subcatchment 4S: Golf Links South

Runoff = 51.85 cfs @ 12.04 hrs, Volume= 3.015 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 year Rainfall=3.70"

	Area (ac)	CN	Description
*	1.760	98	Streets
*	0.870	98	Drives
*	1.360	98	Rooftop
	17.010	74	>75% Grass cover, Good, HSG C
	21.000	79	Weighted Average
	17.010		81.00% Pervious Area
	3.990		19.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	100	0.0550	0.15		**Sheet Flow, Lawn** Grass: Dense n= 0.240 P2= 2.30"
0.5	130	0.0850	4.37		**Shallow Concentrated Flow, Lawn to street** Grassed Waterway Kv= 15.0 fps
11.7	230	Total			

Summary for Pond 5P: Pond-South

Inflow Area = 38.200 ac, 10.65% Impervious, Inflow Depth = 1.38" for 25 year event
Inflow = 54.84 cfs @ 12.04 hrs, Volume= 4.398 af
Outflow = 28.72 cfs @ 12.21 hrs, Volume= 4.398 af, Atten= 48%, Lag= 10.0 min
Primary = 28.72 cfs @ 12.21 hrs, Volume= 4.398 af

Routing by Stor-Ind method, Time Span= 0.00-84.00 hrs, dt= 0.05 hrs
Starting Elev= 485.85' Surf.Area= 5,573 sf Storage= 6,075 cf
Peak Elev= 488.63' @ 12.21 hrs Surf.Area= 22,097 sf Storage= 37,288 cf (31,212 cf above start)

Plug-Flow detention time= 52.9 min calculated for 4.256 af (97% of inflow)
Center-of-Mass det. time= 29.2 min (888.7 - 859.5)

Volume	Invert	Avail.Storage	Storage Description
#1	484.00'	38,692 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
#2	488.00'	7,240 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		45,933 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
484.00	1,203	197.0	0	0	1,203
485.00	3,502	286.0	2,253	2,253	4,632
486.00	5,988	352.0	4,690	6,942	7,998
487.00	8,790	399.0	7,344	14,287	10,832
488.00	12,046	459.0	10,375	24,662	14,951
489.00	16,113	564.0	14,030	38,692	23,514

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
488.00	6,002	352.0	0	0	6,002
489.00	8,554	399.0	7,240	7,240	8,836

Device	Routing	Invert	Outlet Devices
#1	Primary	485.85'	**8.0" Vert. Orifice** C= 0.600
#2	Primary	486.43'	**24.0" W x 12.0" H Vert. Orifice 24"x12"** C= 0.600
#3	Primary	486.38'	**24.0" W x 13.0" H Vert. Orifice 24"x13"** C= 0.600

Primary OutFlow Max=28.68 cfs @ 12.21 hrs HW=488.63' (Free Discharge)
- **1=Orifice** (Orifice Controls 2.63 cfs @ 7.52 fps)
- **2=Orifice 24"x12"** (Orifice Controls 12.49 cfs @ 6.25 fps)
- **3=Orifice 24"x13"** (Orifice Controls 13.56 cfs @ 6.26 fps)

MEADOW RUN: PERMIT 2-1190


Source: USGS
Source: NASA, NGA, USGS
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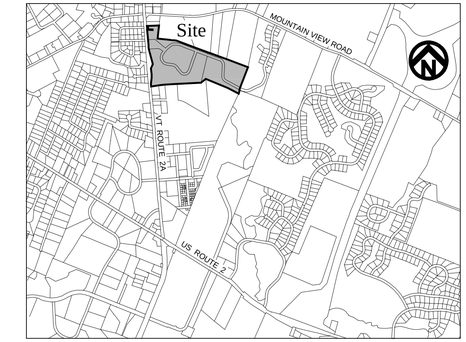
MEADOW RUN & FOREST RUN NEIGHBORHOOD STORMWATER IMPROVEMENT PROJECT



Vicinity Map
NOT TO SCALE

HAINES
03:009:009.000

MCDONALD
03:009:013.000

NEW GRASS SWALE

MOORE
03:009:017.000

376 MOUNTAIN VIEW,LLC
03:009:021.000

474 MOUNTAIN VIEW ROAD LLC
03:009:025.000

TO ESSEX

BOWLEY
03:030:002.000

BERTEAU
03:030:001.000

LONGCHAMP
03:102:043.000

MARTIN
03:102:041.000

TOWN OF WILLISTON
03:102:037.000

VT ROUTE 2A

TYNER
08:035:001.000

SEE SHEET 6

MEADOWRUN ROAD

WHITEWATER CIRCLE

FOREST RUN ROAD (PRIVATE)

SEE SHEETS 2 & 3

SEE SHEETS 4 & 5

WHITEWATER CIRCLE
NEW STORMWATER POND

ALLEN BROOK

FOREST RUN
STORMWATER POND

ALLEN BROOK

MEADOWRUN ROAD

TOWN OF WILLISTON
COM.044,a

DODGE
08:102:029.000

TO TAFT CORNERS

POON
08:102:060.000

PALMER
08:102:056.000

ESSEX ALLIANCE CHURCH
08:102:028.000

ESSEX ALLIANCE CHURCH
08:102:048.000

ESSEX ALLIANCE CHURCH
08:102:028.000

TOWN OF WILLISTON
08:104:010.000,b

GRAPHIC SCALE

100 0 50 100 200 400

(in feet)
1 inch = 100 ft.

INDEX OF SHEETS

NOTES:
1. THE PURPOSE OF THIS PLAN IS TO PRESENT THE OVERALL LAYOUT OF THE PROPOSED STORMWATER IMPROVEMENTS. SEE OTHER PLANS FOR ADDITIONAL DESIGN INFORMATION AND CONSTRUCTION DETAILS.

2. BOUNDARY INFORMATION SHOWN IS BASED UPON FIELD EVIDENCE, TAX MAPS, AND THE PROPERTY PLATS FOR MEADOW RUN AND FOREST RUN. THE PROPERTY LINES SHOWN ON THESE PLANS SHALL ONLY BE USED FOR THE STORMWATER IMPROVEMENTS.

3. EXISTING CONDITIONS SHOWN HEREON ARE BASED UPON A TOPOGRAPHIC SURVEY PERFORMED BY L&D IN SEPTEMBER 2014 AND FEBRUARY 2016. EXISTING UTILITIES ARE BASED UPON THE TOPOGRAPHIC SURVEY AND DIGSAFE MARKINGS FROM OCTOBER 2015 AND FEBRUARY 2016. EXISTING UTILITIES SHOWN ARE APPROXIMATE AND MAY NOT BE COMPLETE.

4. THE SPECIAL FLOOD HAZARD AREA (100 YEAR) IS BASED UPON THE FLOOD INSURANCE RATE MAP FOR CHITTENDEN COUNTY, PANEL 278, MAP NUMBER 50007C0278D, EFFECTIVE JULY 18, 2011.

5. THE WETLAND DELINEATION WAS PERFORMED BY L&D IN MAY & JUNE 2014.

Date	Revision	By

These plans shall only be used for the purpose shown below:

- ☐ Sketch/Concept
- ☐ Preliminary
- ■ Final Local Review
- ☐ Act 250 Review
- ☐ Construction
- ☐ Record Drawing

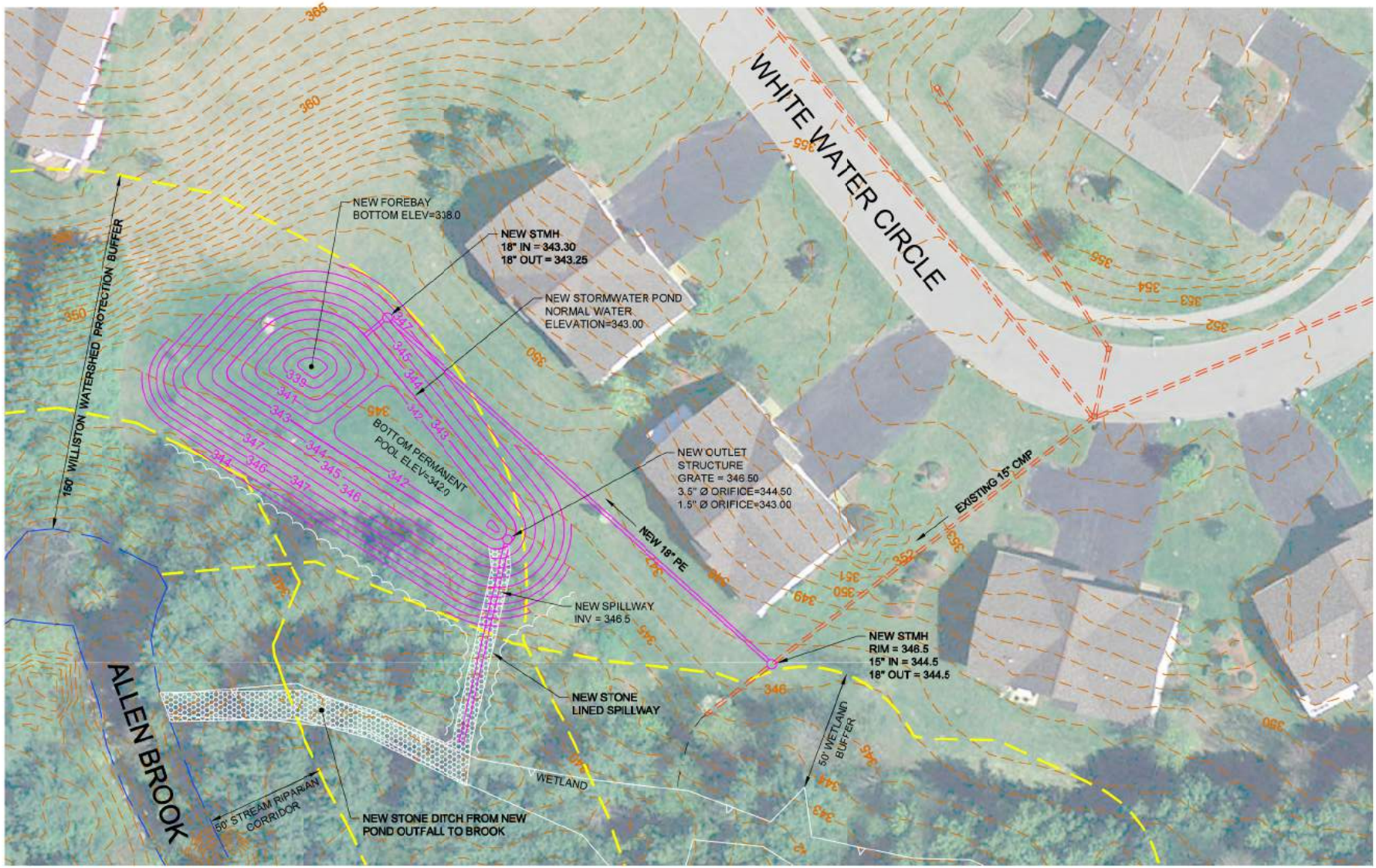
DP # - __
TAX PARCELS: COM.012,a COM.012,b COM.013a

Meadow Run & Forest Run Neighborhood Stormwater Improvement Project
Meadowrun Road, Forest Run Road, & Whitewater Circle

NEIGHBORHOOD STORMWATER IMPROVEMENTS LOCATION PLAN

Project No.	14057
Survey	-
Design	L&D
Drawn	L&D
Checked	ABR/DLG
Date	03-01-16
Scale	1" = 100'
Sheet number	1

Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450 www.LDengineering.com



Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Norse Drive, Essex, VT 05452
802-878-4450
www.LDengineering.com

40 0 20 40 80
1 inch = 40 feet

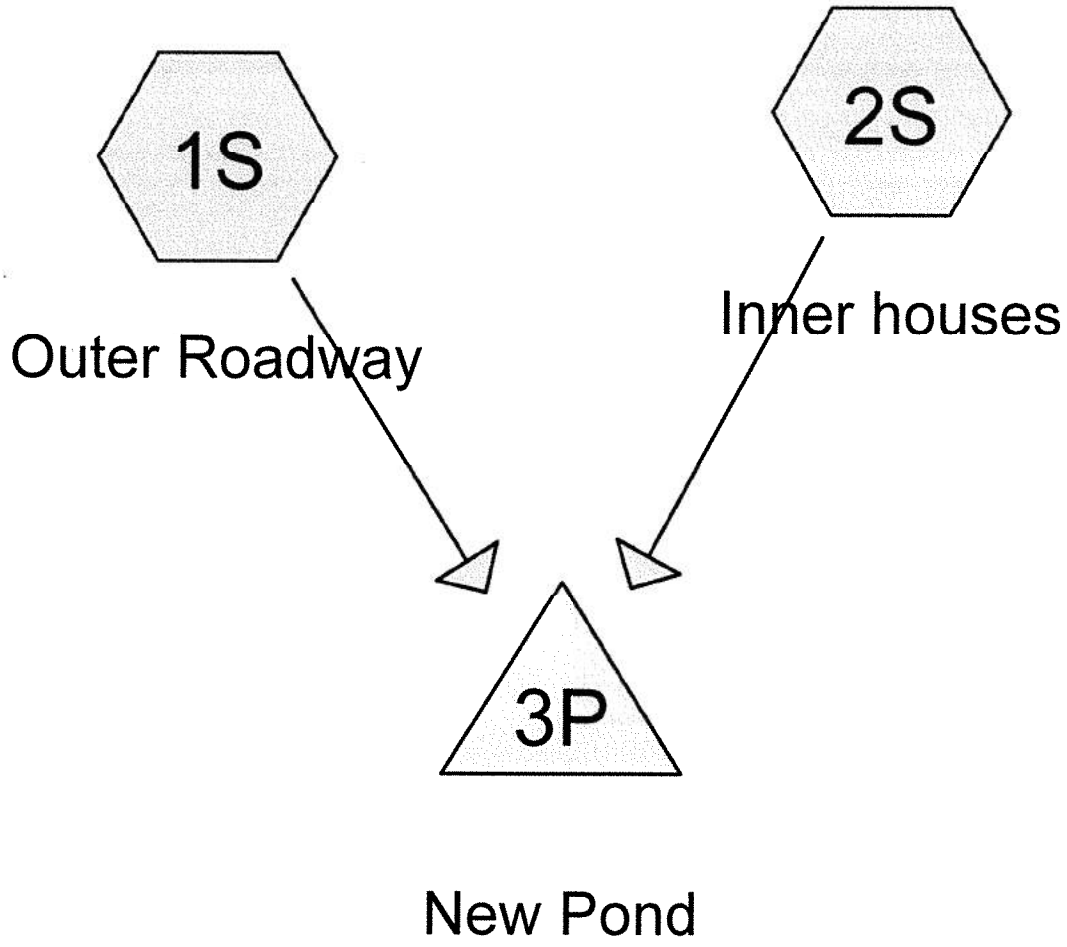
STORMWATER EFA - CONCEPTUAL DESIGN
WHITEWATER CIRCLE
PROPOSED STORMWATER POND
JANUARY 2015

JAN 2015

EXTENDED DETENTION

C_{PV} = 12.9 HRS

WQ_V = 24 HRS



Subcat Reach Pond Link

Drainage Diagram for Whitewater Circle Jan2015
Prepared by Lamoureux & Dickinson, Printed 1/21/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
7.376	80	>75% Grass cover, Good, HSG D (1S, 2S)
1.398	98	Paved parking, HSG D (1S)
1.319	98	Paved roads w/curbs & sewers, HSG D (1S)
0.977	98	Roofs, HSG D (1S)
0.176	98	Sidewalk, HSG D (1S)
0.716	98	Unconnected roofs, HSG D (2S)

Version: 9/06

For the area draining to*: Whitewater Circle Pond

Located in drainage area for S/N: 002

WQ Volume Calculation for Volume-Based Practice

Use this worksheet to calculate the water quality volume draining to your volume based STP if you are not using any of the site design credits in section 3 of the 2002 VSWMM. ***Do not use*** *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice). See the worksheet "Water Quality Volume and Modified Curve Number Calculation for Water Quality Treatment in a Flow-Based Practice"*

Water Quality Volume Calculations

Line			value/calculation	units
1	Site Area (impervious + disturbed pervious)	A=	11.96	acres
2	Impervious area		4.59	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	38.34	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.395	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.356	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.356	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.354	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	15438	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

PERMANENT POOL VOL = 3970 CF

STORAGE VOLUME/EXTENDED DETENTION

VOLUME = 8632 CF

TIME = 24 HRS

(TOTAL RUNOFF VOLUME = 11,848 CF)

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Summary for Subcatchment 1S: Outer Roadway

Runoff = 3.22 cfs @ 12.07 hrs, Volume= 0.237 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-96.00 hrs, dt= 0.1
Type II 24-hr WQv Rainfall=0.90"

	Area (sf)	CN	Description
	57,475	98	Paved roads w/curbs & sewers, HSG D
*	7,650	98	Sidewalk, HSG D
	60,900	98	Paved parking, HSG D
	42,560	98	Roofs, HSG D
	124,199	80	>75% Grass cover, Good, HSG D
	292,784	90	Weighted Average
	124,199	80	42.42% Pervious Area
	168,585	98	57.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	70	0.0100	0.10		**Sheet Flow, Grass yard** Grass: Short n= 0.150 P2= 2.30"
0.7	30	0.0100	0.69		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.9	1,122	0.0200	6.42	5.04	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.1	1,222	Total			

Summary for Subcatchment 2S: Inner houses

Runoff = 0.22 cfs @ 12.20 hrs, Volume= 0.035 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-96.00 hrs, dt= 0.1
Type II 24-hr WQv Rainfall=0.90"

Area (sf)	CN	Description
31,200	98	Unconnected roofs, HSG D
197,093	80	>75% Grass cover, Good, HSG D
228,293	82	Weighted Average
228,293	82	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0200	0.14		**Sheet Flow, Grass yard** Grass: Short n= 0.150 P2= 2.30"
6.0	856	0.0250	2.37		**Shallow Concentrated Flow, Shallow grass swale** Grassed Waterway Kv= 15.0 fps
17.6	956	Total			

Summary for Pond 3P: New Pond

Inflow Area = 11.962 ac, 32.35% Impervious, Inflow Depth = 0.27" for WQv event
Inflow = 3.38 cfs @ 12.08 hrs, Volume= 0.272 af
Outflow = 0.07 cfs @ 19.95 hrs, Volume= 0.269 af, Atten= 98%, Lag= 472.2 min
Primary = 0.07 cfs @ 19.95 hrs, Volume= 0.269 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Starting Elev= 343.00' Surf.Area= 4,610 sf Storage= 3,969 cf
Peak Elev= 344.53' @ 19.95 hrs Surf.Area= 6,727 sf Storage= 12,601 cf (8,632 cf above start)

Plug-Flow detention time= 2,137.1 min calculated for 0.178 af (65% of inflow)
Center-of-Mass det. time= 1,441.1 min (2,267.5 - 826.4)

→ 24 HOURS

Volume	Invert	Avail.Storage	Storage Description
#1	342.00'	38,920 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)
342.00	3,361	295.0	0	0	3,361
343.00	4,610	322.0	3,969	3,969	4,722
344.00	5,969	350.0	5,275	9,244	6,257
345.00	7,440	378.0	6,691	15,935	7,919
346.00	9,020	405.0	8,217	24,152	9,646
347.50	10,694	431.0	14,768	38,920	11,486

Device	Routing	Invert	Outlet Devices
#1	Primary	343.00'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	344.50'	**3.5" Vert. Orifice1** C= 0.600
#3	Primary	346.50'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	346.50'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.07 cfs @ 19.95 hrs HW=344.53' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.07 cfs @ 5.83 fps)
- **2=Orifice1** (Orifice Controls 0.00 cfs @ 0.58 fps)
- **3=Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Outer Roadway

Runoff = 10.20 cfs @ 12.07 hrs, Volume= 0.753 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-96.00 hrs, dt= 0.1
Type II 24-hr 1 year Rainfall=2.10"

	Area (sf)	CN	Description
	57,475	98	Paved roads w/curbs & sewers, HSG D
*	7,650	98	Sidewalk, HSG D
	60,900	98	Paved parking, HSG D
	42,560	98	Roofs, HSG D
	124,199	80	>75% Grass cover, Good, HSG D
	292,784	90	Weighted Average
	124,199	80	42.42% Pervious Area
	168,585	98	57.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	70	0.0100	0.10		**Sheet Flow, Grass yard** Grass: Short n= 0.150 P2= 2.30"
0.7	30	0.0100	0.69		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.9	1,122	0.0200	6.42	5.04	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.1	1,222	Total			

Summary for Subcatchment 2S: Inner houses

Runoff = 4.20 cfs @ 12.11 hrs, Volume= 0.312 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-96.00 hrs, dt= 0.1
Type II 24-hr 1 year Rainfall=2.10"

Area (sf)	CN	Description
31,200	98	Unconnected roofs, HSG D
197,093	80	>75% Grass cover, Good, HSG D
228,293	82	Weighted Average
228,293	82	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0200	0.14		**Sheet Flow, Grass yard** Grass: Short n= 0.150 P2= 2.30"
6.0	856	0.0250	2.37		**Shallow Concentrated Flow, Shallow grass swale** Grassed Waterway Kv= 15.0 fps
17.6	956	Total			

Summary for Pond 3P: New Pond

Inflow Area = 11.962 ac, 32.35% Impervious, Inflow Depth = 1.07" for 1 year event
Inflow = 14.29 cfs @ 12.09 hrs, Volume= 1.065 af
Outflow = 1.84 cfs @ 12.73 hrs, Volume= 1.059 af, Atten= 87%, Lag= 38.5 min
Primary = 1.84 cfs @ 12.73 hrs, Volume= 1.059 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Starting Elev= 343.00' Surf.Area= 4,610 sf Storage= 3,969 cf
Peak Elev= 346.59' @ 12.73 hrs Surf.Area= 9,662 sf Storage= 29,669 cf (25,700 cf above start)

Plug-Flow detention time= 907.4 min calculated for 0.968 af (91% of inflow)
Center-of-Mass det. time= 776.4 min (1,589.5 - 813.1) → 12.9 Hours

Volume	Invert	Avail.Storage	Storage Description
#1	342.00'	38,920 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)
342.00	3,361	295.0	0	0	3,361
343.00	4,610	322.0	3,969	3,969	4,722
344.00	5,969	350.0	5,275	9,244	6,257
345.00	7,440	378.0	6,691	15,935	7,919
346.00	9,020	405.0	8,217	24,152	9,646
347.50	10,694	431.0	14,768	38,920	11,486

Device	Routing	Invert	Outlet Devices
#1	Primary	343.00'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	344.50'	**3.5" Vert. Orifice1** C= 0.600
#3	Primary	346.50'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	346.50'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=1.76 cfs @ 12.73 hrs HW=346.59' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.11 cfs @ 9.04 fps)
- **2=Orifice1** (Orifice Controls 0.45 cfs @ 6.71 fps)
- **3=Grate** (Weir Controls 0.70 cfs @ 0.98 fps)
- **4=Broad-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 0.71 fps)

Summary for Subcatchment 1S: Outer Roadway

Runoff = 25.10 cfs @ 12.07 hrs, Volume= 1.855 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-96.00 hrs, dt= 0.1
Type II 24-hr 100 year Rainfall=4.30"

	Area (sf)	CN	Description
	57,475	98	Paved roads w/curbs & sewers, HSG D
*	7,650	98	Sidewalk, HSG D
	60,900	98	Paved parking, HSG D
	42,560	98	Roofs, HSG D
	124,199	80	>75% Grass cover, Good, HSG D
	292,784	90	Weighted Average
	124,199	80	42.42% Pervious Area
	168,585	98	57.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	70	0.0100	0.10		**Sheet Flow, Grass yard** Grass: Short n= 0.150 P2= 2.30"
0.7	30	0.0100	0.69		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.9	1,122	0.0200	6.42	5.04	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.1	1,222	Total			

Summary for Subcatchment 2S: Inner houses

Runoff = 15.04 cfs @ 12.10 hrs, Volume= 1.075 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-96.00 hrs, dt= 0.1
Type II 24-hr 100 year Rainfall=4.30"

Area (sf)	CN	Description
31,200	98	Unconnected roofs, HSG D
197,093	80	>75% Grass cover, Good, HSG D
228,293	82	Weighted Average
228,293	82	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0200	0.14		**Sheet Flow, Grass yard** Grass: Short n= 0.150 P2= 2.30"
6.0	856	0.0250	2.37		**Shallow Concentrated Flow, Shallow grass swale** Grassed Waterway Kv= 15.0 fps
17.6	956	Total			

Summary for Pond 3P: New Pond

* Inflow Area = 11.962 ac, 32.35% Impervious, Inflow Depth = 2.94" for 100 year event
Inflow = 39.92 cfs @ 12.08 hrs, Volume= 2.930 af
Outflow = 36.88 cfs @ 12.14 hrs, Volume= 2.923 af, Atten= 8%, Lag= 3.4 min
Primary = 36.88 cfs @ 12.14 hrs, Volume= 2.923 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.10 hrs
Starting Elev= 343.00' Surf.Area= 4,610 sf Storage= 3,969 cf
Peak Elev= 347.38' @ 12.14 hrs Surf.Area= 10,560 sf Storage= 37,688 cf (33,719 cf above start)

Plug-Flow detention time= 378.2 min calculated for 2.829 af (97% of inflow)
Center-of-Mass det. time= 345.2 min (1,142.5 - 797.3)

Volume	Invert	Avail.Storage	Storage Description
#1	342.00'	38,920 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)
342.00	3,361	295.0	0	0	3,361
343.00	4,610	322.0	3,969	3,969	4,722
344.00	5,969	350.0	5,275	9,244	6,257
345.00	7,440	378.0	6,691	15,935	7,919
346.00	9,020	405.0	8,217	24,152	9,646
347.50	10,694	431.0	14,768	38,920	11,486

Device	Routing	Invert	Outlet Devices
#1	Primary	343.00'	**1.5" Vert. Orifice1** C= 0.600
#2	Primary	344.50'	**3.5" Vert. Orifice1** C= 0.600
#3	Primary	346.50'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	346.50'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

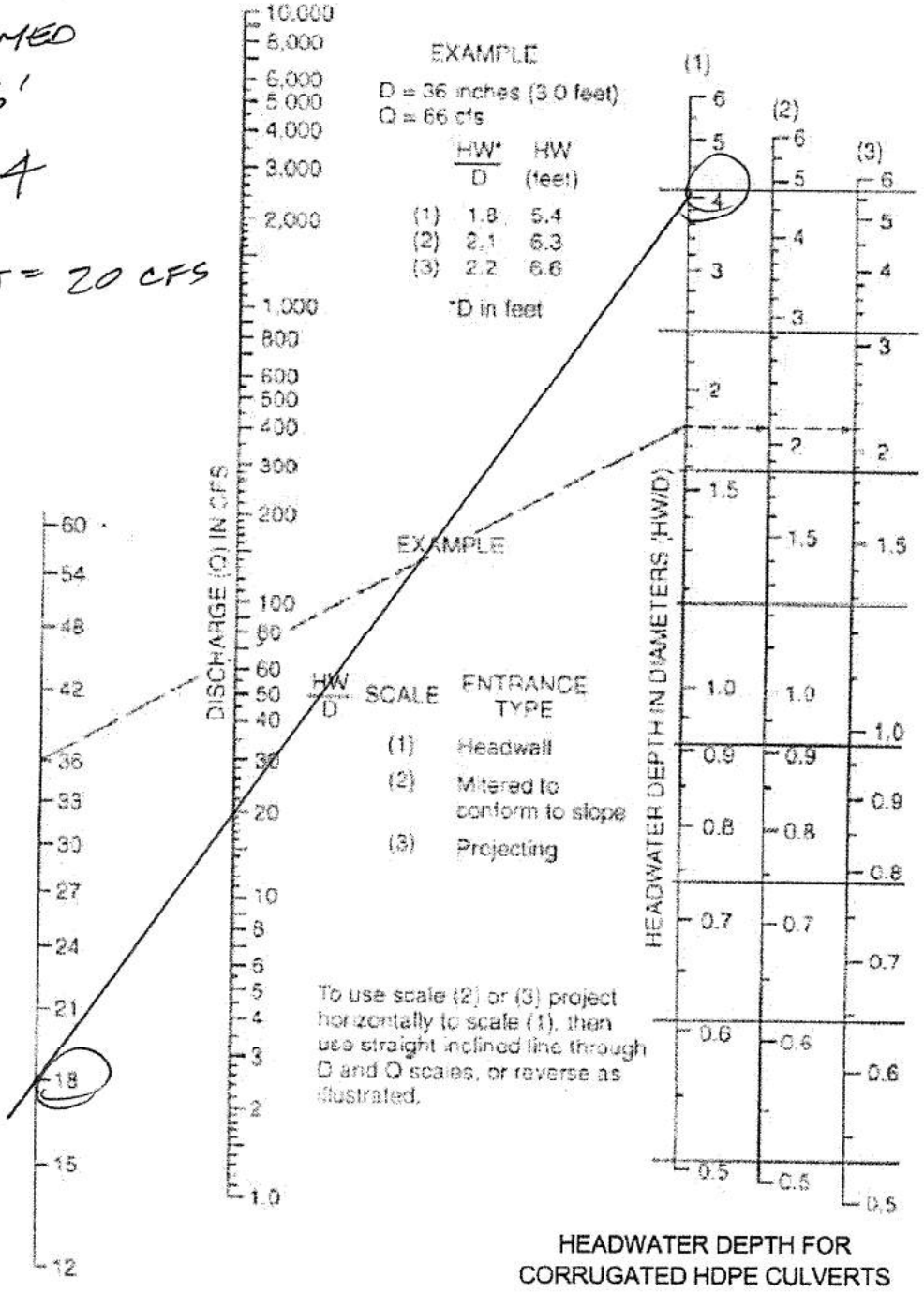
Primary OutFlow Max=35.03 cfs @ 12.14 hrs HW=347.35' (Free Discharge)
- **1=Orifice1** (Orifice Controls 0.12 cfs @ 9.97 fps)
- **2=Orifice1** (Orifice Controls 0.53 cfs @ 7.91 fps)
- **3=Grate** (Orifice Controls 17.71 cfs @ 4.43 fps)
- **4=Broad-Crested Rectangular Weir** (Weir Controls 16.66 cfs @ 2.46 fps)

* CALCULATED INFLOW EXCEEDS THE CAPACITY OF THE INLET PIPE

INLET CONTROL, CIRCULAR HDPE PIPE

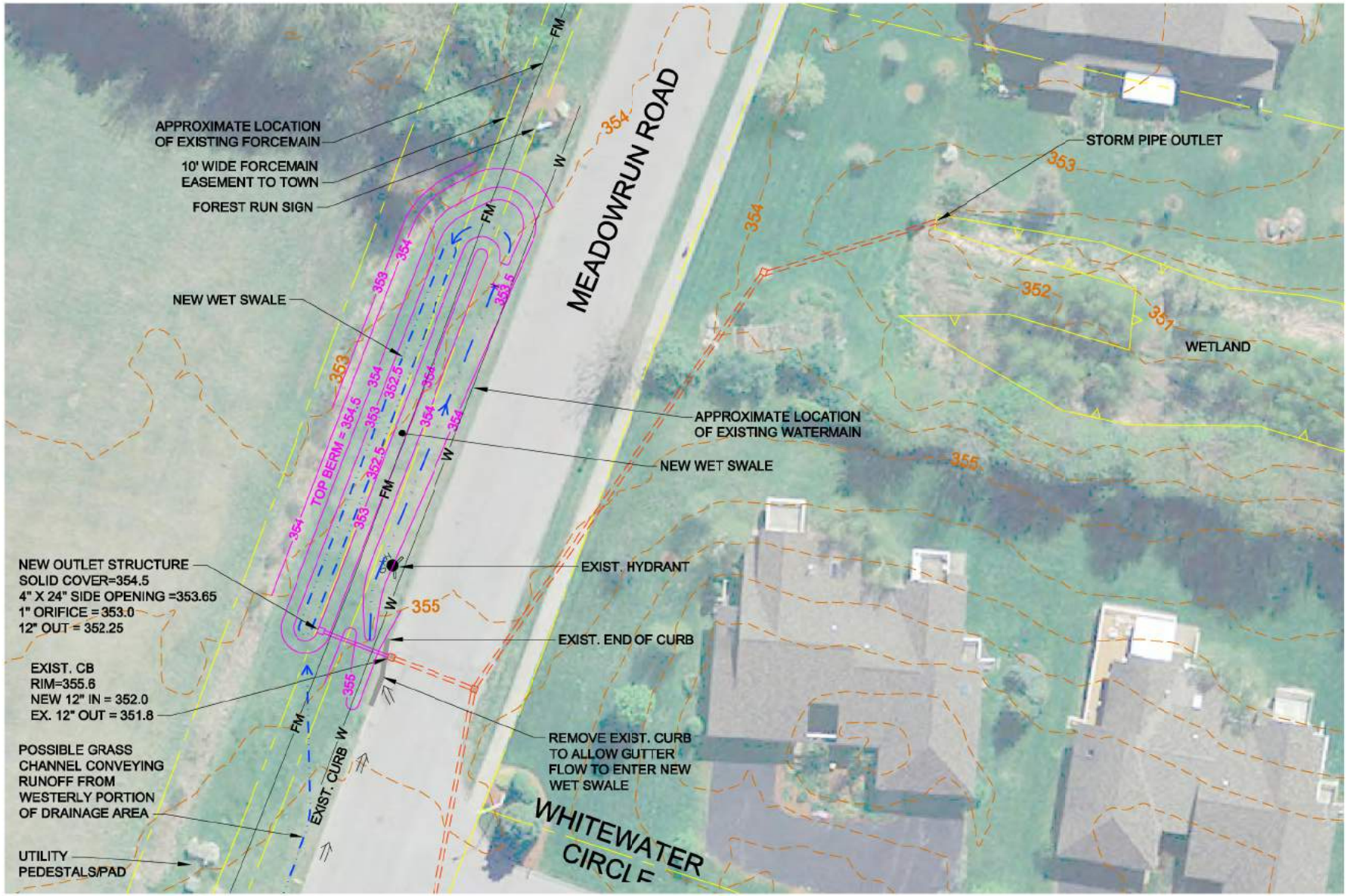
FOR ASSUMED
HW = 6'
HW/D = 4

Q INLET = 20 CFS



HEADWATER DEPTH FOR CORRUGATED HDPE CULVERTS WITH INLET CONTROL

Attachment 6
Meadowrun Road
Proposed Wet Swale



Lamoureux & Dickinson
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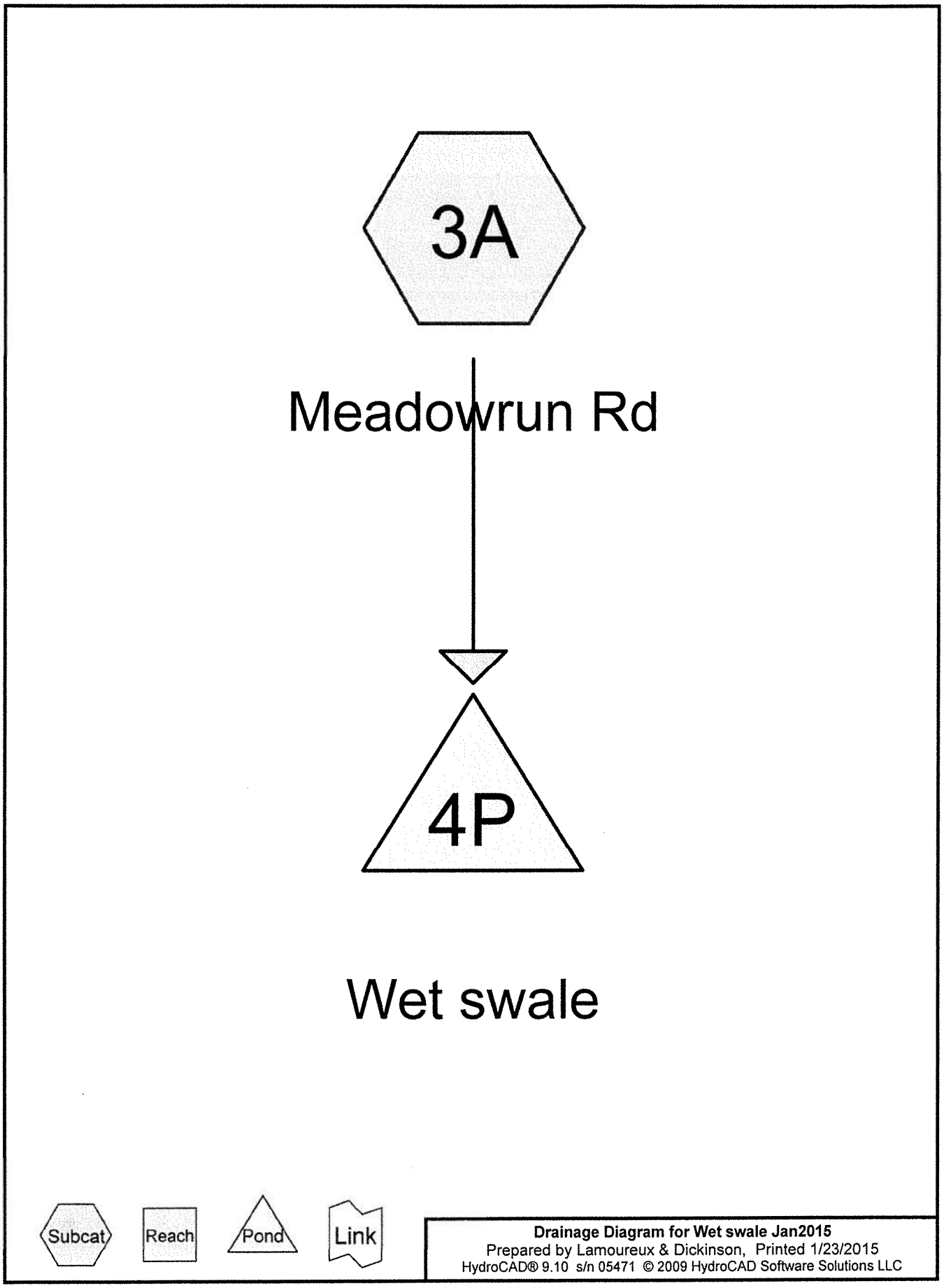
30 0 15 30 60

1 inch = 30 feet

DISCHARGE 3A
PROPOSED WET SWALE
JANUARY 2015


3A
Meadowrun Rd
4P
Wet swale
Subcat
Reach
Pond
Link
Drainage Diagram for Wet swale Jan2015
Prepared by Lamoureux & Dickinson, Printed 1/23/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Version: 9/06

For the area draining to*: Meadowrun Rd wet swale

Located in drainage area for S/N: 003A

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.*

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	1.04	acres
2	Impervious area		0.28	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	26.92	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.292	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.263	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		**0.2**	watershed inches
8	Enter the greater of line 6 or line 7	**WQv** =	0.263	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv** =	0.023	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv** =	993	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

PERMANENT POOL VOL = 458 CF

MAX STORAGE VOL = 531 CF

989 CF

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Meadowrun Rd wet swale

Located in drainage area for S/N: 003A

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.263 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 1.0 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 90.2

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.040	90	Modified CN (3A)

— WATER QUALITY VOL.

Summary for Subcatchment 3A: Meadowrun Rd

Runoff = 0.42 cfs @ 12.01 hrs, Volume= 0.022 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
* 1.040	90	Modified CN ← MOD CN
1.040	90	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0300	0.10		**Sheet Flow, Overland to gutter** Grass: Dense n= 0.240 P2= 2.30"

Summary for Pond 4P: Wet swale

Inflow Area = 1.040 ac, 0.00% Impervious, Inflow Depth = 0.26" for WQv event
Inflow = 0.42 cfs @ 12.01 hrs, Volume= 0.022 af
Outflow = 0.01 cfs @ 15.67 hrs, Volume= 0.022 af, Atten= 97%, Lag= 219.7 min
Primary = 0.01 cfs @ 15.67 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 353.00' Surf.Area= 1,365 sf Storage= 458 cf
Peak Elev= 353.32' @ 15.67 hrs Surf.Area= 2,000 sf Storage= 989 cf (531 cf above start)
→ 4" DEPTH
Plug-Flow detention time= 1,086.2 min calculated for 0.012 af (53% of inflow)
Center-of-Mass det. time= 563.0 min (1,431.7 - 868.6)
→ 9.4 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	352.50'	5,105 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)
352.50	530	271.0	0	0	530
353.00	1,365	346.0	458	458	4,216
354.00	3,773	591.0	2,469	2,927	22,490
354.50	4,969	373.0	2,179	5,105	39,215

Device	Routing	Invert	Outlet Devices
#1	Primary	353.00'	**1.0" Vert. Orifice** C= 0.600
#2	Primary	353.65'	**24.0" W x 4.0" H Vert. Overflow orifice** C= 0.600

Primary OutFlow Max=0.01 cfs @ 15.67 hrs HW=353.32' (Free Discharge)
↑—**1=Orifice** (Orifice Controls 0.01 cfs @ 2.53 fps)
└—**2=Overflow orifice** (Controls 0.00 cfs)

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.760	80	>75% Grass cover, Good, HSG D (3A)
0.280	98	Street (3A)

Summary for Subcatchment 3A: Meadowrun Rd

Runoff = 1.50 cfs @ 12.00 hrs, Volume= 0.083 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.280	98	Street
	0.760	80	>75% Grass cover, Good, HSG D
	1.040	85	Weighted Average
	0.760	80	73.08% Pervious Area
	0.280	98	26.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0300	0.10		**Sheet Flow, Overland to gutter** Grass: Dense n= 0.240 P2= 2.30"

Summary for Pond 4P: Wet swale

Inflow Area = 1.040 ac, 26.92% Impervious, Inflow Depth = 0.96" for 1 year event
Inflow = 1.50 cfs @ 12.00 hrs, Volume= 0.083 af
Outflow = 0.27 cfs @ 12.25 hrs, Volume= 0.083 af, Atten= 82%, Lag= 15.3 min
Primary = 0.27 cfs @ 12.25 hrs, Volume= 0.083 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs / 2 PONDING VOL.
Starting Elev= 353.00' Surf.Area= 1,365 sf Storage= 458 cf
Peak Elev= 353.77' @ 12.25 hrs Surf.Area= 3,100 sf Storage= 2,121 cf (1,663 cf above start)
→ 9" PONDING DEPTH (PLUS 6" PERM. POOL)
Plug-Flow detention time= 714.4 min calculated for 0.073 af (87% of inflow)
Center-of-Mass det. time= 554.1 min (1,366.9 - 812.8)
→ 9.2 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	352.50'	5,105 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)
352.50	530	271.0	0	0	530
353.00	1,365	346.0	458 PERM.	458	4,216
354.00	3,773	591.0	2,469 POOL	2,927	22,490
354.50	4,969	373.0	2,179	5,105	39,215

Device	Routing	Invert	Outlet Devices
#1	Primary	353.00'	**1.0" Vert. Orifice** C= 0.600
#2	Primary	353.65'	**24.0" W x 4.0" H Vert. Overflow orifice** C= 0.600

Primary OutFlow Max=0.27 cfs @ 12.25 hrs HW=353.77' (Free Discharge)
↑ **1=Orifice** (Orifice Controls 0.02 cfs @ 4.10 fps)
2=Overflow orifice (Orifice Controls 0.25 cfs @ 1.09 fps)

Summary for Subcatchment 3A: Meadowrun Rd

Runoff = 2.89 cfs @ 12.00 hrs, Volume= 0.158 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.280	98	Street
	0.760	80	>75% Grass cover, Good, HSG D
	1.040	85	Weighted Average
	0.760	80	73.08% Pervious Area
	0.280	98	26.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0300	0.10		**Sheet Flow, Overland to gutter** Grass: Dense n= 0.240 P2= 2.30"

Summary for Pond 4P: Wet swale

Inflow Area = 1.040 ac, 26.92% Impervious, Inflow Depth = 1.82" for 10 year event
Inflow = 2.89 cfs @ 12.00 hrs, Volume= 0.158 af
Outflow = 1.45 cfs @ 12.11 hrs, Volume= 0.158 af, Atten= 50%, Lag= 6.8 min
Primary = 1.45 cfs @ 12.11 hrs, Volume= 0.158 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 353.00' Surf.Area= 1,365 sf Storage= 458 cf
Peak Elev= 354.03' @ 12.11 hrs Surf.Area= 3,831 sf Storage= 3,026 cf (2,568 cf above start)
↳ 6" FREE BOARD TO TOP BERM
Plug-Flow detention time= 385.8 min calculated for 0.147 af (93% of inflow)
Center-of-Mass det. time= 316.4 min (1,119.9 - 803.4)

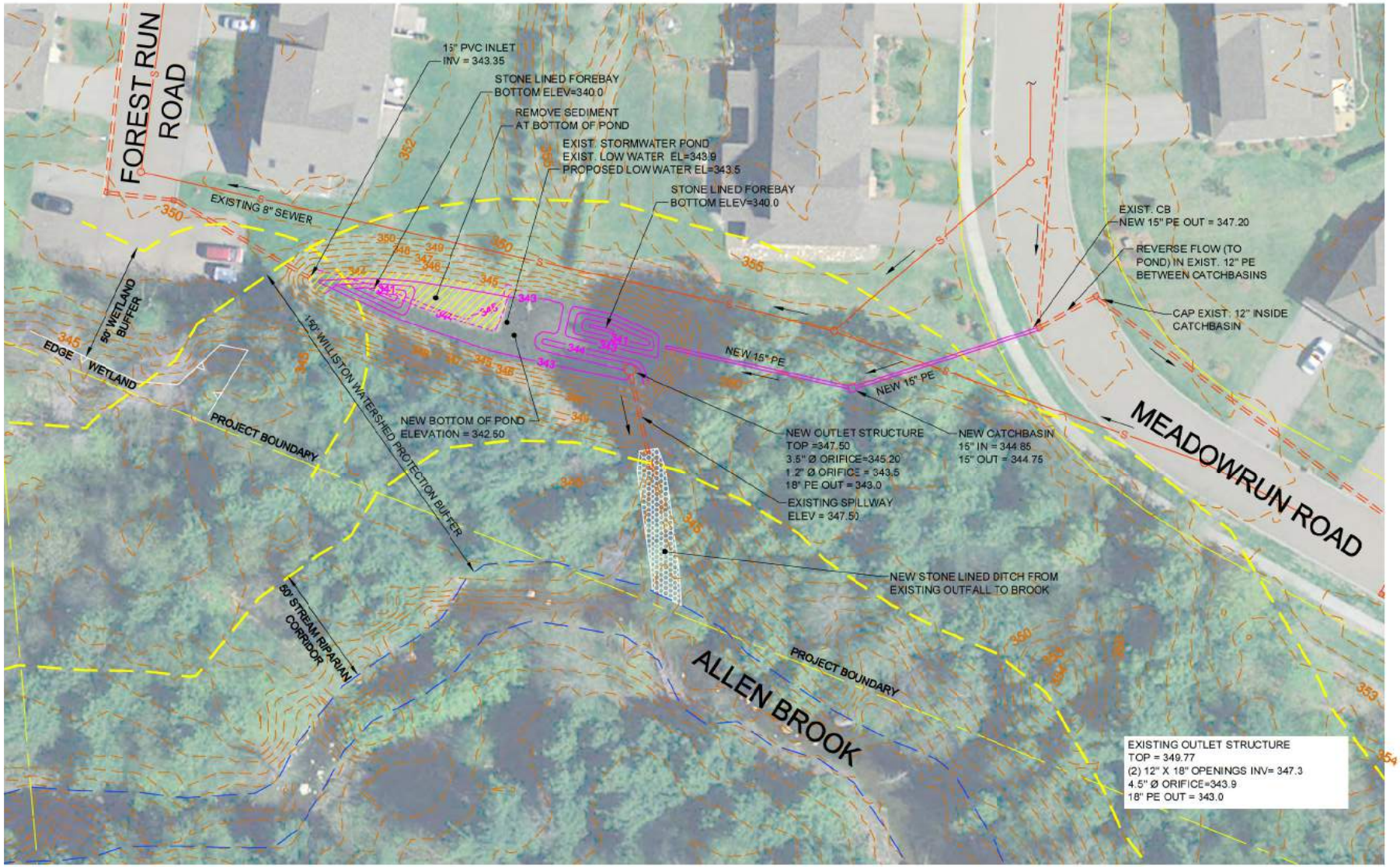
Volume	Invert	Avail.Storage	Storage Description
#1	352.50'	5,105 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
352.50	530	271.0	0	0	530
353.00	1,365	346.0	458	458	4,216
354.00	3,773	591.0	2,469	2,927	22,490
354.50	4,969	373.0	2,179	5,105	39,215

Device	Routing	Invert	Outlet Devices
#1	Primary	353.00'	**1.0" Vert. Orifice** C= 0.600
#2	Primary	353.65'	**24.0" W x 4.0" H Vert. Overflow orifice** C= 0.600

Primary OutFlow Max=1.44 cfs @ 12.11 hrs HW=354.02' (Free Discharge)
↑—**1=Orifice** (Orifice Controls 0.03 cfs @ 4.77 fps)
└—**2=Overflow orifice** (Orifice Controls 1.41 cfs @ 2.12 fps)

Attachment 7
Forest Run Road
Existing Stormwater Pond



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802-878-4450
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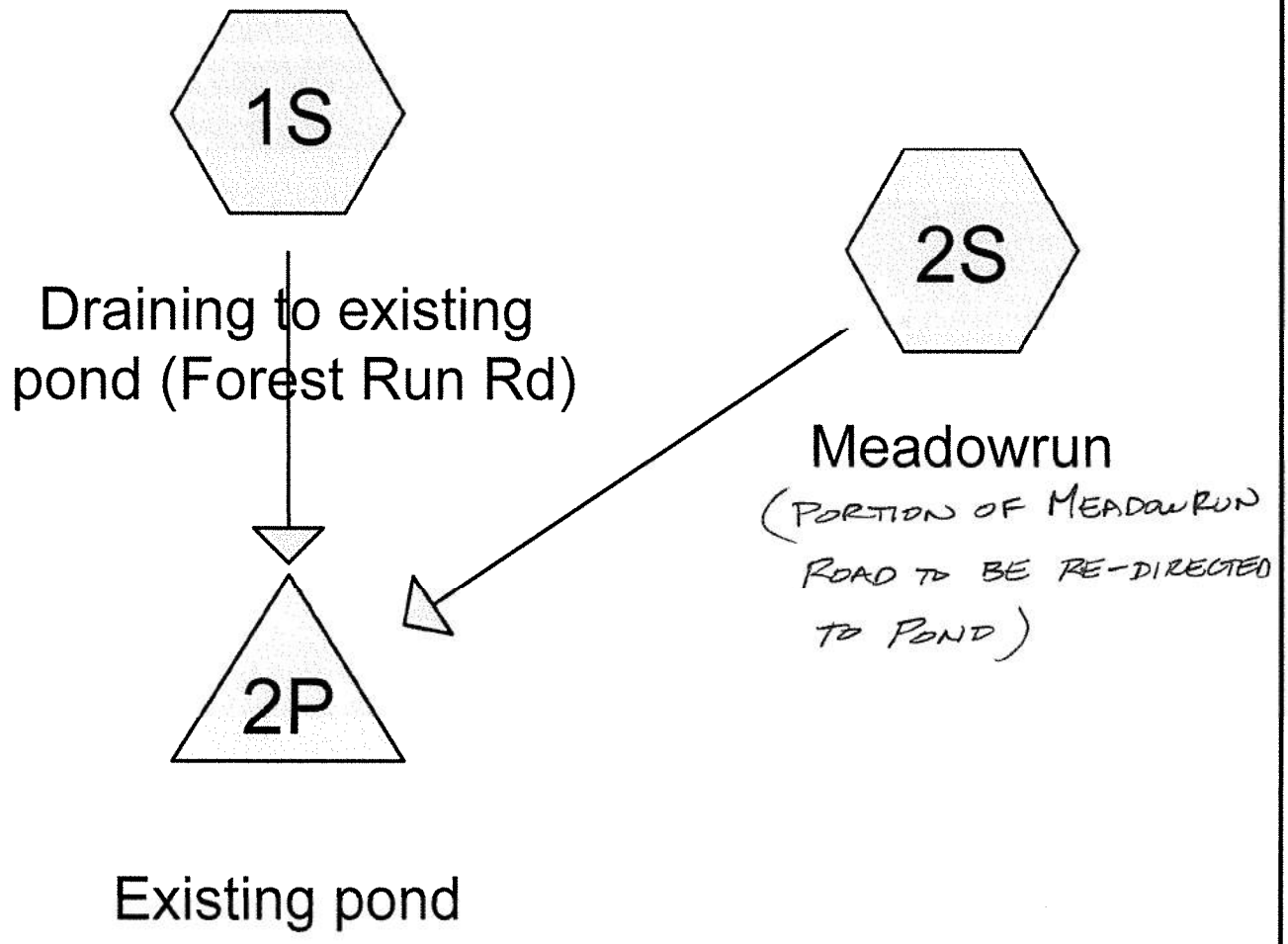
40 0 20 40 80

1 inch = 40 feet

STORMWATER EFA - CONCEPTUAL DESIGN
FOREST RUN ROAD
EXISTING STORMWATER POND
MODIFICATIONS
JANUARY 2015

FOREST RUN

MODIFIED POND



Subcat Reach Pond Link

Drainage Diagram for Existing pond Jan2015
Prepared by Lamoureux & Dickinson, Printed 1/22/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.539	80	>75% Grass cover, Good, HSG D (1S, 2S)
0.296	98	Paved Driveways, HSG D (1S)
0.953	98	Paved Road, HSG D (1S)
0.811	98	Roof, HSG D (1S)
0.600	98	Roofs & drives (2S)
0.072	98	Sidewalk, HSG D (1S)
0.430	98	Street & sidewalk (2S)

6.701 Ac

Version: 9/06

For the area draining to*: Forest Run pond

Located in drainage area for S/N: 004

WQ Volume Calculation for Volume-Based Practice

Use this worksheet to calculate the water quality volume draining to your volume based STP if you are not using any of the site design credits in section 3 of the 2002 VSWMM. ***Do not use*** *this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice). See the worksheet "Water Quality Volume and Modified Curve Number Calculation for Water Quality Treatment in a Flow-Based Practice"*

Water Quality Volume Calculations

Line			value/calculation	units
1	Site Area (impervious + disturbed pervious)	A=	6.70	acres
2	Impervious area		3.16	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	47.19	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.475	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.427	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	**WQv =**	0.427	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	**WQv =**	0.239	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	**WQv =**	10392	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

PERMANENT POOL VOLUME = 2758 CF

STORAGE VOLUME/EXTENDED DETENTION

VOLUME = 6219 CF

TIME = 24.8 HRS

(TOTAL RUNOFF VOLUME = 8668 CF)

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Summary for Subcatchment 1S: Draining to existing pond (Forest Run Rd)

Runoff = 1.75 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (sf)	CN	Description
	113,204	80	>75% Grass cover, Good, HSG D
*	3,131	98	Sidewalk, HSG D
*	41,507	98	Paved Road, HSG D
*	35,309	98	Roof, HSG D
*	12,912	98	Paved Driveways, HSG D
	206,063	88	Weighted Average
	113,204	80	54.94% Pervious Area
	92,859	98	45.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0150	0.13		**Sheet Flow, Grass Lawn** Grass: Short n= 0.150 P2= 2.30"
3.3	368	0.0150	1.84		**Shallow Concentrated Flow, Shallow Grass Swale** Grassed Waterway Kv= 15.0 fps
16.3	468	Total			

Summary for Subcatchment 2S: Meadowrun

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.98 cfs @ 12.01 hrs, Volume= 0.064 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.600	98	Roofs & drives
*	0.430	98	Street & sidewalk
	0.940	80	>75% Grass cover, Good, HSG D
	1.970	89	Weighted Average
	0.940	80	47.72% Pervious Area
	1.030	98	52.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	80	0.0400	0.12		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"

Summary for Pond 2P: Existing pond

Inflow Area = 6.701 ac, 47.19% Impervious, Inflow Depth = 0.36" for WQv event
Inflow = 2.58 cfs @ 12.06 hrs, Volume= 0.199 af
Outflow = 0.07 cfs @ 17.19 hrs, Volume= 0.199 af, Atten= 97%, Lag= 308.2 min
Primary = 0.07 cfs @ 17.19 hrs, Volume= 0.199 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 343.50' Surf.Area= 3,216 sf Storage= 2,758 cf → PERMANENT POOL
Peak Elev= 345.10' @ 17.19 hrs Surf.Area= 4,435 sf Storage= 8,977 cf (6,219 cf above start)

Plug-Flow detention time= 2,172.1 min calculated for 0.135 af (68% of inflow)
Center-of-Mass det. time= 1,489.4 min (2,300.9 - 811.5)
→ 24 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	342.50'	31,624 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)
342.50	2,321	289.0	0	0	2,321
343.00	2,754	305.0	1,267	1,267	3,092
344.00	3,713	327.0	3,222	4,489	4,242
345.00	4,368	339.0	4,036	8,525	4,960
346.00	5,039	352.0	4,700	13,224	5,754
347.00	5,753	365.0	5,392	18,616	6,578
348.00	6,501	377.0	6,123	24,740	7,378
349.00	7,276	391.0	6,885	31,624	8,316

Device	Routing	Invert	Outlet Devices
#1	Primary	343.50'	**1.2" Vert. Orifice1** C= 0.600
#2	Primary	345.00'	**3.5" Vert. Orifice2** C= 0.600
#3	Secondary	347.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.07 cfs @ 17.19 hrs HW=345.10' (Free Discharge)
↑—**1=Orifice1** (Orifice Controls 0.05 cfs @ 6.00 fps)
└—**2=Orifice2** (Orifice Controls 0.02 cfs @ 1.09 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=343.50' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 1S: Draining to existing pond (Forest Run Rd)

Runoff = 6.21 cfs @ 12.09 hrs, Volume= 0.468 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (sf)	CN	Description
	113,204	80	>75% Grass cover, Good, HSG D
*	3,131	98	Sidewalk, HSG D
*	41,507	98	Paved Road, HSG D
*	35,309	98	Roof, HSG D
*	12,912	98	Paved Driveways, HSG D
	206,063	88	Weighted Average
	113,204	80	54.94% Pervious Area
	92,859	98	45.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0150	0.13		**Sheet Flow, Grass Lawn** Grass: Short n= 0.150 P2= 2.30"
3.3	368	0.0150	1.84		**Shallow Concentrated Flow, Shallow Grass Swale** Grassed Waterway Kv= 15.0 fps
16.3	468	Total			

Summary for Subcatchment 2S: Meadowrun

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.24 cfs @ 12.01 hrs, Volume= 0.210 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.600	98	Roofs & drives
*	0.430	98	Street & sidewalk
	0.940	80	>75% Grass cover, Good, HSG D
	1.970	89	Weighted Average
	0.940	80	47.72% Pervious Area
	1.030	98	52.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	80	0.0400	0.12		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"

Summary for Pond 2P: Existing pond

Inflow Area = 6.701 ac, 47.19% Impervious, Inflow Depth = 1.21" for 1 year event
Inflow = 8.96 cfs @ 12.06 hrs, Volume= 0.678 af
Outflow = 0.55 cfs @ 13.56 hrs, Volume= 0.677 af, Atten= 94%, Lag= 90.1 min
Primary = 0.55 cfs @ 13.56 hrs, Volume= 0.677 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 343.50' Surf.Area= 3,216 sf Storage= 2,758 cf
Peak Elev= 347.32' @ 13.56 hrs Surf.Area= 5,987 sf Storage= 20,490 cf (17,732 cf above start)

Plug-Flow detention time= 863.0 min calculated for 0.613 af (90% of inflow)
Center-of-Mass det. time= 732.2 min (1,530.2 - 798.0) → 12.2 HRS

Volume	Invert	Avail.Storage	Storage Description
#1	342.50'	31,624 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)
342.50	2,321	289.0	0	0	2,321
343.00	2,754	305.0	1,267	1,267	3,092
344.00	3,713	327.0	3,222	4,489	4,242
345.00	4,368	339.0	4,036	8,525	4,960
346.00	5,039	352.0	4,700	13,224	5,754
347.00	5,753	365.0	5,392	18,616	6,578
348.00	6,501	377.0	6,123	24,740	7,378
349.00	7,276	391.0	6,885	31,624	8,316

Device	Routing	Invert	Outlet Devices
#1	Primary	343.50'	**1.2" Vert. Orifice1** C= 0.600
#2	Primary	345.00'	**3.5" Vert. Orifice2** C= 0.600
#3	Secondary	347.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.55 cfs @ 13.56 hrs HW=347.32' (Free Discharge)
↑—**1=Orifice1** (Orifice Controls 0.07 cfs @ 9.35 fps)
└—**2=Orifice2** (Orifice Controls 0.47 cfs @ 7.10 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=343.50' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Hydrograph for Pond 2P: Existing pond

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	2,758	343.50	0.00	0.00	**0.00**
0.50	0.00	2,758	343.50	0.00	0.00	0.00
1.00	0.00	2,758	343.50	0.00	0.00	0.00
1.50	0.00	2,758	343.50	0.00	0.00	0.00
2.00	0.00	2,758	343.50	0.00	0.00	0.00
2.50	0.01	2,767	343.50	0.00	0.00	0.00
3.00	0.02	2,791	343.51	0.00	0.00	0.00
3.50	0.03	2,829	343.52	0.00	0.00	0.00
4.00	0.03	2,881	343.54	0.00	0.00	0.00
4.50	0.04	2,945	343.56	0.00	0.00	0.00
5.00	0.05	3,021	343.58	0.01	0.01	0.00
5.50	0.06	3,109	343.61	0.01	0.01	0.00
6.00	0.07	3,210	343.64	0.01	0.01	0.00
6.50	0.08	3,324	343.67	0.01	0.01	0.00
7.00	0.09	3,451	343.71	0.01	0.01	0.00
7.50	0.10	3,591	343.75	0.02	0.02	0.00
8.00	0.11	3,745	343.79	0.02	0.02	0.00
8.50	0.13	3,918	343.84	0.02	0.02	0.00
9.00	0.16	4,139	343.90	0.02	0.02	0.00
9.50	0.18	4,404	343.98	0.02	0.02	0.00
10.00	0.21	4,696	344.06	0.03	0.03	0.00
10.50	0.27	5,072	344.15	0.03	0.03	0.00
11.00	0.38	5,592	344.29	0.03	0.03	0.00
11.50	0.63	6,397	344.49	0.04	0.04	0.00
12.00	**8.32**	11,293	345.61	0.27	0.27	0.00
12.50	**1.63**	19,367	347.13	0.52	0.52	0.00
13.00	0.77	20,297	347.29	0.54	0.54	0.00
13.50	0.57	**20,488**	**347.32**	**0.55**	**0.55**	0.00
14.00	0.44	**20,405**	**347.30**	**0.55**	**0.55**	0.00
14.50	0.38	20,154	347.26	0.54	0.54	0.00
15.00	0.34	19,834	347.21	0.53	0.53	0.00
15.50	0.31	19,462	347.15	0.53	0.53	0.00
16.00	0.27	19,040	347.07	0.52	0.52	0.00
16.50	0.25	18,575	346.99	0.51	0.51	0.00
17.00	0.23	18,101	346.91	0.50	0.50	0.00
17.50	0.22	17,623	346.83	0.49	0.49	0.00
18.00	0.21	17,142	346.74	0.47	0.47	0.00
18.50	0.19	16,659	346.65	0.46	0.46	0.00
19.00	0.18	16,174	346.56	0.45	0.45	0.00
19.50	0.17	15,689	346.47	0.44	0.44	0.00
20.00	0.15	15,203	346.38	0.42	0.42	0.00
20.50	0.14	14,722	346.29	0.41	0.41	0.00
21.00	0.14	14,260	346.20	0.39	0.39	0.00
21.50	0.14	13,820	346.12	0.38	0.38	0.00
22.00	0.14	13,402	346.04	0.36	0.36	0.00
22.50	0.13	13,005	345.96	0.35	0.35	0.00
23.00	0.13	12,630	345.88	0.33	0.33	0.00
23.50	0.13	12,277	345.81	0.32	0.32	0.00
24.00	0.13	11,945	345.74	0.30	0.30	0.00
24.50	0.00	11,515	345.65	0.28	0.28	0.00
25.00	0.00	11,029	345.55	0.26	0.26	0.00
25.50	0.00	10,588	345.46	0.23	0.23	0.00

Hydrograph for Pond 2P: Existing pond (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
26.00	0.00	10,196	345.37	0.20	0.20	0.00
26.50	0.00	9,855	345.30	0.18	0.18	0.00
27.00	0.00	9,569	345.23	0.14	0.14	0.00
27.50	0.00	9,338	345.18	0.11	0.11	0.00
28.00	0.00	9,156	345.14	0.09	0.09	0.00
28.50	0.00	9,008	345.11	0.07	0.07	0.00
29.00	0.00	8,886	345.08	0.06	0.06	0.00
29.50	0.00	8,779	345.06	0.06	0.06	0.00
30.00	0.00	8,684	345.04	0.05	0.05	0.00
30.50	0.00	8,597	345.02	0.05	0.05	0.00
31.00	0.00	8,514	345.00	0.05	0.05	0.00
31.50	0.00	8,433	344.98	0.05	0.05	0.00
32.00	0.00	8,352	344.96	0.04	0.04	0.00
32.50	0.00	8,271	344.94	0.04	0.04	0.00
33.00	0.00	8,191	344.92	0.04	0.04	0.00
33.50	0.00	8,111	344.90	0.04	0.04	0.00
34.00	0.00	8,032	344.89	0.04	0.04	0.00
34.50	0.00	7,954	344.87	0.04	0.04	0.00
35.00	0.00	7,876	344.85	0.04	0.04	0.00
35.50	0.00	7,799	344.83	0.04	0.04	0.00
36.00	0.00	7,722	344.81	0.04	0.04	0.00
36.50	0.00	7,646	344.80	0.04	0.04	0.00
37.00	0.00	7,570	344.78	0.04	0.04	0.00
37.50	0.00	7,495	344.76	0.04	0.04	0.00
38.00	0.00	7,420	344.74	0.04	0.04	0.00
38.50	0.00	7,346	344.72	0.04	0.04	0.00
39.00	0.00	7,273	344.71	0.04	0.04	0.00
39.50	0.00	7,200	344.69	0.04	0.04	0.00
40.00	0.00	7,128	344.67	0.04	0.04	0.00
40.50	0.00	7,056	344.65	0.04	0.04	0.00
41.00	0.00	6,985	344.64	0.04	0.04	0.00
41.50	0.00	6,914	344.62	0.04	0.04	0.00
42.00	0.00	6,844	344.60	0.04	0.04	0.00
42.50	0.00	6,774	344.59	0.04	0.04	0.00
43.00	0.00	6,705	344.57	0.04	0.04	0.00
43.50	0.00	6,637	344.55	0.04	0.04	0.00
44.00	0.00	6,569	344.54	0.04	0.04	0.00
44.50	0.00	6,502	344.52	0.04	0.04	0.00
45.00	0.00	6,435	344.50	0.04	0.04	0.00
45.50	0.00	6,369	344.49	0.04	0.04	0.00
46.00	0.00	6,303	344.47	0.04	0.04	0.00
46.50	0.00	6,238	344.45	0.04	0.04	0.00
47.00	0.00	6,174	344.44	0.04	0.04	0.00
47.50	0.00	6,110	344.42	0.04	0.04	0.00
48.00	0.00	6,047	344.41	0.03	0.03	0.00
48.50	0.00	5,984	344.39	0.03	0.03	0.00
49.00	0.00	5,922	344.37	0.03	0.03	0.00
49.50	0.00	5,861	344.36	0.03	0.03	0.00
50.00	0.00	5,800	344.34	0.03	0.03	0.00
50.50	0.00	5,739	344.33	0.03	0.03	0.00
51.00	0.00	5,680	344.31	0.03	0.03	0.00
51.50	0.00	5,620	344.30	0.03	0.03	0.00

Hydrograph for Pond 2P: Existing pond (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
52.00	0.00	5,562	344.28	0.03	0.03	0.00
52.50	0.00	5,504	344.27	0.03	0.03	0.00
53.00	0.00	5,447	344.25	0.03	0.03	0.00
53.50	0.00	5,390	344.24	0.03	0.03	0.00
54.00	0.00	5,334	344.22	0.03	0.03	0.00
54.50	0.00	5,278	344.21	0.03	0.03	0.00
55.00	0.00	5,223	344.19	0.03	0.03	0.00
55.50	0.00	5,169	344.18	0.03	0.03	0.00
56.00	0.00	5,115	344.17	0.03	0.03	0.00
56.50	0.00	5,062	344.15	0.03	0.03	0.00
57.00	0.00	5,010	344.14	0.03	0.03	0.00
57.50	0.00	4,958	344.12	0.03	0.03	0.00
58.00	0.00	4,906	344.11	0.03	0.03	0.00
58.50	0.00	4,856	344.10	0.03	0.03	0.00
59.00	0.00	4,806	344.08	0.03	0.03	0.00
59.50	0.00	4,756	344.07	0.03	0.03	0.00
60.00	0.00	4,707	344.06	0.03	0.03	0.00
60.50	0.00	4,659	344.05	0.03	0.03	0.00
61.00	0.00	4,612	344.03	0.03	0.03	0.00
61.50	0.00	4,565	344.02	0.03	0.03	0.00
62.00	0.00	4,518	344.01	0.03	0.03	0.00
62.50	0.00	4,472	344.00	0.03	0.03	0.00
63.00	0.00	4,427	343.98	0.02	0.02	0.00
63.50	0.00	4,383	343.97	0.02	0.02	0.00
64.00	0.00	4,339	343.96	0.02	0.02	0.00
64.50	0.00	4,296	343.95	0.02	0.02	0.00
65.00	0.00	4,253	343.94	0.02	0.02	0.00
65.50	0.00	4,211	343.92	0.02	0.02	0.00
66.00	0.00	4,170	343.91	0.02	0.02	0.00
66.50	0.00	4,129	343.90	0.02	0.02	0.00
67.00	0.00	4,089	343.89	0.02	0.02	0.00
67.50	0.00	4,050	343.88	0.02	0.02	0.00
68.00	0.00	4,011	343.87	0.02	0.02	0.00
68.50	0.00	3,973	343.86	0.02	0.02	0.00
69.00	0.00	3,936	343.85	0.02	0.02	0.00
69.50	0.00	3,899	343.84	0.02	0.02	0.00
70.00	0.00	3,863	343.83	0.02	0.02	0.00
70.50	0.00	3,827	343.82	0.02	0.02	0.00
71.00	0.00	3,793	343.81	0.02	0.02	0.00
71.50	0.00	3,758	343.80	0.02	0.02	0.00
72.00	0.00	3,725	343.79	0.02	0.02	0.00
72.50	0.00	3,692	343.78	0.02	0.02	0.00
73.00	0.00	3,660	343.77	0.02	0.02	0.00
73.50	0.00	3,628	343.76	0.02	0.02	0.00
74.00	0.00	3,598	343.75	0.02	0.02	0.00
74.50	0.00	3,568	343.74	0.02	0.02	0.00
75.00	0.00	3,538	343.73	0.02	0.02	0.00
75.50	0.00	3,509	343.73	0.02	0.02	0.00
76.00	0.00	3,481	343.72	0.02	0.02	0.00
76.50	0.00	3,454	343.71	0.02	0.02	0.00
77.00	0.00	3,427	343.70	0.01	0.01	0.00
77.50	0.00	3,401	343.69	0.01	0.01	0.00

Hydrograph for Pond 2P: Existing pond (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
78.00	0.00	3,376	343.69	0.01	0.01	0.00
78.50	0.00	3,351	343.68	0.01	0.01	0.00
79.00	0.00	3,327	343.67	0.01	0.01	0.00
79.50	0.00	3,303	343.67	0.01	0.01	0.00
80.00	0.00	3,281	343.66	0.01	0.01	0.00
80.50	0.00	3,259	343.65	0.01	0.01	0.00
81.00	0.00	3,238	343.65	0.01	0.01	0.00
81.50	0.00	3,217	343.64	0.01	0.01	0.00
82.00	0.00	3,198	343.63	0.01	0.01	0.00
82.50	0.00	3,179	343.63	0.01	0.01	0.00
83.00	0.00	3,160	343.62	0.01	0.01	0.00
83.50	0.00	3,143	343.62	0.01	0.01	0.00
84.00	0.00	3,125	343.61	0.01	0.01	0.00
84.50	0.00	3,109	343.61	0.01	0.01	0.00
85.00	0.00	3,093	343.60	0.01	0.01	0.00
85.50	0.00	3,078	343.60	0.01	0.01	0.00
86.00	0.00	3,064	343.59	0.01	0.01	0.00
86.50	0.00	3,050	343.59	0.01	0.01	0.00
87.00	0.00	3,038	343.59	0.01	0.01	0.00
87.50	0.00	3,026	343.58	0.01	0.01	0.00
88.00	0.00	3,014	343.58	0.01	0.01	0.00
88.50	0.00	3,004	343.58	0.01	0.01	0.00
89.00	0.00	2,994	343.57	0.01	0.01	0.00
89.50	0.00	2,984	343.57	0.01	0.01	0.00
90.00	0.00	2,975	343.57	0.00	0.00	0.00
90.50	0.00	2,967	343.56	0.00	0.00	0.00
91.00	0.00	2,959	343.56	0.00	0.00	0.00
91.50	0.00	2,951	343.56	0.00	0.00	0.00
92.00	0.00	2,944	343.56	0.00	0.00	0.00
92.50	0.00	2,938	343.56	0.00	0.00	0.00
93.00	0.00	2,931	343.55	0.00	0.00	0.00
93.50	0.00	2,925	343.55	0.00	0.00	0.00
94.00	0.00	2,920	343.55	0.00	0.00	0.00
94.50	0.00	2,914	343.55	0.00	0.00	0.00
95.00	0.00	2,909	343.55	0.00	0.00	0.00
95.50	0.00	2,905	343.55	0.00	0.00	0.00
96.00	0.00	2,900	343.54	0.00	0.00	0.00
96.50	0.00	2,896	343.54	0.00	0.00	0.00
97.00	0.00	2,892	343.54	0.00	0.00	0.00
97.50	0.00	2,888	343.54	0.00	0.00	0.00
98.00	0.00	2,885	343.54	0.00	0.00	0.00
98.50	0.00	2,881	343.54	0.00	0.00	0.00
99.00	0.00	2,878	343.54	0.00	0.00	0.00
99.50	0.00	2,875	343.54	0.00	0.00	0.00
100.00	0.00	2,871	343.54	0.00	0.00	0.00
100.50	0.00	2,868	343.53	0.00	0.00	0.00
101.00	0.00	2,865	343.53	0.00	0.00	0.00
101.50	0.00	2,862	343.53	0.00	0.00	0.00
102.00	0.00	2,860	343.53	0.00	0.00	0.00
102.50	0.00	2,857	343.53	0.00	0.00	0.00
103.00	0.00	2,854	343.53	0.00	0.00	0.00
103.50	0.00	2,851	343.53	0.00	0.00	0.00

Hydrograph for Pond 2P: Existing pond (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
104.00	0.00	2,849	343.53	0.00	0.00	0.00
104.50	0.00	2,846	343.53	0.00	0.00	0.00
105.00	0.00	2,844	343.53	0.00	0.00	0.00
105.50	0.00	2,842	343.53	0.00	0.00	0.00
106.00	0.00	2,839	343.53	0.00	0.00	0.00
106.50	0.00	2,837	343.52	0.00	0.00	0.00
107.00	0.00	2,835	343.52	0.00	0.00	0.00
107.50	0.00	2,833	343.52	0.00	0.00	0.00
108.00	0.00	2,831	343.52	0.00	0.00	0.00
108.50	0.00	2,829	343.52	0.00	0.00	0.00
109.00	0.00	2,827	343.52	0.00	0.00	0.00
109.50	0.00	2,825	343.52	0.00	0.00	0.00
110.00	0.00	2,823	343.52	0.00	0.00	0.00
110.50	0.00	2,821	343.52	0.00	0.00	0.00
111.00	0.00	2,820	343.52	0.00	0.00	0.00
111.50	0.00	2,818	343.52	0.00	0.00	0.00
112.00	0.00	2,816	343.52	0.00	0.00	0.00
112.50	0.00	2,815	343.52	0.00	0.00	0.00
113.00	0.00	2,813	343.52	0.00	0.00	0.00
113.50	0.00	2,812	343.52	0.00	0.00	0.00
114.00	0.00	2,810	343.52	0.00	0.00	0.00
114.50	0.00	2,809	343.52	0.00	0.00	0.00
115.00	0.00	2,807	343.52	0.00	0.00	0.00
115.50	0.00	2,806	343.51	0.00	0.00	0.00
116.00	0.00	2,805	343.51	0.00	0.00	0.00
116.50	0.00	2,803	343.51	0.00	0.00	0.00
117.00	0.00	2,802	343.51	0.00	0.00	0.00
117.50	0.00	2,801	343.51	0.00	0.00	0.00
118.00	0.00	2,800	343.51	0.00	0.00	0.00
118.50	0.00	2,799	343.51	0.00	0.00	0.00
119.00	0.00	2,798	343.51	0.00	0.00	0.00
119.50	0.00	2,796	343.51	0.00	0.00	0.00
120.00	0.00	2,795	343.51	0.00	0.00	0.00

Summary for Subcatchment 1S: Draining to existing pond (Forest Run Rd)

Runoff = 16.35 cfs @ 12.08 hrs, Volume= 1.218 af, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Type II 24-hr 100 year Rainfall=4.30"

	Area (sf)	CN	Description
	113,204	80	>75% Grass cover, Good, HSG D
*	3,131	98	Sidewalk, HSG D
*	41,507	98	Paved Road, HSG D
*	35,309	98	Roof, HSG D
*	12,912	98	Paved Driveways, HSG D
	206,063	88	Weighted Average
	113,204	80	54.94% Pervious Area
	92,859	98	45.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	100	0.0150	0.13		**Sheet Flow, Grass Lawn** Grass: Short n= 0.150 P2= 2.30"
3.3	368	0.0150	1.84		**Shallow Concentrated Flow, Shallow Grass Swale** Grassed Waterway Kv= 15.0 fps
16.3	468	Total			

Summary for Subcatchment 2S: Meadowrun

[49] Hint: Tc<2dt may require smaller dt

Runoff = 8.20 cfs @ 12.01 hrs, Volume= 0.528 af, Depth= 3.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Type II 24-hr 100 year Rainfall=4.30"

	Area (ac)	CN	Description
*	0.600	98	Roofs & drives
*	0.430	98	Street & sidewalk
	0.940	80	>75% Grass cover, Good, HSG D
	1.970	89	Weighted Average
	0.940	80	47.72% Pervious Area
	1.030	98	52.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	80	0.0400	0.12		**Sheet Flow, Overland lawn** Grass: Dense n= 0.240 P2= 2.30"

Summary for Pond 2P: Existing pond

Inflow Area = 6.701 ac, 47.19% Impervious, Inflow Depth = 3.13" for 100 year event
Inflow = 23.30 cfs @ 12.06 hrs, Volume= 1.747 af
Outflow = 19.07 cfs @ 12.15 hrs, Volume= 1.749 af, Atten= 18%, Lag= 5.6 min
Primary = 0.68 cfs @ 12.15 hrs, Volume= 0.959 af
Secondary = 18.38 cfs @ 12.15 hrs, Volume= 0.790 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs / 2
Starting Elev= 343.50' Surf.Area= 3,216 sf Storage= 2,758 cf
Peak Elev= 348.60' @ 12.15 hrs Surf.Area= 6,964 sf Storage= 28,808 cf (26,049 cf above start)
TOP BERM = 349.0
Plug-Flow detention time= 422.9 min calculated for 1.686 af (96% of inflow)
Center-of-Mass det. time= 380.5 min (1,165.6 - 785.0)

Volume	Invert	Avail.Storage	Storage Description
#1	342.50'	31,624 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)
342.50	2,321	289.0	0	0	2,321
343.00	2,754	305.0	1,267	1,267	3,092
344.00	3,713	327.0	3,222	4,489	4,242
345.00	4,368	339.0	4,036	8,525	4,960
346.00	5,039	352.0	4,700	13,224	5,754
347.00	5,753	365.0	5,392	18,616	6,578
348.00	6,501	377.0	6,123	24,740	7,378
349.00	7,276	391.0	6,885	31,624	8,316

Device	Routing	Invert	Outlet Devices
#1	Primary	343.50'	**1.2" Vert. Orifice1** C= 0.600
#2	Primary	345.00'	**3.5" Vert. Orifice2** C= 0.600
#3	Secondary	347.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.68 cfs @ 12.15 hrs HW=348.54' (Free Discharge)
↑—**1=Orifice1** (Orifice Controls 0.08 cfs @ 10.76 fps)
└—**2=Orifice2** (Orifice Controls 0.59 cfs @ 8.88 fps)

Secondary OutFlow Max=17.08 cfs @ 12.15 hrs HW=348.54' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Weir Controls 17.08 cfs @ 2.73 fps)

Attachment 8
Discharge 3
Location Map

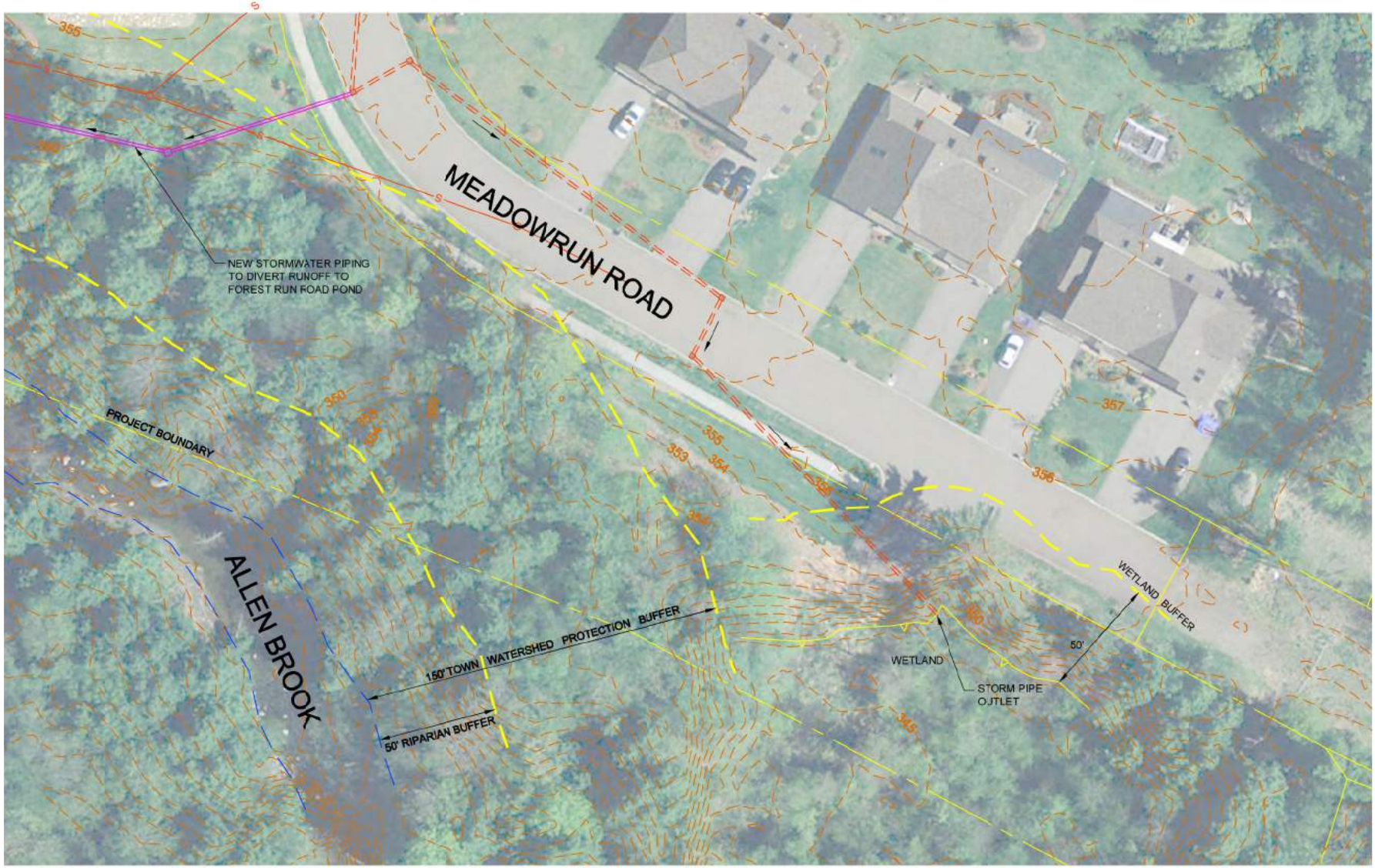
Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Norse Drive, Essex, VT 05452
802-878-4450
www.LDengineering.com

40 0 20 40 80

1 inch = 40 feet

DISCHARGE 3 LOCATION

Attachment 9
Discharge 5
Location Map



Lamoureux & Dickinson
Consulting Engineers, Inc.
14 Morse Drive, Essex, VT 05452
802-878-4450
www.LDengineering.com

40 0 20 40 80

1 inch = 40 feet

DISCHARGE 5 LOCATION

TURTLE POND: PERMIT 2-1191


Source: USGS
Source: NASA, NGA, USGS
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32m
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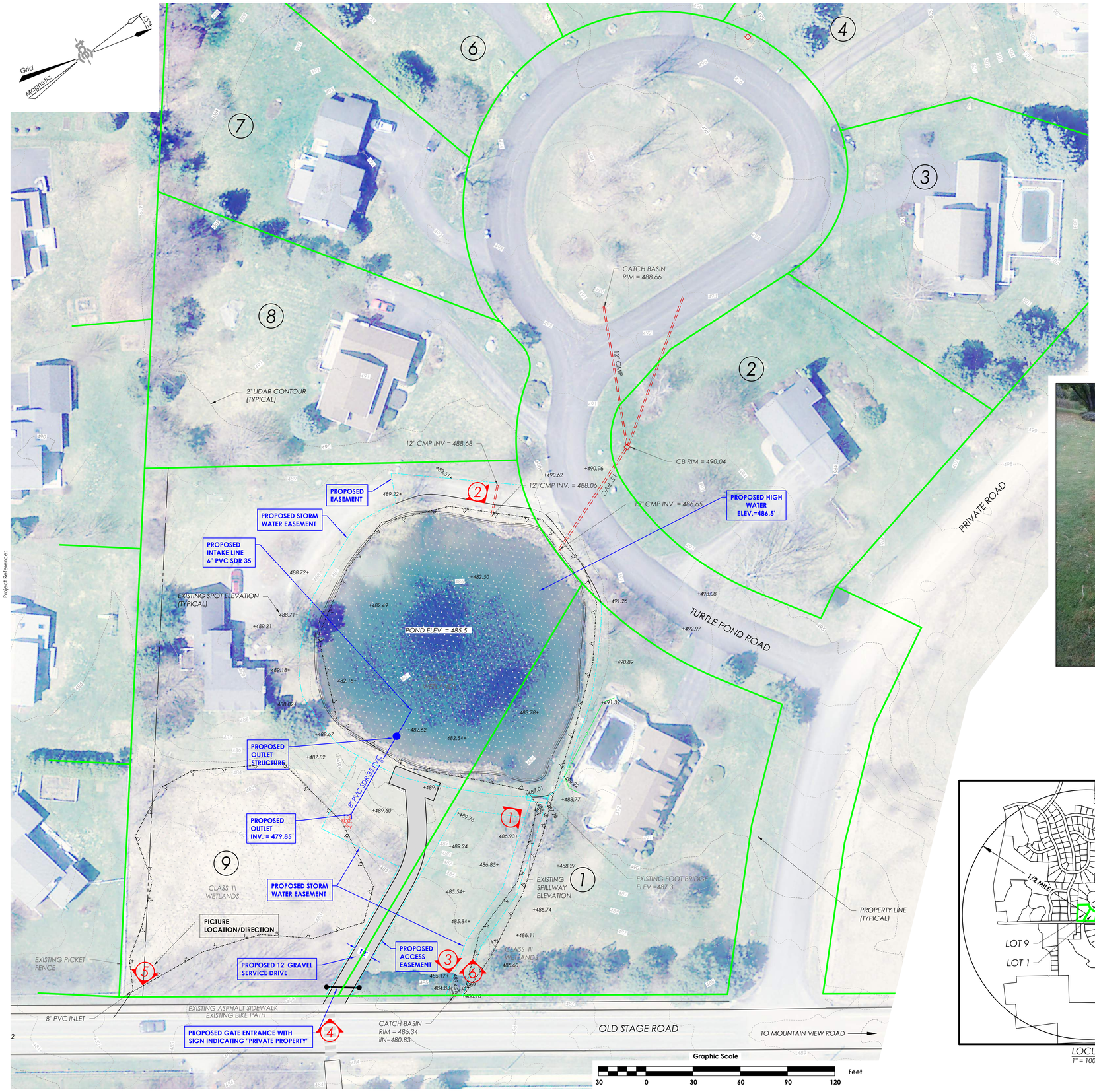

Project Reference:

1

2

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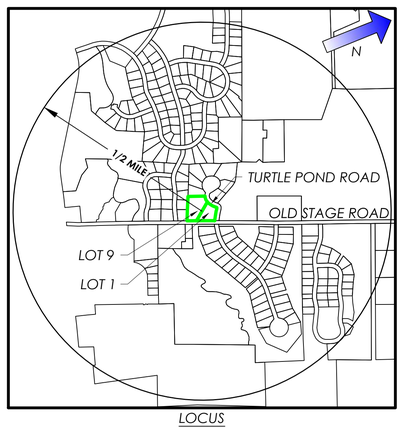


LOCUS
1" = 1000'

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
802 879 6331 | WWW.TCEVT.COM

Revisions

No.	Description	Date	By

Use of These Drawings

1. Unless otherwise noted, these Drawings are intended for preliminary planning, coordination with other disciplines or utilities, and/or approval from the regulatory authorities. They are not intended as construction drawings unless noted as such or marked approved by a regulatory authority.

2. By use of these drawings for construction of the Project, the Owner represents that they have reviewed, approved, and accepted the drawings, obtained all necessary permits, and have met with all applicable parties/disciplines, including but not limited to, the Engineer and the Architect, to insure these plans are properly coordinated including, but not limited to, contract documents, specifications, owner/contractor agreements, building and mechanical plans, private and public utilities, and other pertinent permits for construction.

3. Owner and Architect, are responsible for final design and location of buildings shown, including an area measured a minimum five (5) feet around any building and coordinating final utility connections shown on these plans.

4. Prior to using these plans for construction layout, the user shall contact TCE to ensure the plan contains the most current revisions.

5. These Drawings are specific to the Project and are not transferable. As instruments of service, these drawings, and copies thereof, furnished by TCE are its exclusive property. Changes to the drawings may only be made by TCE. If errors or omissions are discovered, they shall be brought to the attention of TCE immediately.

6. It is the User's responsibility to ensure this copy contains the most current revisions. If unsure, please contact TCE.

STATE OF VERMONT
JOHN P. PITKOWSKY
No. 8104
CIVIL
PROFESSIONAL ENGINEER
LICENSED

Project Title

Turtle Pond
Turtle Pond Road
Williston, Vermont

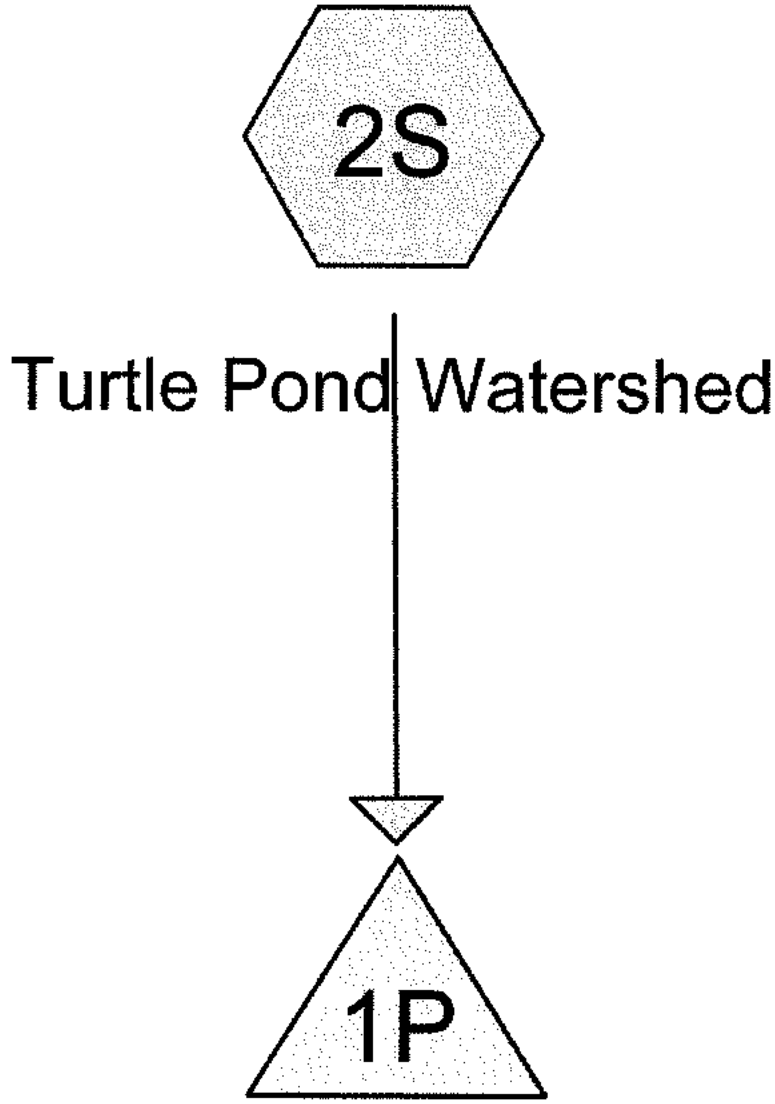
Sheet Title

Site Plan

Date:	---
Scale:	1" = 30'
Project Number:	16-024
Drawn By:	RMP
Project Engineer:	JPP
Approved By:	
Field Book:	

C2-01

PROPOSED POND



Subcat Reach Pond Link

Drainage Diagram for 14079-storm2015
Prepared by Lamoureux & Dickinson, Printed 2/2/2015
HydroCAD® 9.10 s/n 05471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.039	74	>75% Grass cover, Good, HSG C (2S)
1.225	77	Woods, Good, HSG D (2S)
4.700	80	>75% Grass cover, Good, HSG D (2S)
0.157	98	Gravel Drives (2S)
0.817	98	Paved Drives (2S)
0.617	98	Paved Road (2S)
0.516	98	Roofs (2S)

Summary for Subcatchment 2S: Turtle Pond Watershed

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.83 cfs @ 11.93 hrs, Volume= 0.062 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (sf)	CN	Description
	132,381	74	>75% Grass cover, Good, HSG C
*	22,465	98	Roofs
*	6,837	98	Gravel Drives
	204,723	80	>75% Grass cover, Good, HSG D
*	35,569	98	Paved Drives
*	26,894	98	Paved Road
	53,376	77	Woods, Good, HSG D
	482,245	81	Weighted Average
	390,480		80.97% Pervious Area
	91,765		19.03% Impervious Area

Summary for Pond 1P: Existing Pond

Inflow Area = 11.071 ac, 19.03% Impervious, Inflow Depth = 0.07" for WQv event
Inflow = 0.83 cfs @ 11.93 hrs, Volume= 0.062 af
Outflow = 0.02 cfs @ 23.99 hrs, Volume= 0.053 af, Atten= 97%, Lag= 723.7 min
Primary = 0.02 cfs @ 23.99 hrs, Volume= 0.053 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 485.48' Surf.Area= 20,331 sf Storage= 44,019 cf
Peak Elev= 485.58' @ 23.99 hrs Surf.Area= 20,684 sf Storage= 46,022 cf (2,003 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 1,226.8 min (2,182.1 - 955.4)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	119,998 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)
482.50	9,856	364.0	0	0	9,856
483.00	11,355	389.0	5,298	5,298	11,366
484.00	14,636	436.0	12,961	18,259	14,479
485.50	20,414	515.0	26,168	44,427	20,500
486.50	24,031	561.0	22,198	66,625	24,475
488.50	29,433	618.0	53,373	119,998	29,951

Device	Routing	Invert	Outlet Devices
#1	Primary	487.50'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 in 2.0" x 2.0" Grate Limited to weir flow at low heads
#2	Primary	485.48'	**4.0" Vert. Orifice** C= 0.600
#3	Secondary	486.60'	**Spillway, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 1.00 1.50 Width (feet) 3.00 7.00 15.00 25.00

Primary OutFlow Max=0.02 cfs @ 23.99 hrs HW=485.58' (Free Discharge)
└─**1=Grate** (Controls 0.00 cfs)
└─**2=Orifice** (Orifice Controls 0.02 cfs @ 1.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=485.48' (Free Discharge)
└─**3=Spillway** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Turtle Pond Watershed

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 16.40 cfs @ 11.90 hrs, Volume= 0.617 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (sf)	CN	Description
	132,381	74	>75% Grass cover, Good, HSG C
*	22,465	98	Roofs
*	6,837	98	Gravel Drives
	204,723	80	>75% Grass cover, Good, HSG D
*	35,569	98	Paved Drives
*	26,894	98	Paved Road
	53,376	77	Woods, Good, HSG D
	482,245	81	Weighted Average
	390,480		80.97% Pervious Area
	91,765		19.03% Impervious Area

Summary for Pond 1P: Existing Pond

Inflow Area = 11.071 ac, 19.03% Impervious, Inflow Depth = 0.67" for 1 year event
Inflow = 16.40 cfs @ 11.90 hrs, Volume= 0.617 af
Outflow = 0.32 cfs @ 16.23 hrs, Volume= 0.604 af, Atten= 98%, Lag= 259.7 min
Primary = 0.32 cfs @ 16.23 hrs, Volume= 0.604 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 485.48' Surf.Area= 20,331 sf Storage= 44,019 cf
Peak Elev= 486.22' @ 16.23 hrs Surf.Area= 22,992 sf Storage= 60,065 cf (16,046 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 761.0 min (1,615.3 - 854.3)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	119,998 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)
482.50	9,856	364.0	0	0	9,856
483.00	11,355	389.0	5,298	5,298	11,366
484.00	14,636	436.0	12,961	18,259	14,479
485.50	20,414	515.0	26,168	44,427	20,500
486.50	24,031	561.0	22,198	66,625	24,475
488.50	29,433	618.0	53,373	119,998	29,951

Device	Routing	Invert	Outlet Devices
#1	Primary	487.50'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 in 2.0" x 2.0" Grate Limited to weir flow at low heads
#2	Primary	485.48'	**4.0" Vert. Orifice** C= 0.600
#3	Secondary	486.60'	**Spillway, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 1.00 1.50 Width (feet) 3.00 7.00 15.00 25.00

Primary OutFlow Max=0.32 cfs @ 16.23 hrs HW=486.22' (Free Discharge)
└─**1=Grate** (Controls 0.00 cfs)
└─**2=Orifice** (Orifice Controls 0.32 cfs @ 3.65 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=485.48' (Free Discharge)
└─**3=Spillway** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Turtle Pond Watershed

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 74.68 cfs @ 11.90 hrs, Volume= 2.918 af, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 year Rainfall=5.20"

	Area (sf)	CN	Description
	132,381	74	>75% Grass cover, Good, HSG C
*	22,465	98	Roofs
*	6,837	98	Gravel Drives
	204,723	80	>75% Grass cover, Good, HSG D
*	35,569	98	Paved Drives
*	26,894	98	Paved Road
	53,376	77	Woods, Good, HSG D
	482,245	81	Weighted Average
	390,480		80.97% Pervious Area
	91,765		19.03% Impervious Area

Summary for Pond 1P: Existing Pond

Inflow Area = 11.071 ac, 19.03% Impervious, Inflow Depth = 3.16" for 100 year event
Inflow = 74.68 cfs @ 11.90 hrs, Volume= 2.918 af
Outflow = 30.65 cfs @ 11.97 hrs, Volume= 2.902 af, Atten= 59%, Lag= 4.3 min
Primary = 0.67 cfs @ 11.97 hrs, Volume= 1.072 af
Secondary = 29.98 cfs @ 11.97 hrs, Volume= 1.829 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 485.48' Surf.Area= 20,331 sf Storage= 44,019 cf
Peak Elev= 487.74' @ 11.97 hrs Surf.Area= 27,315 sf Storage= 98,426 cf (54,407 cf above start)

Plug-Flow detention time= 669.9 min calculated for 1.891 af (65% of inflow)
Center-of-Mass det. time= 339.3 min (1,148.1 - 808.8)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	119,998 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)
482.50	9,856	364.0	0	0	9,856
483.00	11,355	389.0	5,298	5,298	11,366
484.00	14,636	436.0	12,961	18,259	14,479
485.50	20,414	515.0	26,168	44,427	20,500
486.50	24,031	561.0	22,198	66,625	24,475
488.50	29,433	618.0	53,373	119,998	29,951

Device	Routing	Invert	Outlet Devices
#1	Primary	487.50'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 in 2.0" x 2.0" Grate Limited to weir flow at low heads
#2	Primary	485.48'	**4.0" Vert. Orifice** C= 0.600
#3	Secondary	486.60'	**Spillway, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 1.00 1.50 Width (feet) 3.00 7.00 15.00 25.00

Primary OutFlow Max=0.67 cfs @ 11.97 hrs HW=487.74' (Free Discharge)
↑—**1=Grate** (Orifice Controls 0.07 cfs @ 2.36 fps)
└—**2=Orifice** (Orifice Controls 0.61 cfs @ 6.97 fps)

Secondary OutFlow Max=29.93 cfs @ 11.97 hrs HW=487.74' (Free Discharge)
↑—**3=Spillway** (Weir Controls 29.93 cfs @ 2.91 fps)

Google earth

feet 1000
meters 400

HURRICANE LANE: PERMITS 1-1078, 1-1205, 1-1245, 1-1301, 2-1172


Source: USGS
Source: NASA, NGA, USGS
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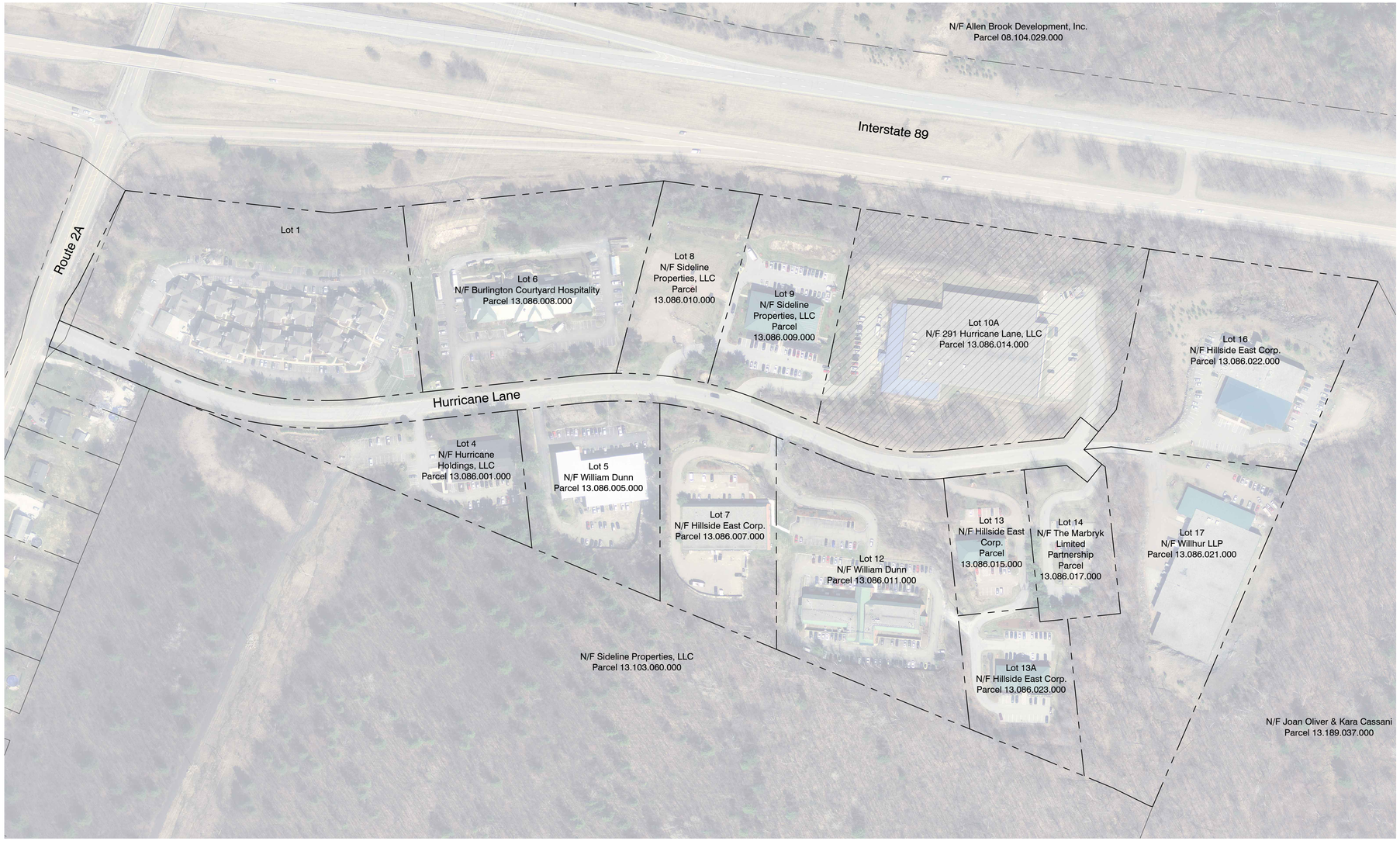
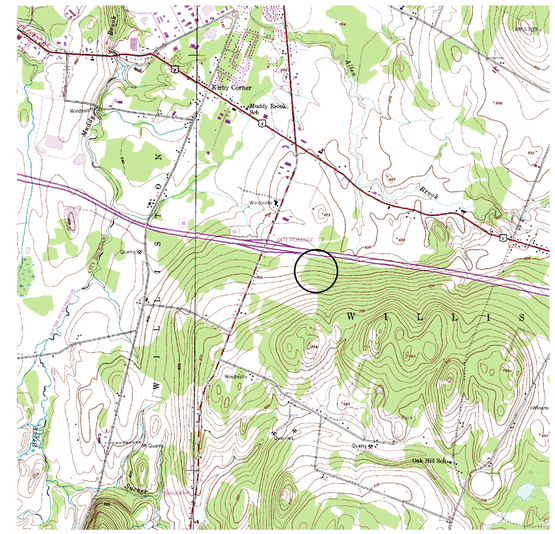
50m
esri





LOCATION

NTS

0' 120' 240' 480' 720'

Bar Scale 1" = 120'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 120'
Date	4/21/16
Project	14133

Overall Site Plan

HILLSIDE EAST - Lot 10A
Stormwater EFA

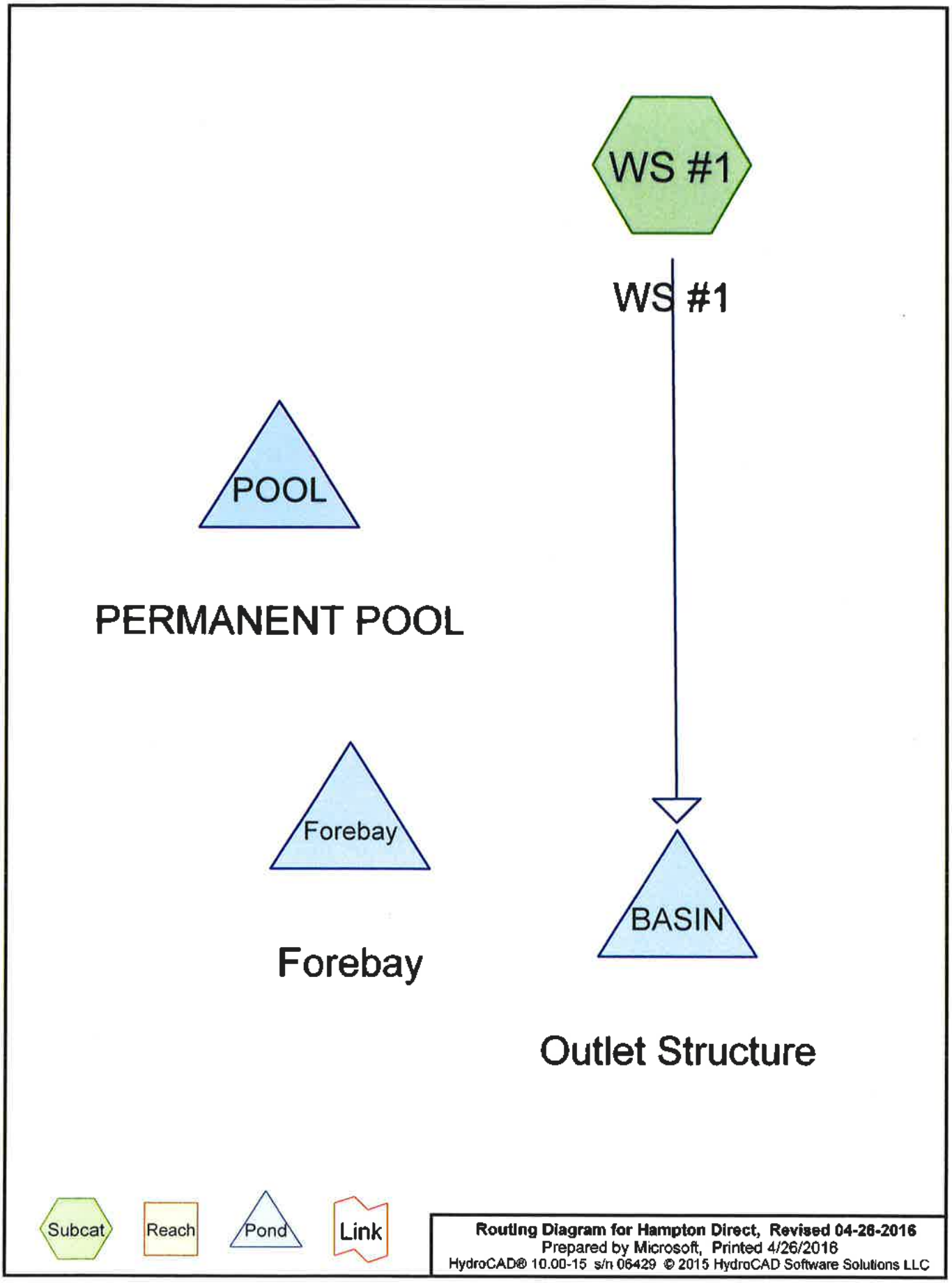
Hurricane Lane — Williston, Vermont

KREBS' & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File: K:\pdnp\14133 ella overall site plan

Printing: 22014
4/26/16

OV-1


WS #1
WS #1
POOL
PERMANENT POOL
Forebay
Forebay
BASIN
Outlet Structure
Subcat
Reach
Pond
Link
Routing Diagram for Hampton Direct, Revised 04-26-2016
Prepared by Microsoft, Printed 4/26/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

291 Hurricane Lane
Hampton Direct Hydrologic Model

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.812	80	>75% Grass cover, Good, HSG D (WS #1)
1.971	98	Impervious (WS #1)
2.784	**93**	**TOTAL AREA**

Time span=0.00-120.00 hrs, dt=0.03 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS #1: WS #1 Runoff Area=121,255 sf 70.82% Impervious Runoff Depth=1.51"
Flow Length=221' Tc=4.2 min CN=WQ Runoff=6.98 cfs 0.350 af

Pond BASIN: Outlet Structure Peak Elev=468.78' Storage=9,786 cf Inflow=6.98 cfs 0.350 af
Outflow=0.17 cfs 0.350 af

Pond Forebay: Forebay Peak Elev=0.00' Storage=0 cf

Pond POOL: PERMANENT POOL Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 2.784 ac Runoff Volume = 0.350 af Average Runoff Depth = 1.51"
29.18% Pervious = 0.812 ac 70.82% Impervious = 1.971 ac

Summary for Subcatchment WS #1: WS #1

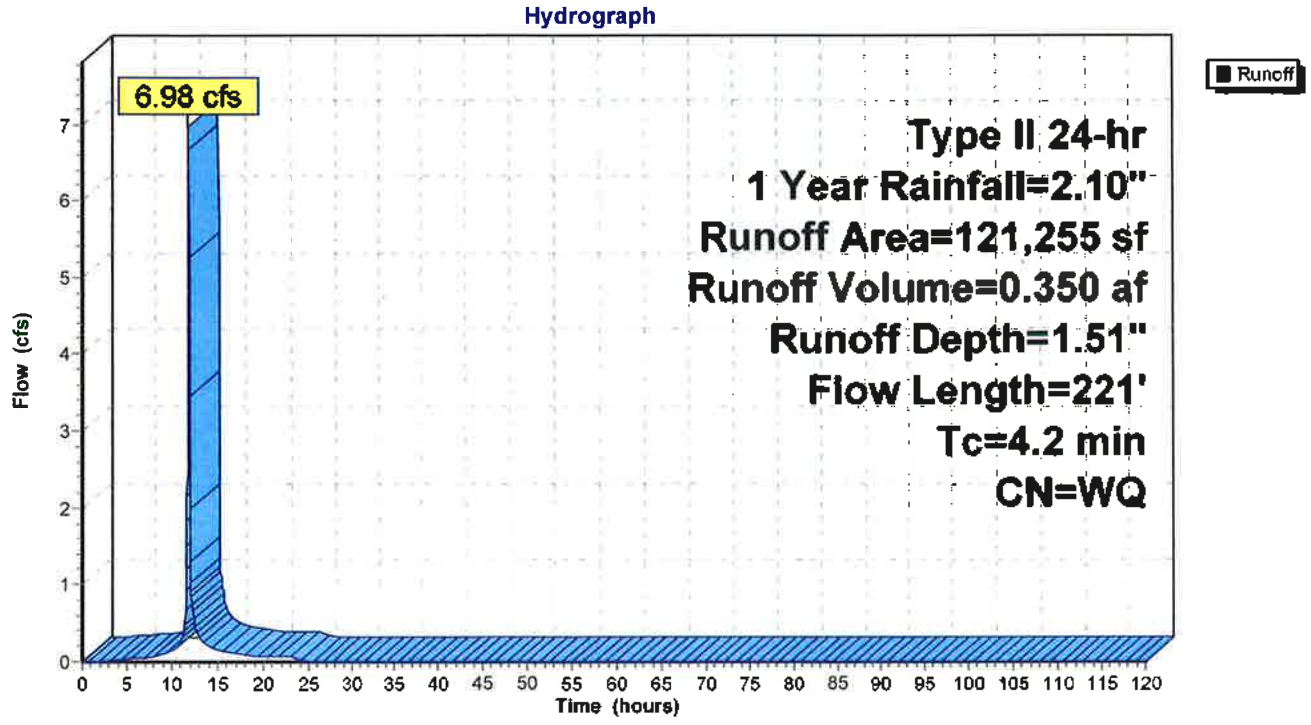
Runoff = 6.98 cfs @ 11.95 hrs, Volume= 0.350 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	85,870	98	Impervious
*	35,385	80	>75% Grass cover, Good, HSG D
	121,255		Weighted Average
	35,385		29.18% Pervious Area
	85,870		70.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	36	0.1400	0.18		**Sheet Flow, Sheet** Grass: Dense n= 0.240 P2= 2.30"
0.8	185	0.0550	3.78		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
4.2	221	Total			

Subcatchment WS #1: WS #1



Summary for Pond BASIN: Outlet Structure

Inflow Area = 2.784 ac, 70.82% Impervious, Inflow Depth = 1.51" for 1 Year event
Inflow = 6.98 cfs @ 11.95 hrs, Volume= 0.350 af
Outflow = 0.17 cfs @ 14.71 hrs, Volume= 0.350 af, Atten= 98%, Lag= 166.0 min
Primary = 0.17 cfs @ 14.71 hrs, Volume= 0.350 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2
Peak Elev= 468.78' @ 14.71 hrs Surf.Area= 6,975 sf Storage= 9,786 cf

Plug-Flow detention time= 737.4 min calculated for 0.350 af (100% of inflow)
Center-of-Mass det. time= 738.5 min (1,511.6 - 773.1)

12.3 hrs

Volume	Invert	Avail.Storage	Storage Description
#1	467.00'	41,264 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

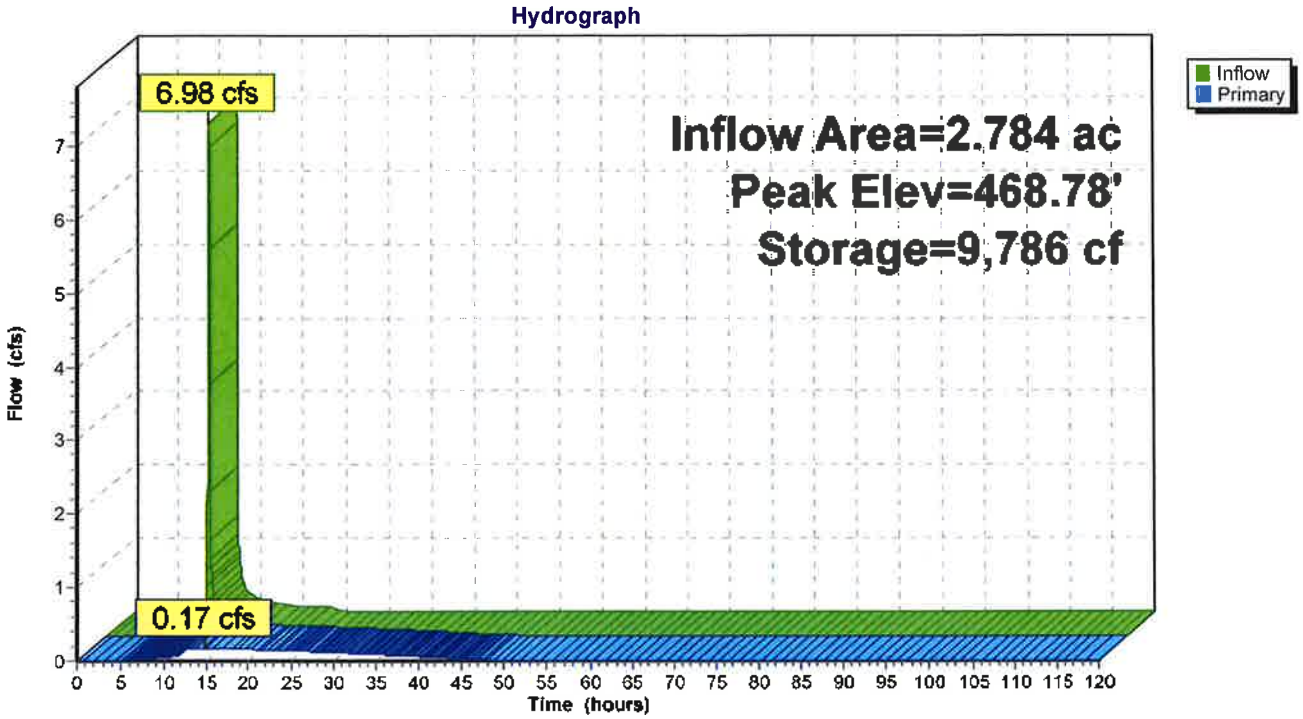
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
467.00	4,117	0	0
468.00	5,610	4,864	4,864
472.00	12,590	36,400	41,264

2.2" Low Flow Orifice @ Elev. 467.00

Device	Routing	Invert	Outlet Devices
#1	Primary	467.00'	**2.2" Vert. Orifice/Grate** C= 0.600
#2	Primary	469.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	471.00'	**5.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.17 cfs @ 14.71 hrs HW=468.78' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.17 cfs @ 6.26 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Outlet Structure



Summary for Pond Forebay: Forebay

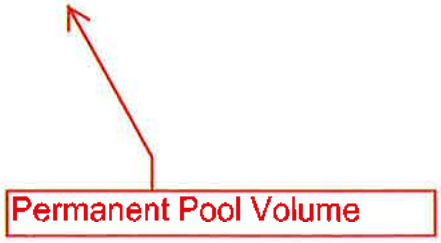
Volume	Invert	Avail.Storage	Storage Description
#1	463.00'	2,409 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

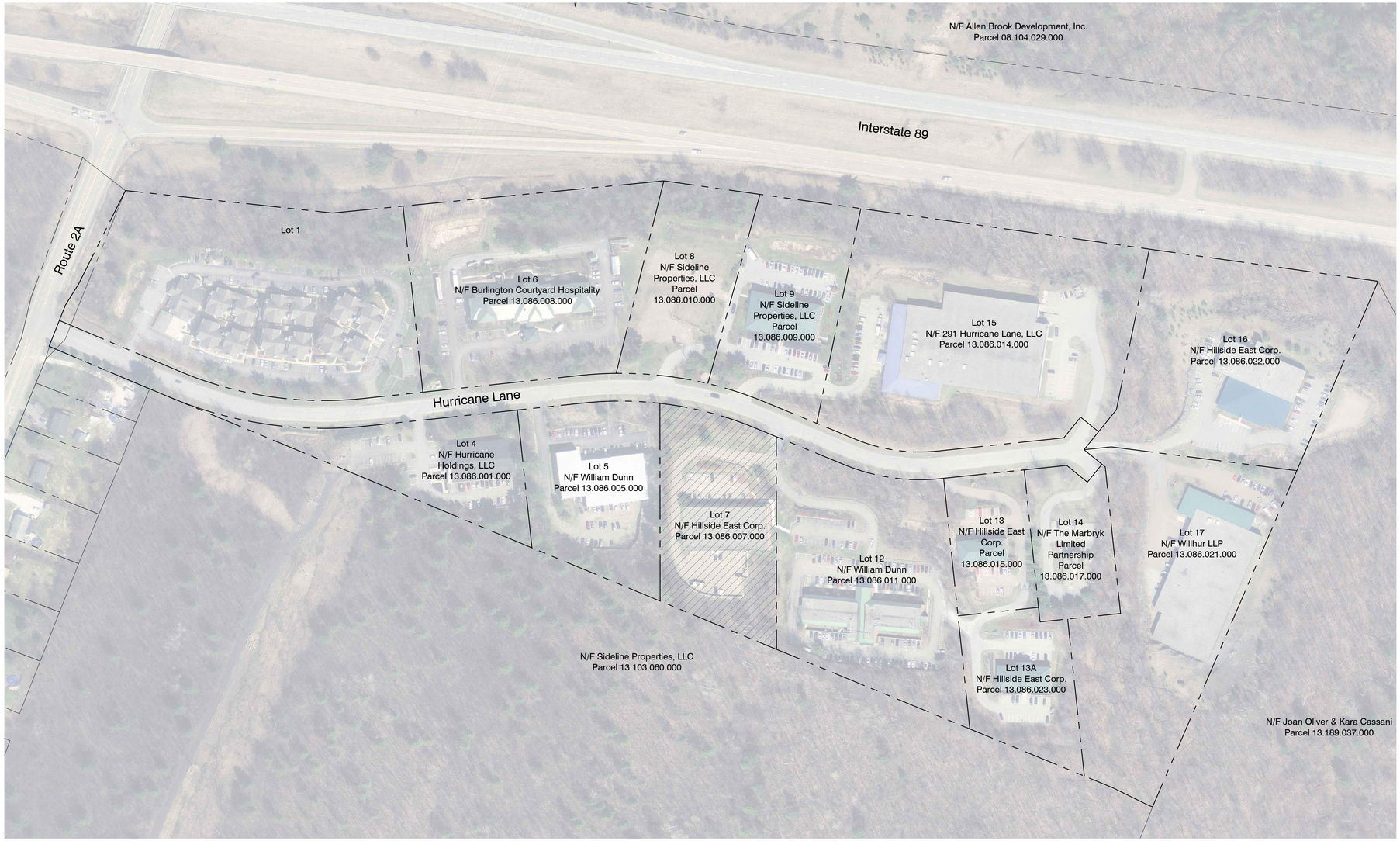
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
463.00	210	0	0
464.00	375	293	293
465.00	579	477	770
466.00	812	696	1,465
467.00	1,076	944	2,409

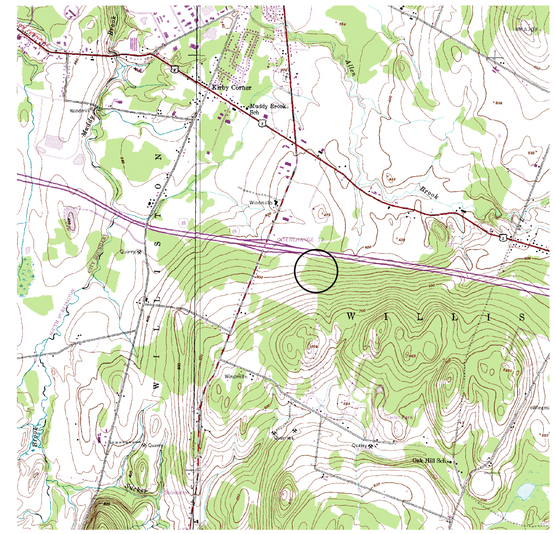
Summary for Pond POOL: PERMANENT POOL

Volume	Invert	Avail.Storage	Storage Description
#1	463.00'	10,045 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
463.00	1,235	0	0
464.00	1,794	1,515	1,515
465.00	2,439	2,117	3,631
466.00	3,136	2,788	6,419
467.00	4,117	3,627	10,045







LOCATION

NTS

0' 120' 240' 480' 720'

Bar Scale 1" = 120'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 120'
Date	4/21/16
Project	14133/94137/85135

Overall Site Plan

HILLSIDE EAST - Lot 7
Stormwater EFA

Hurricane Lane — Williston, Vermont

KREBS' & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 94137 ofa overall site plan

Printing date: 6/6/16

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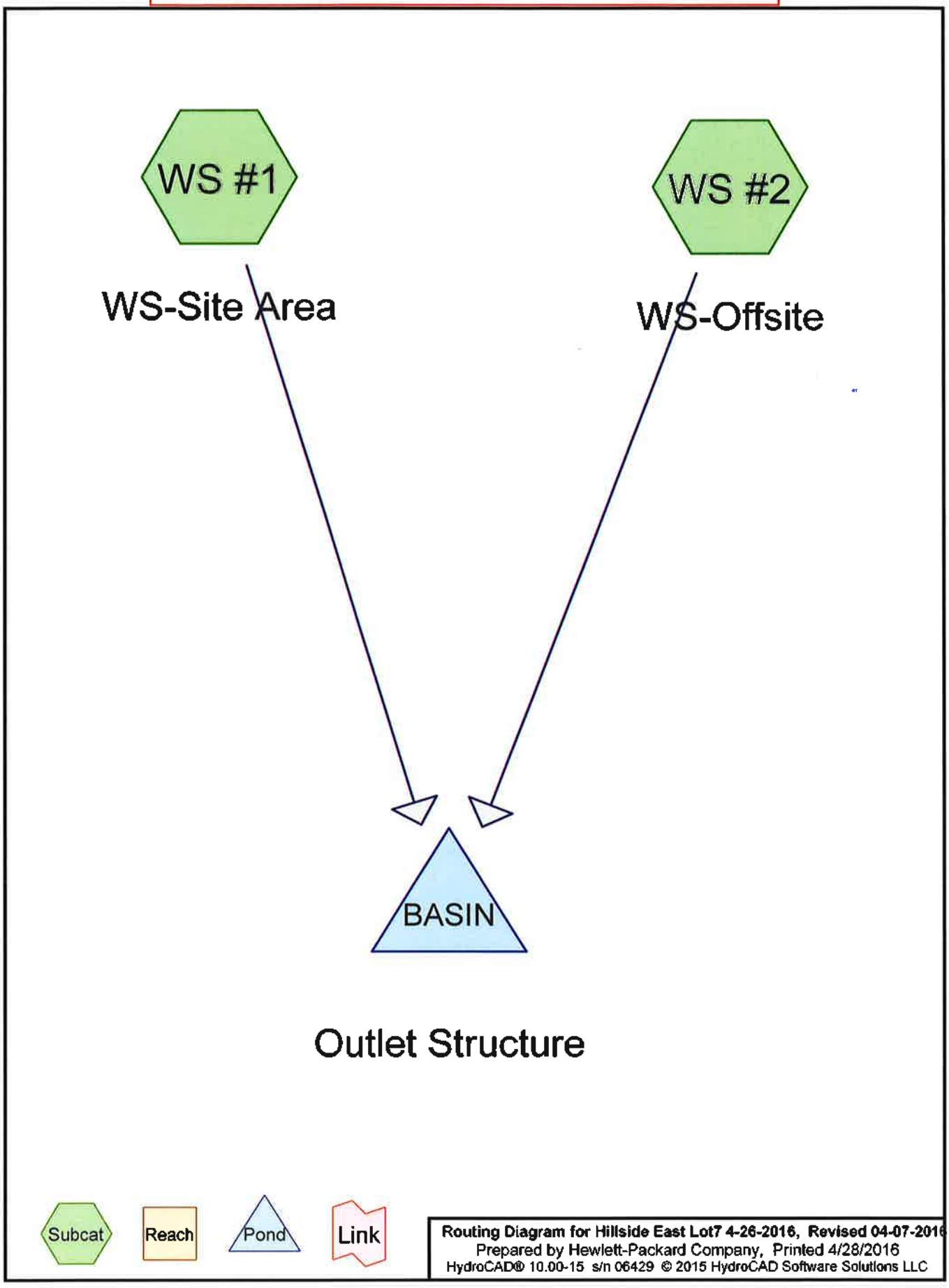

WS #1
WS #2
WS-Site Area
WS-Offsite
BASIN
Outlet Structure
Subcat
Reach
Pond
Link
Routing Diagram for Hillside East Lot7 4-26-2016, Revised 04-07-2016
Prepared by Hewlett-Packard Company, Printed 4/28/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Hillside East Lot #7

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.071	80	>75% Grass cover, Good, HSG D (WS #1)
1.090	98	Impervious (WS #1)
3.927	79	Woods/grass comb., Good, HSG D (WS #2)
6.089	**83**	**TOTAL AREA**

Time span=0.00-120.00 hrs, dt=0.01 hrs, 12001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS #1: WS-Site Area Runoff Area=94,150 sf 50.43% Impervious Runoff Depth=1.25"
Tc=6.0 min CN=WQ Runoff=4.35 cfs 0.226 af

SubcatchmentWS #2: WS-Offsite Runoff Area=171,070 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=1,250' Tc=18.8 min CN=79 Runoff=2.42 cfs 0.190 af

Pond BASIN: Outlet Structure Peak Elev=503.63' Storage=4,275 cf Inflow=5.52 cfs 0.416 af
Outflow=2.58 cfs 0.416 af

Total Runoff Area = 6.089 ac Runoff Volume = 0.416 af Average Runoff Depth = 0.82"
82.10% Pervious = 4.999 ac 17.90% Impervious = 1.090 ac

Summary for Subcatchment WS #1: WS-Site Area

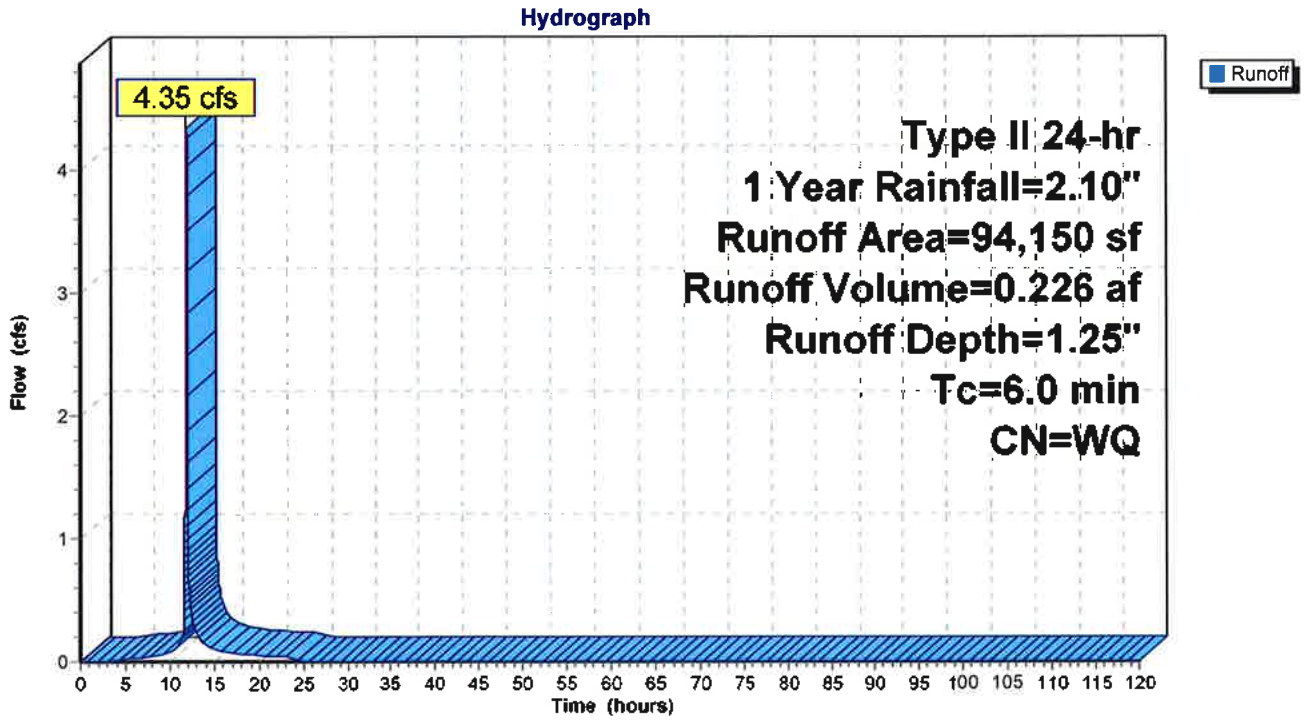
Runoff = 4.35 cfs @ 11.97 hrs, Volume= 0.226 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	47,480	98	Impervious
	46,670	80	>75% Grass cover, Good, HSG D
	94,150		Weighted Average
	46,670		49.57% Pervious Area
	47,480		50.43% Impervious Area

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

Subcatchment WS #1: WS-Site Area



Summary for Subcatchment WS #2: WS-Offsite

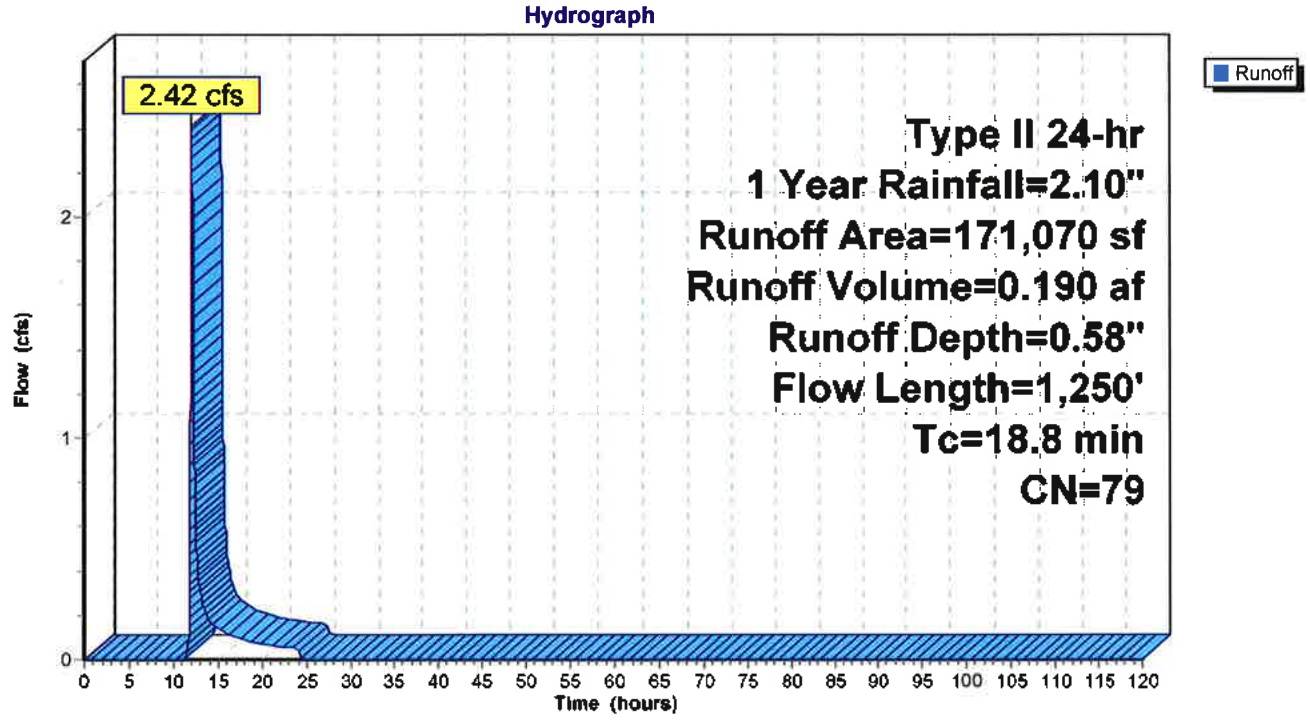
Runoff = 2.42 cfs @ 12.13 hrs, Volume= 0.190 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 Year Rainfall=2.10"

Area (sf)	CN	Description
171,070	79	Woods/grass comb., Good, HSG D
171,070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	150	0.1500	0.16		**Sheet Flow, Sheet Forest** Woods: Light underbrush n= 0.400 P2= 2.30"
3.2	1,100	0.1260	5.71		**Shallow Concentrated Flow, Gras channel** Unpaved Kv= 16.1 fps
18.8	1,250	Total			

Subcatchment WS #2: WS-Offsite



Summary for Pond BASIN: Outlet Structure

Inflow Area = 6.089 ac, 17.90% Impervious, Inflow Depth = 0.82" for 1 Year event
Inflow = 5.52 cfs @ 11.99 hrs, Volume= 0.416 af
Outflow = 2.58 cfs @ 12.22 hrs, Volume= 0.416 af, Atten= 53%, Lag= 14.2 min
Primary = 2.58 cfs @ 12.22 hrs, Volume= 0.416 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 500.33' Surf.Area= 191 sf Storage= 183 cf
Peak Elev= 503.63' @ 12.22 hrs Surf.Area= 2,180 sf Storage= 4,275 cf (4,092 cf above start)

Plug-Flow detention time= 35.2 min calculated for 0.412 af (99% of inflow)
Center-of-Mass det. time= 23.3 min (853.3 - 830.0)

Volume	Invert	Avail.Storage	Storage Description
#1	498.83'	7,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
498.83	53	0	0
500.33	191	183	183
501.00	750	315	498
502.00	1,240	995	1,493
503.00	1,800	1,520	3,013
504.00	2,400	2,100	5,113
505.00	3,080	2,740	7,853

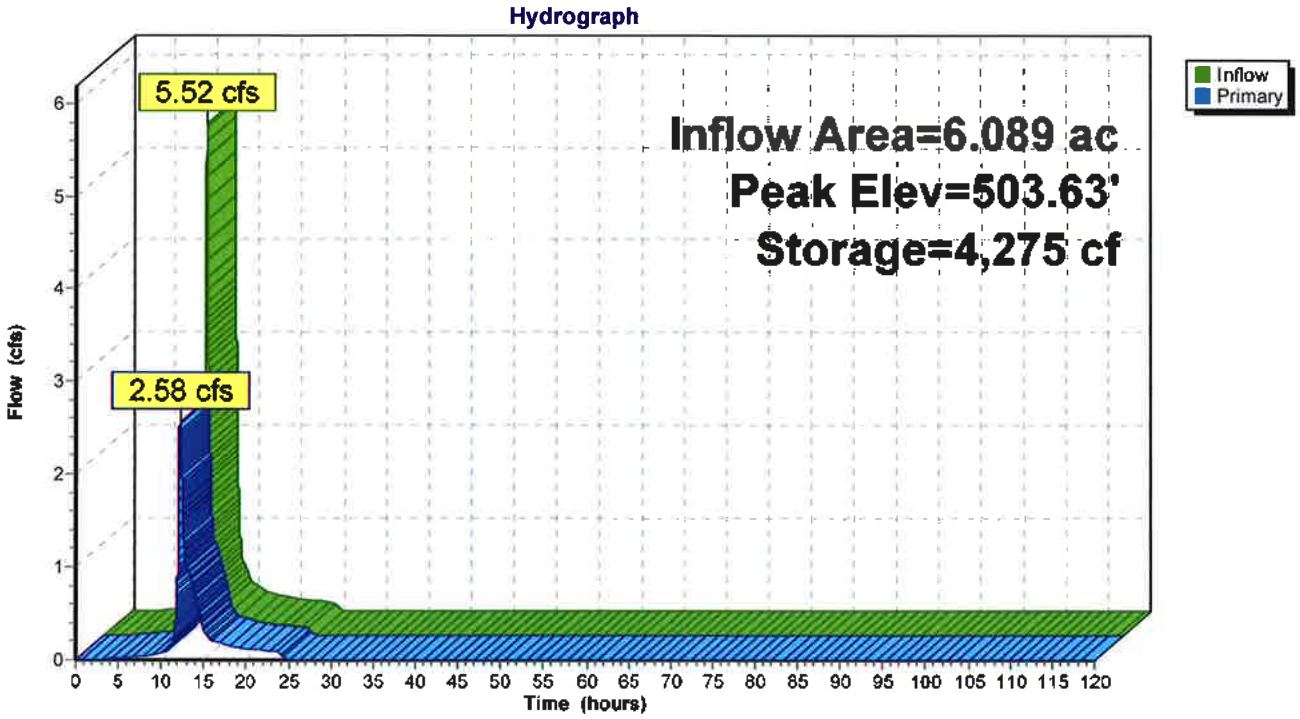
Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	500.33'	**5.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	503.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	504.00'	**15.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Emergency Spillway

Primary OutFlow Max=2.58 cfs @ 12.22 hrs HW=503.63' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 1.16 cfs @ 8.47 fps)
- **2=Orifice/Grate** (Orifice Controls 1.42 cfs @ 2.71 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Outlet Structure



LOCATION

NTS

0' 120' 240' 480' 720'

Bar Scale 1" = 120'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 120'
Date	4/21/16
Project	98189

Overall Site Plan

HILLSIDE EAST - Lots 16 & 17
Stormwater EFA

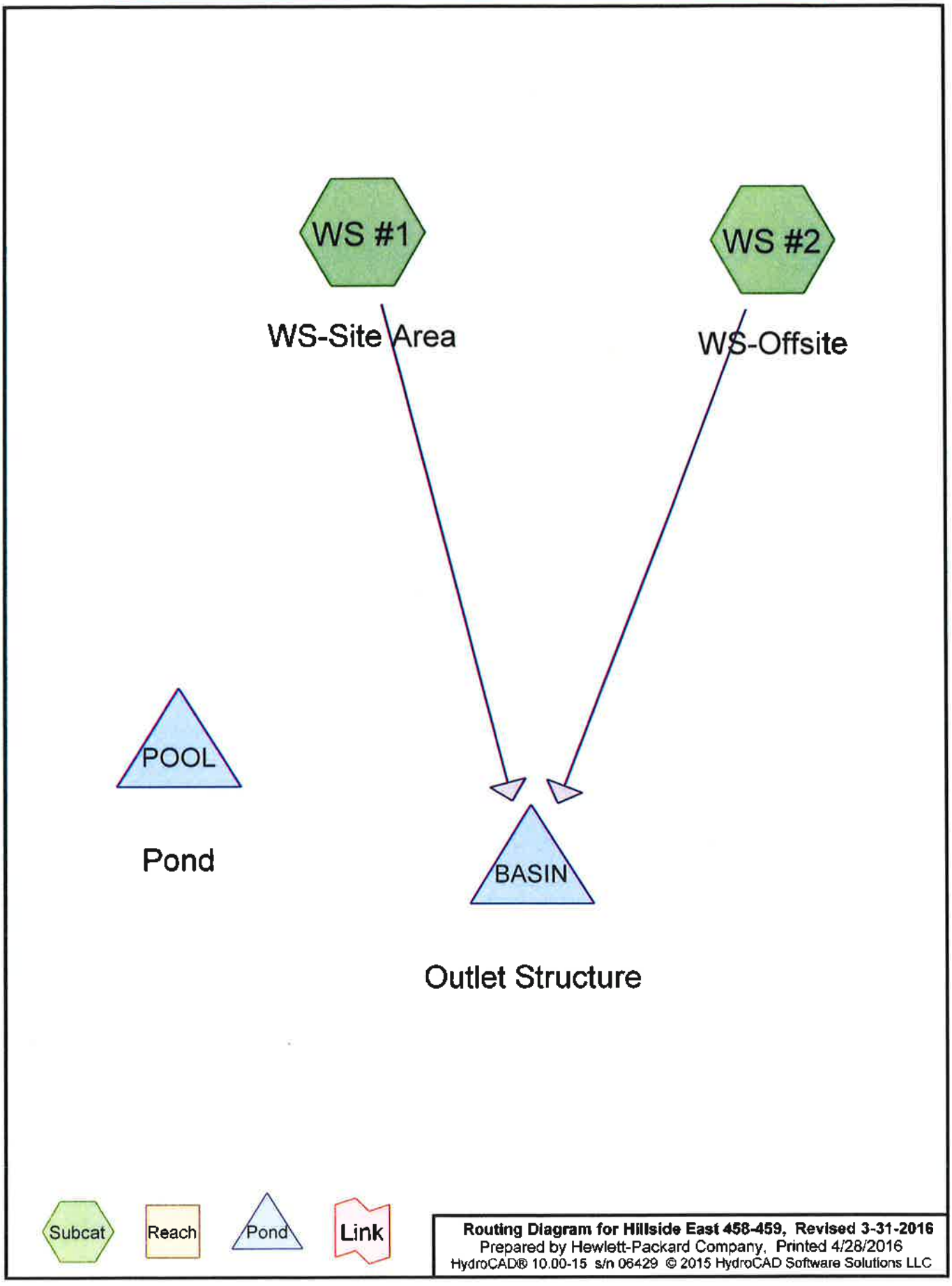
Hurricane Lane — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 98189-ofa overall site plan

Printing: dwg
4/26/16

OV-1



Routing Diagram for Hillside East 458-459, Revised 3-31-2016
Prepared by Hewlett-Packard Company, Printed 4/28/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Hillside East Lot 16 & 17
Hydrologic Model

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.188	80	>75% Grass cover, Good, HSG D (WS #1, WS #2)
2.620	98	Impervious (WS #1)
0.053	98	Water Surface, 0% imp, HSG D (WS #1)
3.861	**92**	**TOTAL AREA**

Time span=0.00-120.00 hrs, dt=0.02 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentWS #1: WS-Site Area Runoff Area=139,080 sf 82.06% Impervious Runoff Depth=1.67"
Flow Length=40' Slope=0.0750 '/' Tc=4.8 min CN=WQ Runoff=8.70 cfs 0.444 af

SubcatchmentWS #2: WS-Offsite Runoff Area=29,100 sf 0.00% Impervious Runoff Depth=0.62"
Flow Length=780' Slope=0.1300 '/' Tc=12.8 min CN=80 Runoff=0.55 cfs 0.035 af

Pond BASIN: Outlet Structure Peak Elev=502.42' Storage=9,787 cf Inflow=9.04 cfs 0.479 af
Outflow=0.67 cfs 0.479 af

Pond POOL: Pond Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 3.861 ac Runoff Volume = 0.479 af Average Runoff Depth = 1.49"
32.14% Pervious = 1.241 ac 67.86% Impervious = 2.620 ac

Summary for Subcatchment WS #1: WS-Site Area

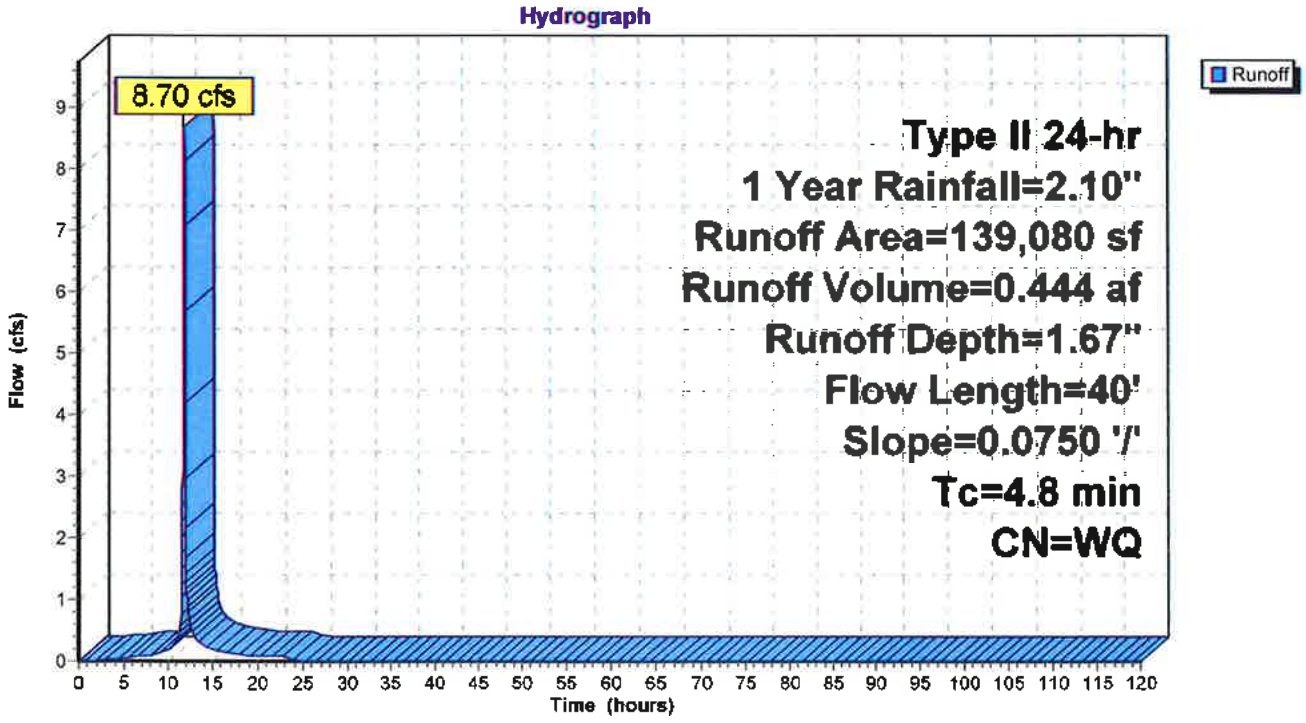
Runoff = 8.70 cfs @ 11.95 hrs, Volume= 0.444 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	114,130	98	Impervious
	22,635	80	>75% Grass cover, Good, HSG D
	2,315	98	Water Surface, 0% imp, HSG D
	139,080		Weighted Average
	24,950		17.94% Pervious Area
	114,130		82.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	40	0.0750	0.14		**Sheet Flow, Sheet Grass** Grass: Dense n= 0.240 P2= 2.30"

Subcatchment WS #1: WS-Site Area



Summary for Subcatchment WS #2: WS-Offsite

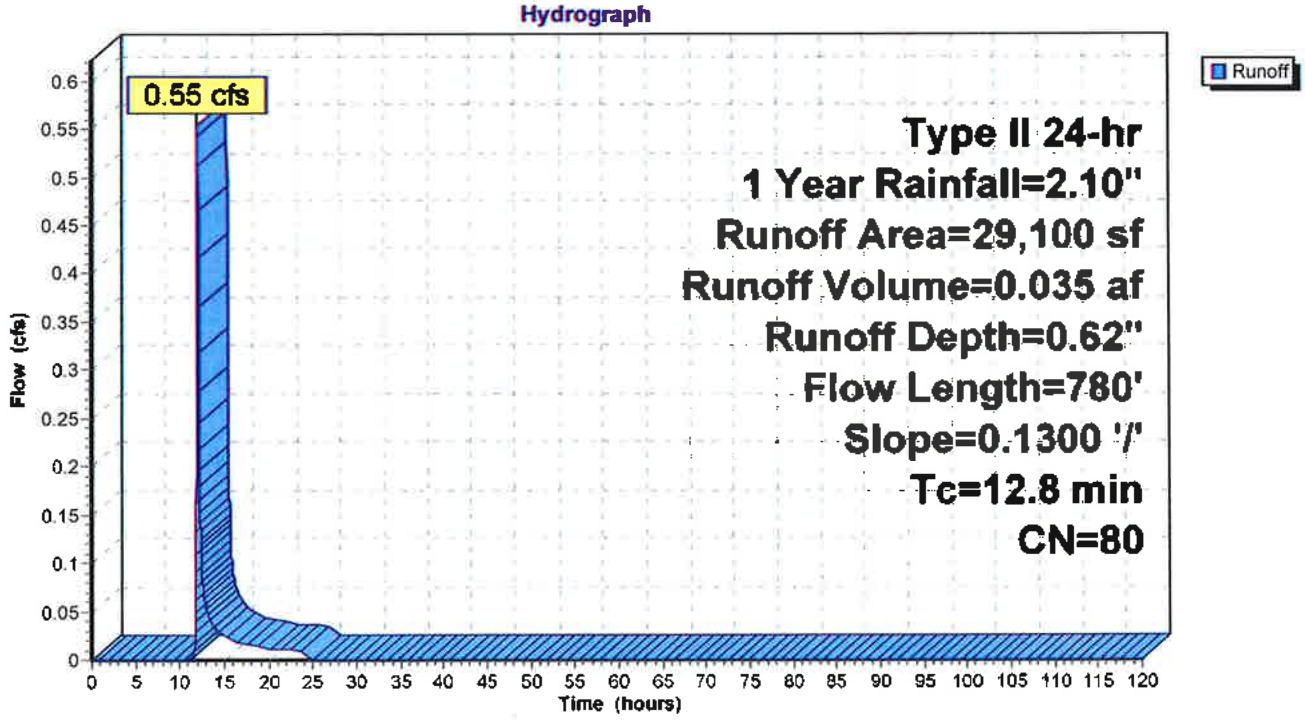
Runoff = 0.55 cfs @ 12.06 hrs, Volume= 0.035 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs
Type II 24-hr 1 Year Rainfall=2.10"

Area (sf)	CN	Description
29,100	80	>75% Grass cover, Good, HSG D
29,100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.1300	0.23		**Sheet Flow, Sheet Forest** Grass: Dense n= 0.240 P2= 2.30"
1.8	630	0.1300	5.80		**Shallow Concentrated Flow, Gras channel** Unpaved Kv= 16.1 fps
12.8	780	Total			

Subcatchment WS #2: WS-Offsite



Summary for Pond BASIN: Outlet Structure

Inflow Area = 3.861 ac, 67.86% Impervious, Inflow Depth = 1.49" for 1 Year event
Inflow = 9.04 cfs @ 11.96 hrs, Volume= 0.479 af
Outflow = 0.67 cfs @ 12.54 hrs, Volume= 0.479 af, Atten= 93%, Lag= 35.1 min
Primary = 0.67 cfs @ 12.54 hrs, Volume= 0.479 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 502.42' @ 12.54 hrs Surf.Area= 3,901 sf Storage= 9,787 cf

Plug-Flow detention time= 166.3 min calculated for 0.479 af (100% of inflow)
Center-of-Mass det. time= 166.5 min (941.5 - 775.0)

Volume	Invert	Avail.Storage	Storage Description
#1	499.13'	19,593 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
499.13	2,400	0	0
500.00	2,517	2,139	2,139
501.00	3,023	2,770	4,909
502.00	3,602	3,313	8,221
503.00	4,318	3,960	12,181
504.00	5,177	4,748	16,929
504.50	5,480	2,664	19,593

Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	499.13'	**3.8" Vert. Orifice/Grate** C= 0.600
#2	Primary	502.80'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	503.50'	**15.0' 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=0.67 cfs @ 12.54 hrs HW=502.42' (Free Discharge)
- 1=**Orifice/Grate** (Orifice Controls 0.67 cfs @ 8.52 fps)
- 2=**Orifice/Grate** (Controls 0.00 cfs)
- 3=Broad-Crested **Rectangular Weir** (Controls 0.00 cfs)

Qp10 Storm

Summary for Pond BASIN: Outlet Structure

Inflow Area = 3.861 ac, 67.86% Impervious, Inflow Depth = 2.49" for 10 Year event
Inflow = 14.77 cfs @ 11.96 hrs, Volume= 0.800 af
Outflow = 3.90 cfs @ 12.10 hrs, Volume= 0.800 af, Atten= 74%, Lag= 8.7 min
Primary = 3.90 cfs @ 12.10 hrs, Volume= 0.800 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 503.48' @ 12.10 hrs Surf.Area= 4,731 sf Storage= 14,356 cf

Plug-Flow detention time= 154.2 min calculated for 0.800 af (100% of inflow)
Center-of-Mass det. time= 153.9 min (921.1 - 767.2)

Volume	Invert	Avail.Storage	Storage Description
#1	499.13'	19,593 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
499.13	2,400	0	0
500.00	2,517	2,139	2,139
501.00	3,023	2,770	4,909
502.00	3,602	3,313	8,221
503.00	4,318	3,960	12,181
504.00	5,177	4,748	16,929
504.50	5,480	2,664	19,593

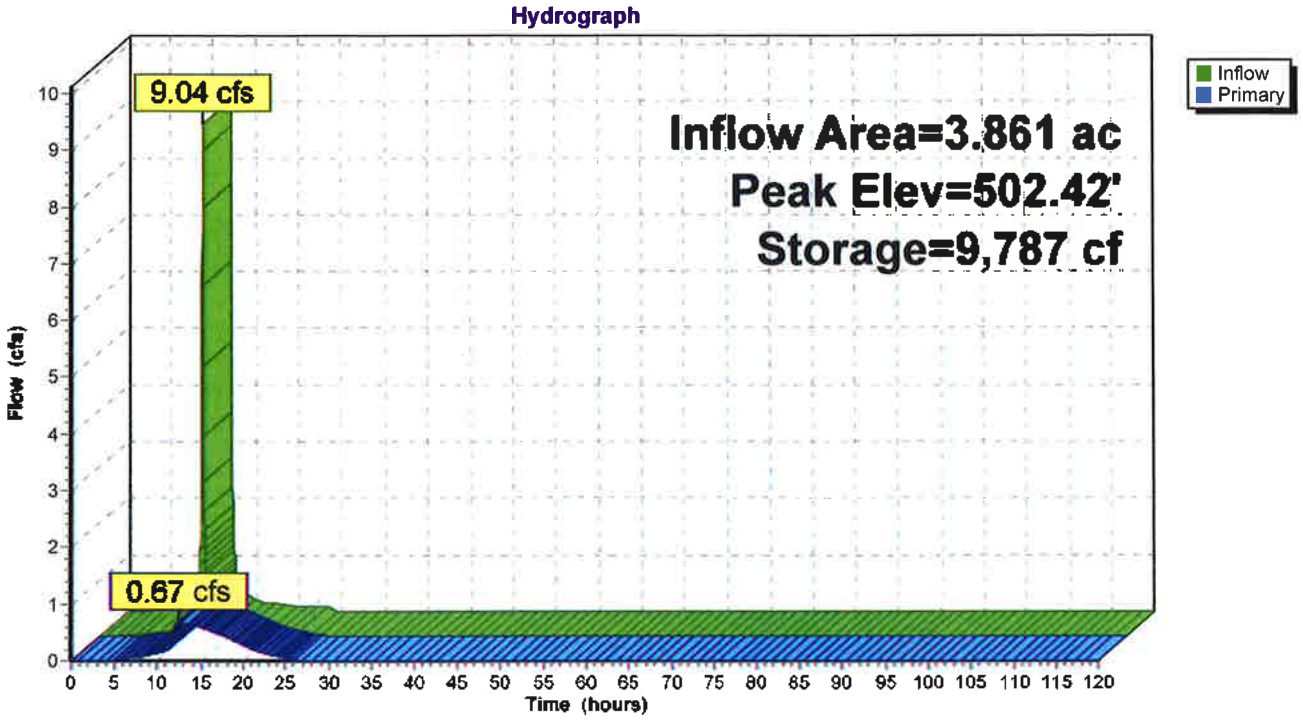
Device	Routing	Invert	Outlet Devices
#1	Primary	499.13'	**3.8" Vert. Orifice/Grate** C= 0.600
#2	Primary	502.80'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	503.50'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 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=3.90 cfs @ 12.10 hrs HW=503.48' (Free Discharge)
└1=**Orifice/Grate** (Orifice Controls 0.78 cfs @ 9.86 fps)
└2=**Orifice/Grate** (Orifice Controls 3.12 cfs @ 3.97 fps)
└3=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Emergency Spillway

Peak water surface elevation of 10 year, 24 hour storm event is just below emergency spillway.

Pond BASIN: Outlet Structure



Summary for Pond POOL: Pond

Volume	Invert	Avail.Storage	Storage Description
#1	495.13'	7,031 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
495.13	790	0	0
496.00	937	751	751
497.00	1,243	1,090	1,841
498.00	1,575	1,409	3,250
499.90	2,405	3,781	7,031

LOCATION

NTS

0' 120' 240' 480' 720'

Bar Scale 1" = 120'

Date revised	Description	Checked	Date

Design	WHN
Drawn	SLM
Checked	WHN
Scale	1" = 120'
Date	4/21/16
Project	93128

Overall Site Plan

HILLSIDE EAST - Lots 12, 13 & 13A
Stormwater EFA

Hurricane Lane — Williston, Vermont

KREBS & LANSING Consulting Engineers, Inc.
164 Main Street, Colchester, Vermont 05446

File name: 93128 efa overall site plan

Printing: dwg
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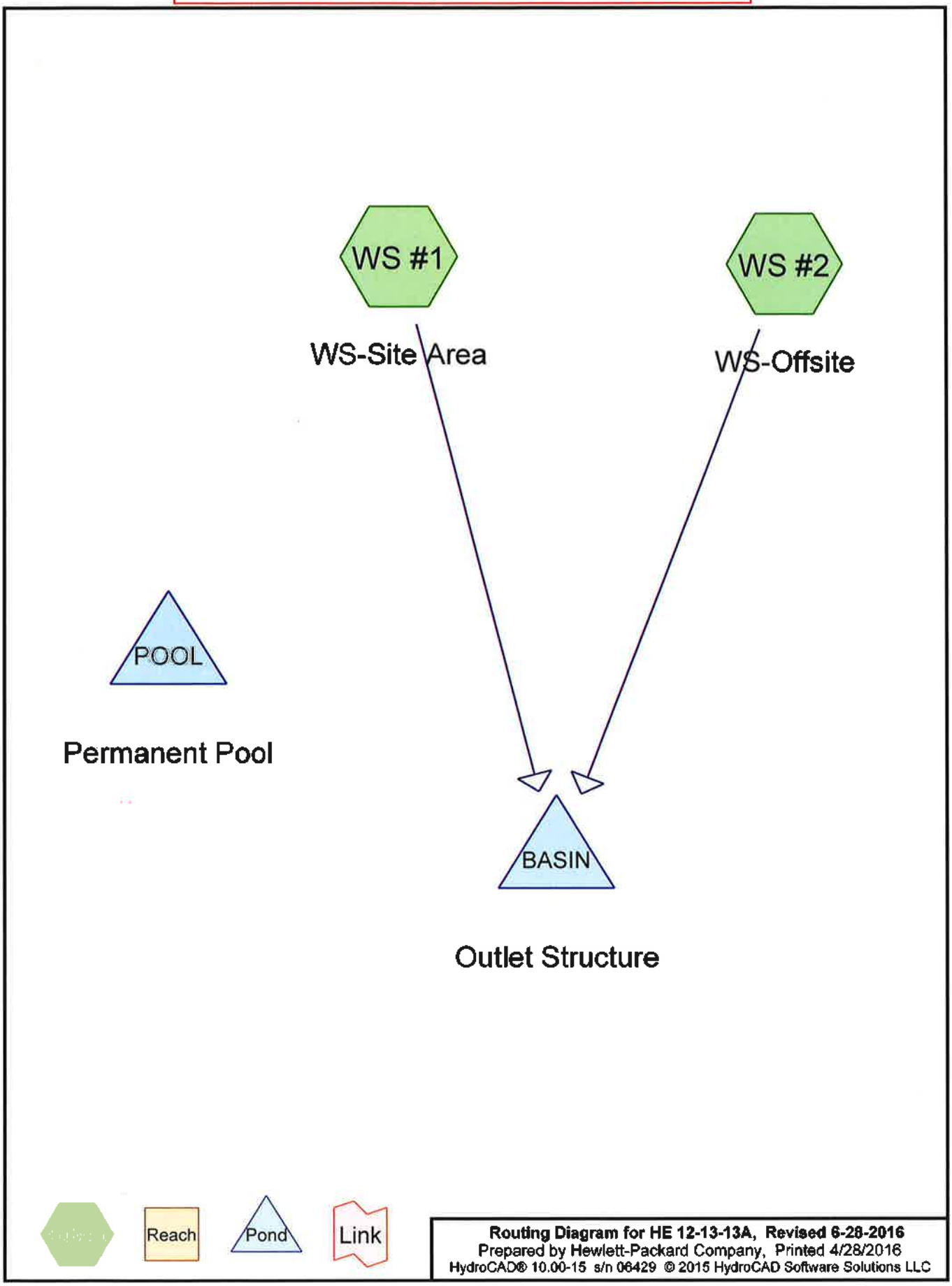
OV-1


WS #1
WS-Site Area
WS #2
WS-Offsite
POOL
Permanent Pool
BASIN
Outlet Structure
Reach
Pond
Link
Routing Diagram for HE 12-13-13A, Revised 6-28-2016
Prepared by Hewlett-Packard Company, Printed 4/28/2016
HydroCAD® 10.00-15 s/n 06429 © 2015 HydroCAD Software Solutions LLC

Project Notes

Lot 12, 13 and 13A Hillside East
Williston, Vermont
Hydrologic Model Calculations

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.175	80	>75% Grass cover, Good, HSG D (WS #1)
2.962	98	Impervious (WS #1)
9.238	77	Woods, Good, HSG D (WS #2)
14.375	**82**	**TOTAL AREA**

Time span=0.00-120.00 hrs, dt=0.03 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment WS #1: WS-Site Area Runoff Area=223,750 sf 57.66% Impervious Runoff Depth=1.18"
Tc=6.0 min CN=90 Runoff=10.67 cfs 0.505 af

Subcatchment WS #2: WS-Offsite Runoff Area=402,420 sf 0.00% Impervious Runoff Depth=0.50"
Flow Length=910' Tc=17.2 min CN=77 Runoff=4.96 cfs 0.387 af

Pond BASIN: Outlet Structure Peak Elev=517.85' Storage=9,873 cf Inflow=13.11 cfs 0.892 af
Outflow=4.02 cfs 0.892 af

Pond POOL: Permanent Pool Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 14.375 ac Runoff Volume = 0.892 af Average Runoff Depth = 0.74"
79.40% Pervious = 11.413 ac 20.60% Impervious = 2.962 ac

Summary for Subcatchment WS #1: WS-Site Area

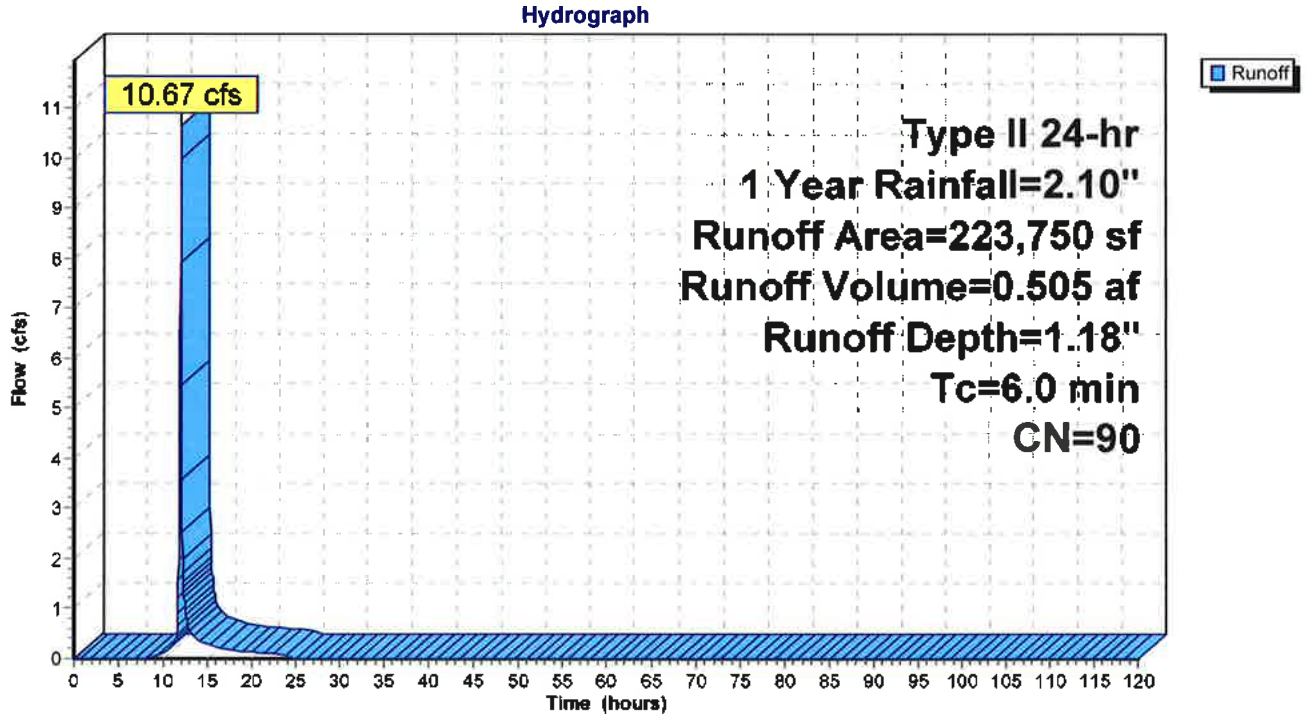
Runoff = 10.67 cfs @ 11.97 hrs, Volume= 0.505 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

	Area (sf)	CN	Description
*	129,010	98	Impervious
	94,740	80	>75% Grass cover, Good, HSG D
	223,750	90	Weighted Average
	94,740		42.34% Pervious Area
	129,010		57.66% Impervious Area

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

Subcatchment WS #1: WS-Site Area



Summary for Subcatchment WS #2: WS-Offsite

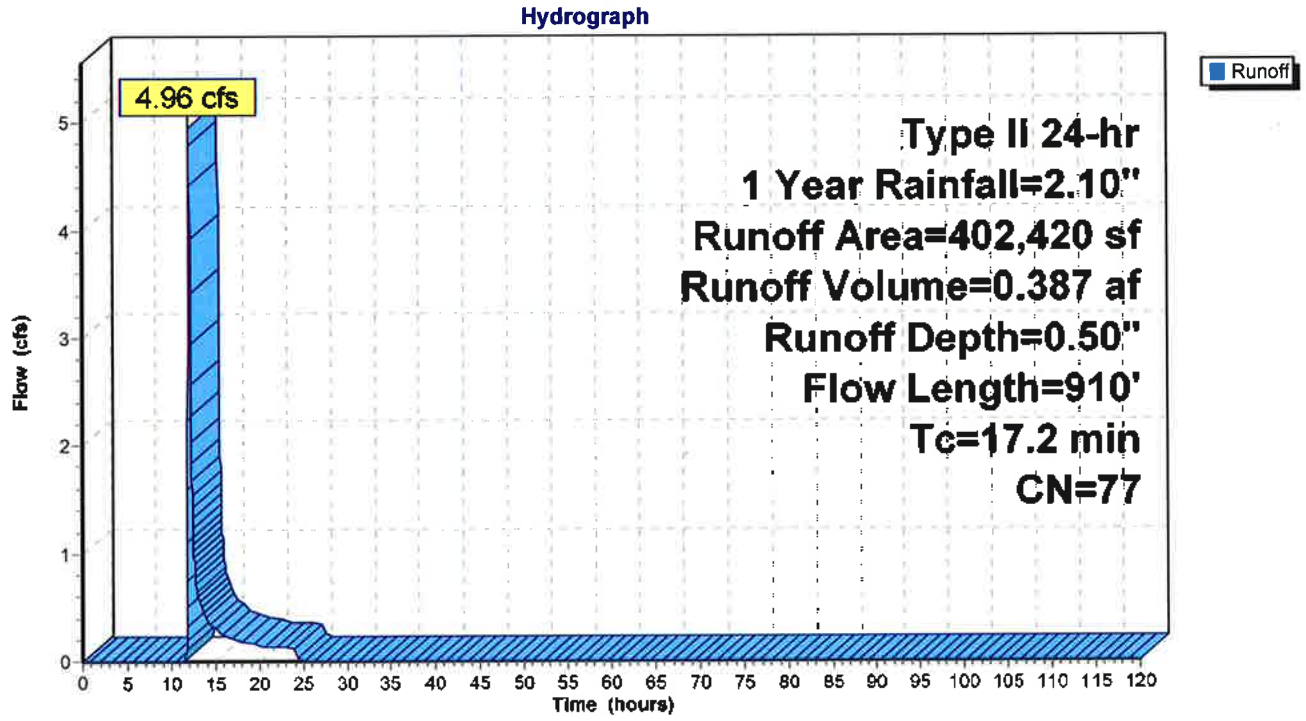
Runoff = 4.96 cfs @ 12.12 hrs, Volume= 0.387 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 Year Rainfall=2.10"

Area (sf)	CN	Description
402,420	77	Woods, Good, HSG D
402,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	150	0.1600	0.16		**Sheet Flow, Sheet Forest** Woods: Light underbrush n= 0.400 P2= 2.30"
2.0	760	0.1500	6.24		**Shallow Concentrated Flow, Gras channel** Unpaved Kv= 16.1 fps
17.2	910	Total			

Subcatchment WS #2: WS-Offsite



Summary for Pond BASIN: Outlet Structure

Inflow Area = 14.375 ac, 20.60% Impervious, Inflow Depth = 0.74" for 1 Year event
Inflow = 13.11 cfs @ 11.99 hrs, Volume= 0.892 af
Outflow = 4.02 cfs @ 12.29 hrs, Volume= 0.892 af, Atten= 69%, Lag= 18.4 min
Primary = 4.02 cfs @ 12.29 hrs, Volume= 0.892 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2
Peak Elev= 517.85' @ 12.29 hrs Surf.Area= 4,032 sf Storage= 9,873 cf

Plug-Flow detention time= 28.1 min calculated for 0.892 af (100% of inflow)
Center-of-Mass det. time= 28.2 min (878.3 - 850.1)

Volume	Invert	Avail.Storage	Storage Description
#1	514.20'	21,170 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
514.20	1,470	0	0
515.00	2,007	1,391	1,391
516.00	2,655	2,331	3,722
517.00	3,360	3,008	6,729
518.00	4,150	3,755	10,484
519.00	4,995	4,573	15,057
520.10	6,120	6,113	21,170

Low Flow Orifice

Device	Routing	Invert	Outlet Devices
#1	Primary	514.20'	**9.2" Vert. Orifice/Grate** C= 0.600
#2	Primary	517.85'	**60.0" W x 12.0" H Vert. Orifice/Grate X 2.00** C= 0.600
#3	Primary	518.60'	**8.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=4.02 cfs @ 12.29 hrs HW=517.85' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 4.02 cfs @ 8.70 fps)
- **2=Orifice/Grate** (Controls 0.00 **cfs**)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Qp10 Storm

Summary for Pond BASIN: Outlet Structure

Inflow Area = 14.375 ac, 20.60% Impervious, Inflow Depth = 1.55" for 10 Year event
Inflow = 27.13 cfs @ 11.99 hrs, Volume= 1.861 af
Outflow = 24.29 cfs @ 12.04 hrs, Volume= 1.861 af, Atten= 10%, Lag= 3.1 min
Primary = 24.29 cfs @ 12.04 hrs, Volume= 1.861 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2
Peak Elev= 518.58' @ 12.04 hrs Surf.Area= 4,637 sf Storage= 13,015 cf

Plug-Flow detention time= 22.1 min calculated for 1.861 af (100% of inflow)
Center-of-Mass det. time= 21.6 min (853.3 - 831.7)

Volume	Invert	Avail.Storage	Storage Description
#1	514.20'	21,170 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
514.20	1,470	0	0
515.00	2,007	1,391	1,391
516.00	2,655	2,331	3,722
517.00	3,360	3,008	6,729
518.00	4,150	3,755	10,484
519.00	4,995	4,573	15,057
520.10	6,120	6,113	21,170

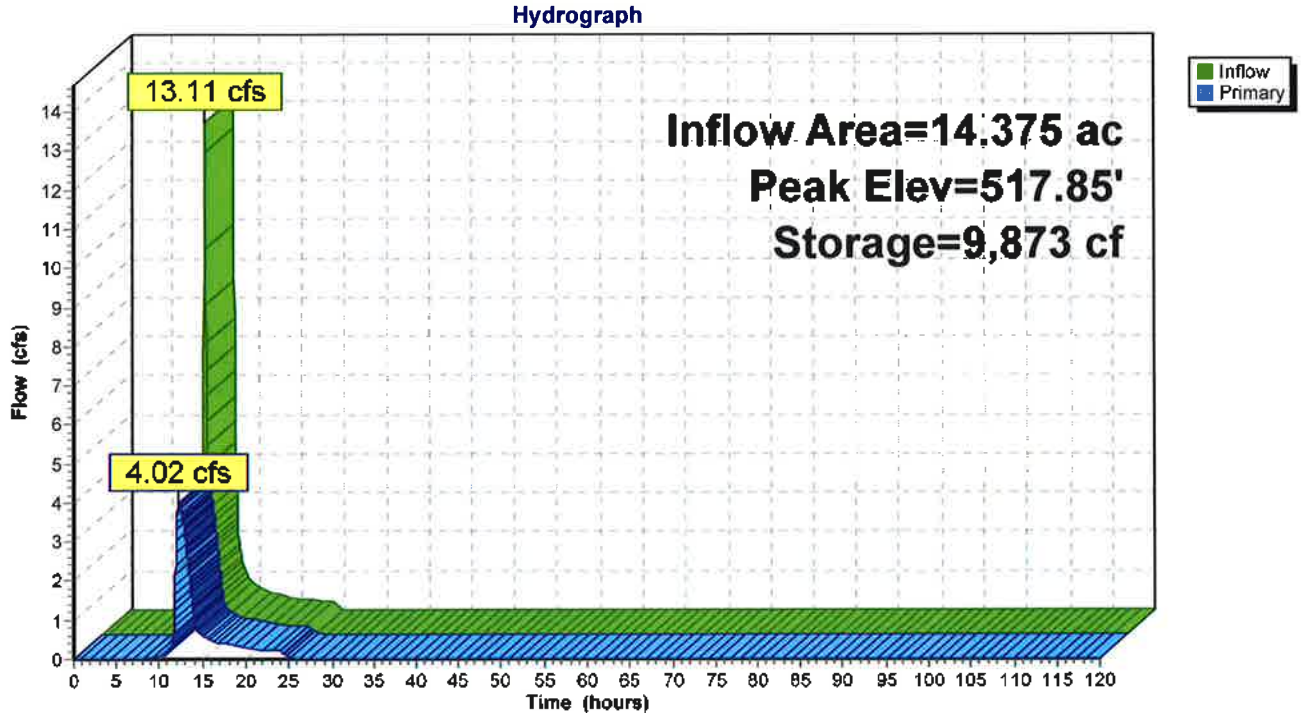
Device	Routing	Invert	Outlet Devices
#1	Primary	514.20'	**9.2" Vert. Orifice/Grate** C= 0.600
#2	Primary	517.85'	**60.0" W x 12.0" H Vert. Orifice/Grate X 2.00** C= 0.600
#3	Primary	518.60'	**8.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Emergency Spillway

Primary OutFlow Max=23.90 cfs @ 12.04 hrs HW=518.57' (Free Discharge)
- 1=**Orifice/Grate** (Orifice Controls 4.44 cfs @ 9.61 fps)
- 2=**Orifice/Grate** (Orifice Controls 19.46 cfs @ 2.72 fps)
- 3=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Peak Water Surface Elevation for 10 year, 24 hour storm is just below the elevation of the emergency spillway.

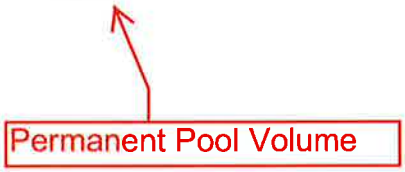
Pond BASIN: Outlet Structure



Summary for Pond POOL: Permanent Pool

Volume	Invert	Avail.Storage	Storage Description
#1	510.20'	3,227 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
510.20	150	0	0
511.00	421	228	228
513.00	1,060	1,481	1,709
514.20	1,470	1,518	3,227

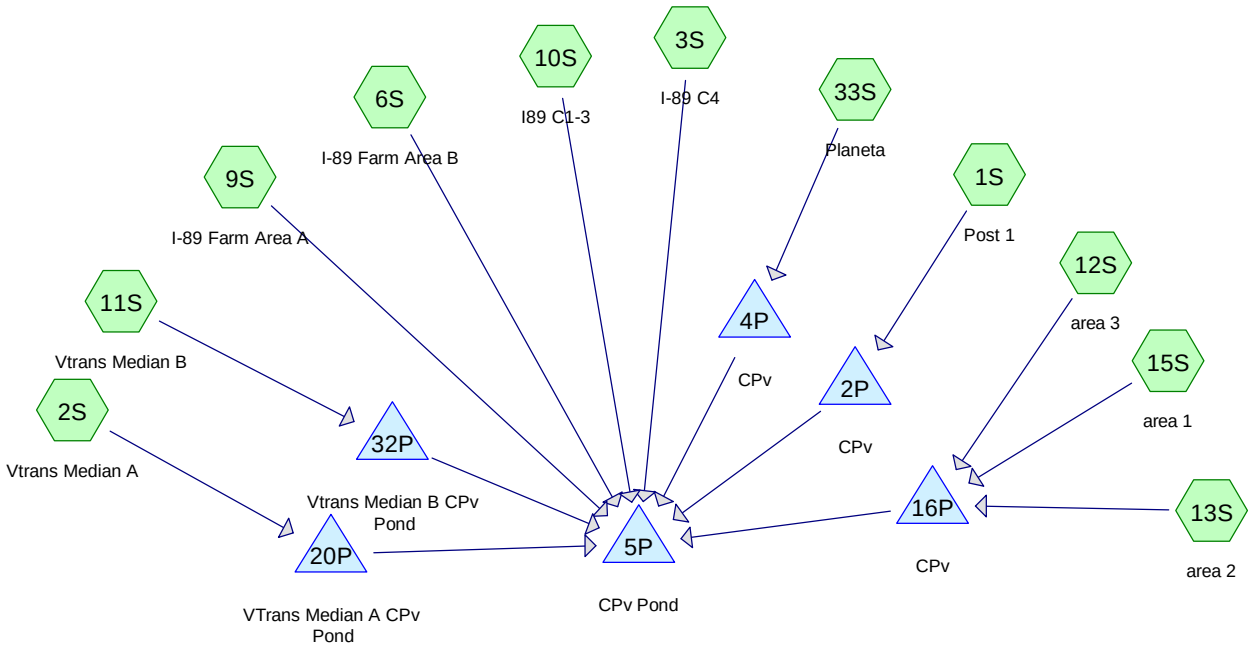


APPENDIX C

TOWN OF WILLISTON BMP PARCELS

AERIAL MAPS AND CPv BMP MODELS

WILLISTON PARCEL: FARMLAND NORTH OF I-89



Subcat Reach Pond Link

Routing Diagram for I89_areas
Prepared by DuBois& King, Inc., Printed 2/1/2012

Summary for Subcatchment 1S: Post 1

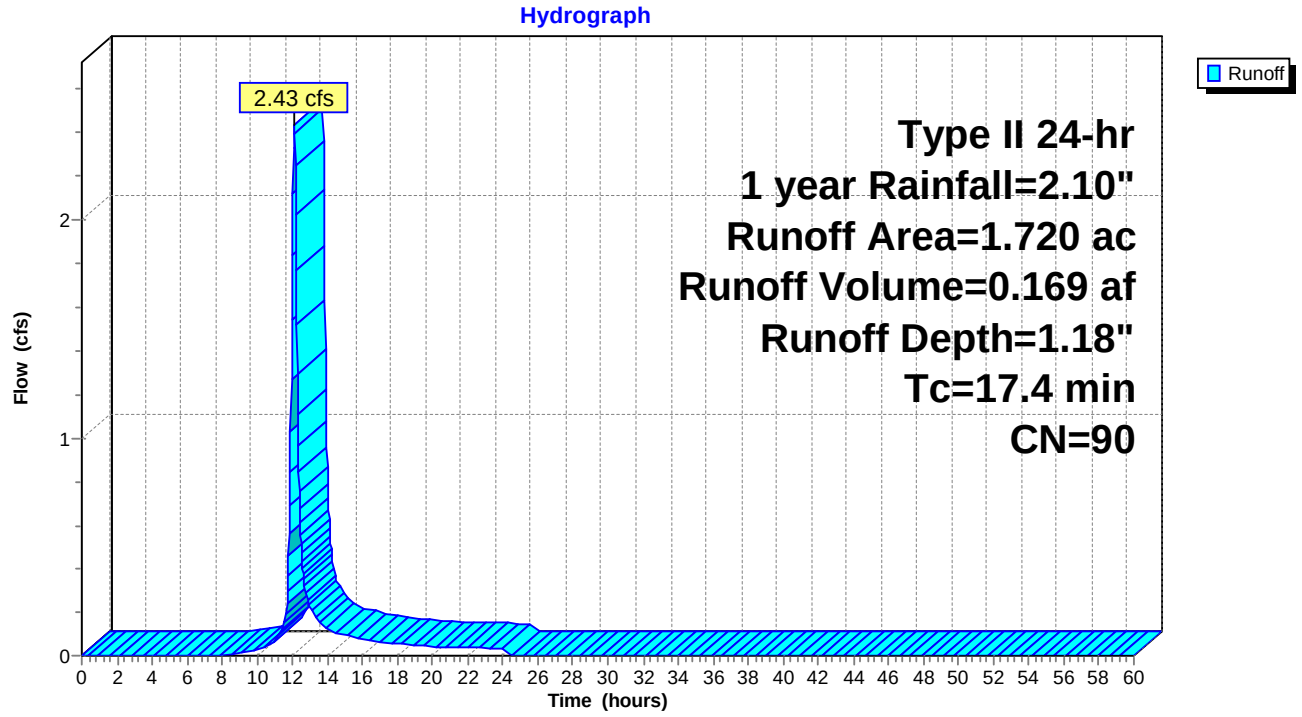
Runoff = 2.43 cfs @ 12.10 hrs, Volume= 0.169 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	1.720	90	
	1.720		100.00% Pervious Area

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

Subcatchment 1S: Post 1



Summary for Subcatchment 2S: Vtrans Median A

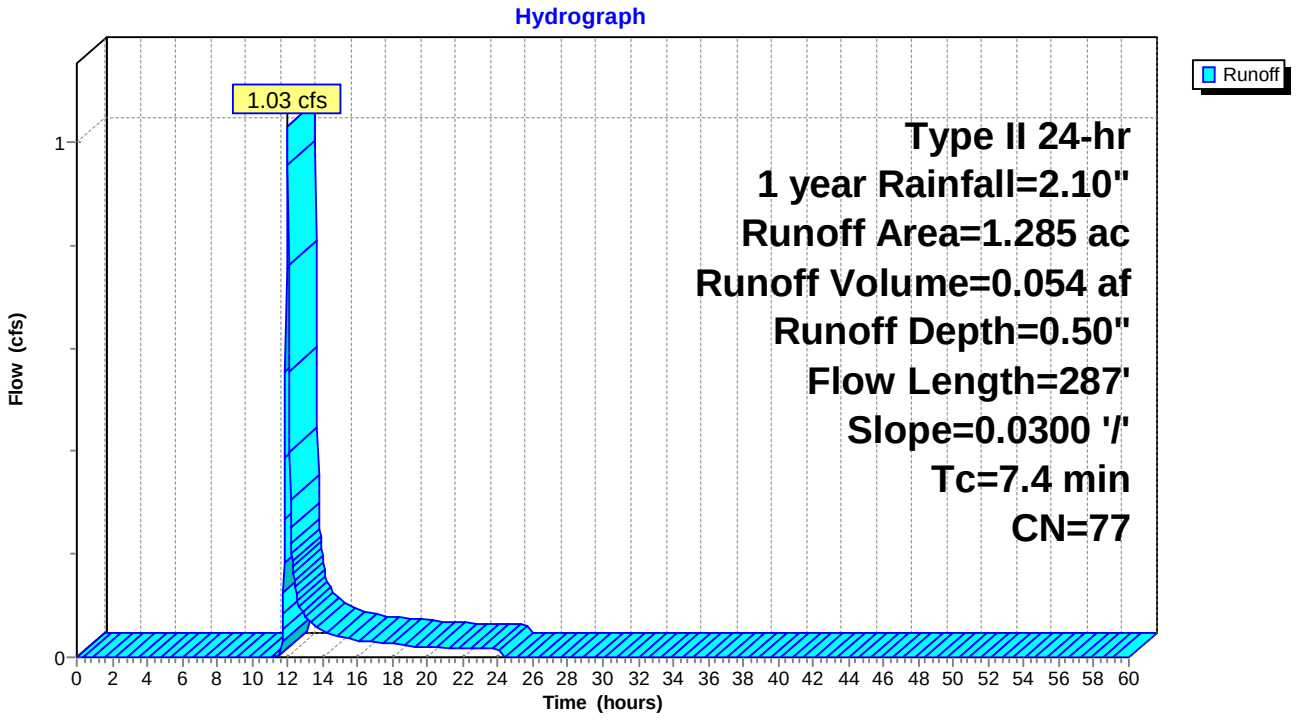
Runoff = 1.03 cfs @ 12.00 hrs, Volume= 0.054 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.285	98	Paved parking, HSG C
1.000	71	Meadow, non-grazed, HSG C
1.285	77	Weighted Average
1.000		77.82% Pervious Area
0.285		22.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	287	0.0300	0.65		**Lag/CN Method,**

Subcatchment 2S: Vtrans Median A



Summary for Subcatchment 3S: I-89 C4

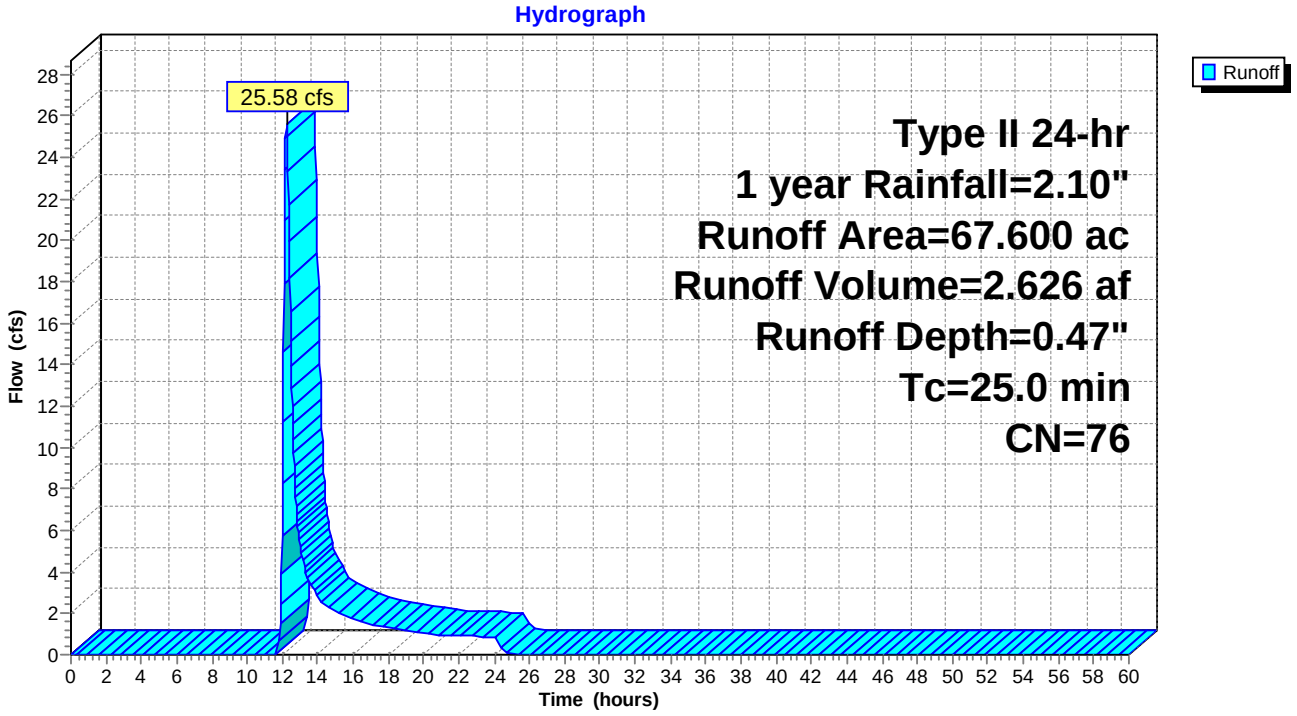
Runoff = 25.58 cfs @ 12.22 hrs, Volume= 2.626 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
20.448	70	Woods, Good, HSG C
42.040	77	Woods, Good, HSG D
5.112	98	Paved parking & roofs
67.600	76	Weighted Average
62.488		92.44% Pervious Area
5.112		7.56% Impervious Area

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

Subcatchment 3S: I-89 C4



Summary for Subcatchment 6S: I-89 Farm Area B

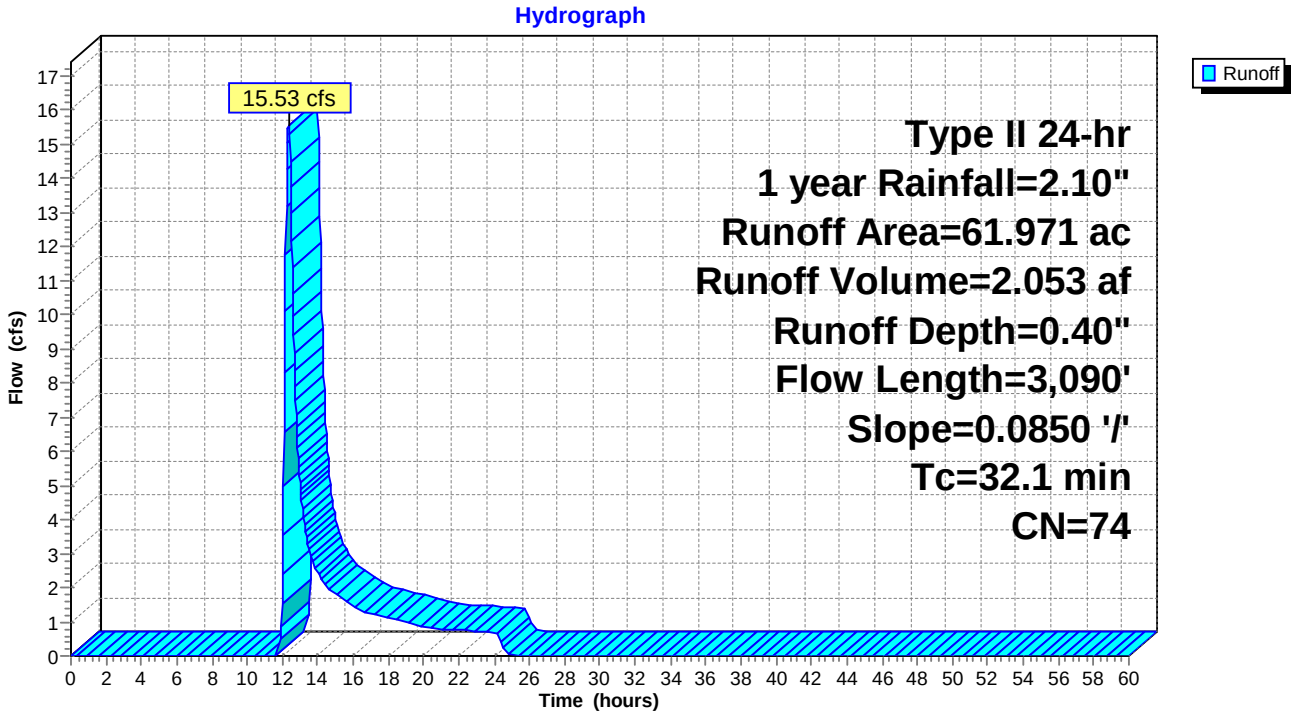
Runoff = 15.53 cfs @ 12.32 hrs, Volume= 2.053 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.288	30	Woods, Good, HSG A
31.207	70	Woods, Good, HSG C
28.181	77	Woods, Good, HSG D
2.295	98	Paved parking & roofs
61.971	74	Weighted Average
59.676		96.30% Pervious Area
2.295		3.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.1	3,090	0.0850	1.60		**Lag/CN Method,**

Subcatchment 6S: I-89 Farm Area B



Summary for Subcatchment 9S: I-89 Farm Area A

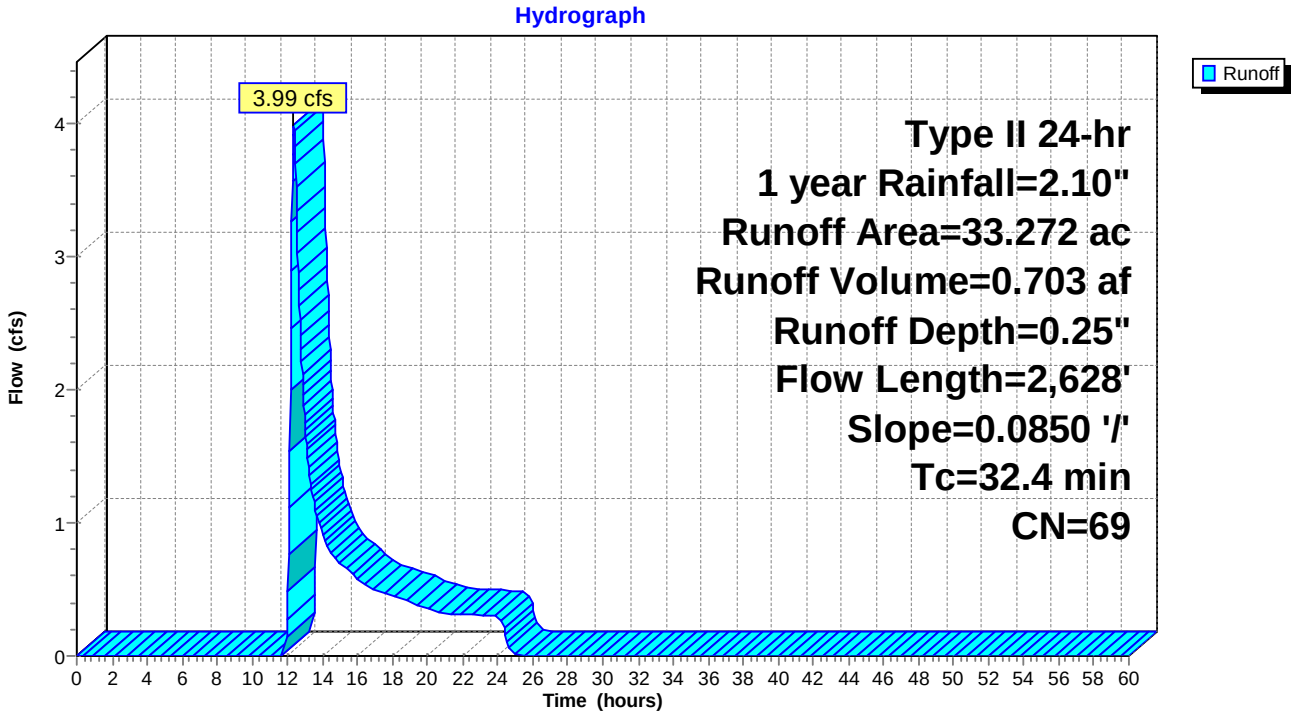
Runoff = 3.99 cfs @ 12.37 hrs, Volume= 0.703 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.218	98	Paved parking & roofs
2.196	30	Woods, Good, HSG A
23.354	70	Woods, Good, HSG C
7.504	77	Woods, Good, HSG D
33.272	69	Weighted Average
33.054		99.34% Pervious Area
0.218		0.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	2,628	0.0850	1.35		**Lag/CN Method,**

Subcatchment 9S: I-89 Farm Area A



Summary for Subcatchment 10S: I89 C1-3

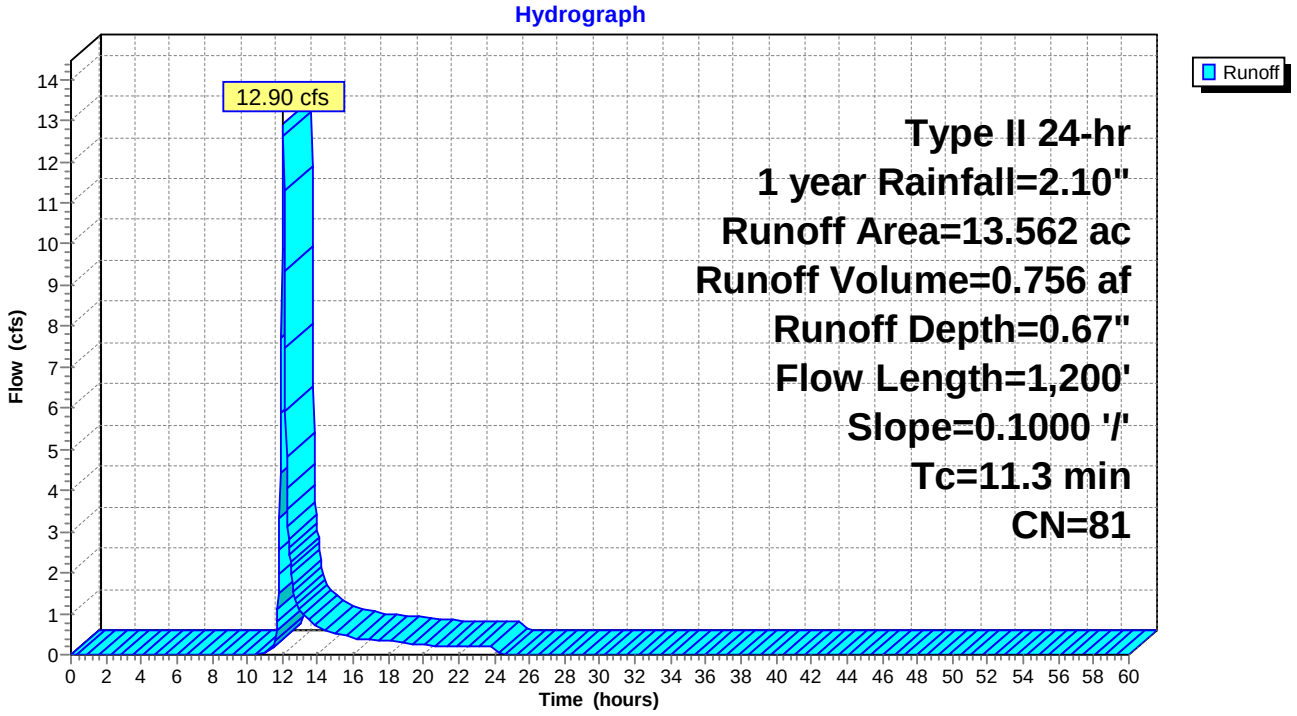
Runoff = 12.90 cfs @ 12.04 hrs, Volume= 0.756 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
1.854	70	Woods, Good, HSG C
8.554	77	Woods, Good, HSG D
3.154	98	Paved parking & roofs
13.562	81	Weighted Average
10.408		76.74% Pervious Area
3.154		23.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	1,200	0.1000	1.78		**Lag/CN Method,**

Subcatchment 10S: I89 C1-3



Summary for Subcatchment 11S: Vtrans Median B

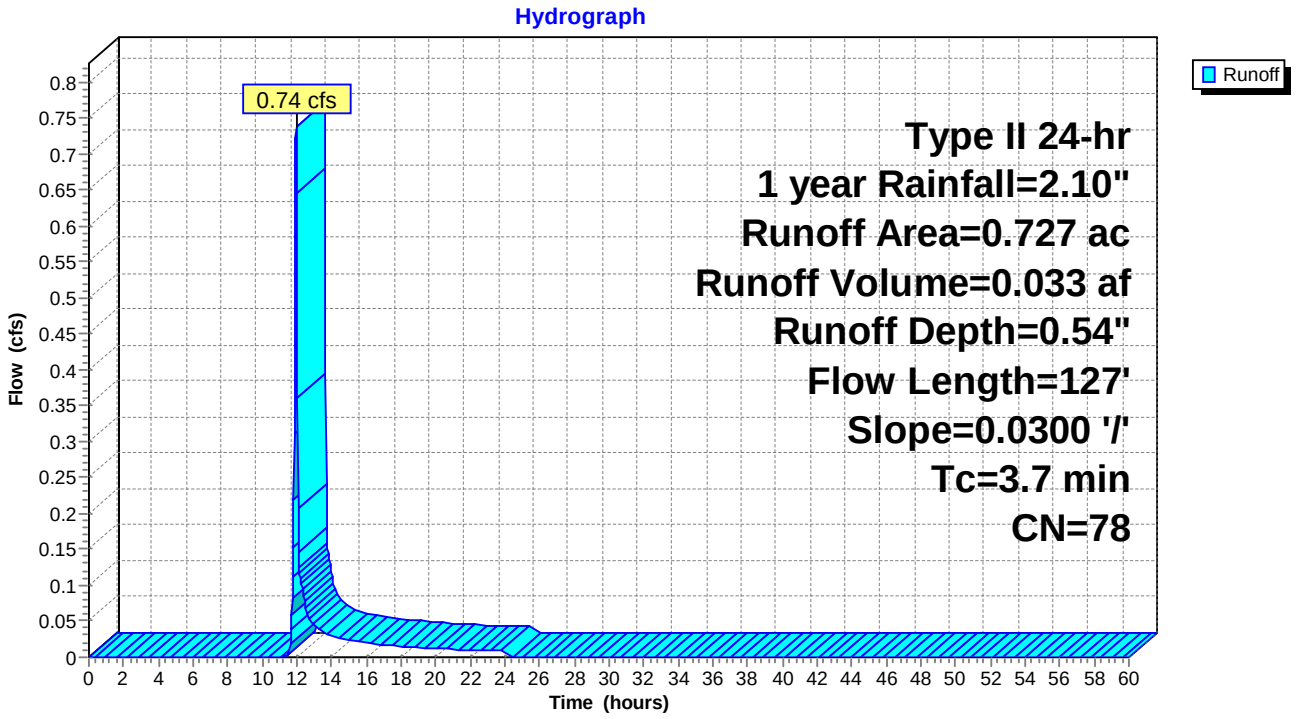
Runoff = 0.74 cfs @ 11.95 hrs, Volume= 0.033 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.197	98	Paved parking, HSG C
0.530	71	Meadow, non-grazed, HSG C
0.727	78	Weighted Average
0.530		72.90% Pervious Area
0.197		27.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	127	0.0300	0.57		**Lag/CN Method,**

Subcatchment 11S: Vtrans Median B



Summary for Subcatchment 12S: area 3

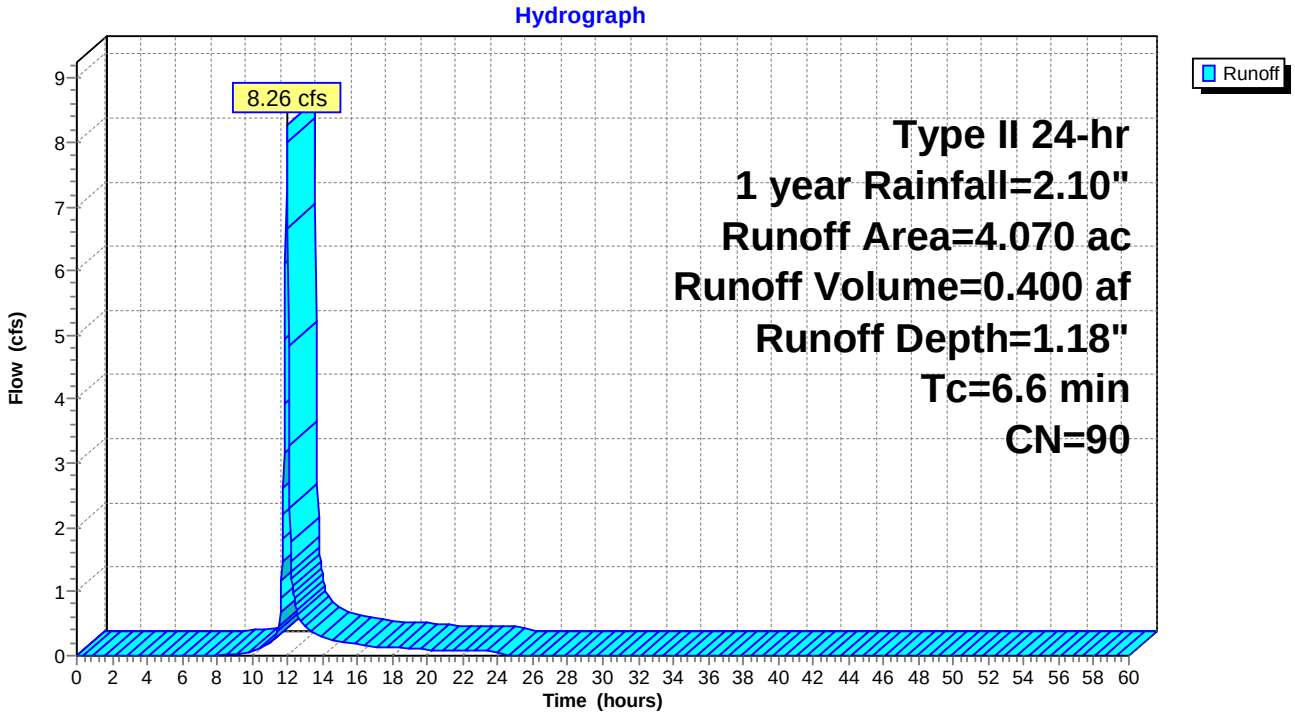
Runoff = 8.26 cfs @ 11.98 hrs, Volume= 0.400 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	4.070	90	
	4.070		100.00% Pervious Area

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

Subcatchment 12S: area 3



Summary for Subcatchment 13S: area 2

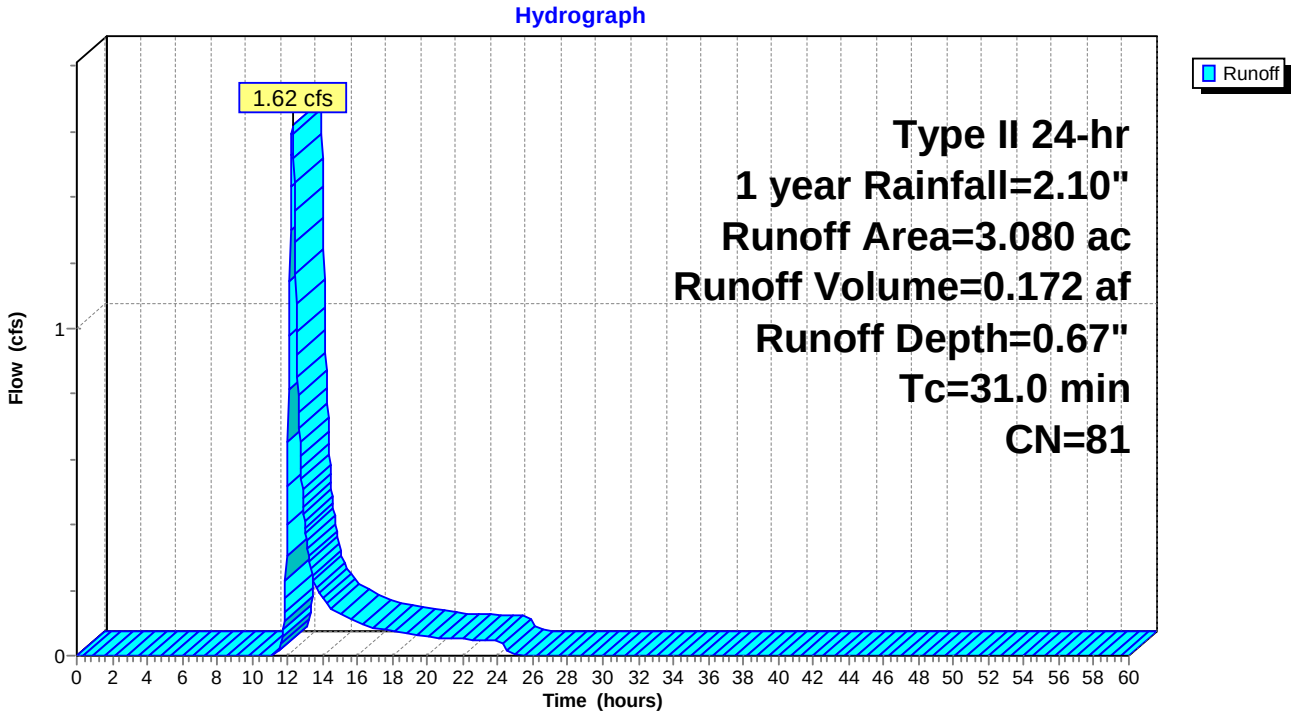
Runoff = 1.62 cfs @ 12.28 hrs, Volume= 0.172 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	3.080	81	
	3.080		100.00% Pervious Area

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

Subcatchment 13S: area 2



Summary for Subcatchment 15S: area 1

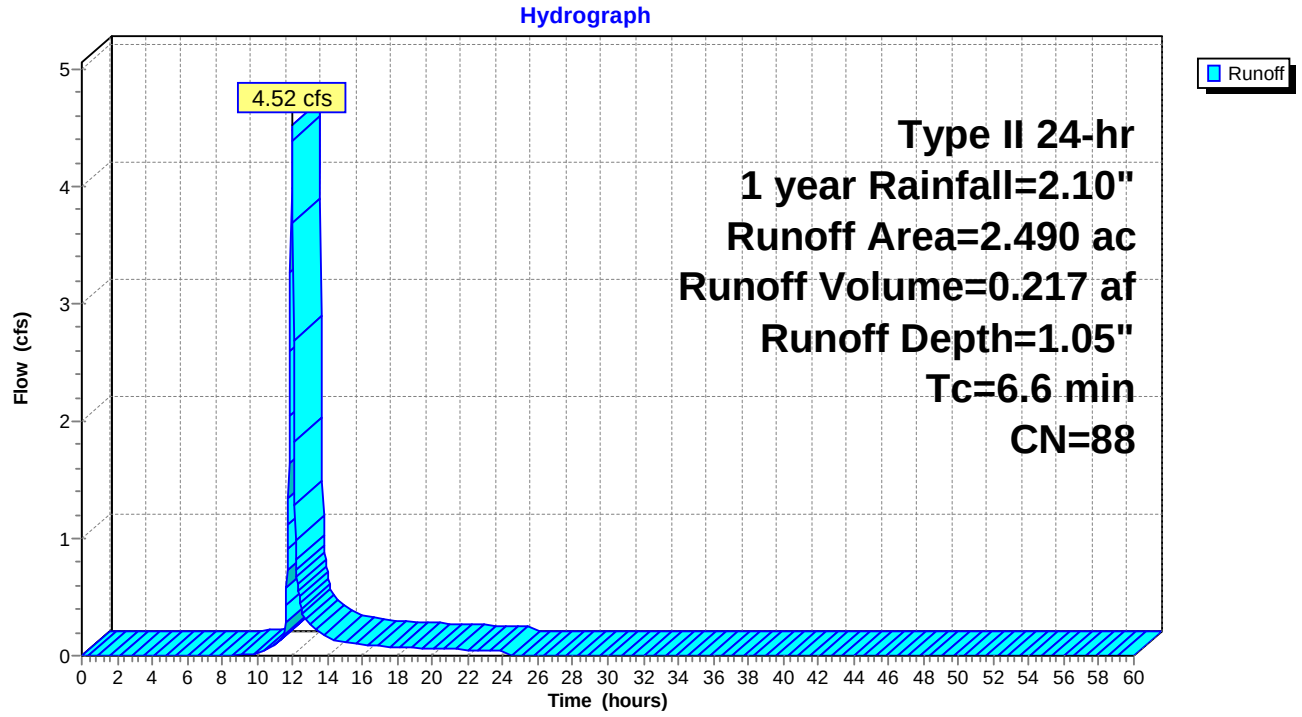
Runoff = 4.52 cfs @ 11.98 hrs, Volume= 0.217 af, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	2.490	88	
	2.490		100.00% Pervious Area

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

Subcatchment 15S: area 1



Summary for Subcatchment 33S: Planeta

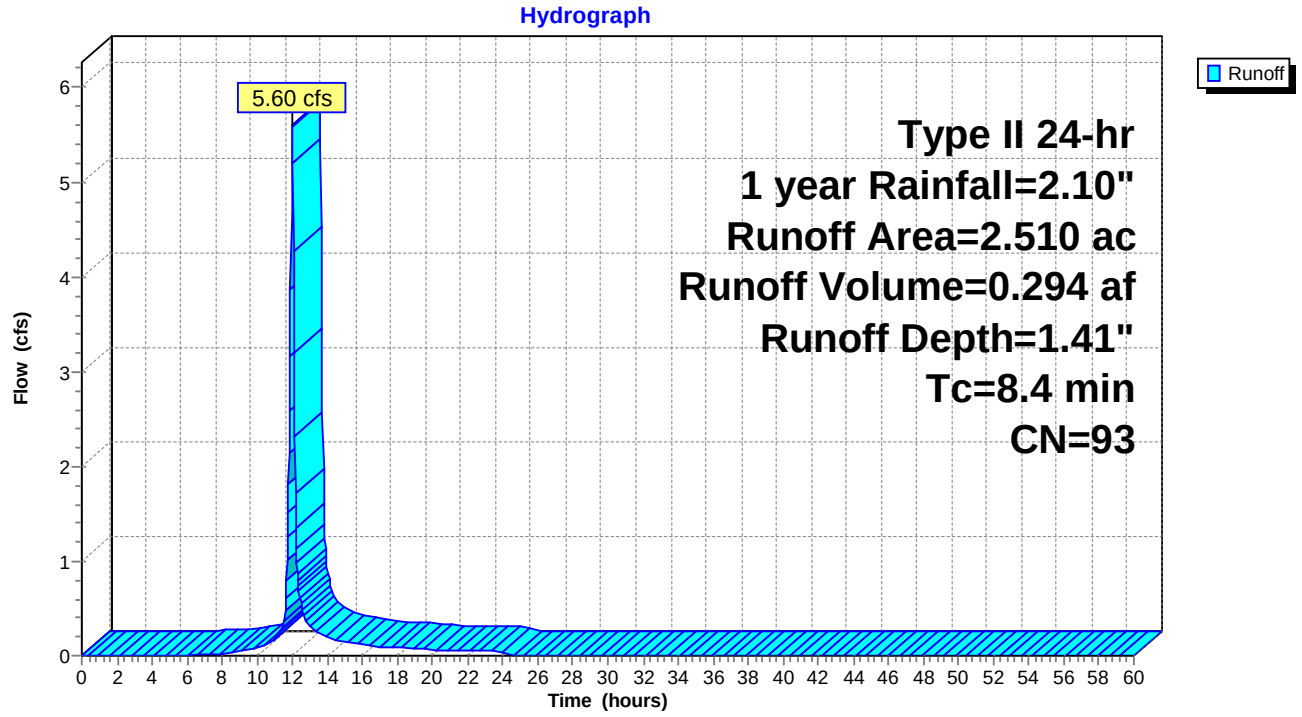
Runoff = 5.60 cfs @ 12.00 hrs, Volume= 0.294 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type II 24-hr 1 year Rainfall=2.10"

	Area (ac)	CN	Description
*	2.510	93	
	2.510		100.00% Pervious Area

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

Subcatchment 33S: Planeta



Summary for Pond 2P: CPv

Inflow Area = 1.720 ac, 0.00% Impervious, Inflow Depth = 1.18" for 1 year event
Inflow = 2.43 cfs @ 12.10 hrs, Volume= 0.169 af
Outflow = 0.01 cfs @ 24.33 hrs, Volume= 0.034 af, Atten= 100%, Lag= 733.9 min
Primary = 0.01 cfs @ 24.33 hrs, Volume= 0.034 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 480.94' @ 24.33 hrs Surf.Area= 0.170 ac Storage= 0.160 af

Plug-Flow detention time= 1,457.8 min calculated for 0.034 af (20% of inflow)
Center-of-Mass det. time= 1,315.9 min (2,147.7 - 831.7)

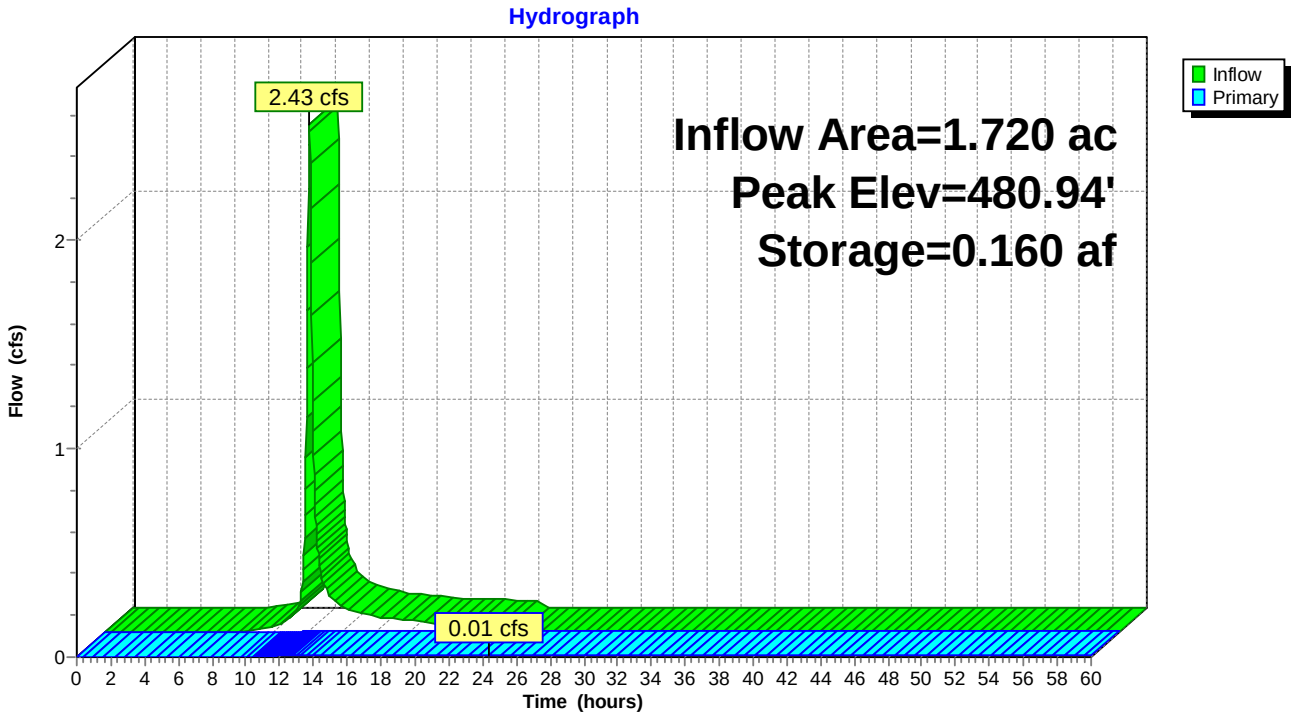
Volume	Invert	Avail.Storage	Storage Description
#1	480.00'	0.340 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
480.00	0.170	0.000	0.000
481.00	0.170	0.170	0.170
482.00	0.170	0.170	0.340

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**1.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0500 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.01 sf
#2	Primary	481.00'	**5.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.01 cfs @ 24.33 hrs HW=480.94' (Free Discharge)
1=Culvert (Barrel Controls 0.01 cfs @ 1.62 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: CPv


Hydrograph
Inflow
Primary
2.43 cfs
0.01 cfs
Inflow Area=1.720 ac
Peak Elev=480.94'
Storage=0.160 af
Flow (cfs)
0
1
2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
Time (hours)

Summary for Pond 4P: CPv

Inflow Area = 2.510 ac, 0.00% Impervious, Inflow Depth = 1.41" for 1 year event
Inflow = 5.60 cfs @ 12.00 hrs, Volume= 0.294 af
Outflow = 0.05 cfs @ 24.03 hrs, Volume= 0.192 af, Atten= 99%, Lag= 721.8 min
Primary = 0.05 cfs @ 24.03 hrs, Volume= 0.192 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 480.96' @ 24.03 hrs Surf.Area= 0.250 ac Storage= 0.240 af

Plug-Flow detention time= 1,374.0 min calculated for 0.192 af (65% of inflow)
Center-of-Mass det. time= 1,271.4 min (2,078.7 - 807.3)

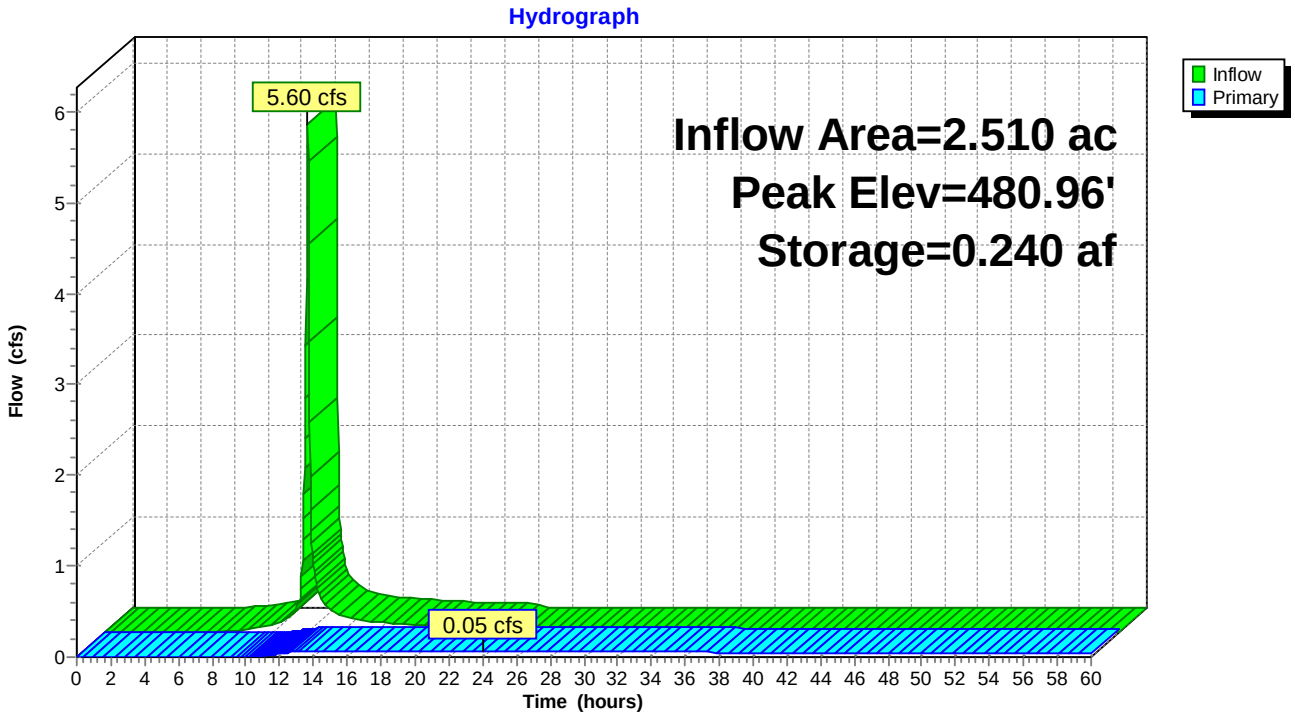
Volume	Invert	Avail.Storage	Storage Description
#1	480.00'	0.500 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
480.00	0.250	0.000	0.000
481.00	0.250	0.250	0.250
482.00	0.250	0.250	0.500

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**2.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0500 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.02 sf
#2	Primary	481.00'	**5.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.05 cfs @ 24.03 hrs HW=480.96' (Free Discharge)
1=Culvert (Barrel Controls 0.05 cfs @ 2.43 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: CPv


Hydrograph
Inflow
Primary
5.60 cfs
0.05 cfs
Inflow Area=2.510 ac
Peak Elev=480.96'
Storage=0.240 af
Flow (cfs)
0
1
2
3
4
5
6
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
Time (hours)

Summary for Pond 5P: CPv Pond

Inflow Area = 192.287 ac, 5.86% Impervious, Inflow Depth > 0.45" for 1 year event
Inflow = 47.38 cfs @ 12.24 hrs, Volume= 7.150 af
Outflow = 8.03 cfs @ 13.76 hrs, Volume= 4.734 af, Atten= 83%, Lag= 91.2 min
Primary = 8.03 cfs @ 13.76 hrs, Volume= 4.734 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 461.19' @ 13.76 hrs Surf.Area= 2.400 ac Storage= 2.866 af

Plug-Flow detention time= 418.4 min calculated for 4.732 af (66% of inflow)
Center-of-Mass det. time= 197.4 min (1,220.5 - 1,023.1)

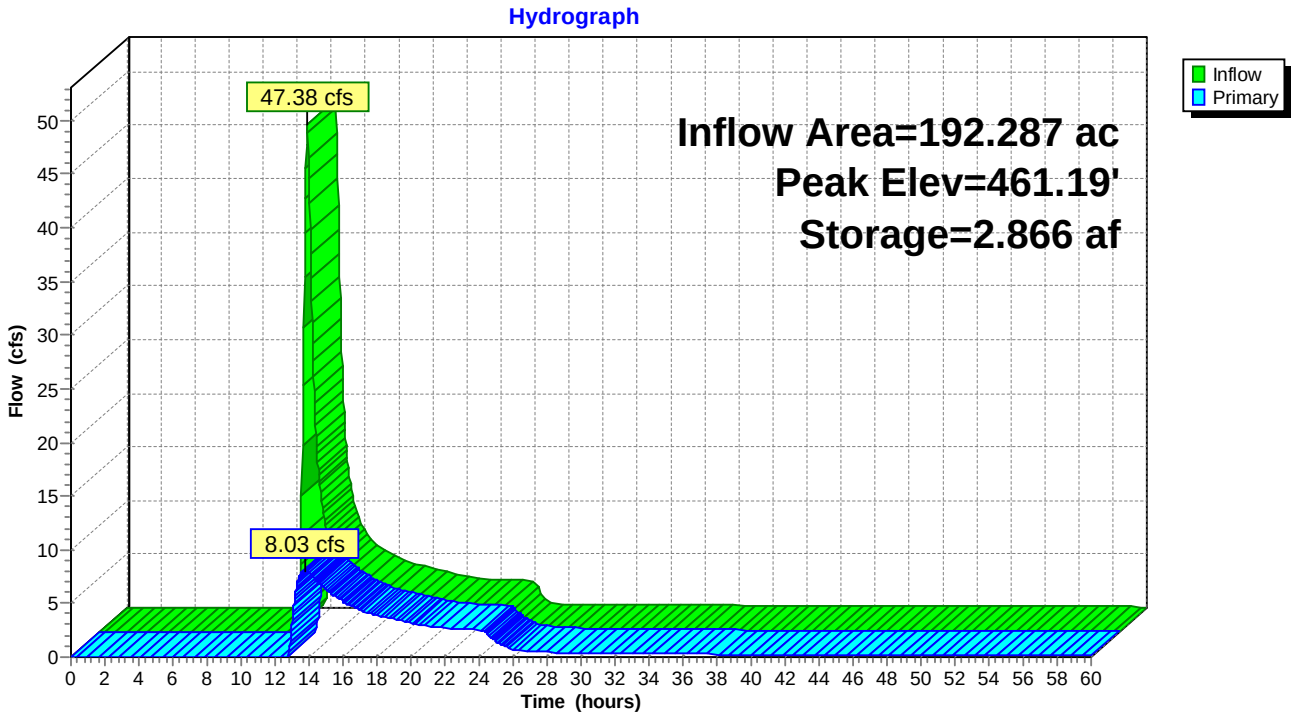
Volume	Invert	Avail.Storage	Storage Description
#1	460.00'	4.800 af	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 0.3

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
460.00	8.000	0.000	0.000
461.00	8.000	8.000	8.000
462.00	8.000	8.000	16.000

Device	Routing	Invert	Outlet Devices
#1	Primary	460.00'	**18.0" Round Culvert X 0.00** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 460.00' / 460.00' S= 0.0000 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.77 sf
#2	Primary	461.00'	**40.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=8.02 cfs @ 13.76 hrs HW=461.19' (Free Discharge)
1=Culvert (Controls 0.00 cfs)
2=Broad-Crested Rectangular Weir (Weir Controls 8.02 cfs @ 1.03 fps)

Pond 5P: CPv Pond



Summary for Pond 16P: CPv

Inflow Area = 9.640 ac, 0.00% Impervious, Inflow Depth = 0.98" for 1 year event
Inflow = 13.22 cfs @ 11.98 hrs, Volume= 0.789 af
Outflow = 0.37 cfs @ 16.05 hrs, Volume= 0.738 af, Atten= 97%, Lag= 244.1 min
Primary = 0.37 cfs @ 16.05 hrs, Volume= 0.738 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 480.93' @ 16.05 hrs Surf.Area= 0.550 ac Storage= 0.510 af

Plug-Flow detention time= 792.3 min calculated for 0.738 af (93% of inflow)
Center-of-Mass det. time= 756.7 min (1,594.3 - 837.6)

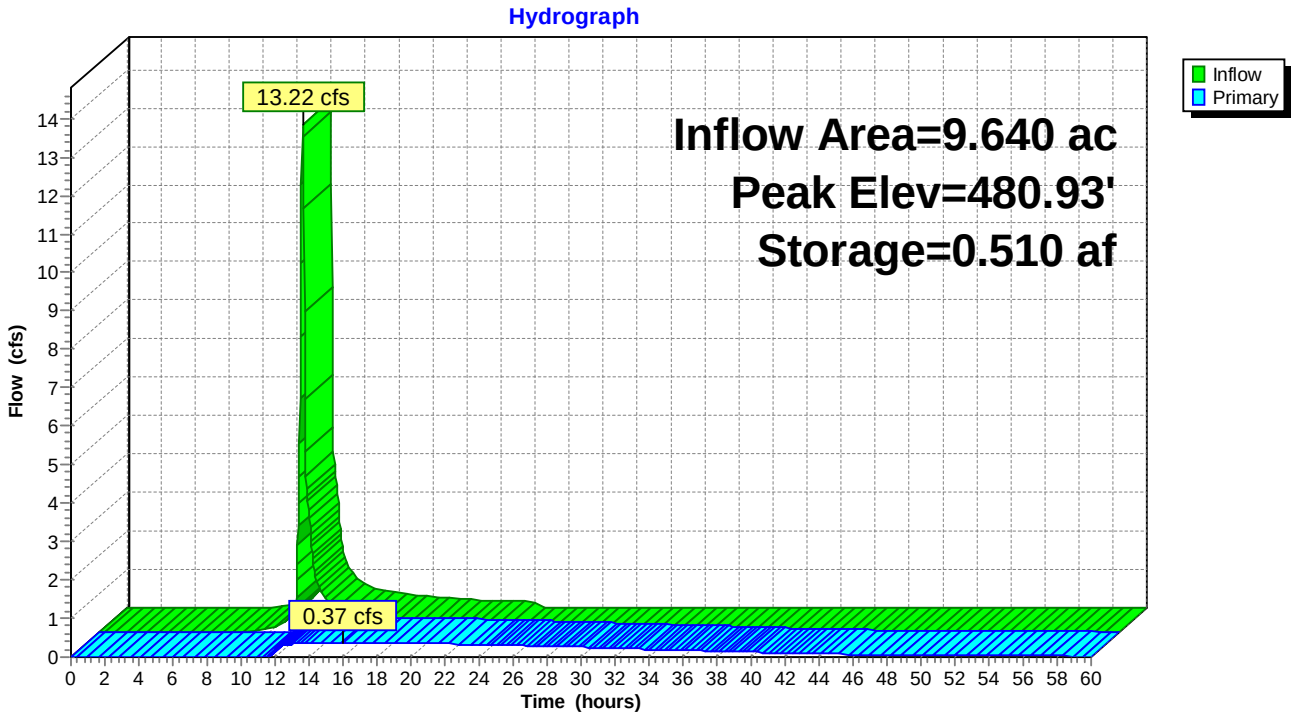
Volume	Invert	Avail.Storage	Storage Description
#1	480.00'	1.100 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
480.00	0.550	0.000	0.000
481.00	0.550	0.550	0.550
482.00	0.550	0.550	1.100

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**4.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 478.50' S= 0.1500 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.09 sf
#2	Primary	481.00'	**5.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.37 cfs @ 16.05 hrs HW=480.93' (Free Discharge)
1=Culvert (Inlet Controls 0.37 cfs @ 4.20 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 16P: CPv


Hydrograph
13.22 cfs
0.37 cfs
Inflow Area=9.640 ac
Peak Elev=480.93'
Storage=0.510 af
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60

Summary for Pond 20P: VTrans Median A CPv Pond

Inflow Area = 1.285 ac, 22.18% Impervious, Inflow Depth = 0.50" for 1 year event
Inflow = 1.03 cfs @ 12.00 hrs, Volume= 0.054 af
Outflow = 0.01 cfs @ 24.12 hrs, Volume= 0.025 af, Atten= 99%, Lag= 727.1 min
Primary = 0.01 cfs @ 24.12 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 470.87' @ 24.12 hrs Surf.Area= 4,824 sf Storage= 2,067 cf

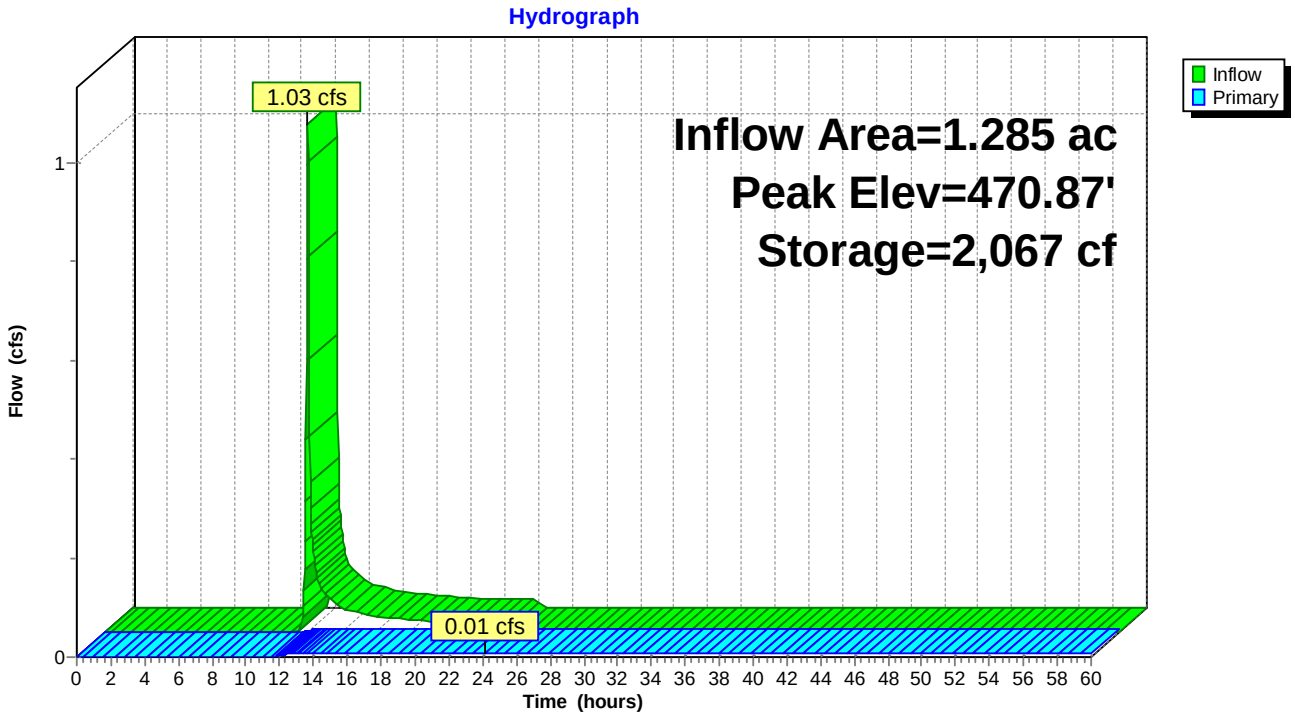
Plug-Flow detention time= 1,414.3 min calculated for 0.025 af (46% of inflow)
Center-of-Mass det. time= 1,261.8 min (2,140.6 - 878.7)

Volume	Invert	Avail.Storage	Storage Description
#1	470.00'	6,300 cf	**386.00'L x 1.50'H Prismatoid Z=7.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	470.00'	**1.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 470.00' / 470.00' S= 0.0000 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.01 sf
#2	Primary	471.50'	**5.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.01 cfs @ 24.12 hrs HW=470.87' (Free Discharge)
1=Culvert (Barrel Controls 0.01 cfs @ 1.23 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 20P: VTrans Median A CPv Pond



Summary for Pond 32P: Vtrans Median B CPv Pond

Inflow Area = 0.727 ac, 27.10% Impervious, Inflow Depth = 0.54" for 1 year event
Inflow = 0.74 cfs @ 11.95 hrs, Volume= 0.033 af
Outflow = 0.01 cfs @ 24.04 hrs, Volume= 0.023 af, Atten= 99%, Lag= 725.3 min
Primary = 0.01 cfs @ 24.04 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 470.79' @ 24.04 hrs Surf.Area= 2,961 sf Storage= 1,160 cf

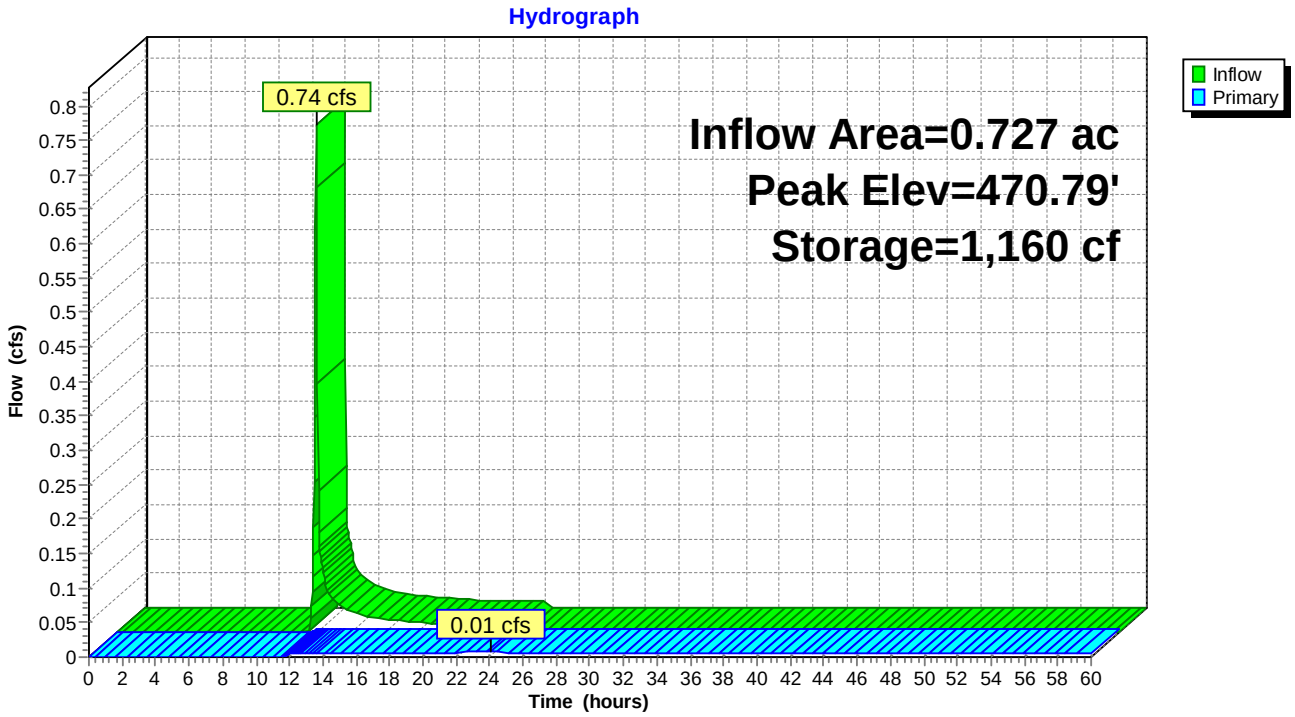
Plug-Flow detention time= 1,345.7 min calculated for 0.023 af (70% of inflow)
Center-of-Mass det. time= 1,230.2 min (2,100.9 - 870.7)

Volume	Invert	Avail.Storage	Storage Description
#1	470.00'	4,237 cf	**255.00'L x 1.50'H Prismatoid Z=7.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	470.00'	**1.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 470.00' / 470.00' S= 0.0000 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.01 sf
#2	Primary	471.50'	**5.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.01 cfs @ 24.04 hrs HW=470.79' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.01 cfs @ 1.17 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 32P: Vtrans Median B CPv Pond



WILLISTON PARCEL: TOWN OFFICES FIELD

ACCESS CONNECTION TO TOWN EASEMENT

APPROXIMATE LOCATION OF EXISTING EASEMENT

TRUE

TRA1

TRA2

PT A

UPLAND

APPROXIMATE SOLAR PANEL LOCATION

TEMPORARY ACCESS ROUTE

WETLAND B

TBM
R.R. SPIKE IN 8" PINE
EL. = 541.86

BMP POND B
REFER TO SHEET ###

CONTOURS WITHIN THIS BOUNDARY ARE BASED ON TOPOGRAPHIC SURVEY BY DUBOIS & KING. CONTOURS OUTSIDE THIS BOUNDARY ARE BASED ON LIDAR DOWNLOAD FROM THE VERMONT CENTER FOR GEOGRAPHIC INFORMATION

50' WETLAND BUFFER (TYP.)

18" RCP CULVERT
INV. EL. = 565.98

18" RCP CULVERT
INV. EL. = 553.96

TBM
R.R. SPIKE IN 10" POPLAR
EL. = 540.94

PT B

BMP POND A
REFER TO SHEET ###

WETLAND A

WETLAND C

TRB2

TRB

1' STREAM

18" RCP CULVERT
INV. EL. = 546.32

SCALE IN FEET
50 0 25 50 100 200

90% CD SUBMITTAL
10-26-2016
WITHOUT ACCESS ROAD

I:\423214L Williston Town Field Stormwater\dwg\423214L_SP_01B.dwg 10/25/2016 11:37 AM

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PROFESSIONAL SEAL

NOT FOR CONSTRUCTION PRELIMINARY PLANS

NO.	DATE	DESCRIPTION	BY	CK'D

TOWN OF WILLISTON

WILLISTON, VERMONT 05495

TOWN FIELDS

STORMWATER FRP SYSTEM

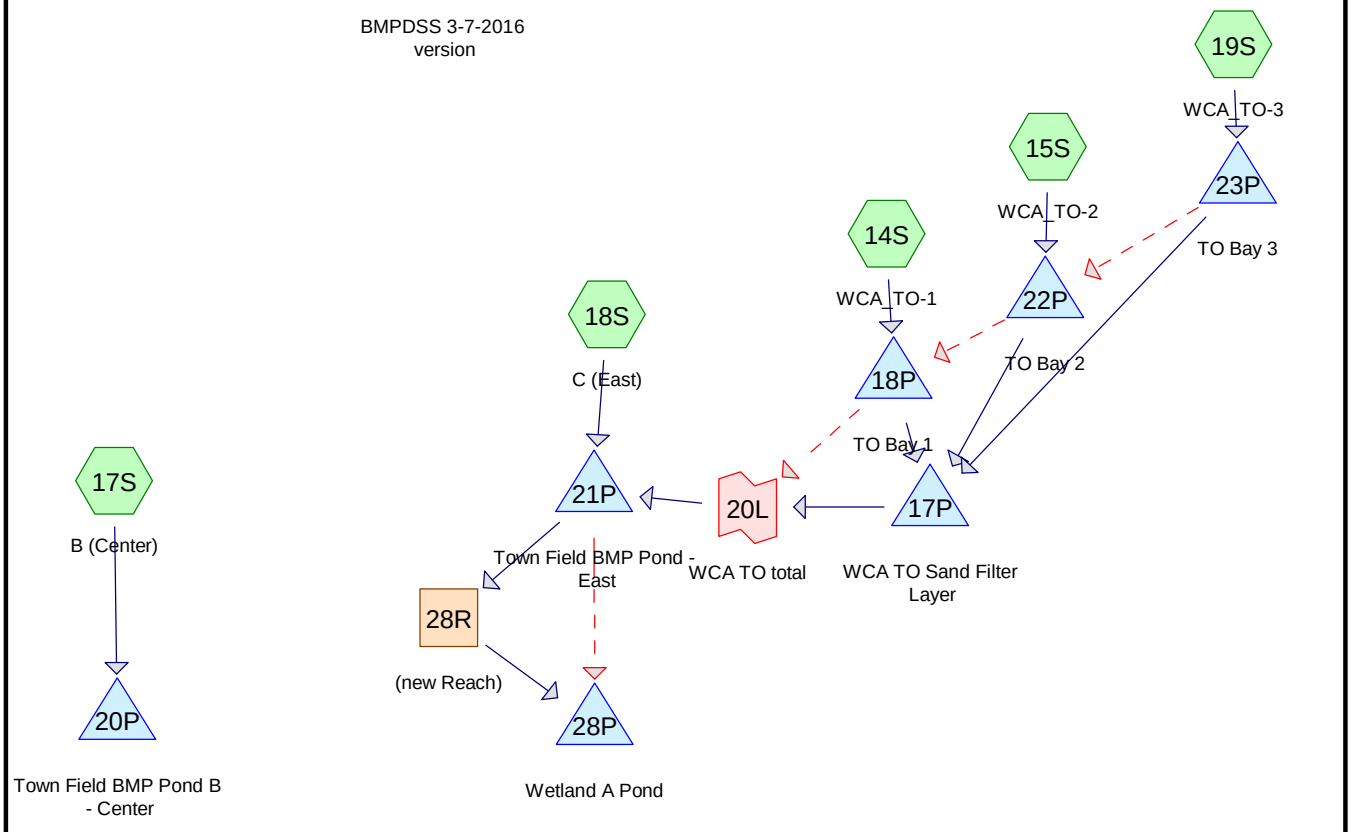
SHEET TITLE

PROPOSED OVERALL SITE PLAN

DRAWN BY	DATE
TJD	OCT. 2016
CHECKED BY	D&K PROJECT #
LDC	423214
PROJ. ENG.	D&K ARCHIVE #
LDC	

SHEET NUMBER

C-4



Subcat Reach Pond Link

Routing Diagram for TownHall_3Ponds- D&K Edits
Prepared by {enter your company name here}, Printed 11/10/2016

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.041	74	>75% Grass cover, Good, HSG C (14S, 15S, 17S, 18S, 19S)
0.220	80	>75% Grass cover, Good, HSG D (17S)
4.130	98	Paved parking, HSG C (14S, 15S, 17S, 18S, 19S)
27.610	70	Woods, Good, HSG C (17S, 18S)
1.900	77	Woods, Good, HSG D (17S, 18S)
36.901	**74**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
34.781	HSG C	14S, 15S, 17S, 18S, 19S
2.120	HSG D	17S, 18S
0.000	Other	
36.901		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	3.041	0.220	0.000	3.261	>75% Grass cover, Good	14S, 15S, 17S, 18S, 19S
0.000	0.000	4.130	0.000	0.000	4.130	Paved parking	14S, 15S, 17S, 18S, 19S
0.000	0.000	27.610	1.900	0.000	29.510	Woods, Good	17S, 18S
0.000	**0.000**	**34.781**	**2.120**	**0.000**	**36.901**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	28R	542.00	541.75	50.0	0.0050	0.010	15.0	0.0	0.0

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 14S: WCA_TO-1 Runoff Area=0.527 ac 15.56% Impervious Runoff Depth=0.63"
Flow Length=100' Tc=3.4 min CN=WQ Runoff=0.56 cfs 0.028 af

Subcatchment 15S: WCA_TO-2 Runoff Area=0.686 ac 17.78% Impervious Runoff Depth=0.66"
Flow Length=100' Tc=3.4 min CN=WQ Runoff=0.77 cfs 0.038 af

Subcatchment 17S: B (Center) Runoff Area=7.900 ac 17.59% Impervious Runoff Depth=0.61"
Flow Length=3,320' Slope=0.0810 '/' Tc=31.9 min CN=WQ Runoff=3.29 cfs 0.404 af

Subcatchment 18S: C (East) Runoff Area=27.105 ac 8.95% Impervious Runoff Depth=0.43"
Flow Length=3,585' Slope=0.0790 '/' Tc=38.6 min CN=WQ Runoff=6.25 cfs 0.974 af

Subcatchment 19S: WCA_TO-3 Runoff Area=0.683 ac 16.25% Impervious Runoff Depth=0.64"
Flow Length=100' Tc=3.4 min CN=WQ Runoff=0.74 cfs 0.036 af

Reach 28R: (new Reach) Avg. Flow Depth=0.24' Max Vel=2.93 fps Inflow=0.49 cfs 0.932 af
15.0" Round Pipe n=0.010 L=50.0' S=0.0050 '/' Capacity=5.94 cfs Outflow=0.49 cfs 0.932 af

Pond 17P: WCA TO Sand Filter Layer Peak Elev=555.49' Storage=0.022 af Inflow=0.06 cfs 0.102 af
Outflow=0.05 cfs 0.102 af

Pond 18P: TO Bay 1 Peak Elev=556.98' Storage=0.015 af Inflow=0.56 cfs 0.028 af
Primary=0.01 cfs 0.028 af Secondary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.028 af

Pond 20P: Town Field BMP Pond B - Center Peak Elev=545.00' Storage=6,651 cf Inflow=3.29 cfs 0.404 af
Outflow=0.49 cfs 0.404 af

Pond 21P: Town Field BMP Pond - East Peak Elev=543.53' Storage=26,147 cf Inflow=6.28 cfs 1.076 af
Primary=0.49 cfs 0.932 af Secondary=0.00 cfs 0.000 af Outflow=0.49 cfs 0.932 af

Pond 22P: TO Bay 2 Peak Elev=558.85' Storage=0.019 af Inflow=0.77 cfs 0.038 af
Primary=0.02 cfs 0.038 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.038 af

Pond 23P: TO Bay 3 Peak Elev=560.92' Storage=0.019 af Inflow=0.74 cfs 0.036 af
Primary=0.02 cfs 0.036 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.036 af

Pond 28P: Wetland A Pond Peak Elev=542.56' Storage=5,611 cf Inflow=0.49 cfs 0.932 af
Outflow=0.49 cfs 0.932 af

Link 20L: WCA TO total Inflow=0.05 cfs 0.102 af
Primary=0.05 cfs 0.102 af

Total Runoff Area = 36.901 ac Runoff Volume = 1.479 af Average Runoff Depth = 0.48"
88.81% Pervious = 32.771 ac 11.19% Impervious = 4.130 ac

Summary for Subcatchment 14S: WCA_TO-1

[49] Hint: Tc<2dt may require smaller dt

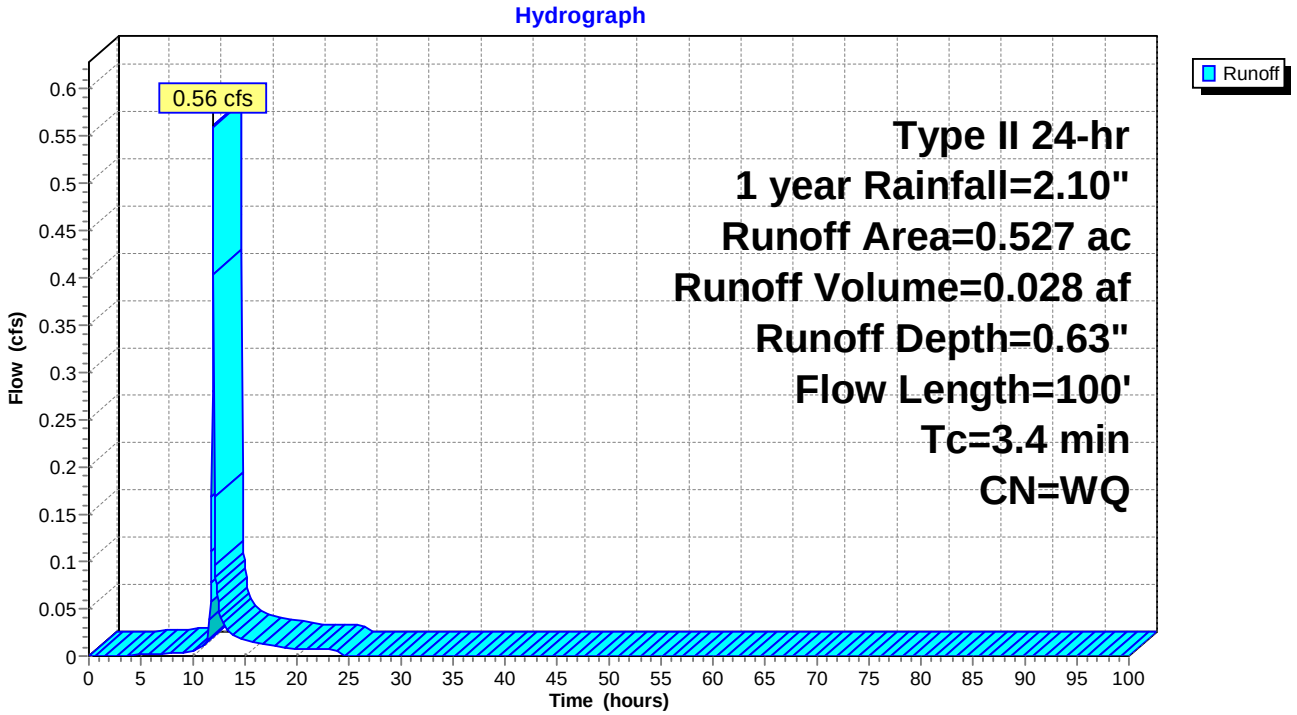
Runoff = 0.56 cfs @ 11.95 hrs, Volume= 0.028 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.445	74	>75% Grass cover, Good, HSG C
0.082	98	Paved parking, HSG C
0.527		Weighted Average
0.445		84.44% Pervious Area
0.082		15.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	57	0.0300	1.20		**Sheet Flow, WCA_4-1** Smooth Surfaces n= 0.011 P2= 2.20"
2.6	43	0.4100	0.27		**Sheet Flow, WCA_4-2** Grass: Dense n= 0.240 P2= 2.20"
3.4	100	Total			

Subcatchment 14S: WCA_TO-1



Summary for Subcatchment 15S: WCA_TO-2

[49] Hint: Tc<2dt may require smaller dt

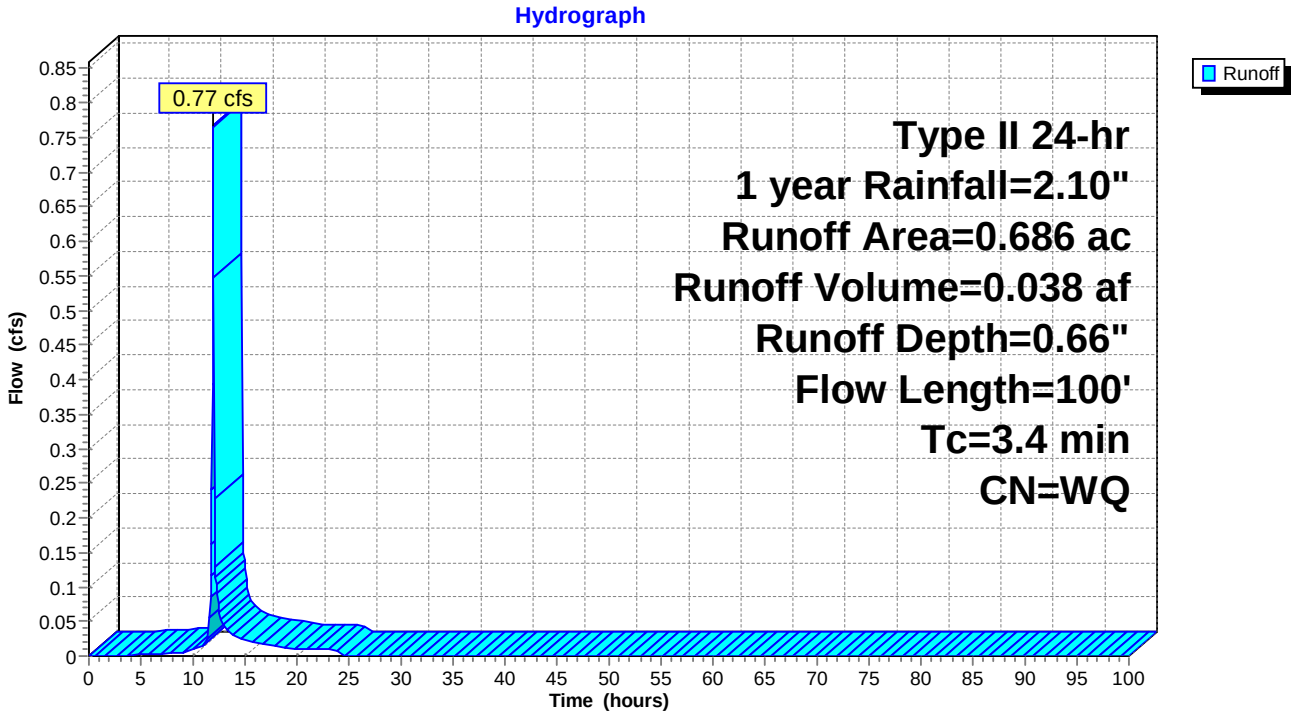
Runoff = 0.77 cfs @ 11.95 hrs, Volume= 0.038 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.564	74	>75% Grass cover, Good, HSG C
0.122	98	Paved parking, HSG C
0.686		Weighted Average
0.564		82.22% Pervious Area
0.122		17.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	57	0.0300	1.20		**Sheet Flow, WCA_4-1** Smooth surfaces n= 0.011 P2= 2.20"
2.6	43	0.4100	0.27		**Sheet Flow, WCA_4-2** Grass: Dense n= 0.240 P2= 2.20"
3.4	100	Total			

Subcatchment 15S: WCA_TO-2



Summary for Subcatchment 17S: B (Center)

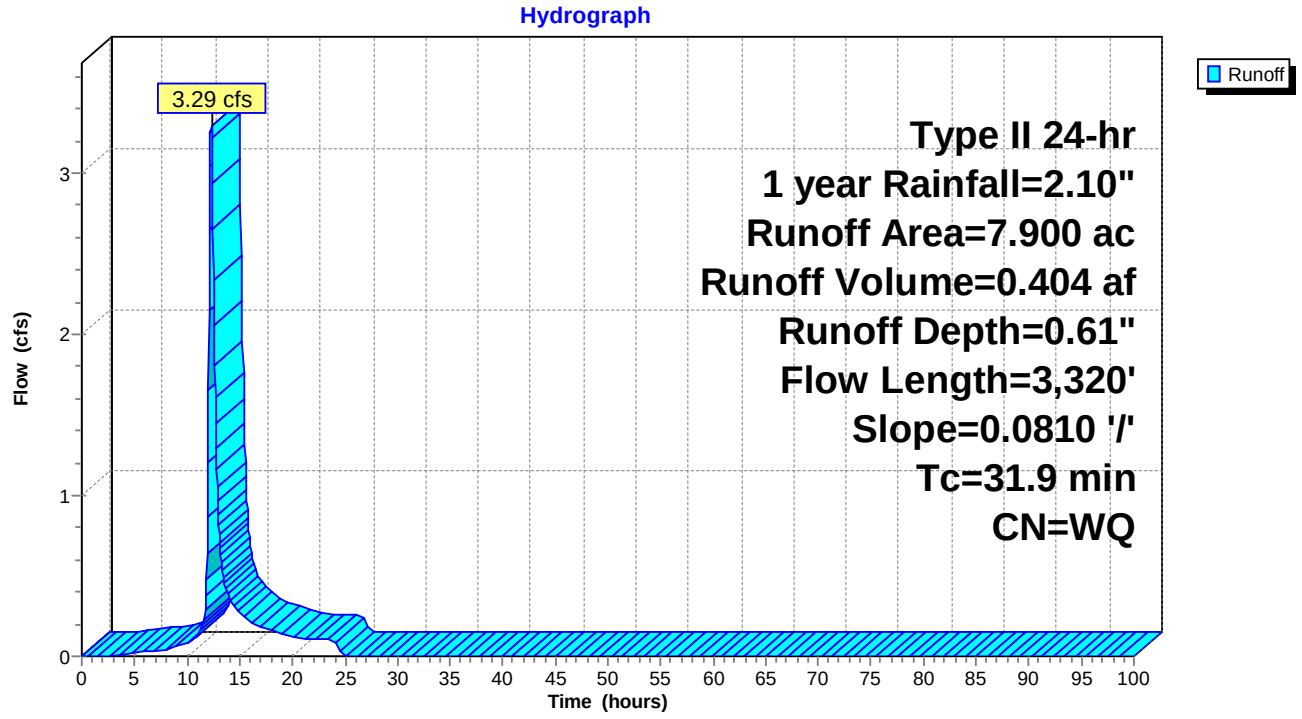
Runoff = 3.29 cfs @ 12.28 hrs, Volume= 0.404 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
1.390	98	Paved parking, HSG C
0.220	80	>75% Grass cover, Good, HSG D
0.450	74	>75% Grass cover, Good, HSG C
1.300	77	Woods, Good, HSG D
4.540	70	Woods, Good, HSG C
7.900		Weighted Average
6.510		82.41% Pervious Area
1.390		17.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.9	3,320	0.0810	1.73		**Lag/CN Method,**

Subcatchment 17S: B (Center)



Summary for Subcatchment 18S: C (East)

Areas lowered based on drainage to VTrans BMP

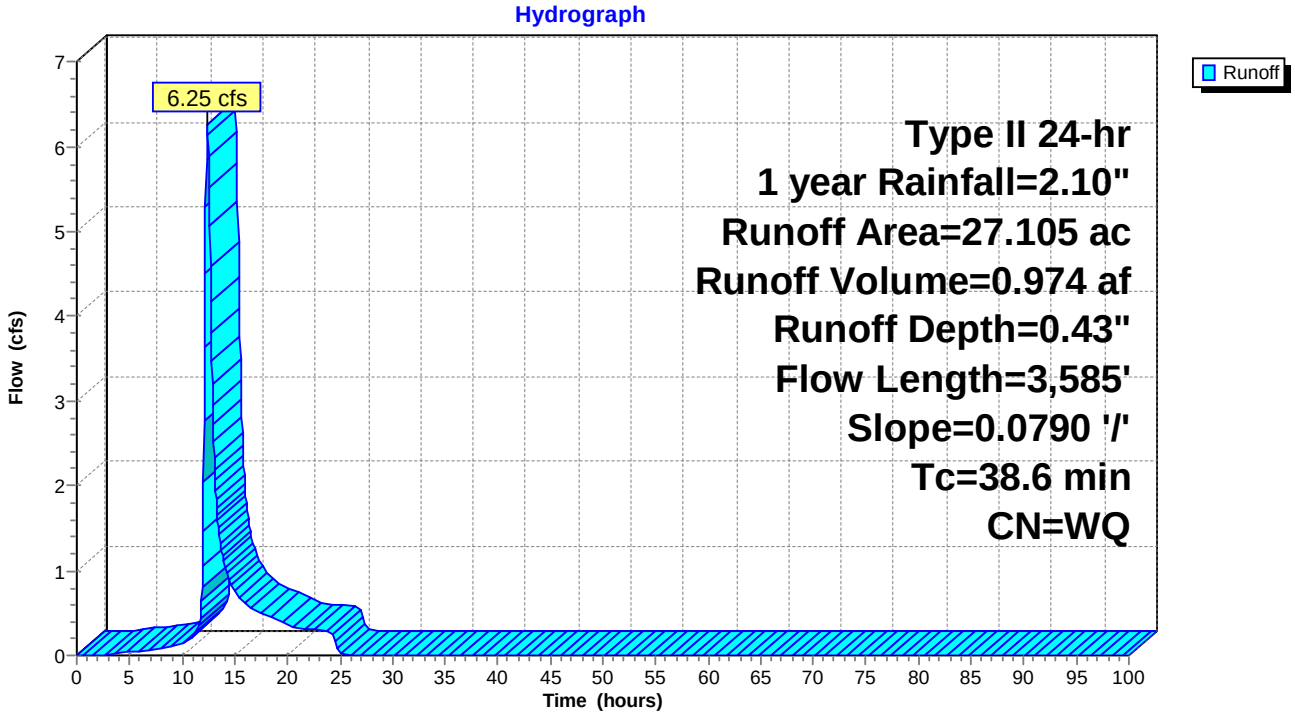
Runoff = 6.25 cfs @ 12.40 hrs, Volume= 0.974 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
2.425	98	Paved parking, HSG C
1.010	74	>75% Grass cover, Good, HSG C
0.600	77	Woods, Good, HSG D
23.070	70	Woods, Good, HSG C
27.105		Weighted Average
24.680		91.05% Pervious Area
2.425		8.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.6	3,585	0.0790	1.55		**Lag/CN Method,**

Subcatchment 18S: C (East)



Summary for Subcatchment 19S: WCA_TO-3

[49] Hint: Tc<2dt may require smaller dt

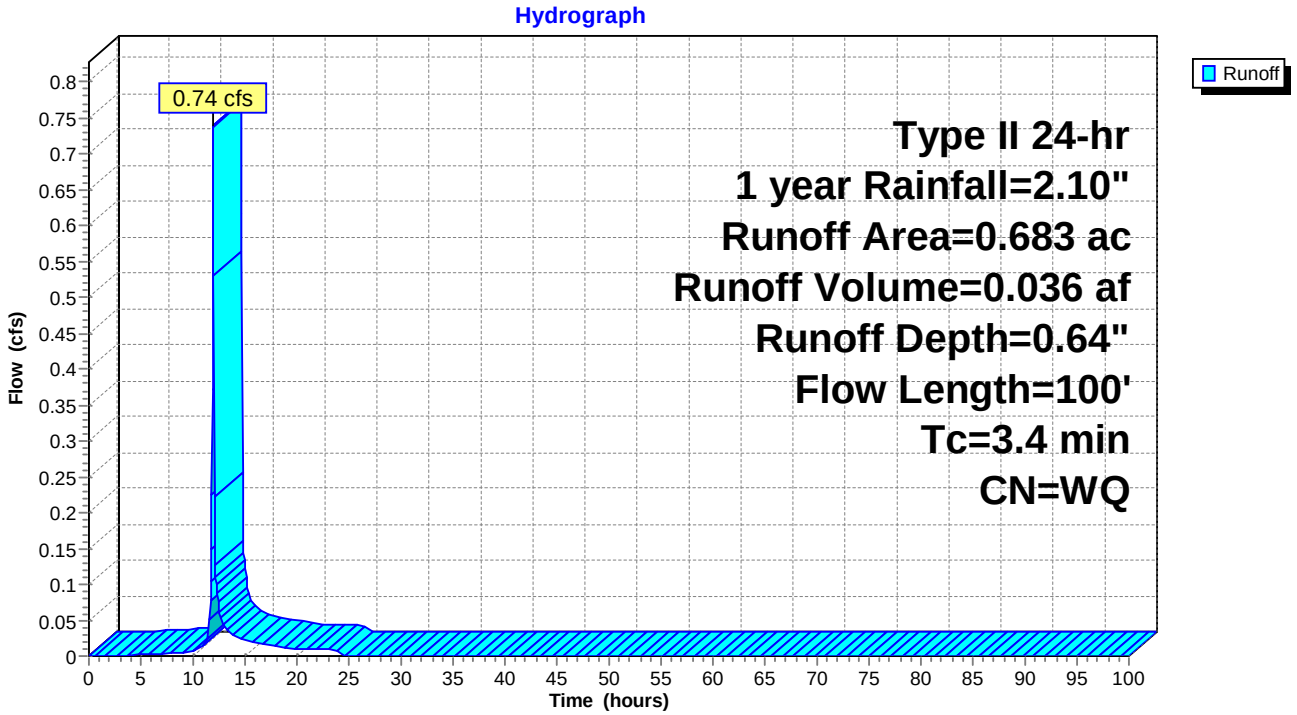
Runoff = 0.74 cfs @ 11.95 hrs, Volume= 0.036 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type II 24-hr 1 year Rainfall=2.10"

Area (ac)	CN	Description
0.572	74	>75% Grass cover, Good, HSG C
0.111	98	Paved parking, HSG C
0.683		Weighted Average
0.572		83.75% Pervious Area
0.111		16.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	57	0.0300	1.20		**Sheet Flow, WCA_4-1** Smooth Surfaces n= 0.011 P2= 2.20"
2.6	43	0.4100	0.27		**Sheet Flow, WCA_4-2** Grass: Dense n= 0.240 P2= 2.20"
3.4	100	Total			

Subcatchment 19S: WCA_TO-3



Summary for Reach 28R: (new Reach)

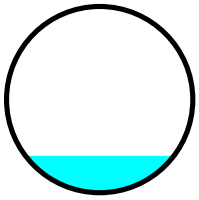
[52] Hint: Inlet/Outlet conditions not evaluated
[79] Warning: Submerged Pond 21P Primary device # 1 by 0.24'

Inflow Area = 29.001 ac, 9.45% Impervious, Inflow Depth > 0.39" for 1 year event
Inflow = 0.49 cfs @ 18.41 hrs, Volume= 0.932 af
Outflow = 0.49 cfs @ 18.41 hrs, Volume= 0.932 af, Atten= 0%, Lag= 0.5 min

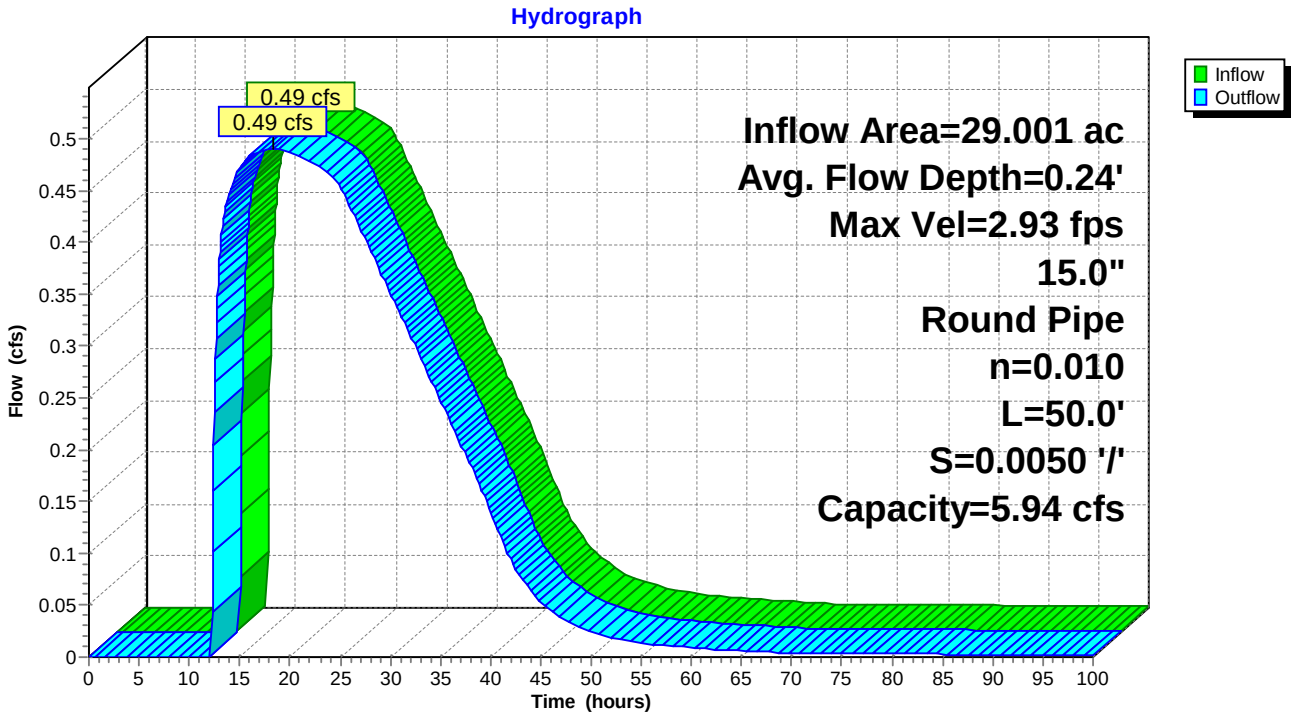
Routing by Stor-Ind+Trans method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.93 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.43 fps, Avg. Travel Time= 0.6 min

Peak Storage= 8 cf @ 18.41 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.94 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 50.0' Slope= 0.0050 '/'
Inlet Invert= 542.00', Outlet Invert= 541.75'



Reach 28R: (new Reach)



Summary for Pond 17P: WCA TO Sand Filter Layer

Inflow Area = 1.896 ac, 16.61% Impervious, Inflow Depth = 0.64" for 1 year event
Inflow = 0.06 cfs @ 11.90 hrs, Volume= 0.102 af
Outflow = 0.05 cfs @ 28.81 hrs, Volume= 0.102 af, Atten= 13%, Lag= 1,014.5 min
Primary = 0.05 cfs @ 28.81 hrs, Volume= 0.102 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 555.49' @ 28.81 hrs Surf.Area= 0.030 ac Storage= 0.022 af

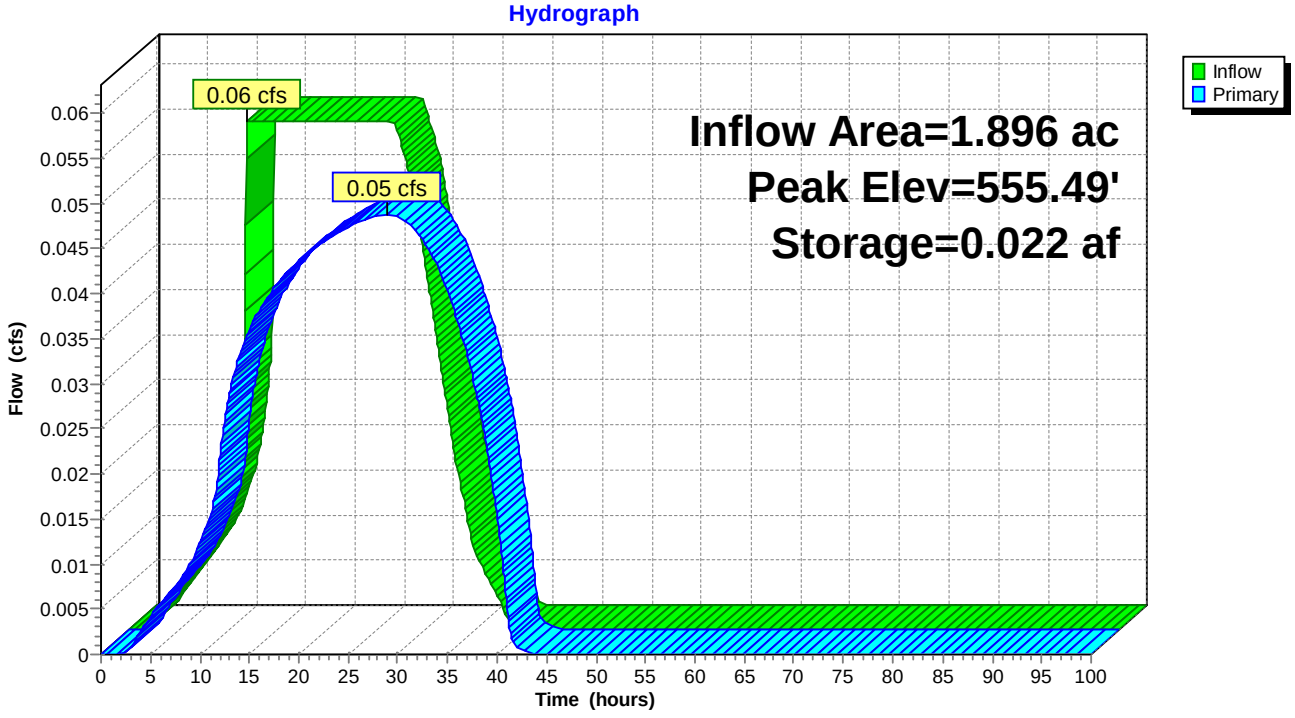
Plug-Flow detention time= 235.3 min calculated for 0.102 af (100% of inflow)
Center-of-Mass det. time= 235.3 min (1,500.4 - 1,265.1)

Volume	Invert	Avail.Storage	Storage Description
#1	552.00'	0.024 af	**1.00'W x 342.00'L x 3.75'H Prismatoid Z=0.4** 0.074 af Overall x 33.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	552.00'	**1.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.05 cfs @ 28.81 hrs HW=555.49' (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.05 cfs @ 8.94 fps)

Pond 17P: WCA TO Sand Filter Layer



Summary for Pond 18P: TO Bay 1

Inflow Area = 0.527 ac, 15.56% Impervious, Inflow Depth = 0.63" for 1 year event
Inflow = 0.56 cfs @ 11.95 hrs, Volume= 0.028 af
Outflow = 0.01 cfs @ 11.85 hrs, Volume= 0.028 af, Atten= 98%, Lag= 0.0 min
Primary = 0.01 cfs @ 11.85 hrs, Volume= 0.028 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 556.98' @ 16.43 hrs Surf.Area= 0.037 ac Storage= 0.015 af

Plug-Flow detention time= 541.1 min calculated for 0.028 af (100% of inflow)
Center-of-Mass det. time= 541.1 min (1,370.7 - 829.6)

Volume	Invert	Avail.Storage	Storage Description
#1	556.00'	0.083 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

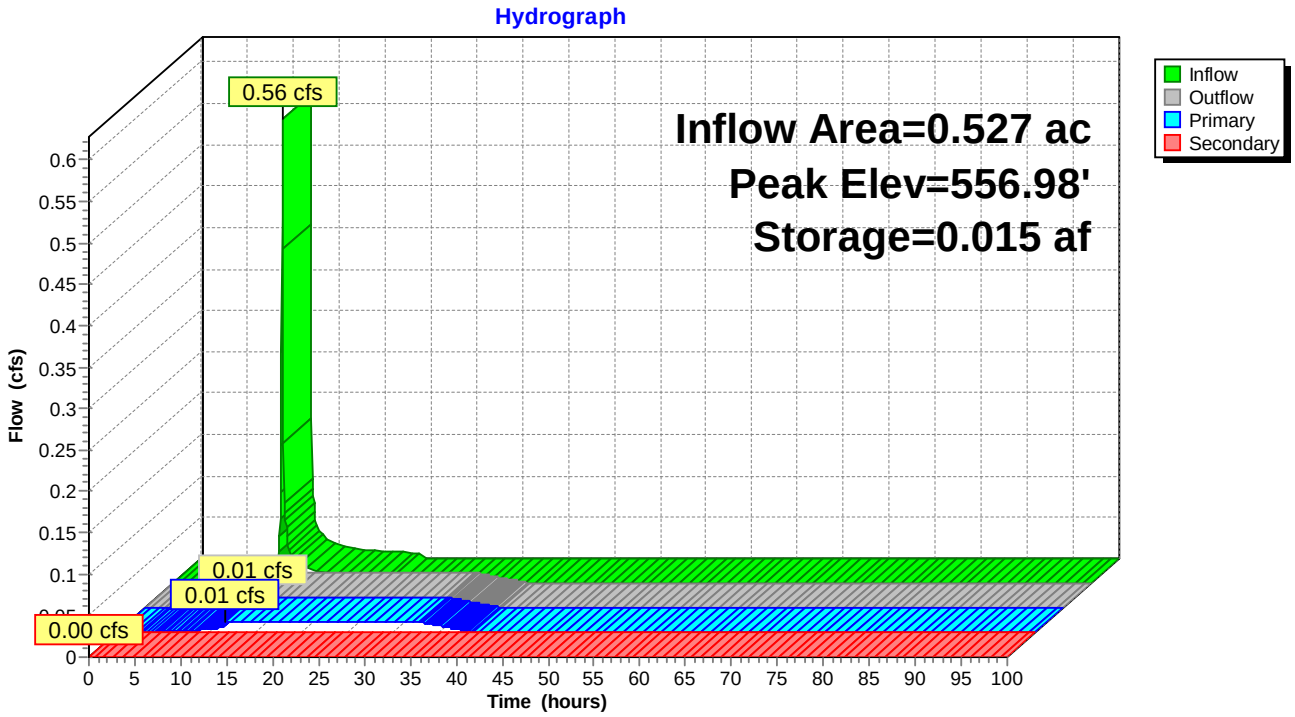
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
556.00	0.000	0.000	0.000
556.50	0.013	0.003	0.003
557.00	0.038	0.013	0.016
557.50	0.067	0.026	0.042
558.00	0.095	0.041	0.083

Device	Routing	Invert	Outlet Devices
#1	Primary	556.00'	**1.000 in/hr Exfiltration over Surface area below 556.50'**
#2	Secondary	557.50'	**47.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.01 cfs @ 11.85 hrs HW=556.50' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=556.00' (Free Discharge)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 18P: TO Bay 1



Summary for Pond 20P: Town Field BMP Pond B - Center

Inflow Area = 7.900 ac, 17.59% Impervious, Inflow Depth = 0.61" for 1 year event
Inflow = 3.29 cfs @ 12.28 hrs, Volume= 0.404 af
Outflow = 0.49 cfs @ 13.48 hrs, Volume= 0.404 af, Atten= 85%, Lag= 71.8 min
Primary = 0.49 cfs @ 13.48 hrs, Volume= 0.404 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 545.00' @ 13.48 hrs Surf.Area= 3,461 sf Storage= 6,651 cf

Plug-Flow detention time= 136.5 min calculated for 0.403 af (100% of inflow)
Center-of-Mass det. time= 136.4 min (986.4 - 850.0)

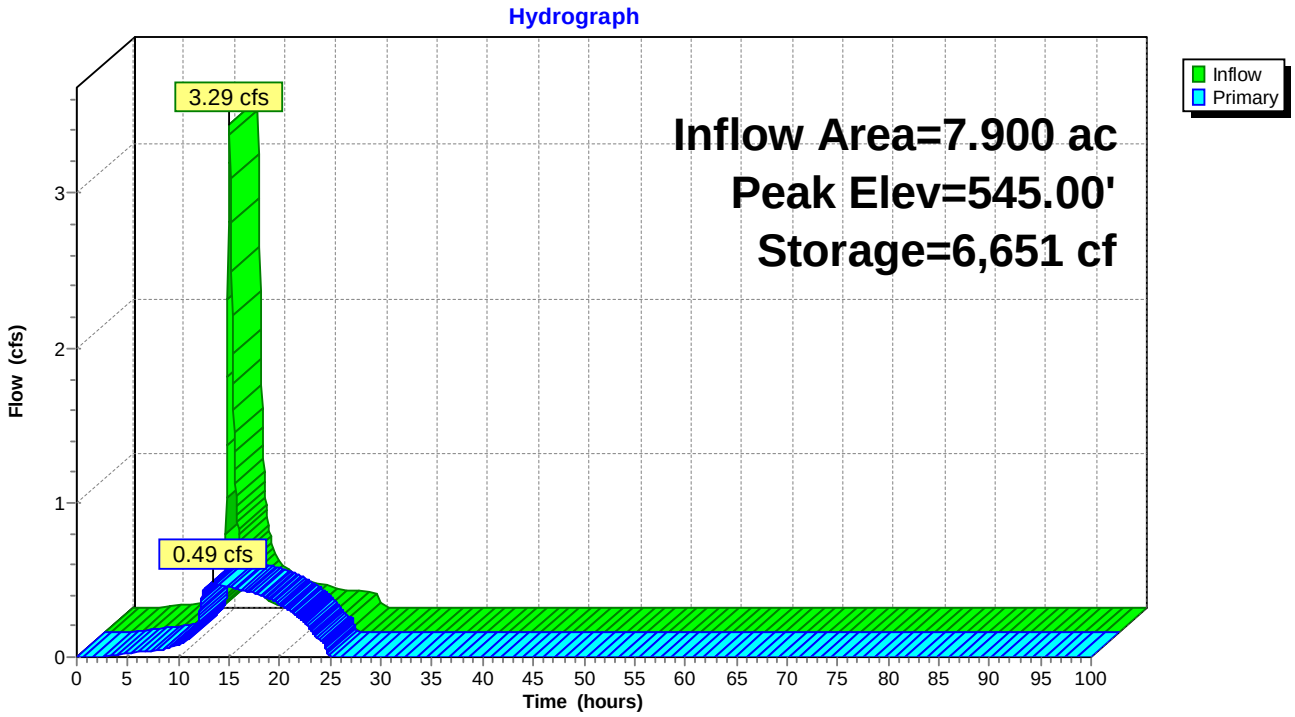
Volume	Invert	Avail.Storage	Storage Description
#1	541.00'	10,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
541.00	0	0	0
542.00	725	363	363
546.00	4,367	10,184	10,547

Device	Routing	Invert	Outlet Devices
#1	Primary	541.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	545.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#3	Primary	545.50'	**40.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.47 cfs @ 13.48 hrs HW=545.00' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.47 cfs @ 9.48 fps)
- **2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.22 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 20P: Town Field BMP Pond B - Center



Summary for Pond 21P: Town Field BMP Pond - East

Inflow Area = 29.001 ac, 9.45% Impervious, Inflow Depth = 0.45" for 1 year event
Inflow = 6.28 cfs @ 12.40 hrs, Volume= 1.076 af
Outflow = 0.49 cfs @ 18.41 hrs, Volume= 0.932 af, Atten= 92%, Lag= 360.5 min
Primary = 0.49 cfs @ 18.41 hrs, Volume= 0.932 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 543.53' @ 18.41 hrs Surf.Area= 14,274 sf Storage= 26,147 cf

Plug-Flow detention time= 727.4 min calculated for 0.932 af (87% of inflow)
Center-of-Mass det. time= 631.9 min (1,574.9 - 943.0)

Volume	Invert	Avail.Storage	Storage Description
#1	541.00'	48,771 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

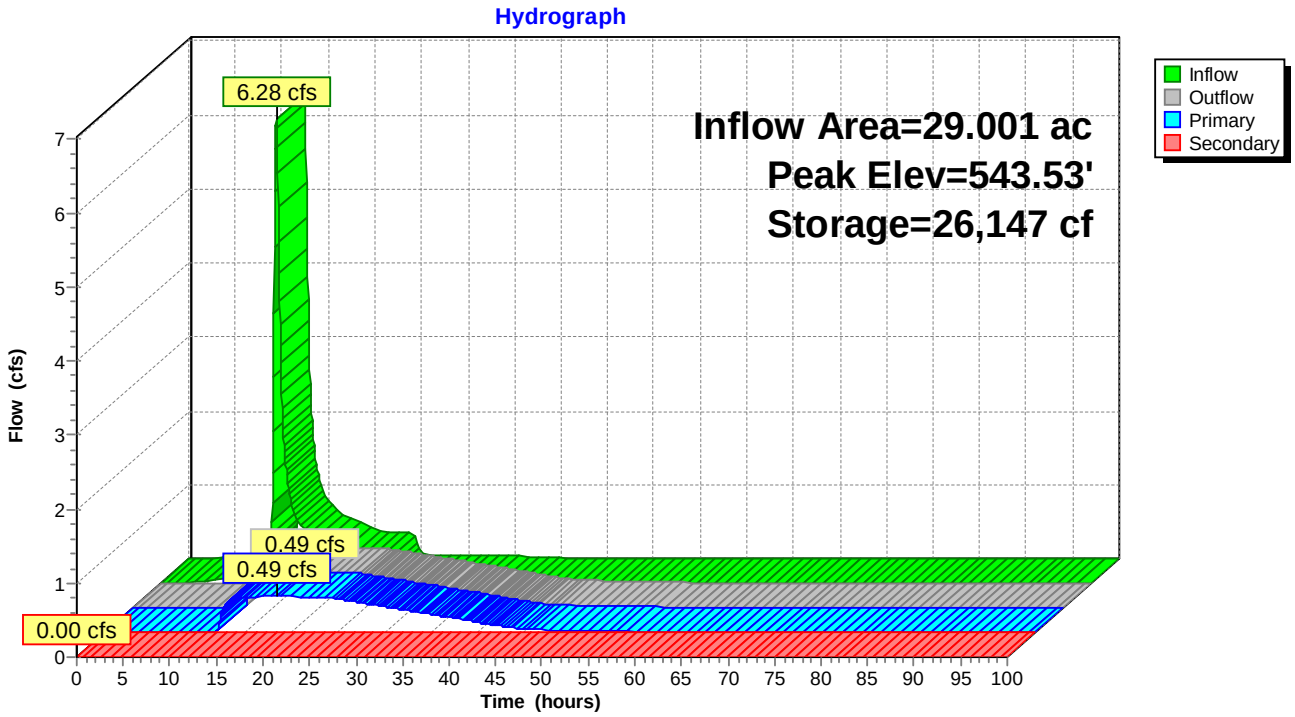
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
541.00	150	0	0
542.00	12,000	6,075	6,075
545.00	16,464	42,696	48,771

Device	Routing	Invert	Outlet Devices
#1	Primary	542.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	543.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#3	Secondary	544.50'	**50.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.49 cfs @ 18.41 hrs HW=543.53' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.49 cfs @ 5.62 fps)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=541.00' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: Town Field BMP Pond - East



Summary for Pond 22P: TO Bay 2

Inflow Area = 0.686 ac, 17.78% Impervious, Inflow Depth = 0.66" for 1 year event
Inflow = 0.77 cfs @ 11.95 hrs, Volume= 0.038 af
Outflow = 0.02 cfs @ 11.90 hrs, Volume= 0.038 af, Atten= 97%, Lag= 0.0 min
Primary = 0.02 cfs @ 11.90 hrs, Volume= 0.038 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 558.85' @ 14.91 hrs Surf.Area= 0.052 ac Storage= 0.019 af

Plug-Flow detention time= 372.7 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 372.8 min (1,197.2 - 824.4)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	0.136 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

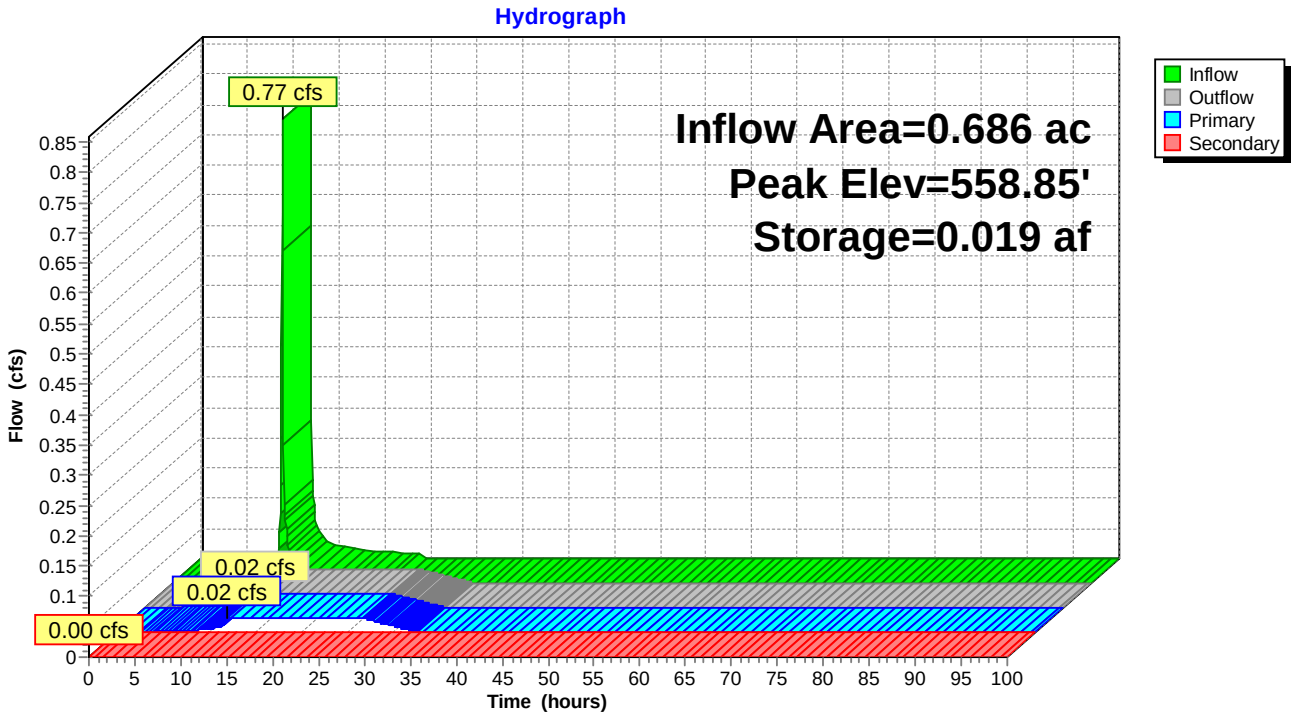
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
558.00	0.000	0.000	0.000
558.50	0.023	0.006	0.006
559.00	0.065	0.022	0.028
559.50	0.107	0.043	0.071
560.00	0.155	0.065	0.136

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**1.000 in/hr Exfiltration over Surface area below 558.50'**
#2	Secondary	559.50'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.02 cfs @ 11.90 hrs HW=558.53' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' (Free Discharge)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 22P: TO Bay 2



Summary for Pond 23P: TO Bay 3

Inflow Area = 0.683 ac, 16.25% Impervious, Inflow Depth = 0.64" for 1 year event
Inflow = 0.74 cfs @ 11.95 hrs, Volume= 0.036 af
Outflow = 0.02 cfs @ 11.90 hrs, Volume= 0.036 af, Atten= 97%, Lag= 0.0 min
Primary = 0.02 cfs @ 11.90 hrs, Volume= 0.036 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 560.92' @ 15.46 hrs Surf.Area= 0.046 ac Storage= 0.019 af

Plug-Flow detention time= 427.4 min calculated for 0.036 af (100% of inflow)
Center-of-Mass det. time= 427.5 min (1,255.4 - 827.9)

Volume	Invert	Avail.Storage	Storage Description
#1	560.00'	0.112 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

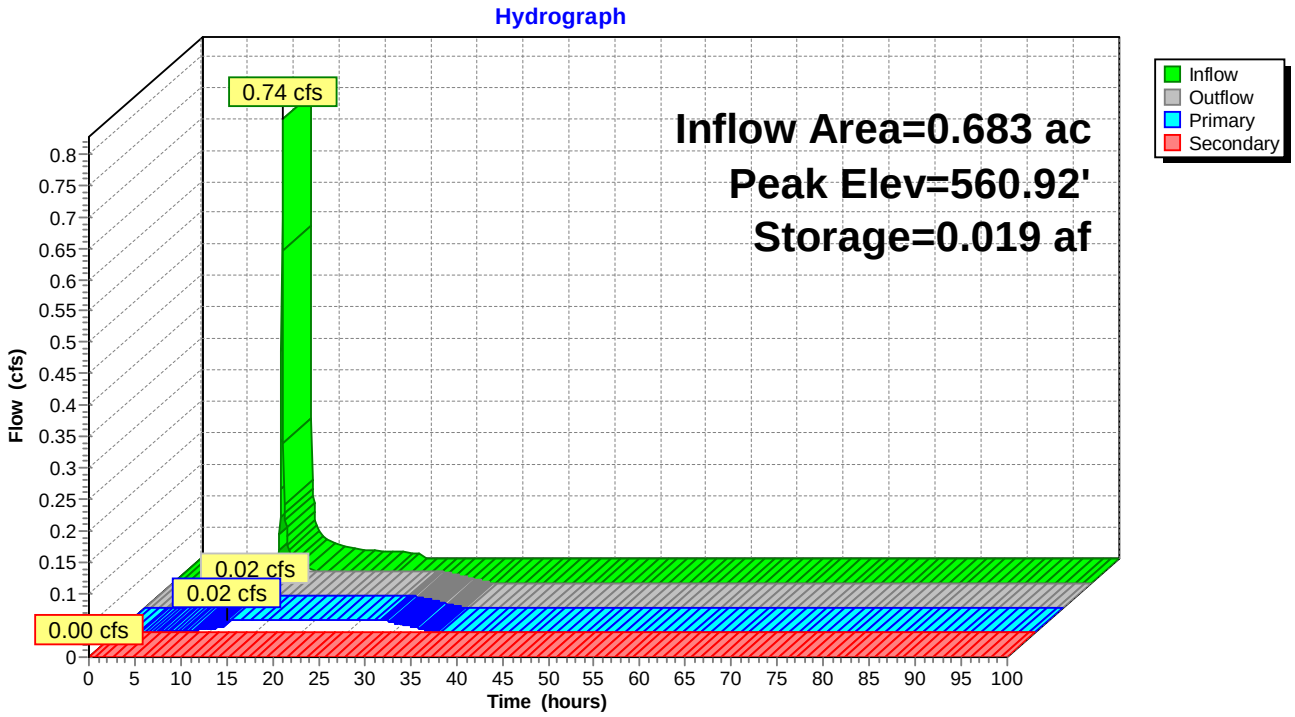
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
560.00	0.000	0.000	0.000
560.50	0.020	0.005	0.005
561.00	0.051	0.018	0.023
561.50	0.086	0.034	0.057
562.00	0.135	0.055	0.112

Device	Routing	Invert	Outlet Devices
#1	Primary	560.00'	**1.000 in/hr Exfiltration over Surface area below 560.50'**
#2	Secondary	561.50'	**65.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.02 cfs @ 11.90 hrs HW=560.55' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=560.00' (Free Discharge)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 23P: TO Bay 3



Summary for Pond 28P: Wetland A Pond

[63] Warning: Exceeded Reach 28R INLET depth by 0.50' @ 0.00 hrs

Inflow Area = 29.001 ac, 9.45% Impervious, Inflow Depth > 0.39" for 1 year event
Inflow = 0.49 cfs @ 18.41 hrs, Volume= 0.932 af
Outflow = 0.49 cfs @ 18.60 hrs, Volume= 0.932 af, Atten= 0%, Lag= 11.4 min
Primary = 0.49 cfs @ 18.60 hrs, Volume= 0.932 af

Routing by Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Starting Elev= 542.50' Surf.Area= 6,939 sf Storage= 5,204 cf
Peak Elev= 542.56' @ 18.60 hrs Surf.Area= 7,205 sf Storage= 5,611 cf (407 cf above start)

Plug-Flow detention time= 293.1 min calculated for 0.813 af (87% of inflow)
Center-of-Mass det. time= 15.1 min (1,590.6 - 1,575.5)

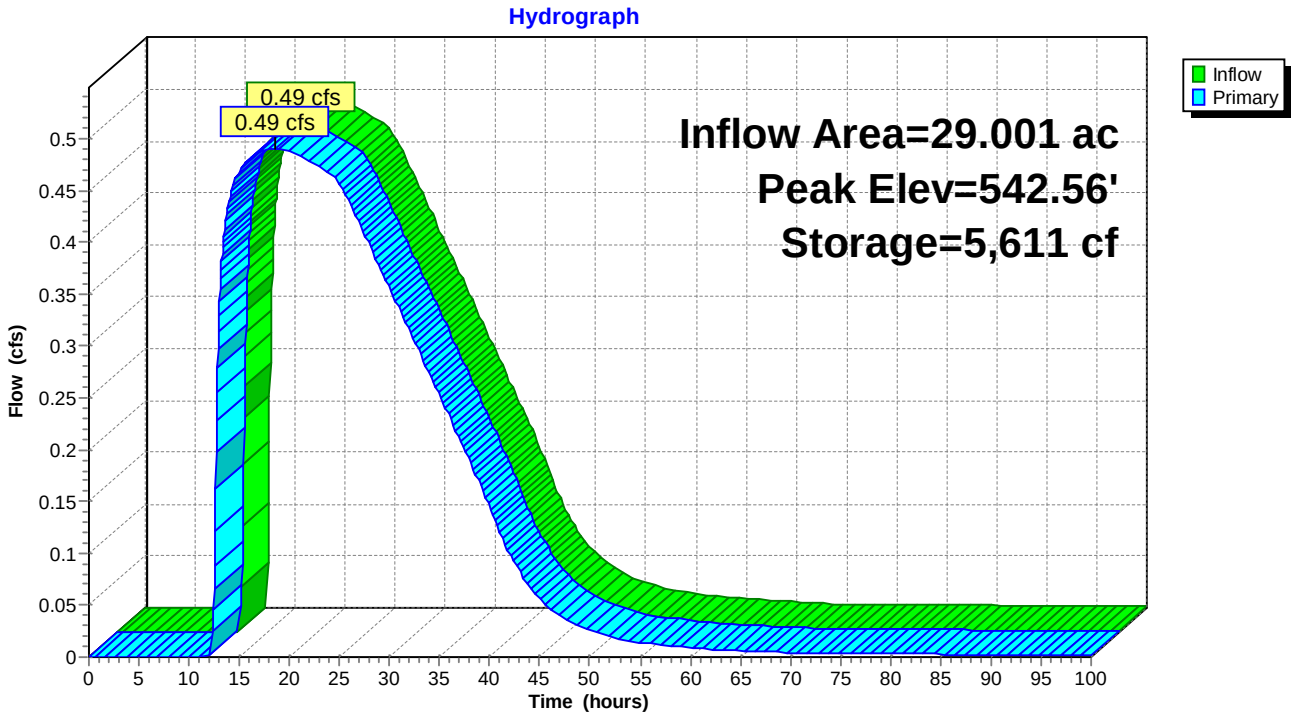
Volume	Invert	Avail.Storage	Storage Description
#1	541.00'	31,865 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
541.00	0	0	0
543.00	9,252	9,252	9,252
545.00	13,361	22,613	31,865

Device	Routing	Invert	Outlet Devices
#1	Primary	542.50'	**15.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.48 cfs @ 18.60 hrs HW=542.56' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.48 cfs @ 0.56 fps)

Pond 28P: Wetland A Pond

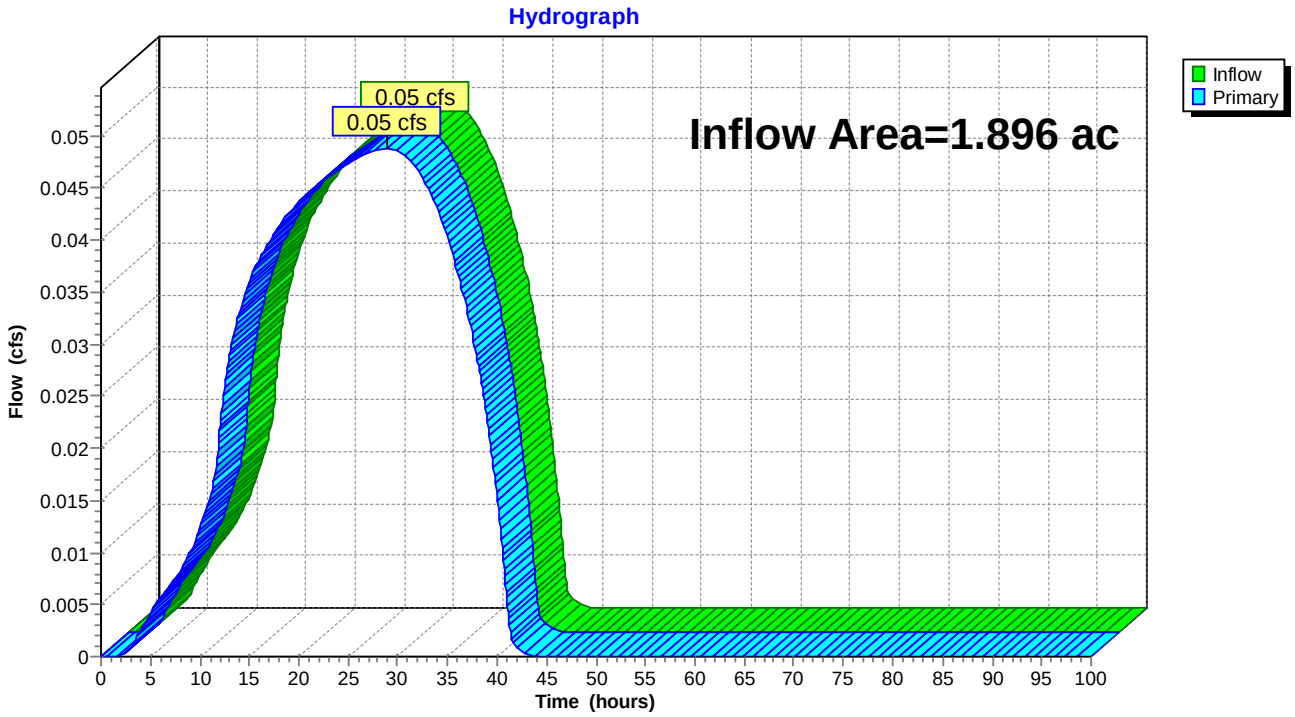


Summary for Link 20L: WCA TO total

Inflow Area = 1.896 ac, 16.61% Impervious, Inflow Depth = 0.64" for 1 year event
Inflow = 0.05 cfs @ 28.81 hrs, Volume= 0.102 af
Primary = 0.05 cfs @ 28.81 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

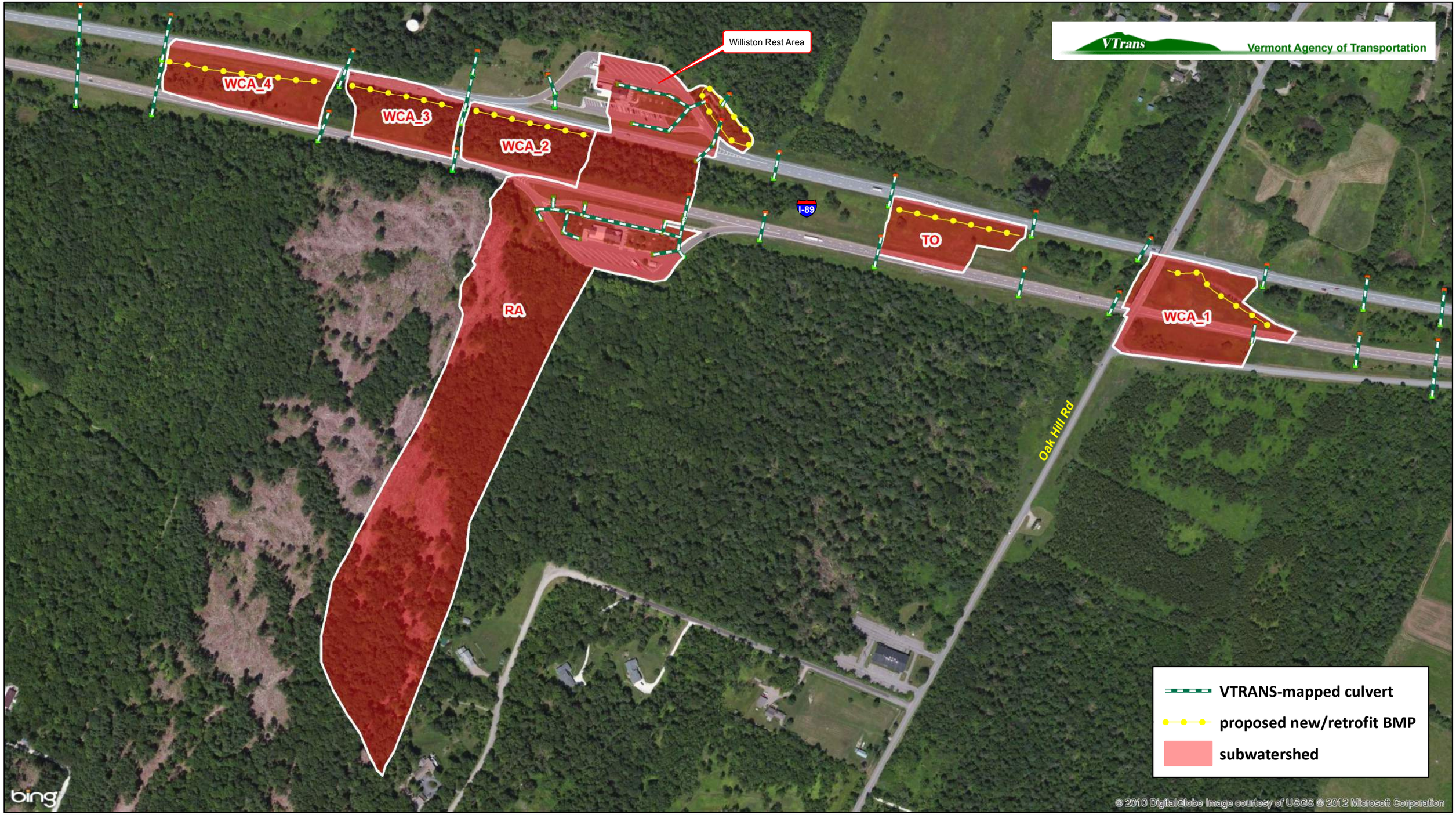
Link 20L: WCA TO total



APPENDIX D

VTRANS I-89 BMP SITES

AERIAL MAPS AND CPv BMP MODELS



VATERSHED
CONSULTING ASSOCIATES, LLC

VTRANS Allen Brook Stormwater Project
I-89 Final Design Locations
Williston, VT
9/27/12

0 210 420 Feet

Prepared by AT/JS
All proposed sites field verified.

Aerial Photo provided by Bing Maps 2011
Georeferenced to NAD 1983 VT
State plane coordiante system.

WATERSHED
CONSULTING ASSOCIATES, LLC
Stormwater Management | Erosion Control

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Waitsfield, VT 05673
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www.watershedca.com

MEMORANDUM

To: Craig Digiammarino (VTrans)

From: Andres Torizzo, CPESC, CPSWQ

Date: 9/28/2012

Re: VTRANS Allen Brook Stormwater Improvement Project: Final Summary Report

Cc: Jennifer Callahan; Jon Armstrong (VTrans)

Dear Craig,

Watershed Consulting Associates, LLC (WCA) has prepared this letter report to summarize the final design recommendations of a stormwater upgrade project along a section of Interstate 89 in the Town of Williston, Vermont including several median sites and a retrofit of the existing Williston Rest Area wet pond. The goal of the proposed project is to reduce flows and improve water quality of runoff going to Allen Brook in an effort to meet EPA Total Maximum Daily Load (TMDL) Targets, and ultimately remove Allen Brook from the State's Stormwater Impaired List. The project was funded by the Vermont Agency of Transportation (VTrans), under VTrans Environmental services contract #PS0155.

Project Scope

The Project included the design of five median stormwater improvement structures and retrofit of the existing Williston Rest Area wet pond, with the purpose of managing runoff from adjacent highway road surfaces. A feasibility assessment of eight median sites identified by DuBois & King and thirteen additional sites identified by WCA was conducted for site selection. The five recommended sites were assessed depending on the extent to which each site 1) could be easily retrofitted based on slope, depth, and drainage configuration, 2) provided a substantial amount of impervious area drainage to maximize flow reduction benefits, and 3) avoided sensitive natural resource areas and existing utilities/drains. A runoff analysis was prepared to facilitate the design of the structures and to quantify the amount of flow reduction achieved. A series of final design plans along with construction details were then prepared, to allow VTRANS to construct the structures. Construction stakeout will be necessary to properly implement the designs.

Median Structure Description

The median structures are equivalent to Dry Swales as defined in the Vermont Stormwater Management Manual (VSWMM, 2002). The structures will be located in existing vegetated stormwater conveyances in the I-89 median. Outlet for the structures will be provided by either existing catch basins and

culverts, or by a surface discharge, depending on the site location. Key features of the structures include earthen check dams designed to create up to 1.5' of ponding depth behind each dam, amended soils consisting of a 50/50 blend of sand and native soil at the surface, and a pure sand filter below. A perforated underdrain wrapped in stone will be located below the sand filter, which will be connected to the outlet structure or daylighted.

Treatment/Flow Reduction Potential

The priority of the median and pond retrofit designs were to maximize Channel Protection Volume (CP_v) mitigation, in lieu of the Flow Restoration Plan to be implemented under the new MS4 permit, which will require reduction of high flows (Q 0.3%) to meet TMDL targets in Allen Brook. The pond retrofit has been designed to meet or exceed the Engineering Feasibility Analysis (EFA, 2004) Standards.

Median Structures

Specifically, Water Quality Volumes (WQ_v) will be captured and filtered through the subsurface sand medium prior to discharge to the underdrain. CP_v volumes will also be retained in the swale system. Overbank Flood Protection flows will be reduced significantly, and will either be partially retained and infiltrated, or partially bypassed through a raised outlet structure (with the exception of WCA-2 and 3 which do not provide reduction of Qp10 flow). Extreme storm events will pass safely through the system. It is not possible to accommodate the Recharge Volume in the median without compromising the interstate select gravel subbase.

Pond Retrofit

The Williston rest area pond retrofit was designed according to the P-3 Wet Extended Detention pond variant as listed in the Vermont Stormwater Management Manual: Vol. I (VSMM 2002). The design meets the (WQ_v) storage requirement of 50% in the permanent pool and 50% in extended detention (VSMM 2002). The total calculated WQ_v for the Rest Area was 16,596 cuft, of which 11,298 cuft is provided in permanent storage. The remaining WQv is provided via extended detention in the pond. Each inlet forebay will hold greater than 10% percent of the WQ_v. Additional WQ_v treatment is provided within the rest area drainage system through vegetated disconnection and grass swales. In addition, the Virginia DCR Stormwater design manual for Wet Ponds (VA DCR 2011) was reviewed, from which the design of a wetland shelf was incorporated into the pond retrofit to provide additional WQ_v treatment.

The pond design is in full compliance with the CP_v requirement. Additionally, the design ensures that the 1-yr 24-hour storm is released over 24 hours as the pond appears to drain to a wetland area, and thus a warm water habitat. The calculated CP_v based on the modeling analysis is 29,172 cf.

While not specifically required under the Engineering Feasibility Analysis procedure, the Overbank Flood Protection flow (10-yr storm) was evaluated. The 10-yr storm peak discharge will be reduced by 30%. The pond was also designed to provide adequate free board and safely pass the Extreme Storm events (100-yr storm). The pond retrofit was not designed to specifically address GW recharge (GW_{re}). However, GW_{re} is currently provided on site by means of grass swales and vegetated disconnections.

Water Quality Treatment and Channel Protection Volume Reductions

Annual load reductions of particulate solids (ie. suspended solids, TSS), total solids (suspended and dissolved, TS) and total phosphorus (TP) were estimated using the source loading analysis model, WinSLAMM v.10 (Table 1). Each median site structure and the rest area pond were modeled individually over the course of a year, using local rainfall data. For each site, initial freeway dirt loading per mile was calculated based on an average daily traffic of 26,900 vehicles per day on I-89 from Exit 11 to Exit 12 (VTrans 2008). The proposed improvements would enhance water quality treatment of runoff to Allen Brook through 74% average reductions in TSS and 55% average reductions in TP on an annual basis. The CP_v reductions are also summarized in Table 1 below:

Table 1: Water Quality Treatment and Channel Protection Volume Reductions for Recommended Sites:

Site	WCA Impervious Area (ac)	Runoff Area (ac)	CPv Storage (cf)	Total Suspended Solids Percent Annual Reduction (%)	Total Solids Percent Annual Reduction (%)	Total Phosphorus Percent Annual Reduction (%)
RA	4.39	26.5	29172	82%	28%	19%
WCA_1	1.12	4.49	7643	57%	46%	40%
WCA_4	0.73	3.24	4404	72%	66%	64%
TO	0.33	2.22	2660	93%	91%	89%
WCA_2	0.44	2.50	1852	75%	66%	63%
WCA_3	0.54	2.30	1318	64%	58%	57%
		WCA SUBTOTAL	47049			

Comparison Between D&K and WCA Reporting

As a part of the Draft Allen Brook Flow Restoration Plan (February 2012), prepared by DuBois & King (D&K) for the Town of Williston, locations where Stormwater BMP's could be implemented were identified within the I-89 ROW. In addition, subwatershed mapping and a runoff analysis was conducted by DuBois & King for eight median sites (Medians A-G and Town Offices site) and the Williston Rest Area.

Site selection for BMP implementation was performed by analyzing the recommended D&K sites, in addition to thirteen additional sites. Subwatershed delineations for each location were prepared in GIS and field verified, including the D&K sites, using topographic contours derived from LIDAR data obtained from VTRANS. The subwatershed mapping conducted by WCA for the D&K sites differed substantially from the original delineations, most likely due to the use of more refined topographic data.

A runoff analysis was performed for each site to facilitate the design of the BMP's and to quantify the CP_v reductions expected for each median structure and the rest area pond. The CP_v storage estimates

prepared by WCA varied from the D&K estimates due to several reasons including differences in subwatershed mapping, design of the structures, and the use of mapped soil groups rather than a generic selection of Hydrologic Soil Group C.

The final design recommendations presented by WCA will mitigate VTRANS CP_v storage requirement as outlined in the FRP with the implementation of 4 median BMP's and the pond retrofit, rather than the 7 median BMP's and pond retrofit recommended by D&K. The WCA design recommendation will mitigate 47,049 cf of CP_v, which is 2,121 more than estimated by D&K (Table 2). The reduction in required BMP implementation is primarily as a result of WCA's refined subwatershed mapping, use of mapped soils, and feasibility assessment for site selection.

Table 2: Comparison Between D&K and WCA Estimated CPv Storage for Project

	CPv Storage (cf)
DuBois & King	44928
WCA	47049
Additional CP_v above FRP Requirement for VTrans sites	2121

Typical Median System Maintenance Tasks

- The swale and check dams should be kept mowed during the growing season as necessary to maintain heights between 4 to 6 inches. (Note: Surface of sand filter at bottom of median swale may be softer under mower tires. Minor rutting is acceptable, but major ruts should be rolled out.)

- Annually inspect the base of the swale, check dam approach, check dam spillway, downstream check dam toe, and catch basin inlet for signs of erosion. Revegetate or otherwise repair to original design specification as necessary.

- Annually inspect for flow bypassing around check dams or end dams.

- Annually inspect for collected debris and sediment upstream of the check dams. Sediment should be removed when it exceeds 4" of depth.

- Annually inspect for collected debris at the catch basin grates. Organic and woody debris should be removed.

- If residual ponding is observed greater than 24-hours after a storm event, check orifice plate for blockage. The orifice plate is located on the end of the underdrain pipe. If no blockage exists and ponding continues, service underdrain cleanout locations. If ponding appears to be a result of

surface conditions, remove silty sediment, and roto till any residual silty sediment into the sand/soil mixture to restore the permeability.

Typical Pond Maintenance Tasks

- Check inlets and outlets for blockage, structural integrity, and evidence of erosion. Repair erosion by adding stone or re-vegetating as necessary.
- Inspect pilot channels and stone armoring for evidence of undermining, slumping, and scouring. Replace stone material as per specification.
- Inspect wetland shelves and main pool for sediment accumulation. Dispose of sediment material in an upland location away from surface waters.
- Replace dead or diseased plantings. Remove invasive species as necessary.

Please contact me should you have any questions.

Sincerely,

Andres Torizzo, CPESC, CPSWQ
Principal

References

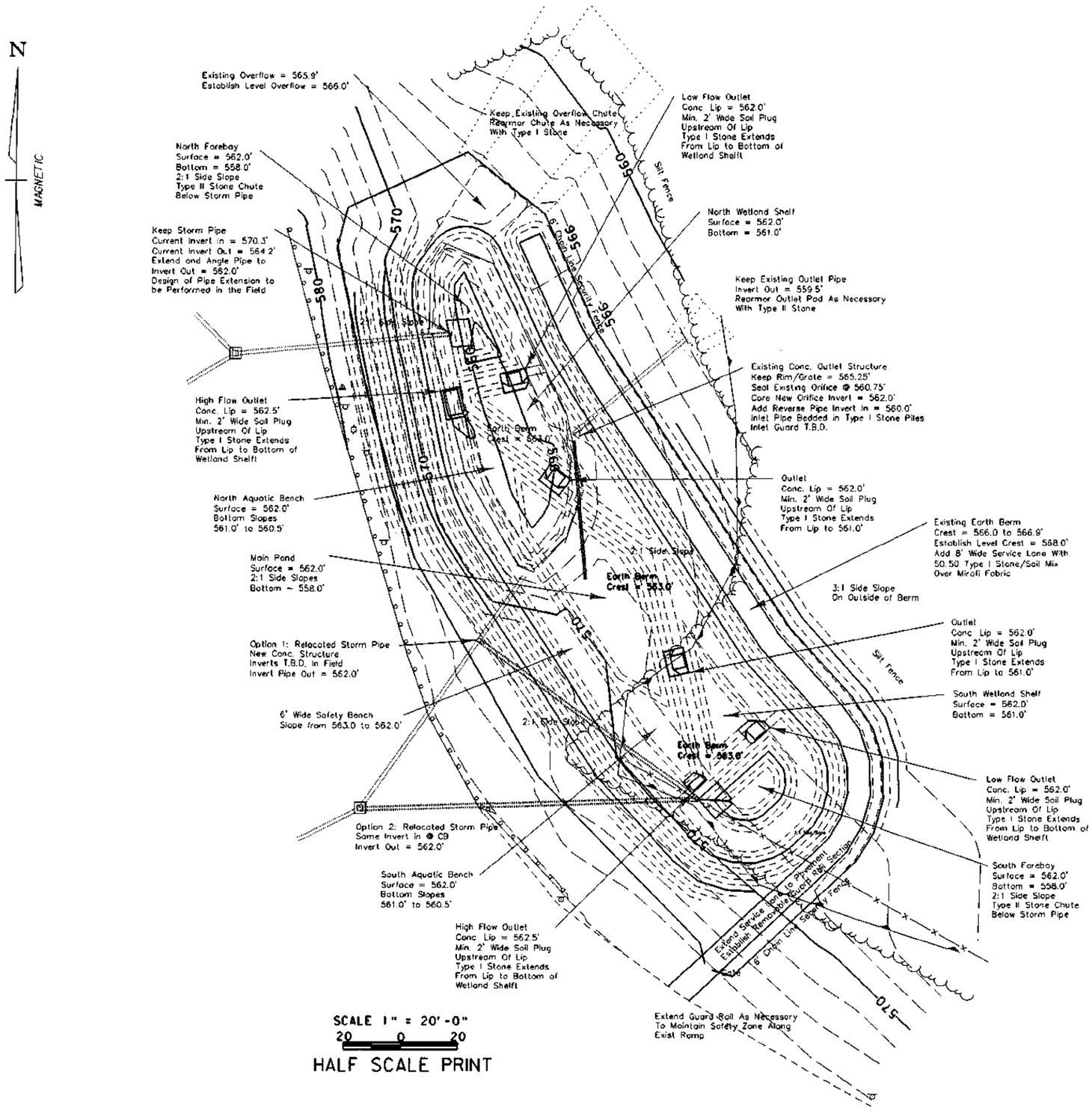
Dubois & King (D&K). (2012). "Town of Williston Allen Brook Flow Restoration Plan Draft Report.

Vermont ANR. (2002).*Vermont Stormwater Management Manual: Volume I- Stormwater Treatment Standards.*

Vermont ANR. (2004). *VTDEC Procedure for Evaluation of Stormwater Discharges and Offsets in Stormwater Impaired Watersheds.*

Virginia Department of Conservation & Recreation (VA DCR). (2011). "VA DCR Stormwater Design Specification No. 14: Wet Pond". <http://chesapeakestormwater.net/wp-content/uploads/downloads/2012/02/DCR-BMP-Spec-No-14_WET-PONDS_Final-Draft_v1-9_03012011.pdf>(August 16th, 2012)

Vermont Agency of Transportation (VTrans). (2008). *Annual Average Daily Traffic (AADT's) State Highways Route Logs*. <http://www.ccrpcvt.org/library/I89/Exit12B/Exit12B_Interstate_Access_Analysis_Report_20101119.pdf>(Sept 21st, 2012).



Erosion Control Notes:

1) Silt fence to be placed along toe of slope of the proposed earthen berm.

2) Erosion control blankets are to be placed on all slopes 3:1 or greater which are proposed for disturbance.

3) Equipment and materials staging is to be established in the northeast corner of the rest area truck parking lot.

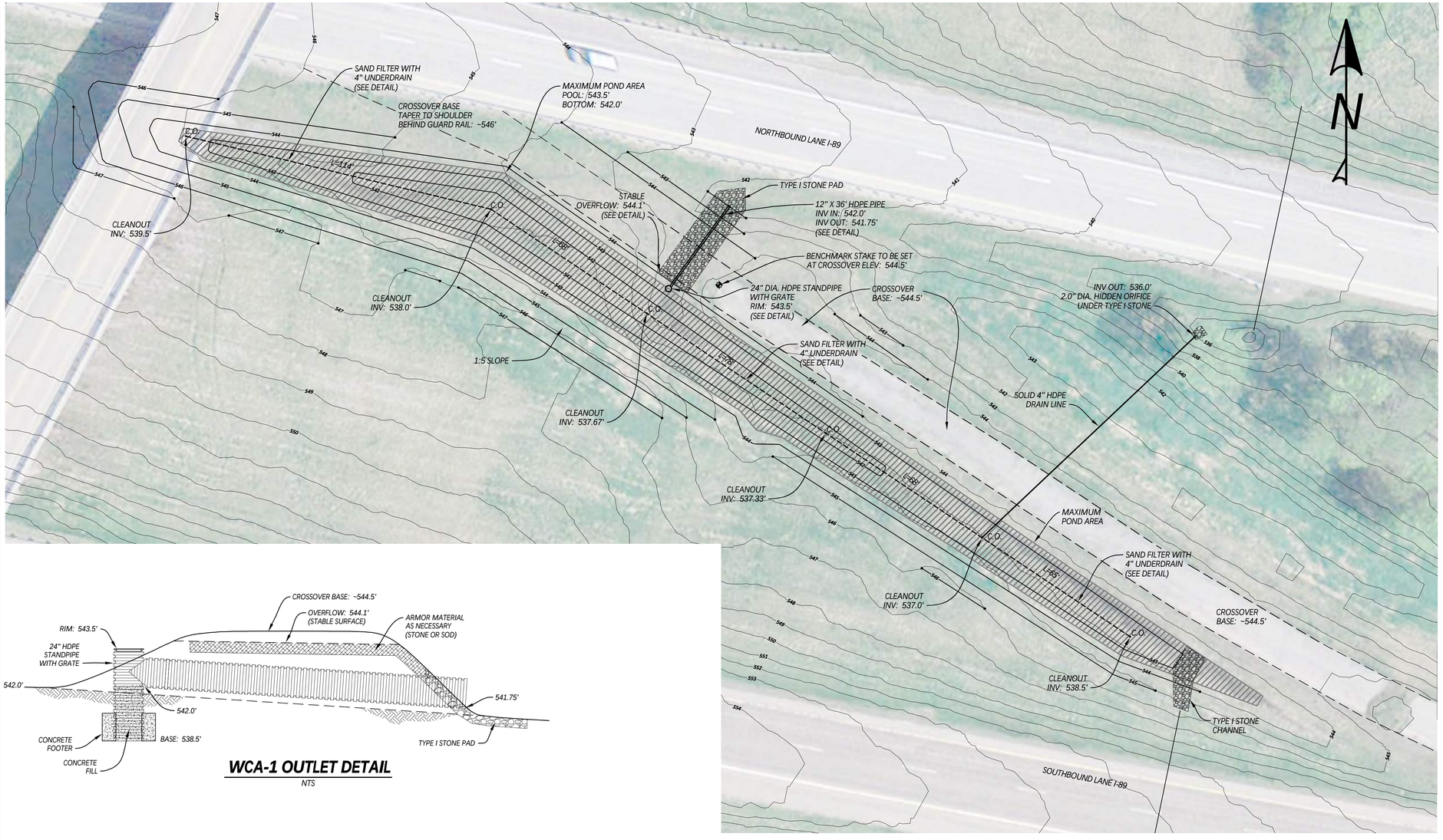
Notes:

Wetland impact of design is calculated to be 7,650 square feet.

Project horizontal and vertical datum is assumed.

Benchmark is the concrete top of the existing pond outlet structure

SURVEY: EIV DESIGNED: LEG DRAWN: EIV CHECKED: A.T. SCALE: as noted	EIV TECHNICAL SERVICES 111 East Allen Street, Ste. A Winooski, Vt 05404 o: 802.497.3653 f: 802.497.3656	Site Plan I-89 Northbound Rest Area Stormwater Treatment Pond I-89, Williston, Vermont ©	DATE: 9/26/12 DRAWING NO. SHEET 2 OF 4 PROJECT NO. 1675

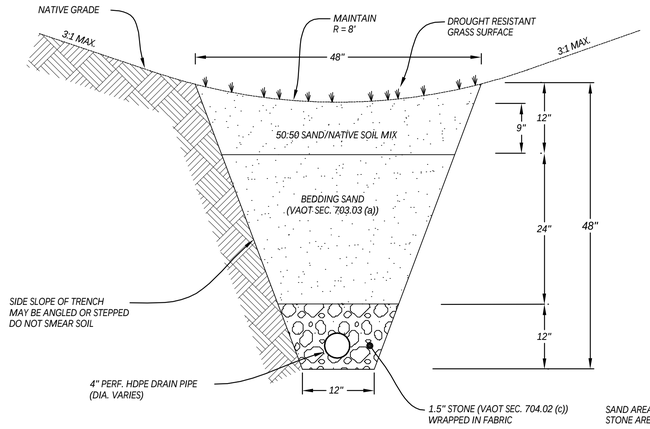


GRAPHIC SCALE

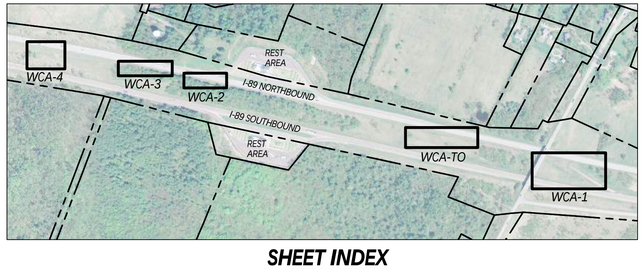
20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

WCA-1 OUTLET DETAIL
NTS



SAND FILTER/UNDERDRAIN SECTION
1" = 1'



SHEET INDEX
NTS

LOOKING DOWN EAST SWALE ALONG CROSSOVER

OUTLET

LOOKING UP WEST SWALE FROM CROSSOVER

VTRANS MEDIAN STORMWATER UPGRADE

WILLISTON, VERMONT

LAYOUT PLAN - WCA-1

LAKESIDE ENVIRONMENTAL GROUP

P.O. BOX 4081
BURLINGTON, VT 05406
P: (802) 489-5214
WWW.LEGVT.COM

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APPROVED BY:	AT
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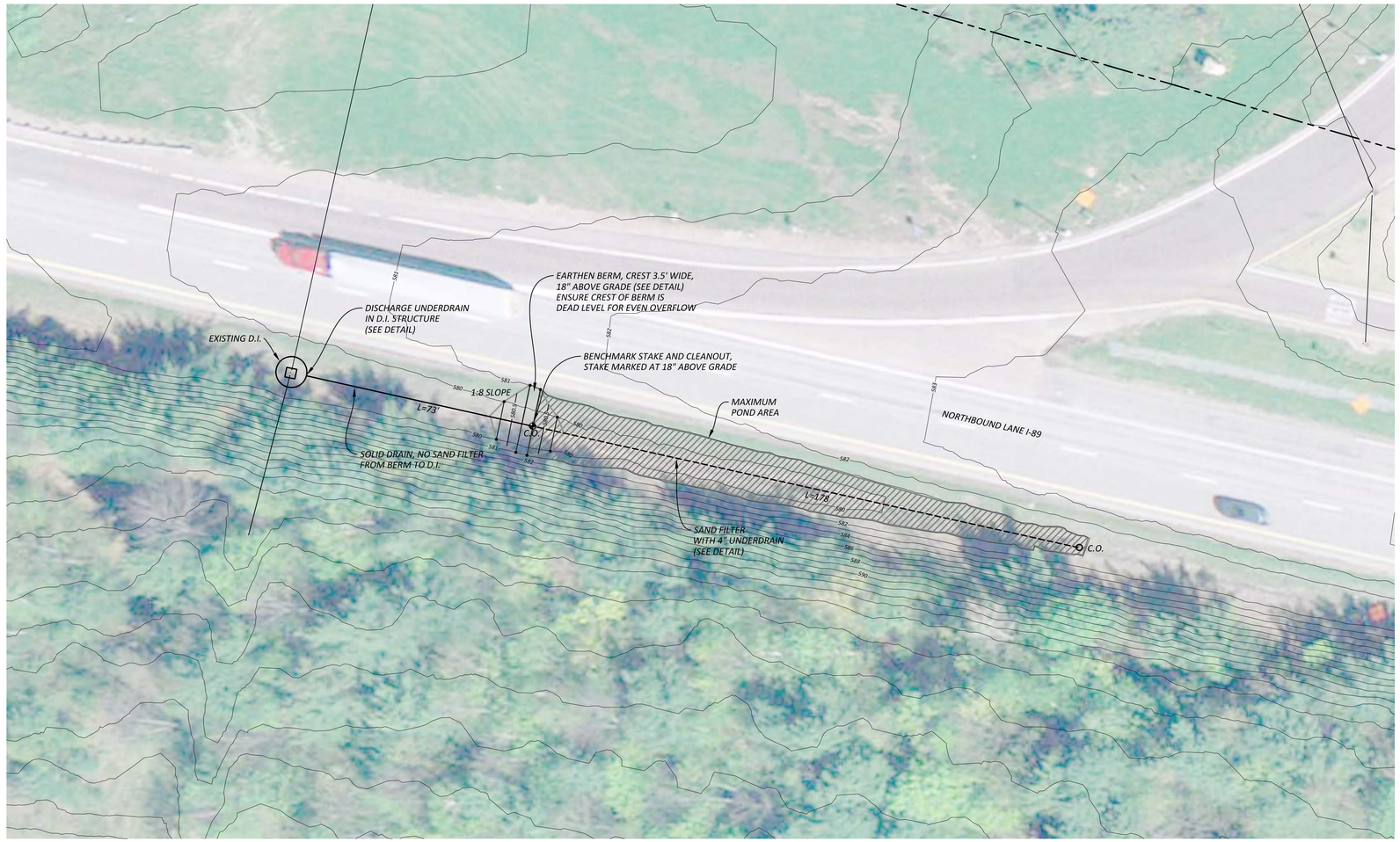
P:\VTRANS WILLISTON MEDIAN\BASE PLAN-FEET.dwg



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LOOKING UP SWALE FROM OUTLET

GRAPHIC SCALE

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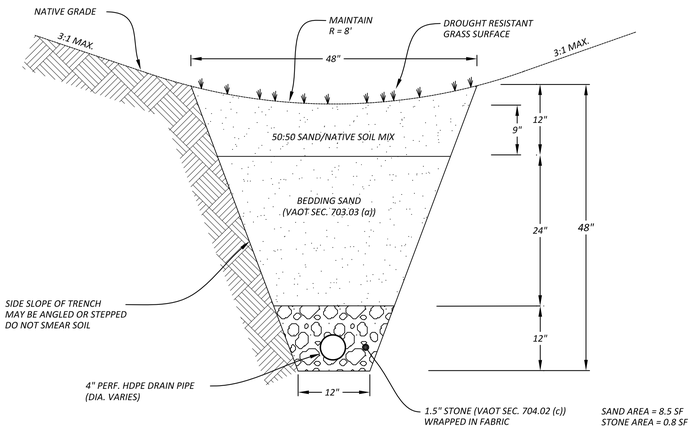
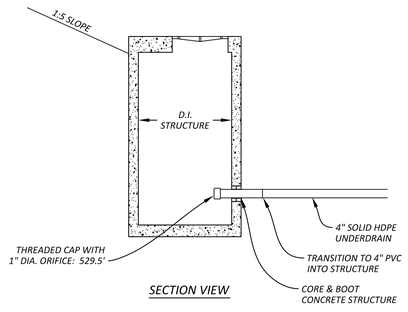
(IN FEET)
1 inch = 20 ft.



SAND FILTER/UNDERDRAIN SECTION

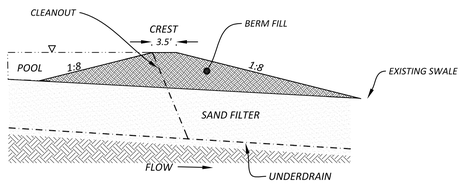
1" = 1'



SECTION VIEW

D.I. DRAIN CORING DETAIL

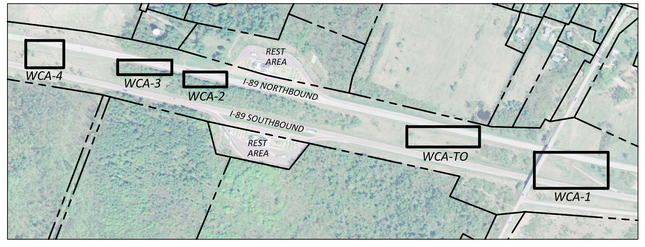
NTS



NOTE:
BERM FILL MUST BE COMPACTED IN 6" LIFTS
TO ENSURE NO SETTLING SO AS TO MAINTAIN
DEAD LEVEL LIP ON BERM.

EARTH BERM DETAIL

NTS



SHEET INDEX

NTS

VTRANS MEDIAN STORMWATER UPGRADE

WILLISTON, VERMONT

LAYOUT PLAN - WCA-2

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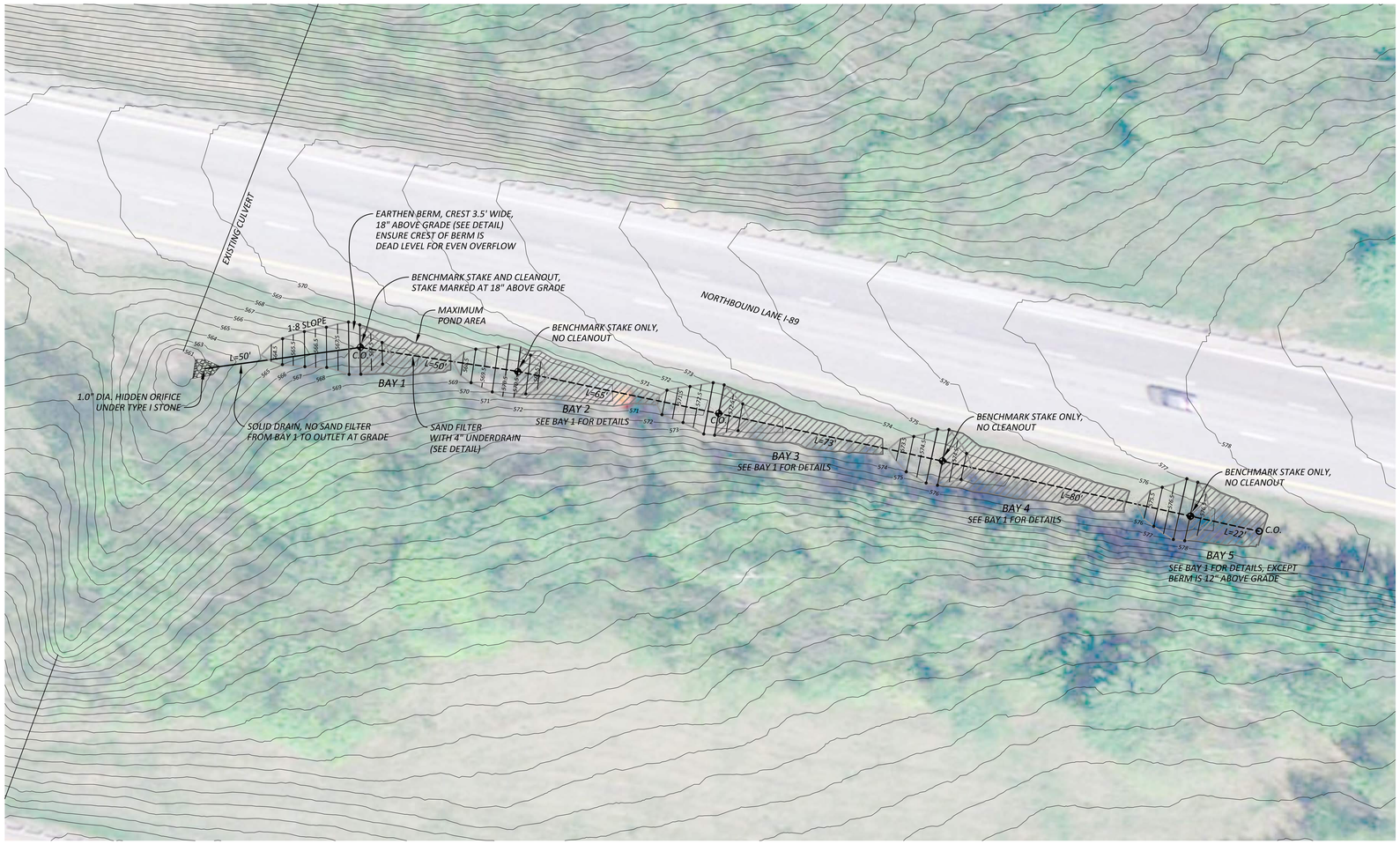


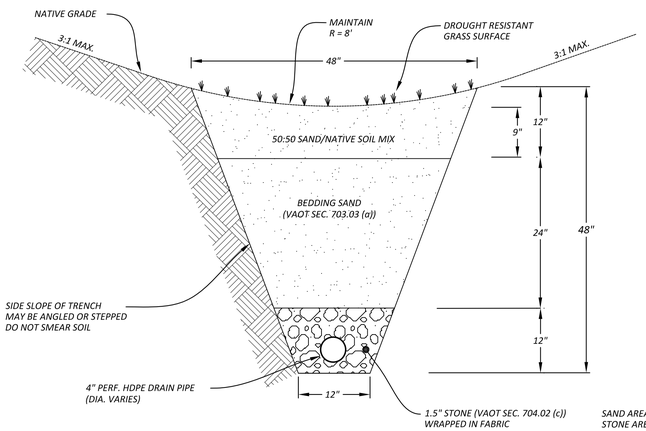
GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

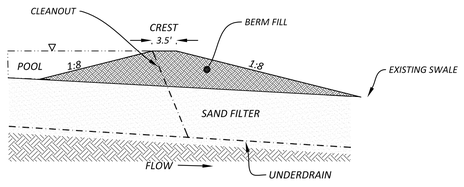
LOOKING UP SWALE FROM OUTLET

OUTLET



SAND FILTER/UNDERDRAIN SECTION

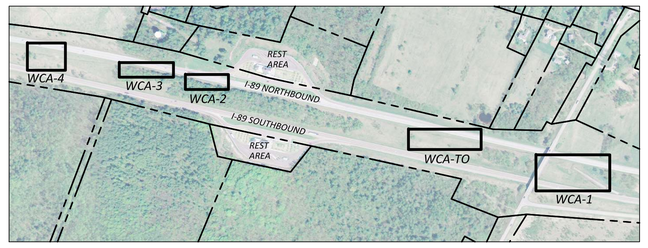
1" = 1'



NOTE:
BERM FILL MUST BE COMPACTED IN 6" LIFTS TO ENSURE NO SETTLING SO AS TO MAINTAIN DEAD LEVEL LIP ON BERM.

EARTH BERM DETAIL

NTS



SHEET INDEX

NTS

VTRANS MEDIAN STORMWATER UPGRADE

WILLISTON, VERMONT

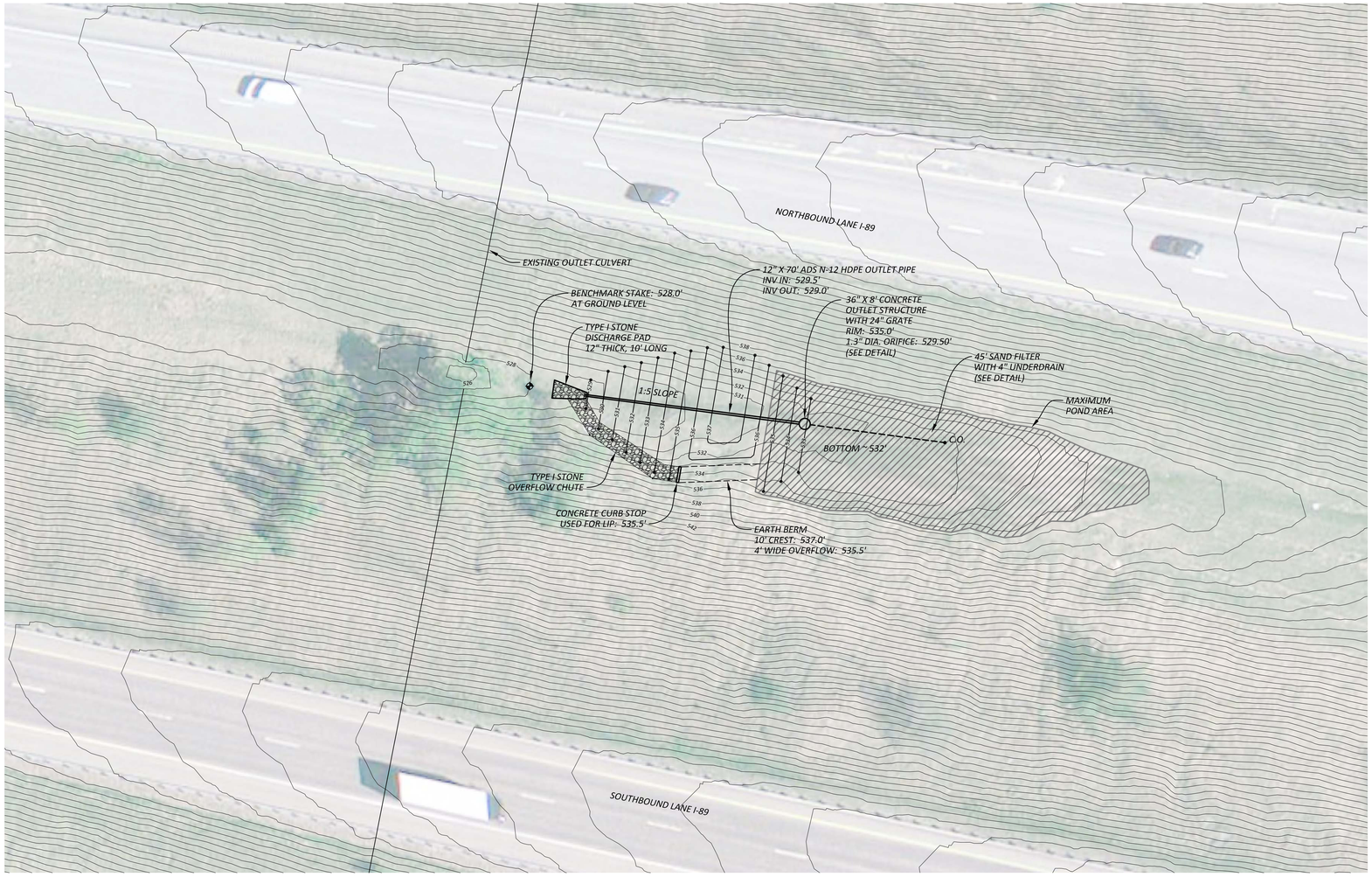
LAYOUT PLAN - WCA-3

LAKESIDE ENVIRONMENTAL GROUP
P.O. BOX 4081
BURLINGTON, VT 05406
P: (802) 489-5214
WWW.LEGVT.COM

DRAWN BY:	SMS
CHECKED BY:	AT/ATS
APPROVED BY:	AT
DATE:	9-27-12
SCALE:	NOTED
SHEET:	1 OF

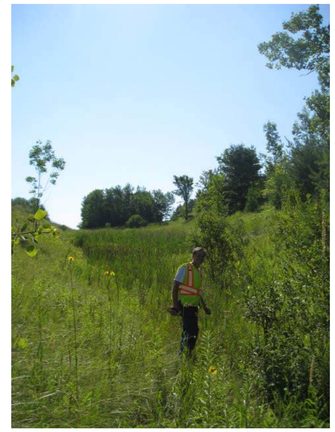
WATERSHED CONSULTING ASSOCIATES, LLC
P.O. BOX 1085
WAITSFIELD, VT 05673
P: (802) 496-5130 F: (602) 496-5131
www.watershedca.com
specializing in stormwater management and erosion-sediment control

P:\VTRANS WILLISTON MEDIAN\BASE PLAN-FEET.dwg

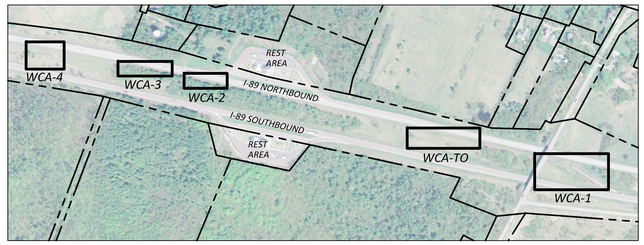


LOOKING DOWN SWALE FROM DIVIDE

OUTLET



LOOKING UP SWALE FROM OUTLET



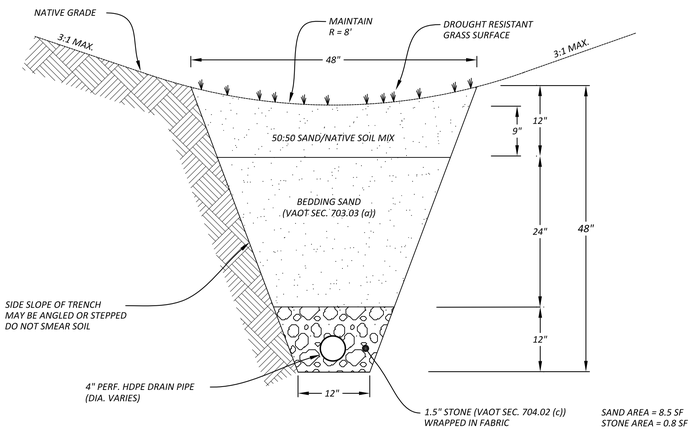
SHEET INDEX

NTS

GRAPHIC SCALE

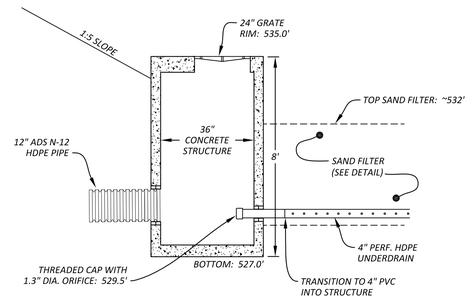
20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.



SAND FILTER/UNDERDRAIN SECTION

1" = 1'



SECTION VIEW

WCA-4 OUTLET DETAIL

NTS

VTRANS MEDIAN STORMWATER UPGRADE

WILLISTON, VERMONT

LAYOUT PLAN - WCA-4

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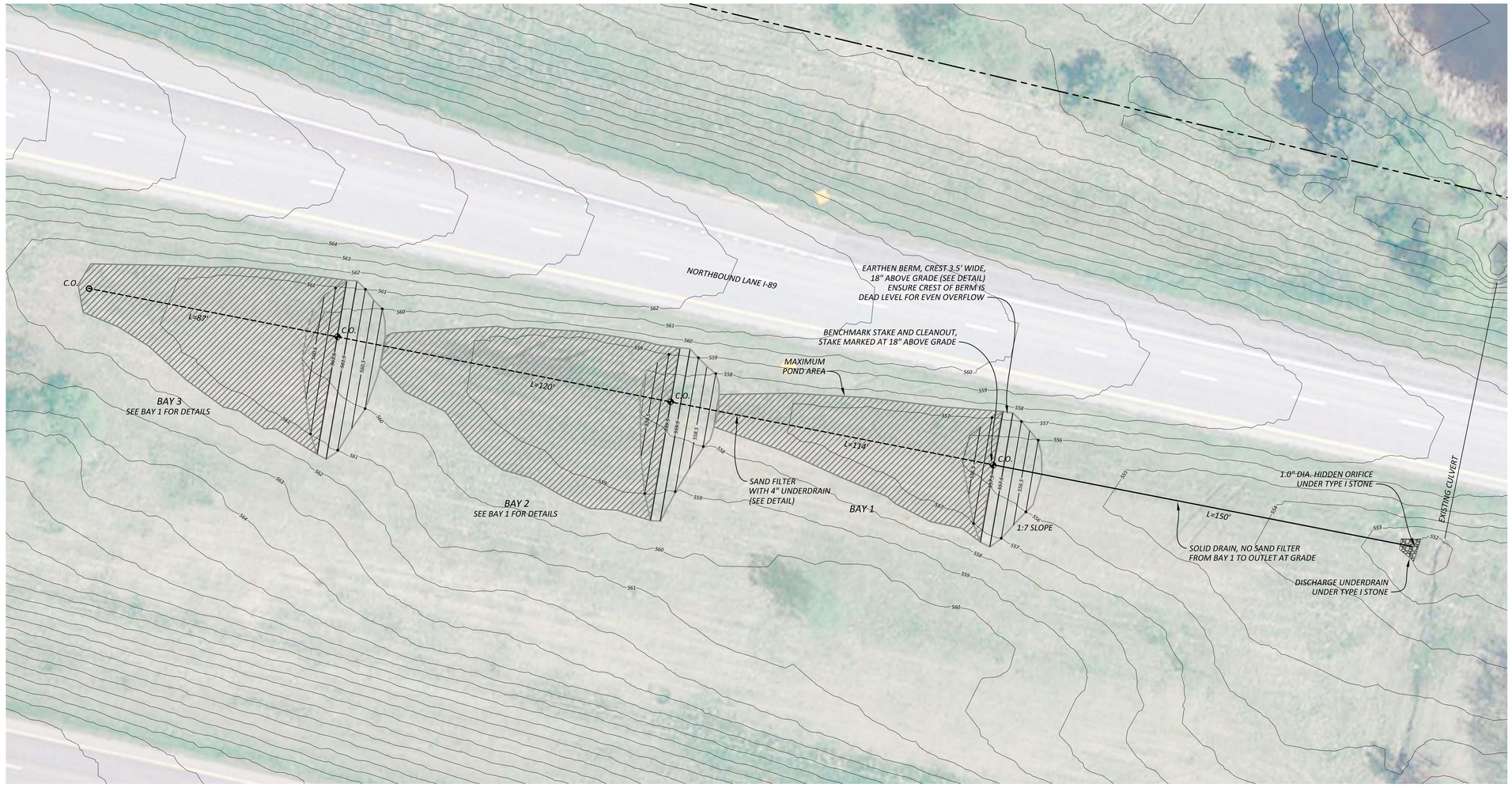
P:\VTRANS WILLISTON MEDIAN\BASE PLAN-FEET.dwg



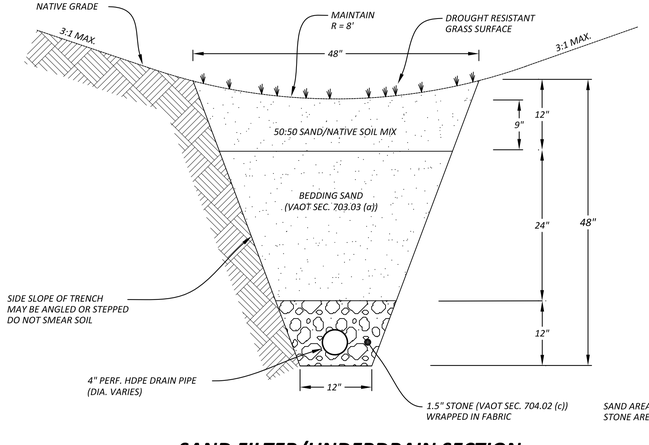
OUTLET

LOOKING UP SWALE FROM OUTLET

GRAPHIC SCALE

20 0 10 20 40 80

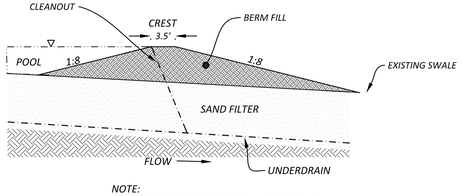
(IN FEET)
1 inch = 20 ft.



SAND AREA = 8.5 SF
STONE AREA = 0.8 SF

SAND FILTER/UNDERDRAIN SECTION

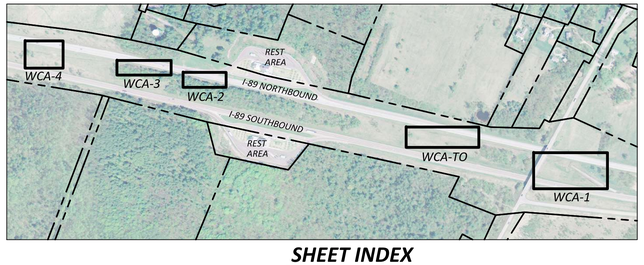
1" = 1'



NOTE:
BERM FILL MUST BE COMPACTED IN 6" LIFTS TO ENSURE NO SETTLING SO AS TO MAINTAIN DEAD LEVEL LIP ON BERM.

EARTH BERM DETAIL

NTS



SHEET INDEX

NTS

VTRANS MEDIAN STORMWATER UPGRADE

WILLISTON, VERMONT

LAYOUT PLAN - WCA-TO

LAKESIDE ENVIRONMENTAL GROUP
P.O. BOX 4081
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DRAWN BY:	SMS
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APPENDIX E

VTDEC MODEL RUN SUMMARY

Input file	Description	Area (s mi)	Normali ed flow (cfs/ s mi)		Unadjusted flow (cfs)		% of TMDL Target
			Q	Q	Q	Q	
Allen_base_9-19-2016	Base model with pre 2002 BMPs. Modified subwatersheds near Meadowridge based on EFA and field data.	9.81	13.429	0.2079	131.740	2.040	
Allen_post_9-20-2016	Current Scenario model. Altered some subwatershed and drainage area boundaries to conform with the other models.	9.82	13.328	0.2087	130.920	2.050	1 %
% Change vs Base					-0.62%	0.49%	
Allen_FRP_9-20-2016	Updated EFA information from the Town of Williston through 9/2016. ERROR: this run did not include Town Field A & B BMPs	9.82	12.957	0.2077	127.280	2.040	1 2 %
% Change vs Base					-3.39%	0.00%	
Allen_FRP_VTrans_10-6-2016	Added VTrans median BMPs A, B,E , F, G, H, I back in from the 2012 Draft FRP.	9.82	12.920	0.2077	126.910	2.040	111 1%
% Change vs Base					-3.67%	0.00%	
Allen_FRP_10-6-2016_noTownField	Same as Allen_FRP_VTrans_10-6-2016, but the Town Field BMPs are not included	9.82	12.959	0.2077	127.300	2.040	1 2 1%
% Change vs Base					-3.37%	0.00%	
TMDL Waste Load Allocation (% change vs base)					-3.30%	7.40%	

	Development	EFA Documents Available		IS							
Permit No	Name	Plans	ydrocad Files	Drainage Area acre	Williston Notes	DEC Notes	ydroCAD provided	Designer		Date of Most Recent ydroCAD	Changed since /1/2/1 version
1-0664	South Ridge Estates	Yes	Yes	68.74	4 ponds	upgrade of existing ponds	x	Lamoureux & Dickinson		9/26/2014	No Change
1-0963	Whitney Hill	Yes	Yes	8.18		upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	4/26/2016	probably changed
1-1047	Pinecrest Village				Determined no storage necessary.		no	n/a	n/a	n/a	n/a
1-1052	Williston Commons	Yes	Yes	23.82		upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	4/28/2016	storage and orifice change
1-1230.9508	Allen Brook Elementary School	Yes	Yes			upgrade of existing pond	x	Donald Hamlin Consulting		5/12/2016	storage and orifice change
1-1258	Heritage Meadows	Yes	Yes	16.79	aka: Wildflower Circle	upgrade of existing pond	x	Lamoureux & Dickinson		1/16/2015	No Change
1-1272 s/n 2	Brennan Woods	Yes	yes	71.41		upgrade of existing pond	x	Lamoureux & Dickinson		9/21/2014	No Change
1-1507	Coyote Run	Yes	Yes	20.5		upgrade of existing ponds	x	Krebs and Lansing	Scott Holmstead	4/13/2016	storage and orifice change
2-0231	Pleasant Acres	Yes	Yes	2.2		Different BMP location and drainage area from 3/2015 EFA. New swale.	x	Krebs and Lansing	Scott Holmstead	4/13/2016	new "pond" and drainage area
2-0954	Allenbrook Meadows	Yes	Yes	4.03		new bioretention	no	WCA		10/15/2014	No Change
2-1107	Meadow Ridge	Yes	Yes	219.93		3 new ponds. March 2016 submittal had 4 ponds. Drainage areas have changed.	x	Trudell		4/29/2016	storage and orifice change. Possibly drainage area changes as well.
2-1146	Old Stage Estates	Yes	yes	30.21	2 Ponds		x	Lamoureux & Dickinson		1/1/2015	No Change
2-1180	Golf Links	Yes	yes	57.23	4 ponds		x	Lamoureux & Dickinson		1/30/2015	orifice change. Defined slightly more storage
2-1190	Meadow Run - Forest Run	Yes	Yes	17.65	2 ponds, 1 grass swale		x	Lamoureux & Dickinson		1/21/2015	No Change
1-0932	Williston Central School	yes	Yes		4 ponds		x	Donald Hamlin Consulting		5/5/2016	Pond 1 no change. Pond 2a orifice change only. Pond 2b orifice change and slight storage change. No information provided for pond 3.
TAFT FARMS											
1-0513	Tafts Farm	Yes	Yes	12.94		originall permitted under 1-0513, but most recent coverage under 1-1275. Covers lots A & B.	x	Lamoureux & Dickinson		~3/2015	No Change
	Condo Pond	Yes	Yes	4.72		upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	4/28/2016	storage changed
	Lot C-D	Yes	Yes	1.45		upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	4/27/2016	storage and orifice change
	Lot F-G, Respite House Pond	Yes	Yes	4.36		upgrade of existing pond	x	Krebs and Lansing		4/28/2016	storage and orifice change
	Lot H	Yes	Yes	2.41		upgrade of existing pond	x	Krebs and Lansing		4/27/2016	storage and orifice change
1-1217	Taft Farms Indian Ridge	Yes	Yes	16.69		upgrade of existing pond in recreation area. Small pond on Wilson lane was not upgraded as part of EFA	x	Krebs and Lansing		4/28/2016	storage and orifice change
TURTLE POND											
2-1191	Turtle Pond	Yes	Yes	11.01		upgrade of existing pond	X	Lamoureux & Dickinson		2/2/2015	orifice change only
1-0792	Turtle Crossing	Yes	Yes	2.64	Dry Swale/Infiltration trenches; no final plans	kept 3/2015 EFA version in the model. Two new dry swales.	no	?		?	?
HURRICANE LANE											
1-0530 S/N 2	Hillside East Lot 5	Yes	Yes			new pond. Perhaps there was an existing depression, but it was not included in the base model.	x	Krebs and Lansing	Bill Nedde	4/26/2016	storage changed
1-0754	Hillside Park Lot 14	Yes	Yes			upgrade of existing tanks	x	Krebs and Lansing	Bill Nedde	9/19/2014	No Change
1-1078	Lots 10A	Yes	Yes	2.42	Changed name from Lots 10, 11, 15 to Lot 10A	upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	4/26/2016	storage and orifice change
1-1205	Lot 7	Yes	Yes	2.1		upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	4/28/2016	minor storage and orifice change
1-1245	Lots 16 & 17	Yes	Yes	5.41		upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	4/28/2016	storage and orifice change
1-1301	Lots 12, 13, 13A	Yes	Yes	8.07		upgrade of existing pond	x	Krebs and Lansing	Bill Nedde	6/28/2016	storage and orifice change
2-1172	Access Road			2.23	Remove BMP from FR Model	No previous EFA was provided to DEC, so the existing basin with minimal treatment was left in the model.	no				

Matt Mears <mmears@dubois-king.com>

Allen Brook Modeling Update

1 message

Schelley, Emily <Emily.Schelley@vermont.gov> Tue, Sep 20, 2016 at 4:11 PM
To: "James Sherrard (jsherrard@willistonvt.org)" <jsherrard@willistonvt.org>, Dave Conger <dconger@dubois-king.com>, Matt Mears <mmears@dubois-king.com>
Cc: "Callahan, Jennifer" <Jennifer.Callahan@vermont.gov>, Andres Torizzo <andres@watershedca.com>, "'Kerrie Garvey' (kerrie@watershedca.com)" <kerrie@watershedca.com>

Hello All,

I have attached the results from the latest batch of information submitted to me by the town. A run summary is included as well as flow duration curves for the base, post 2002 (current), and the FRP scenario. I have also updated the EFA info spreadsheet that was provided with the HydroCADs with some additional notes and information.

Subwatershed and Drainage Area shapefiles area available here: ftp://ftp.anr.state.vt.us/BMPDSS/Allen%20Brook/

Username: waterq

Password: redolent

Our IT department sporadically cleans out the FTP site, so I can't guarantee how long the information will stay available.

Let me know if you need additional information or would like to discuss.

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
STORMWATER PROGRAM

Emily Schelley, ***Environmental Analyst, Stormwater Section***
1 National Life Drive, Main 2

Montpelier, VT 05620-3522

802-490-6172 / Emily.Schelley@vermont.gov
www.watershedmanagement.vermont.gov

5 attachments

Williston FRP Data Summary - ELS 9-20-2016.xlsx
16K

APPENDIX F

TETRA TECH CONSTRUCTION COST ESTIMATING MEMO 10-30-2007

Tetra Tech, Inc.
10306 Eaton Place, Suite 340
Fairfax, VA 22030
Telephone (703) 385-6000
Fax (703) 385-6007
Water Resources Group

MEMORANUM

Date: October 30, 2007
From: Tham Saravanapavan
To: Jennifer Callahan, Vermont Department of Environmental Conservation
Re: BMP Cost Function in Vermont's BMPDSS

Defining Cost Function and Variables

When refer to the cost of stormwater best management practices (BMP), generally it includes construction cost, maintenance and inspection cost, and land opportunity cost (Wossink and Hunt, 2003). In BMPDSS (Cheng et al., 2006), a generic cost function is employed as described below.

Total Cost = Installation Cost [**I**] + Land Cost [**L**] + Fixed Cost [**F**]

Installation Cost [**I**] represents the material and labor expenses related to the construction of the BMP. Land Cost [**L**] represents the land value. It is important to note that L is negligible if the BMP were installed in small areas, such as bioretention or infiltration, and underground storages. Fixed Cost [**F**] represents the cost associated with design and permitting activities. Due to the unavailability of the cost information on maintenance and inspection, these costs were not included in the equation.

In Vermont BMPDSS, a detention BMP (assumed a wet pond) represents to control the flood flow and a bio-infiltration BMP represents to control the low flow. The following equations represent the selected BMPs.

Detention BMP:
Cost = **I** * Detention Volume (ft^3) + Detention Surface Area (acre)***L** + **F**

I = \$5 per ft^3 and **L** = \$ 217,800 per acre, were based on USEPA (1999a) similar to the Prince George's County model.
F = [\$ 2,000 **x** number of eligible parcels within a sub-watershed] (Assuming each parcel will install a separate BMP and it will cost \$ 2,000 for permitting and design of these BMPs)

Infiltraion BMP:
Cost = **I** * BMP volume (ft^3) + **F**

I = \$6 per ft^3, was based on USEPA (1999b) similar to the Prince George's County model.
F = [\$ 2,000 **x** number of eligible parcels within a sub-watershed] (Assuming each parcel will install a separate BMP and it will cost \$ 2,000 for permitting and design of these BMPs)

Discussion on Selection of Cost Function and Variables

One of the challenges to apply BMPDSS in Vermont is to identify appropriate cost variables to be input into BMPDSS that represent Vermont's site specific environment. Tetra Tech, along with Vermont Department of Environmental Conservation, has conducted a limited research on BMP cost information available for Vermont environment, including data and reports from University of Vermont (UVM) and the City of South Burlington.

The cost information available at the City of South Burlington excludes the resources that were directly provided by the City (For example, the staff time of City employees, the use of City owned equipments, etc.). Therefore, the data is not complete enough to be represented in BMPDSS. A review further revealed that the cost information available at UVM Redesigning American Neighborhood (RAN) program are based on USEPA (1999 a & b) that is the same information of the Prince George's County BMPDSS.

Due to the unavailability of the site-specific cost data for Vermont and USEPA (1999 a & b) data are presently used in UVM RAN program, Tetra Tech has employed the cost information of existing BMPDSS model. As and when more site specific information available, the variables can be easily updated in BMPDSS. Although the changes in these variables will result in changes in the total cost for implementing BMP, the optimization and other BMPDSS results, such as sizing and locations, have no impact due the changes.

Reference:

Cheng, M.S., C.A. Akinbobola, J. Zhen, J. Riverson, K. Alvi, and L. Shoemaker. 2006. BMP decision support system for evaluating watershed-based stormwater management alternatives. In *Proc. 2006 World Environmental and Water Resources Congress*, May 21-25, 2006, Omaha, Nebraska.

United States Environmental Protection Agency, 1999a. Stormwater Technology Fact Sheet: Wet Detention Pond, EPA 832-F-99-048.

United States Environmental Protection Agency, 1999b. Stormwater Technology Fact Sheet: Bioretention, EPA 832-F-99-012.

University of Vermont, Redesigning the American Neighborhood (RAN) Toolbox. http://www.uvm.edu/~ran/ran/toolbox/bmp/index.php, (accessed May 2007).

Wossink, A. and B. Hunt, 2003. An evaluation of cost and benefits of structural stormwater BMPs in North Carolina, NC State Corporative Extension.

APPENDIX H

VTRANS INTER-MS4 COOPERATIVE AGREEMENT

STATE OF VERMONT
INTER-MS4 COOPERATIVE AGREEMENT

1. ***Parties.*** This is a Cooperative Agreement between the State of Vermont, Agency of Transportation (hereafter called "VTRANS"), and the Town of Williston, VT, (hereafter called Williston").

2. ***Subject Matter.*** The subject matter of this Cooperative Agreement is generally on the subject of a collaborative compliance approach to the Federal Phase II Stormwater Regulations and NPDES General Permit for Stormwater Discharges from MS4S **(GP-3-9014)** specifically related to the TMDL flow restoration requirements in the Allen Brook watershed. Details of the Cooperative Agreement are described in Attachment A.

3. ***Agreement Term.*** The period of Williston's performance shall begin on May 6, 2011 and end on May 6, 2011.

4. ***Amendment.*** No changes, modifications, or amendments in the terms and conditions of this Agreement shall be effective unless reduced to writing, numbered and signed by the duly authorized representative of VTRANS and Williston.

5. ***Cancellation.*** This Agreement may be canceled by either party by giving written notice at least 90 days in advance, or upon submittal of a satisfactory FRP to ANR, whichever is sooner.

6. **Entire Agreement:** This Agreement represents the entire agreement between the parties on the subject matter. All prior agreements, representations, statements, negotiations, and understandings shall have no effect.

7. **Applicable Law:** This Agreement will be governed by the laws of the State of Vermont.

8. ***Attachments***. This Cooperative Agreement consists of 5 pages including the following attachment which are incorporated herein: Attachment A - Specifications of the Cooperative Agreement

---

WE THE UNDERSIGNED PARTIES AGREE TO BE BOUND BY THIS COOPERATIVE AGREEMENT.

By the State of Vermont, Agency of Transportation:
Date: 5/11/11
Signature: 
Name: Brian Searles
Title: Secretary of Transportation

By the Town of Williston:
Date: 5-5-11
Signature: 
Name: Richard McGuire
Title: Town Manager

ATTACHMENT A – Specifications of the Cooperative Agreement

**INTER-MS4 COOPERATIVE AGREEMENT
REGARDING A COLLABORATIVE COMPLIANCE APPROACH TO
THE FEDERAL PHASE II STORMWATER REGULATIONS AND
NPDES GENERAL PERMIT FOR STORMWATER
DISCHARGES FROM MS4S (GP-3-9014)
SPECIFICALLY RELATED TO THE TMDL
FLOW RESTORATION REQUIREMENTS
IN THE ALLEN BROOK WATERSHED (MOA)**

WHEREAS; the United States Environmental Protection Agency (EPA) National Pollutant Elimination System (NPDES) Phase II Federal Stormwater Regulations (40 CFR Sections 122 and 123) require regulated Municipal Separate Storm Sewer System (MS4s) operators in urbanized areas to obtain a permit; and

WHEREAS; the Vermont Agency of Natural Resources (VANR), via EPA authorization, has been delegated to administer the NPDES Phase II requirements; and

WHEREAS; in Vermont, those designated as Municipal Separate Storm Sewer Systems (MS4s) are required to obtain and comply with the VANR NPDES General Permit for Stormwater Discharges from MS4s (GP-3-9014) and any amendments thereto; and

WHEREAS; the State of Vermont Agency of Transportation (VTRANS) and the Town of Williston (WILLISTON) have been designated as operating a MS4s regulated under VANR NPDES General Permit for Stormwater Discharges from MS4s (GP-3-9014), and have coverage under GP-3-9014; and

WHEREAS; the VANR pursuant to the Secretary's federally-delegated NPDES program is proposing to reissue the NPDES General Permit for the Discharge of Stormwater from certain small MS4s to waters within the State of Vermont. Upon its effective date, this permit will replace the existing MS4 GP-3-9014 issued in 2003, amended in February, 2004 and subsequently modified by the Vermont Water Resources Board in July 2005; and

WHEREAS; the current and proposed re-issued MS4 permit will apply to the following regulated MS4s: Burlington, Colchester, Essex, Essex Junction, Milton, Shelburne, South Burlington, Williston, Winooski, the University of Vermont, the Burlington International Airport and the Vermont Agency of Transportation. This permit will also provide coverage for any additional small MS4s designated by the Secretary pursuant to 40 CFR 123.35(b) or 122.32(a)(2); and

WHEREAS; the permit includes provisions to ensure that discharges do not cause or contribute to exceedances of Vermont water quality standards; and

WHEREAS; pursuant to federal regulation, Vermont must develop a list of water bodies that are not meeting the water quality standards applicable to the water body. This list, the "303(d) List", refers to the section of the Clean Water Act (CWA) that requires the listing of the water bodies. Vermont must update its 303(d) list every two years; and

WHEREAS; Federal regulations require that Total Maximum Daily Loads (TMDLs) be developed for water bodies not meeting applicable standards (see 40 CFR § 130.7 for the regulations associated with TMDLs). A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards. The TMDL allocates pollutant loadings to the impaired waterbody from all point and non-point pollutant sources. Regulations at 40 CFR §130.2 define the TMDL as "the sum of the individual wasteload allocations (WLA) for point sources and load allocations (LAs) for non-point sources"; and

WHEREAS; a TMDL may establish a specific waste load allocation (WLA) for a specific source, or may establish an aggregate WLA that applies to numerous sources. Typically stormwater sources are expressed as an aggregate in a WLA; and

WHEREAS; MS4 permittees must identify in its MS4 Stormwater Management Plan (SWMP) how it will achieve any applicable WLA established in the TMDL. This will include specific BMPs and specific measures to meet the WLA, if applicable. The permittees demonstration of meeting the requirements of the WLA should focus on evidence that shows that the BMPs are implemented properly and adequately maintained. This demonstration may be an iterative process; and

WHEREAS; the Federal EPA approved stormwater TMDLS have been issued for a number of waters into which certain regulated MS4s discharge. The Allen Brook watershed in Williston is one of these waters; and

WHEREAS; each of these TMDLs includes an aggregate point source WLA and does not specify MS4-specific WLAs. Each TMDL contains an individual waterbody description, problem assessment and a generalized discussion of potential implementation actions, including permits that may be necessary to regulate stormwater consistent with established WLAs. The Secretary has considered the stormwater TMDLs, including the aggregate WLA, in the development of permit requirements necessary to protect water quality. The Secretary considers these permit requirements, including but not limited to the stormwater TMDL implementation requirements in Part IV of the draft permit, to be consistent with the assumptions and requirements of the TMDLs and necessary to support the achievement of the WLAs; and

WHEREAS; the draft permit recommends that each MS4 permittee, in consultation with the Agency, should consider working cooperatively with any other MS4 permittees that discharge into the same stormwater impaired watershed to develop and submit a single, comprehensive Flow Restoration Plan (FRP) for the stormwater impaired watershed. The FRP shall be submitted within the first three years of the permit term. The FRP will include:

- Identification of the suite of necessary stormwater Best Management/Stormwater Treatment Practices (BM/STPs) to achieve the flow restoration targets; and

- A design and construction schedule for the identified suite of stormwater BM/STPs which provides for implementation of the BMPs no later than 10 years from the effective date of the permit; and

- A financing plan that estimates the costs for implementing the Flow Reduction Plan and describes a strategy for financing the Plan; and

- A regulatory analysis that identifies and describes what, if any additional regulatory authorities, including the authority to require low impact development BMPs, the permittee will need to effectively implement the Flow Reduction Plan; and

- An identification of regulatory assistance that the permittee will need in order to effectively implement the Flow Reduction Plan (e.g. use of residual designation authority by the Secretary); and

WHEREAS; parties to this MOA own & control regulated impervious surface within the designated Stormwater Impaired Allen Brook Watershed; and

WHEREAS; VTrans owns 16% of the total impervious surface in Stormwater Impaired Allen Brook comprised of I-89, US2, US2A and I-89 Welcome Centers. The remaining 84% is owned & controlled by Williston and its residents, businesses and commercial developments; and

WHEREAS; in the MS4 draft re-issued permit, MS4 permittees are required to contribute its proportional share of the costs in the development and implementation of the FRP; and

WHEREAS; parties to this MOA agree to use percent impervious surface within the limits of the Stormwater Impaired Allen Brook Watershed as the basis for determining proportional share for each party to this MOA; and

WHEREAS; the parties to this MOA recognizes that it is advantageous to participate in a coordinated approach with each other in developing a FRP for the Stormwater Impaired Allen Brook Watershed; and

WHEREAS; parties to this MOA wish to commence a collaborative FRP process effort even though MS4 Permit requirement is pending with ANR using the DRAFT MS4 GP-3-9014 (re-issuance) as a guide; and

WHEREAS; parties to this MOA agree to an FRP BM/STP decision making process that is targeted at meeting the TMDL targets established by VANR under the Stormwater Impaired Allen Brook TMDL. It is further agreed that decisions will be based on constructability; impact to roadway infrastructure, utilities, and public/private property; the most reasonable and practical alternative and considers buy in from all parties in terms of location, payment, operation and maintenance. BM/STPs must be acceptable to the party who owns/controls the land upon which the stormwater BM/STP is proposed; and

NOW THEREFORE; parties to this MOA shall be solely responsible and liable for its own activities under this MOA, for obtaining and maintaining its current and future permit coverage under GP-3-9014, and for the preparation, implementation, operation and maintenance of its own stormwater management program, including but not limited to, the required minimum control measures and applicable Best Management Practices for Pollutants of Concern; and

THEREFORE; Parties to the MOA agree to participate in a collaborative process in order to achieve compliance with the MS4 FRP requirements for the Stormwater Impaired Allen Brook Watershed; and

THEREFORE; due to State and Federal contracting requirements, VTrans will contract directly with DuBoise & King (D&K) instead of co-signing with Williston on a single contract with D&K. VTrans will contract FRP services with D&K for its proportional share under its Environmental General Services Retainer Contract (GSRC) with D&K for a maximum of $6,185 of the total Flow Restoration Planning Services agreed upon between Williston, VTrans and D&K for inclusion of its impervious surface in the Allen Brook FRP process. All services under the Environmental GSRC with VTrans will be completed and invoiced to VTrans before June 30, 2011 (the termination date of the current Environmental GSRC).

THEREFORE; Parties agree to an FRP process that, at a minimum, includes the following:

- Equal representation in and under all MS4 FRP requirements; and
- Inclusion of VTrans impervious surfaces in the Williston FRP process and documents; and
- Equal access to D&K as necessary to discuss FRP; and
- Equal opportunity to participate in all scheduled meetings with D&K and/or ANR; and
- Equal opportunity to review propose BMP's at all stages in the FRP process; and
- Equal opportunity to review draft and Final FRP and to make comment; and
- Two paper copies and one PDF version of the final FRP; and

THEREFORE; VTRANS will actively participate in FRP process; and

THEREFORE; Parties agree that due to the contracting issues, to include each other in meetings, discussions, and decision making under each of the two contracts with D&K; and

THEREFORE; if any provision, paragraph, sentence or clause of this MOA shall be held invalid or unenforceable, for any reason, the invalidity or unenforceability of such provision, paragraph, sentence or clause shall not affect the remainder of this MOA. This MOA shall be construed and enforced, consistent with its expressed purposes, as if such invalid and unenforceable provision, paragraph, sentence, or clause had not been contained in the MOA.

APPENDIX G

STORMWATER AGREEMENTS

STORMWATER AGREEMENT

This AGREEMENT, made this First day of July, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Allen Brook Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit #_____ and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by December (month) of 2020 (year) [4 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Allenbrook Homeowners Association
160 Lefebvre Ln
Williston, VT 05495

Copy to Attorney: Roger Scharf
PO Box 340
Hinesburg, VT 05461

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this First day of ~~July~~ August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this First day of July, 2016.

IN THE PRESENCE OF:

Witness

Owner: Allenbrook HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: REBECCA THARP

STORMWATER AGREEMENT

This AGREEMENT, made this 24th day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Brennan Woods Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-1272 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by [October] (month) of [2022] (year) [[6] years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Brennan Woods Homeowners Association
726 Hanon Drive
Williston, VT 05495

Copy to Attorney: N/A

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 24 day of JUNE, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Owner: Brennan Woods HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: Lisa G. Roy

STORMWATER AGREEMENT

This AGREEMENT, made this 29th day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Cathedral Square Corporation ~~Homeowner's Association~~, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-0963 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by October (month) of 2011 (year) [5 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Cathedral Square Corporation
Whitney Hill Homestead
412 Farrell Street Suite 100
South Burlington, VT 05403

Copy to Attorney: _____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: Richard McGuire
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this ___ day of July, 2016.

IN THE PRESENCE OF:

Witness
Miranda Lescaze

Owner: Cathedral Square Corporation ~~HOMEOWNER'S ASSOCIATION~~

By: James S. Whitcomb
Duly-appointed Agent of Owner

Print Name: James S. Whitcomb

END OF DOCUMENT

STORMWATER AGREEMENT

This AGREEMENT, made this 29 day of JUNE, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Coyote Run Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-1502 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by 9 (month) of 2021 (year) [5 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: HERGENROTHER CONST LLC
97 BLAKELY RD STE 103
COLCHESTER VT, 05446

Copy to Attorney: ROGER KOHN
HINESBURG VT

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 29 day of JUNE, 2016

IN THE PRESENCE OF:

Witness

Owner: COYOTE RUN HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: THOMAS HERGENROTHER SR.

STORMWATER AGREEMENT

This AGREEMENT, made this 28 day of July, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Golf Links Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 2-1180 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by 12 (month) of 2021 (year) [5 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495
President

If to Owner: CAROL M. DAVIS
172 TAMARACK DR.
WILLISTON 05495

Copy to Attorney: _____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 28 day of July, 2016.
1st August

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this _____ day of _____, 20___.

IN THE PRESENCE OF:

Witness

James Shennard

Owner: Golf Links HOMEOWNER'S ASSOCIATION President.

By: _____
Duly-appointed Agent of Owner

Print Name: CAROL M. DAVIS.

STORMWATER AGREEMENT

This AGREEMENT, made this 18th day of July, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Meadow Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-1258 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by July (month) of 2026 (year) [10 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Heritage Meadow Homeowner Assn.
P.O. Box 1614
Williston VT 05495

Copy to Attorney: Kohn Rath Dannon & Lynch, LLP
P.O. Box 340
Hinesburg VT 05461

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 18th day of July, 2016. 1st August 2016

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this _____ day of _____, 20___.

IN THE PRESENCE OF:

Witness

Owner: Heritage Meadow HOMEOWNER'S ASSOCIATION

By: Liza A. Poulin President
Duly-appointed Agent of Owner

Print Name: Liza Poulin

STORMWATER AGREEMENT

This AGREEMENT, made this 29th day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Taft Farms Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-1217

and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any

construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by June (month) of 2023 (year) [7 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater

system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the

Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in

Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: AFT Farms Homeowners Assoc
Darlene Worth
173 Isham Circle
Williston, Vt

Copy to Attorney: _____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 29th day of June, 2016.

IN THE PRESENCE OF:

Witness

Owner: Indian Ridge HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: Darlene Worth

STORMWATER AGREEMENT

This AGREEMENT, made this 1st day of July, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Meadow Run Condominium + Forest Run Homeowner's Association, (hereinafter referred to as "Owner"). WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 2-1190 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by December (month) of 2024 (year) [5 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to ~~Owner:~~ Forest Run Homeowner's Association
Property Management Meadow Run Condominium Association
c/o HomeTown Property Mgmt
158 Whitewater Circle
Williston, VT 05495

** ~~Copy to Attorney:~~ (See below)

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

** Copy to Attorney:
Carl H. Lisman esq.
84 Pine St, Suite 5
Burlington, VT 05401
864-5756

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 29th day of June, 2016.

IN THE PRESENCE OF:

Owner: Forest Run HOMEOWNER'S ASSOCIATION

Witness

By: Patricia M Griffin
Duly-appointed Agent of Owner

Print Name: PATRICIA M. GRIFFIN.
Forest Run Homeowners Association

Date: 6/29/16 By: Elizabeth Merrill
Duly Appointed Agent of Owner

Print Name: Elizabeth Merrill
Meadow Run Condominium association

Witness

END OF DOCUMENT

STORMWATER AGREEMENT

This AGREEMENT, made this 28th day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Meadowridge Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 2-1107 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by October (month) of 2026 (year) [10 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Arthur Seoane
83 Plateau Rd
Williston, VT 05495

Copy to Attorney: Paolo Welser c/o Primmer Piper
100 East State St.
Montpelier, VT 05601

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 28 day of June, 2016.

IN THE PRESENCE OF:

Witness

Owner: Meadowridge HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: Arthur Segane

STORMWATER AGREEMENT

This AGREEMENT, made this 19th day of August, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Old Stage Estates Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 2-1146 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by August (month) of 2026 (year) [10 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: OSEHA
c/o Myra Boenke
348 Southfield Drive
Williston, VT 05495

Copy to Attorney: Kohn Rath Danon + Lynch, LLP
attn: Robert Scharf
P.O. Box 340
Hinesburg, VT 05461

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 19th day of August, 2016.
29th Agust, 2016

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard Mc Guire

DATED this _____ day of _____, 20___.

IN THE PRESENCE OF:

Witness

Owner: Old Stage Estates HOMEOWNER'S ASSOCIATION

By: Myra Boenke
Duly-appointed Agent of Owner

Print Name: Myra Boenke
President, OSEHA Board

STORMWATER AGREEMENT

This AGREEMENT, made this 16th day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Pinecrest Village Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-1047 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by N/A (month) of _____ (year) [_____ years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Pinecrest Village c/o PMA
PO Box 1201
Williston, VT 05495

Copy to Attorney: _____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 16th day of June, 2016.

IN THE PRESENCE OF:

Witness

Owner: Pinecrest Villa HOMEOWNER'S ASSOCIATION

By: Kari A Dupratt
Duly-appointed Agent of Owner

Print Name: Kari A Dupratt

STORMWATER AGREEMENT

This AGREEMENT, made this 30 day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Pleasant Acres Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit #_____ and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by December (month) of 2019 (year) [3 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Byron Batres
57 Pleasant Acres Drive
Williston, VT 05495

Copy to Attorney: _____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this ~~30~~ 1st day of ~~June~~ August, 2016

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 30 day of June, 2016.

IN THE PRESENCE OF:

Witness

Owner: Pleasant Acres HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: Byron Batres

STORMWATER AGREEMENT

This AGREEMENT, made this 30th day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the South Ridge Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-0664 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by October (month) of 2026 (year) [10 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: South Ridge Homeowners Association
PO Box 366
Williston, VT 05495

Copy to Attorney: _____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 30 day of June, 2016.

IN THE PRESENCE OF:

Witness

Owner: South Ridge HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: Steven Shepard

STORMWATER AGREEMENT

This AGREEMENT, made this 13th day of July, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Tafts Farms Master Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit [residential portions of permit #1-0513 east of Allen Brook] and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by June (month) of 2023 (year) [7 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Property Management
~~Associates~~
~~Post Office Box 1201~~
Williston, Vermont 05495

Copy to Attorney: _____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this ~~12~~ 3 day of ~~July~~ August 5, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: _____
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 12 day of July, 2016.

IN THE PRESENCE OF:

Witness

Owner: Taft's Farms Phase II HOMEOWNER'S ASSOCIATION

By: _____
Duly-appointed Agent of Owner

Print Name: Scott Michaud, Agent

END OF DOCUMENT

STORMWATER AGREEMENT

This AGREEMENT, made this 15th day of August, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Turtle Crossing, LLC ~~Homeowner's Association~~ (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit #1-0792 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by October (month) of 2021 (year) [5 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: Andrew Beaumier
22 Brookside Dr.
Williston, VT 05495

Edward Kenney
46 Lawnwood Drive
Williston, VT 05495

Copy to Attorney: Edward M. Kenney, Esq.
46 Lawnwood Drive
Williston, Vermont 05495

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 24th day of August, , 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By:
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 22nd day of August, 2016.

IN THE PRESENCE OF:

Turtle Crossing, LLC
Owner: ~~XXXXXXXXXXXXXXXXXXXXXXXXXX~~

Witness

By:
Duly-appointed Agent of Owner

Print Name: Andrew Beaumier, President

STORMWATER AGREEMENT

This AGREEMENT, made this 22nd day of August, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Residents of Turtle Pond, Louis Kimball Simmons and June W. Simmons, Lori Durieux, Doug Aitken and Martha Aitken, Joel Klein and Abby Klein, Eric Simmons and Theresa Krainz, Mary Elizabeth Flegenheimer, The Marie T. Kerbaugh Trust, Jerold and Kathleen Fernee and Charles and Debra Goller, who all reside along Turtle Pond Road in the Town of Williston, (hereinafter referred to collectively as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit #1191-1 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's

stormwater system arising subsequent to the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by September of 2021 [5 years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, which may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the

stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance set forth in the Stormwater Easement Deed and Bill of Sale appended hereto as Exhibit B. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner (in their collective capacity), its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising out of any occurrence prior to the Town's acceptance of the system. Owner shall have no obligation or indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith.

Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town:	Town of Williston 7900 Williston Road Williston, VT 05495
If to Owner:	John Pitrowisksi Trudell Consulting Engineers 478 Blair Park Road

Copy to Attorney: _____Williston, VT 05495_____

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

18. ACT 250. This Agreement and Owner's obligations to proceed hereunder are expressly contingent upon the Act 250 Commission's approval of the amendments identified on Exhibit A, and the issuance of an Amended Act 250 Permit #4C0697 required to effect changes to Owner's stormwater system contemplated by this Agreement.

19. REQUIRED CONTACT FOR OWNER. At all times during the term of this Agreement Owner shall provide Town with the name, address, telephone number and email address of a representative of Owner which Town is required to contact under this Agreement or under the Stormwater Easement Deed and Bill of Sale to be executed by Owner in connection with this Agreement.

DATED this 29th day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: Richard McGuire
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 22 day of August, 2016.

IN PRESENCE OF:

Witness (as to all Owners)

OWNER:

By: Louis Kimball Simmons
Louis Kimball Simmons

By: June W Simmons
June W. Simmons

By: Lori Durieux
Lori Durieux

By: Doug Aitken by ASL w/authority
Doug Aitken

By: Martha Aitken by ASL w/authority
Martha Aitken

By:
Joel Klein

By: Abby Klein
Abby Klein

By: Eric Simmons
Eric Simmons

By: _____
Theresa Krainz

By: _____
Mary Elizabeth Flegenheimer

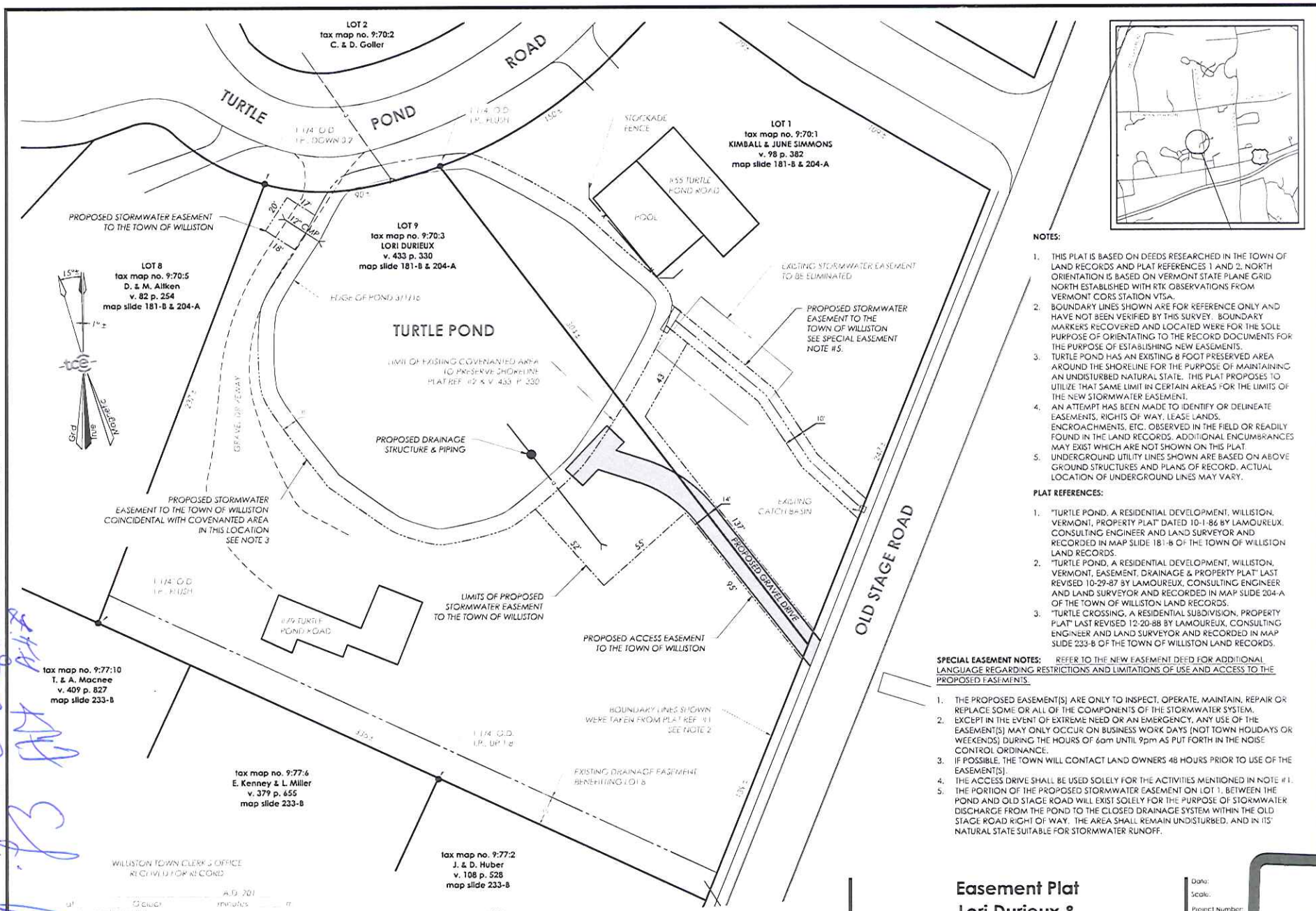
By: _____
_____, Trustee of the
Marie T. Kerbaugh Trust

By: _____
Jerold Fernee

By: _____
Kathleen Fernee

By: _____
Charles Goller

By: _____
Debra Goller



NOTES:

1. THIS PLAT IS BASED ON DEEDS RESEARCHED IN THE TOWN OF LAND RECORDS AND PLAT REFERENCES 1 AND 2. NORTH ORIENTATION IS BASED ON VERMONT STATE PLANE GRID NORTH ESTABLISHED WITH RTK OBSERVATIONS FROM VERMONT CORS STATION VTSA.
2. BOUNDARY LINES SHOWN ARE FOR REFERENCE ONLY AND HAVE NOT BEEN VERIFIED BY THIS SURVEY. BOUNDARY MARKERS RECOVERED AND LOCATED WERE FOR THE SOLE PURPOSE OF ORIENTATING TO THE RECORD DOCUMENTS FOR THE PURPOSE OF ESTABLISHING NEW EASEMENTS.
3. TURTLE POND HAS AN EXISTING 8 FOOT PRESERVED AREA AROUND THE SHORELINE FOR THE PURPOSE OF MAINTAINING AN UNDISTURBED NATURAL STATE. THIS PLAT PROPOSES TO UTILIZE THAT SAME LIMIT IN CERTAIN AREAS FOR THE LIMITS OF THE NEW STORMWATER EASEMENT.
4. AN ATTEMPT HAS BEEN MADE TO IDENTIFY OR DELINEATE EASEMENTS, RIGHTS OF WAY, LEASE LANDS, ENCROACHMENTS, ETC. OBSERVED IN THE FIELD OR READILY FOUND IN THE LAND RECORDS. ADDITIONAL ENCUMBRANCES MAY EXIST WHICH ARE NOT SHOWN ON THIS PLAT.
5. UNDERGROUND UTILITY LINES SHOWN ARE BASED ON ABOVE GROUND STRUCTURES AND PLANS OF RECORD. ACTUAL LOCATION OF UNDERGROUND LINES MAY VARY.

PLAT REFERENCES:

1. "TURTLE POND, A RESIDENTIAL DEVELOPMENT, WILLISTON, VERMONT, PROPERTY PLAT" DATED 10-1-86 BY LAMOUREUX, CONSULTING ENGINEER AND LAND SURVEYOR AND RECORDED IN MAP SLIDE 181-B OF THE TOWN OF WILLISTON LAND RECORDS.
2. "TURTLE POND, A RESIDENTIAL DEVELOPMENT, WILLISTON, VERMONT, EASEMENT, DRAINAGE & PROPERTY PLAT" LAST REVISED 10-29-87 BY LAMOUREUX, CONSULTING ENGINEER AND LAND SURVEYOR AND RECORDED IN MAP SLIDE 204-A OF THE TOWN OF WILLISTON LAND RECORDS.
3. "TURTLE CROSSING, A RESIDENTIAL SUBDIVISION, PROPERTY PLAT" LAST REVISED 12-20-88 BY LAMOUREUX, CONSULTING ENGINEER AND LAND SURVEYOR AND RECORDED IN MAP SLIDE 233-B OF THE TOWN OF WILLISTON LAND RECORDS.

SPECIAL EASEMENT NOTES: REFER TO THE NEW EASEMENT DEED FOR ADDITIONAL LANGUAGE REGARDING RESTRICTIONS AND LIMITATIONS OF USE AND ACCESS TO THE PROPOSED EASEMENTS.

1. THE PROPOSED EASEMENT(S) ARE ONLY TO INSPECT, OPERATE, MAINTAIN, REPAIR OR REPLACE SOME OR ALL OF THE COMPONENTS OF THE STORMWATER SYSTEM.
2. EXCEPT IN THE EVENT OF EXTREME NEED OR AN EMERGENCY, ANY USE OF THE EASEMENT(S) MAY ONLY OCCUR ON BUSINESS WORK DAYS (NOT TOWN HOLIDAYS OR WEEKENDS) DURING THE HOURS OF 6am UNTIL 9pm AS PUT FORTH IN THE NOISE CONTROL ORDINANCE.
3. IF POSSIBLE, THE TOWN WILL CONTACT LAND OWNERS 48 HOURS PRIOR TO USE OF THE EASEMENT(S).
4. THE ACCESS DRIVE SHALL BE USED SOLELY FOR THE ACTIVITIES MENTIONED IN NOTE #1.
5. THE PORTION OF THE PROPOSED STORMWATER EASEMENT ON LOT 1, BETWEEN THE POND AND OLD STAGE ROAD WILL EXIST SOLELY FOR THE PURPOSE OF STORMWATER DISCHARGE FROM THE POND TO THE CLOSED DRAINAGE SYSTEM WITHIN THE OLD STAGE ROAD RIGHT OF WAY. THE AREA SHALL REMAIN UNDISTURBED, AND IN ITS' NATURAL STATE SUITABLE FOR STORMWATER RUNOFF.

This plat meets the requirements of 27 VSA 1403. _____ (Signature)

Easement Plat
Lori Durieux & Kimball & June Simmons

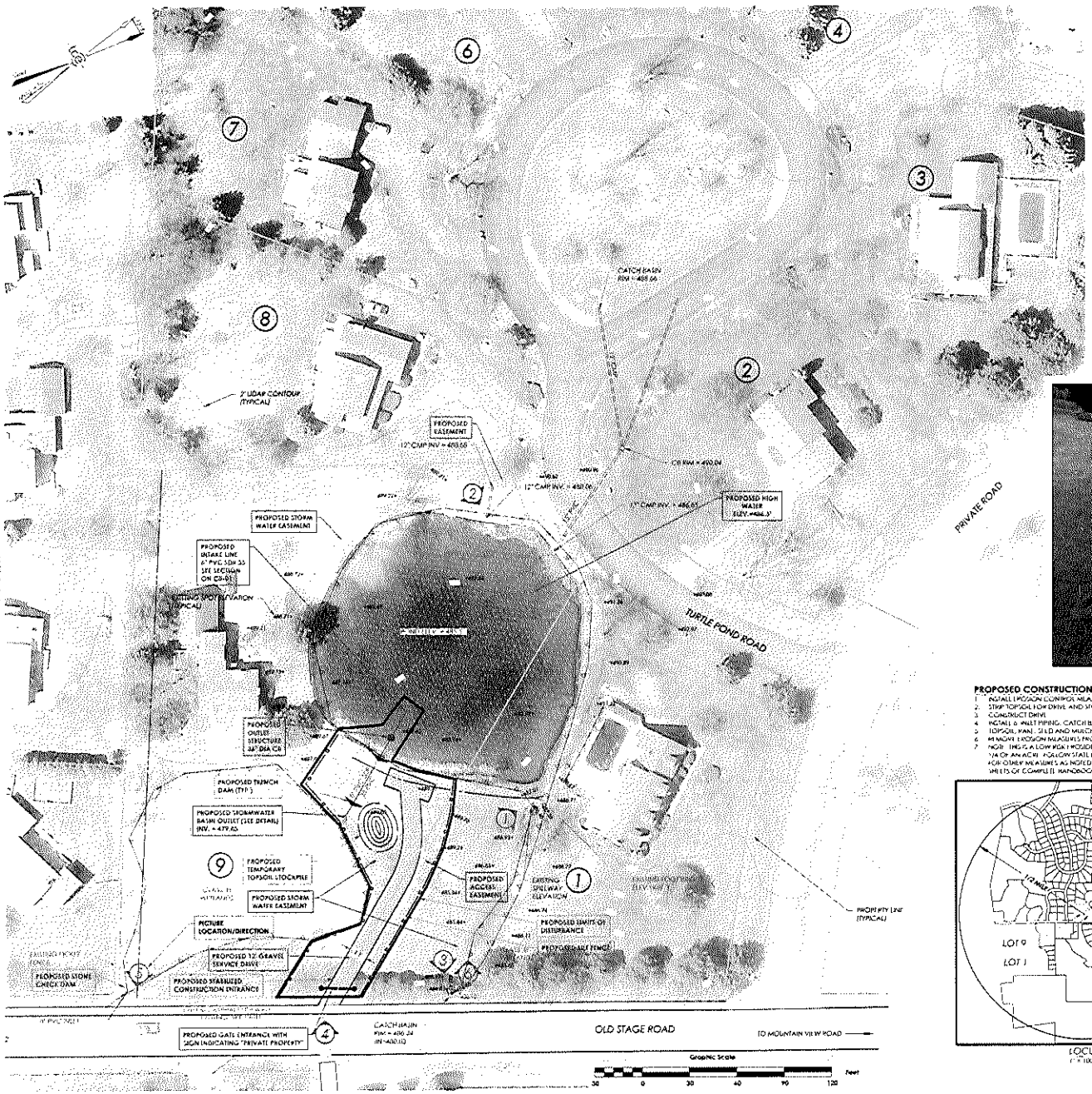
Turtle Pond Road
Williston, Vermont

Revisions	#	Description	Date	By

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495 802.879.6331 | WWW.TCEVT.COM

Date:	
Scale:	
Project Number:	
Drawn By:	
Project Manager:	
Approved By:	
Field Book:	
Cra file:	
Sheet:	

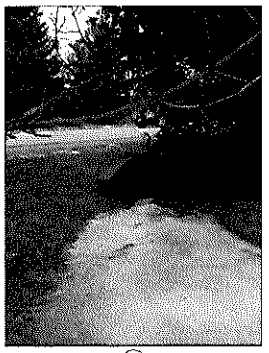
A



1

2

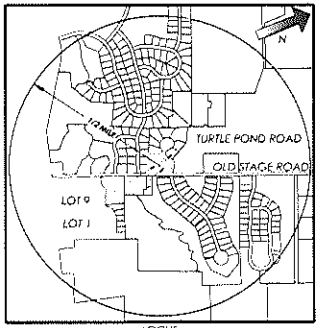
6



3

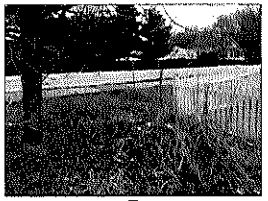
PROPOSED CONSTRUCTION NOTES

1. INSTALL EROSION CONTROL MEASURES
2. STRIP TOPSOIL FOR DRIVE AND STOCKPILE
3. CONSTRUCT DRIVE
4. INSTALL 6" INLET PIPING, CATCH BASIN, AND 18" OUTLET PIPING
5. TOPSOIL, RAKE, SEED AND MULCH DISTURBED AREAS
6. MAINTAIN EROSION MEASURES UNTIL PROJECT STABILIZATION
7. NOTE: THIS IS A LOW RISK FOR SOIL DISTURBANCE AREAS ABOUT 1/4 OF AN ACRE. FOLLOW STATE LOW RISK EROSION HANDBOOK FOR OTHER MEASURES AS NOTED IN HANDBOOK (SEE DETAIL SHEETS OF COMPLETE HANDBOOK AS PART OF THIS PACKAGE)



LOCUS
1" = 1000'

4



5

TRUDELL CONSULTING ENGINEERS

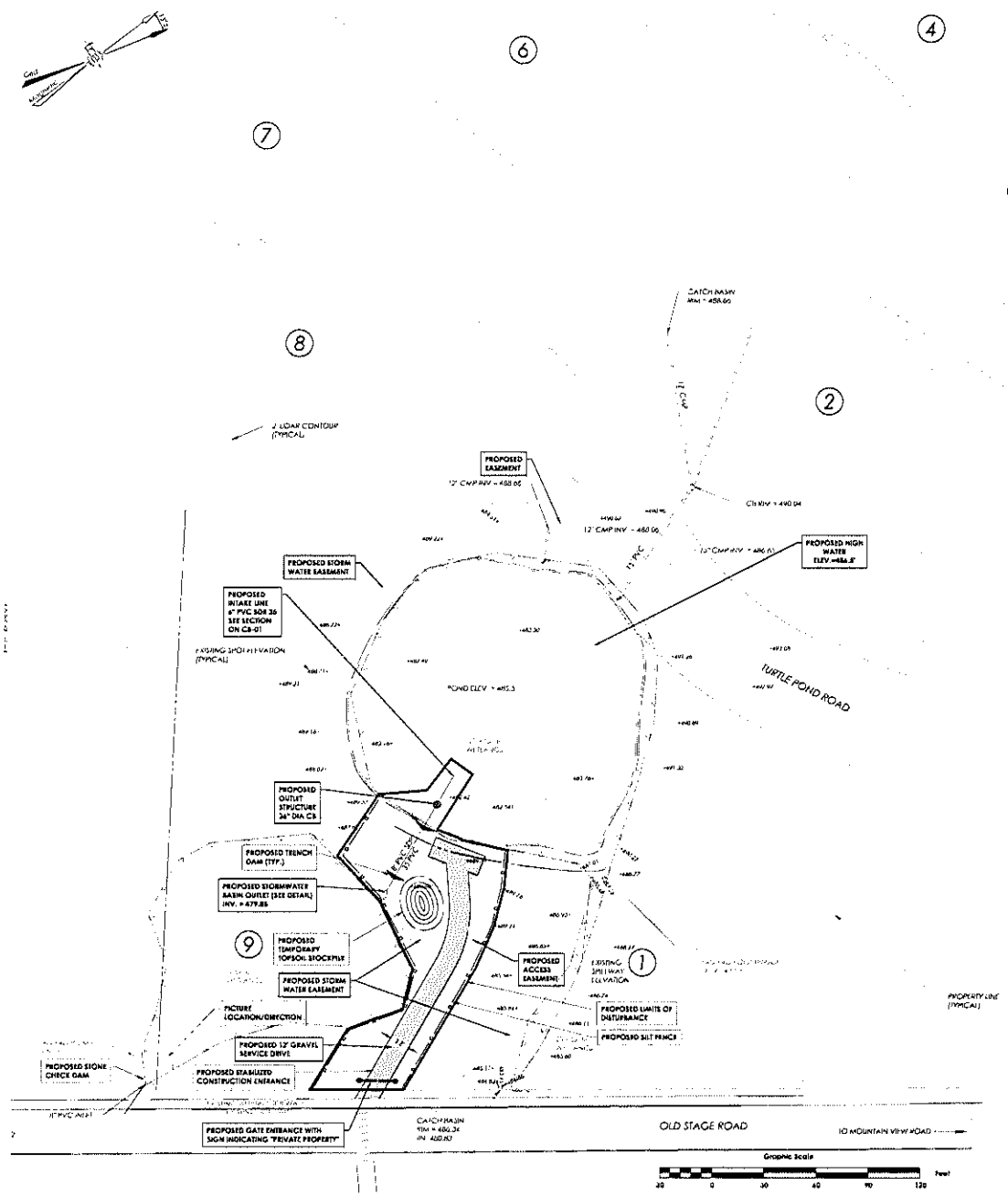
Project Title

Turtle Pond
Turtle Pond Road
Williston, Vermont

Sheet Title

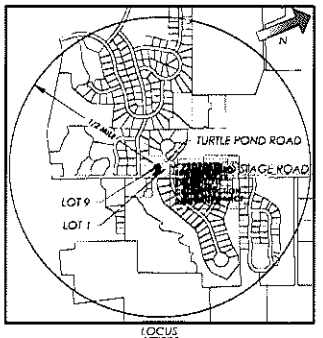
Site Plan

C2-01



PROPOSED CONSTRUCTION NOTES

1. INSTALL EROSION CONTROL MEASURES
2. STRIP TOPSOIL FOR DRIVE AND STOCKPILE
3. CONSTRUCT DRIVE
4. INSTALL 6" INLET PIPING, CATCH BASIN, AND 8" OUTLET PIPING
5. GRADE REMAINING SITE AND MULCH DISTURBED AREAS
6. REMOVE EROSION MEASURES FROM STABILIZATION
7. NOTE: THIS IS A LOW RISK EROSION SITE AS IMPACTS ARE ABOUT 1/4 OF AN ACRE, HOWEVER STATE LOW RISK EROSION HANDBOOK FOR OTHER MEASURES AS NOTED IN HANDBOOK (SEE DETAIL SHEETS OF COMPLETE HANDBOOK AS PART OF THIS PACKAGE).



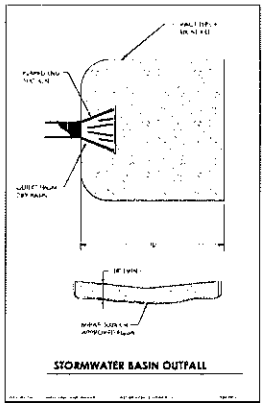
LOCUS

TRUDELL CONSULTING ENGINEERS

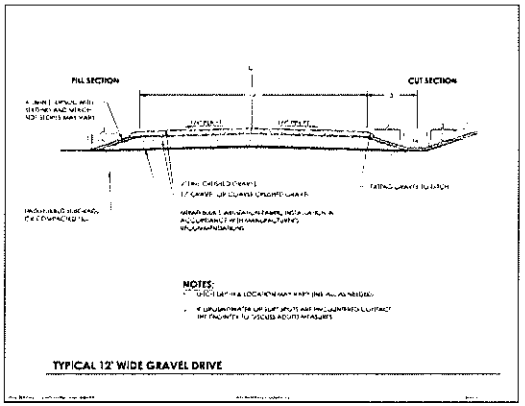
Turtle Pond
Turtle Pond Road
Williston, Vermont

Site Plan

C2-02



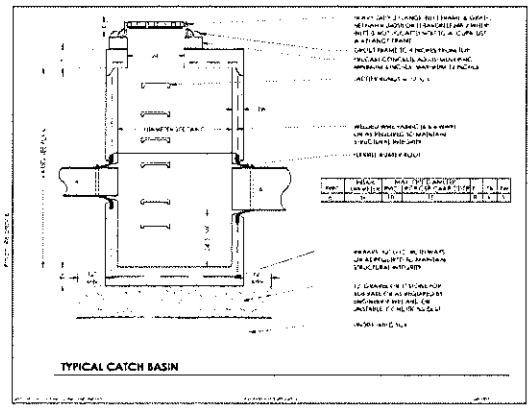
STORMWATER BASIN OUTFALL



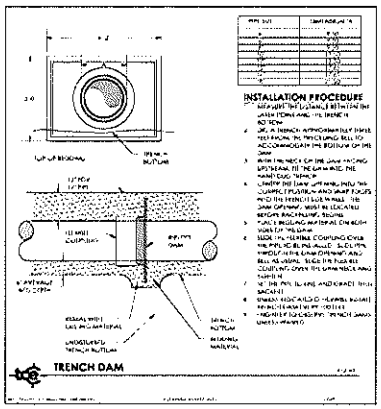
TYPICAL 12' WIDE GRAVEL DRIVE

STABILIZATION REQUIREMENTS

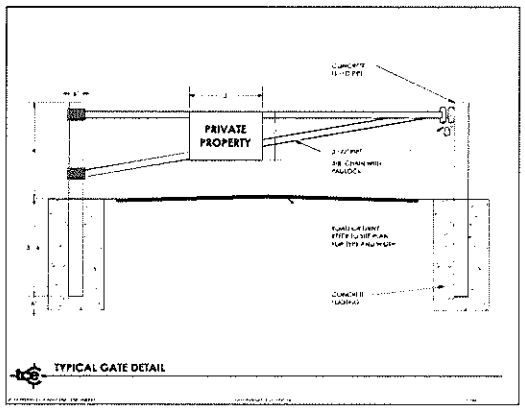
SEEDING SPECIFICATIONS



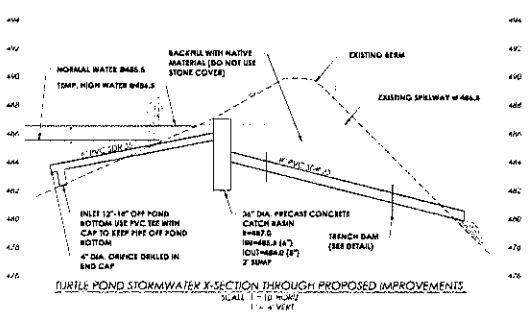
TYPICAL CATCH BASIN



TRENCH DAM



TYPICAL GATE DETAIL



TURTLE POND STORMWATER X-SECTION THROUGH PROPOSED IMPROVEMENTS

RIP-RAP STABILIZATION NOTES

CONSTRUCTION NOTES FOR CONTRACTOR & CLIENT/OWNER

CONSTRUCTION NOTES FOR CONTRACTOR & CLIENT/OWNER

TRUDELL CONSULTING ENGINEERS

Turtle Pond

Turtle Pond Road

Williston, Vermont

Details

C8-01

B

STORMWATER EASEMENT DEED and BILL OF SALE
(Stormwater System)

KNOW ALL PERSONS BY THESE PRESENTS, that we, Louis Kimball Simmons and June W. Simmons, Lori Durieux, Doug Aitken and Martha Aitken, Joel Klein and Abby Klein, Eric Simmons and Theresa Krainz, Mary Elizabeth Flegenheimer, The Marie T. Kerbaugh Trust, Jerold and Kathleen Fernee and Charles and Debra Goller who all reside along Turtle Pond Road in the Town of Williston ("Grantors"), in consideration of the sum of Ten and More Dollars paid to our full satisfaction by the TOWN OF WILLISTON, a Vermont municipality in the County of Chittenden and State of Vermont ("Grantee"), by these presents, does freely GIVE, GRANT, SELL, CONVEY and CONFIRM unto the said Grantee, the TOWN OF WILLISTON, and its successors and assigns forever, a perpetual easement and right-of-way for the purpose of inspecting, operating, maintaining, repairing and replacing the Stormwater System described below, on and through property located off Turtle Pond Road in the Town of Williston, County of Chittenden and State of Vermont described as follows, viz:

Being an easement over Grantors' lands and premises in the Town of Williston for Grantee and its successors and assigns to use, maintain, repair and replace the components of the existing Stormwater System that has been constructed within the area as specifically identified on "Easement Drainage & Property Plat" recorded in Map Volume 8, Page 38 of the Town of Williston Land Records and permitted under Stormwater Permit No. 1191 issued to Sterling Construction, ("Existing Condition Plan") and as such existing Stormwater System may be altered by those changes to Turtle Pond depicted on Easement Plat, Lori Durieux & Kimball & June Simmons, Turtle Pond Road, Williston, Vermont" dated 3/3/16 by Trudell Consulting Engineers and recorded in Map Slide _____ of the Town of Williston Land Records ("Permitted Alterations Plan").

These easements over Grantors properties are only granted as reasonably necessary to construct, inspect, operate, maintain, repair or replace any the portions of the Stormwater System, including Turtle Pond, not accessible from public Turtle Pond Road.

In the course of inspecting, operating, maintaining, repairing or replacing portions of the Stormwater System, or due to failing to inspect or maintain, should the Town cause damage to lands, the Town shall restore any damaged portion to their prior condition.

Grantee agrees for itself and its successors and assigns that it will not remove any trees, shrubs, boulders, bushes or other landscaping except as necessary to maintain the Stormwater System.

The easement granted for stormwater on Lot 1 running between Turtle Pond and Old Stage Road shall not permit the Town to do any construction, or alter the ground surface in anyway. This easement is only for purposes of stormwater discharge from Turtle Pond to Old Stage Road. Should the discharge or stormwater alter the surface in anyway, the Town shall restore the land to its current undisturbed grass state.

The "Proposed Gravel Drive" shall only grant the Town the right of access for the purposes of inspecting, operating, maintaining, repairing or replacing portions of the Stormwater System in Turtle Pond. Should the Town use this right of access to access the Stormwater System and cause damage, the Town shall restore any damages portion of the property to its prior condition. The Grantors shall have the right to cover this drive with 2" of topsoil and grass at their discretion. Such coverage shall not extinguish or in any way alter the easement.

This Stormwater Easement, and the rights of access herein, shall only be used on business workdays (not legal holidays or weekends) between the hours of 8 A.M. and 5 P.M. Grantee will attempt to provide Grantor's representative with 24 hours' advance notice of when it intends to exercise its rights under this Easement Deed; provided, however, that no notice need be given in cases of emergency.

This Stormwater Easement requires that the Town of Williston utilize and maintain Turtle Pond in its current condition except as specifically permitted to be altered as shown on the Permitted Alterations Plat or any applicable permits.

Upon the execution of this Stormwater Easement, the Town of Williston shall have the duty and responsibility to inspect, operate, maintain, repair, and upkeep the Stormwater System, including all responsibility to ensure that the Stormwater System meets all applicable State and Federal regulations, permitting requirements and discharge or treatment standards. including but not limited to Act 250 Permit No. 4C0697 and Stormwater Permit No. 1191, as such may be amended.

The components of the Stormwater System and all related improvements and appurtenances are hereby conveyed to Grantee in "as is, where is" condition and this Easement Deed shall act as a bill of sale for all the stormwater components. Fee ownership of Turtle Pond shall remain with Louis Kimball Simmons and June W. Simmons, Lori Durieux their heirs and assigns.

Grantors and their successors and assigns shall have the right to make use of the portions of the Property subject to the Easement, including landscaping, provided such use is not inconsistent with the use of the easement by the within Grantee. Grantors and their successors and assigns shall place no structures on the portions of the Property subject to the Easement or take action which shall prevent or interfere with Grantee's ability to exercise its rights granted hereunder.

By its recording of this Easement Deed, Grantee agrees, for itself and its successors and assigns, that any premises of Grantors lying outside the easement area disturbed or affected by Grantee's exercise of the rights granted it hereunder shall be restored to their condition prior to such entry at Grantee's own cost and within a reasonable time.

The rights and easements granted hereby are subject to: (a) all easements, rights of way and encroachments depicted on the Plat, not meaning to reinstate any claims barred by operation of the Vermont Marketable Record Title Act, 27 V.S.A. § 601 et seq.; (b) terms

and conditions of the following permits and approvals issued in connection with the proposed development of the Property, including without limitation the improvements that are depicted on the drawings and plans approved thereby (c) the provisions of municipal ordinances, public laws, and special acts.

Reference is hereby made to the above-mentioned plan and deeds and the records thereof, and the references therein made all in further aid of this description.

TO HAVE AND TO HOLD the rights and easements conveyed hereby, with all the privileges and appurtenances thereto, to Grantee, The Town of Williston, and its successors and assigns, to their own use and behoof forever; and we said Grantors, Louis Kimball Simmons and June W. Simmons, Lori Durieux, Doug Aitken and Martha Aitken, Joel Klein and Abby Klein, Eric Simmons and Theresa Krainz, Mary Elizabeth Flegenheimer, The Marie T. Kerbaugh Trust, Jerold and Kathleen Fernee and Charles and Debra Goller, the residents of Turtle Pond Road, for ourselves and our heirs and assigns, does covenant with the said Grantee and its successors and assigns, that until the ensealing of these presents, Grantor is the sole owner of the Property, and has good right and title to convey the same in the manner aforesaid, that the Property is FREE FROM EVERY ENCUMBRANCE, except as aforementioned; and it hereby engages to WARRANT and DEFEND the same against all lawful claims whatever, except as aforementioned.

Signature Page to Follow

STORMWATER AGREEMENT

This AGREEMENT, made this 28th day of June, 2016, by and between the Town of Williston, (hereinafter referred to as "Town"), and the Commons at Williston Village Homeowner's Association, (hereinafter referred to as "Owner").

WHEREAS, the Owner has an expired Stormwater Permit benefitting Owner's stormwater discharge system; and

WHEREAS, Town has agreed to accept responsibility for maintenance and future upgrades of Owner's stormwater system providing the conditions in this Agreement have been satisfied.

NOW, THEREFORE, in consideration of the mutual promises herein set forth and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. OWNER'S STORMWATER SYSTEM. Owner's stormwater system covered by Discharge Permit # 1-1052 and the components thereof are more particularly described in the Final Design Plan appended hereto and incorporated herein by reference as Exhibit A (hereinafter the "stormwater system").

2. OWNER'S IMPROVEMENTS. Owner shall take all necessary and appropriate action to improve/repair the stormwater system to the extent such system lies within its property and/or Owner has legal access thereto so that it complies with the Final Design Plan submitted and accepted by the Town as of the date of this Agreement (hereinafter "Owner's improvements"). (Prior to the execution of this Agreement, Owner shall advise Town if Owner does not have legal access to any portion of the stormwater system.) At Owner's request, Town agrees to review the Final Design Plan to determine if the plan complies with Town's Public Water Standards as adopted by the Williston Selectboard and in place at the time of this Agreement (hereinafter "Town's Public Works Standards"). Any construction/installation shall be in accord with any State or Town permits/approvals issued to Owner for such construction. Any changes in zoning bylaws or any other regulations which result in supplementary requirements for the Owner's stormwater system arising subsequent to

the Town's acceptance and approval of the Owner's Final Design Plan shall be the sole responsibility of the Town, and the Owner shall have no further obligation to revise its Final Design Plan or alter, add to or supplement its construction of any modifications, improvements or repairs as part of this Agreement.

3. SCHEDULE. The Owner shall complete Owner's improvements by October (month) of 2026 (year) [ten years].

4. PERMITS/APPROVALS. Owner shall be solely responsible for securing all required permits/approvals for the construction of Owner's improvements to the stormwater system.

5. FAILURE TO CONSTRUCT. If the Owner fails to construct or install Owner's improvements covered by this Agreement within the time frame established, the Town, after thirty (30) days' written notice to the Owner, may ask the State to exercise its power under the Residual Designation Authority to ensure the Owner completes the required improvements. The Owner shall be responsible for any and all costs, including fines, penalties and/or attorney's fees, that may be imposed by the State for non-compliance of this Agreement. Town shall have no obligation to take over the stormwater system and to incur any expense on account thereof unless and until: (a) the Owner has completed the Owner's improvements described in Exhibit A; (b) all applicable permits/approvals have been issued therefor; and (c) the required certification set forth in Section 6 has been received by Town.

6. NOTICE OF COMPLETION OF REQUIRED REPAIRS. Owner shall notify Town when all of Owner's improvements to the stormwater system have been made. Such notice shall be accompanied by the certification by a Vermont licensed engineer certifying that all required Owner improvements described in Exhibit A have been made and that the stormwater system is in compliance with the Final Design Plan and any Town or State permits and all other requirements in this Agreement.

7. ACCEPTANCE BY TOWN. The Town shall formally accept the stormwater system within forty-five (45) days of submission of the engineer's certification referred to in Section 6 to the Town and the submission of the legal documents executed in proper form specified in Paragraph 8. Formal acceptance of the stormwater system by the Town will be in

the form of a written document as recommended by the Director of Public Works and his/her designee and signed by the Town Manager or his/her designee. As part of its formal acceptance of the stormwater system, the Town shall represent to Owner that all future repairs, maintenance, modifications and improvements related to the stormwater system shall be the sole responsibility of the Town. If the Town does not accept the stormwater system by virtue of Owner's failure to comply with this Agreement, Owner shall continue being responsible for the repair, maintenance and permit compliance of the stormwater system.

8. OWNER'S EASEMENT TO TOWN. Prior to Town's acceptance, Owner shall grant to Town the necessary easements and/or licenses to access the stormwater system from a public right of way in form and substance acceptable to Town's attorney and the Owner's attorney. The Town will provide model language to the Owner. The Easement Deed(s) and/or licenses shall be accompanied by a mylar prepaid at Owner's expense suitable for recording depicting the easements/licenses described in the transfer instrument and by the opinion of an attorney licensed to practice law in Vermont certifying that Owner has good and marketable title to the easement/license area free and clear of all material liens and encumbrances and has the authority to convey such easement/license.

9. TOWN'S RESPONSIBILITY POST-ACCEPTANCE. After Town accepts the stormwater system, it shall be solely responsible, at its own cost and expense for (a) maintaining and repairing the stormwater system in accordance with applicable law including the payment of fees (if any) arising after Town's acceptance of the system and submitting all required engineering certifications and statements of compliance, if any, that may be required by applicable law; and (b) for future upgrades to the stormwater system should they be required by applicable law.

10. INDEMNIFICATION. The Owner, its successors and/or assigns, shall indemnify and hold harmless the Town and its officers, agents and employees for any and all damages, accidents, casualties, occurrences, claims or attorney's fees arising prior to the Town's acceptance of the stormwater control facilities subject to the Agreement. In the event a claim is asserted against the Town, its officers, agents or employees, the Town shall notify Owner and the Owner shall defend at Owner's expense any suit based on such claim arising

out of any occurrence prior to the Town's acceptance of the system. (Owner shall have no obligation of indemnity on account of maintenance and repairs performed or which were required to be performed under this Agreement by Town. If any judgment or claims arising from an occurrence prior to the Town's acceptance of the stormwater system shall be allowed, the Owner shall pay all costs (including reasonable attorney's fees) and expenses in connection therewith. Notwithstanding the foregoing, Owner shall have no obligation to the Town hereunder for claims arising from the Town's gross negligence or willful misconduct.

11. AGREEMENT RUNS WITH LAND. This Agreement runs with the land/permit to which it applies. It is binding on the Owner and its successors and assigns and on the Town and its successors and assigns. The Owner shall not be able to transfer, assign or modify its responsibilities with respect to this Agreement without the Town's written consent. Nothing herein shall be construed to prohibit a transfer by Owner. If either party learns that an assignment, sale, conveyance, foreclosure, lease or any other event is likely to change the identity of any party, that party shall provide written notice to the other party within 48 hours of such change, and shall provide the other party with copies of all documents relating to the transfer of interest in the agreement.

12. INSPECTIONS. It is understood that the signature of the Owner in this Agreement constitutes permission for representatives of the Town to enter onto the private property for the purpose of completing the necessary inspections. The Owner further agrees to provide the Town with reasonable entry into locked areas, if any. Prior to the turnover of the system, the Owner will also, at its expense, provide the opportunity for the Town to discuss work on the improvements with contractors, designers and employees retained by the Owner. A final inspection schedule consistent with the Public Works Standards will be set at the pre-construction meeting, the date, time and place for which will be set by mutual agreement of the Town and the Owner.

13. AS-BUILTS. As-built drawings for the Owner's improvements described in Exhibit A must be provided to the Town as required by the Town's Public Works Standards.

14. NOTICES. Any notice or other communication to be given hereunder shall be in writing and mailed by certified mail, return receipt requested, to the address set forth below:

If to Town: Town of Williston
7900 Williston Road
Williston, VT 05495

If to Owner: The Commons at Williston Village
c/o John W. Sherpless
152 Commons Rd.
Williston, VT 05495

Copy to Attorney: Carl Lisman, Esq.
84 Pine St., 5th floor
Burlington, VT 05401

or to such other person and address as the party entitled to such notice or communication shall have specified by notice to the other party. Any such notice or other communication shall be deemed given if mailed, when deposited in the United States mail, sent by certified mail, return receipt requested.

15. WAIVER OF RULE OF CONSTRUCTION. The parties waive the benefit of any rule that this Agreement is to be construed strictly against one party or the other.

16. ENTIRE AGREEMENTS, APPLICABLE LAW. This Agreement contains the entire agreement of the parties and no representations, inducements, promises or agreements not embodied herein shall be of any force or effect, unless the same were in writing and signed by or on behalf of the party to be charged. The captions of particular sections are inserted as a matter of convenience only and are in no way to affect or define the scope or intent of this Agreement or any provision thereof. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Vermont.

17. SEVERABILITY. In case one or more of the provisions contained in this Agreement shall be invalid, illegal or unenforceable in any respect under any law, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

DATED this 1st day of August, 2016.

IN THE PRESENCE OF:

Witness

Town: TOWN OF WILLISTON

By: Richard McGuire
Town Manager and Duly Authorized Agent

Print Name: Richard McGuire

DATED this 28 day of June, 2016.

IN THE PRESENCE OF:

Witness Secretary

Owner: The Commons at Williston Village HOMEOWNER'S ASSOCIATION

By: John W. Sharpless
Duly-appointed Agent of Owner

Print Name: John W. Sharpless
President