Response to Technical Review Comments

Volume 1 of 2

Clear River Energy Center and Burrillville Interconnection Project

Burrillville, Rhode Island

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September 2017

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September 18, 2017

Chuck Horbert, Program Supervisor
RIDEM Office of Water Resources
Freshwater Wetlands Program
235 Promenade Street
Providence, RI 02908

Re: Clear River Energy Center, LLC
Burrillville RI
Application No. 17-0079

Dear Chuck,

Please find the enclosed responses to the biologist and engineer review comments provided on June 19, 2017. As previously discussed, the applicants delayed this response, in order to incorporate the results of additional wetland edge verification efforts recently completed by RIDEM staff. As requested, we have attached three hard copies of the responses and associated exhibits. Please let us know if you have additional questions.

Sincerely,

ESS GROUP, INC.

Craig A. Wood
Principal Scientist

Attachments: Response to Comments

C: Bryan Schueler, Clear River Energy, LLC

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL
MANAGEMENT OFFICE OF WATER RESOURCES
FRESHWATER WETLANDS PROGRAM

Technical Review Comments of Documents Received by RI DEM on April 4, 2017

APPLICANT: Algonquin Gas Transmission, LLC (c/o Clear River Energy,

LLC) APPLICATION NO: 17-0079

BIOLOGIST REVIEW COMMENTS (Nancy Freeman 401-222-6820, extension 7408):

Initial site and file review reveals that the Program was not provided with sufficiently detailed site plans or adequate site work to conduct our review. Accordingly, a full review of all submitted materials and all areas of the site has been suspended pending submittal of revised materials and completion of additional site workas detailed herein. The following comments should therefore not be misconstrued to be the entirety of all initial comments, since it is anticipated that additional comments will be generated upon receipt and review of the necessary plan revisions and site work. Please address the following items to be addressed in order tocontinue our review:

l. The site plans submitted for the CREC portion of the project do not depict individual wetland flags. The wetland edge is shown only as a solid line. Individual wetlands flags must be depicted on revised site plans in their entirety. Furthermore the Department only verified portions of the wetland edges requested under Application No. 15-0239. There are large areas proposed for work (e.g. the temporary spoil and laydown/stockpile area and the CREC) that were not previously inspected or verified under the wetland verification letter. For Applications to Alter, all adjacent wetland flags must be verified. Therefore, wetland flags previously delineated near and within the LOD must be refreshed with numbers legible and all additional wetland edges near the project limits (i.e. those not previously reviewed) must be flagged and depicted on revised site plans. The Special Aquatic Sites have been flagged on-site, but their respective flag locations and numbers have not been depicted on the site plans. Any additional new areas of wetland discovered must also be flagged and depicted.

Response: Subsequent to the review comments received on April 4th, Chuck Horbert (Program Supervisor, RIDEM Office of Water Resources, Freshwater Wetlands Program) provided an email (Exhibit 5, dated September 5, 2017) which summarized a review of a more recent wetland edge plans developed in response to comments 2 through 5 below.

ESS has refreshed and/or revised all wetland flags near and within the project LOD to satisfy comments within this letter as well as those discussed in the email from September 5th. Numbered wetland flags (including flags delineating Special Aquatic Sites) have been added to the revised site plans (see Exhibit 1, sheets 01C100 through 01C107, 01C300 through 01C307, 01C700 through 01C703, 01C901 through 01C904, and 01C906 through 01C921).

2. Site inspection revealed that the LOD has been flagged along with the road centerline and drainage features. The LOD flags are numbered; however, no corresponding plan showing the LOD numberswas provided and adjacent wetland flags are missing and/or not legible. Due to size of the propertyand the density of vegetation, walking is prohibitive and sight lines are limited. If feasible, pleaseprovide a separate sheet showing the LOD flag locations and corresponding

numbers (i.e. not aspart of the overall site plan set), which would greatly facilitate our review. While it is likely not feasible or necessary to stake out and label all project components (edge of roads, parking areas,tanks, buildings, etc.), there is a lack of good fixed reference points within the interior of the main development; please therefore at least place and label a stake marking the location of each catchbasin, labeling it with the corresponding identifier number provided on the site plans. Catch basins within close proximity to the LOD stakes do not need to be so marked.

Response: ESS provided a revised wetland field map with the information requested above under a separate cover. This mapping was the subject of comments received in the email dated September 5th. The revised site plans (see Exhibit 1) include all revised wetland flags near and within the project LOD.

3. While following the LOD for the temporary spoil area, additional wetlands were observed along and near the LOD flags. The stream east of the LOD falls within a distinct valley with associatedwetland, which was flagged and verified. However, just west and upslope of the flagged edge, thereare some areas along the LOD where the topography dips back down and the presences of sphagnum moss patches were noted. There are small wet pockets throughout portions of the upland that are,isolated, too small to delineate and that do not meet the definition of a regulated freshwater wetland.However, some of these small wet areas are forested wetlands and some appear to be connected toportions of swamp that were not verified. Because adjacent wetland flags were mostly no longerpresent, the only references are the LOD flags. Please have your wetland consultants (not just thesurveyor) revisit the area *at least* along and near the LOD north/northwest of the proposed 13P Detention Basin and along the far northwestern comer of the temporary stockpile area and along thewestern edge back to the woods path. A wetland Flag 57-d was observed close to the LOD in thefar comer and it appears that perimeter wetland and swamp might extend into the LOD in this general area. Following the LOD flag southerly back towards the woods path (the LOD flag pathwas lost in a dense stand of mountain laurel), pockets of sphagnum moss were observed and it appears that unverified portions of swamp might extent into portions of the LOD here as well. SomeLOD flags where wetland was noted nearby include at least: 6239, 6249, 6253, 6254 and near Flag 133. Please flag any additional wetlands located, depict them on revised site plans and revise the LOD accordingly.

Response: ESS has revised the wetland delineation in the proximity of the staging area consistent with these comments as well as those included in the email dated September 5th. This revised wetland boundary is reflected in the revised plan set (see Exhibit 1).

4. An area subject to storm flowage (ASSF) was observed extending from the southern terminus of the Special Aquatic Site (SAS) east of proposed 4P Detention Pond into the swamp proper. Please flag and depict on revised site plans any additional wetland.

Response: This ASSF has been flagged in the field and the flags have been added to the revised site plans (see Exhibit 1, sheets 01C102, 01C106, 01C302, 01C306, 01C702, 01C903, 01C908, 01C912, 01C916, 01C920).

5. A SAS within an old graveled area is present that appears to be just south of the LOD, south of the 3P gravel wetland and should be identified on the plans due to its proximity.

Response: This SAS (identified as SAS3) has been flagged in the field and the flags have been added to the revised site plans (see Exhibit 1, sheets 01C102, 01C106, 01C302, 01C306, 01C702, 01C903, 01C908, 01C912, 01C916, 01C920).

6. All wetlands should be labeled properly on revised site plans (e.g. swamp, not Biological Wetland 1).

Response: Wetlands have been re-labelled on the revised site plans as either swamp or forested wetland (see Exhibit 1, sheets 01C100 through 01C107, 01C300 through 01C307, 01C700 through

01C703, 01C901 through 01C904, and 01C906 through 01C921).

7. All site plans sheets provided in the set related to the CREC portion of the project appear to be reduced-sized plan sheets. Most, for example, are labeled as l"=50'; however, the actual scale appears to be 1 "=100', and in fact may be slightly off this since the reduction was not exactly 50%. Please revise the site plans to provide a correct scale or provide full-sized site plans rather than reduced-sized site plans.

   Response: The revised site plans have the correct scale at 11" x 17" prints. Full-sized plan sheets can be provided if necessary.

8. Please incorporate Figure 6-1 (roadway cross section) from the narrative into the site plan set details, and clearly indicate the roadway stations applicable to the cross sections. Note it appears that most slopes adjacent to the road (other than access ramps) are steeper than the 3:1 slope specified in the detail. Please clarify/correct.

   Response: Figure 6-1 was included in the permit narrative illustrate compliance with wetland avoidance and minimization requirements. The roadway from Wallum Lake Road into the Facility has been designed to avoid and minimize wetland impacts to the maximum extent practicable. Instead of typical 3:1 embankment slopes, the roadway will be constructed with retaining walls that will considerably reduce its overall width and impact to Wetland 1. The graphic is not intended for design purposes and consequently was not included in the plan set.

9. The only site plans showing details of the various components of the proposed CREC development are 01C002 (Overall Site Arrangement), 01C003 (Overall General Arrangement), 01C400 (Proposed Drainage Plan, which does not show all components) and at a very general level of detail on the sheets O l C918 through 01C921 (SESC Plan Phase TV, which will be removed). All components must be depicted and labeled on a site plan at a useful scale for review within the plan set, ideally on either the Grading Plans or on the Drainage and Water Quality plans.

   Response: Drawings 01C200 through 01C203 (Proposed Site Layout) show the drainage components and references where the detail for each can be found on the 01C800 through 01C805 (Details) drawings.

10. The only site plan sheet showing the entirety of the connection of the project to the existing gas line is Sheet O IC002, "Overall Site Arrangement", which is not at a suitable scale or level of detail. Please incorporate all details and associated limits of disturbance at a scale of no smaller than 1"=100' depicting the connection of the proposed gas supply line to the existing supply lines. Specify whether this is an above-ground or underground supply line.

    Response: Drawing 01C200 shows the extent of the gas pipeline for which Invenergy is responsible. Spectra Energy will be designing the portion of the pipeline that leaves Invenergy property and connects with the larger Spectra Energy system.

11. Note that the wetland limits depicted on Sheets O1 C002 and O1C003 do not correspond with limits depicted on the rest of the plans and may in fact be an earlier, unverified limit of wetlands. **Of greatest relevance and concern is that this older version of the wetland edge is the same wetland edge depicted on the site plans provided to DEM's OWTS Program.** The corrected wetland edges that are depicted throughout the rest of the plan set indicate that the proposed OWTS system is located within freshwater wetland limits. The OWTS system will likely therefore need to

be relocated and other relevant components of the project revised to accommodate the changes. All discrepancies between the depicted wetland edges and limits must be corrected.

Response: The OWTS has been relocated.

12. The Abutters Maps show project impact area, but the wetland is not identified on the various sheets. There is therefore no way to confirm if the maps are correct. Please clearly depict all wetland limits on the 200-foot radius maps and identify the wetlands similarly to how they are identified on the plan set.

Response: The abutters maps have been revised to depict all wetlands, and depicted wetlands have been labelled in a similar manner to the plan set (see Exhibit 2).

13. The BIP plan key sheet (Sheet 6 of 63) does not correspond with the actual site plan sheet numbers and should be revised to do so.

Response: TNEC has revised the plan key sheet accordingly (see Exhibit 1).

14. The "Existing Drainage Conditions" plans (01C104 through 01C107) are duplicative and can be removed from the plan set. All SESC-related site plans (01C900 through 01C925) should be removed from the plan set and incorporated into the corresponding SESC Plan document. **Please note** all plan sheets need to be numbered consecutively as sheet 1 of x, 2 of x etc. where x= the total number of sheets in the plan set. Please number accordingly.

Response: Drawings 01C104 through 01C107 have been removed from the plans. Drawings 01C900 through 01C925 have been removed and are now included in the SESC Plan document. The remaining drawings have retained the original drawing number sequence so the drawings can be separated or easily referenced by discipline or subject matter. Please refer to page 01C000 drawing index that illustrates the drawing package layout.

15. Please do not provide any reports or site plans bound in three-ring binders. Most other methods of binding are acceptable.

Response: So noted.

ENGINEER REVIEW COMMENTS: (Nicholas A. Pisani, PE 401-222-6820, extension 7423):

(1) Please provide a RI professional engineer's stamp on the submitted stormwater analysis.

Response: The stormwater calculations are now sealed by a RI professional engineer on the cover sheet (see Exhibit 3).

(2) Please provide existing and proposed condition node diagrams (depicting all Subcatchment areas, ponds, reaches and links that are identified in the submitted hydrologic and hydraulic analysis.

Response: A node map has been added to the existing conditions and proposed conditions calculation sets. Scaled drawing maps (with nodes) have also been added to the calculations. Revised calculation sets are enclosed with this response (see Exhibit 3).

(3) Please provide existing and proposed condition subwatershed maps that are prepared in accordance with the guidance found in the Appendices of the Rhode Island Stormwater Design

and Installation Standards Manual (RISDISM). Provide a scale of 1"=l00' or greater detail. Also be sure to clearly label all proposed stormwater practice labels that correspond to the submitted hydrologic and hydraulic analysis. Please note that the submitted "proposed drainage and Water Quality Plan" drawings do not appear to adequately label all drainage features. Also, several of the indicated Subcatchment areas extend beyond the page. Please include the complete boundaries of all pertinent Subcatchment areas, even if it requires using a smaller scale for portions of Subcatchment areas that extend off of the subject site. These plans should be separate from the primary plan set.

Response: As mentioned in the response to Item 2 above, scaled drawing maps (with nodes) have been added to the calculation sets. A 1" = 600' scale was used to show the offsite drainage and a 1" = 100' scale was used to show the drainage on the site (see Exhibit 3).

(4) Please refer to the proposed gravel wet vegetated treatment system as such. Please remove all references to "gravel wetland" from this submittal.

Response: References to gravel wetland have been removed from the Drainage Report and revised site plans.

(5) Please provide overall key drawings to assist with review of all drawings with match lines.

Response: The rived site plans have been modified to include a small drawing index to the lower left corner of the plans.

(6) Please recheck the submitted calculation of the channel protection volume release rate and revise the analysis and design as necessary. From a review of the submitted materials the I -year total runoff volume from proposed condition Subcatchment 1S is 3.397 acre feet or 147,973 cubic feet (cf). The required channel protection volume is 0.65 times this value, or 96,183 cf. Dividing by24 x 60 x 60 yields a value of 1.11 cubic feet per second (cfs) for the average channel protectionvolume release rate. To obtain the maximum channel protection volume release rate multiplythis value by two to obtain 2.22 cfs. Please note that the maximum computed release rate provided is 2.57 cfs, which is slightly greater than the 2.22 cfs value. Please address if the 2.22 cfs value can be provided; otherwise please provide a technical justification that the 2.57 value will not be detrimental, and demonstrate that the design meets the standard to the "maximum extent practicable".

Response: The control structure has been modified and the calculations revised. The maximum channel protection volume release rate is now 2.16 cfs (see Exhibit 3).

(7) Please note the requirement to provide a 3' vertical separation to the seasonal high groundwater table (SHGWT) from the top of dry swale (the top of the bioretention soil layer, which is at thebottom of the channel formed by the dry swale), as per RISDISM standard 5.7.1 bullet 2. Pleaseprovide an adequate number of soils tests so as to determine the elevation profile of the seasonal high water table along the length of the proposed series of dry swales. Please also provide soilstests that will demonstrate an infiltration rate along the length of the proposed series of dryswales. Along with these items, please provide a completed Table 5-3 of the Appendix A checklist (which was left blank in the submittal).

Response: The upper swale (from the creek to the site) has the 3 foot separation from the SWGWT but has an infiltration rate less than the 0.5 in/hr rate required in the regulations (TP-5). The lower swale (from the creek to Wallum Lake Road) does meet the required minimum infiltration rate, (see TP-3) but not the 3-foot SWGWT separation. Therefore, the swales are now

lined (see Exhibit 1). The detail is shown on Sheet 01C804 detail 5.

(8) Please provide an adequate number of soils tests (see the pertinent RISDISM minimum standards) at each of the proposed detention ponds and the proposed wet vegetated treatment system (WVTS). Please note that if the bottom of any of these practices is below the elevation of the seasonal high groundwater table, then the impacted practices will need to be lined with an impervious liner and protected from impacts of buoyancy.

Response: Based on the Geotechnical Report, the SHGWT is at depth 4 inches to 22 inches below the ground surface. A conservative approach was used that assumed the groundwater was at the surface and therefore the WVTS and both detention ponds are lined and have a subdrain system included under the liner to prevent buoyancy (see Exhibit 1). See Sheet 01C101 and 01C102 for details.

(9) Please provide calculations that will demonstrate that the proposed series of dry swales will infiltrate the required recharge volume being discharged from the proposed contributing roadway areas.

Response: Please see the response to Item (7) above, it is impractical to do any infiltration on site.

(l0) Please provide specifications for the indicated "filter fabric" proposed around the proposed dry swale. Please indicate the permeability of this fabric.

Response: The permeability has been added to the label on the drawings (95 g/min/sf) (see Exhibit 1). Please see Sheet 01C802 for details.

(11) If the proposed dry swales are to provide recharge, please explain the purpose of the proposed underdrain. Please address the impact of the proposed underdrain on recharge.

Response: The dry swales are no longer providing recharge (see response to Item (7) above).

(12) With respect to the outlet control structure of proposed Detention Pond I, please revise the submitted analysis so as to include the weir formed by the top of the outlet control structure situated at elevation 567.0'.

Response: The attached calculations have been revised to include the weir (see Exhibit 3).

(13) With respect to proposed Detention Pond l, please describe what the secondary outlet (#4) refers to as depicted on the submitted plans.

Response: This is an emergency overflow and is now labeled as such on Detail 1 on Drawing 01C800 (see Exhibit 1).

(14) The details of the proposed drainage diversion into proposed Detention Pond 2 is unclear. Please provide adequate details on the plans and in the submitted analysis. Please clearly indicate how runoff will enter this detention basin.

Response: Detail 1 on Drawing 01C805 has been revised and Detail 6 on Drawing 01C805 have been added to better show this diversion (see Exhibit 1). The calculation sets were also updated to show these revisions (see Exhibit 3).

(15) With respect to proposed Detention Pond 2 (Pond 13P) please indicate the 539.5' rim elevation (which is indicated in the submitted analysis) on the detail sheet for this device (Sheet 01C804).

Response: Rim elevation is now shown on Detail 3 Drawing 01C804 (Control Structure Detail – 13P) (see Exhibit 1).

(16) Please complete the water body ID number for Iron Mine Brook on page A-2 of the Appendix A checklist. Please also indicate the cold water / warm water / unassessed status.

Response: Appendix A has been revised as requested and is attached (see Exhibit 4).

(17) Please complete the "First Receiving Water ID or MS4" column of the Subwatershed Summary on page A-17 of the submitted Appendix A checklist.

Response: Appendix A has been revised as requested and is attached (see Exhibit 4).

(18) With respect to the submitted Burrillville Interconnection Project plan set, please revise the proposed perimeter erosion controls to omit staked hay bales. The latest Rhode Island Soil Erosion and Sedimentation Control Handbook (RISESCH) does not consider staked hay bales to be an effective perimeter control practice.

Response: TNEC has revised the Burrillville Interconnection Project plan set to remove reference to staked hay bales. In accordance with National Grid's Environmental Guidance Document EG-303, Access, Maintenance and Construction Best Management Practices, TNEC would still like to reserve the option to use staked straw bales, as a construction-phase best management practice (BMP). TNEC can commit to including a requirement for the contractor to use straw bales or wattles (not hay), in addition to other BMPs approved under the RISESCH and National Grid's EG-303.

(19) On page A-3 of the submitted Appendix A checklist, the submittal indicates that "restriction or modifications are proposed to the flow path or velocities in a floodway". Please explain and provide pertinent analysis of any such impact associated with this alteration of floodway.

Response: The "restriction or modification" noted in Appendix A checklist has been removed from the application.

(20) Please provide complete cut vs. fill calculations to demonstrate that impacts to areas of 100-year floodplain will be mitigated.

Response: Cut and fill calculations are now included with the floodplain calculations at the end of Exhibit 3.

(21) With respect to the submitted section addressing floodplain impacts, please provide all pertinent supporting floodplain analysis materials, including all calculation developing the flow values for the watercourse studied.

Response: Floodplain calculations are included at the end of Exhibit 3.

CONCLUDING COMMENTS:

1. Please submit three (3) sets of revised site plans.

Response: Three sets have been provided.

2. In order to facilitate the review of future revisions to your project, please provide written responses indicating how each of the above items was addressed.

   Response: This document provides written responses to how each of the above items was addressed.

3. lf you have any questions regarding this letter or the processing of your application, or with respect to any of the above-noted biological review comments, please contact Nancy Freeman at 401-222-6820, extension 7408.

   Response: So noted.

4. If you have any questions with respect to the above engineering review comments, please contact Nicholas A. Pisani, PE at 401-222-6820, extension 7423.

   Response: So noted.

List of Exhibits:

Exhibit 1: Revised site plans
Exhibit 2: Abutters maps
Exhibit 3: Drainage Report
Exhibit 4: Appendix A: Stormwater Management Checklist and LID Planning Report
Exhibit 5: Email from Chuck Horbert (Program Supervisor, RIDEM Office of Water Resources, Freshwater Wetlands Program) dated September 5, 2017

Exhibit 1
Revised Site Plans

Exhibit 2
Abutters Maps

CLEAR RIVER ENERGY CENTER AND BURRILLVILLE INTERCONNECTION PROJECT LIST OF ABUTTERS							
PARCEL ID	**Owner**	**LOCATION**	**MAILING ADDRESS LINE 1**	**MAILING ADDRESS LINE 2**	**CITY**	**STATE**	**ZIP**
007-002	BREAU GARY C & ROSE M	1661 SHERMAN FARM RD	1661 SHERMAN FARM RD		HARRISVILLE	RI	02830
021-005	ALLES DEBRA	0 ROUND TOP RD	98 WEST SHORE LANE		PASCOAG	RI	02859
021-010	TASCHEREAU STEVEN R & LISA G	1600 ROUND TOP RD	1600 ROUND TOP ROAD		HARRISVILLE	RI	02830
021-013	HUSSAIN CHAUDRY	1524 ROUND TOP RD	1524 ROUND TOP RD		HARRISVILLE	RI	02830
021-016	FARLEY WILFRED J III ET UX	1535 ROUND TOP RD	1535 ROUND TOP ROAD	P O BOX 454	HARRISVILLE	RI	02830
022-001	SAVAGE JAMES P & CHARLENE E	310 COLLINS TAFT RD	310 COLLINS TAFT RD		HARRISVILLE	RI	02830
022-004	FRENETTE KEVIN M & TAMMY A	375 COLLINS TAFT RD	375 COLLINS TAFT RD		HARRISVILLE	RI	02830
022-006	SHUGRUE ROBERT C & RENAY M	315 COLLINS TAFT RD	315 COLLINS TAFT RD		HARRISVILLE	RI	02830
022-007	CHRISTENSEN DAVID W & MARGARET WILSON	275 COLLINS TAFT RD	275 COLLINS TAFT RD		HARRISVILLE	RI	02830
034-057	FIELDING JAMES M & FATEMEH H	0 EAST WALLUM LAKE RD	65 HATFIELD ST		PAWTUCKET	RI	02861
037-004	CHILD JOHN W ET AL	0 HILL RD	130 BAYWOOD ROAD	PO BOX 721	NORTH EASTHAM	MA	02651-0721
038-002	ALLES STEWART F & DEBRA L	0 ROUND TOP RD	98 WEST SHORE RD		PASCOAG	RI	02859
038-006	FARLEY ALICE E	1443 ROUND TOP RD	1443 ROUND TOP ROAD		HARRISVILLE	RI	02830
039-001	STATE OF RHODE ISLAND	1265 ROUND TOP RD	STATE PROPERTY COMM	1 CAPITOL HILL PLAZA	PROVIDENCE	RI	02908
040-001	WALLUM LAKE ROD & GUN CLUB	0 BROOK RD	200 BROOK ROAD		HARRISVILLE	RI	02830
040-004	WALLUM LAKE ROD & GUN CLUB	200 BROOK RD	200 BROOK RD		HARRISVILLE	RI	02830
040-005	WALLUM LAKE ROD & GUN CLUB	0 SHERMAN FARM RD	ATTN: TREASURER	200 BROOK ROAD	HARRISVILLE	RI	02830
054-009	LAWTON IRENE R ESTATE OF	1525 HILL RD	1525 HILL ROAD		PASCOAG	RI	02859
054-011	CRABBE ROBERT C TRUSTEE	0 STONE BARN RD	185 STONE BARN ROAD	P O BOX 1	PASCOAG	RI	02859
055-011	FERRY BRENDA LYNN	50 ANNE LN	50 ANNE LANE		PASCOAG	RI	02859
070-020	MURPHY MARK & LISA M TE	595 TOWN FARM RD	595 TOWN FARM ROAD		PASCOAG	RI	02859
071-003	VALENTI ROBERT A JR & ROBERT A SR	1365 HILL RD	1365 HILL RD		PASCOAG	RI	02859
071-012	HOULE PETER JR & SANDRA L	1324 HILL RD	1324 HILL ROAD		PASCOAG	RI	02859
071-014	SWART JOHN F III & BEAUCHAMP LUCILLE	0 HILL RD	2530 DONNS WAY		OAKTON	VA	22124
071-017	EXCEL MANAGEMENT INC	0 TOWN FARM RD	9 OLD JENCKES HILL ROAD		LINCOLN	RI	02865
072-030	CRESTWOOD ESTATES HOMEOWNERS ASSOC	0 ANNE LN	25 ANNE LANE		PASCOAG	RI	02859
087-004	HOPKINS ALLAN E & JOAN TRUSTEES	1166 EAST WALLUM LAKE RD	PO BOX 202		PASCOAG	RI	02859
087-005	HOPKINS ALLAN E & JOAN TRUSTEES	1166 EAST WALLUM LAKE RD	PO BOX 202		PASCOAG	RI	02859
087-006	JENSEN ROBERT	0 EAST WALLUM LAKE RD	9 OLD JENCKES HILL RD		LINCOLN	RI	02865
101-018	AYOTTE ARTHUR R	0 BUCK HILL RD	508 BUCK HILL RD		PASCOAG	RI	02859
102-002	RAMBONE JACQUELINE	1485 WALLUM LAKE RD	1485 WALLUM LAKE ROAD		PASCOAG	RI	02859-1830
102-003	LAMBERT ROLAND A & CAROL A	1455 WALLUM LAKE RD	1455 WALLUM LAKE RD		PASCOAG	RI	02859
102-006	BERTRAND THEODORE R & LINDA A TE	1335 WALLUM LAKE RD	1335 WALLUM LAKE		PASCOAG	RI	02859
102-011	NAULT JASON O & CHRISTINE A	1504 WALLUM LAKE RD	1504 WALLUM LAKE RD		PASCOAG	RI	02859
102-012	SILVA FRANK G III & KELLY A	1478 WALLUM LAKE RD	P O BOX 42		PASCOAG	RI	02859
102-013	SONIER JULIE A	25 BUCK HILL RD	25 BUCK HILL ROAD		PASCOAG	RI	02859
102-014	NEYMAN MONICA A	35 BUCK HILL RD	35 BUCK HILL RD		PASCOAG	RI	02859
102-015	MULCAHY SUSAN M &MICHAEL F TE	63 BUCK HILL RD	63 BUCK HILL RD		PASCOAG	RI	02859
102-016	LETOILE RENE & RACHEL TE	105 BUCK HILL RD	105 BUCK HILL RD		PASCOAG	RI	02859
102-017	SMITH DAVID L & JOANNE M TE	135 BUCK HILL RD	135 BUCK HILL RD		PASCOAG	RI	02859
102-019	LEPORE JOSEPH J & DEBRA A	64 BUCK HILL RD	64 BUCK HILL ROAD		PASCOAG	RI	02859
102-021	BONOYER CHRISTINE M	140 BUCK HILL RD	140 BUCK HILL ROAD		PASCOAG	RI	02859
103-001	BURRILLVILLE LAND TRUST	0 WALLUM LAKE RD	PO BOX 506		HARRISVILLE	RI	02830
103-002	LAMBERT ROLAND A & CAROL & KEITH M	0 EAST WALLUM LAKE RD	1455 WALLUM LAKE ROAD		PASCOAG	RI	02859
104-001	JALBERT MARY M TRUST	986 EAST WALLUM LAKE RD	986 EAST WALLUM LAKE RD		PASCOAG	RI	02859
118-002	AYOTTE ARTHUR R	508 BUCK HILL RD	508 BUCK HILL RD		PASCOAG	RI	02859
137-006	HARRIS DAVID B	200 MANLY DR	200 MANLY DR		PASCOAG	RI	02859
137-008	BOLDUC PAUL R & MARY L L/E	915 WALLUM LAKE RD	915 WALLUM LAKE RD		PASCOAG	RI	02859
137-009	SHALOU BETTY L L/E	935 WALLUM LAKE RD	935 WALLUM LAKE RD		PASCOAG	RI	02859
137-010	WALKER LYLE	945 WALLUM LAKE RD	945 WALLUM LAKE RD		PASCOAG	RI	02859

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\l108_Abutters_Fig01_Index.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut

Town of Douglas

Massachusetts

Rhode Island

Town of Uxbridge

Town of Burrillville

Wallum Lake

Wilson Reservoir

Spring Lake

WALLUM LAKE RD

E WALLUM LAKE RD

WALLUM LAKE RD

BENSON MOUNTAIN TRL

DONAHUE RD

STONE BARN RD

STONE BARN RD

HILL RD

ROUND TOP RD

COLLINS TAFT RD

WEST IRONSTONE RD

DOUGLAS TPKE

WEST RD

ROUND TOP RD

SHERMAN FARM RD

CHERRY FARM RD

HILL RD

TOWN FARM RD

E WALLUM LAKE RD

BUCK HILL RD

BUCK HILL RD

WAKEFIELD RD

WALLUM LAKE RD

ALGONQUIN LN

JACKSON SCHOOLHOUSE RD

EAGLE PEAK RD

WHIPPLE RD

E WALLUM LAKE RD

NORTH RD

MAIN ST

NORTH SHORE RD

SPRING LAKE RD

SPRING LAKE RD

BLACK HUT RD

BLACK HUT RD

EAST AVE

WHIPPLE AVE

CENTRAL ST

CLEAR RIVER DR

CENTRAL ST

STEERE FARM RD

NOWRY ST

MUNYON TRL

WILSON TRL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands
Burrillville, RI

1 inch = 2,383 feet

Source: 1) ESRI, World Imagery, 2017
2) Town of Burrillville RI, Parcel Data, 2017

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0 600 1,200 2,400 Feet

Legend
- Limit of Disturbance
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)

Index - Project Abutters

Figure 1

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Inventory\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut

1
State : Swamp
Federal : PFO1E/R2/R4

1
State : Swamp
Federal : PFO1E/R2/R4

1
State : Swamp
Federal : PF01E/R2/R4

1
State : Swamp
Federal : PF01E/R2/R4

1
State : Swamp
Federal : PF01E/R2/R4

Iron Mine Brook
State : Riverine
Federal : R2

Map-Lot:
137-10
WALKER LYLE

Map-Lot: 137-9
SHALOU
BETTY L L/E

Map-Lot: 137-8
BOLDUC PAUL R
& MARY L L/E

Map-Lot:
137-6
HARRIS DAVID B

WALLUM LAKE RD

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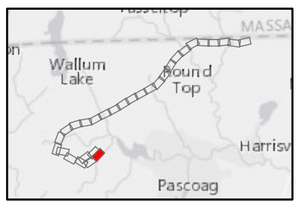
environmental consulting
& engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 102 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 1 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut

ALGONQUIN LN

WALLUM LAKE RD

1
State : Swamp
Federal : PFO1E/R2/R4

1
State : Swamp
Federal : PFO1E/R2/R4

1
State : Swamp
Federal : PFO1E/R2/R4

5
State : Forested Wetland
Federal : PFO1E

6
State : Forested Wetland
Federal : PFO1E

1
State : Swamp
Federal : PFO1E/R2/R4

ASSF- CL6A

ASSF- CL1A

Map-Lot:
137-10
WALKER LYLE

Map-Lot: 137-9
SHALOU BETTY L L/E

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 102 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017

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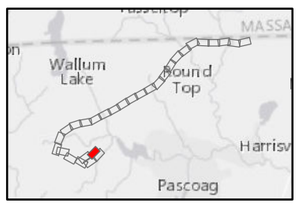
0 25 50 100 Feet



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 2 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017. Author: SDeHainaut

Map-Lot: 153-1
ALGONQUIN GAS
TRANSMISSION C

1
State : Swamp
Federal : PFO1E/R2/R4

1
State : Swamp
Federal : PF01E/R2/R4

1
State : Swamp
Federal : PF01E/R2/R4

State
: Swamp
Federal :

1-33a 1-32a 1-32a2 1-46d 1-43d 5-17 5-18 5-15 5-19 5-20 5-14 5-13 5-16 1-42d 1-41d 1-40d4 1-40d3 1-40d2 1-40d 1-40d1 1-40d1a 1-16c line break 1-15c 1-34b 1-34c line break 1-34a 1-34 1-33 1-32 1-31 1-33b 1-33c 1-33d 1-34a 1-35a 1-36a 1-37a 1-37a4 1-37a5 1-37a6 1-37a1 1-37a3 1-37a7 1-37a2 1-38a 1-39a 1-39a2 1-14c 1-11c1 1-12c 1-13c 1-11c 1-10c 1-35b start 1-77b end 1-35b2 1-36b 1-37b 1-38b 1-39b 1-40b 1-41b 1-42b 1-43b 1-44b 1-30 1-29 1-76b 1-9c 1-75b 1-8c 1-6c 1-7c 1-5c 1-40a 1-74b 1-73b 1-72b 1-71b 1-41a 1-42a 1-70b 1-69b 1-47b 1-42a2 1b-3 1b-2 1b-4 1-37a/1-1c line break 1b-1 1b-4a 1b-5 1-38b 1-38a 1-2c 1-3c 1-38b1 1-38b2 1-39a 1-4c SAS2-G SAS2-H SAS2-F SAS2-I SAS2-E SAS2-D SAS2-J SAS2-K SAS2-C SAS2-L SAS2-M 1-45d 1-45c 1-45b 1-45g SAS1F SAS1A SAS1E SAS1D SAS1C SAS1B

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 101 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017

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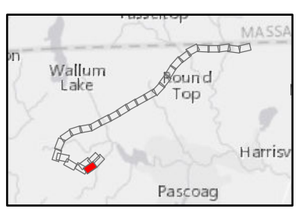
0 25 50 100 Feet



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

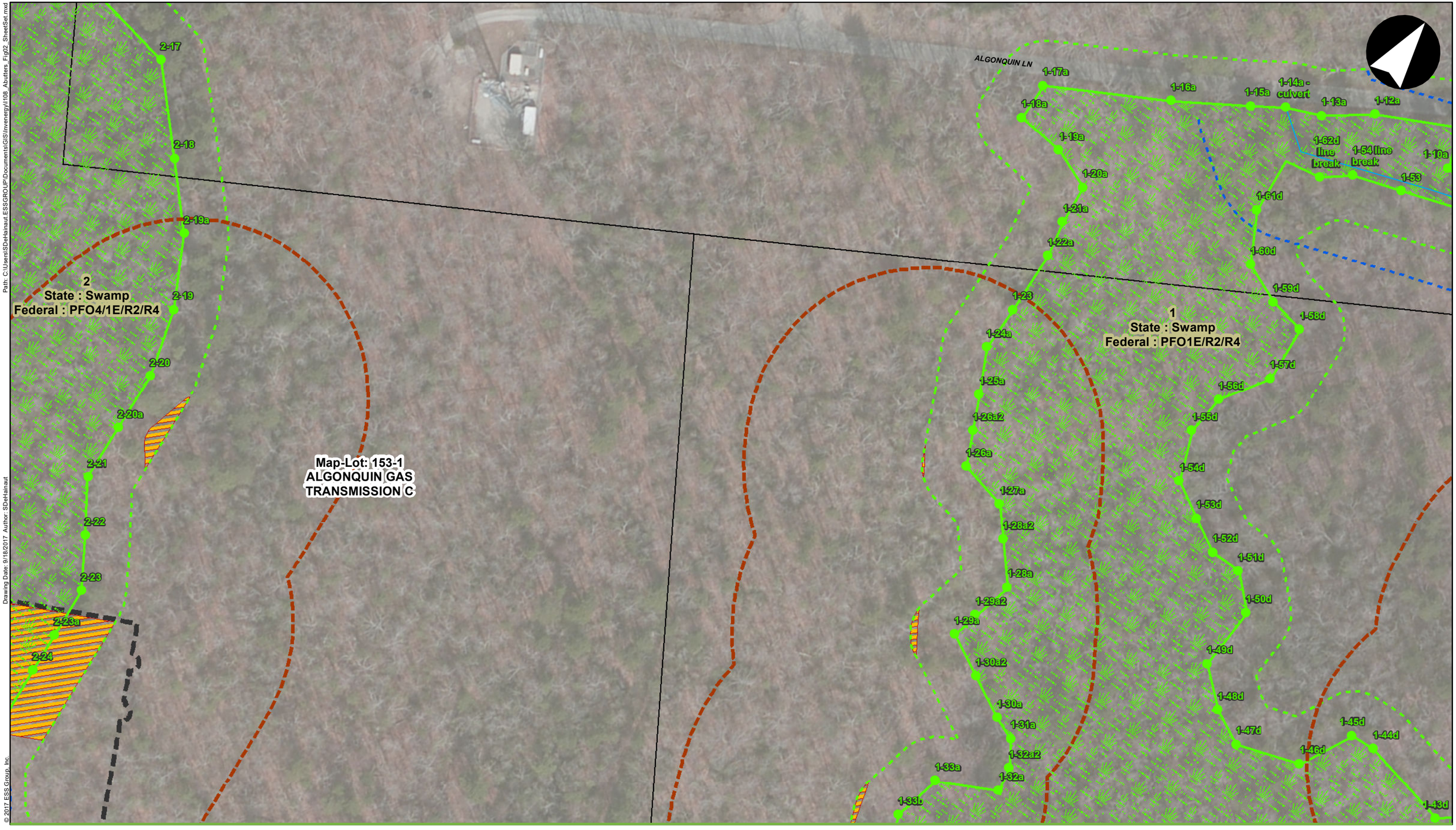
Project Abutters

Figure 2

Sheet 3 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut



Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 101 feet

Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017

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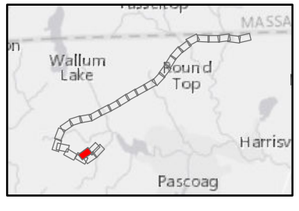
0 25 50 100 Feet



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 4 of 30

2-15
2-16
2-17
2-18
2-19a
2-19
2-20
2-20a
2-21
2-22
2-23
2-23a
2-24
2-24a
2-25
2-25a
2-25b
2-26
2-27
2-27a
2-27b
2-28
2-29
2-30
2-31
2-32
2-32a
2-40
2-41
2-42
2-43
2-44
2-45
2-46
2-47
2-48
2-49
2-50
2-51
2-52
2-53
2-53a
2-54
2-54a
2-55
2-56
2-57
2-58
2-59
2-60
2-61

SAS1A
SAS1D
SAS1B
SAS1F
SAS1E
SAS1C

2
State : Swamp
Federal : PFO4/1E/R2/R4

Map-Lot: 153-1
ALGONQUIN GAS
TRANSMISSION C

Map-Lot: 135-2
ALGONQUIN GAS
TRANSMISSION C

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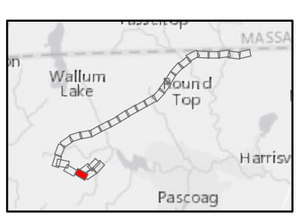
& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 102 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
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- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2
Sheet 5 of 30

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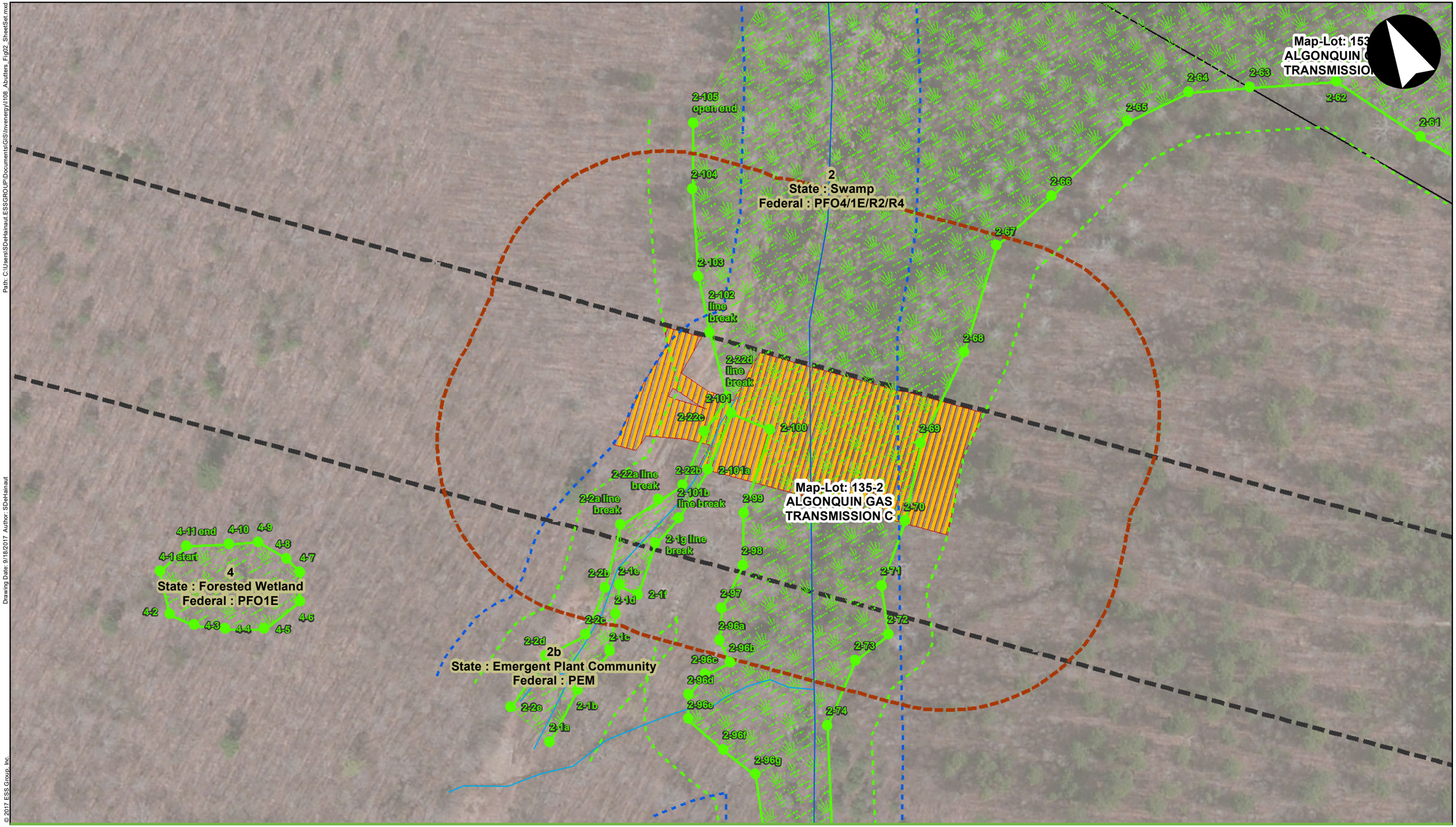
Drawing Date: 9/18/2017 Author: SDeHainaut



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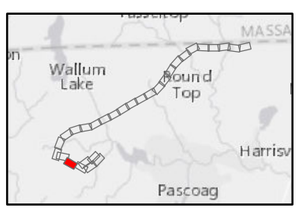
0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 103 feet

Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
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- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 6 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut

3-9 open end
3-10
3-8 open end
Map-Lot: 135-2
ALGONQUIN GAS
TRANSMISSION C
3-11
3-12
3-7
3-13
3-5
3-6
3-14
3-4
3
State : Swamp
Federal : PFO1E
3-3
3-2
3-28
3-27
3-29
3-31
3-32 end
3-1 start
3-30

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 101 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017

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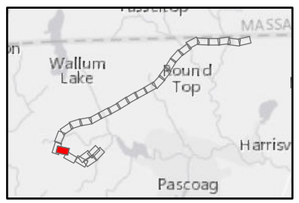
0 25 50 100 Feet



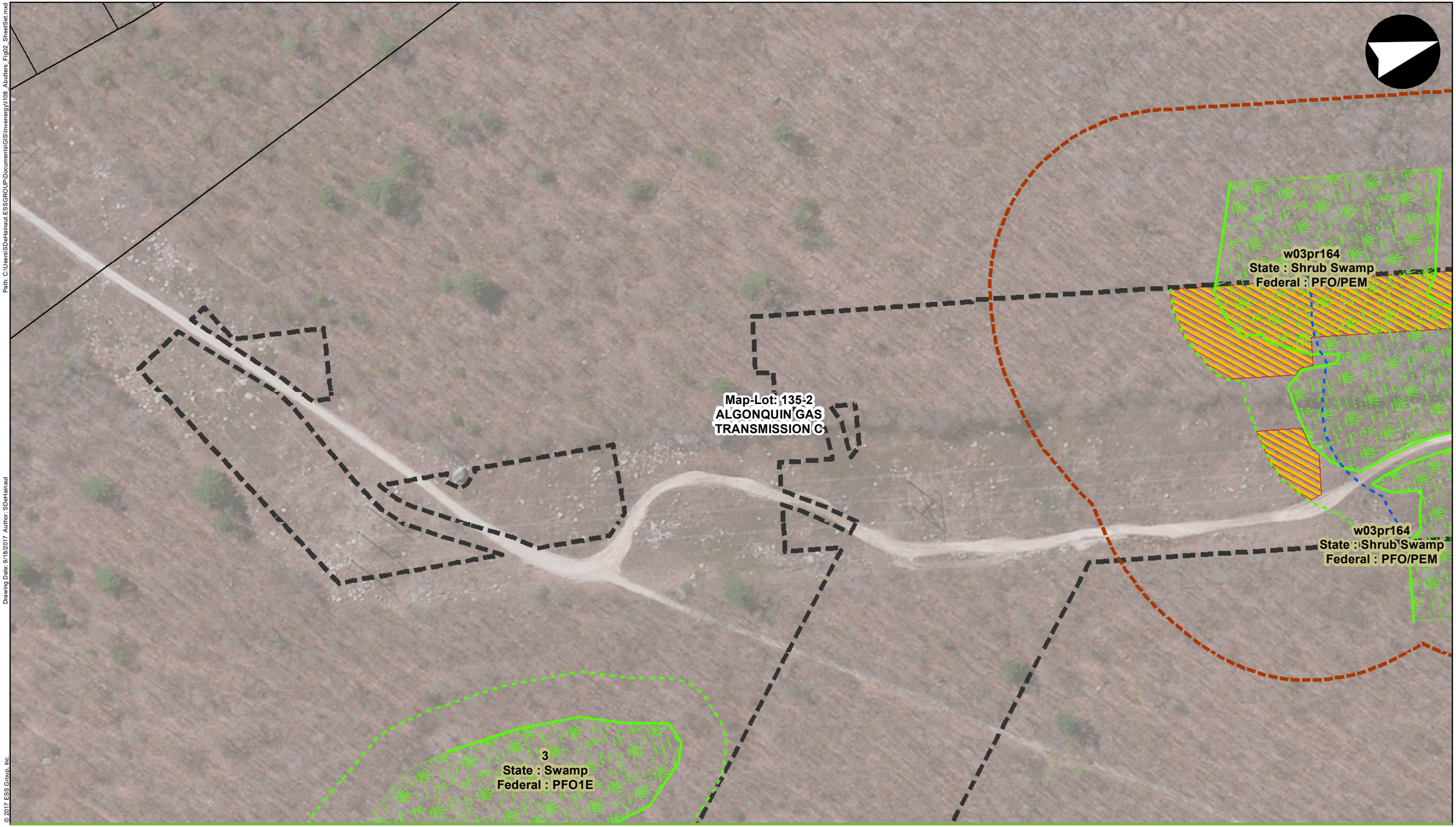
Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 7 of 30

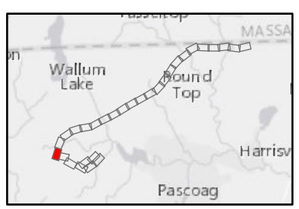


Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017

0 25 50 100 Feet



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 8 of 30

Map-Lot: 118-2
AYOTTE ARTHUR R

w03pr163
State : Shrub Swamp
Federal : PFO/PEM

Map-Lot: 135-2
ALGONQUIN GAS
TRANSMISSION C

w03pr164
State : Shrub Swamp
Federal : PFO/PEM

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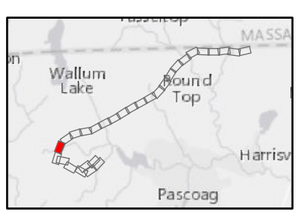
0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

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- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
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- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2
Sheet 9 of 30

Map-Lot: 102-21
BONOYER CHRISTINE M

Map-Lot: 118-2
AYOTTE ARTHUR R

Map-Lot: 101-18
AYOTTE
ARTHUR R

w03pr160
State : Emergent Plant Community
Federal : PEM

Map-Lot: 102-20
NARRAGANSETT
ELECTRIC COMPANY

w03pr162
State : Swamp
Federal : PEM/PFO

w03pr161
State : Swamp
Federal : PFO

Map-Lot: 135-2
ALGONQUIN GAS
TRANSMISSION C

Map-Lot: 102-19
LEPORE JOSEPH
J & DEBRA A

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& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017

Legend

- Limit of Disturbance
- Project Impact Area
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- Abutter's Parcel (CREC)
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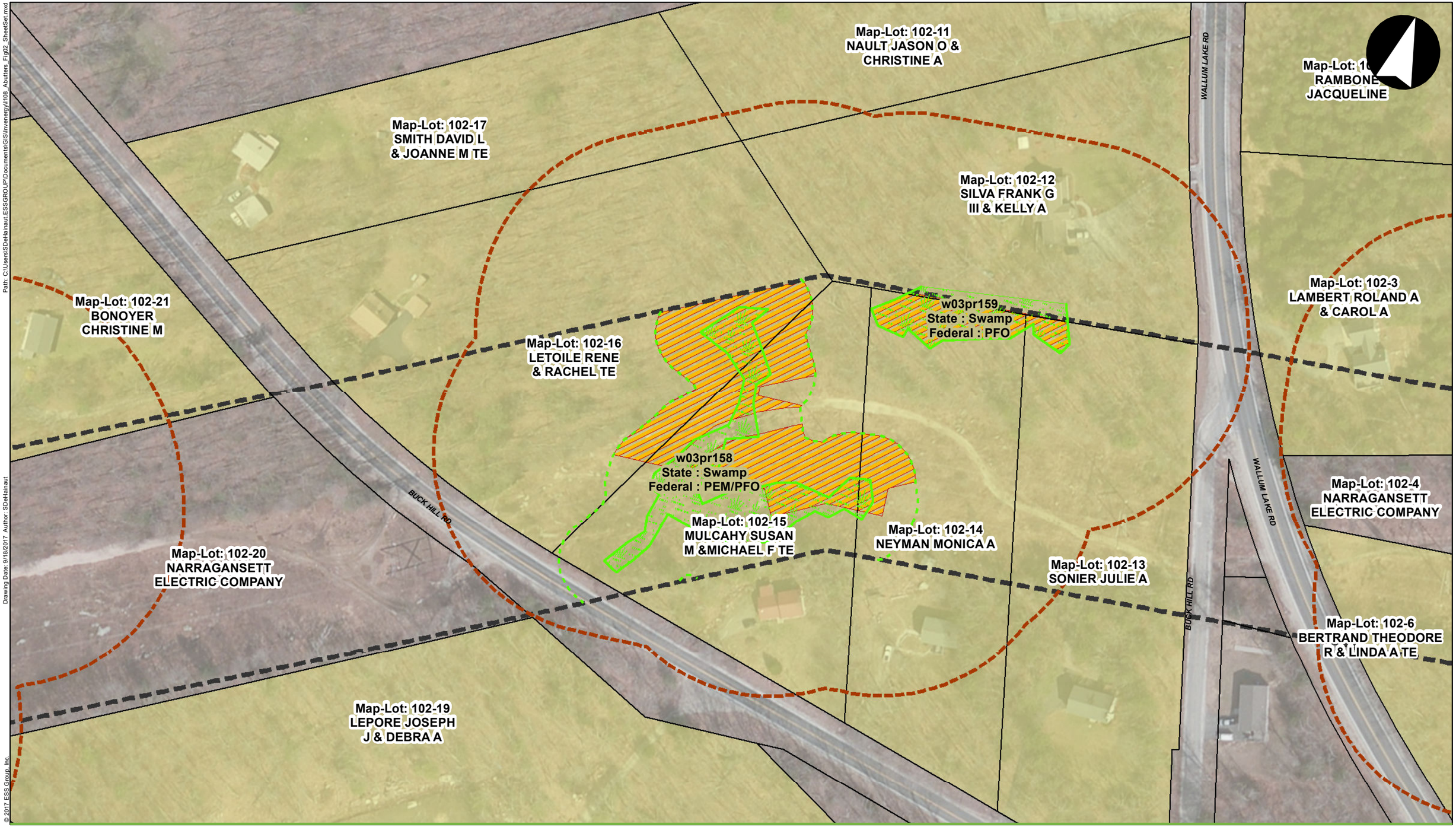
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2
Sheet 10 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut



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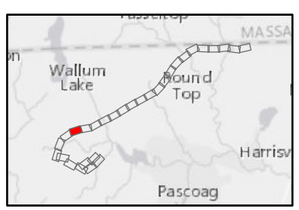
0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
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- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 11 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\I108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017. Author: SDeHainaut

Map-Lot: 102-3
LAMBERT ROLAND
A & CAROL A

Map-Lot: 102-2
RAMBONE
JACQUELINE

w03pr156
State : Swamp
Federal : PFO

Map-Lot: 102-4
NARRAGANSETT
ELECTRIC COMPANY

w03pr155
State : Swamp
Federal : PFO

w03pr153
State :
Shrub Wetland
Federal : PSS

w03pr152
State :
Emergent Plant
Community
Federal : PEM

w03pr154
State : Emergent Plant Community
Federal : PEM

w03pr157
State : Swamp
Federal : PEM/PFO

Map-Lot: 102-6
BERTRAND THEODORE R
& LINDA A TE

WALLUM LAKE RD

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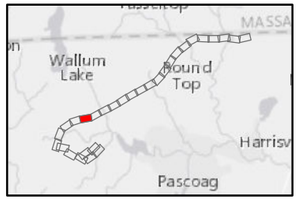
& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2
Sheet 12 of 30

Map-Lot: 102-2
RAMBONE
JACQUELINE

Map-Lot: 103-2
LAMBERT ROLAND A
& CAROL & KEITH M

w03pr150
State : Swamp
Federal : PFO/PSS

w03pr149
State : Swamp
Federal : PFO/PEM

w03pr153
State : Shrub Wetland
Federal : PSS

w03pr152
State : Emergent Plant Community
Federal : PEM

Map-Lot: 102-6
BERTRAND THEODORE
R & LINDA A TE

Map-Lot: 103-1
BURRILLVILLE
LAND TRUST

w03pr151
State : Swamp
Federal : PFO/PEM

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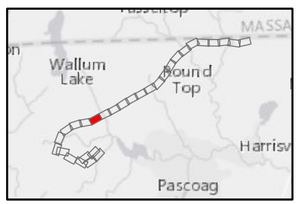
& engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 13 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\InvenergyII108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut

Map-Lot: 34-57
FIELDING JAMES M
& FATEMEH H

Map-Lot: 87-3
NARRAGANSETT
ELECTRIC COMPANY

Map-Lot: 103-2
LAMBERT ROLAND A
& CAROL & KEITH M

w03pr148
State : Swamp
Federal : PFO/PEM

w03pr144
State : Swamp
Federal : PFO

Map-Lot: 104-1
JALBERT MARY
M TRUST

w03pr149
State : Swamp
Federal : PFO/PEM

w03pr147
State : Swamp
Federal : PFO

Map-Lot: 103-1
BURRILLVILLE
LAND TRUST

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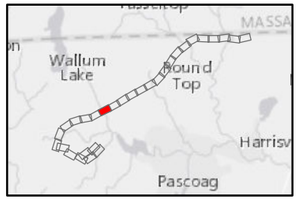
environmental consulting
& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 14 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\I108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017, Author: SDeHainaut

w03pr144
State : Swamp
Federal : PFO

Map-Lot: 34-57
FIELDING JAMES
M & FATEMEH H

Map-Lot: 87-3
NARRAGANSETT
ELECTRIC COMPANY

w03pr142
State : Swamp
Federal : PFO/PEM

w03pr146
State : Swamp
Federal : PFO/PEM

w03pr143
State : Swamp
Federal : PFO/PEM

Map-Lot: 87-8
NARRAGANSETT
ELECTRIC COMPANY

Map-Lot: 87-4
HOPKINS ALLAN E &
JOAN TRUSTEES

E WALLUM LAKE RD

w03pr138
State : Swamp
Federal : PFO

Map-Lot: 87-7
NARRAGANSETT
ELECTRIC CO.

w03pr147
State : Swamp
Federal : PFO

Map-Lot: 104-1
JALBERT MARY M
TRUST

w03pr145
State : Swamp
Federal : PFO

Map-Lot: 87-5
HOPKINS ALLAN E
& JOAN TRUSTEES

Map-Lot: 87-6
JENSEN
ROBERT

environmental consulting & engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
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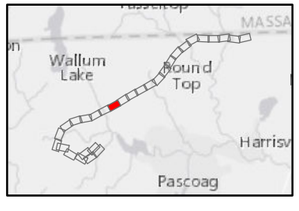
3) Power Engineers, Wetland Data, 2017



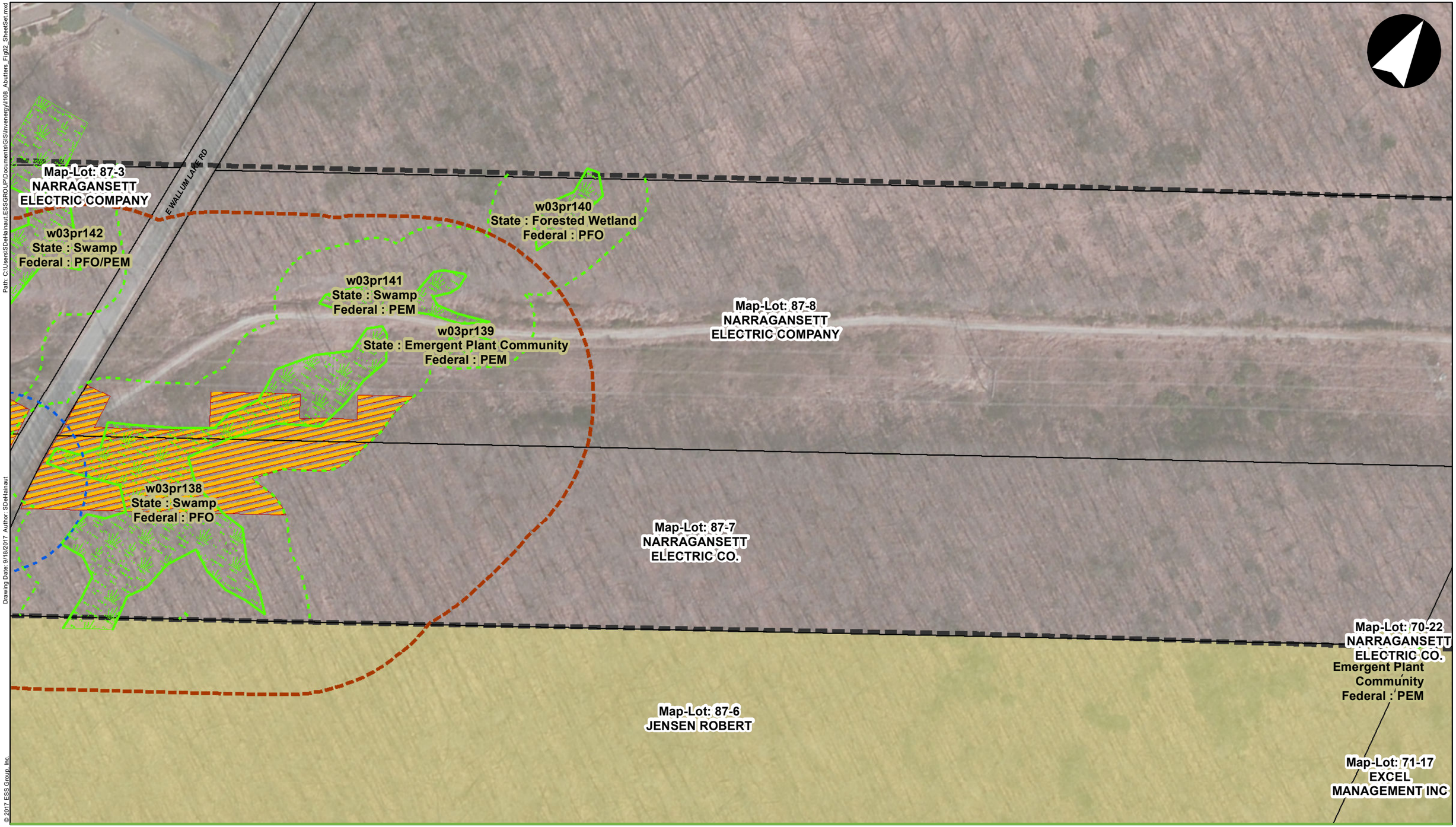
Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 15 of 30



environmental consulting & engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

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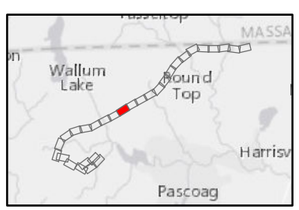

Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
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- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 16 of 30

w03pr135
State : Swamp
Federal : PFO

w03pr136
State : Swamp
Federal : PFO/PEM

w03pr137
State : Emergent Plant Community
Federal : PEM

Map-Lot: 87-8
NARRAGANSETT
ELECTRIC COMPANY

Map-Lot: 70-23
NARRAGANSETT
ELECTRIC COMPANY

Map-Lot: 87-7
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 70-22
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 87-6
JENSEN
ROBERT

Map-Lot: 71-17
EXCEL
MANAGEMENT INC

TOWN FARM RD

environmental consulting & engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
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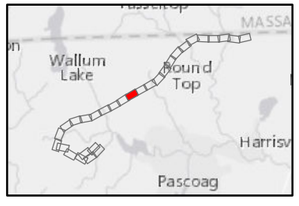
3) Power Engineers, Wetland Data, 2017



Legend

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- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 17 of 30

Map-Lot: 70-23
NARRAGANSETT
ELECTRIC COMPANY

Map-Lot: 70-20
MURPHY MARK
& LISA M TE

Map-Lot: 54-11
CRABBE ROBERT
C TRUSTEE

w03pr132
State : Swamp
Federal : PFO/PEM

TOWN FARM RD

Map-Lot: 70-22
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 70-21
NARRAGANSETT
ELECTRIC CO.

w03pr133
State : Swamp
Federal : PFO

Map-Lot: 71-15
NARRAGANSETT
ELECTRIC CO.

w03pr134
State : Forested Wetland
Federal : PFO

Map-Lot: 71-17
EXCEL
MANAGEMENT INC

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environmental consulting
& engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

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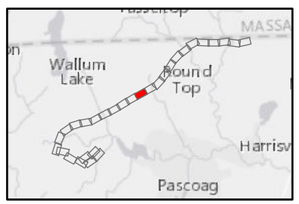
3) Power Engineers, Wetland Data, 2017



Legend

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- Project Impact Area
- 200' Buffer Around Project Impact Area
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- Special Aquatic Site

Project Abutters

Figure 2

Sheet 18 of 30

Map-Lot: 54-11
CRABBE ROBERT
C TRUSTEE

w03pr132
State : Swamp
Federal : PFO/PEM

w03pr129
State : Swamp
Federal : PFO/PEM

w03pr130
State : Emergent Plant Community
Federal : PEM

w03pr128
State : Swamp
Federal : PFO

Map-Lot: 71-14
SWART JOHN F III
& BEAUCHAMP LUCILLE

STONE BARN RD

HILL RD

w03pr131
State : Swamp
Federal : PFO/PEM

w03pr127
State : Swamp
Federal : PFO/PEM

Map-Lot: 71-13
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 71-15
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 71-12
HOULE PETER JR
& SANDRA L

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& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
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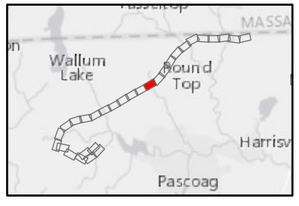
3) Power Engineers, Wetland Data, 2017



Legend

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- Special Aquatic Site

Project Abutters

Figure 2
Sheet 19 of 30

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HILL RD

STONE BARN RD

Map-Lot: 54-9
LAWTON IRENE
R ESTATE OF

w03pr125
State : Swamp
Federal : PFO

w05pr002
State : Swamp
Federal : PFO

Map-Lot: 54-10
NARRAGANSETT
ELECTRIC COMPANY

w03pr126
State : Shrub Wetland
Federal : PSS/PFO

w03pr123
State : Swamp
Federal : PFO

Map-Lot: 71-13
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 71-12
HOULE PETER
JR & SANDRA L

Map-Lot: 71-2
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 55-1
NARRAGANSETT
ELECTRIC CO.

w03pr124
State : Swamp
Federal : PFO

Map-Lot: 71-3
VALENTI ROBERT
A JR & ROBERT A SR

w03pr122
State : Swamp
Federal : PFO/PEM

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& engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
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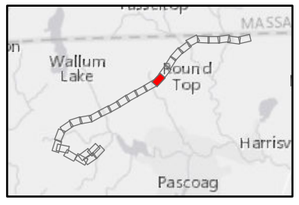
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

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- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
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- Special Aquatic Site

Project Abutters

Figure 2

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w03pr121
State : Swamp
Federal : PFO

w03pr120
State : Swamp
Federal : PFO

w03pr115
State : Swamp
Federal : PFO

w12pr200
State : Swamp
Federal : PFO

Map-Lot: 54-9
LAWTON IRENE
R ESTATE OF

Map-Lot: 37-4
CHILD JOHN
W ET AL

w03pr119
State : Emergent Plant Community
Federal : PSS

w03pr117
State : Emergent Plant Community
Federal : PEM

w03pr118
State : Shrub Wetland
Federal : PSS

w03pr123
State : Swamp
Federal : PFO

w05pr005
State : Forested Wetland
Federal : PFO

w03pr116
State : Swamp
Federal : PFO

Map-Lot: 72-30
CRESTWOOD ESTATES
HOMEOWNERS ASSOC

Map-Lot: 55-1
NARRAGANSETT
ELECTRIC CO.

w03pr122
State : Swamp
Federal : PFO/PEM

Map-Lot: 55-11
FERRY BRENDA
LYNN

Map-Lot: 71-3
VALENTI ROBERT A
JR & ROBERT A SR

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& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
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3) Power Engineers, Wetland Data, 2017

Legend

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- Special Aquatic Site

Project Abutters

Figure 2

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Map-Lot: 37-4
CHILD
JOHN W ET AL

w12pr200
State : Swamp
Federal : PFO

w03pr114
State : Swamp
Federal : PFO/PEM

Map-Lot: 72-30
CRESTWOOD ESTATES
HOMEOWNERS ASSOC

Map-Lot: 21-5
ALLES
DEBRA

w03pr116
State : Swamp
Federal : PFO

Map-Lot: 21-14
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 38-2
ALLES STEWART
F & DEBRA L

Drawing Date: 9/18/2017 Author: SDeHainaut

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0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

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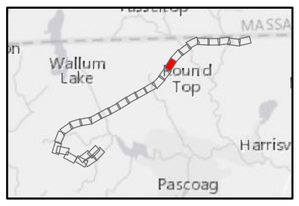
3) Power Engineers, Wetland Data, 2017



Legend

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- 200' Buffer Around Project Impact Area
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- Abutter's Parcel (CREC)
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- Special Aquatic Site

Project Abutters

Figure 2

Sheet 22 of 30

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Drawing Date: 9/18/2017 Author: SDeHainaut

Map-Lot:
21-5
ALLES DEBRA

Map-Lot: 21-10
TASCHEREAU STEVEN
R & LISA G

w03pr113
State : Emergent Plant Community
Federal : PEM

Map-Lot: 21-13
HUSSAIN CHAUDRY

Map-Lot: 21-14
NARRAGANSETT
ELECTRIC CO.

ROUND TOP RD

Map-Lot: 38-2
ALLES STEWART
F & DEBRA L

Map-Lot: 21-15
NARRAGANSETT
ELECTRIC CO.

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& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

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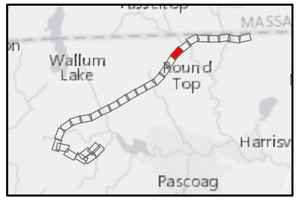

Legend

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- Abutter's Parcel (BIP)
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- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 23 of 30

ROUND TOP RD

ROUND TOP RD

Map-Lot:
21-13
HUSSAIN CHAUDRY

Map-Lot: 21-16
FARLEY WILFRED
J III ET UX

w03pr110
State : Swamp
Federal : PFO/PEM

w03pr110
State : Swamp
Federal : PFO/PEM

w03pr110
State : Swamp
Federal : PFO/PEM

Map-Lot: 39-1
STATE OF
RHODE ISLAND

w03pr110
State : Swamp
Federal : PFO/PEM

Map-Lot: 22-1
SAVAGE JAMES P
& CHARLENE E

Map-Lot: 21-14
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 21-15
NARRAGANSETT
ELECTRIC CO.

w03pr112
State : Shrub Wetland
Federal : PSS

Map-Lot:
38-6
FARLEY ALICE E

Map-Lot: 38-2
ALLES STEWART
F & DEBRA L

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& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

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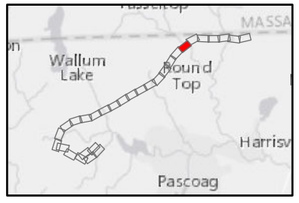

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- Abutter's Parcel (CREC)
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Project Abutters

Figure 2
Sheet 24 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut

Map-Lot: 39-1
STATE OF
RHODE ISLAND

w03pr109
State : Swamp
Federal : PFO

w03pr108
State : Forested Wetland
Federal : PFO

w03pr110
State : Swamp
Federal : PFO/PEM

Map-Lot: 22-1
SAVAGE JAMES P
& CHARLENE E

COLLINS TAFT RD

Map-Lot: 22-4
FRENETTE KEVIN
M & TAMMY A

w03pr111
State : Forested Wetland
Federal : PFO

w03pr110
State : Swamp
Federal : PFO/PEM

w03pr110
State : Swamp
Federal : PFO/PEM

Map-Lot: 22-5
NARRAGANSETT
ELECTRIC CO.

Map-Lot: 22-6
SHUGRUE ROBERT C
& RENAY M

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& engineering services

0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

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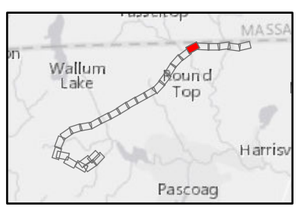
3) Power Engineers, Wetland Data, 2017



Legend

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- 100' Riverbank Wetland
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- Special Aquatic Site

Project Abutters

Figure 2

Sheet 25 of 30

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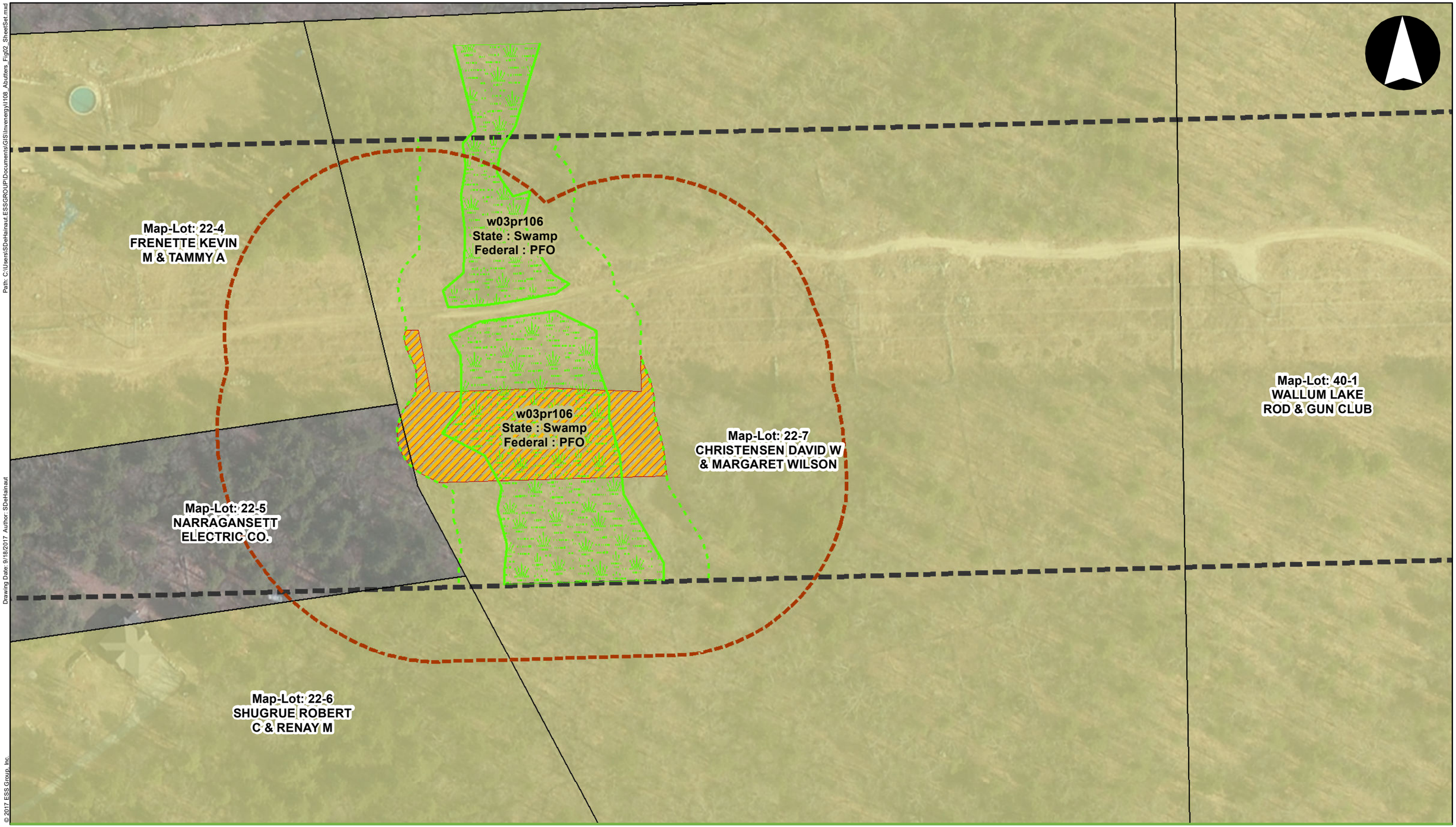

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environmental consulting
& engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
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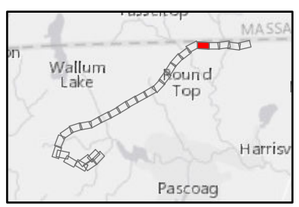
3) Power Engineers, Wetland Data, 2017



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- Abutter's Parcel (CREC)
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Project Abutters

Figure 2

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w03pr107
State : Swamp
Federal : PFO

w03pr105
State : Shrub Wetland
Federal : PSS/PEM

Map-Lot: 40-4
WALLUM LAKE
ROD & GUN CLUB

w03pr104
State : Swamp
Federal : PFO/PSS

Map-Lot: 40-1
WALLUM LAKE
ROD & GUN CLUB

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& engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
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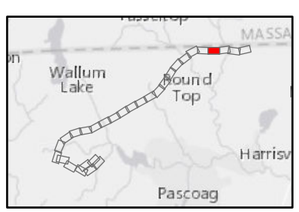
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 27 of 30

w03pr102
State : Swamp
Federal : PFO

w03pr099
State : Swamp
Federal : PEM/PFO

w03pr103
State : Swamp
Federal : PFO

Map-Lot: 40-4
WALLUM LAKE
ROD & GUN CLUB

w03pr101
State : Emergent Plant Community
Federal : PEM

w03pr104
State : Swamp
Federal : PFO/PSS

Map-Lot: 40-5
WALLUM LAKE
ROD & GUN CLUB

w03pr100
State : Swamp
Federal : PFO/PEM

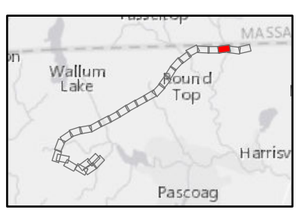
environmental consulting & engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



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Project Abutters

Figure 2

Sheet 28 of 30

Map-Lot: 5-2

w03pr
State : Swamp
Federal : PFO/POW/PEM

Map-Lot: 24-16
NARRAGANSETT
ELECTRIC COMPANY

SHERMAN FARM RD

w03pr096
State : Swamp
Federal : PFO/POW/PEM

Map-Lot: 40-5
WALLUM LAKE
ROD & GUN CLUB

w03pr099
State : Swamp
Federal : PEM/PFO

w03pr098
State : Emergent Plant Community
Federal : PEM

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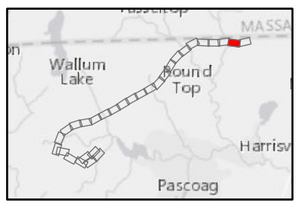
0 25 50 100
Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
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- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
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- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 29 of 30

Path: C:\Users\SDeHainaut.ESSGROUP\Documents\GIS\Invenergy\1108_Abutters_Fig02_SheetSet.mxd

Drawing Date: 9/18/2017 Author: SDeHainaut

Map-Lot: 5-2

w03pr096
State : Swamp
Federal : PFO/POW/PEM

Map-Lot: 24-16
NARRAGANSETT
ELECTRIC COMPANY

w03pr095b
State : Emergent Plant Community
Federal : PEM

w03pr095a
State : Emergent Plant Community
Federal : PEM

w03pr097
State : Swamp
Federal : PFO/PEM

w03pr098a
State : Shrub Wetland
Federal : PFO

w03pr099a
State : Shrub Wetland
Federal : PFO

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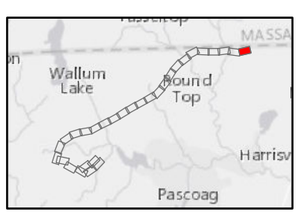
& engineering services

0 25 50 100 Feet

Clear River Energy Center and Burrillville Interconnection Project
Application to Alter Freshwater Wetlands

Burrillville, RI

1 inch = 100 feet
Source: 1) ESRI, World Imagery, 2016
2) Town of Burrillville RI, Parcel Data, 2017
3) Power Engineers, Wetland Data, 2017



Legend

- Limit of Disturbance
- Project Impact Area
- 200' Buffer Around Project Impact Area
- Abutter's Parcel (BIP)
- Abutter's Parcel (CREC)
- Field Delineated Wetland
- 50' Perimeter Wetland
- 100' Riverbank Wetland
- 200' Riverbank Buffer
- Special Aquatic Site

Project Abutters

Figure 2

Sheet 30 of 30

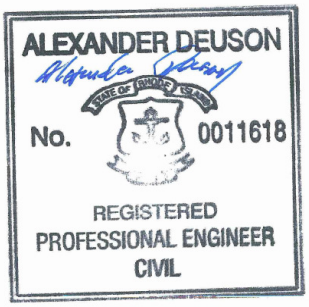
Exhibit 3
Drainage Report

Drainage Report

For

Clear River Energy LLC
Rhode Island

March 2017
Rev. September 2017



DISCHARGE POINT COMPARISONS

Point A			
Storm	**Existing (1S)**	**Proposed (21L)**	**Velocity [1]**
10-Year	20.16	17.72	0.77
100-Year	46.68	39.67	1.05
Note [1] - Exit at Level Spreader			

Point B			
Storm	**Existing (2S)**	**Proposed (22L)**	
10-Year	86.73	74.75	
100-Year	181.63	174.13	
Note 1 -			
Note 2			

Point C			
Storm	**Existing (3S)**	**Proposed (21R)**	
10-Year	9.01	8.29	
100-Year	20.85	18.29	

Point D			
Storm	**Existing (4S)**	**Proposed (23S)**	**% Increase**
10-Year	140.96	137.55	-2.42%
100-Year	327.06	319.56	-2.29%

DISCHARGE POINT COMPARISONS

Point E (at Culvert under Wallum Lake Road)			
Storm	**Existing**	**Proposed**	**% Increase**
10-Year	137.39	119.16	-13.27%
100-Year	324.81	279.00	-14.10%

Point F			
Storm	**Existing**	**Proposed**	**% Increase**
10-Year	13.08	7.01	-46.41%
100-Year	30.37	16.28	-46.39%

Invenergy – Rhode Island - Clear River Energy

Main Site (2P & 3P)

Total Drainage Area = 17.993 ac
Impervious Area = 16.51 ac
HSG = D

Groundwater Recharge (Re_v)

Note: LUHPPL therefore no infiltration required

$$Re_v = (1")(F)\left(\frac{I}{12}\right)$$

Table 3-4	
HSG	**Recharge Factor (F)**
A	0.60
B	0.35
C	0.25
D	0.10

F = recharge factor (Table 3-4)
I = 16.51 impervious area (ac)

Re_v = 1*F*(I/12)

Re_v = 0 groundwater recharge volume (ac-ft)

Re_v = 0 groundwater recharge volume (ft^3)

Water Quality Volume (WQ_v)

Note:

$$WQ_v = (1")\left(\frac{I}{12}\right)$$

I = 16.51 impervious area (ac)

WQ_v = 1*(I/12)

WQ_v = 1.376 Total Water Quality Volume (ac-ft) **OR** 59,931 ft^3 65,192 ft^3 - Actual Total Volume; 1.4966 ac-ft - Actual Total Volume

Forbay = 0.14 10% of WQ_v in ac-ft **OR** 5,993 ft^3 19,882 ft^3 - Actual Forbay volume

WQ_v = 1.24 90% of WQ_v in ac-ft **OR** 53,938 ft^3 45,310 ft^3 - Actual rest of the WQ volume

---

Modified CN

Note:

$$CN = 1000/\left[10 + 5P + 10Q - 10\left(Q^2 + 1.25QP\right)^{1/2}\right]$$

P = 1.2 rainfall in inches (use 1.2 inches for the Water Quality Storm)
Q = 0.92 runoff volume in watershed inches (equal to WQ_v / total drainage area)
A_t = 17.993 total drainage area in acres

CN = 1000/(10+5*P+10*Q-10*((Q^2)+1.25*Q*P)^(1/2))

CN = 97.26 Use = 98

Invenergy – Rhode Island - Clear River Energy

Main Site (2P & 3P)

Water Quality Flow (WQ_f)

Note:

$$WQ_f = (q_u)(A)(Q)$$

I_a = 0.04

T_c = 6 min. **OR** 0.10 hrs

I_a /P = 0.03

q_u = 260 unit peak discharge in cfs/mi^2/inch (from Exhibit 4-III of the TR-55 Manual)

A = 0.028 drainage area in mi^2

Q = 0.92

WQ_f = qu*A*Q

WQ_f = 6.71 peak discharge for a water quality event (cfs)

WQ_{f_actual} = 5.10 actual peak discharge for a water quality event (cfs) from HydroCAD **OK**

Surface Area of Filter Bed (A_f)

Note: LUHPPL therefore no infiltration required

$$A_f = (WQ_v)(d_f)/[(k)(h_f + d_f)(t_f)]$$

WQ_v = 59,931 Water Quality Volume in ft^3

d_f = Filter Bed Depth in ft

k = Coefficient of Permeability of Filter Media in ft/day

h_f = Average height of water above surface in ft

t_f = Design filter bed drain time in days

A_f = (WQv*df)/((k)*(hf+df)*(tf))

A_f = Surface area of filter bed in ft^2

Channel Protection Volume (CP_v)

Note:

$$CP_v = (V_r) \times (0.65)$$

V_r = 147,973 runoff volume from 1-yr 24-hr Type III storm (ft^3)

T = 86400 Extended detention time (24 hrs) sec

CP_v = 96,182 required channel protection storage volume (ft^3)

CP_v / T = 1.11 Average Release Rate (cfs)

(CP_v / T)*2 = 2.23 Maximum Release Rate (cfs)

Invenergy – Rhode Island - Clear River Energy

Main Site (2P & 3P)

2.16 Actual Release Rate (cfs) from HydroCAD **OK**

Downstream Analysis (Point E)

Note: Flow rates are from HydroCAD

DA_{total} =	468.979	total drainage area in acres
DA_{site} =	16.505	Site impervious drainage area in acres
	3.52%	

Pre_{10} =	137.39	cfs
$Post_{10}$ =	119.16	cfs
	13.27%	decrease

Pre_{100} =	324.81	cfs
$Post_{100}$ =	278.98	cfs
	14.11%	decrease

Gravel WVTS Surface Analysis

Note:

DA_{site} =	16.505	site drainage area in acres
DA_{site} =	718,958	site drainage area in sq. ft.

Min-$WVTS_{surface}$ = 2,516 required minimum surface area for WVTS in sq. ft.

$Forebay_{surface}$ =	3,802	14.21% minimum is 10%	**OK**
$WVTS_{surface}$ =	22,959		

$WVTS_{surface}$ = 26,761 Actual WVTS surface area provided in sq ft **OK**

Invenergy – Rhode Island - Clear River Energy

Entrance Road - West End (15R & 25R)

Total Drainage Area = 1.26 ac
Impervious Area = 0.899 ac
HSG = D

Groundwater Recharge (Re_v)

Note: Infiltration rate is < 0.5 inch/hr

$$Re_v = (1")(F)\left(\frac{I}{12}\right)$$

Table 3-4	
HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	0.10

F = recharge factor (Table 3-4)
I = 0.899 impervious area (ac)

Re_v = 1*F*(I/12)

Re_v = 0 groundwater recharge volume (ac-ft)

Re_v = 0 groundwater recharge volume (ft^3)

Water Quality Volume (WQ_v)

Note:

$$WQ_v = (1")\left(\frac{I}{12}\right)$$

I = 0.899 impervious area (ac)

WQ_v = 1*(I/12)

WQ_v = 0.075 Water Quality Volume (ac-ft) **OR** 3,263 ft^3

$Re_v + WQ_v$ = 3,263 ft^3 Actual = 5,141 ft^3 **OK**

$Re_v + WQ_v$ = 0.075 ac-ft Actual = 0.118 ac-ft

Modified CN

Note:

$$CN = 1000/\left[10 + 5P + 10Q - 10\left(Q^2 + 1.25QP\right)^{1/2}\right]$$

P = 1.2 rainfall in inches (use 1.2 inches for the Water Quality Storm)
Q = 0.71 runoff volume in watershed inches (equal to WQ_v / total drainage area)
A_t = 1.259 total drainage area in acres

CN = 1000/(10+5*P+10*Q-10*((Q^2)+1.25*Q*P)^(1/2))

CN = 94.63 Use = 95 Composit CN

Invenergy – Rhode Island - Clear River Energy

Entrance Road - West End (15R & 25R)

Water Quality Flow (WQ_f)

Note: from DP 13P

$$WQ_f = (q_u)(A)(Q)$$

I_a = 0.11

T_c = 6 min. **OR** 0.10 hrs

I_a /P = 0.09

q_u = 260 unit peak discharge in cfs/mi^2/inch (from Exhibit 4-III of the TR-55 Manual)

A = 0.002 drainage area in mi^2

Q = 0.71

WQ_f = qu*A*Q

WQ_f = 0.37 peak discharge for a water quality event (cfs)

0.08 Actual peak discharge (cfs) from HydroCad **OK**

Surface Area of Filter Bed (A_f)

Note: For a Dry Swell

$$A_f = (WQ_v)(d_f)/[(k)(h_f + d_f)(t_f)]$$

WQ_v = 3,263 Water Quality Volume in ft^3

d_f = 2.5 Filter Bed Depth in ft

k = 1 Coefficient of Permeability of Filter Media in ft/day

h_f = 0.31 Average height of water above surface in ft

t_f = 2 Design filter bed drain time in days

A_f = (WQv*df)/((k)*(hf+df)*(tf))

A_f = 1,452 Surface area of filter bed in ft^2

2,571 Actual surface area **OK**

Channel Protection Volume (CP_v)

Note: West End Ditch from 29P

$$CP_v = (V_r) \times (0.65)$$

V_r = 8,102 runoff volume from 1-yr 24-hr Type III storm (ft^3)

T = 86400 Extended detention time (24 hrs) sec

CP_v = 5,266 required channel protection storage volume (ft^3)

CP_v / T = 0.06 Average Release Rate (cfs)

(CP_v / T)*2 = 0.12 Maximum Release Rate (cfs)

Invenergy – Rhode Island - Clear River Energy

Entrance Road - West End (15R & 25R)

1.94 Actual Release Rate (cfs) from HydroCAD **OK - below 2 cfs**

Invenergy – Rhode Island - Clear River Energy

Entrance Road - East End (19S, & 34S)

Total Drainage Area = 0.81 ac
Impervious Area = 0.589 ac
HSG = D

Groundwater Recharge (Re_v)

Note: Seperation from SHWT is less than 3 feet

$$Re_v = (1")(F)\left(\frac{I}{12}\right)$$

Table 3-4	
HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	0.10

F = recharge factor (Table 3-4)
I = 0.589 impervious area (ac)

Re_v = 1*F*(I/12)

Re_v = 0 groundwater recharge volume (ac-ft)

Re_v = 0 groundwater recharge volume (ft^3)

Water Quality Volume (WQ_v)

Note:

$$WQ_v = (1")\left(\frac{I}{12}\right)$$

I = 0.589 impervious area (ac)

WQ_v = 1*(I/12)

WQ_v = 0.049 Water Quality Volume (ac-ft) **OR** 2,138 ft^3

$Re_v + WQ_v$ = 2,138 ft^3 Actual = 2,420 ft^3 **OK**

$Re_v + WQ_v$ = 0.049 ac-ft Actual = 0.056 ac-ft

Modified CN

Note:

$$CN = 1000/\left[10 + 5P + 10Q - 10\left(Q^2 + 1.25QP\right)^{1/2}\right]$$

P = 1.2 rainfall in inches (use 1.2 inches for the Water Quality Storm)
Q = 0.73 runoff volume in watershed inches (equal to WQ_v / total drainage area)
A_t = 0.805 total drainage area in acres

CN = 1000/(10+5*P+10*Q-10*((Q^2)+1.25*Q*P)^(1/2))

CN = 94.89 Use = 95

Invenergy – Rhode Island - Clear River Energy

Entrance Road - East End (19S, & 34S)

Water Quality Flow (WQ_f)

Note:

$$WQ_f = (q_u)(A)(Q)$$

I_a =	0.11				
T_c =	6	min.	**OR**	0.10	hrs
I_a/P =	0.09				
q_u =	260	unit peak discharge in cfs/mi^2/inch (from Exhibit 4-III of the TR-55 Manual)			
A =	0.001	drainage area in mi^2			
Q =	0.73				

WQ_f = qu*A*Q

WQ_f = 0.24 peak discharge for a water quality event (cfs)

0.24 Actual peak discharge (cfs) **OK**

Surface Area of Filter Bed (A_f)

Note: For a Dry Swell

$$A_f = (WQ_v)(d_f)/[(k)(h_f + d_f)(t_f)]$$

WQ_v =	2,138	Water Quality Volume in ft^3
d_f =	2.5	Filter Bed Depth in ft
k =	1	Coefficient of Permeability of Filter Media in ft/day
h_f =	0.31	Average height of water above surface in ft
t_f =	2	Design filter bed drain time in days

A_f = (WQv*df)/((k)*(hf+df)*(tf))

A_f = 951 Surface area of filter bed in ft^2

1,415 Actual surface area **OK**

Channel Protection Volume (CP_v)

Note: Next to Wallum Road (23P)

$$CP_v = (V_r) \times (0.65)$$

V_r =	10,873	runoff volume from 1-yr 24-hr Type III storm (ft^3)
T =	86400	Extended detention time (24 hrs) sec

CP_v = 7,067 required channel protection storage volume (ft^3)

CP_v / T =	0.08	Average Release Rate (cfs)
(CP_v / T)*2 =	0.16	Maximum Release Rate (cfs)

Invenergy – Rhode Island - Clear River Energy

Entrance Road - East End (19S, & 34S)

1.56 Actual Release Rate (cfs) from HydroCAD **OK - below 2 cfs**

Invenergy – Rhode Island - Clear River Energy
Polution Calculations Summary Tables

Polution Calculations for Main Site (2P & 3P)			
Pollutant	**Pre-Development**	**Post with out BMP Net Increase**	**Post with BMP Net Increase**
TSS (lbs TN/year)	477.3	19,242.7	5,123.4
TP (lbs TN/year)	1.0	40.1	13.1
TN(lbs TN/year)	16.3	328.8	187.4
Bacteria (#col/100ml/year)	2,807.5	391,592.8	124,918.1

Polution Calculations for Dry Swale (15R & 29R)			
Pollutant	**Pre-Development**	**Post with out BMP Net Increase**	**Post with BMP Net Increase**
TSS (lbs TN/year)	33.4	1,320.3	132.0
TP (lbs TN/year)	0.1	2.2	1.5
TN(lbs TN/year)	1.1	19.6	8.8
Bacteria (#col/100ml/year)	196.5	15,146.0	4,543.8

Polution Calculations for Dry Swale (18R & 20R)			
Pollutant	**Pre-Development**	**Post with out BMP Net Increase**	**Post with BMP Net Increase**
TSS (lbs TN/year)	21.4	866.8	86.7
TP (lbs TN/year)	0.0	1.4	1.0
TN(lbs TN/year)	0.7	12.9	5.8
Bacteria (#col/100ml/year)	125.6	9,940.5	2,982.2

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for TSS

A = 17.99 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TSS = 51 mg/l (Table H-2)

Post-Development:
Note: Site is Industrial

TSS = 120 mg/l (Table H-2)

TSS Removal
Note: For Main Site

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	51	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D34*D35*D36)/12)*D37*D38*2.72

L = 477.3 lbs TN/year

Post-Development:
Note: Site is Industrial

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.878	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	120	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 92 the percent of site imperviousness

L = ((D54*D55*D56)/12)*D57*D58*2.72

L = 19,720.0 lbs

Conclusion:

Net = 19,242.7 Increase in TSS

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for TSS

Pollutant Removal:

1st BMP:

Note: Forebay

RE = 25% Removal Efficiency from Table H-4

LR = 4,810.7 Load Reduction (lbs TN/year)

Net Load = 14,432.1 lbs TN/year

2nd BMP:

Note: Gravel WVTS

2nd BMP will operate at 75% efficiency

RE = 86% Removal Efficiency from Table H-3

LR = 9,308.7 Load Reduction (lbs TN/year)

TSS Net Load = **5,123.4** lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for TP

A = 17.99 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TP = 0.11 mg/l (Table H-2)

Post-Development:
Note: Site is Industrial

TP = 0.25 mg/l (Table H-2)

TSS Removal
Note: For Main Site

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	0.11	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D34*D35*D36)/12)*D37*D38*2.72

L = 1.0 lbs TN/year

Post-Development:
Note: Site is Industrial

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.878	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	0.25	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 92 the percent of site imperviousness

L = ((D54*D55*D56)/12)*D57*D58*2.72

L = 41.1 lbs

Conclusion:

Net = 40.1 Increase in TSS

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for TP

Pollutant Removal:

1st BMP:

Note: Forebay

RE = 8% Removal Efficiency from Table H-4

LR = 3.2 Load Reduction (lbs TN/year)

Net Load = 36.8 lbs TN/year

2nd BMP:

Note: Gravel WVTS

2nd BMP will operate at 75% efficiency

RE = 86% Removal Efficiency from Table H-3

LR = 23.8 Load Reduction (lbs TN/year)

TP Net Load = **13.1** lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for TN

A = 17.99 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TN = 1.74 mg/l (Table H-2)

Post-Development:
Note: Site is Industrial

TN = 2.1 mg/l (Table H-2)

TSS Removal
Note: For Main Site

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	1.74	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D34*D35*D36)/12)*D37*D38*2.72

L = 16.3 lbs TN/year

Post-Development:
Note: Site is Industrial

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.878	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	2.1	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 92 the percent of site imperviousness

L = ((D54*D55*D56)/12)*D57*D58*2.72

L = 345.1 lbs

Conclusion:

Net = 328.8 Increase in TSS

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for TN

Pollutant Removal:

1st BMP:

Note: Forebay

RE = 3% Removal Efficiency from Table H-4

LR = 9.9 Load Reduction (lbs TN/year)

Net Load = 319.0 lbs TN/year

2nd BMP:

Note: Gravel WVTS

2nd BMP will operate at 75% efficiency

RE = 55% Removal Efficiency from Table H-3

LR = 131.6 Load Reduction (lbs TN/year)

TN Net Load = 187.4 lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for **Bacteria**

A = 17.99 drainage area in acres

P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:

Note: Site is Undeveloped/Rural

Bacteria = 300 #col/100ml (Table H-2)

Post-Development:

Note: Site is Industrial

Bacteria = 2400 #col/100ml (Table H-2)

TSS Removal

Note: For Main Site

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:

Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	300	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 2,807.5 lbs TN/year

Post-Development:

Note: Site is Industrial

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.878	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	2400	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	17.99	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 92 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 394,400.3 lbs

Conclusion:

Net = 391,592.8 Increase in TSS

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Main Site (2P & 3P) for Bacteria

Pollutant Removal:

1st BMP:

Note: Forebay

RE =	12%	Removal Efficiency from Table H-4
LR =	46,991.1	Load Reduction (lbs TN/year)
Net Load =	344,601.7	lbs TN/year

2nd BMP:

Note: Gravel WVTS

2nd BMP will operate at 75% efficiency

RE =	85%	Removal Efficiency from Table H-3
LR =	219,683.6	Load Reduction (lbs TN/year)

Bacteria Net Load = **124,918.1** #col/100ml/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for TSS

A = 1.259 drainage area in acres

P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:

Note: Site is Undeveloped/Rural

TSS = 51 mg/l (Table H-2)

Post-Development:

Note: Site is a Road

TSS = 150 mg/l (Table H-2)

TSS Removal

Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:

Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	51	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 33.4 lbs TN/year

Post-Development:

Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.689	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	150	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 71 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 1,353.7 lbs

Conclusion:

Net = 1,320.3 Increase in TSS

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for TSS

Pollutant Removal:

1st BMP:

Note: Dry Swale

RE =	90%	Removal Efficiency from Table H-3
LR =	1,188.3	Load Reduction (lbs TN/year)
TSS Net Load =	**132.0**	lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for TP

A = 1.259 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TP = 0.11 mg/l (Table H-2)

Post-Development:
Note: Site is a Road

TP = 0.25 mg/l (Table H-2)

TSS Removal
Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	0.11	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 0.1 lbs TN/year

Post-Development:
Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.689	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	0.25	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 71 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 2.3 lbs

Conclusion:

Net = 2.2 Increase in TSS

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for TP

Pollutant Removal:

1st BMP:

Note: Dry Swale

	RE =	30%	Removal Efficiency from Table H-3
	LR =	0.7	Load Reduction (lbs TN/year)
TP	**Net Load =**	**1.5**	lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for TN

A = 1.259 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TN = 1.74 mg/l (Table H-2)

Post-Development:
Note: Site is a Road

TN = 2.3 mg/l (Table H-2)

TSS Removal
Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	1.74	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 1.1 lbs TN/year

Post-Development:
Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.689	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	2.3	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 71 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 20.8 lbs

Conclusion:

Net = 19.6 Increase in TSS

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for TN

Pollutant Removal:

1st BMP:

Note: Dry Swale

	RE =	55%	Removal Efficiency from Table H-3
	LR =	10.8	Load Reduction (lbs TN/year)
TN	**Net Load =**	**8.8**	lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for Bacteria

A = 1.259 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

Bacteria = 300 #col/100ml (Table H-2)

Post-Development:
Note: Site is a Road

Bacteria = 1700 #col/100ml (Table H-2)

TSS Removal
Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	300	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 196.5 #col/100ml/year

Post-Development:
Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.689	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	1700	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	1.259	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 71 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 15,342.4 lbs

Conclusion:

Net = 15,146.0 Increase

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (15R & 29R) for Bacteria

Pollutant Removal:

1st BMP:

Note: Dry Swale

	RE =	70%	Removal Efficiency from Table H-3
	LR =	10,602.2	Load Reduction
Bacteria	**Net Load =**	**4,543.8**	#col/100ml/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for TSS

A = 0.805 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TSS = 51 mg/l (Table H-2)

Post-Development:
Note: Site is a Road

TSS = 150 mg/l (Table H-2)

TSS Removal
Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	51	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 21.4 lbs TN/year

Post-Development:
Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.707	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	150	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 73 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 888.2 lbs

Conclusion:

Net = 866.8 Increase

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for TSS

Pollutant Removal:

1st BMP:

Note: Dry Swale

	RE =	90%	Removal Efficiency from Table H-3
	LR =	780.2	Load Reduction
TSS	**Net Load =**	**86.7**	lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for TP

A = 0.805 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TP = 0.11 mg/l (Table H-2)

Post-Development:
Note: Site is a Road

TP = 0.25 mg/l (Table H-2)

TSS Removal
Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	0.11	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 0.0 lbs TN/year

Post-Development:
Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.707	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	0.25	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 73 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 1.5 lbs

Conclusion:

Net = 1.4 Increase

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for TP

Pollutant Removal:

1st BMP:

Note: Dry Swale

RE =	30%	Removal Efficiency from Table H-3
LR =	0.4	Load Reduction
TP Net Load =	**1.0**	lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for TN

A = 0.805 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

TN = 1.74 mg/l (Table H-2)

Post-Development:
Note: Site is a Road

TN = 2.3 mg/l (Table H-2)

TSS Removal
Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	1.74	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 0.7 lbs TN/year

Post-Development:
Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.707	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	2.3	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 73 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 13.6 lbs

Conclusion:

Net = 12.9 Increase

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for TN

Pollutant Removal:

1st BMP:

Note: Dry Swale

	RE =	55%	Removal Efficiency from Table H-3
	LR =	7.1	Load Reduction
TN	**Net Load =**	**5.8**	lbs TN/year

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for Bacteria

A = 0.805 drainage area in acres
P = 51 rainfall depth (inches) - from Figure H-8

Pre-Development:
Note: Site is Undeveloped/Rural

Bacteria = 300 #col/100ml (Table H-2)

Post-Development:
Note: Site is a Road

Bacteria = 1700 #col/100ml (Table H-2)

TSS Removal
Note: For Dry Swale along West half of Road

$$L = [(P)(Pj)(Rv)/12](C)(A)(2.72)$$

Pre-Development:
Note: Site is Undeveloped/Rural

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.05	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	300	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 0 the percent of site imperviousness

L = ((D26*D27*D28)/12)*D29*D30*2.72

L = 125.6 #col/100ml/year

Post-Development:
Note: Site is a Road

P =	51	rainfall depth (inches) - from Figure H-8
Pj =	0.9	rainfall correction factor
Rv =	0.707	runoff coefficient expressing the fraction of rainfall converted to runoff
C =	1700	flow-weighted mean concentration of the pollutant in urban runoff (mg/L) - from Table H-2
A =	0.805	contributing drainage area of development site (acres)

Rv = 0.05 + 0.009(%I)

%I = 73 the percent of site imperviousness

L = ((D46*D47*D48)/12)*D49*D50*2.72

L = 10,066.2 lbs

Conclusion:

Net = 9,940.5 Increase

Invenergy – Rhode Island - Clear River Energy

Polution Calculations for Dry Swale (18R & 20R) for Bacteria

Pollutant Removal:

1st BMP:

Note: Dry Swale

	RE =	70%	Removal Efficiency from Table H-3
	LR =	6,958.4	Load Reduction
Bacteria	**Net Load =**	**2,982.2**	#col/100ml/year

DITCH CALCULATIONS

Dry Swale - 1 (15R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.38	0.11	1.49
1-Year	1.58	0.26	2.40
10-Year	3.47	0.40	3.05
100-Year	6.75	0.58	3.69
Note 1 - Depth of ditch is 2 feet			

Dry Swale - 2 (29R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.47	0.13	1.64
1-Year	1.94	0.29	2.62
10-Year	4.30	0.45	3.33
100-Year	8.38	0.64	4.02
Note 1 - Depth of ditch is 2 feet			

Dry Swale - 3 (18R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.28	0.04	1.03
1-Year	1.11	0.10	1.75
10-Year	2.41	0.16	2.34
100-Year	4.65	0.24	2.99
Note 1 - Depth of ditch is 2 feet			

DITCH CALCULATIONS

Dry Swale - 4 (20R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
WQv	0.4	0.14	1.27
1-Year	1.61	0.31	1.99
10-Year	3.52	0.47	2.52
100-Year	6.82	0.67	3.03
Note 1 - Depth of ditch is 2 feet			

Rerouting Ditch (23R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
1-Year	0.95	0.19	2.06
10-Year	2.95	0.37	2.94
100-Year	6.85	0.58	3.76
Note 1 - Ditch is 1' deep; 2' wide; with 2:1 side slopes			

Ditch below Culvert (30R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
1-Year	1.56	0.23	2.81
10-Year	4.87	0.43	3.99
100-Year	11.31	0.67	5.07
Note 1 - Ditch is 1' deep; 2' wide; with 2:1 side slopes			

Level Spreader (8R)			
Storm	**Flow**	**Depth**	**Velocity**
1-Year	2.57	0.05	0.67
10-Year	3.75	0.06	0.77
100-Year	8.38	0.10	1.05

DITCH CALCULATIONS

Entr. Pipe Exit Ditch (21R)			
Storm	**Flow**	**Depth[1]**	**Velocity**
1-Year	2.88	0.15	2.02
10-Year	8.29	0.29	3.00
100-Year	18.29	0.46	4.00

Note 1 - Ditch is 1' deep; 10' wide; with 2:1 side slopes

STORM WATER CALCULATIONS

Flow Splitter

	24P (Flow Splitter)		
Storms			
	Proposed thru Secondary	**Proposed thru Primary (cfs)**	**Water Elev. (ft)**
WQ_f	0	17.23	565.26
10-Year	54.59	26.66	568.34
100-Year	105.27	33.99	570.34

POINT A

	2P (Forebay)		
Storms			
	Existing Calculated (cfs)	**Total Proposed (cfs)**	**Water Elev. (ft)**
WQ_f	6.72	5.10	564.50
10-Year		27.83	565.24
100-Year		36.51	565.30

STORM WATER CALCULATIONS

	3P (Gravel WVTS)		
Storms			
	Total	**Total**	
	In (cfs)	**Out (cfs)**	**Water Elev. (ft)**
WQ_f		3.31	561.77
10-Year		23.97	562.95
100-Year		37.4	563.86

	4P (Detention Pond)		
Storms			
	Total	**Total**	
	In (cfs)	**Out (cfs)**	**Water Elev. (ft)**
WQ_f		1.07	558.74
10-Year		3.08	561.7
100-Year		7.62	563.93
1-Year		2.16	559.99

STORM WATER CALCULATIONS

	18P (Level Spreader)		
Storms			
	Total	**Total**	
	In (cfs)	**Out (cfs)**	**Water Elev. (ft)**
WQ_f		1.07	558.07
10-Year		3.08	558.15
100-Year		7.62	558.27
1-Year		2.16	558.12
	21L (Point A)		
Storms			
	Existing	**Proposed Total**	
	Calculated		
	(cfs)	**(cfs)**	**Water Elev. (ft)**
WQ_f [1]	6.72	1.13	
10-Year	20.16	17.72	
100-Year	46.68	39.67	
Note 1 = Calculated			

STORM WATER CALCULATIONS

POINT B

	28P (DP for Ramp Culvert)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
1-Year		1.58	555.44
10-Year		3.46	555.69
100-Year		6.71	556.03

	29P (Gravel Inlet for Swale into 13P)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
WQ_f		0.47	538.59
1-Year		1.94	539.00
10-Year		4.30	539.59
100-Year		8.38	541.84

STORM WATER CALCULATIONS

	13P (DP for Swale - 1 & 2)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
WQ_f	0.22	0.05	538.22
1-Year	0.14	0.13	538.86
10-Year		0.78	539.56
100-Year		6.50	539.94

STORM WATER CALCULATIONS

	17P (12' x 6' Box)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
1-Year	28.94	24.02	533.00
10-Year	86.73	74.75	533.76
100-Year[1]	181.63	174.13	534.93
1. Includes flow crossing from the Dry Arm Basin			

	30P (Culvert 2)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
1-Year		0.95	534.07
10-Year		2.95	534.46
100-Year[1]		6.85	535.14

STORM WATER CALCULATIONS

	22L (Point B)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
1-Year	28.94	24.02	
10-Year	86.73	74.75	
100-Year[1]	181.63	174.13	
1. Includes flow crossing from the Dry Arm Basin			

STORM WATER CALCULATIONS

POINT C

	15P (Point C - Culvert at Entr.)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
1-Year	2.89	2.88	529.83
10-Year	9.01	8.29	530.16
100-Year	20.85	18.29	530.33

	31P (Culvert 3)		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**Water Elev. (ft)**
1-Year		1.11	533.44
10-Year		2.41	533.68
100-Year[1]		4.65	534.01

STORM WATER CALCULATIONS

	23P (DP for Swell at Entrence)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
WQ_f	0.22	0.22	530.99
1-Year		1.56	531.74
10-Year		3.47	531.86
100-Year		6.73	532.01

STORM WATER CALCULATIONS

POINT D

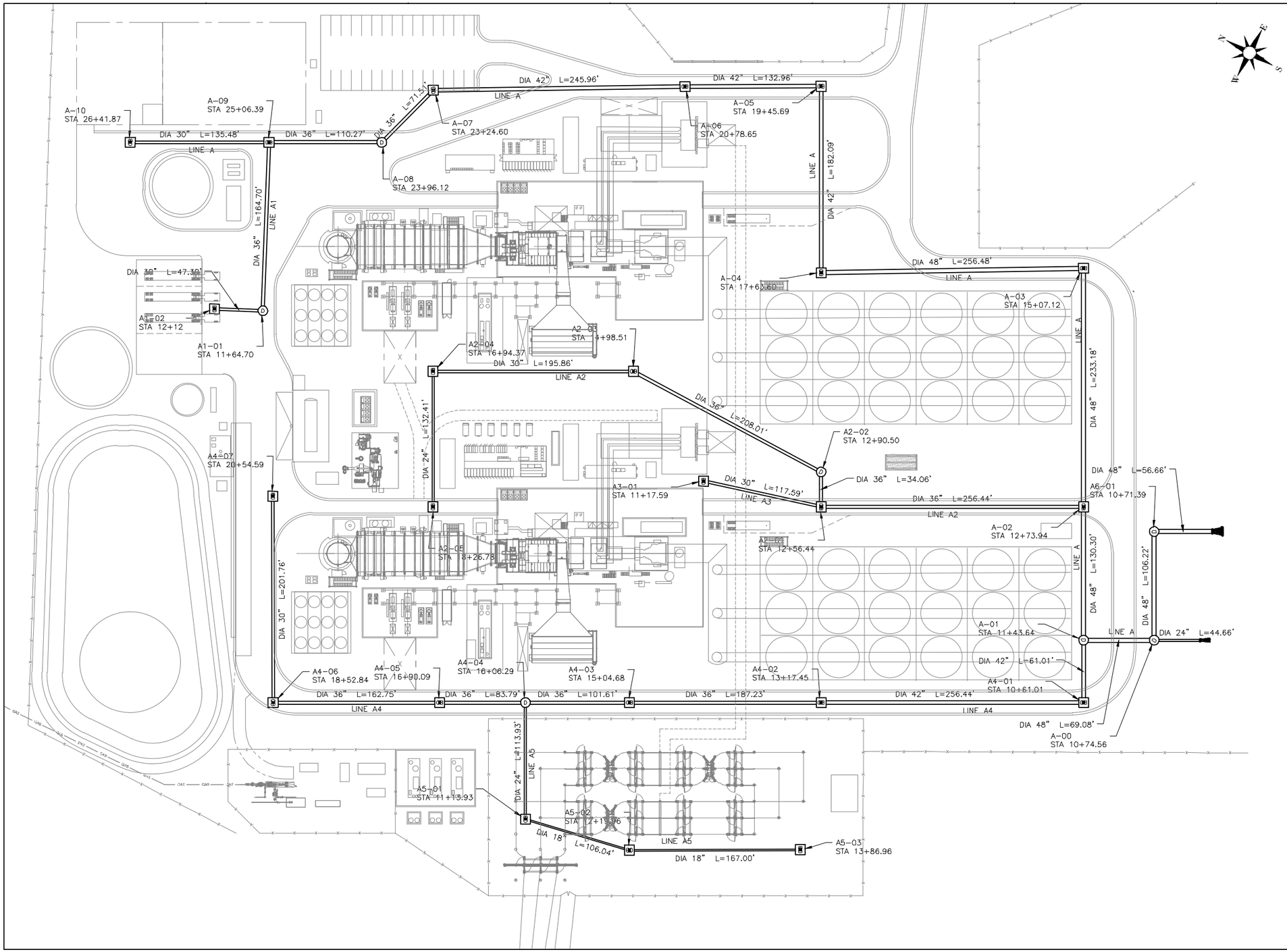
	Point D		
Storms			
	Existing Total (cfs)	**Proposed Total (cfs)**	**% Reduction**
1-Year	45.55	44.54	2.22%
10-Year	140.96	137.55	2.42%
100-Year	327.06	319.56	2.29%

STORM WATER CALCULATIONS

POINT F

	(Wildlife Crossing #2)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
1-Year	4.23	2.27	
10-Year	13.08	7.01	
100-Year	30.37	16.28	

	28L (Point F)		
Storms			
	Existing Total	**Proposed Total**	
	(cfs)	**(cfs)**	**Water Elev. (ft)**
1-Year	4.23	2.27	
10-Year	13.08	7.01	
100-Year	30.37	16.28	



STRUCTURE TABLE

NAME	TYPE	LAYOUT COORDINATES	LID	SUMP ELEVATION
A-00	FLOW SPLITTER	N:320779.39 E:259167.35	575.96	562.96
A-01	MANHOLE	N:320837.98 E:259130.75	573.78	563.12
A-02	DROP BOX INLET	N:320907.01 E:259241.27	572.62	563.43
A-03	DROP BOX INLET	N:321030.54 E:259439.04	572.38	564.02
A-04	DROP BOX INLET	N:321245.76 E:259299.53	572.69	564.66
A-05	DROP BOX INLET	N:321342.22 E:259453.97	572.94	565.11
A-06	DROP BOX INLET	N:321454.91 E:259383.40	572.57	565.43
A-07	DROP BOX INLET	N:321661.52 E:259249.96	573.02	566.05
A-08	MANHOLE	N:321677.22 E:259180.19	573.50	566.25
A-09	DROP BOX INLET	N:321770.75 E:259121.77	573.00	566.52
A-10	DROP BOX INLET	N:321885.65 E:259050.00	573.00	566.86
A1-01	MANHOLE	N:321688.60 E:258979.02	573.36	566.89
A1-02	DROP BOX INLET	N:321729.69 E:258955.59	572.77	567.01
A2-01	DROP BOX INLET	N:321124.51 E:259105.41	573.16	564.09
A2-02	MANHOLE	N:321142.55 E:259134.30	573.59	564.18
A2-03	DROP BOX INLET	N:321350.11 E:259120.61	572.95	564.70
A2-04	DROP BOX INLET	N:321516.23 E:259016.85	572.95	565.19
A2-05	DROP BOX INLET	N:321446.08 E:258904.55	573.17	565.52
A3-01	DROP BOX INLET	N:321235.22 E:259065.79	573.16	564.88
A4-01	DROP BOX INLET	N:320805.65 E:259079.00	572.62	563.27

STRUCTURE TABLE

NAME	TYPE	LAYOUT COORDINATES	LID	SUMP ELEVATION
A4-02	DROP BOX INLET	N:321023.15 E:258943.15	573.16	563.91
A4-03	DROP BOX INLET	N:321181.95 E:258843.96	573.16	564.38
A4-04	MANHOLE	N:321268.12 E:258790.13	574.34	564.63
A4-05	DROP BOX INLET	N:321339.19 E:258745.74	572.89	564.84
A4-06	DROP BOX INLET	N:321477.23 E:258659.52	573.50	565.29
A4-07	DROP BOX INLET	N:321584.23 E:258830.56	573.50	565.77
A5-01	DROP BOX INLET	N:321207.77 E:258693.50	574.34	564.91
A5-02	DROP BOX INLET	N:321105.53 E:258721.62	573.45	565.18
A5-03	DROP BOX INLET	N:320964.15 E:258810.50	573.26	565.60
A6-01	MANHOLE	N:320835.66 E:259257.44	574.84	562.43

STRUCTURE TABLE

NAME	TYPE	LAYOUT COORDINATES	LID	SUMP ELEVATION
B-01	MANHOLE	N:321256.01 E:259815.13	558.92	551.20
B-02	MANHOLE	N:321225.30 E:259660.67	561.99	553.00
B-03	MANHOLE	N:321120.14 E:259459.76	565.53	555.27
B-04	MANHOLE	N:321016.43 E:259473.41	566.17	556.32

DRAWING INDEX

ISSUE	DATE	DESCRIPTION
4	7/19/2017	REVISED PER TECHNICAL REVIEW COMMENTS BY RI DEM OF JUNE 19, 2017
3	3/27/2017	REVISION
2	2/17/2017	REVISION
1	8/17/2016	SOIL EROSION SEDIMENT CONTROL PLAN

PROJECT MANAGER C. JACOBS

PROJECT NUMBER 10021318

ALEXANDER DEUSON
No. 0011618
REGISTERED PROFESSIONAL ENGINEER
CIVIL

CLEAR RIVER ENERGY LLC
CLEAR RIVER ENERGY CENTER
WALLUM LAKE ROAD LOT NO.
135-002, 137-002, 137-003, 137-021,
153-001, 153-002
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

PROPOSED DRAINAGE PLAN

FILENAME 01C400.dwg
SCALE 1" = 100'

SHEET 01C400

MH STORM SEWER CALCULATIONS
10-YEAR STORM

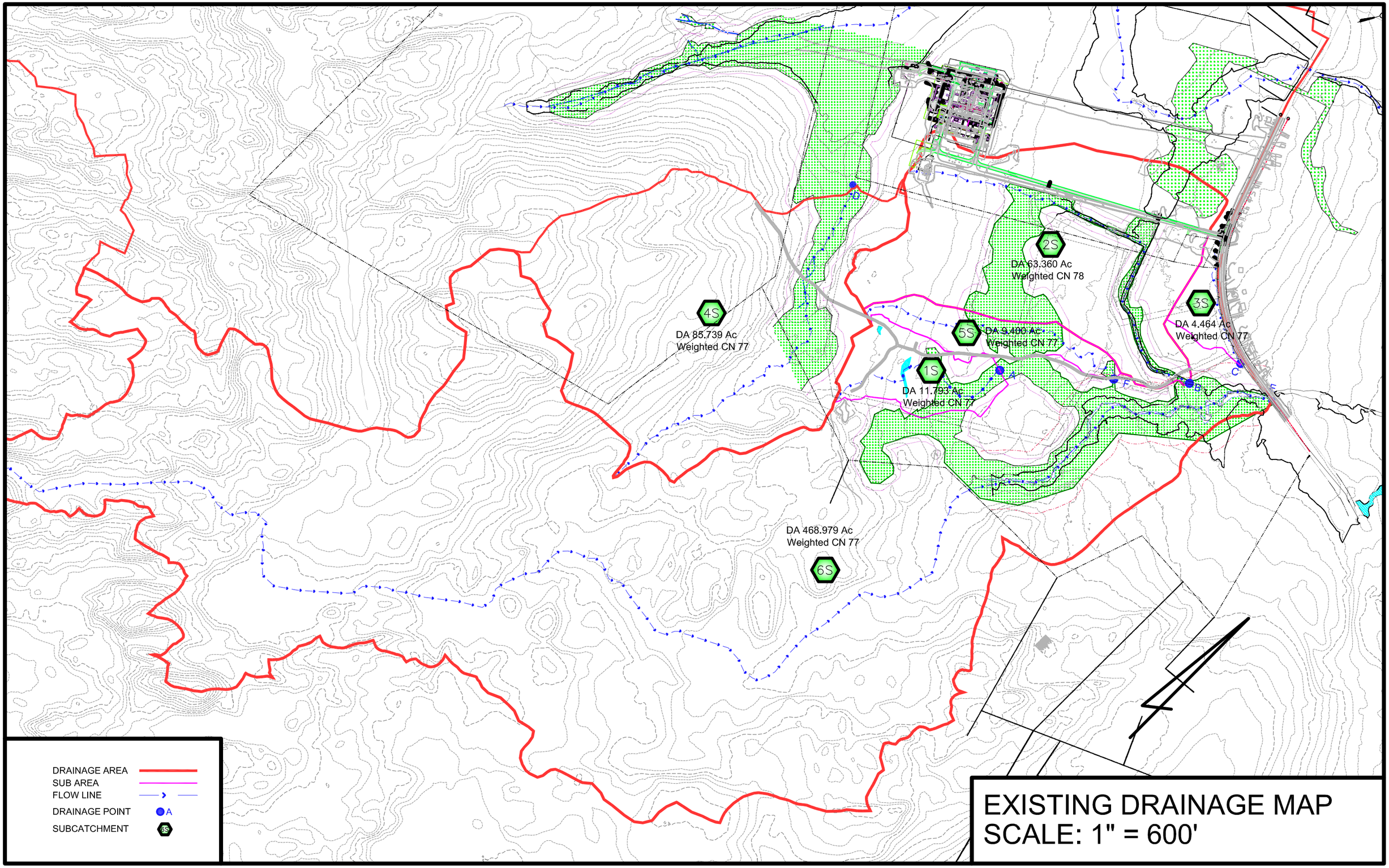
SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)
1	A-01	563.12	573.78	10.66	57.91	0.00	564.44	1.32
2	A-02	563.43	572.62	9.19	39.46	3.86	564.44	1.01
3	A-03	564.02	572.38	8.36	21.98	3.05	564.45	0.43
4	A-04	564.66	572.69	8.03	19.70	3.39	564.80	0.14
5	A-05	565.11	572.94	7.83	16.91	2.60	565.25	0.14
6	A-06	565.44	572.57	7.13	14.85	2.53	565.56	0.13
7	A-07	566.05	573.02	6.97	12.67	3.31	566.16	0.11
8	A-08	566.25	573.84	7.59	9.57	0.00	566.35	0.10
9	A-09	566.52	572.90	6.38	9.72	2.40	566.63	0.11
10	A-10	566.86	572.90	6.04	2.40	2.40	566.92	0.06
11	A1-01	566.89	573.36	6.47	5.11	0.00	566.97	0.08
12	A1-02	567.01	572.77	5.76	5.13	5.13	567.09	0.08
13	A2-01	564.09	573.16	9.07	14.65	3.39	564.45	0.36
14	A2-02	564.18	573.59	9.41	8.66	0.00	564.45	0.27
15	A2-03	564.70	572.95	8.25	9.12	3.31	564.81	0.11
16	A2-04	565.19	572.95	7.76	6.39	3.31	565.28	0.09
17	A2-05	565.52	573.17	7.65	3.31	3.31	565.59	0.07
18	A3-01	564.38	573.16	8.78	3.31	3.31	564.47	0.09
19	A4-01	563.27	572.62	9.35	18.57	2.29	564.44	1.17
20	A4-02	563.91	573.16	9.25	16.75	3.39	564.44	0.53
21	A4-03	564.38	573.16	8.78	13.86	3.31	564.52	0.14
22	A4-04	564.63	574.34	9.71	11.05	0.00	564.76	0.13
23	A4-05	564.84	572.89	8.05	8.73	3.96	564.95	0.11
24	A4-06	565.29	572.92	7.63	5.45	2.45	565.37	0.08
25	A4-07	565.77	572.75	6.98	3.31	3.31	565.83	0.06
26	A5-01	564.91	574.34	9.43	2.88	0.00	564.98	0.07
27	A5-02	565.18	573.45	8.27	3.14	1.67	565.26	0.08
28	A5-03	565.60	573.26	7.66	1.72	1.72	565.65	0.05
29	A6-01	562.49	576.00	13.51	51.65	0.00	563.81	1.32

MH STORM SEWER CALCULATIONS
100-YEAR STORM

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)
1	A-01	563.12	573.78	10.66	122.71	0.00	564.49	1.37
2	A-02	563.43	572.62	9.19	83.70	6.88	564.50	1.07
3	A-03	564.02	572.38	8.36	47.29	5.44	564.52	0.50
4	A-04	564.66	572.69	8.03	41.90	6.04	564.87	0.21
5	A-05	565.11	572.94	7.83	35.85	4.65	565.32	0.21
6	A-06	565.44	572.57	7.13	31.17	4.51	565.63	0.20
7	A-07	566.05	573.02	6.97	26.66	5.90	566.22	0.17
8	A-08	566.25	573.84	7.59	20.76	0.00	566.41	0.16
9	A-09	566.52	572.90	6.38	20.04	4.27	566.68	0.16
10	A-10	566.86	572.90	6.04	4.27	4.27	566.96	0.10
11	A1-01	566.89	573.36	6.47	11.39	0.00	567.01	0.12
12	A1-02	567.01	572.77	5.76	9.15	9.15	567.14	0.13
13	A2-01	564.09	573.16	9.07	29.88	6.04	564.52	0.43
14	A2-02	564.18	573.59	9.41	17.78	0.00	564.53	0.35
15	A2-03	564.70	572.95	8.25	17.75	5.90	564.87	0.17
16	A2-04	565.19	572.95	7.76	11.82	5.90	565.34	0.15
17	A2-05	565.52	573.17	7.65	5.90	5.90	565.64	0.12
18	A3-01	564.38	573.16	8.78	5.90	5.90	564.53	0.15
19	A4-01	563.27	572.62	9.35	39.82	4.09	564.49	1.22
20	A4-02	563.91	573.16	9.25	35.86	6.04	564.50	0.59
21	A4-03	564.38	573.16	8.78	29.89	5.90	564.59	0.21
22	A4-04	564.63	574.34	9.71	23.56	0.00	564.83	0.20
23	A4-05	564.84	572.89	8.05	17.37	7.06	565.01	0.17
24	A4-06	565.29	572.92	7.63	10.29	4.37	565.42	0.13
25	A4-07	565.77	572.75	6.98	5.90	5.90	565.88	0.11
26	A5-01	564.91	574.34	9.43	6.08	0.00	565.04	0.13
27	A5-02	565.18	573.45	8.27	6.05	2.97	565.31	0.13
28	A5-03	565.60	573.26	7.66	3.07	3.07	565.69	0.09
29	A6-01	562.49	576.00	13.51	95.11	0.00	563.82	1.33

PIPES FOR STORM SEWER CALCULATIONS

SN	LINE ID	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Pipe Diameter	Manning's Roughness
				(ft)	(ft)	(ft)	(%)	(inches)	
28	P-0	A-0	Out-02	44.65	562.96	562.00	2.1500	24.000	0.0130
13	P-1	A-01	A6-01	69.08	563.12	562.96	0.2300	48.000	0.0130
2	P-2	A-02	A-01	130.31	563.43	563.12	0.2400	48.000	0.0130
3	P-3	A-03	A-02	233.18	564.02	563.43	0.2500	48.000	0.0130
4	P-4	A-04	A-03	256.48	564.66	564.02	0.2500	48.000	0.0130
5	P-5	A-05	A-04	182.09	565.11	564.66	0.2500	42.000	0.0130
6	P-6	A-06	A-05	132.96	565.43	565.11	0.2400	42.000	0.0130
7	P-7	A-07	A-06	245.96	566.05	565.43	0.2500	42.000	0.0130
8	P-8	A-08	A-07	78.69	566.25	566.05	0.2500	36.000	0.0130
9	P-9	A-09	A-08	110.45	566.52	566.25	0.2500	36.000	0.0130
1	P-10	A-10	A-09	135.48	566.86	566.52	0.2500	30.000	0.0130
10	P-11	A1-01	A-09	148.86	566.89	566.52	0.2500	36.000	0.0130
11	P-12	A1-02	A1-01	47.30	567.01	566.89	0.2500	30.000	0.0130
22	P-13	A2-01	A-02	256.44	564.09	563.43	0.2600	36.000	0.0130
23	P-14	A2-02	A2-01	34.06	564.18	564.09	0.2700	36.000	0.0130
24	P-15	A2-03	A2-02	208.02	564.70	564.18	0.2500	36.000	0.0130
25	P-16	A2-04	A2-03	195.86	565.19	564.70	0.2500	30.000	0.0130
26	P-17	A2-05	A2-04	132.41	565.52	565.19	0.2500	24.000	0.0130
27	P-18	A3-01	A2-01	117.59	564.38	564.09	0.2500	30.000	0.0130
14	P-19	A4-01	A-01	61.01	563.27	563.12	0.2500	42.000	0.0130
12	P-20	A4-02	A4-01	256.44	563.91	563.27	0.2500	42.000	0.0130
31	P-21	A4-03	A4-02	187.23	564.38	563.91	0.2500	36.000	0.0130
15	P-22	A4-04	A4-03	101.61	564.63	564.38	0.2500	36.000	0.0130
16	P-23	A4-05	A4-04	83.80	564.84	564.63	0.2500	36.000	0.0130
17	P-24	A4-06	A4-05	180.43	565.29	564.84	0.2500	36.000	0.0130
18	P-25	A4-07	A4-06	191.32	565.77	565.29	0.2500	30.000	0.0130
19	P-26	A5-01	A4-04	113.93	564.91	564.63	0.2500	30.000	0.0130
20	P-27	A5-02	A5-01	106.04	565.18	564.91	0.2500	24.000	0.0130
21	P-28	A5-03	A5-02	167.00	565.60	565.18	0.2500	24.000	0.0130
29	P-29	A6-01	Out-01	56.66	562.43	558.00	7.8200	48.000	0.0150
30	P-30	A-0	A6-01	96.09	562.97	562.49	0.5000	48.000	0.0150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2S
DA 63.360 Ac
Weighted CN 78
3S
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Weighted CN 77
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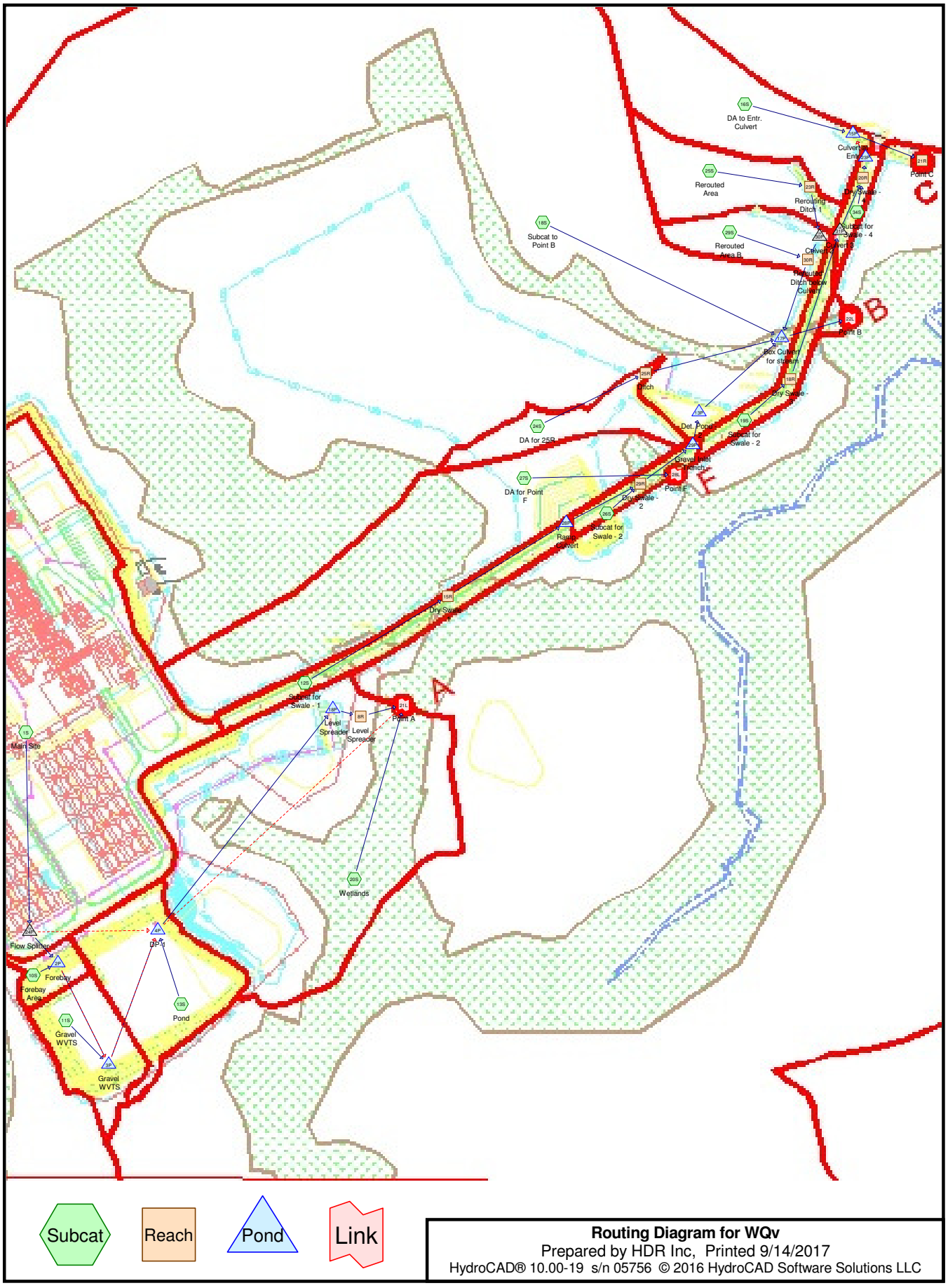
Weighted CN 77
1S
DA 11.793 Ac
Weighted CN 77
DA 468.979 Ac
Weighted CN 77
6S
A
B
C
D
E
F
DRAINAGE AREA
SUB AREA
FLOW LINE
DRAINAGE POINT
SUBCATCHMENT
EXISTING DRAINAGE MAP
SCALE: 1" = 600'


Subcat
Reach
Pond
Link
Routing Diagram for WQv
Prepared by HDR Inc, Printed 9/14/2017
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Summary for Subcatchment 1S: Main Site

Runoff = 17.23 cfs @ 12.10 hrs, Volume= 1.356 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
16.505	98	Paved parking, HSG D
16.505		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.007 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 11S: Gravel WVTS

Runoff = 0.55 cfs @ 12.08 hrs, Volume= 0.039 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 12S: Subcat for Swale - 1

Runoff = 0.82 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
*	0.253	95	>75% Grass cover, Good, HSG C
*	0.665	95	Paved parking, HSG C
	0.918	95	Weighted Average
	0.918		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	993	0.1266	3.33		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 1.31 cfs @ 12.08 hrs, Volume= 0.090 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 0.12 cfs @ 12.51 hrs, Volume= 0.027 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
3.168	77	Woods, Good, HSG D
0.028	98	Paved parking, HSG D
3.196	77	Weighted Average
3.168		99.12% Pervious Area
0.028		0.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 1.40 cfs @ 12.93 hrs, Volume= 0.448 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
52.205	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
53.103	77	Weighted Average
52.205		98.31% Pervious Area
0.898		1.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.5	3,073	0.0324	1.08		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swale - 2

Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.034 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
*	0.400	95	Water Surface, HSG C
*	0.144	95	>75% Grass cover, Good, HSG C
	0.544	95	Weighted Average
	0.544		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	313	0.1239	2.62		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 0.29 cfs @ 12.54 hrs, Volume= 0.066 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 0.03 cfs @ 12.75 hrs, Volume= 0.008 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
0.916	77	Woods, Good, HSG D
0.916		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 0.05 cfs @ 12.49 hrs, Volume= 0.012 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
1.380	77	Woods, Good, HSG D
1.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	734	0.0260	0.73		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swale - 2

Runoff = 0.34 cfs @ 12.03 hrs, Volume= 0.021 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
*	0.234	95	Paved parking, HSG D
*	0.107	95	>75% Grass cover, Good, HSG C
	0.341	95	Weighted Average
	0.341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	293	0.1266	2.61		**Lag/CN Method,**

Summary for Subcatchment 27S: DA for Point F

Runoff = 0.14 cfs @ 12.86 hrs, Volume= 0.042 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (ac)	CN	Description
5.040	77	Woods, Good, HSG D
5.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 29S: Rerouted Area B

Runoff = 0.04 cfs @ 12.44 hrs, Volume= 0.007 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

Area (sf)	CN	Description
37,749	77	Woods, Good, HSG D
37,749		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	599	0.0260	0.70		**Lag/CN Method,**

Summary for Subcatchment 34S: Subcat for Swale - 4

Runoff = 0.26 cfs @ 12.03 hrs, Volume= 0.016 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.20"

	Area (ac)	CN	Description
*	0.072	95	>75% Grass cover, Good, HSG C
*	0.189	95	Paved parking, HSG C
	0.261	95	Weighted Average
	0.261		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	292	0.1265	2.61		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 0.75" for WQv event
Inflow = 1.24 cfs @ 16.31 hrs, Volume= 1.250 af
Outflow = 1.24 cfs @ 16.32 hrs, Volume= 1.250 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.50 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 2.6 min

Peak Storage= 118 cf @ 16.32 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

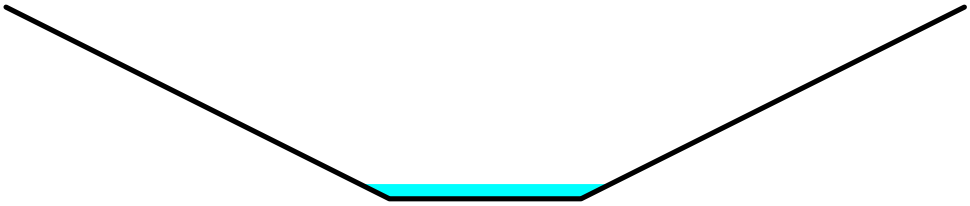
Summary for Reach 15R: Dry Swale - 1

Inflow Area = 0.918 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.82 cfs @ 12.07 hrs, Volume= 0.057 af
Outflow = 0.62 cfs @ 12.14 hrs, Volume= 0.057 af, Atten= 25%, Lag= 3.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.76 fps, Min. Travel Time= 8.5 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 25.6 min

Peak Storage= 317 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 87.10 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 904.0' Slope= 0.0190 '/'
Inlet Invert= 572.17', Outlet Invert= 555.00'



Summary for Reach 18R: Dry Swale - 3

Inflow Area = 0.544 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.54 cfs @ 12.03 hrs, Volume= 0.034 af
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af, Atten= 26%, Lag= 3.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 7.8 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 22.1 min

Peak Storage= 187 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 54.76 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 550.0' Slope= 0.0273 '/'
Inlet Invert= 548.05', Outlet Invert= 533.01'

‡

Summary for Reach 20R: Dry Swale - 4

Inflow Area = 0.805 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.62 cfs @ 12.06 hrs, Volume= 0.050 af
Outflow = 0.59 cfs @ 12.09 hrs, Volume= 0.050 af, Atten= 4%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.44 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 7.2 min

Peak Storage= 81 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 66.01 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 198.0' Slope= 0.0109 '/'
Inlet Invert= 532.35', Outlet Invert= 530.19'

Summary for Reach 21R: Point C

Inflow Area = 4.001 ac, 0.70% Impervious, Inflow Depth = 0.23" for WQv event
Inflow = 0.35 cfs @ 12.50 hrs, Volume= 0.077 af
Outflow = 0.35 cfs @ 12.52 hrs, Volume= 0.077 af, Atten= 0%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 2.3 min

Peak Storage= 30 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch 1

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQv event
Inflow = 0.05 cfs @ 12.49 hrs, Volume= 0.012 af
Outflow = 0.05 cfs @ 12.53 hrs, Volume= 0.012 af, Atten= 2%, Lag= 2.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.73 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 7.3 min

Peak Storage= 12 cf @ 12.53 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.18 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 171.0' Slope= 0.0137 '/'
Inlet Invert= 536.00', Outlet Invert= 533.66'

Summary for Reach 25R: Ditch

Inflow Area = 0.916 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQv event
Inflow = 0.03 cfs @ 12.75 hrs, Volume= 0.008 af
Outflow = 0.03 cfs @ 12.90 hrs, Volume= 0.008 af, Atten= 6%, Lag= 8.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.45 fps, Min. Travel Time= 9.7 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 12.5 min

Peak Storage= 15 cf @ 12.90 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swale - 2

Inflow Area = 1.259 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.78 cfs @ 12.10 hrs, Volume= 0.077 af
Outflow = 0.77 cfs @ 12.14 hrs, Volume= 0.077 af, Atten= 1%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.94 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 7.1 min

Peak Storage= 108 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 90.04 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 273.0' Slope= 0.0203 '/'
Inlet Invert= 553.62', Outlet Invert= 548.08'

Summary for Reach 30R: Rerouted Ditch below Culvert

Inflow Area = 2.247 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQv event
Inflow = 0.09 cfs @ 12.50 hrs, Volume= 0.019 af
Outflow = 0.09 cfs @ 12.54 hrs, Volume= 0.019 af, Atten= 1%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.00 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 6.7 min

Peak Storage= 18 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.17 cfs

2.00' x 1.00' deep channel, n= 0.013
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 212.0' Slope= 0.0058 '/'
Inlet Invert= 533.54', Outlet Invert= 532.32'

Summary for Pond 2P: Forebay

Inflow Area = 16.859 ac, 98.41% Impervious, Inflow Depth = 0.97" for WQv event
Inflow = 17.32 cfs @ 12.10 hrs, Volume= 1.363 af
Outflow = 5.10 cfs @ 12.41 hrs, Volume= 1.360 af, Atten= 71%, Lag= 18.4 min
Primary = 5.10 cfs @ 12.41 hrs, Volume= 1.360 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 564.50' @ 12.45 hrs Surf.Area= 5,436 sf Storage= 19,882 cf (16,094 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 101.4 min calculated for 1.273 af (93% of inflow)
Center-of-Mass det. time= 42.5 min (826.4 - 783.9)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	565.00'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.10 cfs @ 12.41 hrs HW=564.49' TW=561.57' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.10 cfs @ 6.49 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=561.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 3P: Gravel WVTS

Inflow Area = 17.988 ac, 95.60% Impervious, Inflow Depth > 0.93" for WQv event
Inflow = 5.31 cfs @ 12.36 hrs, Volume= 1.399 af
Outflow = 3.31 cfs @ 13.42 hrs, Volume= 1.384 af, Atten= 38%, Lag= 63.8 min
Primary = 3.31 cfs @ 13.42 hrs, Volume= 1.384 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 22,959 sf Storage= 27,438 cf
Peak Elev= 561.77' @ 13.42 hrs Surf.Area= 23,705 sf Storage= 45,310 cf (17,872 cf above start)
Flood Elev= 568.00' Surf.Area= 30,084 sf Storage= 212,684 cf (185,246 cf above start)

Plug-Flow detention time= 413.2 min calculated for 0.754 af (54% of inflow)
Center-of-Mass det. time= 130.8 min (958.1 - 827.3)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	243,305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	22,771	626.2	0.0	0	0	22,771
559.00	22,834	626.9	40.0	9,121	9,121	23,401
560.00	22,897	627.7	40.0	9,146	18,267	24,034
561.00	22,959	628.5	40.0	9,171	27,438	24,667
562.00	23,935	639.2	100.0	23,445	50,884	25,919
563.00	24,924	649.9	100.0	24,428	75,312	27,192
564.00	25,928	660.6	100.0	25,424	100,736	28,486
565.00	26,947	671.3	100.0	26,436	127,172	29,801
566.00	27,978	682.1	100.0	27,461	154,633	31,146
567.00	29,024	692.8	100.0	28,499	183,132	32,504
568.00	30,084	703.5	100.0	29,552	212,684	33,883
569.00	31,161	714.3	100.0	30,621	243,305	35,293

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=3.31 cfs @ 13.42 hrs HW=561.77' TW=558.41' (Dynamic Tailwater)
- **1=Culvert** (Passes 3.31 cfs of 42.23 cfs potential flow)
  - **2=Orifice/Grate** (Passes 3.31 cfs of 3.85 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 3.31 cfs @ 4.21 fps)
    - **5=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 0.89" for WQv event
Inflow = 3.42 cfs @ 13.37 hrs, Volume= 1.474 af
Outflow = 1.24 cfs @ 16.30 hrs, Volume= 1.251 af, Atten= 64%, Lag= 175.7 min
Primary = 1.24 cfs @ 16.30 hrs, Volume= 1.251 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 558.71' @ 16.30 hrs Surf.Area= 49,114 sf Storage= 34,309 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 492.3 min calculated for 1.250 af (85% of inflow)

Center-of-Mass det. time= 396.7 min (1,347.5 - 950.7)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 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)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**9.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Secondary	568.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=1.24 cfs @ 16.30 hrs HW=558.71' TW=558.08' (Dynamic Tailwater)
↑**1=Culvert** (Passes 1.24 cfs of 1.57 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 1.24 cfs @ 2.87 fps)
3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' TW=0.00' (Dynamic Tailwater)
↑**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.259 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.77 cfs @ 12.14 hrs, Volume= 0.077 af
Outflow = 0.08 cfs @ 13.91 hrs, Volume= 0.074 af, Atten= 90%, Lag= 106.2 min
Primary = 0.08 cfs @ 13.91 hrs, Volume= 0.074 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 538.35' @ 13.91 hrs Surf.Area= 5,456 sf Storage= 1,839 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 381.1 min calculated for 0.074 af (96% of inflow)
Center-of-Mass det. time= 357.9 min (1,192.5 - 834.6)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 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)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.08 cfs @ 13.91 hrs HW=538.35' TW=533.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.08 cfs of 0.57 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.08 cfs @ 2.41 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 4.001 ac, 0.70% Impervious, Inflow Depth = 0.23" for WQv event
Inflow = 0.35 cfs @ 12.50 hrs, Volume= 0.077 af
Outflow = 0.35 cfs @ 12.50 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.50 hrs, Volume= 0.077 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 527.35' @ 12.50 hrs Surf.Area= 11 sf Storage= 2 cf

Plug-Flow detention time= 0.2 min calculated for 0.077 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (880.1 - 880.0)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 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)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.35 cfs @ 12.50 hrs HW=527.35' TW=526.69' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.35 cfs @ 2.16 fps)
  └**2=Orifice/Grate** (Passes 0.35 cfs of 0.38 cfs potential flow)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 17P: Box Culvert for stream

Inflow Area = 57.525 ac, 1.56% Impervious, Inflow Depth > 0.11" for WQv event
Inflow = 1.54 cfs @ 12.93 hrs, Volume= 0.549 af
Outflow = 1.54 cfs @ 12.93 hrs, Volume= 0.549 af, Atten= 0%, Lag= 0.0 min
Primary = 1.54 cfs @ 12.93 hrs, Volume= 0.549 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.00' @ 0.00 hrs Surf.Area= 412 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,015.4 - 1,015.4)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 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)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 60.0" H Box Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 60.00 sf

Primary OutFlow Max=0.00 cfs @ 12.93 hrs HW=533.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 27.56 cfs potential flow)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 0.75" for WQv event
Inflow = 1.24 cfs @ 16.30 hrs, Volume= 1.251 af
Outflow = 1.24 cfs @ 16.31 hrs, Volume= 1.250 af, Atten= 0%, Lag= 0.8 min
Primary = 1.24 cfs @ 16.31 hrs, Volume= 1.250 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.08' @ 16.31 hrs Surf.Area= 2,625 sf Storage= 7,435 cf (85 cf above start)

Plug-Flow detention time= 221.0 min calculated for 1.082 af (86% of inflow)
Center-of-Mass det. time= 1.2 min (1,348.6 - 1,347.5)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.24 cfs @ 16.31 hrs HW=558.08' TW=558.03' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 1.24 cfs @ 0.83 fps)

Summary for Pond 23P:

Inflow Area = 0.805 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.59 cfs @ 12.09 hrs, Volume= 0.050 af
Outflow = 0.23 cfs @ 12.44 hrs, Volume= 0.050 af, Atten= 61%, Lag= 21.1 min
Primary = 0.23 cfs @ 12.44 hrs, Volume= 0.050 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.41' @ 12.44 hrs Surf.Area= 558 sf Storage= 317 cf

Plug-Flow detention time= 6.9 min calculated for 0.050 af (100% of inflow)
Center-of-Mass det. time= 6.8 min (835.5 - 828.7)

Volume	Invert	Avail.Storage	Storage Description
#1	527.33'	793 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.33	4	8.0	0.0	0	0	4
527.34	4	8.0	35.0	0	0	4
530.16	4	8.0	35.0	4	4	27
530.19	56	110.4	100.0	1	5	991
531.00	317	180.9	100.0	137	141	2,630
532.01	1,044	364.9	100.0	652	793	10,626

Device	Routing	Invert	Outlet Devices
#1	Primary	527.33'	**2.5" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 527.33' / 527.17' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.03 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 12.44 hrs HW=531.41' TW=527.35' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.23 cfs @ 6.83 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=527.33' TW=527.17' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 24P: Flow Splitter

Inflow Area = 16.505 ac,100.00% Impervious, Inflow Depth = 0.99" for WQv event
Inflow = 17.23 cfs @ 12.10 hrs, Volume= 1.356 af
Outflow = 17.23 cfs @ 12.10 hrs, Volume= 1.356 af, Atten= 0%, Lag= 0.0 min
Primary = 17.23 cfs @ 12.10 hrs, Volume= 1.356 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 565.26' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	562.96'	**24.0" Round Culvert** L= 44.7' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.00' S= 0.0215 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Secondary	562.96'	**48.0" Round Culvert** L= 106.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.43' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#3	Device 2	565.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=17.21 cfs @ 12.10 hrs HW=565.25' TW=563.34' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 17.21 cfs @ 5.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=562.96' TW=558.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)
↑—**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.918 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.62 cfs @ 12.14 hrs, Volume= 0.057 af
Outflow = 0.62 cfs @ 12.15 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.4 min
Primary = 0.62 cfs @ 12.15 hrs, Volume= 0.056 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 555.27' @ 12.15 hrs Surf.Area= 108 sf Storage= 31 cf
Flood Elev= 557.00' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= 5.5 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 2.8 min (836.1 - 833.3)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 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)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	555.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 555.00' / 553.62' S= 0.0460 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.62 cfs @ 12.15 hrs HW=555.27' TW=553.79' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Inlet Controls 0.62 cfs @ 1.87 fps)

Summary for Pond 29P: Gravel Inlet Trench

Inflow Area = 1.259 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.77 cfs @ 12.14 hrs, Volume= 0.077 af
Outflow = 0.77 cfs @ 12.14 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.14 hrs, Volume= 0.077 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 538.69' @ 12.14 hrs Surf.Area= 4 sf Storage= 1 cf

Plug-Flow detention time= 0.0 min calculated for 0.077 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (834.6 - 834.5)

Volume	Invert	Avail.Storage	Storage Description
#1	538.25'	14 cf	**2.00'W x 2.00'L x 9.75'H Prismatoid** 39 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	538.25'	**15.0" Round Culvert** L= 25.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.25' / 538.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.77 cfs @ 12.14 hrs HW=538.69' TW=538.17' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.77 cfs @ 2.98 fps)

Summary for Pond 30P: Culvert 2

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQv event
Inflow = 0.05 cfs @ 12.53 hrs, Volume= 0.012 af
Outflow = 0.05 cfs @ 12.53 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.53 hrs, Volume= 0.012 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.76' @ 12.53 hrs
Flood Elev= 534.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.66'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.66' / 533.54' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.05 cfs @ 12.53 hrs HW=533.76' TW=533.58' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Barrel Controls 0.05 cfs @ 1.05 fps)

Summary for Pond 31P: Culvert 3

Inflow Area = 0.544 ac, 0.00% Impervious, Inflow Depth = 0.74" for WQv event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.26' @ 12.09 hrs
Flood Elev= 538.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.00' / 532.35' S= 0.0271 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.40 cfs @ 12.09 hrs HW=533.26' TW=532.52' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Inlet Controls 0.40 cfs @ 1.29 fps)

Summary for Link 21L: Point A

Inflow Area = 27.710 ac, 66.61% Impervious, Inflow Depth > 0.57" for WQv event
Inflow = 1.30 cfs @ 16.04 hrs, Volume= 1.316 af
Primary = 1.30 cfs @ 16.04 hrs, Volume= 1.316 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

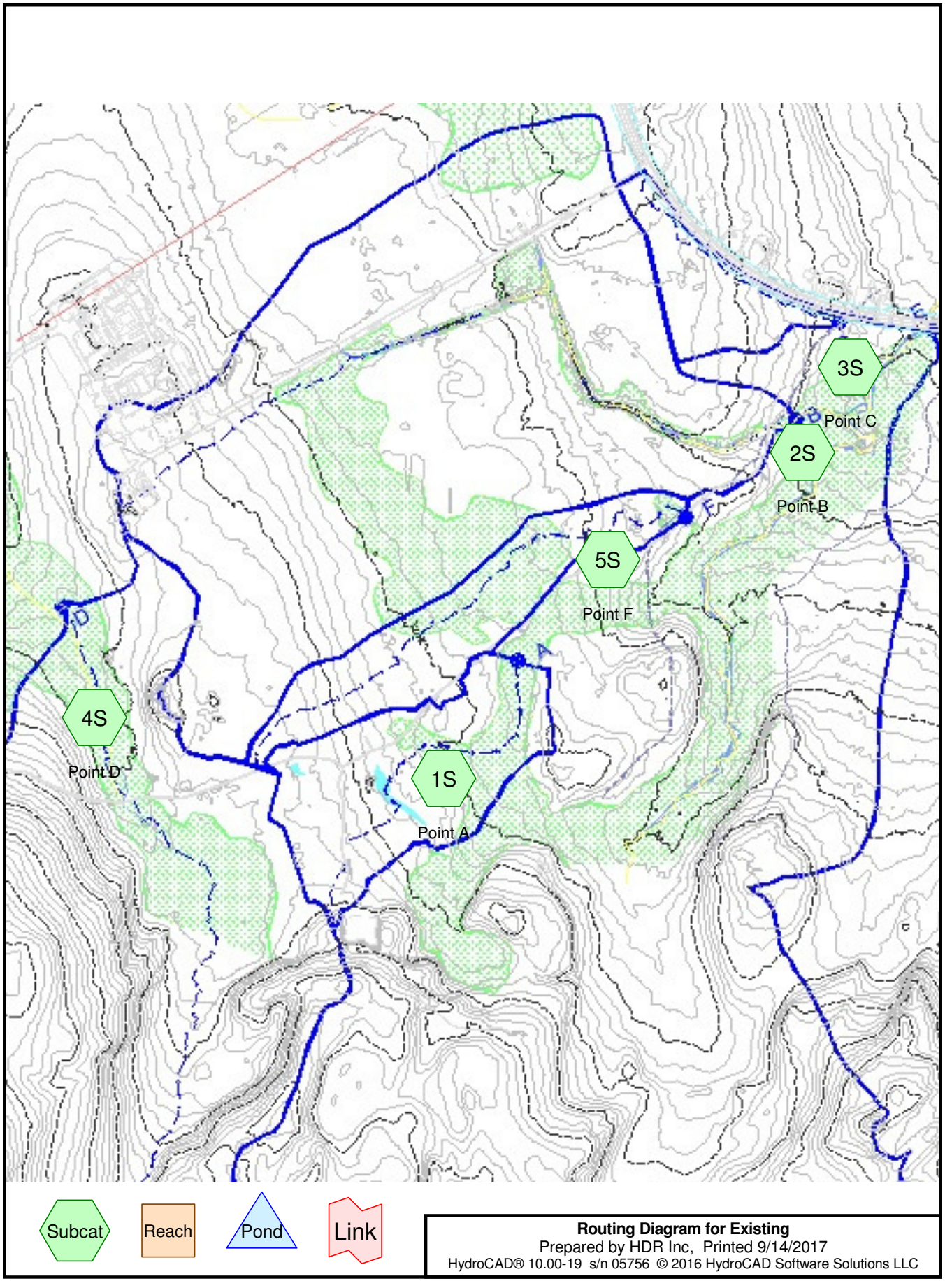
Inflow Area = 57.525 ac, 1.56% Impervious, Inflow Depth > 0.11" for WQv event
Inflow = 1.54 cfs @ 12.93 hrs, Volume= 0.549 af
Primary = 1.54 cfs @ 12.93 hrs, Volume= 0.549 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 28L: Point F

Inflow Area = 5.040 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQv event
Inflow = 0.14 cfs @ 12.86 hrs, Volume= 0.042 af
Primary = 0.14 cfs @ 12.86 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



Routing Diagram for Existing
Prepared by HDR Inc, Printed 9/14/2017

Summary for Subcatchment 1S: Point A

Runoff = 6.50 cfs @ 12.44 hrs, Volume= 0.854 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
11.793	77	Woods, Good, HSG D
11.793		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.0	1,588	0.0303	0.91		**Lag/CN Method,**

Summary for Subcatchment 2S: Point B

Runoff = 28.94 cfs @ 12.69 hrs, Volume= 4.860 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
2,678,932	77	Woods, Good, HSG D
81,040	98	Paved parking, HSG D
2,759,972	78	Weighted Average
2,678,932		97.06% Pervious Area
81,040		2.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.6	3,073	0.0291	1.05		**Lag/CN Method,**

Summary for Subcatchment 3S: Point C

Runoff = 2.89 cfs @ 12.29 hrs, Volume= 0.323 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
4.464	77	Woods, Good, HSG D
4.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	1,034	0.0331	0.88		**Lag/CN Method,**

Summary for Subcatchment 4S: Point D

Runoff = 45.55 cfs @ 12.49 hrs, Volume= 6.206 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
85.739	77	Woods, Good, HSG D
85.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	3,135	0.0762	1.66		**Lag/CN Method,**

Summary for Subcatchment 5S: Point F

Runoff = 4.23 cfs @ 12.66 hrs, Volume= 0.680 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
9.400	77	Woods, Good, HSG D
9.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 1S: Point A

Runoff = 20.16 cfs @ 12.41 hrs, Volume= 2.496 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
11.793	77	Woods, Good, HSG D
11.793		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.0	1,588	0.0303	0.91		**Lag/CN Method,**

Summary for Subcatchment 2S: Point B

Runoff = 86.73 cfs @ 12.69 hrs, Volume= 13.871 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
2,678,932	77	Woods, Good, HSG D
81,040	98	Paved parking, HSG D
2,759,972	78	Weighted Average
2,678,932		97.06% Pervious Area
81,040		2.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.6	3,073	0.0291	1.05		**Lag/CN Method,**

Summary for Subcatchment 3S: Point C

Runoff = 9.01 cfs @ 12.28 hrs, Volume= 0.945 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
4.464	77	Woods, Good, HSG D
4.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	1,034	0.0331	0.88		**Lag/CN Method,**

Summary for Subcatchment 4S: Point D

Runoff = 140.96 cfs @ 12.43 hrs, Volume= 18.145 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
85.739	77	Woods, Good, HSG D
85.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	3,135	0.0762	1.66		**Lag/CN Method,**

Summary for Subcatchment 5S: Point F

Runoff = 13.08 cfs @ 12.61 hrs, Volume= 1.989 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
9.400	77	Woods, Good, HSG D
9.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 1S: Point A

Runoff = 46.68 cfs @ 12.40 hrs, Volume= 5.818 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
11.793	77	Woods, Good, HSG D
11.793		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.0	1,588	0.0303	0.91		**Lag/CN Method,**

Summary for Subcatchment 2S: Point B

Runoff = 197.47 cfs @ 12.64 hrs, Volume= 31.899 af, Depth= 6.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
2,678,932	77	Woods, Good, HSG D
81,040	98	Paved parking, HSG D
2,759,972	78	Weighted Average
2,678,932		97.06% Pervious Area
81,040		2.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.6	3,073	0.0291	1.05		**Lag/CN Method,**

Summary for Subcatchment 3S: Point C

Runoff = 20.85 cfs @ 12.27 hrs, Volume= 2.202 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
4.464	77	Woods, Good, HSG D
4.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	1,034	0.0331	0.88		**Lag/CN Method,**

Summary for Subcatchment 4S: Point D

Runoff = 327.06 cfs @ 12.43 hrs, Volume= 42.299 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
85.739	77	Woods, Good, HSG D
85.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	3,135	0.0762	1.66		**Lag/CN Method,**

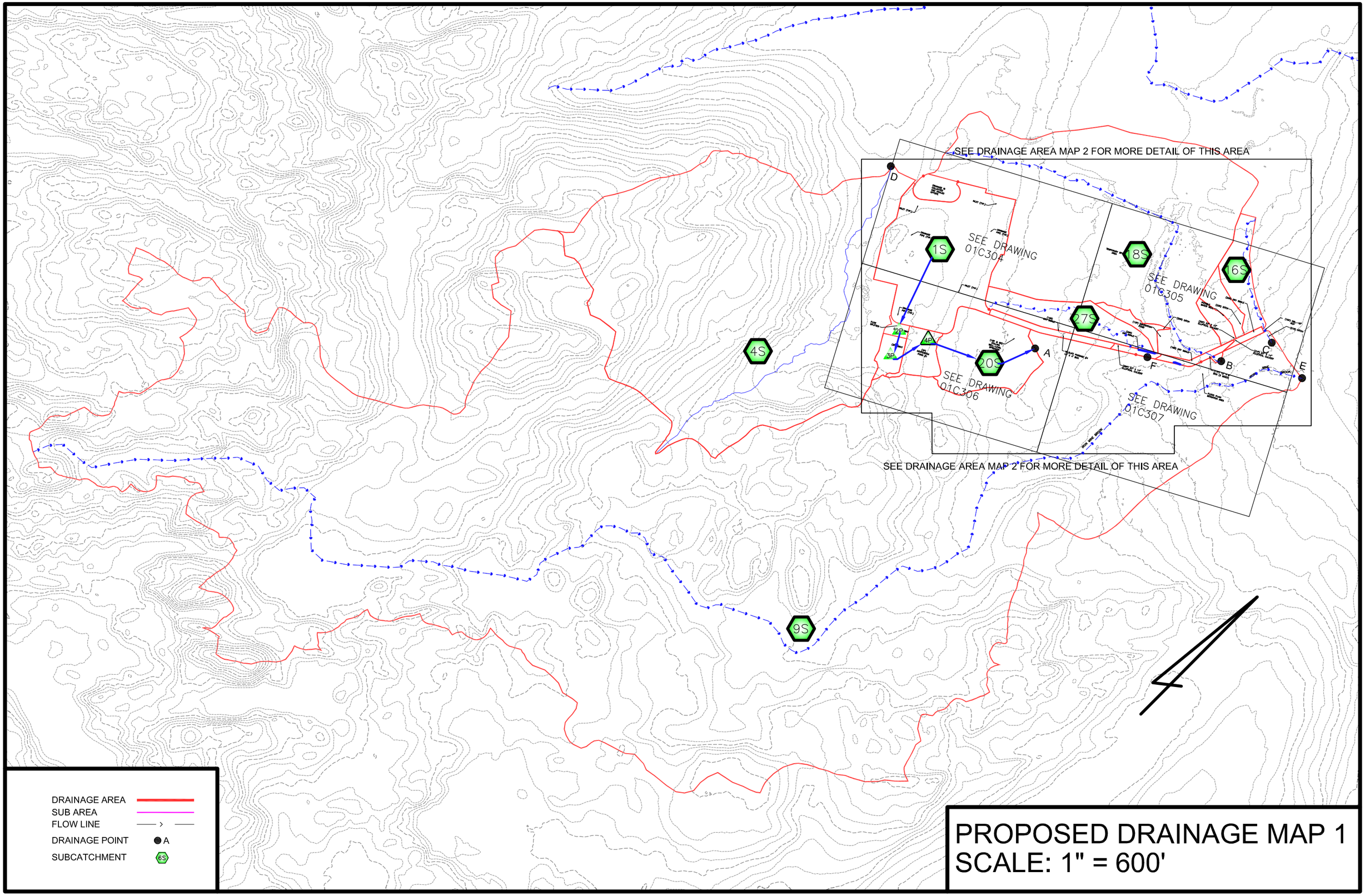
Summary for Subcatchment 5S: Point F

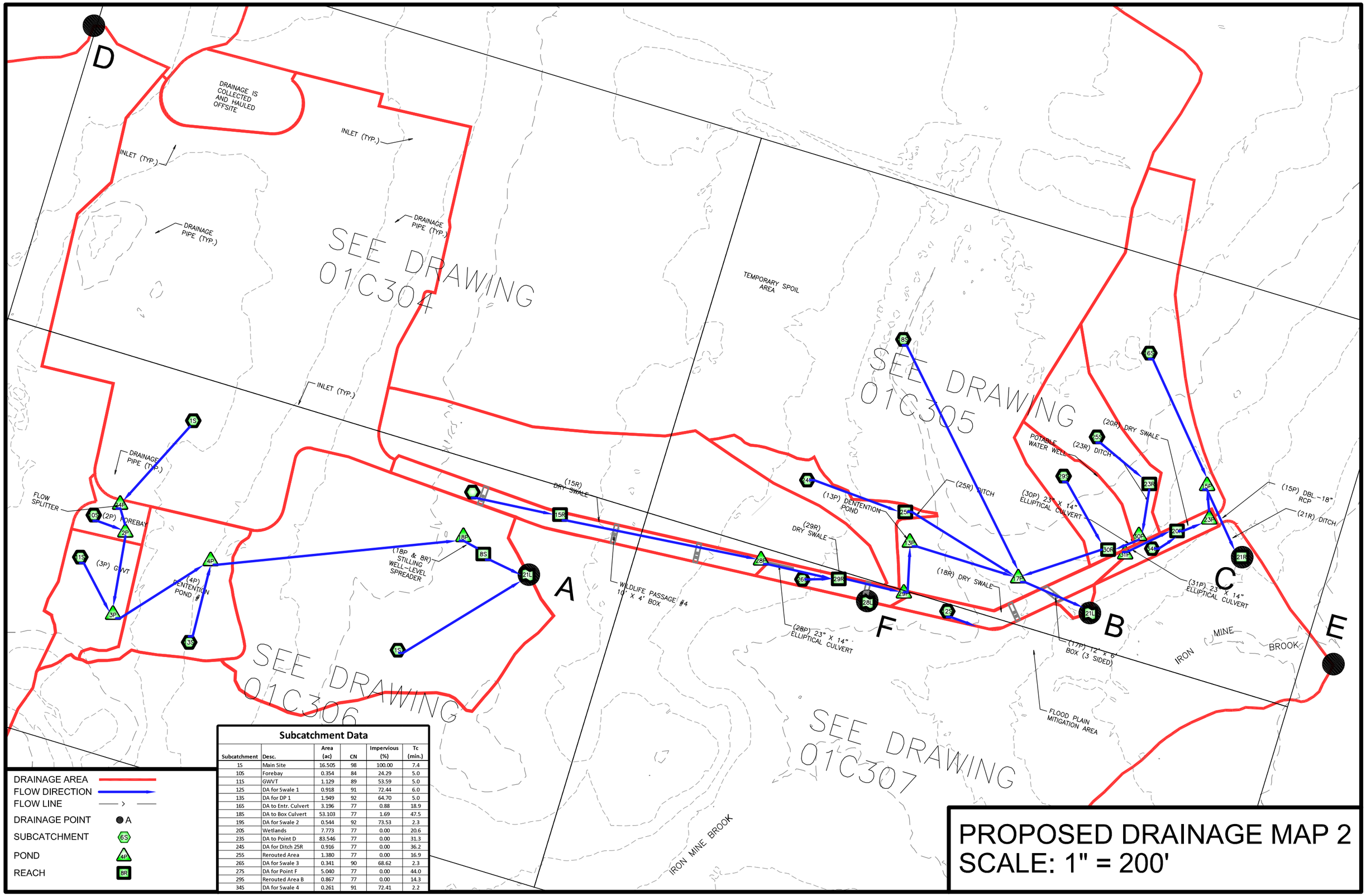
Runoff = 30.37 cfs @ 12.57 hrs, Volume= 4.637 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
9.400	77	Woods, Good, HSG D
9.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**


SEE DRAINAGE AREA MAP 2 FOR MORE DETAIL OF THIS AREA
SEE DRAINAGE AREA MAP 2 FOR MORE DETAIL OF THIS AREA
SEE DRAWING 01C304
SEE DRAWING 01C305
SEE DRAWING 01C306
SEE DRAWING 01C307
1S
2S
3S
4S
5S
6S
7S
8S
9S
A
B
C
D
E
F
DRAINAGE AREA
SUB AREA
FLOW LINE
DRAINAGE POINT
SUBCATCHMENT
PROPOSED DRAINAGE MAP 1
SCALE: 1" = 600'

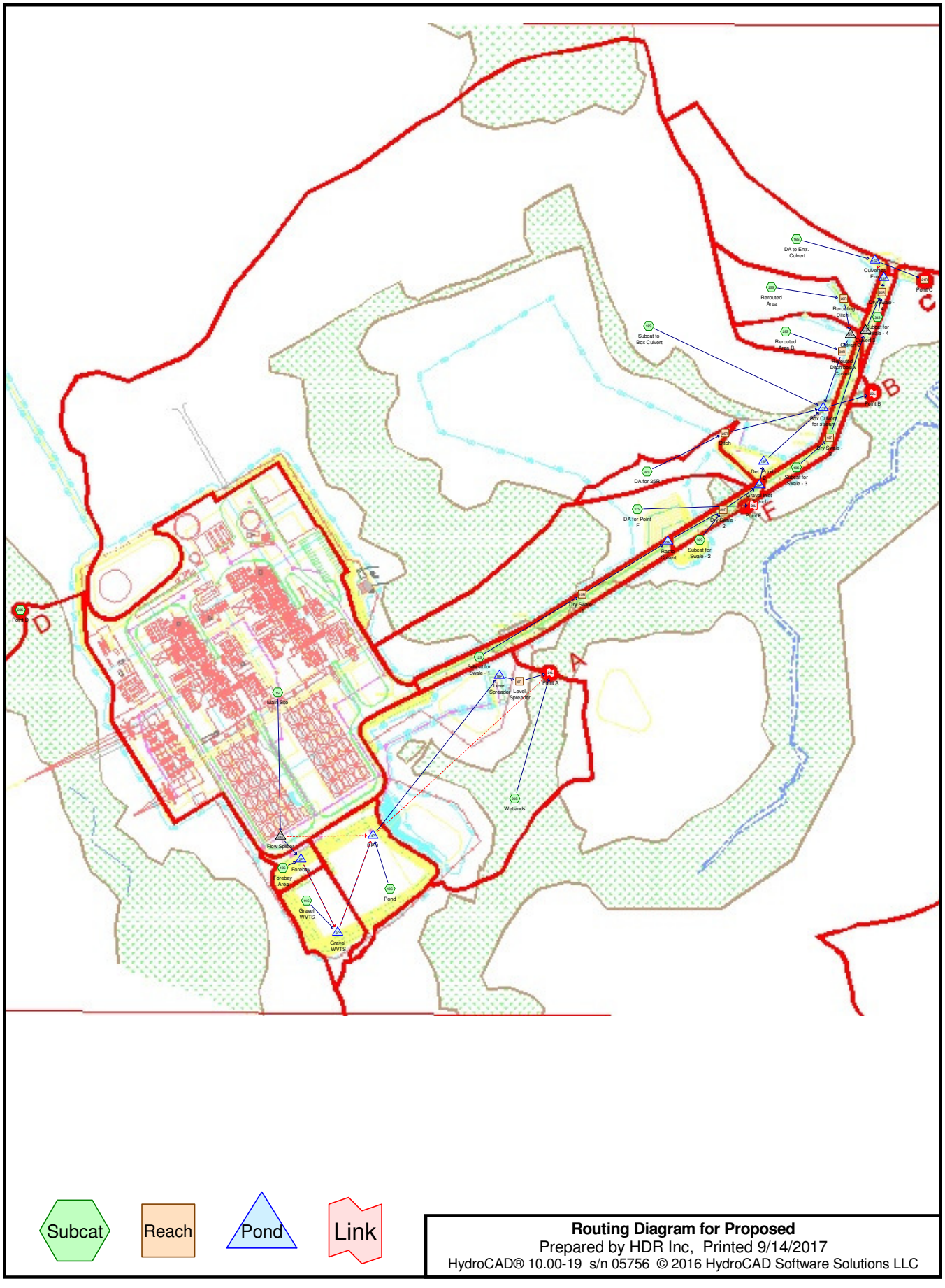


DRAINAGE AREA
FLOW DIRECTION
FLOW LINE
DRAINAGE POINT A
SUBCATCHMENT 6S
POND 4P
REACH 8R

Subcatchment Data

Subcatchment	Desc.	Area (ac)	CN	Impervious (%)	Tc (min.)
1S	Main Site	16.505	98	100.00	7.4
10S	Forebay	0.354	84	24.29	5.0
11S	GWVT	1.129	89	53.59	5.0
12S	DA for Swale 1	0.918	91	72.44	6.0
13S	DA for DP 1	1.949	92	64.70	5.0
16S	DA to Entr. Culvert	3.196	77	0.88	18.9
18S	DA to Box Culvert	53.103	77	1.69	47.5
19S	DA for Swale 2	0.544	92	73.53	2.3
20S	Wetlands	7.773	77	0.00	20.6
23S	DA to Point D	83.546	77	0.00	31.3
24S	DA for Ditch 25R	0.916	77	0.00	36.2
25S	Rerouted Area	1.380	77	0.00	16.9
26S	DA for Swale 3	0.341	90	68.62	2.3
27S	DA for Point F	5.040	77	0.00	44.0
29S	Rerouted Area B	0.867	77	0.00	14.3
34S	DA for Swale 4	0.261	91	72.41	2.2

PROPOSED DRAINAGE MAP 2
SCALE: 1" = 200'



Subcat | Reach | Pond | Link

Routing Diagram for Proposed
Prepared by HDR Inc, Printed 9/14/2017
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Summary for Subcatchment 1S: Main Site

Runoff = 41.05 cfs @ 12.10 hrs, Volume= 3.397 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
16.505	98	Paved parking, HSG D
16.505		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 0.55 cfs @ 12.08 hrs, Volume= 0.038 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 11S: Gravel WVTS

Runoff = 2.23 cfs @ 12.07 hrs, Volume= 0.153 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 12S: Subcat for Swale - 1

Runoff = 1.91 cfs @ 12.09 hrs, Volume= 0.137 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.665	98	Paved parking, HSG C
	0.918	91	Weighted Average
	0.253		27.56% Pervious Area
	0.665		72.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 4.39 cfs @ 12.07 hrs, Volume= 0.305 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 2.11 cfs @ 12.28 hrs, Volume= 0.231 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
3.168	77	Woods, Good, HSG D
0.028	98	Paved parking, HSG D
3.196	77	Weighted Average
3.168		99.12% Pervious Area
0.028		0.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Box Culvert

Runoff = 22.91 cfs @ 12.72 hrs, Volume= 3.844 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
52.205	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
53.103	77	Weighted Average
52.205		98.31% Pervious Area
0.898		1.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.5	3,073	0.0324	1.08		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swale - 3

Runoff = 1.35 cfs @ 12.03 hrs, Volume= 0.085 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

	Area (ac)	CN	Description
	0.400	98	Water Surface, HSG C
*	0.144	74	>75% Grass cover, Good, HSG C
	0.544	92	Weighted Average
	0.144		26.47% Pervious Area
	0.400		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 4.95 cfs @ 12.31 hrs, Volume= 0.563 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 44.54 cfs @ 12.48 hrs, Volume= 6.047 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
83.546	77	Woods, Good, HSG D
83.546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 0.46 cfs @ 12.55 hrs, Volume= 0.066 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.916	77	Woods, Good, HSG D
0.916		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 0.95 cfs @ 12.26 hrs, Volume= 0.100 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
1.380	77	Woods, Good, HSG D
1.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	734	0.0260	0.73		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swale - 2

Runoff = 0.78 cfs @ 12.03 hrs, Volume= 0.049 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
* 0.234	98	Paved parking, HSG D
0.107	74	>75% Grass cover, Good, HSG C
0.341	90	Weighted Average
0.107		31.38% Pervious Area
0.234		68.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.08		**Lag/CN Method,**

Summary for Subcatchment 27S: DA for Point F

Runoff = 2.27 cfs @ 12.66 hrs, Volume= 0.365 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
5.040	77	Woods, Good, HSG D
5.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 29S: Rerouted Area B

Runoff = 0.64 cfs @ 12.21 hrs, Volume= 0.063 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.867	77	Woods, Good, HSG D
0.867		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	599	0.0260	0.70		**Lag/CN Method,**

Summary for Subcatchment 34S: Subcat for Swale - 4

Runoff = 0.62 cfs @ 12.03 hrs, Volume= 0.039 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.70"

	Area (ac)	CN	Description
*	0.072	74	>75% Grass cover, Good, HSG C
*	0.189	98	Paved parking, HSG C
	0.261	91	Weighted Average
	0.072		27.59% Pervious Area
	0.189		72.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	292	0.1265	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 2.15" for 1-Year event
Inflow = 2.16 cfs @ 18.11 hrs, Volume= 3.578 af
Outflow = 2.16 cfs @ 18.12 hrs, Volume= 3.578 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.63 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 1.8 min

Peak Storage= 166 cf @ 18.12 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swale - 1

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 1.79" for 1-Year event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 0.137 af
Outflow = 1.58 cfs @ 12.14 hrs, Volume= 0.137 af, Atten= 18%, Lag= 3.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.40 fps, Min. Travel Time= 6.3 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 21.0 min

Peak Storage= 595 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 87.10 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 904.0' Slope= 0.0190 '/'
Inlet Invert= 572.17', Outlet Invert= 555.00'

Summary for Reach 18R: Dry Swale - 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 1.88" for 1-Year event
Inflow = 1.35 cfs @ 12.03 hrs, Volume= 0.085 af
Outflow = 1.11 cfs @ 12.08 hrs, Volume= 0.085 af, Atten= 18%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 19.2 min

Peak Storage= 349 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 54.76 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 550.0' Slope= 0.0273 '/'
Inlet Invert= 548.05', Outlet Invert= 533.01'

‡

Summary for Reach 20R: Dry Swale - 4

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 1.85" for 1-Year event
Inflow = 1.66 cfs @ 12.06 hrs, Volume= 0.124 af
Outflow = 1.61 cfs @ 12.08 hrs, Volume= 0.124 af, Atten= 3%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.99 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 5.7 min

Peak Storage= 160 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 66.01 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 198.0' Slope= 0.0109 '/'
Inlet Invert= 532.35', Outlet Invert= 530.19'

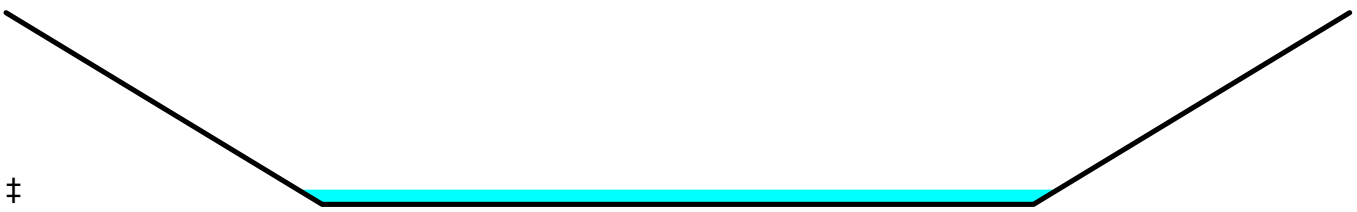
Summary for Reach 21R: Point C

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 1.07" for 1-Year event
Inflow = 2.88 cfs @ 12.31 hrs, Volume= 0.356 af
Outflow = 2.88 cfs @ 12.31 hrs, Volume= 0.356 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.02 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 1.9 min

Peak Storage= 110 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'



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Summary for Reach 23R: Rerouting Ditch 1

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1-Year event
Inflow = 0.95 cfs @ 12.26 hrs, Volume= 0.100 af
Outflow = 0.95 cfs @ 12.27 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.06 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.73 fps, Avg. Travel Time= 3.9 min

Peak Storage= 79 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.18 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 171.0' Slope= 0.0137 '/'
Inlet Invert= 536.00', Outlet Invert= 533.66'

Summary for Reach 25R: Ditch

Inflow Area = 0.916 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1-Year event
Inflow = 0.46 cfs @ 12.55 hrs, Volume= 0.066 af
Outflow = 0.45 cfs @ 12.59 hrs, Volume= 0.066 af, Atten= 1%, Lag= 2.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.25 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 8.6 min

Peak Storage= 95 cf @ 12.59 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swale - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 1.77" for 1-Year event
Inflow = 1.96 cfs @ 12.11 hrs, Volume= 0.186 af
Outflow = 1.94 cfs @ 12.14 hrs, Volume= 0.186 af, Atten= 1%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.62 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 5.7 min

Peak Storage= 202 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 90.04 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 273.0' Slope= 0.0203 '/'
Inlet Invert= 553.62', Outlet Invert= 548.08'

Summary for Reach 30R: Rerouted Ditch below Culvert

Inflow Area = 2.247 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1-Year event
Inflow = 1.56 cfs @ 12.24 hrs, Volume= 0.163 af
Outflow = 1.56 cfs @ 12.26 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.81 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 3.6 min

Peak Storage= 117 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.17 cfs

2.00' x 1.00' deep channel, n= 0.013
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 212.0' Slope= 0.0058 '/'
Inlet Invert= 533.54', Outlet Invert= 532.32'

Summary for Pond 2P: Forebay

Inflow Area = 16.859 ac, 98.41% Impervious, Inflow Depth = 2.21" for 1-Year event
Inflow = 21.45 cfs @ 12.10 hrs, Volume= 3.107 af
Outflow = 21.33 cfs @ 12.11 hrs, Volume= 3.105 af, Atten= 1%, Lag= 0.8 min
Primary = 5.53 cfs @ 12.03 hrs, Volume= 2.601 af
Secondary = 15.94 cfs @ 12.11 hrs, Volume= 0.503 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 565.19' @ 12.11 hrs Surf.Area= 5,780 sf Storage= 23,758 cf (19,969 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 74.0 min calculated for 3.018 af (97% of inflow)
Center-of-Mass det. time= 41.1 min (806.9 - 765.8)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	565.00'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.52 cfs @ 12.03 hrs HW=565.14' TW=561.73' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.52 cfs @ 7.02 fps)

Secondary OutFlow Max=15.93 cfs @ 12.11 hrs HW=565.19' TW=561.96' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Weir Controls 15.93 cfs @ 1.42 fps)

Summary for Pond 3P: Gravel WVTS

Inflow Area = 17.988 ac, 95.60% Impervious, Inflow Depth = 2.17" for 1-Year event
Inflow = 23.38 cfs @ 12.10 hrs, Volume= 3.258 af
Outflow = 9.25 cfs @ 12.54 hrs, Volume= 3.242 af, Atten= 60%, Lag= 26.4 min
Primary = 9.25 cfs @ 12.54 hrs, Volume= 3.242 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 22,959 sf Storage= 27,438 cf
Peak Elev= 562.63' @ 12.54 hrs Surf.Area= 24,553 sf Storage= 66,078 cf (38,640 cf above start)
Flood Elev= 568.00' Surf.Area= 30,084 sf Storage= 212,684 cf (185,246 cf above start)

Plug-Flow detention time= 272.0 min calculated for 2.611 af (80% of inflow)
Center-of-Mass det. time= 119.1 min (926.5 - 807.4)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	243,305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	22,771	626.2	0.0	0	0	22,771
559.00	22,834	626.9	40.0	9,121	9,121	23,401
560.00	22,897	627.7	40.0	9,146	18,267	24,034
561.00	22,959	628.5	40.0	9,171	27,438	24,667
562.00	23,935	639.2	100.0	23,445	50,884	25,919
563.00	24,924	649.9	100.0	24,428	75,312	27,192
564.00	25,928	660.6	100.0	25,424	100,736	28,486
565.00	26,947	671.3	100.0	26,436	127,172	29,801
566.00	27,978	682.1	100.0	27,461	154,633	31,146
567.00	29,024	692.8	100.0	28,499	183,132	32,504
568.00	30,084	703.5	100.0	29,552	212,684	33,883
569.00	31,161	714.3	100.0	30,621	243,305	35,293

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=9.25 cfs @ 12.54 hrs HW=562.63' TW=559.01' (Dynamic Tailwater)
- **1=Culvert** (Passes 9.25 cfs of 56.41 cfs potential flow)
  - **2=Orifice/Grate** (Passes 7.04 cfs of 8.03 cfs potential flow)
    - **3=Orifice/Grate** (Orifice Controls 4.82 cfs @ 6.14 fps)
    - **5=Orifice/Grate** (Weir Controls 2.21 cfs @ 1.16 fps)
  - **4=Orifice/Grate** (Weir Controls 2.21 cfs @ 1.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 2.33" for 1-Year event
Inflow = 27.87 cfs @ 12.10 hrs, Volume= 3.874 af
Outflow = 2.16 cfs @ 18.10 hrs, Volume= 3.579 af, Atten= 92%, Lag= 360.1 min
Primary = 2.16 cfs @ 18.10 hrs, Volume= 3.579 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 559.99' @ 18.10 hrs Surf.Area= 51,727 sf Storage= 98,834 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 594.7 min calculated for 3.579 af (92% of inflow)
Center-of-Mass det. time= 542.5 min (1,442.6 - 900.0)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 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)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600

#4	Device 1	566.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600
#5	Secondary	567.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=2.16 cfs @ 18.10 hrs HW=559.99' TW=558.12' (Dynamic Tailwater)
- **1=Culvert** (Passes 2.16 cfs of 18.79 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 2.16 cfs @ 6.20 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' TW=0.00' (Dynamic Tailwater)
- **5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 1.77" for 1-Year event
Inflow = 1.94 cfs @ 12.14 hrs, Volume= 0.186 af
Outflow = 0.13 cfs @ 14.75 hrs, Volume= 0.181 af, Atten= 93%, Lag= 156.4 min
Primary = 0.13 cfs @ 14.75 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 538.86' @ 14.75 hrs Surf.Area= 6,074 sf Storage= 4,803 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 484.7 min calculated for 0.181 af (98% of inflow)
Center-of-Mass det. time= 470.0 min (1,294.3 - 824.3)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 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)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.13 cfs @ 14.75 hrs HW=538.86' TW=533.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.13 cfs of 2.87 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 4.21 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 1.07" for 1-Year event
Inflow = 3.00 cfs @ 12.24 hrs, Volume= 0.356 af
Outflow = 2.88 cfs @ 12.31 hrs, Volume= 0.356 af, Atten= 4%, Lag= 4.0 min
Primary = 2.88 cfs @ 12.31 hrs, Volume= 0.356 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 529.83' @ 12.31 hrs Surf.Area= 238 sf Storage= 245 cf

Plug-Flow detention time= 0.5 min calculated for 0.356 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (857.0 - 856.6)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 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)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.88 cfs @ 12.31 hrs HW=529.83' TW=526.80' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.88 cfs of 25.01 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.88 cfs @ 7.67 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 17P: Box Culvert for stream

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth > 0.89" for 1-Year event
Inflow = 24.02 cfs @ 12.71 hrs, Volume= 4.254 af
Outflow = 24.02 cfs @ 12.71 hrs, Volume= 4.254 af, Atten= 0%, Lag= 0.0 min
Primary = 24.02 cfs @ 12.71 hrs, Volume= 4.254 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.00' @ 12.71 hrs Surf.Area= 413 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (916.8 - 916.8)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 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)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 60.0" H Box Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 60.00 sf

Primary OutFlow Max=27.58 cfs @ 12.71 hrs HW=533.00' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 27.58 cfs @ 2.87 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 2.15" for 1-Year event
Inflow = 2.16 cfs @ 18.10 hrs, Volume= 3.579 af
Outflow = 2.16 cfs @ 18.11 hrs, Volume= 3.578 af, Atten= 0%, Lag= 0.6 min
Primary = 2.16 cfs @ 18.11 hrs, Volume= 3.578 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.12' @ 18.11 hrs Surf.Area= 2,625 sf Storage= 7,473 cf (123 cf above start)

Plug-Flow detention time= 91.1 min calculated for 3.410 af (95% of inflow)
Center-of-Mass det. time= 0.9 min (1,443.5 - 1,442.6)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.16 cfs @ 18.11 hrs HW=558.12' TW=558.05' (Dynamic Tailwater)
↑**1=Orifice/Grate** (Weir Controls 2.16 cfs @ 1.01 fps)

Summary for Pond 23P:

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 1.85" for 1-Year event
Inflow = 1.61 cfs @ 12.08 hrs, Volume= 0.124 af
Outflow = 1.56 cfs @ 12.10 hrs, Volume= 0.124 af, Atten= 4%, Lag= 1.4 min
Primary = 0.23 cfs @ 12.04 hrs, Volume= 0.093 af
Secondary = 1.36 cfs @ 12.10 hrs, Volume= 0.031 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.74' @ 12.10 hrs Surf.Area= 810 sf Storage= 546 cf

Plug-Flow detention time= 8.5 min calculated for 0.124 af (100% of inflow)
Center-of-Mass det. time= 8.5 min (823.3 - 814.7)

Volume	Invert	Avail.Storage	Storage Description
#1	527.33'	793 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.33	4	8.0	0.0	0	0	4
527.34	4	8.0	35.0	0	0	4
530.16	4	8.0	35.0	4	4	27
530.19	56	110.4	100.0	1	5	991
531.00	317	180.9	100.0	137	141	2,630
532.01	1,044	364.9	100.0	652	793	10,626

Device	Routing	Invert	Outlet Devices
#1	Primary	527.33'	**2.5" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 527.33' / 527.17' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.03 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 12.04 hrs HW=531.64' TW=527.66' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.23 cfs @ 6.79 fps)

Secondary OutFlow Max=1.35 cfs @ 12.10 hrs HW=531.74' TW=528.92' (Dynamic Tailwater)
└**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.35 cfs @ 1.23 fps)

Summary for Pond 24P: Flow Splitter

Inflow Area = 16.505 ac,100.00% Impervious, Inflow Depth = 2.47" for 1-Year event
Inflow = 41.05 cfs @ 12.10 hrs, Volume= 3.397 af
Outflow = 41.05 cfs @ 12.10 hrs, Volume= 3.397 af, Atten= 0%, Lag= 0.0 min
Primary = 20.93 cfs @ 12.10 hrs, Volume= 3.070 af
Secondary = 20.12 cfs @ 12.10 hrs, Volume= 0.327 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 567.10' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	562.96'	**24.0" Round Culvert** L= 44.7' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.00' S= 0.0215 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Secondary	562.96'	**48.0" Round Culvert** L= 106.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.43' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#3	Device 2	565.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=20.92 cfs @ 12.10 hrs HW=567.10' TW=565.19' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 20.92 cfs @ 6.66 fps)

Secondary OutFlow Max=20.10 cfs @ 12.10 hrs HW=567.10' TW=558.64' (Dynamic Tailwater)
└**2=Culvert** (Passes 20.10 cfs of 76.05 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 20.10 cfs @ 3.87 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 1.79" for 1-Year event
Inflow = 1.58 cfs @ 12.14 hrs, Volume= 0.137 af
Outflow = 1.58 cfs @ 12.15 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.4 min
Primary = 1.58 cfs @ 12.15 hrs, Volume= 0.137 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 555.44' @ 12.15 hrs Surf.Area= 151 sf Storage= 54 cf
Flood Elev= 557.00' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= 2.7 min calculated for 0.137 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (824.3 - 822.7)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 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)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	555.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 555.00' / 553.62' S= 0.0460 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=1.57 cfs @ 12.15 hrs HW=555.44' TW=553.91' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Inlet Controls 1.57 cfs @ 2.44 fps)

Summary for Pond 29P: Gravel Inlet Trench

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 1.77" for 1-Year event
Inflow = 1.94 cfs @ 12.14 hrs, Volume= 0.186 af
Outflow = 1.94 cfs @ 12.14 hrs, Volume= 0.186 af, Atten= 0%, Lag= 0.0 min
Primary = 1.94 cfs @ 12.14 hrs, Volume= 0.186 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 539.00' @ 12.14 hrs Surf.Area= 4 sf Storage= 1 cf

Plug-Flow detention time= 0.1 min calculated for 0.186 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (824.3 - 824.3)

Volume	Invert	Avail.Storage	Storage Description
#1	538.25'	14 cf	**2.00'W x 2.00'L x 9.75'H Prismatoid** 39 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	538.25'	**15.0" Round Culvert** L= 25.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.25' / 538.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=1.94 cfs @ 12.14 hrs HW=539.00' TW=538.43' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.94 cfs @ 3.63 fps)

Summary for Pond 30P: Culvert 2

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1-Year event
Inflow = 0.95 cfs @ 12.27 hrs, Volume= 0.100 af
Outflow = 0.95 cfs @ 12.27 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Primary = 0.95 cfs @ 12.27 hrs, Volume= 0.100 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.07' @ 12.27 hrs
Flood Elev= 534.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.66'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.66' / 533.54' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=0.95 cfs @ 12.27 hrs HW=534.07' TW=533.77' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Barrel Controls 0.95 cfs @ 2.33 fps)

Summary for Pond 31P: Culvert 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 1.88" for 1-Year event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.085 af
Outflow = 1.11 cfs @ 12.08 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Primary = 1.11 cfs @ 12.08 hrs, Volume= 0.085 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.44' @ 12.08 hrs
Flood Elev= 538.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.00' / 532.35' S= 0.0271 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=1.11 cfs @ 12.08 hrs HW=533.44' TW=532.66' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Inlet Controls 1.11 cfs @ 1.72 fps)

Summary for Link 21L: Point A

Inflow Area = 27.710 ac, 66.61% Impervious, Inflow Depth > 1.79" for 1-Year event
Inflow = 6.18 cfs @ 12.31 hrs, Volume= 4.140 af
Primary = 6.18 cfs @ 12.31 hrs, Volume= 4.140 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth > 0.89" for 1-Year event
Inflow = 24.02 cfs @ 12.71 hrs, Volume= 4.254 af
Primary = 24.02 cfs @ 12.71 hrs, Volume= 4.254 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 28L: Point F

Inflow Area = 5.040 ac, 0.00% Impervious, Inflow Depth = 0.87" for 1-Year event
Inflow = 2.27 cfs @ 12.66 hrs, Volume= 0.365 af
Primary = 2.27 cfs @ 12.66 hrs, Volume= 0.365 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1S: Main Site

Runoff = 75.45 cfs @ 12.10 hrs, Volume= 6.414 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
16.505	98	Paved parking, HSG D
16.505		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 1.36 cfs @ 12.07 hrs, Volume= 0.094 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 11S: Gravel WVTS

Runoff = 4.90 cfs @ 12.07 hrs, Volume= 0.346 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 12S: Subcat for Swale - 1

Runoff = 4.01 cfs @ 12.08 hrs, Volume= 0.297 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.665	98	Paved parking, HSG C
	0.918	91	Weighted Average
	0.253		27.56% Pervious Area
	0.665		72.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 8.98 cfs @ 12.07 hrs, Volume= 0.648 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 6.55 cfs @ 12.26 hrs, Volume= 0.676 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
3.168	77	Woods, Good, HSG D
0.028	98	Paved parking, HSG D
3.196	77	Weighted Average
3.168		99.12% Pervious Area
0.028		0.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Box Culvert

Runoff = 70.88 cfs @ 12.66 hrs, Volume= 11.238 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
52.205	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
53.103	77	Weighted Average
52.205		98.31% Pervious Area
0.898		1.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.5	3,073	0.0324	1.08		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swale - 3

Runoff = 2.77 cfs @ 12.03 hrs, Volume= 0.181 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
	0.400	98	Water Surface, HSG C
*	0.144	74	>75% Grass cover, Good, HSG C
	0.544	92	Weighted Average
	0.144		26.47% Pervious Area
	0.400		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 15.41 cfs @ 12.29 hrs, Volume= 1.645 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 137.55 cfs @ 12.44 hrs, Volume= 17.681 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
83.546	77	Woods, Good, HSG D
83.546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 1.41 cfs @ 12.51 hrs, Volume= 0.194 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.916	77	Woods, Good, HSG D
0.916		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 2.96 cfs @ 12.23 hrs, Volume= 0.292 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
1.380	77	Woods, Good, HSG D
1.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	734	0.0260	0.73		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swale - 2

Runoff = 1.67 cfs @ 12.03 hrs, Volume= 0.107 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
* 0.234	98	Paved parking, HSG D
0.107	74	>75% Grass cover, Good, HSG C
0.341	90	Weighted Average
0.107		31.38% Pervious Area
0.234		68.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.08		**Lag/CN Method,**

Summary for Subcatchment 27S: DA for Point F

Runoff = 7.01 cfs @ 12.61 hrs, Volume= 1.067 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
5.040	77	Woods, Good, HSG D
5.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 29S: Rerouted Area B

Runoff = 1.98 cfs @ 12.20 hrs, Volume= 0.183 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.867	77	Woods, Good, HSG D
0.867		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	599	0.0260	0.70		**Lag/CN Method,**

Summary for Subcatchment 34S: Subcat for Swale - 4

Runoff = 1.31 cfs @ 12.03 hrs, Volume= 0.084 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
*	0.072	74	>75% Grass cover, Good, HSG C
*	0.189	98	Paved parking, HSG C
	0.261	91	Weighted Average
	0.072		27.59% Pervious Area
	0.189		72.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	292	0.1265	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 4.16" for 10-Year event
Inflow = 3.08 cfs @ 18.09 hrs, Volume= 6.915 af
Outflow = 3.08 cfs @ 18.10 hrs, Volume= 6.913 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.72 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 1.4 min

Peak Storage= 206 cf @ 18.10 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swale - 1

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.01 cfs @ 12.08 hrs, Volume= 0.297 af
Outflow = 3.47 cfs @ 12.13 hrs, Volume= 0.297 af, Atten= 13%, Lag= 2.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.05 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 17.3 min

Peak Storage= 1,028 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 87.10 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 904.0' Slope= 0.0190 '/'
Inlet Invert= 572.17', Outlet Invert= 555.00'

Summary for Reach 18R: Dry Swale - 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 2.77 cfs @ 12.03 hrs, Volume= 0.181 af
Outflow = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af, Atten= 13%, Lag= 2.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.34 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 16.1 min

Peak Storage= 565 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 54.76 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 550.0' Slope= 0.0273 '/'
Inlet Invert= 548.05', Outlet Invert= 533.01'

‡

Summary for Reach 20R: Dry Swale - 4

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 3.96" for 10-Year event
Inflow = 3.59 cfs @ 12.05 hrs, Volume= 0.265 af
Outflow = 3.52 cfs @ 12.07 hrs, Volume= 0.265 af, Atten= 2%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 4.7 min

Peak Storage= 277 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 66.01 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 198.0' Slope= 0.0109 '/'
Inlet Invert= 532.35', Outlet Invert= 530.19'

Summary for Reach 21R: Point C

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 2.82" for 10-Year event
Inflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af
Outflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.00 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 1.5 min

Peak Storage= 214 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch 1

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 2.96 cfs @ 12.23 hrs, Volume= 0.292 af
Outflow = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 2.9 min

Peak Storage= 172 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.18 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 171.0' Slope= 0.0137 '/'
Inlet Invert= 536.00', Outlet Invert= 533.66'

Summary for Reach 25R: Ditch

Inflow Area = 0.916 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 1.41 cfs @ 12.51 hrs, Volume= 0.194 af
Outflow = 1.40 cfs @ 12.54 hrs, Volume= 0.194 af, Atten= 1%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.80 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 6.5 min

Peak Storage= 205 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swale - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 3.85" for 10-Year event
Inflow = 4.33 cfs @ 12.11 hrs, Volume= 0.404 af
Outflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af, Atten= 1%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 4.7 min

Peak Storage= 353 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 90.04 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 273.0' Slope= 0.0203 '/'
Inlet Invert= 553.62', Outlet Invert= 548.08'

Summary for Reach 30R: Rerouted Ditch below Culvert

Inflow Area = 2.247 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 4.88 cfs @ 12.22 hrs, Volume= 0.476 af
Outflow = 4.87 cfs @ 12.24 hrs, Volume= 0.476 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 2.7 min

Peak Storage= 259 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.17 cfs

2.00' x 1.00' deep channel, n= 0.013
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 212.0' Slope= 0.0058 '/'
Inlet Invert= 533.54', Outlet Invert= 532.32'

Summary for Pond 2P: Forebay

Inflow Area = 16.859 ac, 98.41% Impervious, Inflow Depth = 3.79" for 10-Year event
Inflow = 27.95 cfs @ 12.10 hrs, Volume= 5.323 af
Outflow = 27.83 cfs @ 12.11 hrs, Volume= 5.320 af, Atten= 0%, Lag= 0.7 min
Primary = 5.36 cfs @ 11.70 hrs, Volume= 4.011 af
Secondary = 23.18 cfs @ 12.11 hrs, Volume= 1.309 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 565.24' @ 12.11 hrs Surf.Area= 5,806 sf Storage= 24,063 cf (20,274 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 63.1 min calculated for 5.232 af (98% of inflow)
Center-of-Mass det. time= 41.9 min (797.7 - 755.8)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	565.00'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.35 cfs @ 11.70 hrs HW=565.11' TW=561.90' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.35 cfs @ 6.81 fps)

Secondary OutFlow Max=23.18 cfs @ 12.11 hrs HW=565.24' TW=562.84' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Weir Controls 23.18 cfs @ 1.62 fps)

Summary for Pond 3P: Gravel WVTS

Inflow Area = 17.988 ac, 95.60% Impervious, Inflow Depth = 3.78" for 10-Year event
Inflow = 32.38 cfs @ 12.10 hrs, Volume= 5.665 af
Outflow = 23.97 cfs @ 12.24 hrs, Volume= 5.648 af, Atten= 26%, Lag= 8.8 min
Primary = 23.97 cfs @ 12.24 hrs, Volume= 5.648 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 22,959 sf Storage= 27,438 cf
Peak Elev= 562.95' @ 12.24 hrs Surf.Area= 24,875 sf Storage= 74,094 cf (46,656 cf above start)
Flood Elev= 568.00' Surf.Area= 30,084 sf Storage= 212,684 cf (185,246 cf above start)

Plug-Flow detention time= 229.6 min calculated for 5.018 af (89% of inflow)
Center-of-Mass det. time= 114.9 min (912.4 - 797.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	243,305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	22,771	626.2	0.0	0	0	22,771
559.00	22,834	626.9	40.0	9,121	9,121	23,401
560.00	22,897	627.7	40.0	9,146	18,267	24,034
561.00	22,959	628.5	40.0	9,171	27,438	24,667
562.00	23,935	639.2	100.0	23,445	50,884	25,919
563.00	24,924	649.9	100.0	24,428	75,312	27,192
564.00	25,928	660.6	100.0	25,424	100,736	28,486
565.00	26,947	671.3	100.0	26,436	127,172	29,801
566.00	27,978	682.1	100.0	27,461	154,633	31,146
567.00	29,024	692.8	100.0	28,499	183,132	32,504
568.00	30,084	703.5	100.0	29,552	212,684	33,883
569.00	31,161	714.3	100.0	30,621	243,305	35,293

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=23.97 cfs @ 12.24 hrs HW=562.95' TW=560.17' (Dynamic Tailwater)
- **1=Culvert** (Passes 23.97 cfs of 56.81 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 9.11 cfs @ 5.80 fps)
    - **3=Orifice/Grate** (Passes < 5.28 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 14.86 cfs potential flow)
  - **4=Orifice/Grate** (Weir Controls 14.86 cfs @ 2.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 4.50" for 10-Year event
Inflow = 74.97 cfs @ 12.11 hrs, Volume= 7.481 af
Outflow = 3.08 cfs @ 18.08 hrs, Volume= 6.916 af, Atten= 96%, Lag= 358.3 min
Primary = 3.08 cfs @ 18.08 hrs, Volume= 6.916 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 561.70' @ 18.08 hrs Surf.Area= 55,296 sf Storage= 190,514 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 760.3 min calculated for 6.915 af (92% of inflow)
Center-of-Mass det. time= 705.3 min (1,577.1 - 871.8)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 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)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600

#4	Device 1	566.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600
#5	Secondary	567.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=3.08 cfs @ 18.08 hrs HW=561.70' TW=558.15' (Dynamic Tailwater)
- **1=Culvert** (Passes 3.08 cfs of 62.80 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 3.08 cfs @ 8.84 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' TW=0.00' (Dynamic Tailwater)
- **5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 3.85" for 10-Year event
Inflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af
Outflow = 0.78 cfs @ 12.72 hrs, Volume= 0.399 af, Atten= 82%, Lag= 35.9 min
Primary = 0.78 cfs @ 12.72 hrs, Volume= 0.399 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 539.56' @ 12.72 hrs Surf.Area= 6,928 sf Storage= 9,328 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 390.7 min calculated for 0.399 af (99% of inflow)
Center-of-Mass det. time= 381.7 min (1,181.1 - 799.4)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 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)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.78 cfs @ 12.72 hrs HW=539.56' TW=533.74' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.78 cfs of 5.72 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.18 cfs @ 5.82 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.30 cfs @ 3.38 fps)
  └**4=Orifice/Grate** (Weir Controls 0.31 cfs @ 0.81 fps)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 2.82" for 10-Year event
Inflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af
Outflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af, Atten= 0%, Lag= 0.0 min
Primary = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 530.16' @ 12.24 hrs Surf.Area= 306 sf Storage= 333 cf

Plug-Flow detention time= 0.6 min calculated for 0.942 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (830.9 - 830.5)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 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)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.29 cfs @ 12.24 hrs HW=530.16' TW=526.94' (Dynamic Tailwater)
└**1=Culvert** (Passes 8.29 cfs of 27.35 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 3.06 cfs @ 8.16 fps)
  └**3=Orifice/Grate** (Weir Controls 5.23 cfs @ 1.33 fps)

Summary for Pond 17P: Box Culvert for stream

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 2.57" for 10-Year event
Inflow = 74.83 cfs @ 12.62 hrs, Volume= 12.306 af
Outflow = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af, Atten= 0%, Lag= 1.8 min
Primary = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.76' @ 12.65 hrs Surf.Area= 3,542 sf Storage= 1,301 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (878.2 - 878.1)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 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)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 60.0" H Box Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 60.00 sf

Primary OutFlow Max=74.75 cfs @ 12.65 hrs HW=533.76' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 74.75 cfs @ 4.00 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 4.16" for 10-Year event
Inflow = 3.08 cfs @ 18.08 hrs, Volume= 6.916 af
Outflow = 3.08 cfs @ 18.09 hrs, Volume= 6.915 af, Atten= 0%, Lag= 0.6 min
Primary = 3.08 cfs @ 18.09 hrs, Volume= 6.915 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.15' @ 18.09 hrs Surf.Area= 2,625 sf Storage= 7,505 cf (155 cf above start)

Plug-Flow detention time= 55.4 min calculated for 6.746 af (98% of inflow)
Center-of-Mass det. time= 0.7 min (1,577.8 - 1,577.1)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.08 cfs @ 18.09 hrs HW=558.15' TW=558.06' (Dynamic Tailwater)
↑**1=Orifice/Grate** (Weir Controls 3.08 cfs @ 1.14 fps)

Summary for Pond 23P:

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 3.96" for 10-Year event
Inflow = 3.52 cfs @ 12.07 hrs, Volume= 0.265 af
Outflow = 3.47 cfs @ 12.08 hrs, Volume= 0.265 af, Atten= 1%, Lag= 0.8 min
Primary = 0.23 cfs @ 13.96 hrs, Volume= 0.156 af
Secondary = 3.32 cfs @ 12.08 hrs, Volume= 0.109 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.86' @ 12.08 hrs Surf.Area= 908 sf Storage= 645 cf

Plug-Flow detention time= 8.4 min calculated for 0.265 af (100% of inflow)
Center-of-Mass det. time= 8.3 min (799.5 - 791.2)

Volume	Invert	Avail.Storage	Storage Description
#1	527.33'	793 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.33	4	8.0	0.0	0	0	4
527.34	4	8.0	35.0	0	0	4
530.16	4	8.0	35.0	4	4	27
530.19	56	110.4	100.0	1	5	991
531.00	317	180.9	100.0	137	141	2,630
532.01	1,044	364.9	100.0	652	793	10,626

Device	Routing	Invert	Outlet Devices
#1	Primary	527.33'	**2.5" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 527.33' / 527.17' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.03 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 13.96 hrs HW=531.58' TW=527.56' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.23 cfs @ 6.82 fps)

Secondary OutFlow Max=3.31 cfs @ 12.08 hrs HW=531.86' TW=530.14' (Dynamic Tailwater)
└**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 3.31 cfs @ 1.65 fps)

Summary for Pond 24P: Flow Splitter

Inflow Area = 16.505 ac,100.00% Impervious, Inflow Depth = 4.66" for 10-Year event
Inflow = 75.45 cfs @ 12.10 hrs, Volume= 6.414 af
Outflow = 75.45 cfs @ 12.10 hrs, Volume= 6.414 af, Atten= 0%, Lag= 0.0 min
Primary = 26.66 cfs @ 12.10 hrs, Volume= 5.229 af
Secondary = 48.79 cfs @ 12.10 hrs, Volume= 1.185 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 568.34' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	562.96'	**24.0" Round Culvert** L= 44.7' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.00' S= 0.0215 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Secondary	562.96'	**48.0" Round Culvert** L= 106.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.43' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#3	Device 2	565.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=26.65 cfs @ 12.10 hrs HW=568.34' TW=565.24' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 26.65 cfs @ 8.48 fps)

Secondary OutFlow Max=48.75 cfs @ 12.10 hrs HW=568.34' TW=559.57' (Dynamic Tailwater)
└**2=Culvert** (Passes 48.75 cfs of 97.98 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 48.75 cfs @ 5.31 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 3.47 cfs @ 12.13 hrs, Volume= 0.297 af
Outflow = 3.46 cfs @ 12.14 hrs, Volume= 0.297 af, Atten= 0%, Lag= 0.4 min
Primary = 3.46 cfs @ 12.14 hrs, Volume= 0.297 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 555.69' @ 12.14 hrs Surf.Area= 224 sf Storage= 99 cf
Flood Elev= 557.00' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= 1.7 min calculated for 0.297 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (799.5 - 798.3)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 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)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	555.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 555.00' / 553.62' S= 0.0460 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=3.46 cfs @ 12.14 hrs HW=555.69' TW=554.07' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Inlet Controls 3.46 cfs @ 3.11 fps)

Summary for Pond 29P: Gravel Inlet Trench

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 3.85" for 10-Year event
Inflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af
Outflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.0 min
Primary = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 539.59' @ 12.18 hrs Surf.Area= 4 sf Storage= 2 cf

Plug-Flow detention time= 0.1 min calculated for 0.404 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (799.4 - 799.3)

Volume	Invert	Avail.Storage	Storage Description
#1	538.25'	14 cf	**2.00'W x 2.00'L x 9.75'H Prismatoid** 39 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	538.25'	**15.0" Round Culvert** L= 25.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.25' / 538.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=4.20 cfs @ 12.12 hrs HW=539.53' TW=539.01' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 4.20 cfs @ 4.15 fps)

Summary for Pond 30P: Culvert 2

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af
Outflow = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.0 min
Primary = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.46' @ 12.24 hrs
Flood Elev= 534.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.66'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.66' / 533.54' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=2.95 cfs @ 12.24 hrs HW=534.46' TW=533.97' (Dynamic Tailwater)
↑**1=RCP_Elliptical 23x14** (Barrel Controls 2.95 cfs @ 3.11 fps)

Summary for Pond 31P: Culvert 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af
Outflow = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Primary = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.68' @ 12.07 hrs
Flood Elev= 538.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.00' / 532.35' S= 0.0271 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=2.40 cfs @ 12.07 hrs HW=533.68' TW=532.82' (Dynamic Tailwater)
↑**1=RCP_Elliptical 23x14** (Inlet Controls 2.40 cfs @ 2.18 fps)

Summary for Link 21L: Point A

Inflow Area = 27.710 ac, 66.61% Impervious, Inflow Depth > 3.71" for 10-Year event
Inflow = 17.72 cfs @ 12.29 hrs, Volume= 8.558 af
Primary = 17.72 cfs @ 12.29 hrs, Volume= 8.558 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 2.57" for 10-Year event
Inflow = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af
Primary = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 28L: Point F

Inflow Area = 5.040 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 7.01 cfs @ 12.61 hrs, Volume= 1.067 af
Primary = 7.01 cfs @ 12.61 hrs, Volume= 1.067 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1S: Main Site

Runoff = 134.52 cfs @ 12.10 hrs, Volume= 11.636 af, Depth= 8.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
16.505	98	Paved parking, HSG D
16.505		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 2.81 cfs @ 12.07 hrs, Volume= 0.200 af, Depth= 6.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 11S: Gravel WVTS

Runoff = 9.47 cfs @ 12.07 hrs, Volume= 0.694 af, Depth= 7.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 12S: Subcat for Swale - 1

Runoff = 7.56 cfs @ 12.08 hrs, Volume= 0.583 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.253	74	>75% Grass cover, Good, HSG C
* 0.665	98	Paved parking, HSG C
0.918	91	Weighted Average
0.253		27.56% Pervious Area
0.665		72.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 16.77 cfs @ 12.07 hrs, Volume= 1.257 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 15.19 cfs @ 12.25 hrs, Volume= 1.577 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
3.168	77	Woods, Good, HSG D
0.028	98	Paved parking, HSG D
3.196	77	Weighted Average
3.168		99.12% Pervious Area
0.028		0.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Box Culvert

Runoff = 164.85 cfs @ 12.62 hrs, Volume= 26.198 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
52.205	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
53.103	77	Weighted Average
52.205		98.31% Pervious Area
0.898		1.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.5	3,073	0.0324	1.08		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swale - 3

Runoff = 5.16 cfs @ 12.03 hrs, Volume= 0.351 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
	0.400	98	Water Surface, HSG C
*	0.144	74	>75% Grass cover, Good, HSG C
	0.544	92	Weighted Average
	0.144		26.47% Pervious Area
	0.400		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 35.64 cfs @ 12.28 hrs, Volume= 3.835 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 319.56 cfs @ 12.42 hrs, Volume= 41.217 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
83.546	77	Woods, Good, HSG D
83.546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 3.27 cfs @ 12.51 hrs, Volume= 0.452 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.916	77	Woods, Good, HSG D
0.916		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 6.87 cfs @ 12.23 hrs, Volume= 0.681 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
1.380	77	Woods, Good, HSG D
1.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	734	0.0260	0.73		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swale - 2

Runoff = 3.18 cfs @ 12.03 hrs, Volume= 0.213 af, Depth= 7.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
* 0.234	98	Paved parking, HSG D
0.107	74	>75% Grass cover, Good, HSG C
0.341	90	Weighted Average
0.107		31.38% Pervious Area
0.234		68.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.08		**Lag/CN Method,**

Summary for Subcatchment 27S: DA for Point F

Runoff = 16.28 cfs @ 12.57 hrs, Volume= 2.486 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
5.040	77	Woods, Good, HSG D
5.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 29S: Rerouted Area B

Runoff = 4.60 cfs @ 12.19 hrs, Volume= 0.428 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.867	77	Woods, Good, HSG D
0.867		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	599	0.0260	0.70		**Lag/CN Method,**

Summary for Subcatchment 34S: Subcat for Swale - 4

Runoff = 2.47 cfs @ 12.03 hrs, Volume= 0.166 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
*	0.072	74	>75% Grass cover, Good, HSG C
*	0.189	98	Paved parking, HSG C
	0.261	91	Weighted Average
	0.072		27.59% Pervious Area
	0.189		72.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	292	0.1265	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 7.33" for 100-Year event
Inflow = 7.62 cfs @ 14.64 hrs, Volume= 12.178 af
Outflow = 7.62 cfs @ 14.65 hrs, Volume= 12.174 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.02 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 1.2 min

Peak Storage= 360 cf @ 14.65 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swale - 1

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 7.56 cfs @ 12.08 hrs, Volume= 0.583 af
Outflow = 6.75 cfs @ 12.12 hrs, Volume= 0.583 af, Atten= 11%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.69 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 14.2 min

Peak Storage= 1,651 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 87.10 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 904.0' Slope= 0.0190 '/'
Inlet Invert= 572.17', Outlet Invert= 555.00'

Summary for Reach 18R: Dry Swale - 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 5.16 cfs @ 12.03 hrs, Volume= 0.351 af
Outflow = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af, Atten= 10%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.99 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 13.2 min

Peak Storage= 857 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 54.76 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 550.0' Slope= 0.0273 '/'
Inlet Invert= 548.05', Outlet Invert= 533.01'

‡

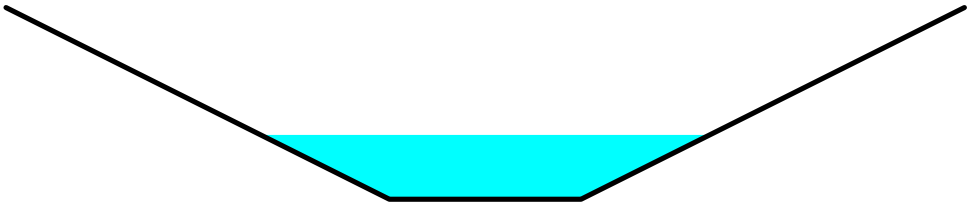
Summary for Reach 20R: Dry Swale - 4

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 7.70" for 100-Year event
Inflow = 6.94 cfs @ 12.05 hrs, Volume= 0.516 af
Outflow = 6.82 cfs @ 12.06 hrs, Volume= 0.516 af, Atten= 2%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.03 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 3.9 min

Peak Storage= 445 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 66.01 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 198.0' Slope= 0.0109 '/'
Inlet Invert= 532.35', Outlet Invert= 530.19'



Summary for Reach 21R: Point C

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 6.28" for 100-Year event
Inflow = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af
Outflow = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.00 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 1.2 min

Peak Storage= 354 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch 1

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 6.87 cfs @ 12.23 hrs, Volume= 0.681 af
Outflow = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.76 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 2.3 min

Peak Storage= 312 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.18 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 171.0' Slope= 0.0137 '/'
Inlet Invert= 536.00', Outlet Invert= 533.66'

Summary for Reach 25R: Ditch

Inflow Area = 0.916 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 3.27 cfs @ 12.51 hrs, Volume= 0.452 af
Outflow = 3.26 cfs @ 12.52 hrs, Volume= 0.452 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.31 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 5.3 min

Peak Storage= 369 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swale - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 7.58" for 100-Year event
Inflow = 8.43 cfs @ 12.10 hrs, Volume= 0.795 af
Outflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.02 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 3.8 min

Peak Storage= 569 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 90.04 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 273.0' Slope= 0.0203 '/'
Inlet Invert= 553.62', Outlet Invert= 548.08'

Summary for Reach 30R: Rerouted Ditch below Culvert

Inflow Area = 2.247 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 11.33 cfs @ 12.22 hrs, Volume= 1.109 af
Outflow = 11.31 cfs @ 12.23 hrs, Volume= 1.109 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.07 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 2.1 min

Peak Storage= 473 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.17 cfs

2.00' x 1.00' deep channel, n= 0.013
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 212.0' Slope= 0.0058 '/'
Inlet Invert= 533.54', Outlet Invert= 532.32'

Summary for Pond 2P: Forebay

Inflow Area = 16.859 ac, 98.41% Impervious, Inflow Depth = 6.30" for 100-Year event
Inflow = 36.64 cfs @ 12.10 hrs, Volume= 8.855 af
Outflow = 36.51 cfs @ 12.11 hrs, Volume= 8.850 af, Atten= 0%, Lag= 0.6 min
Primary = 5.22 cfs @ 10.36 hrs, Volume= 5.271 af
Secondary = 32.14 cfs @ 12.11 hrs, Volume= 3.579 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 565.30' @ 12.11 hrs Surf.Area= 5,835 sf Storage= 24,399 cf (20,611 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 62.9 min calculated for 8.761 af (99% of inflow)
Center-of-Mass det. time= 49.3 min (796.8 - 747.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	565.00'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.21 cfs @ 10.36 hrs HW=565.05' TW=562.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.21 cfs @ 6.64 fps)

Secondary OutFlow Max=32.11 cfs @ 12.11 hrs HW=565.30' TW=563.16' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Weir Controls 32.11 cfs @ 1.80 fps)

Summary for Pond 3P: Gravel WVTS

Inflow Area = 17.988 ac, 95.60% Impervious, Inflow Depth = 6.37" for 100-Year event
Inflow = 45.42 cfs @ 12.09 hrs, Volume= 9.544 af
Outflow = 37.08 cfs @ 12.14 hrs, Volume= 9.514 af, Atten= 18%, Lag= 2.8 min
Primary = 37.08 cfs @ 12.14 hrs, Volume= 9.514 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 22,959 sf Storage= 27,438 cf
Peak Elev= 563.97' @ 14.47 hrs Surf.Area= 25,900 sf Storage= 100,017 cf (72,579 cf above start)
Flood Elev= 568.00' Surf.Area= 30,084 sf Storage= 212,684 cf (185,246 cf above start)

Plug-Flow detention time= 262.7 min calculated for 8.882 af (93% of inflow)
Center-of-Mass det. time= 169.2 min (964.4 - 795.2)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	243,305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	22,771	626.2	0.0	0	0	22,771
559.00	22,834	626.9	40.0	9,121	9,121	23,401
560.00	22,897	627.7	40.0	9,146	18,267	24,034
561.00	22,959	628.5	40.0	9,171	27,438	24,667
562.00	23,935	639.2	100.0	23,445	50,884	25,919
563.00	24,924	649.9	100.0	24,428	75,312	27,192
564.00	25,928	660.6	100.0	25,424	100,736	28,486
565.00	26,947	671.3	100.0	26,436	127,172	29,801
566.00	27,978	682.1	100.0	27,461	154,633	31,146
567.00	29,024	692.8	100.0	28,499	183,132	32,504
568.00	30,084	703.5	100.0	29,552	212,684	33,883
569.00	31,161	714.3	100.0	30,621	243,305	35,293

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=36.74 cfs @ 12.14 hrs HW=563.20' TW=562.03' (Dynamic Tailwater)
- **1=Culvert** (Passes 36.74 cfs of 36.76 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 8.17 cfs @ 5.20 fps)
    - **3=Orifice/Grate** (Passes < 4.08 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 28.57 cfs potential flow)
  - **4=Orifice/Grate** (Weir Controls 28.57 cfs @ 2.73 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 8.28" for 100-Year event
Inflow = 151.64 cfs @ 12.10 hrs, Volume= 13.750 af
Outflow = 7.62 cfs @ 14.63 hrs, Volume= 12.180 af, Atten= 95%, Lag= 151.8 min
Primary = 7.62 cfs @ 14.63 hrs, Volume= 12.180 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 563.93' @ 14.63 hrs Surf.Area= 60,062 sf Storage= 318,983 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 709.3 min calculated for 12.180 af (89% of inflow)
Center-of-Mass det. time= 600.7 min (1,495.5 - 894.8)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 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)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600

#4	Device 1	566.00'	**60.0" W x 60.0" H Vert. Orifice/Grate** C= 0.600
#5	Secondary	567.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=7.62 cfs @ 14.63 hrs HW=563.93' TW=558.27' (Dynamic Tailwater)
- **1=Culvert** (Passes 7.62 cfs of 94.70 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 3.98 cfs @ 11.39 fps)
  - **3=Orifice/Grate** (Orifice Controls 3.65 cfs @ 4.64 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' TW=0.00' (Dynamic Tailwater)
- **5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 7.58" for 100-Year event
Inflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af
Outflow = 6.50 cfs @ 12.23 hrs, Volume= 0.789 af, Atten= 22%, Lag= 6.7 min
Primary = 6.50 cfs @ 12.23 hrs, Volume= 0.789 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 539.94' @ 12.23 hrs Surf.Area= 7,405 sf Storage= 12,015 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 249.7 min calculated for 0.789 af (99% of inflow)
Center-of-Mass det. time= 244.2 min (1,023.9 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 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)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.50 cfs @ 12.23 hrs HW=539.94' TW=534.02' (Dynamic Tailwater)
└**1=Culvert** (Passes 6.50 cfs of 6.65 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 6.52 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.39 cfs @ 4.49 fps)
  └**4=Orifice/Grate** (Weir Controls 5.91 cfs @ 2.16 fps)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 6.28" for 100-Year event
Inflow = 18.30 cfs @ 12.24 hrs, Volume= 2.093 af
Outflow = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af, Atten= 0%, Lag= 0.0 min
Primary = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 530.33' @ 12.24 hrs Surf.Area= 351 sf Storage= 389 cf

Plug-Flow detention time= 0.4 min calculated for 2.093 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (809.7 - 809.2)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 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)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=18.29 cfs @ 12.24 hrs HW=530.33' TW=527.11' (Dynamic Tailwater)
└**1=Culvert** (Passes 18.29 cfs of 28.48 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 3.15 cfs @ 8.39 fps)
  └**3=Orifice/Grate** (Weir Controls 15.14 cfs @ 1.89 fps)

Summary for Pond 17P: Box Culvert for stream

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 5.96" for 100-Year event
Inflow = 175.13 cfs @ 12.61 hrs, Volume= 28.547 af
Outflow = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af, Atten= 1%, Lag= 1.8 min
Primary = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.93' @ 12.64 hrs Surf.Area= 11,204 sf Storage= 9,851 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (849.1 - 848.7)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 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)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 60.0" H Box Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 60.00 sf

Primary OutFlow Max=174.11 cfs @ 12.64 hrs HW=534.93' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 174.11 cfs @ 5.31 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 7.33" for 100-Year event
Inflow = 7.62 cfs @ 14.63 hrs, Volume= 12.180 af
Outflow = 7.62 cfs @ 14.64 hrs, Volume= 12.178 af, Atten= 0%, Lag= 0.4 min
Primary = 7.62 cfs @ 14.64 hrs, Volume= 12.178 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.27' @ 14.64 hrs Surf.Area= 2,625 sf Storage= 7,632 cf (282 cf above start)

Plug-Flow detention time= 34.0 min calculated for 12.009 af (99% of inflow)
Center-of-Mass det. time= 0.5 min (1,496.0 - 1,495.5)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.62 cfs @ 14.64 hrs HW=558.27' TW=558.10' (Dynamic Tailwater)
↑**1=Orifice/Grate** (Weir Controls 7.62 cfs @ 1.55 fps)

Summary for Pond 23P:

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 7.70" for 100-Year event
Inflow = 6.82 cfs @ 12.06 hrs, Volume= 0.516 af
Outflow = 6.73 cfs @ 12.08 hrs, Volume= 0.516 af, Atten= 1%, Lag= 0.8 min
Primary = 0.23 cfs @ 15.93 hrs, Volume= 0.231 af
Secondary = 6.58 cfs @ 12.08 hrs, Volume= 0.286 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 532.01' @ 12.08 hrs Surf.Area= 1,041 sf Storage= 790 cf

Plug-Flow detention time= 8.6 min calculated for 0.516 af (100% of inflow)
Center-of-Mass det. time= 8.6 min (781.2 - 772.6)

Volume	Invert	Avail.Storage	Storage Description
#1	527.33'	793 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.33	4	8.0	0.0	0	0	4
527.34	4	8.0	35.0	0	0	4
530.16	4	8.0	35.0	4	4	27
530.19	56	110.4	100.0	1	5	991
531.00	317	180.9	100.0	137	141	2,630
532.01	1,044	364.9	100.0	652	793	10,626

Device	Routing	Invert	Outlet Devices
#1	Primary	527.33'	**2.5" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 527.33' / 527.17' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.03 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 15.93 hrs HW=531.57' TW=527.61' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.23 cfs @ 6.77 fps)

Secondary OutFlow Max=6.57 cfs @ 12.08 hrs HW=532.01' TW=530.29' (Dynamic Tailwater)
└**2=Sharp-Crested Vee/Trap Weir** (Orifice Controls 6.57 cfs @ 2.10 fps)

Summary for Pond 24P: Flow Splitter

Inflow Area = 16.505 ac,100.00% Impervious, Inflow Depth = 8.46" for 100-Year event
Inflow = 134.52 cfs @ 12.10 hrs, Volume= 11.636 af
Outflow = 134.52 cfs @ 12.10 hrs, Volume= 11.636 af, Atten= 0%, Lag= 0.0 min
Primary = 33.99 cfs @ 12.10 hrs, Volume= 8.655 af
Secondary = 100.53 cfs @ 12.10 hrs, Volume= 2.980 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 570.34' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	562.96'	**24.0" Round Culvert** L= 44.7' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.00' S= 0.0215 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Secondary	562.96'	**48.0" Round Culvert** L= 106.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.43' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#3	Device 2	565.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=33.98 cfs @ 12.10 hrs HW=570.34' TW=565.30' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 33.98 cfs @ 10.82 fps)

Secondary OutFlow Max=100.46 cfs @ 12.10 hrs HW=570.34' TW=561.68' (Dynamic Tailwater)
└**2=Culvert** (Passes 100.46 cfs of 140.16 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 100.46 cfs @ 7.05 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 6.75 cfs @ 12.12 hrs, Volume= 0.583 af
Outflow = 6.71 cfs @ 12.13 hrs, Volume= 0.582 af, Atten= 0%, Lag= 0.6 min
Primary = 6.71 cfs @ 12.13 hrs, Volume= 0.582 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 556.03' @ 12.13 hrs Surf.Area= 350 sf Storage= 196 cf
Flood Elev= 557.00' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= 1.2 min calculated for 0.582 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (780.0 - 779.1)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 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)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	555.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 555.00' / 553.62' S= 0.0460 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=6.71 cfs @ 12.13 hrs HW=556.03' TW=554.25' (Dynamic Tailwater)
↑—**1=RCP_Elliptical 23x14** (Inlet Controls 6.71 cfs @ 3.96 fps)

Summary for Pond 29P: Gravel Inlet Trench

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 7.58" for 100-Year event
Inflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af
Outflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af, Atten= 0%, Lag= 0.0 min
Primary = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 541.84' @ 12.13 hrs Surf.Area= 4 sf Storage= 5 cf

Plug-Flow detention time= 0.2 min calculated for 0.795 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (779.7 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1	538.25'	14 cf	**2.00'W x 2.00'L x 9.75'H Prismatoid** 39 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	538.25'	**15.0" Round Culvert** L= 25.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.25' / 538.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=8.33 cfs @ 12.12 hrs HW=541.83' TW=539.84' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 8.33 cfs @ 6.79 fps)

Summary for Pond 30P: Culvert 2

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af
Outflow = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af, Atten= 0%, Lag= 0.0 min
Primary = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 535.14' @ 12.24 hrs
Flood Elev= 534.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.66'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.66' / 533.54' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=6.85 cfs @ 12.24 hrs HW=535.14' TW=534.21' (Dynamic Tailwater)
↑**1=RCP_Elliptical 23x14** (Inlet Controls 6.85 cfs @ 3.75 fps)

Summary for Pond 31P: Culvert 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af
Outflow = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af, Atten= 0%, Lag= 0.0 min
Primary = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.01' @ 12.06 hrs
Flood Elev= 538.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.00' / 532.35' S= 0.0271 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=4.65 cfs @ 12.06 hrs HW=534.01' TW=533.02' (Dynamic Tailwater)
↑**1=RCP_Elliptical 23x14** (Inlet Controls 4.65 cfs @ 2.77 fps)

Summary for Link 21L: Point A

Inflow Area = 27.710 ac, 66.61% Impervious, Inflow Depth > 6.93" for 100-Year event
Inflow = 39.67 cfs @ 12.29 hrs, Volume= 16.009 af
Primary = 39.67 cfs @ 12.29 hrs, Volume= 16.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

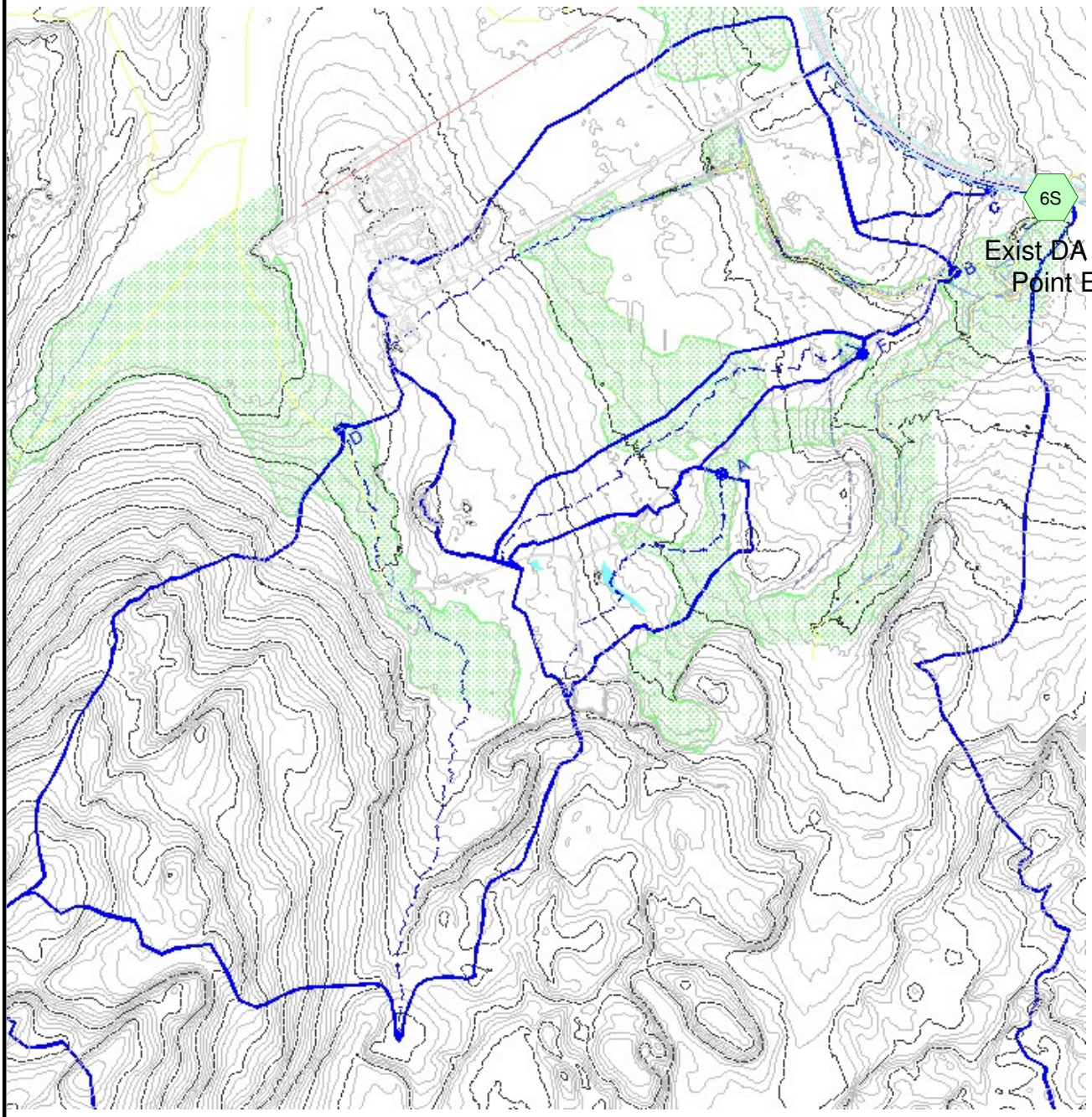
Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 5.96" for 100-Year event
Inflow = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af
Primary = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 28L: Point F

Inflow Area = 5.040 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 16.28 cfs @ 12.57 hrs, Volume= 2.486 af
Primary = 16.28 cfs @ 12.57 hrs, Volume= 2.486 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



Subcat Reach Pond Link

Routing Diagram for Pt E Exist_Dn_Stream
Prepared by HDR Inc, Printed 9/14/2017

Summary for Subcatchment 6S: Exist DA at Point E

Runoff = 137.39 cfs @ 17.72 hrs, Volume= 99.250 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
467.119	77	Woods, Good, HSG D
1.860	98	Paved parking, HSG D
468.979	77	Weighted Average
467.119		99.60% Pervious Area
1.860		0.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			

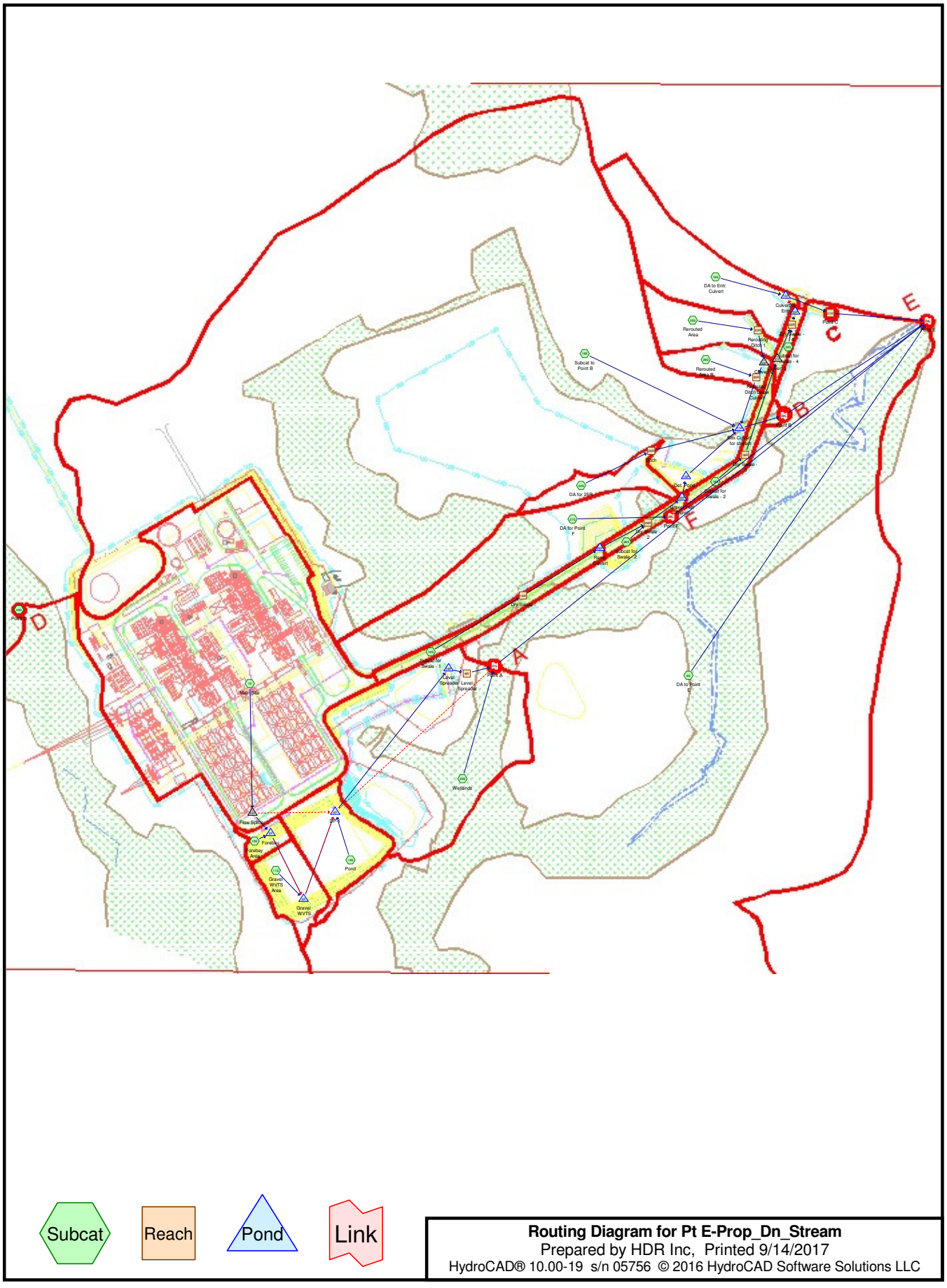
Summary for Subcatchment 6S: Exist DA at Point E

Runoff = 324.81 cfs @ 17.71 hrs, Volume= 231.369 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
467.119	77	Woods, Good, HSG D
1.860	98	Paved parking, HSG D
468.979	77	Weighted Average
467.119		99.60% Pervious Area
1.860		0.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			



Routing Diagram for Pt E-Prop_Dn_Stream
Prepared by HDR Inc, Printed 9/14/2017

Summary for Subcatchment 1S: Main Site

Runoff = 75.45 cfs @ 12.10 hrs, Volume= 6.414 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
16.505	98	Paved parking, HSG D
16.505		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 9S: DA to Point E

Runoff = 109.77 cfs @ 17.72 hrs, Volume= 79.298 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
16,322,075	77	Woods, Good, HSG D
16,322,075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 1.36 cfs @ 12.07 hrs, Volume= 0.094 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 11S: Gravel WVTS Area

Runoff = 4.90 cfs @ 12.07 hrs, Volume= 0.346 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 12S: Subcat for Swale - 1

Runoff = 4.01 cfs @ 12.08 hrs, Volume= 0.297 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.665	98	Paved parking, HSG C
	0.918	91	Weighted Average
	0.253		27.56% Pervious Area
	0.665		72.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 8.98 cfs @ 12.07 hrs, Volume= 0.648 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 6.55 cfs @ 12.26 hrs, Volume= 0.676 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
3.168	77	Woods, Good, HSG D
0.028	98	Paved parking, HSG D
3.196	77	Weighted Average
3.168		99.12% Pervious Area
0.028		0.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 70.88 cfs @ 12.66 hrs, Volume= 11.238 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
52.205	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
53.103	77	Weighted Average
52.205		98.31% Pervious Area
0.898		1.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.5	3,073	0.0324	1.08		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swale - 2

Runoff = 2.77 cfs @ 12.03 hrs, Volume= 0.181 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
	0.400	98	Water Surface, HSG C
*	0.144	74	>75% Grass cover, Good, HSG C
	0.544	92	Weighted Average
	0.144		26.47% Pervious Area
	0.400		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 15.41 cfs @ 12.29 hrs, Volume= 1.645 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 137.55 cfs @ 12.44 hrs, Volume= 17.681 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
3,639,264	77	Woods, Good, HSG D
3,639,264		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 1.41 cfs @ 12.51 hrs, Volume= 0.194 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
0.916	77	Woods, Good, HSG D
0.916		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 2.96 cfs @ 12.23 hrs, Volume= 0.292 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
1.380	77	Woods, Good, HSG D
1.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	734	0.0260	0.73		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swale - 2

Runoff = 1.67 cfs @ 12.03 hrs, Volume= 0.107 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
* 0.234	98	Paved parking, HSG D
0.107	74	>75% Grass cover, Good, HSG C
0.341	90	Weighted Average
0.107		31.38% Pervious Area
0.234		68.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.08		**Lag/CN Method,**

Summary for Subcatchment 27S: DA for Point F

Runoff = 7.01 cfs @ 12.61 hrs, Volume= 1.067 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (ac)	CN	Description
5.040	77	Woods, Good, HSG D
5.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 29S: Rerouted Area B

Runoff = 1.98 cfs @ 12.20 hrs, Volume= 0.183 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
37,749	77	Woods, Good, HSG D
37,749		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	599	0.0260	0.70		**Lag/CN Method,**

Summary for Subcatchment 34S: Subcat for Swale - 4

Runoff = 1.31 cfs @ 12.03 hrs, Volume= 0.084 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

	Area (ac)	CN	Description
*	0.072	74	>75% Grass cover, Good, HSG C
*	0.189	98	Paved parking, HSG C
	0.261	91	Weighted Average
	0.072		27.59% Pervious Area
	0.189		72.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	292	0.1265	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 4.16" for 10-Year event
Inflow = 3.08 cfs @ 18.09 hrs, Volume= 6.915 af
Outflow = 3.08 cfs @ 18.10 hrs, Volume= 6.913 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.72 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 1.4 min

Peak Storage= 206 cf @ 18.10 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swale - 1

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.01 cfs @ 12.08 hrs, Volume= 0.297 af
Outflow = 3.47 cfs @ 12.13 hrs, Volume= 0.297 af, Atten= 13%, Lag= 2.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.05 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 17.3 min

Peak Storage= 1,028 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 87.10 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 904.0' Slope= 0.0190 '/'
Inlet Invert= 572.17', Outlet Invert= 555.00'

Summary for Reach 18R: Dry Swale - 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 2.77 cfs @ 12.03 hrs, Volume= 0.181 af
Outflow = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af, Atten= 13%, Lag= 2.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.34 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 16.1 min

Peak Storage= 565 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 54.76 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 550.0' Slope= 0.0273 '/'
Inlet Invert= 548.05', Outlet Invert= 533.01'

‡

Summary for Reach 20R: Dry Swale - 4

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 3.96" for 10-Year event
Inflow = 3.59 cfs @ 12.05 hrs, Volume= 0.265 af
Outflow = 3.52 cfs @ 12.07 hrs, Volume= 0.265 af, Atten= 2%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 4.7 min

Peak Storage= 277 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 66.01 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 198.0' Slope= 0.0109 '/'
Inlet Invert= 532.35', Outlet Invert= 530.19'

Summary for Reach 21R: Point C

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 2.82" for 10-Year event
Inflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af
Outflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.00 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 1.5 min

Peak Storage= 214 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch 1

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 2.96 cfs @ 12.23 hrs, Volume= 0.292 af
Outflow = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 2.9 min

Peak Storage= 172 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.18 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 171.0' Slope= 0.0137 '/'
Inlet Invert= 536.00', Outlet Invert= 533.66'

Summary for Reach 25R: Ditch

Inflow Area = 0.916 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 1.41 cfs @ 12.51 hrs, Volume= 0.194 af
Outflow = 1.40 cfs @ 12.54 hrs, Volume= 0.194 af, Atten= 1%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.80 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 6.5 min

Peak Storage= 205 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swale - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 3.85" for 10-Year event
Inflow = 4.33 cfs @ 12.11 hrs, Volume= 0.404 af
Outflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af, Atten= 1%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 4.7 min

Peak Storage= 353 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 90.04 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 273.0' Slope= 0.0203 '/'
Inlet Invert= 553.62', Outlet Invert= 548.08'

Summary for Reach 30R: Rerouted Ditch below Culvert

Inflow Area = 2.247 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 4.88 cfs @ 12.22 hrs, Volume= 0.475 af
Outflow = 4.87 cfs @ 12.24 hrs, Volume= 0.475 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 2.7 min

Peak Storage= 259 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.17 cfs

2.00' x 1.00' deep channel, n= 0.013
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 212.0' Slope= 0.0058 '/'
Inlet Invert= 533.54', Outlet Invert= 532.32'

Summary for Pond 2P: Forebay

Inflow Area = 16.859 ac, 98.41% Impervious, Inflow Depth = 3.79" for 10-Year event
Inflow = 27.95 cfs @ 12.10 hrs, Volume= 5.323 af
Outflow = 27.83 cfs @ 12.11 hrs, Volume= 5.320 af, Atten= 0%, Lag= 0.7 min
Primary = 5.36 cfs @ 11.70 hrs, Volume= 4.011 af
Secondary = 23.18 cfs @ 12.11 hrs, Volume= 1.309 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 565.24' @ 12.11 hrs Surf.Area= 5,806 sf Storage= 24,063 cf (20,274 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 63.1 min calculated for 5.232 af (98% of inflow)
Center-of-Mass det. time= 41.9 min (797.7 - 755.8)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	565.00'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.35 cfs @ 11.70 hrs HW=565.11' TW=561.90' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.35 cfs @ 6.81 fps)

Secondary OutFlow Max=23.18 cfs @ 12.11 hrs HW=565.24' TW=562.84' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 23.18 cfs @ 1.62 fps)

Summary for Pond 3P: Gravel WVTS

Inflow Area = 17.988 ac, 95.60% Impervious, Inflow Depth = 3.78" for 10-Year event
Inflow = 32.38 cfs @ 12.10 hrs, Volume= 5.665 af
Outflow = 23.97 cfs @ 12.24 hrs, Volume= 5.648 af, Atten= 26%, Lag= 8.8 min
Primary = 23.97 cfs @ 12.24 hrs, Volume= 5.648 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 22,959 sf Storage= 27,438 cf
Peak Elev= 562.95' @ 12.24 hrs Surf.Area= 24,875 sf Storage= 74,094 cf (46,656 cf above start)
Flood Elev= 568.00' Surf.Area= 30,084 sf Storage= 212,684 cf (185,246 cf above start)

Plug-Flow detention time= 229.6 min calculated for 5.018 af (89% of inflow)
Center-of-Mass det. time= 114.9 min (912.4 - 797.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	243,305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	22,771	626.2	0.0	0	0	22,771
559.00	22,834	626.9	40.0	9,121	9,121	23,401
560.00	22,897	627.7	40.0	9,146	18,267	24,034
561.00	22,959	628.5	40.0	9,171	27,438	24,667
562.00	23,935	639.2	100.0	23,445	50,884	25,919
563.00	24,924	649.9	100.0	24,428	75,312	27,192
564.00	25,928	660.6	100.0	25,424	100,736	28,486
565.00	26,947	671.3	100.0	26,436	127,172	29,801
566.00	27,978	682.1	100.0	27,461	154,633	31,146
567.00	29,024	692.8	100.0	28,499	183,132	32,504
568.00	30,084	703.5	100.0	29,552	212,684	33,883
569.00	31,161	714.3	100.0	30,621	243,305	35,293

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=23.97 cfs @ 12.24 hrs HW=562.95' TW=560.17' (Dynamic Tailwater)
- **1=Culvert** (Passes 23.97 cfs of 56.81 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 9.11 cfs @ 5.80 fps)
    - **3=Orifice/Grate** (Passes < 5.28 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 14.86 cfs potential flow)
  - **4=Orifice/Grate** (Weir Controls 14.86 cfs @ 2.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 4.50" for 10-Year event
Inflow = 74.97 cfs @ 12.11 hrs, Volume= 7.481 af
Outflow = 3.08 cfs @ 18.08 hrs, Volume= 6.916 af, Atten= 96%, Lag= 358.3 min
Primary = 3.08 cfs @ 18.08 hrs, Volume= 6.916 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 561.70' @ 18.08 hrs Surf.Area= 55,296 sf Storage= 190,514 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 760.3 min calculated for 6.915 af (92% of inflow)

Center-of-Mass det. time= 705.3 min (1,577.1 - 871.8)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 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)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	566.00'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=3.08 cfs @ 18.08 hrs HW=561.70' TW=558.15' (Dynamic Tailwater)
- **1=Culvert** (Passes 3.08 cfs of 62.80 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 3.08 cfs @ 8.84 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' TW=0.00' (Dynamic Tailwater)
- **5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 3.85" for 10-Year event
Inflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af
Outflow = 0.78 cfs @ 12.72 hrs, Volume= 0.399 af, Atten= 82%, Lag= 35.9 min
Primary = 0.78 cfs @ 12.72 hrs, Volume= 0.399 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 539.56' @ 12.72 hrs Surf.Area= 6,928 sf Storage= 9,328 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 390.7 min calculated for 0.399 af (99% of inflow)
Center-of-Mass det. time= 381.7 min (1,181.1 - 799.4)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 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)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.78 cfs @ 12.72 hrs HW=539.56' TW=533.74' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.78 cfs of 5.72 cfs potential flow)
├**2=Orifice/Grate** (Orifice Controls 0.18 cfs @ 5.82 fps)
├**3=Orifice/Grate** (Orifice Controls 0.30 cfs @ 3.38 fps)
└**4=Orifice/Grate** (Weir Controls 0.31 cfs @ 0.81 fps)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 2.82" for 10-Year event
Inflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af
Outflow = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af, Atten= 0%, Lag= 0.0 min
Primary = 8.29 cfs @ 12.24 hrs, Volume= 0.942 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 530.16' @ 12.24 hrs Surf.Area= 306 sf Storage= 333 cf

Plug-Flow detention time= 0.6 min calculated for 0.942 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (830.9 - 830.5)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 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)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.29 cfs @ 12.24 hrs HW=530.16' TW=526.94' (Dynamic Tailwater)
└─**1=Culvert** (Passes 8.29 cfs of 27.35 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.06 cfs @ 8.16 fps)
  └─**3=Orifice/Grate** (Weir Controls 5.23 cfs @ 1.33 fps)

Summary for Pond 17P: Box Culvert for stream

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 2.57" for 10-Year event
Inflow = 74.83 cfs @ 12.62 hrs, Volume= 12.306 af
Outflow = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af, Atten= 0%, Lag= 1.8 min
Primary = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.76' @ 12.65 hrs Surf.Area= 3,542 sf Storage= 1,300 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (878.2 - 878.1)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 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)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 60.0" H Box Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 60.00 sf

Primary OutFlow Max=74.75 cfs @ 12.65 hrs HW=533.76' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 74.75 cfs @ 4.00 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 4.16" for 10-Year event
Inflow = 3.08 cfs @ 18.08 hrs, Volume= 6.916 af
Outflow = 3.08 cfs @ 18.09 hrs, Volume= 6.915 af, Atten= 0%, Lag= 0.6 min
Primary = 3.08 cfs @ 18.09 hrs, Volume= 6.915 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.15' @ 18.09 hrs Surf.Area= 2,625 sf Storage= 7,505 cf (155 cf above start)

Plug-Flow detention time= 55.4 min calculated for 6.745 af (98% of inflow)
Center-of-Mass det. time= 0.7 min (1,577.8 - 1,577.1)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.08 cfs @ 18.09 hrs HW=558.15' TW=558.06' (Dynamic Tailwater)
↑**1=Orifice/Grate** (Weir Controls 3.08 cfs @ 1.14 fps)

Summary for Pond 23P:

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 3.96" for 10-Year event
Inflow = 3.52 cfs @ 12.07 hrs, Volume= 0.265 af
Outflow = 3.47 cfs @ 12.08 hrs, Volume= 0.265 af, Atten= 1%, Lag= 0.8 min
Primary = 0.23 cfs @ 13.96 hrs, Volume= 0.156 af
Secondary = 3.32 cfs @ 12.08 hrs, Volume= 0.109 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 531.86' @ 12.08 hrs Surf.Area= 908 sf Storage= 645 cf

Plug-Flow detention time= 8.4 min calculated for 0.265 af (100% of inflow)
Center-of-Mass det. time= 8.3 min (799.5 - 791.2)

Volume	Invert	Avail.Storage	Storage Description
#1	527.33'	793 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.33	4	8.0	0.0	0	0	4
527.34	4	8.0	35.0	0	0	4
530.16	4	8.0	35.0	4	4	27
530.19	56	110.4	100.0	1	5	991
531.00	317	180.9	100.0	137	141	2,630
532.01	1,044	364.9	100.0	652	793	10,626

Device	Routing	Invert	Outlet Devices
#1	Primary	527.33'	**2.5" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 527.33' / 527.17' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.03 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 13.96 hrs HW=531.58' TW=527.56' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.23 cfs @ 6.82 fps)

Secondary OutFlow Max=3.31 cfs @ 12.08 hrs HW=531.86' TW=530.14' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 3.31 cfs @ 1.65 fps)

Summary for Pond 24P: Flow Splitter

Inflow Area = 16.505 ac,100.00% Impervious, Inflow Depth = 4.66" for 10-Year event
Inflow = 75.45 cfs @ 12.10 hrs, Volume= 6.414 af
Outflow = 75.45 cfs @ 12.10 hrs, Volume= 6.414 af, Atten= 0%, Lag= 0.0 min
Primary = 26.66 cfs @ 12.10 hrs, Volume= 5.229 af
Secondary = 48.79 cfs @ 12.10 hrs, Volume= 1.185 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 568.34' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	562.96'	**24.0" Round Culvert** L= 44.7' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.00' S= 0.0215 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Secondary	562.96'	**48.0" Round Culvert** L= 106.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.43' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#3	Device 2	565.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=26.65 cfs @ 12.10 hrs HW=568.34' TW=565.24' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 26.65 cfs @ 8.48 fps)

Secondary OutFlow Max=48.75 cfs @ 12.10 hrs HW=568.34' TW=559.57' (Dynamic Tailwater)
└**2=Culvert** (Passes 48.75 cfs of 97.98 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 48.75 cfs @ 5.31 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 3.47 cfs @ 12.13 hrs, Volume= 0.297 af
Outflow = 3.46 cfs @ 12.14 hrs, Volume= 0.297 af, Atten= 0%, Lag= 0.4 min
Primary = 3.46 cfs @ 12.14 hrs, Volume= 0.297 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 555.69' @ 12.14 hrs Surf.Area= 224 sf Storage= 99 cf
Flood Elev= 557.00' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= 1.7 min calculated for 0.297 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (799.5 - 798.3)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 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)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	555.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 555.00' / 553.62' S= 0.0460 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=3.46 cfs @ 12.14 hrs HW=555.69' TW=554.07' (Dynamic Tailwater)
└**1=RCP_Elliptical 23x14** (Inlet Controls 3.46 cfs @ 3.11 fps)

Summary for Pond 29P: Gravel Inlet Trench

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 3.85" for 10-Year event
Inflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af
Outflow = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.0 min
Primary = 4.30 cfs @ 12.12 hrs, Volume= 0.404 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 539.59' @ 12.18 hrs Surf.Area= 4 sf Storage= 2 cf

Plug-Flow detention time= 0.1 min calculated for 0.404 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (799.4 - 799.3)

Volume	Invert	Avail.Storage	Storage Description
#1	538.25'	14 cf	**2.00'W x 2.00'L x 9.75'H Prismatoid** 39 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	538.25'	**15.0" Round Culvert** L= 25.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.25' / 538.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=4.20 cfs @ 12.12 hrs HW=539.53' TW=539.01' (Dynamic Tailwater)
1=Culvert (Outlet Controls 4.20 cfs @ 4.15 fps)

Summary for Pond 30P: Culvert 2

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af
Outflow = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.0 min
Primary = 2.95 cfs @ 12.24 hrs, Volume= 0.292 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.46' @ 12.24 hrs
Flood Elev= 534.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.66'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.66' / 533.54' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=2.95 cfs @ 12.24 hrs HW=534.46' TW=533.97' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Barrel Controls 2.95 cfs @ 3.11 fps)

Summary for Pond 31P: Culvert 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af
Outflow = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Primary = 2.41 cfs @ 12.07 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 533.68' @ 12.07 hrs
Flood Elev= 538.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14**

L= 24.0' RCP, mitered to conform to fill, Ke= 0.700
Inlet / Outlet Invert= 533.00' / 532.35' S= 0.0271 '/' Cc= 0.900
n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=2.40 cfs @ 12.07 hrs HW=533.68' TW=532.82' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Inlet Controls 2.40 cfs @ 2.18 fps)

Summary for Link 21L: Point A

Inflow Area = 27.710 ac, 66.61% Impervious, Inflow Depth > 3.71" for 10-Year event
Inflow = 17.72 cfs @ 12.29 hrs, Volume= 8.558 af
Primary = 17.72 cfs @ 12.29 hrs, Volume= 8.558 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 2.57" for 10-Year event
Inflow = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af
Primary = 74.75 cfs @ 12.65 hrs, Volume= 12.306 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 28L: Point F

Inflow Area = 5.040 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 7.01 cfs @ 12.61 hrs, Volume= 1.067 af
Primary = 7.01 cfs @ 12.61 hrs, Volume= 1.067 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 29L: Point E

Inflow Area = 468.979 ac, 4.45% Impervious, Inflow Depth > 2.61" for 10-Year event
Inflow = 119.16 cfs @ 17.72 hrs, Volume= 102.170 af
Primary = 119.16 cfs @ 17.72 hrs, Volume= 102.170 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1S: Main Site

Runoff = 134.52 cfs @ 12.10 hrs, Volume= 11.636 af, Depth= 8.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
16.505	98	Paved parking, HSG D
16.505		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	158	0.0100	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.5	135	0.0025	4.18	20.51	**Pipe Channel, 130-131** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
0.4	110	0.0025	4.72	33.35	**Pipe Channel, 131-132** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.3	79	0.0025	4.72	33.35	**Pipe Channel, 132-133** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
0.8	246	0.0025	5.23	50.30	**Pipe Channel, 133-134** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.4	133	0.0025	5.23	50.30	**Pipe Channel, 134-135** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.6	182	0.0025	5.23	50.30	**Pipe Channel, 135-136** 42.0" Round Area= 9.6 sf Perim= 11.0' r= 0.88' n= 0.013
0.7	256	0.0025	5.72	71.82	**Pipe Channel, 136-137** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.7	233	0.0025	5.72	71.82	**Pipe Channel, 137-138** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.4	130	0.0025	5.72	71.82	**Pipe Channel, 138-139** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
0.3	113	0.0025	5.72	71.82	**Pipe Channel, 139-Outlet** 48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00' n= 0.013
7.4	1,775	Total			

Summary for Subcatchment 9S: DA to Point E

Runoff = 259.51 cfs @ 17.71 hrs, Volume= 184.858 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
16,322,075	77	Woods, Good, HSG D
16,322,075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	80	0.0480	0.26		**Sheet Flow,** Range n= 0.130 P2= 3.30"
391.3	7,875	0.0180	0.34		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
34.5	3,919	0.0130	1.90	182.01	**Channel Flow,** Area= 96.0 sf Perim= 81.1' r= 1.18' n= 0.100 Very weedy reaches w/pools
430.9	11,874	Total			

Summary for Subcatchment 10S: Forebay Area

Runoff = 2.81 cfs @ 12.07 hrs, Volume= 0.200 af, Depth= 6.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.268	80	>75% Grass cover, Good, HSG D
0.086	98	Water Surface, HSG D
0.354	84	Weighted Average
0.268		75.71% Pervious Area
0.086		24.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 11S: Gravel WVTS Area

Runoff = 9.47 cfs @ 12.07 hrs, Volume= 0.694 af, Depth= 7.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.605	98	Water Surface, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
1.129	89	Weighted Average
0.524		46.41% Pervious Area
0.605		53.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 12S: Subcat for Swale - 1

Runoff = 7.56 cfs @ 12.08 hrs, Volume= 0.583 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
	0.253	74	>75% Grass cover, Good, HSG C
*	0.665	98	Paved parking, HSG C
	0.918	91	Weighted Average
	0.253		27.56% Pervious Area
	0.665		72.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	993	0.1266	2.77		**Lag/CN Method,**

Summary for Subcatchment 13S: Pond

Runoff = 16.77 cfs @ 12.07 hrs, Volume= 1.257 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
1.261	98	Water Surface, HSG C
0.624	80	>75% Grass cover, Good, HSG D
0.064	77	Woods, Good, HSG D
1.949	92	Weighted Average
0.688		35.30% Pervious Area
1.261		64.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 16S: DA to Entr. Culvert

Runoff = 15.19 cfs @ 12.25 hrs, Volume= 1.577 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
3.168	77	Woods, Good, HSG D
0.028	98	Paved parking, HSG D
3.196	77	Weighted Average
3.168		99.12% Pervious Area
0.028		0.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	1,034	0.0359	0.91		**Lag/CN Method,**

Summary for Subcatchment 18S: Subcat to Point B

Runoff = 164.85 cfs @ 12.62 hrs, Volume= 26.198 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
52.205	77	Woods, Good, HSG D
0.898	98	Paved parking, HSG D
53.103	77	Weighted Average
52.205		98.31% Pervious Area
0.898		1.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.5	3,073	0.0324	1.08		**Lag/CN Method,**

Summary for Subcatchment 19S: Subcat for Swale - 2

Runoff = 5.16 cfs @ 12.03 hrs, Volume= 0.351 af, Depth= 7.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
	0.400	98	Water Surface, HSG C
*	0.144	74	>75% Grass cover, Good, HSG C
	0.544	92	Weighted Average
	0.144		26.47% Pervious Area
	0.400		73.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	313	0.1239	2.27		**Lag/CN Method,**

Summary for Subcatchment 20S: Wetlands

Runoff = 35.64 cfs @ 12.28 hrs, Volume= 3.835 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
7.773	77	Woods, Good, HSG D
7.773		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,002	0.0286	0.81		**Lag/CN Method,**

Summary for Subcatchment 23S: Point D

Runoff = 319.56 cfs @ 12.42 hrs, Volume= 41.217 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
3,639,264	77	Woods, Good, HSG D
3,639,264		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.3	3,135	0.0772	1.67		**Lag/CN Method,**

Summary for Subcatchment 24S: DA for 25R

Runoff = 3.27 cfs @ 12.51 hrs, Volume= 0.452 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
0.916	77	Woods, Good, HSG D
0.916		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.2	1,580	0.0192	0.73		**Lag/CN Method,**

Summary for Subcatchment 25S: Rerouted Area

Runoff = 6.87 cfs @ 12.23 hrs, Volume= 0.681 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
1.380	77	Woods, Good, HSG D
1.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	734	0.0260	0.73		**Lag/CN Method,**

Summary for Subcatchment 26S: Subcat for Swale - 2

Runoff = 3.18 cfs @ 12.03 hrs, Volume= 0.213 af, Depth= 7.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
*	0.234	98	Paved parking, HSG D
	0.107	74	>75% Grass cover, Good, HSG C
	0.341	90	Weighted Average
	0.107		31.38% Pervious Area
	0.234		68.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	293	0.1266	2.08		**Lag/CN Method,**

Summary for Subcatchment 27S: DA for Point F

Runoff = 16.28 cfs @ 12.57 hrs, Volume= 2.486 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (ac)	CN	Description
5.040	77	Woods, Good, HSG D
5.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.0	2,185	0.0219	0.83		**Lag/CN Method,**

Summary for Subcatchment 29S: Rerouted Area B

Runoff = 4.60 cfs @ 12.19 hrs, Volume= 0.428 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
37,749	77	Woods, Good, HSG D
37,749		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	599	0.0260	0.70		**Lag/CN Method,**

Summary for Subcatchment 34S: Subcat for Swale - 4

Runoff = 2.47 cfs @ 12.03 hrs, Volume= 0.166 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.70"

	Area (ac)	CN	Description
*	0.072	74	>75% Grass cover, Good, HSG C
*	0.189	98	Paved parking, HSG C
	0.261	91	Weighted Average
	0.072		27.59% Pervious Area
	0.189		72.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	292	0.1265	2.17		**Lag/CN Method,**

Summary for Reach 8R: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 7.33" for 100-Year event
Inflow = 7.62 cfs @ 14.64 hrs, Volume= 12.178 af
Outflow = 7.62 cfs @ 14.65 hrs, Volume= 12.174 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.02 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 1.2 min

Peak Storage= 360 cf @ 14.65 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 105.0 sf, Capacity= 439.80 cfs

75.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 30.0 '/' Top Width= 135.00'
Length= 48.0' Slope= 0.0100 '/'
Inlet Invert= 558.00', Outlet Invert= 557.52'

‡

Summary for Reach 15R: Dry Swale - 1

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 7.56 cfs @ 12.08 hrs, Volume= 0.583 af
Outflow = 6.75 cfs @ 12.12 hrs, Volume= 0.583 af, Atten= 11%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.69 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 14.2 min

Peak Storage= 1,651 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 87.10 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 904.0' Slope= 0.0190 '/'
Inlet Invert= 572.17', Outlet Invert= 555.00'

Summary for Reach 18R: Dry Swale - 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 5.16 cfs @ 12.03 hrs, Volume= 0.351 af
Outflow = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af, Atten= 10%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.99 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 13.2 min

Peak Storage= 857 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 54.76 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 550.0' Slope= 0.0273 '/'
Inlet Invert= 548.05', Outlet Invert= 533.01'

‡

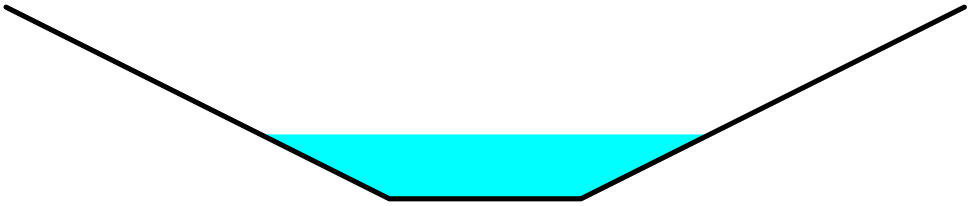
Summary for Reach 20R: Dry Swale - 4

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 7.70" for 100-Year event
Inflow = 6.94 cfs @ 12.05 hrs, Volume= 0.516 af
Outflow = 6.82 cfs @ 12.06 hrs, Volume= 0.516 af, Atten= 2%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.03 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 3.9 min

Peak Storage= 445 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 66.01 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 198.0' Slope= 0.0109 '/'
Inlet Invert= 532.35', Outlet Invert= 530.19'



Summary for Reach 21R: Point C

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 6.28" for 100-Year event
Inflow = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af
Outflow = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.00 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 1.2 min

Peak Storage= 354 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 26.0 sf, Capacity= 240.09 cfs

9.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 2.0 '/' Top Width= 17.00'
Length= 77.4' Slope= 0.0136 '/'
Inlet Invert= 526.65', Outlet Invert= 525.60'

‡

Summary for Reach 23R: Rerouting Ditch 1

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 6.87 cfs @ 12.23 hrs, Volume= 0.681 af
Outflow = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.76 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 2.3 min

Peak Storage= 312 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.18 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 171.0' Slope= 0.0137 '/'
Inlet Invert= 536.00', Outlet Invert= 533.66'

Summary for Reach 25R: Ditch

Inflow Area = 0.916 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 3.27 cfs @ 12.51 hrs, Volume= 0.452 af
Outflow = 3.26 cfs @ 12.52 hrs, Volume= 0.452 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.31 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 5.3 min

Peak Storage= 369 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 60.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 262.2' Slope= 0.0064 '/'
Inlet Invert= 540.67', Outlet Invert= 539.00'

Summary for Reach 29R: Dry Swale - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 7.58" for 100-Year event
Inflow = 8.43 cfs @ 12.10 hrs, Volume= 0.795 af
Outflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.02 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 3.8 min

Peak Storage= 569 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 90.04 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 273.0' Slope= 0.0203 '/'
Inlet Invert= 553.62', Outlet Invert= 548.08'

Summary for Reach 30R: Rerouted Ditch below Culvert

Inflow Area = 2.247 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 11.33 cfs @ 12.22 hrs, Volume= 1.108 af
Outflow = 11.31 cfs @ 12.23 hrs, Volume= 1.108 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.07 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 2.1 min

Peak Storage= 473 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 25.17 cfs

2.00' x 1.00' deep channel, n= 0.013
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 212.0' Slope= 0.0058 '/'
Inlet Invert= 533.54', Outlet Invert= 532.32'

Summary for Pond 2P: Forebay

Inflow Area = 16.859 ac, 98.41% Impervious, Inflow Depth = 6.30" for 100-Year event
Inflow = 36.64 cfs @ 12.10 hrs, Volume= 8.855 af
Outflow = 36.51 cfs @ 12.11 hrs, Volume= 8.850 af, Atten= 0%, Lag= 0.6 min
Primary = 5.22 cfs @ 10.36 hrs, Volume= 5.271 af
Secondary = 32.14 cfs @ 12.11 hrs, Volume= 3.579 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 3,802 sf Storage= 3,789 cf
Peak Elev= 565.30' @ 12.11 hrs Surf.Area= 5,835 sf Storage= 24,399 cf (20,611 cf above start)
Flood Elev= 568.00' Surf.Area= 7,249 sf Storage= 42,057 cf (38,268 cf above start)

Plug-Flow detention time= 62.9 min calculated for 8.761 af (99% of inflow)
Center-of-Mass det. time= 49.3 min (796.8 - 747.5)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	49,579 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	2,536	269.1	0.0	0	0	2,536
559.00	2,944	279.8	40.0	1,095	1,095	3,078
560.00	3,366	290.5	40.0	1,261	2,356	3,641
561.00	3,802	301.2	40.0	1,433	3,789	4,225
562.00	4,252	312.0	100.0	4,025	7,814	4,835
563.00	4,716	322.7	100.0	4,482	12,296	5,462
564.00	5,194	333.4	100.0	4,953	17,249	6,110
565.00	5,687	344.1	100.0	5,439	22,687	6,779
566.00	6,193	354.8	100.0	5,938	28,626	7,469
567.00	6,714	365.5	100.0	6,452	35,077	8,180
568.00	7,249	376.2	100.0	6,980	42,057	8,912
569.00	7,798	386.9	100.0	7,522	49,579	9,666

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	565.00'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.21 cfs @ 10.36 hrs HW=565.05' TW=562.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.21 cfs @ 6.64 fps)

Secondary OutFlow Max=32.11 cfs @ 12.11 hrs HW=565.30' TW=563.16' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Weir Controls 32.11 cfs @ 1.80 fps)

Summary for Pond 3P: Gravel WVTS

Inflow Area = 17.988 ac, 95.60% Impervious, Inflow Depth = 6.37" for 100-Year event
Inflow = 45.42 cfs @ 12.09 hrs, Volume= 9.544 af
Outflow = 37.08 cfs @ 12.14 hrs, Volume= 9.514 af, Atten= 18%, Lag= 2.8 min
Primary = 37.08 cfs @ 12.14 hrs, Volume= 9.514 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 561.00' Surf.Area= 22,959 sf Storage= 27,438 cf
Peak Elev= 563.97' @ 14.47 hrs Surf.Area= 25,900 sf Storage= 100,017 cf (72,579 cf above start)
Flood Elev= 568.00' Surf.Area= 30,084 sf Storage= 212,684 cf (185,246 cf above start)

Plug-Flow detention time= 263.0 min calculated for 8.884 af (93% of inflow)
Center-of-Mass det. time= 169.2 min (964.4 - 795.2)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	243,305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
558.00	22,771	626.2	0.0	0	0	22,771
559.00	22,834	626.9	40.0	9,121	9,121	23,401
560.00	22,897	627.7	40.0	9,146	18,267	24,034
561.00	22,959	628.5	40.0	9,171	27,438	24,667
562.00	23,935	639.2	100.0	23,445	50,884	25,919
563.00	24,924	649.9	100.0	24,428	75,312	27,192
564.00	25,928	660.6	100.0	25,424	100,736	28,486
565.00	26,947	671.3	100.0	26,436	127,172	29,801
566.00	27,978	682.1	100.0	27,461	154,633	31,146
567.00	29,024	692.8	100.0	28,499	183,132	32,504
568.00	30,084	703.5	100.0	29,552	212,684	33,883
569.00	31,161	714.3	100.0	30,621	243,305	35,293

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**36.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 558.00' / 558.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	561.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 2	558.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	562.50'	**60.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	564.00'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=36.74 cfs @ 12.14 hrs HW=563.20' TW=562.03' (Dynamic Tailwater)
- **1=Culvert** (Passes 36.74 cfs of 36.76 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 8.17 cfs @ 5.20 fps)
    - **3=Orifice/Grate** (Passes < 4.08 cfs potential flow)
    - **5=Orifice/Grate** (Passes < 28.57 cfs potential flow)
  - **4=Orifice/Grate** (Weir Controls 28.57 cfs @ 2.73 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=561.00' TW=558.00' (Dynamic Tailwater)
- **6=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: DP-1

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 8.28" for 100-Year event
Inflow = 151.64 cfs @ 12.10 hrs, Volume= 13.750 af
Outflow = 7.62 cfs @ 14.63 hrs, Volume= 12.180 af, Atten= 95%, Lag= 151.8 min
Primary = 7.62 cfs @ 14.63 hrs, Volume= 12.180 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 563.93' @ 14.63 hrs Surf.Area= 60,062 sf Storage= 318,983 cf
Flood Elev= 565.00' Surf.Area= 62,400 sf Storage= 384,495 cf

Plug-Flow detention time= 709.2 min calculated for 12.178 af (89% of inflow)

Center-of-Mass det. time= 600.7 min (1,495.5 - 894.8)

Volume	Invert	Avail.Storage	Storage Description
#1	558.00'	651,999 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)
558.00	47,688	883.6	0	0	47,688
559.00	49,705	899.0	48,693	48,693	50,047
560.00	51,750	914.4	50,724	99,417	52,448
561.00	53,824	929.8	52,784	152,201	54,888
562.00	55,926	945.2	54,872	207,072	57,370
563.00	58,056	960.6	56,988	264,060	59,893
564.00	60,214	976.1	59,132	323,192	62,470
565.00	62,400	991.5	61,304	384,495	65,075
566.00	64,615	1,006.9	63,504	448,000	67,720
567.00	66,858	1,022.3	65,733	513,733	70,405
568.00	69,129	1,037.7	67,990	581,723	73,132
569.00	71,429	1,053.2	70,276	651,999	75,915

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**48.0" Round Culvert** L= 663.9' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 558.00' / 551.36' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#2	Device 1	558.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	562.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	566.00'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	**45.0 deg x 100.0' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=7.62 cfs @ 14.63 hrs HW=563.93' TW=558.27' (Dynamic Tailwater)
- **1=Culvert** (Passes 7.62 cfs of 94.70 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 3.98 cfs @ 11.39 fps)
  - **3=Orifice/Grate** (Orifice Controls 3.65 cfs @ 4.64 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=558.00' TW=0.00' (Dynamic Tailwater)
- **5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 13P: Det. Pond - 2

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 7.58" for 100-Year event
Inflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af
Outflow = 6.50 cfs @ 12.23 hrs, Volume= 0.789 af, Atten= 22%, Lag= 6.7 min
Primary = 6.50 cfs @ 12.23 hrs, Volume= 0.789 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 539.94' @ 12.23 hrs Surf.Area= 7,405 sf Storage= 12,015 cf
Flood Elev= 541.00' Surf.Area= 8,791 sf Storage= 20,626 cf

Plug-Flow detention time= 249.7 min calculated for 0.789 af (99% of inflow)
Center-of-Mass det. time= 244.2 min (1,023.9 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1	538.00'	20,626 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)
538.00	5,054	387.0	0	0	5,054
539.00	6,243	405.8	5,638	5,638	6,305
540.00	7,489	424.7	6,857	12,495	7,621
541.00	8,791	423.9	8,131	20,626	8,049

Device	Routing	Invert	Outlet Devices
#1	Primary	538.00'	**15.0" Round Culvert** L= 94.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.00' / 537.00' S= 0.0106 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	538.00'	**2.4" Vert. Orifice/Grate** C= 0.600
#3	Device 1	538.90'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	539.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.50 cfs @ 12.23 hrs HW=539.94' TW=534.02' (Dynamic Tailwater)
└─**1=Culvert** (Passes 6.50 cfs of 6.65 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 6.52 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.39 cfs @ 4.49 fps)
  └─**4=Orifice/Grate** (Weir Controls 5.91 cfs @ 2.16 fps)

Summary for Pond 15P: Culvert at Entr.

Inflow Area = 4.001 ac, 15.42% Impervious, Inflow Depth = 6.28" for 100-Year event
Inflow = 18.30 cfs @ 12.24 hrs, Volume= 2.093 af
Outflow = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af, Atten= 0%, Lag= 0.0 min
Primary = 18.29 cfs @ 12.24 hrs, Volume= 2.093 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 530.33' @ 12.24 hrs Surf.Area= 351 sf Storage= 389 cf

Plug-Flow detention time= 0.4 min calculated for 2.093 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (809.7 - 809.2)

Volume	Invert	Avail.Storage	Storage Description
#1	527.17'	1,407 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)
527.17	6	14.0	0	0	6
528.00	44	35.0	18	18	90
529.00	121	58.1	79	98	268
530.00	266	92.9	189	286	693
531.00	555	117.6	402	688	1,120
532.00	897	157.4	719	1,407	2,001

Device	Routing	Invert	Outlet Devices
#1	Primary	527.17'	**18.0" Round Culvert X 2.00** L= 52.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 527.17' / 526.65' S= 0.0098 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	527.17'	**18.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	530.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=18.29 cfs @ 12.24 hrs HW=530.33' TW=527.11' (Dynamic Tailwater)
└─**1=Culvert** (Passes 18.29 cfs of 28.48 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.15 cfs @ 8.39 fps)
  └─**3=Orifice/Grate** (Weir Controls 15.14 cfs @ 1.89 fps)

Summary for Pond 17P: Box Culvert for stream

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 5.96" for 100-Year event
Inflow = 175.13 cfs @ 12.61 hrs, Volume= 28.547 af
Outflow = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af, Atten= 1%, Lag= 1.8 min
Primary = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.93' @ 12.64 hrs Surf.Area= 11,204 sf Storage= 9,851 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (849.1 - 848.7)

Volume	Invert	Avail.Storage	Storage Description
#1	533.00'	25,714 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)
533.00	412	159.8	0	0	412
534.00	5,210	513.7	2,362	2,362	19,382
535.00	11,714	795.5	8,245	10,608	48,748
536.00	18,774	996.6	15,106	25,714	77,441

Device	Routing	Invert	Outlet Devices
#1	Primary	532.20'	**144.0" W x 60.0" H Box Culvert** L= 51.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 532.20' / 530.66' S= 0.0299 '/' Cc= 0.900 n= 0.024, Flow Area= 60.00 sf

Primary OutFlow Max=174.11 cfs @ 12.64 hrs HW=534.93' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 174.11 cfs @ 5.31 fps)

Summary for Pond 18P: Level Spreader

Inflow Area = 19.937 ac, 92.58% Impervious, Inflow Depth > 7.33" for 100-Year event
Inflow = 7.62 cfs @ 14.63 hrs, Volume= 12.180 af
Outflow = 7.62 cfs @ 14.64 hrs, Volume= 12.178 af, Atten= 0%, Lag= 0.4 min
Primary = 7.62 cfs @ 14.64 hrs, Volume= 12.178 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 558.00' Surf.Area= 2,625 sf Storage= 7,350 cf
Peak Elev= 558.27' @ 14.64 hrs Surf.Area= 2,625 sf Storage= 7,632 cf (282 cf above start)

Plug-Flow detention time= 34.0 min calculated for 12.007 af (99% of inflow)
Center-of-Mass det. time= 0.5 min (1,496.0 - 1,495.5)

Volume	Invert	Avail.Storage	Storage Description
#1	551.00'	8,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 21,000 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
551.00	2,625	0	0
556.00	2,625	13,125	13,125
557.00	2,625	2,625	15,750
558.00	2,625	2,625	18,375
559.00	2,625	2,625	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	558.00'	**75.0" x 35.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.62 cfs @ 14.64 hrs HW=558.27' TW=558.10' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 7.62 cfs @ 1.55 fps)

Summary for Pond 23P:

Inflow Area = 0.805 ac, 73.17% Impervious, Inflow Depth = 7.70" for 100-Year event
Inflow = 6.82 cfs @ 12.06 hrs, Volume= 0.516 af
Outflow = 6.73 cfs @ 12.08 hrs, Volume= 0.516 af, Atten= 1%, Lag= 0.8 min
Primary = 0.23 cfs @ 15.93 hrs, Volume= 0.231 af
Secondary = 6.58 cfs @ 12.08 hrs, Volume= 0.286 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 532.01' @ 12.08 hrs Surf.Area= 1,041 sf Storage= 790 cf

Plug-Flow detention time= 8.6 min calculated for 0.516 af (100% of inflow)
Center-of-Mass det. time= 8.6 min (781.2 - 772.6)

Volume	Invert	Avail.Storage	Storage Description
#1	527.33'	793 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
527.33	4	8.0	0.0	0	0	4
527.34	4	8.0	35.0	0	0	4
530.16	4	8.0	35.0	4	4	27
530.19	56	110.4	100.0	1	5	991
531.00	317	180.9	100.0	137	141	2,630
532.01	1,044	364.9	100.0	652	793	10,626

Device	Routing	Invert	Outlet Devices
#1	Primary	527.33'	**2.5" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 527.33' / 527.17' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.03 sf
#2	Secondary	531.60'	**30.0 deg x 7.7' long x 0.40' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.23 cfs @ 15.93 hrs HW=531.57' TW=527.61' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.23 cfs @ 6.77 fps)

Secondary OutFlow Max=6.57 cfs @ 12.08 hrs HW=532.01' TW=530.29' (Dynamic Tailwater)
↑—**2=Sharp-Crested Vee/Trap Weir** (Orifice Controls 6.57 cfs @ 2.10 fps)

Summary for Pond 24P: Flow Splitter

Inflow Area = 16.505 ac,100.00% Impervious, Inflow Depth = 8.46" for 100-Year event
Inflow = 134.52 cfs @ 12.10 hrs, Volume= 11.636 af
Outflow = 134.52 cfs @ 12.10 hrs, Volume= 11.636 af, Atten= 0%, Lag= 0.0 min
Primary = 33.99 cfs @ 12.10 hrs, Volume= 8.655 af
Secondary = 100.53 cfs @ 12.10 hrs, Volume= 2.980 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 570.34' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	562.96'	**24.0" Round Culvert** L= 44.7' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.00' S= 0.0215 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Secondary	562.96'	**48.0" Round Culvert** L= 106.2' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 562.96' / 562.43' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
#3	Device 2	565.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=33.98 cfs @ 12.10 hrs HW=570.34' TW=565.30' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 33.98 cfs @ 10.82 fps)

Secondary OutFlow Max=100.46 cfs @ 12.10 hrs HW=570.34' TW=561.68' (Dynamic Tailwater)
└**2=Culvert** (Passes 100.46 cfs of 140.16 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 100.46 cfs @ 7.05 fps)

Summary for Pond 28P: Ramp Culvert

Inflow Area = 0.918 ac, 72.44% Impervious, Inflow Depth = 7.62" for 100-Year event
Inflow = 6.75 cfs @ 12.12 hrs, Volume= 0.583 af
Outflow = 6.71 cfs @ 12.13 hrs, Volume= 0.582 af, Atten= 0%, Lag= 0.6 min
Primary = 6.71 cfs @ 12.13 hrs, Volume= 0.582 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 556.03' @ 12.13 hrs Surf.Area= 350 sf Storage= 196 cf
Flood Elev= 557.00' Surf.Area= 534 sf Storage= 342 cf

Plug-Flow detention time= 1.2 min calculated for 0.582 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (780.0 - 779.1)

Volume	Invert	Avail.Storage	Storage Description
#1	554.61'	342 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)
554.61	4	8.0	0	0	4
555.00	56	45.8	10	10	166
556.00	337	150.1	177	187	1,795
556.36	534	184.0	155	342	2,698

Device	Routing	Invert	Outlet Devices
#1	Primary	555.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 30.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 555.00' / 553.62' S= 0.0460 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=6.71 cfs @ 12.13 hrs HW=556.03' TW=554.25' (Dynamic Tailwater)
└**1=RCP_Elliptical 23x14** (Inlet Controls 6.71 cfs @ 3.96 fps)

Summary for Pond 29P: Gravel Inlet Trench

Inflow Area = 1.259 ac, 71.41% Impervious, Inflow Depth = 7.58" for 100-Year event
Inflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af
Outflow = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af, Atten= 0%, Lag= 0.0 min
Primary = 8.38 cfs @ 12.12 hrs, Volume= 0.795 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 541.84' @ 12.13 hrs Surf.Area= 4 sf Storage= 5 cf

Plug-Flow detention time= 0.2 min calculated for 0.795 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (779.7 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1	538.25'	14 cf	**2.00'W x 2.00'L x 9.75'H Prismatoid** 39 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	538.25'	**15.0" Round Culvert** L= 25.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 538.25' / 538.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=8.33 cfs @ 12.12 hrs HW=541.83' TW=539.84' (Dynamic Tailwater)
1=Culvert (Inlet Controls 8.33 cfs @ 6.79 fps)

Summary for Pond 30P: Culvert 2

Inflow Area = 1.380 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af
Outflow = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af, Atten= 0%, Lag= 0.0 min
Primary = 6.85 cfs @ 12.24 hrs, Volume= 0.681 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 535.14' @ 12.24 hrs
Flood Elev= 534.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.66'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14** L= 24.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 533.66' / 533.54' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=6.85 cfs @ 12.24 hrs HW=535.14' TW=534.21' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Inlet Controls 6.85 cfs @ 3.75 fps)

Summary for Pond 31P: Culvert 3

Inflow Area = 0.544 ac, 73.53% Impervious, Inflow Depth = 7.74" for 100-Year event
Inflow = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af
Outflow = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af, Atten= 0%, Lag= 0.0 min
Primary = 4.65 cfs @ 12.06 hrs, Volume= 0.351 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 534.01' @ 12.06 hrs
Flood Elev= 538.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	533.00'	**23.0" W x 14.0" H, R=22.0" Elliptical RCP_Elliptical 23x14**

L= 24.0' RCP, mitered to conform to fill, Ke= 0.700
Inlet / Outlet Invert= 533.00' / 532.35' S= 0.0271 '/' Cc= 0.900
n= 0.013, Flow Area= 1.83 sf

Primary OutFlow Max=4.65 cfs @ 12.06 hrs HW=534.01' TW=533.02' (Dynamic Tailwater)
1=RCP_Elliptical 23x14 (Inlet Controls 4.65 cfs @ 2.77 fps)

Summary for Link 21L: Point A

Inflow Area = 27.710 ac, 66.61% Impervious, Inflow Depth > 6.93" for 100-Year event
Inflow = 39.67 cfs @ 12.29 hrs, Volume= 16.009 af
Primary = 39.67 cfs @ 12.29 hrs, Volume= 16.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 22L: Point B

Inflow Area = 57.525 ac, 3.12% Impervious, Inflow Depth = 5.96" for 100-Year event
Inflow = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af
Primary = 174.13 cfs @ 12.64 hrs, Volume= 28.547 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 28L: Point F

Inflow Area = 5.040 ac, 0.00% Impervious, Inflow Depth = 5.92" for 100-Year event
Inflow = 16.28 cfs @ 12.57 hrs, Volume= 2.486 af
Primary = 16.28 cfs @ 12.57 hrs, Volume= 2.486 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link 29L: Point E

Inflow Area = 468.979 ac, 4.45% Impervious, Inflow Depth > 5.99" for 100-Year event
Inflow = 279.00 cfs @ 17.71 hrs, Volume= 233.994 af
Primary = 279.00 cfs @ 17.71 hrs, Volume= 233.994 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Technical Memorandum

Date:	Friday, January 20, 2017
Project:	Clear River Energy Center Town of Burrillville, Providence County, Rhode Island
To:	Type recipient(s) here
From:	Type sender(s) here
Subject:	Revised HEC-RAS Model of Dry Arm Brook and Iron Mine Brook

1.0 INTRODUCTION

The purpose of this technical memorandum is to describe the updated modeling completed by HDR in support of the determination of the base flood elevations (BFEs) for Dry Arm Brook and Iron Mine Brook in Burrillville, Rhode Island. Hodge WaterResources (HWR) determined the BFEs for these two brooks upstream of Wallum Lake Road in a Technical Memorandum dated October 11, 2016. HDR was to update the model to show the effects of the culverts under Algonquin Road which allow water to flow from the Dry Arm Brook Basin into the Iron Mine Branch Basin. HDR completed the modeling using the Hydrologic Engineering Center's River Analysis System (HEC-RAS), which is developed and maintained by the United States Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC).

2.0 MODEL SETUP

The process of setting up a steady-flow HEC-RAS model includes four components.

- Development of Model Geometry
- Inclusion of Structures
- Determination of Upstream Flow Boundary Condition
- Determination of Downstream Water Level Boundary Condition

Model Geometry

HDR developed the channel geometry by digitizing the stream centerline; stream bank lines and cross-section locations for each brook based on Figure 3 in HWR's October 11, 2016 Technical Memorandum. In addition, HDR added a stream from Algoquin Road to Iron Mine Branch to help model any spillover from Dry Arm Brook to Iron Mine Branch and a stream was added parallel to Wallum Lake Road to help model the spillover from Iron Mine Branch south to another road crossing. The HEC-RAS geometric model was developed from the stream centerlines, edge of banks, and cross-sections that were mapped by Lidar furnished by the ESS Group, Inc. (ESS). Modifications were made to the cross-sections just above and below the culvert crossings to ensure the ground matched the entrance and exit of the culverts. The attached drawing "HEC-RAS Model Geometry and Floodplain Delineation" shows the locations of the cross-sections. For clarity, not all of the model is shown.

Inclusion of Structures

Both Dry Arm Brook and Iron Mine Branch cross under Wallum Lake Road through culverts. The culvert for Dry Arm Brook is a box culvert with a height of 2.42 ft, a width of 5.76 ft, and an upstream invert of 537.33 ft relative to the North American Vertical Datum of 1988 (NAVD88). The culvert for Iron Mine Brook is a double-barreled circular pipe culvert. Each pipe has a diameter of 2.5 ft and an upstream invert of 513.56 ft NAVD88. These dimensions were measured by ESS during a site survey conducted in August and October 2015. HDR used these measurements to incorporate the culverts into the HEC-RAS model. The culvert survey information was provided to HDR by ESS.

In addition to the culverts, HDR used a lateral structure in the modeling of Algonquin Road. The lateral structure allows water to flow under Algonquin Road when the flood waters back up high enough from the Dry Arm Brook culvert and flows into the Iron Mine Branch basin. Also, at the location where Iron Mine Brook enters the culvert under Wallum Lake Road, the topography of the surrounding area is such that if a surcharge were to occur at the upstream end of the culvert, water would flow east, parallel to Wallum Lake Road and away from the culvert. HDR modeled the potential for water to flow away from the culvert by including another stream adjacent to where Iron Mine Brook meets Wallum Lake Road.

Determination of Upstream Flow Boundary Conditions

In order to determine the BFE for a stretch of either brook, it is necessary to make a determination of the flow in the brook during a 1% annual chance storm event (commonly called a 100-year storm event). The original model used StreamStats to determine the flow in each stream. StreamStats estimates flows in Rhode Island based on studies completed by the USGS (Zarriello et al., 2012; Bent et al., 2014). The prediction of flow from StreamStats depends on the size of the watershed upstream of the requested point. StreamStats has a recommended minimum drainage area limit of 4 sq. miles. Both the Dry Arm Basin and the Iron Mine Basin are below this limit and therefore StreamStats was not used.

Dry Arm Brook has a stream gage on it by Wallum Lake Road so this data was used for the Dry Arm Book flows. In order to provide an appropriately conservative upstream steady-flow boundary for the model, HDR distributed the flow between the flow from the stream gage of Dry Arm Brook based on the relative sizes of their contributing watersheds. HDR drew the drainage areas based on the provided Lidar and calculated the flows for Iron Mine Branch using HydroCAD version 10.0. The subsequent flow values were applied to the boundary of Iron Mine Brook.

Determination of Downstream Water Level Boundary Condition

Dry Arm Brook and Iron Mine Brook drain to the western end of Wilson Reservoir, which in turn drains to the Clear River. The effective Flood Insurance Study (FIS) for Providence County (FEMA, 2015) provides a 1% annual chance flood profile of the Clear River, and the upstream limit is the outfall of Wilson Reservoir under East Wallum Lake Road. The 1% annual chance flood elevation at Wilson Reservoir at the location where Clear River flows from the Reservoir is 444 ft NAVD88. HDR used this water level as the downstream water level boundary condition in the HEC-RAS model.

After developing the model geometry, including all relevant structures, and specifying boundary conditions, HDR ran the HEC-RAS model in the steady flow condition in order to determine the BFEs for Dry Arm Brook and Iron Mine Brook.

3.0 MODEL RESULTS

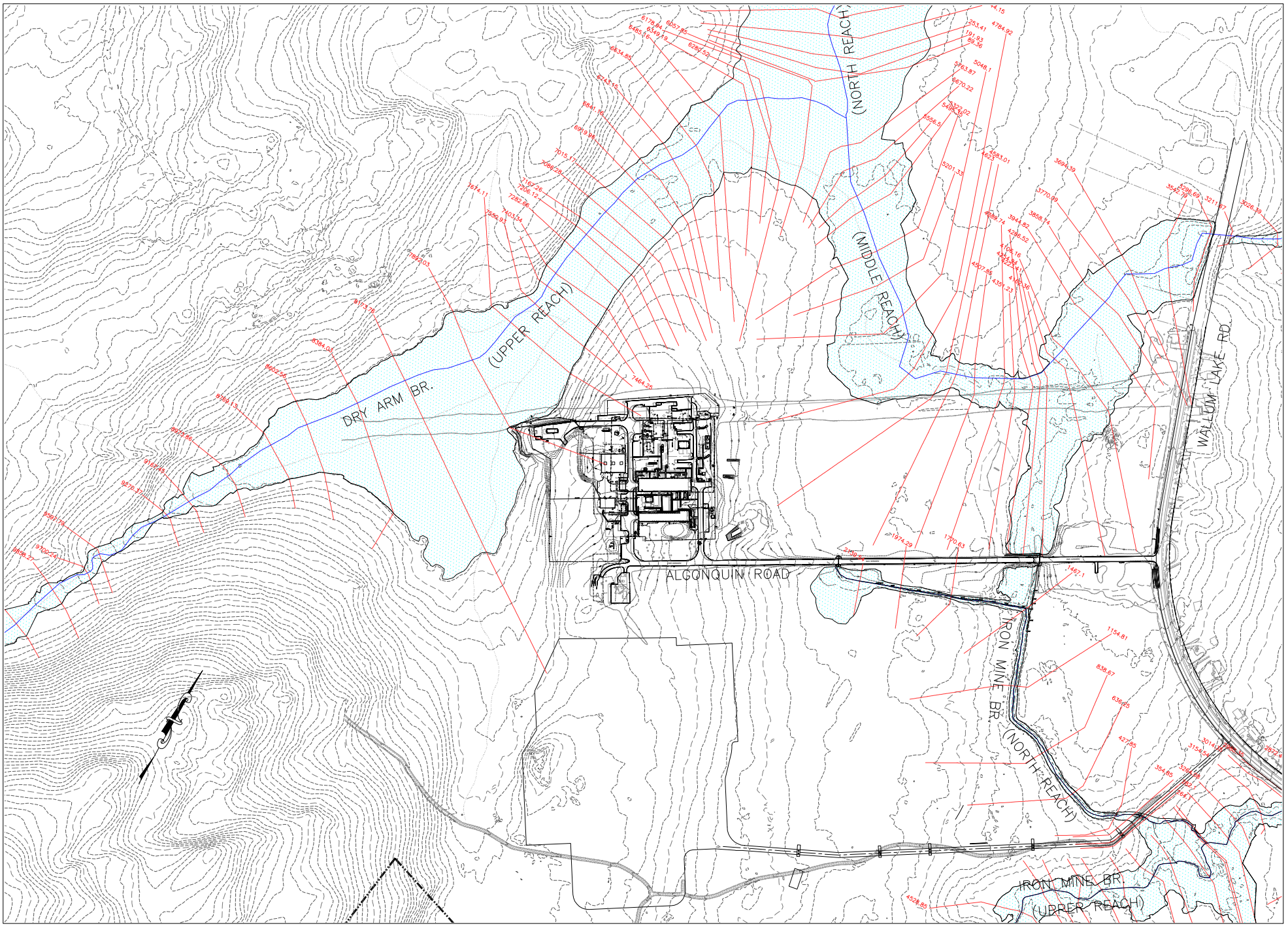
The HEC-RAS model shows that 4.64 cfs during the 100 year storm flows from the Dry Arm Brook to the Iron Mine Branch. This additional water has no appreciable effect on the Iron Mine Branch Basin.

HEC-RAS Plan: Exist Profile: 100 yr

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
IRON MINE BR	Upper	5582.71	100 yr	428.76	549.00	550.01		550.16	0.014332	3.10	138.23	172.06	0.61
IRON MINE BR	Upper	5357.25	100 yr	428.76	545.59	547.60	547.12	547.76	0.008250	3.30	151.32	134.77	0.50
IRON MINE BR	Upper	5174.02	100 yr	428.76	544.00	545.36		545.60	0.018148	3.99	117.51	138.90	0.70
IRON MINE BR	Upper	4856.72	100 yr	428.76	540.61	542.43		542.58	0.005828	3.24	169.80	128.25	0.44
IRON MINE BR	Upper	4654.34	100 yr	428.76	538.97	540.51		540.71	0.017182	3.60	120.31	142.89	0.67
IRON MINE BR	Upper	4528.85	100 yr	428.76	537.68	539.17		539.26	0.008041	2.37	193.40	299.15	0.46
IRON MINE BR	Upper	4390.26	100 yr	428.76	536.06	537.73		537.92	0.011703	3.60	143.77	167.49	0.58
IRON MINE BR	Upper	4339.74	100 yr	428.76	535.53	537.23		537.39	0.009050	3.31	154.73	182.34	0.52
IRON MINE BR	Upper	4238.33	100 yr	428.76	534.52	535.76	535.59	536.03	0.021854	4.34	121.63	157.16	0.77
IRON MINE BR	Upper	4134.29	100 yr	428.76	531.54	533.36	533.23	533.66	0.023660	4.58	114.21	211.42	0.81
IRON MINE BR	Upper	4046.46	100 yr	428.76	530.00	531.57	531.41	531.84	0.018667	4.42	127.90	240.77	0.73
IRON MINE BR	Upper	3900.5	100 yr	428.76	526.02	527.68	527.68	528.08	0.037534	5.12	87.95	227.31	0.98
IRON MINE BR	Upper	3806.38	100 yr	428.76	524.19	526.37		526.49	0.006722	2.82	165.57	216.49	0.44
IRON MINE BR	Upper	3611.18	100 yr	428.76	523.99	525.34		525.41	0.004566	2.16	215.37	332.73	0.36
IRON MINE BR	Upper	3456.73	100 yr	428.76	522.64	524.77		524.85	0.003137	2.25	225.56	533.72	0.32
IRON MINE BR	North	2139.54	100 yr	152.44	552.00	554.65		554.68	0.001283	1.54	120.32	157.71	0.21
IRON MINE BR	North	1974.29	100 yr	152.44	551.59	553.99		554.21	0.009541	3.77	40.46	26.81	0.54
IRON MINE BR	North	1770.63	100 yr	152.44	548.24	550.19	550.19	550.79	0.035807	6.22	24.52	20.66	1.01
IRON MINE BR	North	1467.1	100 yr	152.44	540.99	543.46		543.50	0.001602	1.63	93.74	58.33	0.23
IRON MINE BR	North	1154.81	100 yr	152.44	539.99	542.66		542.76	0.003755	2.59	58.96	34.25	0.35
IRON MINE BR	North	838.67	100 yr	152.44	538.35	540.52		540.77	0.012188	4.06	37.55	26.78	0.60
IRON MINE BR	North	636.25	100 yr	152.44	536.00	538.08		538.31	0.012088	3.86	39.47	30.35	0.60
IRON MINE BR	North	427.85	100 yr	152.44	533.99	535.59		535.75	0.012314	3.18	47.92	50.10	0.57
IRON MINE BR	North	354.85	100 yr	152.44	533.47	534.09	534.07	534.24	0.041458	3.07	49.73	137.93	0.90
IRON MINE BR	North	282.1	100 yr	152.44	531.85	532.78	532.76	533.01	0.042347	3.85	39.83	83.35	0.96
IRON MINE BR	North	264.10	100 yr	152.44	530.99	532.05	532.05	532.31	0.039736	4.22	41.53	97.70	0.96
IRON MINE BR	Middle	3386	100 yr	581.20	522.64	524.48		524.55	0.005382	2.50	426.87	518.59	0.40
IRON MINE BR	Middle	3346.58	100 yr	581.20	521.99	524.09		524.14	0.003945	2.43	527.27	582.89	0.35
IRON MINE BR	Middle	3264.08	100 yr	581.20	519.56	523.32		523.43	0.004341	2.82	251.45	185.44	0.38
IRON MINE BR	Middle	3154.54	100 yr	581.20	519.67	521.73	521.73	522.38	0.030307	6.48	95.17	92.28	0.96
IRON MINE BR	Lower West	3014.35	100 yr	122.52	513.49	519.96		519.97	0.000787	0.96	129.18	105.70	0.15
IRON MINE BR	Lower West	2988.35	100 yr	122.52	513.37	519.91	515.55	519.95	0.000605	1.72	91.39	209.71	0.13
IRON MINE BR	Lower West	2961		Culvert									
IRON MINE BR	Lower West	2872.42	100 yr	122.52	513.10	515.21		515.52	0.017332	4.45	27.56	21.89	0.70
IRON MINE BR	Lower West	2576.99	100 yr	122.52	508.87	510.21		510.34	0.017168	2.88	45.39	107.26	0.64
IRON MINE BR	Lower West	2283.58	100 yr	122.52	501.48	502.52	502.52	502.83	0.041936	4.46	27.49	132.04	0.99
IRON MINE BR	Lower West	2033.89	100 yr	122.52	491.99	493.24	493.13	493.53	0.026249	4.33	28.92	122.74	0.83
IRON MINE BR	Lower West	1786.16	100 yr	122.52	483.68	485.20	485.20	485.66	0.039027	5.45	22.46	24.87	1.01
IRON MINE BR	Lower West	1548.29	100 yr	122.52	473.00	474.53	474.30	474.76	0.018246	3.83	32.02	34.18	0.70
IRON MINE BR	Lower West	1289.63	100 yr	122.52	466.27	467.53	467.53	467.87	0.042384	4.71	26.01	145.35	1.01
IRON MINE BR	Lower West	974.67	100 yr	122.52	452.00	453.02	453.02	453.36	0.041871	4.66	26.28	55.69	1.00
IRON MINE BR	Lower West	707.55	100 yr	122.52	446.62	448.04		448.07	0.003960	1.49	82.41	116.17	0.31
IRON MINE BR	Lower West	438.89	100 yr	122.52	444.00	445.21	445.21	445.47	0.048379	4.11	29.81	59.71	1.02
IRON MINE BR	Lower West	152.26	100 yr	122.52	442.00	444.38		444.39	0.000166	0.51	239.32	154.65	0.07
IRON MINE BR	Lower East	2851.75	100 yr	458.68	517.97	519.52	519.52	519.98	0.031441	5.62	102.27	131.36	0.94
IRON MINE BR	Lower East	2664.45	100 yr	458.68	516.00	518.31		518.35	0.001641	1.55	310.05	258.92	0.23
IRON MINE BR	Lower East	2455.3	100 yr	458.68	515.98	517.91		517.96	0.001992	1.74	263.14	173.45	0.25
IRON MINE BR	Lower East	2203.36	100 yr	458.68	515.96	516.79		516.92	0.012487	2.84	165.56	217.82	0.56
IRON MINE BR	Lower East	2056.72	100 yr	458.68	514.06	516.40		516.44	0.001368	1.55	301.82	188.28	0.21
IRON MINE BR	Lower East	1817.17	100 yr	458.68	513.76	514.99	514.99	515.48	0.040963	6.42	107.85	117.15	1.08
IRON MINE BR	Lower East	1610.83	100 yr	458.68	505.05	506.89	506.89	507.53	0.030641	6.62	81.96	72.13	0.97
IRON MINE BR	Lower East	1505.77	100 yr	458.68	496.22	497.77	497.77	498.36	0.033639	6.20	78.33	73.06	0.99
IRON MINE BR	Lower East	1403.85	100 yr	458.68	490.23	491.68	491.64	492.17	0.028793	5.90	102.04	112.61	0.92
IRON MINE BR	Lower East	1265.67	100 yr	458.68	485.87	487.39	487.39	487.90	0.036837	5.77	79.48	78.00	1.01
IRON MINE BR	Lower East	1141.44	100 yr	458.68	479.43	480.99	480.99	481.53	0.034269	5.93	83.52	88.54	0.99
IRON MINE BR	Lower East	1017.25	100 yr	458.68	473.73	475.11	475.11	475.64	0.033581	5.91	85.80	93.11	0.98
IRON MINE BR	Lower East	889.8	100 yr	458.68	468.64	469.69	469.68	470.12	0.037593	5.53	103.15	131.61	1.00
IRON MINE BR	Lower East	667.81	100 yr	458.68	460.46	461.49	461.49	461.92	0.036308	5.34	93.54	121.21	0.98
IRON MINE BR	Lower East	466.67	100 yr	458.68	452.00	453.44		453.63	0.013205	3.55	137.79	153.92	0.61
IRON MINE BR	Lower East	229.03	100 yr	458.68	446.67	448.22	448.22	448.76	0.035353	5.93	78.77	79.84	1.00
IRON MINE BR	Lower East	22.38	100 yr	458.68	440.50	444.00	441.56	444.01	0.000190	0.85	658.28	287.79	0.09
DRY ARM BRANCH	Upper	10503.76	100 yr	123.21	590.09	590.82	590.82	591.08	0.046185	4.05	30.57	62.14	1.00
DRY ARM BRANCH	Upper	10301.42	100 yr	123.21	585.00	585.76		585.85	0.013763	2.43	50.92	89.52	0.56
DRY ARM BRANCH	Upper	10056.52	100 yr	123.21	583.00	583.76		583.80	0.005534	1.67	77.64	135.59	0.36
DRY ARM BRANCH	Upper	9858.27	100 yr	123.21	580.50	581.30	581.28	581.49	0.038532	3.54	38.34	97.39	0.91
DRY ARM BRANCH	Upper	9700.24	100 yr	123.21	576.22	577.33	577.13	577.51	0.017679	3.44	36.77	50.46	0.67
DRY ARM BRANCH	Upper	9597.79	100 yr	123.21	573.83	574.47	574.47	574.71	0.047174	3.92	31.82	70.59	1.00
DRY ARM BRANCH	Upper	9270.37	100 yr	123.21	562.25	563.90	563.62	564.14	0.016169	3.90	31.76	31.54	0.67
DRY ARM BRANCH	Upper	9167.45	100 yr	123.21	560.25	561.23	561.23	561.47	0.047834	3.93	32.49	77.10	1.01
DRY ARM BRANCH	Upper	8973.86	100 yr	123.21	558.00	558.65		558.68	0.003904	1.32	93.73	161.01	0.30
DRY ARM BRANCH	Upper	8769.13	100 yr	123.21	557.18	558.19		558.21	0.001523	0.90	139.03	222.72	0.19
DRY ARM BRANCH	Upper	8602.56	100 yr	123.21	557.00	558.05		558.05	0.000618	0.71	227.28	322.50	0.13
DRY ARM BRANCH	Upper	8384.03	100 yr	123.21	557.00	557.95		557.95	0.000353	0.51	246.74	552.47	0.10
DRY ARM BRANCH	Upper	8173.76	100 yr	123.21	557.00	557.90		557.90	0.000168	0.33	377.83	787.30	0.07
DRY ARM BRANCH	Upper	7892.03	100 yr	123.21	557.00	557.86		557.86	0.000117	0.28	432.92	518.22	0.05
DRY ARM BRANCH	Upper	7674.11	100 yr	123.21	557.00	557.83		557.83	0.000223	0.38	325.49	413.80	0.08
DRY ARM BRANCH	Upper	7550.93	100 yr	123.21	557.00	557.79		557.79	0.000461	0.52	236.85	321.52	0.11
DRY ARM BRANCH	Upper	7464.25	100 yr	123.21	556.58	557.73		557.74	0.000929	0.86	251.99	309.57	0.16
DRY ARM BRANCH	Upper	7403.34	100 yr	123.21	556.02	557.67		557.68	0.000908	1.06	232.04	302.31	0.16
DRY ARM BRANCH	Upper	7282.66	100 yr	123.21	556.28	557.52		557.53	0.001653	1.17	144.70	297.68	0.21
DRY ARM BRANCH	Upper	7206.12	100 yr	123.21	556.08	557.33		557.35	0.003682	1.28	101.16	297.92	0.29
DRY ARM BRANCH	Upper	7167.26	100 yr	123.21	556.00	557.28		557.29	0.000844	0.80	156.01	312.53	0.15
DRY ARM BRANCH	Upper	7086.28	100 yr	123.21	556.00	557.22		557.23	0.000670	0.74	178.50	330.95	0.13
DRY ARM BRANCH	Upper	7015.17	100 yr	123.21	556.00	557.13		557.15	0.001842	1.12	117.89	329.93	0.22
DRY ARM BRANCH	Upper	6919.96	100 yr	123.21	556.00	556.81		556.85	0.006120	1.72	78.59	290.78	0.38
DRY ARM BRANCH	Upper	6841.16	100 yr	123.21	556.00	556.66		556.67	0.001090	0.72	172.14	284.86	0.16
DRY ARM BRANCH	Upper	6743.15	100 yr	123.21	556.00	556.50		556.51	0.002668	0.93	131.99	278.32	0.24

HEC-RAS Plan: Exist Profile: 100 yr (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DRY ARM BRANCH	Upper	6634.85	100 yr	123.21	555.01	556.31		556.32	0.001171	0.89	166.26	298.69	0.17
DRY ARM BRANCH	Upper	6485.16	100 yr	123.21	555.00	556.01		556.04	0.003821	1.37	94.32	326.79	0.30
DRY ARM BRANCH	Upper	6349.19	100 yr	123.21	555.00	555.63		555.65	0.002192	0.92	134.00	382.96	0.22
DRY ARM BRANCH	Upper	6280.52	100 yr	123.21	555.00	555.55		555.56	0.000827	0.54	232.63	488.83	0.13
DRY ARM BRANCH	Upper	6178.94	100 yr	123.21	555.00	555.48		555.48	0.000645	0.45	274.62	599.00	0.12
DRY ARM BRANCH	Upper	6057.85	100 yr	123.21	554.71	555.40		555.40	0.000720	0.43	287.47	734.33	0.12
DRY ARM BRANCH	North	1674	100 yr	76.79	555.01	556.13		556.14	0.000518	0.55	141.96	980.60	0.11
DRY ARM BRANCH	North	1300.2	100 yr	76.79	555.00	555.99		555.99	0.000312	0.42	184.47	1422.92	0.09
DRY ARM BRANCH	North	720.12	100 yr	76.79	555.00	555.75		555.75	0.000557	0.46	175.74	1035.21	0.11
DRY ARM BRANCH	North	597.35	100 yr	76.79	555.00	555.67		555.67	0.000825	0.55	138.45	714.45	0.14
DRY ARM BRANCH	North	506.65	100 yr	76.79	555.00	555.60		555.60	0.000734	0.50	154.87	650.97	0.13
DRY ARM BRANCH	North	429.49	100 yr	76.79	555.00	555.56		555.56	0.000305	0.34	230.26	720.81	0.08
DRY ARM BRANCH	North	344.15	100 yr	76.79	555.00	555.53		555.53	0.000622	0.46	167.09	695.26	0.12
DRY ARM BRANCH	North	253.41	100 yr	76.79	555.00	555.49		555.49	0.000315	0.32	239.29	750.92	0.08
DRY ARM BRANCH	North	191.93	100 yr	76.79	555.00	555.47		555.47	0.000263	0.28	270.28	728.27	0.07
DRY ARM BRANCH	North	89.36	100 yr	76.79	555.00	555.43		555.43	0.000612	0.41	187.06	764.50	0.11
DRY ARM BRANCH	Middle	5763.87	100 yr	200.00	554.19	554.96		554.98	0.002946	1.13	186.61	442.14	0.26
DRY ARM BRANCH	Middle	5670.22	100 yr	200.00	554.00	554.79		554.80	0.001271	0.79	255.45	422.90	0.17
DRY ARM BRANCH	Middle	5556.5	100 yr	200.00	554.00	554.64		554.65	0.001428	0.83	248.90	424.24	0.18
DRY ARM BRANCH	Middle	5495.35	100 yr	200.00	554.00	554.51		554.53	0.003053	1.02	201.74	443.81	0.26
DRY ARM BRANCH	Middle	5322.02	100 yr	200.00	552.88	553.79		553.82	0.005714	1.42	140.46	278.33	0.35
DRY ARM BRANCH	Middle	5201.33	100 yr	200.00	552.19	553.17		553.20	0.004806	1.34	149.37	285.10	0.33
DRY ARM BRANCH	Middle	5048.1	100 yr	200.00	551.99	552.85		552.86	0.001240	0.80	250.62	376.30	0.17
DRY ARM BRANCH	Middle	4784.92	100 yr	200.00	551.18	552.22		552.24	0.005942	1.23	163.11	416.46	0.35
DRY ARM BRANCH	Middle	4623	100 yr	200.00	549.99	551.42		551.46	0.003935	1.49	134.32	188.07	0.31
DRY ARM BRANCH	Middle	4620		Lat Struct									
DRY ARM BRANCH	Middle	4583.01	100 yr	200.00	549.97	551.16		551.24	0.007593	2.24	89.14	110.38	0.44
DRY ARM BRANCH	Middle	4507.85	100 yr	200.00	549.40	550.64		550.70	0.006784	1.90	105.28	153.92	0.40
DRY ARM BRANCH	Middle	4389.74	100 yr	200.00	547.80	549.13	549.06	549.25	0.027992	2.82	70.88	165.71	0.76
DRY ARM BRANCH	Middle	4351.23	100 yr	200.00	546.93	548.13		548.28	0.022872	3.05	65.57	117.12	0.72
DRY ARM BRANCH	Middle	4286.52	100 yr	200.00	546.34	547.84		547.86	0.002666	1.18	201.24	774.94	0.25
DRY ARM BRANCH	Middle	4254.94	100 yr	200.00	545.98	547.72		547.75	0.004731	1.54	162.92	858.37	0.34
DRY ARM BRANCH	Middle	4223.41	100 yr	200.00	545.96	547.54		547.58	0.005792	1.59	126.09	880.66	0.36
DRY ARM BRANCH	Middle	4162.36	100 yr	200.00	546.00	546.61	546.60	546.80	0.047619	3.48	57.44	388.91	0.98
DRY ARM BRANCH	Middle	4106.16	100 yr	200.00	545.00	546.51		546.52	0.001388	0.81	248.10	419.53	0.18
DRY ARM BRANCH	Middle	3944.82	100 yr	200.00	545.00	546.38		546.39	0.000539	0.65	328.32	403.12	0.12
DRY ARM BRANCH	Middle	3858.74	100 yr	200.00	545.45	546.21		546.26	0.012759	2.06	141.67	362.93	0.52
DRY ARM BRANCH	Middle	3770.09	100 yr	200.00	544.46	545.71		545.73	0.003445	1.33	150.27	225.44	0.29
DRY ARM BRANCH	Middle	3694.39	100 yr	200.00	543.98	545.58		545.59	0.001080	0.91	220.95	247.57	0.17
DRY ARM BRANCH	Middle	3542.79	100 yr	200.00	542.27	545.57		545.57	0.000049	0.38	636.47	341.77	0.04
DRY ARM BRANCH	Middle	3296.69	100 yr	200.00	537.20	545.56	539.43	545.56	0.000022	0.34	966.27	316.64	0.03
DRY ARM BRANCH	Middle	3250		Culvert									
DRY ARM BRANCH	Middle	3211.67	100 yr	200.00	536.55	538.64	538.64	539.40	0.034397	6.98	28.66	19.23	1.01
DRY ARM BRANCH	Middle	3026.39	100 yr	200.00	529.68	530.74	530.65	531.01	0.029257	4.20	47.57	63.18	0.85
DRY ARM BRANCH	Middle	2851.21	100 yr	200.00	523.70	524.72	524.71	525.06	0.039802	4.69	42.65	60.55	0.98
DRY ARM BRANCH	Middle	2651.4	100 yr	200.00	515.50	516.61	516.61	517.00	0.040909	4.96	40.33	53.76	1.01
DRY ARM BRANCH	Middle	2444.26	100 yr	200.00	506.24	507.54	507.53	507.91	0.039770	4.90	40.81	54.20	1.00
DRY ARM BRANCH	Middle	2328.41	100 yr	200.00	501.41	502.90	502.90	503.36	0.038629	5.48	36.52	40.04	1.01
DRY ARM BRANCH	Middle	2207.75	100 yr	200.00	496.15	497.86	497.83	498.26	0.035927	5.10	39.19	45.26	0.97
DRY ARM BRANCH	Middle	2081.27	100 yr	200.00	492.01	493.59	493.53	493.96	0.032179	4.87	41.10	47.01	0.92
DRY ARM BRANCH	Middle	1983.2	100 yr	200.00	488.56	490.06	490.06	490.53	0.038088	5.45	36.67	40.04	1.00
DRY ARM BRANCH	Middle	1883.54	100 yr	200.00	483.39	484.48	484.48	484.86	0.041002	4.96	40.33	53.81	1.01
DRY ARM BRANCH	Middle	1698.02	100 yr	200.00	476.43	477.54	477.49	477.88	0.033293	4.68	42.75	53.26	0.92
DRY ARM BRANCH	Middle	1607.13	100 yr	200.00	472.95	474.17	474.17	474.60	0.039370	5.25	38.10	45.26	1.01
DRY ARM BRANCH	Middle	1459.98	100 yr	200.00	467.66	468.74	468.71	469.09	0.035378	4.69	42.64	55.39	0.94
DRY ARM BRANCH	Middle	1357.47	100 yr	200.00	463.68	464.82	464.82	465.20	0.040567	5.00	40.01	52.34	1.01
DRY ARM BRANCH	Middle	1246.32	100 yr	200.00	460.11	461.14	460.97	461.31	0.019508	3.34	59.89	82.92	0.69
DRY ARM BRANCH	Middle	1085.08	100 yr	200.00	455.39	456.45	456.45	456.73	0.044879	4.22	47.39	86.32	1.00
DRY ARM BRANCH	Middle	861.63	100 yr	200.00	449.29	450.39	450.13	450.50	0.012603	2.58	77.37	113.42	0.55
DRY ARM BRANCH	Middle	698.48	100 yr	200.00	445.90	446.67	446.67	446.94	0.045369	4.19	47.73	88.57	1.01
DRY ARM BRANCH	Middle	577.6	100 yr	200.00	443.25	444.71		444.77	0.005524	2.02	116.55	175.61	0.38
DRY ARM BRANCH	Middle	340.79	100 yr	200.00	442.00	444.35		444.37	0.000516	0.97	256.34	240.85	0.13
DRY ARM BRANCH	Middle	95.96	100 yr	200.00	441.98	444.34		444.34	0.000039	0.28	735.36	449.43	0.04
DRY ARM BRANCH	Lower	357.61	100 yr	1814.03	439.00	444.10		444.17	0.001131	2.48	1307.14	517.43	0.22
DRY ARM BRANCH	Lower	162.94	100 yr	1814.03	439.00	444.00	440.80	444.03	0.000484	1.70	2272.54	884.74	0.15



LEGEND

CENTERLINE

CROSS-SECTIONS

FLOODPLAIN

SCALE IN FEET

0 250 500

CLEAR RIVER ENERGY LLC
TOWN OF BURRILLVILLE,
PROVIDENCE COUNTY, RHODE ISLAND

HEC-RAS MODEL GEOMETRY
AND FLOODPLAIN DELINEATION

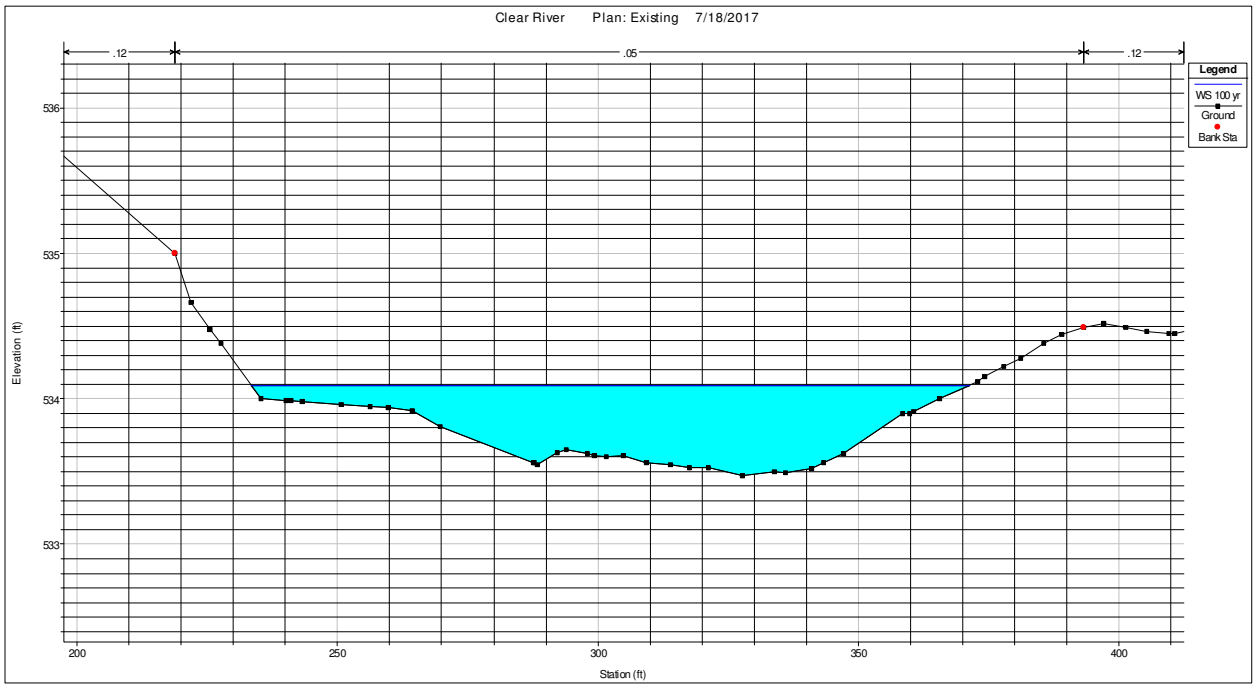
FILENAME HEC-RAS MAP.DWG

SCALE AS SHOWN

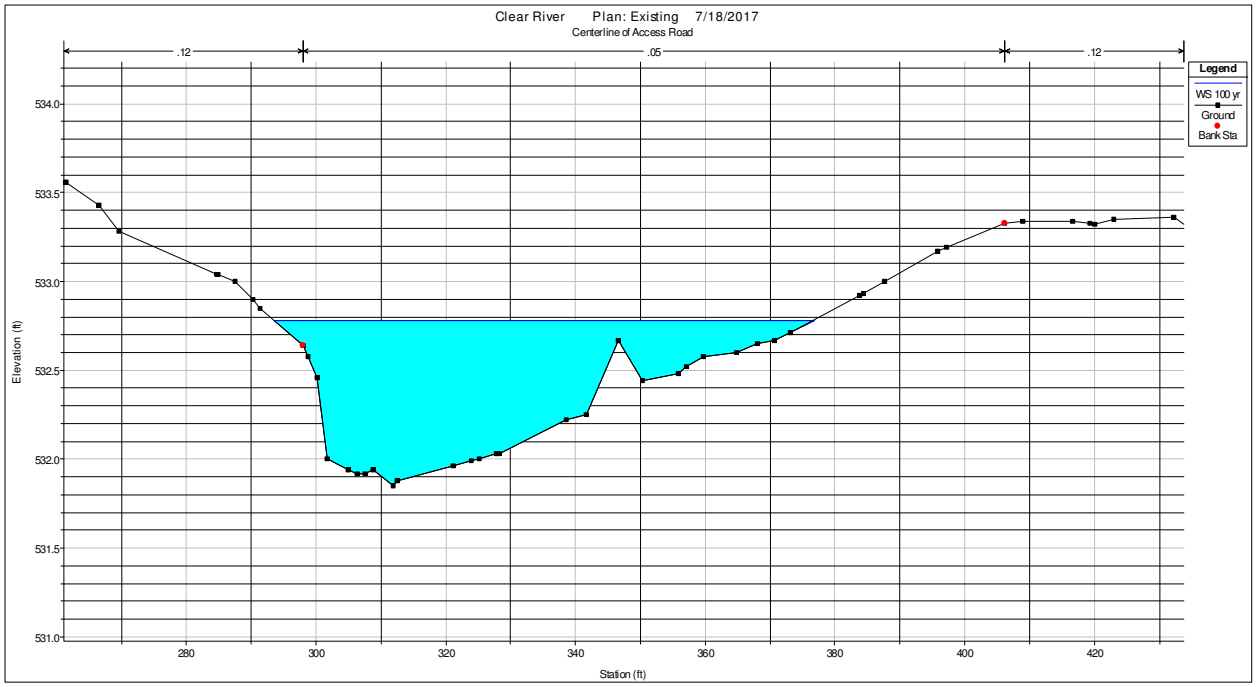
1 of 1

Calculations for the Flood Volume Encroachment

IRON BRANCH – NORTH – STA. 3+54.85 (Elev. 534.09)

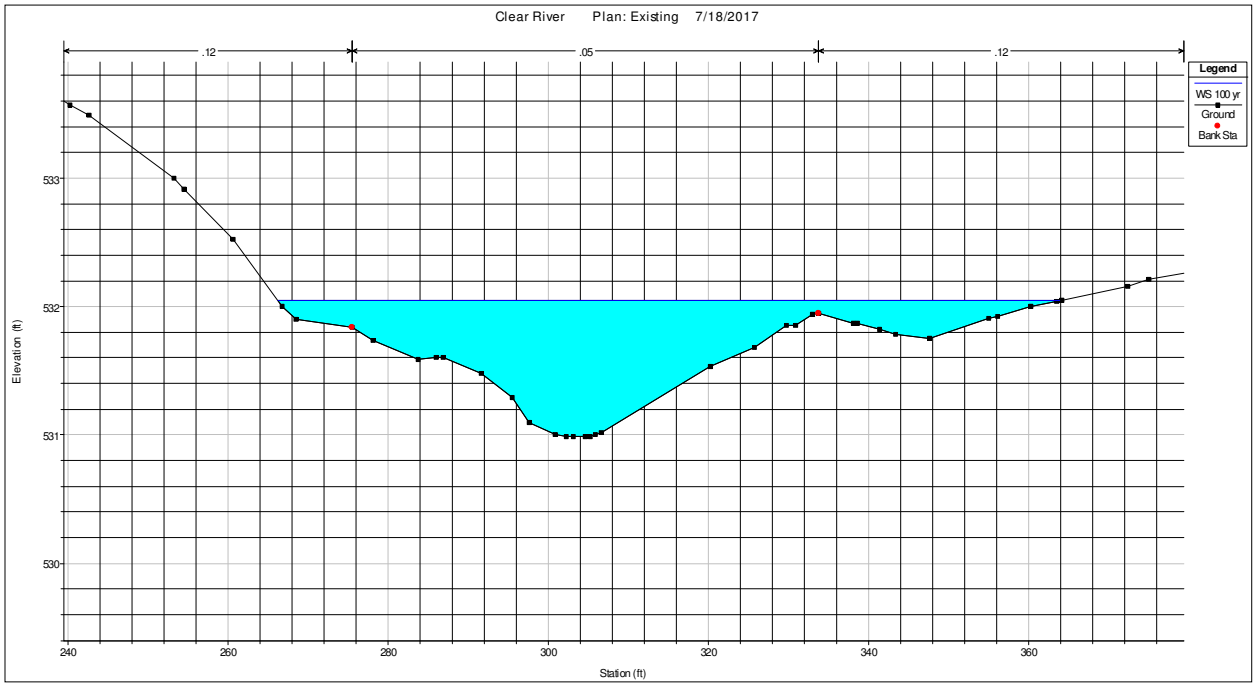


IRON BRANCH – NORTH – STA. 2+82.10 (Elev. 532.78)

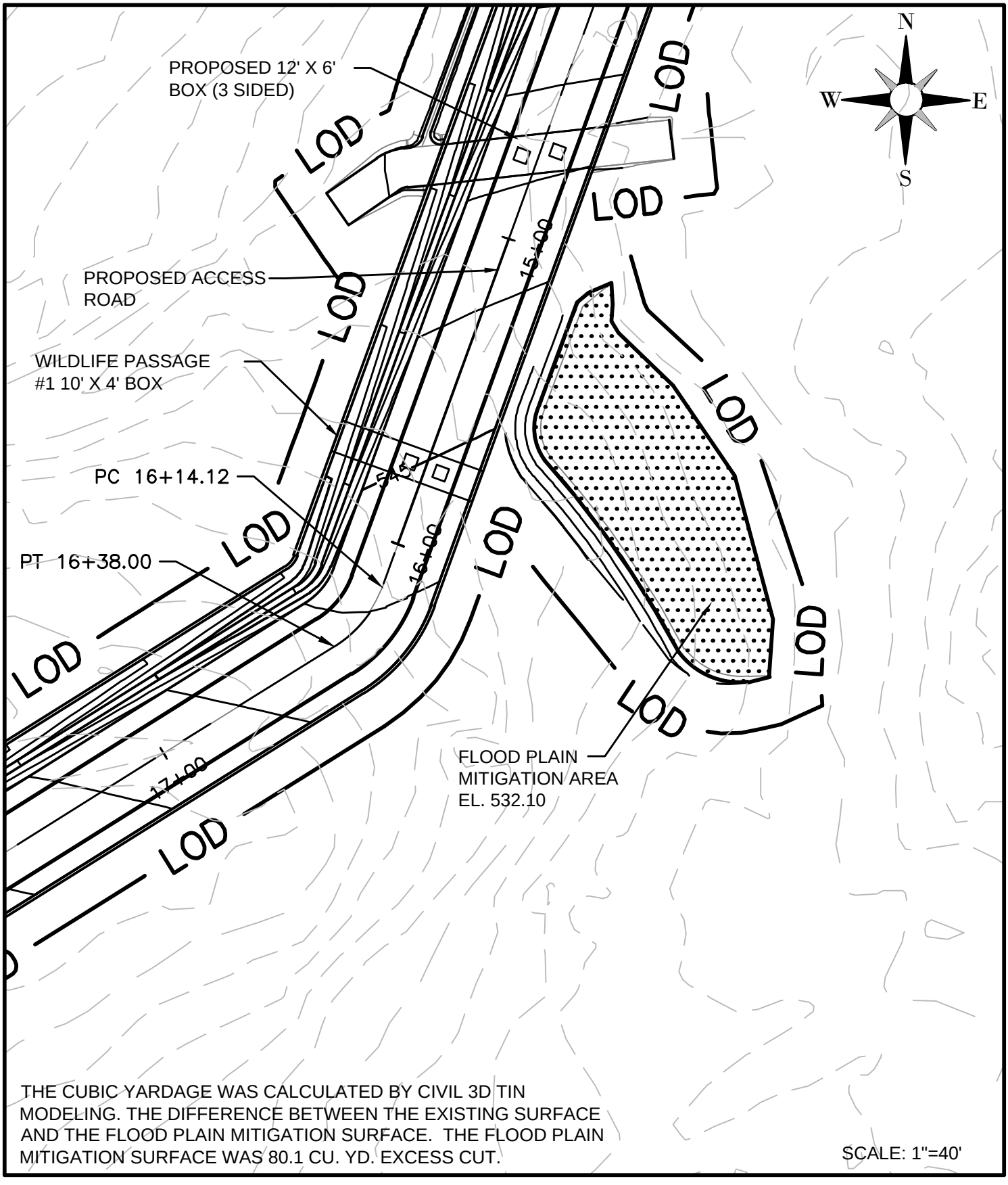


Calculations for the Flood Volume Encroachment

IRON BRANCH – NORTH – STA. 2+64.10 (Elev. 532.05)



FLOOD VOLUME CALCULATIONS					
Station	**Area (sf)**	**Avg Area (sf)**	**Distance (ft)**	**Area (cf)**	
3+54.85	49.67				
		44.75	28	1,253.00	
2+82.10	39.83				
2+82.10	39.83				
		40.66	16	650.56	
2+64.10	41.49				
			44	1,903.56	cf
				70.50	cy



THE CUBIC YARDAGE WAS CALCULATED BY CIVIL 3D TIN MODELING. THE DIFFERENCE BETWEEN THE EXISTING SURFACE AND THE FLOOD PLAIN MITIGATION SURFACE. THE FLOOD PLAIN MITIGATION SURFACE WAS 80.1 CU. YD. EXCESS CUT.

SCALE: 1"=40'

HDR

FLOOD PLAIN MITIGATION AREA

DATE
07/17/2017

FIGURE

Exhibit 4
Appendix A: Stormwater Management Checklist and LID Planning Report

APPENDIX A: STORMWATER MANAGEMENT CHECKLIST AND LID PLANNING REPORT

PROJECT NAME: CLEAR RIVER ENERGY CENTER	(RIDEM USE ONLY)
CONTACT FOR STORMWATER DESIGN QUESTIONS: Alexander E. Deuson, P.E.	
PHONE NUMBER: (602) 385-1621	
EMAIL ADDRESS: alexander.deuson@hdrinc.com	
BRIEF PROJECT DESCRIPTION: New Electric Plant	DATE RECEIVED

STORMWATER MANAGEMENT PLAN ELEMENTS

APPENDIX A: STORMWATER MANAGEMENT CHECKLIST	STORMWATER ANALYSIS AND DRAINAGE REPORT	SOIL EROSION AND SEDIMENT CONTROL PLAN	OPERATIONS AND MAINTENANCE PLAN
PART 1: PROJECT AND SITE INFORMATION **MINIMUM STANDARDS:** 6. REDEVELOPMENT 8. LUHHPL IDENTIFICATION **PART 2.** **MINIMUM STANDARD:** 1. LID SITE PLANNING **PART 3.** SUMMARY OF REMAINING STANDARDS **PART 4.** SUBWATERSHED MAPPING SITE PLAN DETAILS	ADDRESSES MINIMUM STANDARDS: 2. GROUNDWATER RECHARGE 3. WATER QUALITY VOLUME 4. CONVEYANCE & NATURAL CHANNEL PROTECTION 5. OVERBANK AND FLOOD PROTECTION 9. ILLICIT DISCHARGE DETECTION AND ELIM.	ADDRESSES MINIMUM STANDARDS: 7. POLLUTION PREVENTION DURING CONSTRUCTION 10. CONSTRUCTION EROSION AND SEDIMENTATION CONTROL	ADDRESSES MINIMUM STANDARDS: 7. POLLUTION PREVENTION AFTER CONSTRUCTION 11. OPERATIONS AND MAINTENANCE

Note: **All** stormwater construction projects **must submit** a Stormwater Management Plan (SMP). However, not every element listed below (see the Stormwater Management Plan Table) is required per the RISDISM and the RIPDES Construction General Permit (CGP). This checklist will help you identify the elements of the stormwater plan you are required to submit with your permit application.

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

☐ RESIDENTIAL	X COMMERCIAL	☐ FEDERAL	☐ RETROFIT	☐ RESTORATION
X ROAD	X UTILITY	X FILL	☐ DREDGE	☐ MINE

☐ OTHER: (please explain)	
SITE INFORMATION	
X VICINITY MAP	
X EXISTING ZONING	
DISCHARGE LOCATION: The WQv discharges to: (you may choose more than one answer if there are several discharge points on the project) (Guidance to identify receiving waters)	
☐ GROUNDWATER	GROUNDWATER ☐ GAA ☐ GA ☐ GB
X SURFACE WATER	☐ ISOLATED WETLAND ☐ NAMED WATERBODY X UNNAMED WATERBODY CONNECTED TO NAMED WATERBDY
☐ MS4	☐ RIDOT ☐ RIDOT ALTERATION PERMIT IS APPROVED ☐ TOWN ☐ OTHER:_____
RECEIVING WATER INFORMATION: (check all that apply and *repeat* this row for each waterbody)	
THE WATER QUALITY VOLUME DISCHARGES TO: ☐ N/A (discharges to: CSO, Disconnected wetland or Groundwater) WATERBODY NAME:__Iron Mine Brook_____ WATERBODY ID: _RI0001002R-06_____ IMPAIRMENTS: _____ ☐ TMDL FOR: _____ ☐ CONTRIBUTES TO A PRIORITY OUTFALL LISTED IN THE TMDL	☐ IMPAIRED (303(d) LIST) ☐ SRPW ☐ COLDWATER ☐ WARMWATER X UNASSESSED ☐ 4TH ORDER STREAM ☐ POND OF 50 ACRES OR MORE ☐ KNOWN HISTORY OF REPETITIVE FLOODING (i.e. Pocassett River) ☐ CONTRIBUTES STORMWATER TO A PUBLIC BEACH ☐ CONTRIBUTES TO SHELLFISHING GROUNDS
PROJECT HISTORY:	
X PRE-APPPLICATION MEETING DATE: __Oct. 2016_____	☐ MINUTES ARE ATTACHED
☐ RIDEM GRANT FUNDING INVOLVED	GRANT SOURCE:_____
☐ TOWN MASTER PLAN APPROVAL DATE: _____	☐ MINUTES ARE ATTACHED
☐ SUBDIVISION SUITABILITY REQUIRED	APPROVAL #: _____
☐ PREVIOUS ENFORCEMENT ACTION HAS BEEN TAKEN ON THIS PROPERTY	ENFORCEMENT # _____

FRESHWATER WETLANDS JURISDICTION: X **FEMA FLOODPLAIN FIRMETTE HAS BEEN REVIEWED** ☐ CALCULATIONS ARE PROVIDED FOR CUT/FILL PROPOSED ANYWHERE WITHIN THE 100-YR FLOODPLAIN ☐ RESTRICTIONS OR MODIFICATINS ARE PROPOSED TO THE FLOWPATH OR VELOCITIES IN A FLOODWAY. ☐ FLOODPLAIN STORAGE CAPACITY IS IMPACTED	AMOUNT OF FILL: _____(CY) AMOUNT OF CUT: _____(CY) Access road fills in a portion of the floodplain but an area next to the road was cut to compensate for this encroachment.
CRMC JURISDICTION ☐ THIS PROJECT REQUIRES A CRMC PERMIT ☐ THE PROPERTY IS SUBJECT TO A SPECIAL AREA MANAGEMENT PLAN ☐ SEA LEVEL RISE MITIGATION WAS DESIGNED INTO THIS PROJECT	
MINUMUM STANDARD 8: LUHHPL IDENTIFICATION	
OFFICE OF WASTE MANAGEMENT (OWM) ☐ THERE ARE KNOWN OR SUSPECTED RELEASES OF HAZARDOUS MATERIAL AT THE SITE ☐ THIS SITE IS ON THE LIST OF CERCLA and STATE SITES in RI	OWM CONTACT: _____ ☐ SITE ID#:_____
STORMWATER INDUSTRIAL PERMITTING X THERE ARE EXISTING OR PROPOSED ACTIVITIES THAT ARE CONSIDERED LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPLS) (see Table 3-2) X CONSTRUCTION IS PROPOSED ON A SITE THAT IS SUBJECT TO THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS. ☐ ADDITIONAL STORMWATER TREATMENT IS REQUIRED BY THE MSGP	ACTIVITIES: (SE) Electric Power Generation Natural Gas SECTOR: 01 MSGP PERMIT #: RIR500000 EXPLAIN ADDITIONAL TREATMENT: ____ _____

MINIMUM STANDARD 6. REDEVELOPMENT (*Required calculation for all construction projects)

☐ PRE-CONSTRUCTION IMPERVIOUS AREA		TOTAL IMPERVIOUS AREA **(TIA)** = _____
☐ CALCULATE THE SITE SIZE SITE SIZE **(SS)** = **(TSA)** – **(JW)** – **(CL)** = _____		TOTAL SITE AREA **(TSA)** = _____ JURISDICTIONAL WETLANDS **(JW)**: _____ CONSERVATION LAND **(CL)** = _____
(TIA)/(SS) = _____	**(TIA)/(SS)** IS **>** 0.4) ☐ YES (REDEVELOPMENT) (address minimum standards 3 and 7-11)	**(TIA)/(SS)** IS **<** 0.4) X NO (NEW DEVELOPMENT) (all standards must be addressed)

PART 2: MINIMUM STANDARD 1

LOW IMPACT DEVELOPMENT ASSESSMENT

(**NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS**) – You may delete this section if it is not required

State Law requires the use of low impact-design techniques as the primary method of stormwater control to the maximum extent practicable. LID is intended to maintain or replicate predevelopment hydrology through the use of site planning, source control, and small-scale practices integrated throughout the site to prevent, infiltrate, and manage runoff as close to its source as possible. Non-structural LID techniques to Avoid and Reduce the stormwater impacts of development shall be explored as a first priority before LID structural practices are planned to Manage stormwater as part of a comprehensive LID approach.

The applicant must document specific LID Site Planning and Design Strategies applied for the project (see Manual Chapter Four and the *RI Low Impact Development (LID) Site Planning and Design Guidance Manual* for more details regarding each strategy). This checklist is designed to guide the required documentation of the site planning process, and to ensure that the proposed project is consistent with and taking advantage of LID strategies required or allowed in the municipality where the project is proposed. Included within this checklist are specific LID techniques (and practices) taken from the *RI Low Impact Development (LID) Site Planning and Design Guidance Manual* that a municipality may require or allow.

If a particular strategy is not used or not applicable, a written description of why a certain method is not used or applicable at the site must be provided. Appropriate answers may include such statements as:

- Town requires XXX (state the specific local requirement)
- Meets Town's dimensional requirement of XXXXX.
- Not practical for site because XXXXXX.
- Applying for waiver/variance to achieve this (pending; was approved; was denied)
- Applying for wavier/variance to seek relief from this (pending; approved; denied)

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS AND FLOODPLAINS	***IF NOT IMPLEMENTED - EXPLAIN HERE***
X Sensitive resource areas and site constraints are identified (required)	
X Local development regulations have been reviewed (required)	
☐ All vegetated buffers and coastal and freshwater wetlands have been designed to be protected during and after construction	
X Conservation Development or other site design technique to protect open space and pre-development hydrology; [NOTE: If this technique has been used, check box and skip to **c**.]	
☐ Maintain as much natural vegetation and pre-development hydrology as possible	
B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS	***IF NOT IMPLEMENTED - EXPLAIN HERE*** **This is a LUHPPL Project**
☐ Building envelopes/ development sites directed away from wetlands/waterbodies	
☐ Development and stormwater systems are located in areas with greatest infiltration capacity (e.g., soil groups A and B.	
☐ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's)	
☐ Building envelopes/ development sites are directed away from floodplains	
☐ Site designed to locate buildings, roadways and parking to avoid impacts to surface water features.	
☐ Building envelopes/ development sites directed away from steep slopes (≥15%)	
☐ Other:	
C) MINIMIZE CLEARING AND GRADING	***IF NOT IMPLEMENTED - EXPLAIN HERE***
X Site clearing restricted to <u>minimum area needed</u> for building footprints, development activities, construction access and safety.	
X Site designed to locate buildings, roadways and parking to minimize grading (cut and fill quantities)	
X Protection for stands of trees and individual trees and their root zones to be preserved is specified and such protection extends at least to the drip line	
☐ Notes on plan specify that public trees that are removed or damaged during construction shall be replaced with equivalent.	**This is Private Property**

D) REDUCE IMPERVIOUS COVER	***IF NOT IMPLEMENTED - EXPLAIN HERE***
X Reduce roadway widths (≤22 feet for ADT ≤ 400; ≤ 26 feet for ADT 400-2,000)	**This is a industrial power generation facility. Road widths are set to accommodate full range and size of vehicles up to and including semi trailer trucks.**
☐ Reduce driveway areas (length minimized via reduced ROW width (≤ 45 ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to ≤ 9 ft. wide one lane; ≤ 18 ft. wide two lanes; shared driveways; pervious surface)	
X Reduced building footprint: Explain approach	**Limited powerblock area**
X Reduce sidewalk area (≤ 4 ft. wide; one side of the street; unpaved path; pervious surface)	**None proposed**
X Reduce cul-de-sacs (radius < 45 ft; vegetated island; alternative turn-around)	**None proposed**
☐ Reduced parking lot area: Explain approach	
X Pervious surfaces (driveways, sidewalks, parking areas/overflow parking area)	**LUHPPL Site**
☐ Maximum Impervious Surface (project meets or is less than the maximum specified by the Zoning Ordinance	
☐ Other (describe):	
E) DISCONNECT IMPERVIOUS AREA	***IF NOT IMPLEMENTED - EXPLAIN HERE***
☐ Impervious surfaces have been disconnected and runoff has been diverted to QPAs to the maximum extent possible	**LUHPPL Site**
☐ Residential street edges allow side-of-the-road drainage into vegetated open swales	
☐ Parking lot landscaping breaks up impervious expanse AND accepts runoff	
☐ Other:	
F) MITIGATE RUNOFF AT THE POINT OF GENERATION	***IF NOT IMPLEMENTED - EXPLAIN HERE***
X Small-scale BMPs have been designated to treat runoff as close as possible to the source	**Dry Swale**
G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION	***IF NOT IMPLEMENTED - EXPLAIN HERE***
X Low-maintenance landscaping is proposed using native species and cultivars	
X Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on the site plan	
☐ Lawn areas have been limited and/or minimized and yards have been kept undisturbed to the maximum extent on residential lots	
H) RESTORE STREAMS/WETLANDS	***IF NOT IMPLEMENTED - EXPLAIN HERE***
☐ Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands.	**N/A no historical drainage patterns**
☐ Removal of invasive species	**No invasive species**
X Other	**Removed flow restrictions from existing culverts**

PART 3: SUMMARY OF REMAINING STANDARDS

Minimum Standard 2: Groundwater Recharge

☐ YES ☒ NO The project has been designed to meet the groundwater recharge standard.

If No, please explain the justification for groundwater recharge criterion waiver (i.e. threat of groundwater contamination, or physical limitation), if applicable (see Section 3.3.2);

Please describe your waiver request __

LUHHPL Site

☐ YES ☒ NO Is this site listed as a CERCLA or contaminated site?, if yes?

☐ YES ☐ NO Has any part of the site been approved for infiltration by the Office of Waste Management? (see Subsurface Contamination Guidance)

☐ YES ☐ NO Is there an ELUR on the property?

TABLE 2-1: Summary of Recharge (see Manual section 3.3.2)

Subwatershed	Total Re_v Required (Acre-ft)	LID Stormwater Credits (Manual see Section 4.6.1)		Recharge Required by Remaining BMPs (acre-ft)	Recharge Provided by BMPs (acre-ft)
		Impervious volume directed to a QPA (acre-ft)	Recharge Credit Applied (acre-ft)		
DP-1: Point B	0.0187	N/A	N/A	0	0.024
DP-2: Point C	0.0123	N/A	N/A	0	0.049
DP-3:					
DP-4:					
Totals:	0.031	N/A	N/A	0	0.073

**Note: Only BMPs listed in Manual Table 3-5, List of BMPs Acceptable for Recharge may be used to meet the recharge requirement.*

☒ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e. name of report/document, page numbers);

Appendix C - Sections 3 & 4

Minimum Standard 3: Water Quality

X YES ☐ NO Does this project meet or exceed the required water quality volume WQv (see section 3.3.3)?

× YES ☐ NO Is the proposed final impervious cover is greater than 20% of the disturbed area (see section 3.3.3)?

☐ If yes, the Spit Pervious/Impervious method in Hydro-Cad was used to calculate WQv, or

☒ If yes, TR-55 or TR-20 was used to calculate WQv, and

☐ If no, the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.

X YES ☐ NO Does this project meet or exceed the ability to treat required water quality flow WQf(see section 3.3.3.2)?

☐ YES X NO Is there an increase of impervious cover to a receiving water body with impairments?

If yes, please indicate below the method that was used to address the water quality requirements of no further degradation to a low quality water.

☐ RISDISM section H.3 Pollutant Loading Analysis

☐ The Water Quality Guidance Document (Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters)

☐ YES X NO BMPs are proposed that are on the approved technology list if yes, please provide all of the required worksheets from the manufacturer.

☐ YES X NO Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP or other watershed-specific requirements; If yes, please describe:

_____

_____

_____

TABLE 3-1: Summary of Water Quality (see Manual section 3.3.3)

Subwatershed	Total WQ_v Required (Acre-ft)	LID Stormwater Credits (Manual see Section 4.6.1)		Water Quality Treatment Remaining (acre-ft)	Water Quality Provided by BMPs (acre-ft)
		Impervious volume directed to a QPA (acre-ft)	Water Quality Credit Applied (acre-ft)		
DP-1: Point A	1.376	N/A	N/A	0.121	1.497
DP-2: Point B	0.075	N/A	N/A	0.024	0.094
DP-3: Point C	0.049	N/A	N/A	0	0.049
DP-4:					
Totals:	1.500	N/A	N/A	0.145	1.640

**Note: Only BMPs listed in Chapter 5 of the Manual or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.*

X YES ☐ NO This project has met the setback requirements for each BMP. If no, please explain

_____

_____

_____

☒ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e. name of report/document, page numbers);

Appendix C - Sections 3 & 4

Minimum Standard 4: Conveyance and Natural Channel Protection (3.3.4)

☐ YES X NO Is this standard waived? If yes, please check indicate one or more of the reasons below:

- ☐ The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for State-wide list and map of stream order), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
- ☐ The project directs is a small facility with impervious cover of less than or equal to 1 acre.
- ☐ The project has a post-development peak discharge rate from the facility that is less than 2 cfs for the 1-year, 24-hour Type III design storm event (prior to any attenuation). (**NOTE:** *LID design strategies can greatly reduce the peak discharge rate)*

X YES ☐ NO Conveyance and natural channel protection for the site have been met.

If no, explain why _____

_____

TABLE 4-1: Summary of Channel Protection Volumes (see Manual section 3.3.4)

Drainage Point	Receiving Water Body Name	Coldwater Fishery? Y/N	Total CPv Required (acre-ft)	Total CPv Provided (acre-ft)	Release Rate Modeled in the 1-yr storm (cfs)
DP-1:	Iron Mine Brook	N	5.97	4.31	2.57
DP-2:	Iron Mine Brook	N	0.61	0.11	0.26
DP-3:					
DP-4:					
Totals:			6.58	4.42	2.83

X YES ☐ NO The CPv is released at roughly a uniform rate over a 24-hour duration (see example sizing calculations in Appendix D of the RISDISM).

☐ YES X NO Do additional design restrictions apply resulting from any discharge to cold water fisheries;

If yes, please indicate restrictions and solutions

_____

_____

X Indicate below where the pertinent calculations and/or information for the above items are provided (i.e. name of report/document, page numbers);

Minimum Standard 5: Overbank Flood Protection (3.3.5) (and other potential high flows)

☐ YES X NO Is this standard waived? If yes, please check indicate one or more of the reasons below:

- ☐ The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for State-wide list and map of stream order), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
- ☐ A Downstream Analysis (see section 3.3.6), indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (i.e. through coincident peaks)

☐ YES X NO Does the project flow to an MS4 system? If yes, indicate below:

☐ RIDOT ☐ Other _____

(**NOTE**: *your project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** than pre-volumes for the 10-yr storm at the design point entering the RIDOT system).* If you have not already received approval for the discharge to an MS4, please explain your strategy to comply with RIDEM and the MS4.

_____
_____
_____

X YES ☐ NO Did you use a model for your analysis, if yes, indicate below

☐ TR-55 X TR-20 X Hydrocad ☐ Other _____

X YES ☐ NO Does the hydrologic model demonstrate that flows from the 100-year event will be safely conveyed to a control practice designed to manage the 100-year event? If no, please explain

_____
_____

X YES ☐ NO Do off-site areas contribute to the subwatersheds and design points? If yes,

X YES ☐ NO Are the areas modeled as "present condition" for both pre- and post-development analysis

X YES ☐ NO Are the off-site areas are shown on the subwatershed maps

X YES ☐ NO Does the hydrologic model confirm safe passage of the 100-year flow through the site for off-site runoff;

X YES ☐ NO Is a Downstream Analysis required? (see Manual Section 3.3.6):

Please calculate the following:

Area of disturbance within the sub-watershed (areas) 35.14

Impervious cover (%) 51.8

☐ YES X NO Is a dam breach analysis required (earthen embankements over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam?

X YES ☐ NO Does this project meet the overbank flood protection standard?

Table 5-1 Hydraulic Analysis Summary

Subwatershed (design point)	1.2" Peak Flow Pre (cfs)	Post (cfs)	1-yr Peak Flow Pre (cfs)	Post (cfs)	10-yr Peak Flow Pre (cfs)	Post (cfs)	100-yr Peak Flow Pre (cfs)	Post (cfs)
DP-1: Point A	0.39	1.30	6.5	6.44	20.16	18.29	46.68	40.42
DP-2: Point B	2.12	1.52	28.94	24.02	86.73	74.75	197.47	174.13
DP-3: Point C	0.17	0.3	2.89	2.88	9.01	8.29	20.85	18.29
DP-4: Point F	0.26	0.14	4.23	2.27	13.08	7.01	30.37	16.28
DP-5: Point D	2.72	2.65	45.55	44.54	140.96	137.55	327.06	319.56
Totals:	5.66	5.91	88.11	80.15	269.94	245.89	622.43	568.68

X Indicate below where the pertinent calculations and/or information for the above items are provided (i.e. name of report/document, page numbers);

- ✓ Existing condition analysis for each subwatershed, including (curve numbers, times of concentration, runoff rates, volumes, and water surface elevations showing methodologies used and supporting calculations);

  Appendix C - Section 11

- ✓ Proposed condition analysis for each subwatershed, including (curve numbers, times of concentration, runoff rates, volumes, water surface elevations, and routing showing the methodologies used and supporting calculations);

  Appendix C – Section 12

- ✓ Final sizing calculations for structural stormwater BMPs including, contributing drainage area, storage, and outlet configuration;

  Appendix C - Section 6

- ✓ Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities);

  Appendix C – Section 12

Table 5-2 Summary of Best Management Practices

DP No.	BMP ID.	BMP Type (i.e. bioretention or tree filter)	BMP Functions (acre-ft)				Overbank Flood Reduction	Internal Bypass	Horizontal Setback Criteria Met	
			Pre-treatment (volume)	Re_v	WQ_v	CP_v	Y/N	Y/N	Distance (ft)	From constraint (i.e. private well or foundation)
A	2P & 3P	Gravel WVTS	0.14	0	1.24	5.23	Y	Y	N/A	N/A
B	15R & 25R	Dry Swales	0	0	0.07	0.28	Y	N	588’	Building
C	18R & 20R	Dry Swales	0	0	0.05	0.55	Y	N	184’	Private Water Well
		TOTAL:	0.14	0	1.36	6.06				

Table 5-3 Summary of Soils to evaluate each BMP

DP No.	BMP ID.	BMP Type (i.e. bioretention or tree filter)	Soils Analysis for Each BMP						
			Primary Test Pit ID #	Secondary	Top of Filter Elevation (ft)	SHWT Elevation (ft)	Separation Distance (ft)	Hydrologic Soil Group A,B,C or D	Exfiltration Rate Applied (in/hr)
1	3P	GWVTS	N/A		N/A	N/A	N/A	D	N/A
2	18R 20R	Dry Swale	TP-3		530.16	531	-0.84	D	0.9
3	15R 29R	Dry Swale	TP-5		548.1	542	6.1	D	0.1
		TOTAL:							

Minimum Standard 7: (questions are now asked in Minimum Standard 10 and 11)

Minimum Standard 8: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

X YES ☐ NO Are there any existing activities or land uses proposed that would be considered LUHPPLs (see Manual Table 3-2)? If yes, please describe. If no, you may continue on to Minimum Standard 9:

Electric Power Facility

☐ YES X NO Are these activities already covered under an MSGP? If, no please explain if you have applied for an MSGP, or intend to do so?

_____

_____

X YES ☐ NO ☐ List the specific BMPs that are proposed for this project that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in Manual Table 3-3, "Acceptable BMPs for Use at LUHPPLs";

Please list BMPs Lined Gravel WVTS

☐ Additional BMPs, or additional pretreatment BMP's if any, that meet RIPDES MSGP requirements;

Please list BMPs _____

☐ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e. name of report/document, page numbers);_____

_____

Minimum Standard 9: Illicit Discharges

☐ YES ☐ NO Have you checked for illicit discharges? N/A

☐ YES ☐ NO Have any been found and/or corrected? If yes, please identify

_____

X YES ☐ NO Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

Minimum Standard 10 Soil Erosion and Sediment Control

X YES ☐ NO Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?

X YES ☐ NO Did you provide a separately bound document based upon the SESC Template? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed). If no, include a document with your submittal that addresses the following:

Elements of a SESC Plan:

☐ Soil Erosion and Sediment Control Plan project narrative including a description of how the fifteen (15) Performance Criteria have been met:

- ☐ Provide Natural Buffers and Maintain Existing Vegetation;
- ☐ Minimize Area of Disturbance;
- ☐ Minimize the Disturbance of Steep Slopes;

☐ Preserve Topsoil;
☐ Stabilize Soils;
☐ Protect Storm Drain Inlets;
☐ Protect Storm Drain Outlets;
☐ Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures;
☐ Establish Perimeter Controls and Sediment Barriers;
☐ Divert or Manage Run-On from Up-Gradient Areas;
☐ Properly Design Constructed Stormwater Conveyance Channels;
☐ Retain Sediment On-Site;
☐ Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows;
☐ Apply construction Activity Pollution Prevention Control Measures;
☐ Install, Inspect, and Maintain Control Measures and Take Corrective Actions.

☐ Qualified SESC plan preparer's information and certification;
☐ Operator's information and certification; if not known at the time of application the operator must certify the SESC Plan upon selection and prior to initiating site activities;
☐ Description of control measures such as temporary sediment trapping and conveyance practices, including design calculations and supporting documentation, as required.

Minimum Standard 7&11: Stormwater Management System Operation, Maintenance and Pollution Prevention Plan (See section 3.2.11 and Appendices G and E for guidance)

X YES ☐ NO Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?

X YES ☐ NO Have you provided a separately bound **Operations, Maintenance and Pollution Prevention Manual** for the site and for all of the BMPs?

The (O&M and PP Plan Contains):

X YES ☐ NO Contact name, address, and phone number of the responsible party for maintenance;

X YES ☐ NO 8.5" x 11" map indicating the location of all of the proposed stormwater BMPs that will require maintenance;

X YES ☐ NO Description of routine and non-routine maintenance tasks and their frequency for required elements for each BMP;

☐ YES X NO A description and delineation of public safety features;

X YES ☐ NO An estimated operations and maintenance budget;

☐ YES X NO Minimum vegetative cover requirements;

X YES ☐ NO Access and safety for maintenance?

X YES ☐ NO Lawn, Garden and Landscape Management meet the requirements of section G.7? If not, why not?

_____

_____

☐ YES X NO Is the property owner or homeowners association is responsible for the stormwater maintenance of all BMP's?

If no, you must provide a legally binding and enforceable maintenance agreement (see Appendix E-page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Please indicate where this agreement can be found in your report: N/A

☐ YES X NO Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, and covenants).
If yes, have you obtained them? Or please explain your plan to obtain them:
_____
_____

☐ YES X NO Is stormwater being directed from public areas to private property? If yes, *(***NOTE***: this is not allowed unless there is a funding mechanism in place to provide the finances for the long-term maintenance of the BMP and drainage unless there is a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner*)
_____
_____

Pollution Prevention Section Contains:

X YES ☐ NO Designated snow stockpile locations?

X YES ☐ NO Trash racks to prevent floatables, trash and debris from discharging to waters of the state?

☐ YES X NO Asphalt only based sealants?

☐ YES X NO Pet waste stations? (**NOTE:** *if a receiving water has a bacterial impairment and the project involves housing units, this could be an important part your pollution prevention plan*)

☐ YES X NO Regular sweeping? Please describe _____

X YES ☐ NO Deicing specifications in accordance with Appendix G of the Manual. (**NOTE***: if the groundwater is GAA or this area contributes to a drinking water supply, this could be an important part of your pollution prevention plan (see Appendix G):*
_____

X YES ☐ NO A prohibition of phosphate based fertilizers? (**NOTE**: *if the site discharges to a phosphorus impaired waterbody, this could be an important part of your pollution prevention plan*)?

PART 3: SUBWATERSHED MAPPING AND SITE PLAN DETAILS

Existing and Proposed Subwatershed Mapping (REQUIRED)

X Existing and proposed drainage area delineations

- ✓ Locations, cross sections, and profiles of all streams and drainage swales and their method of stabilization;
- ✓ Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in Appendix K).
- ✓ Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable;
- ✓ Logs of borings and/or test pit investigations along with supporting soils/geotechnical report.

☐ Mapped seasonal high water table,

X Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs

X Mapped locations of the BMPs with the BMPs consistently identified on the Site Construction Plans

☐ Mapping bedrock within 3' of any BMP

☐ YES X NO Soils were logged by a:

☐ DEM-licensed Class IV soil evaluator Name: _____

☐ RI-registered PE. Name; _____

Subwatershed Summary *(add or subtract rows as necessary)*				
Subwatershed (acres to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (acres)**	**Existing Impervious (acres)**	**Proposed Impervious (acres)**
DP-1: Point A	RI0001002R-06	6.02	0	18.46
DP-2: Point B	RI0001002R-06	19.00	1.86	1.80
DP-3: Point C	RI0001002R-06	0.88	0	0.62
DP-4: Point F	RI0001002R-06	3.63	0	0
DP-5: Point D	RI0001002R-06	4.10	0	0
Totals:		33.63	1.86	20.88

Site Construction Plans (the following applicable specifications are provided)

- ✓ Existing and proposed plans (scale not greater than 1" = 40') with North arrow
- ✓ Existing and proposed site topography (with 1 or 2-foot contours). 10-foot contours accepted for off-site areas
- ✓ Boundaries of existing predominant vegetation and proposed limits of clearing;
- ✓ Site Location clarification
- ✓ Location and field-verified boundaries of resource protection areas such as:
  - ▸ freshwater and coastal wetlands, lakes, ponds,
  - ▸ coastal shoreline features
  - ▸ Perennial and intermittent streams, in addition to areas subject to storm flowage (ASSFs);
- ✓ All required setbacks (e.g., buffers, water supply wells, septic systems);
- ✓ Representative cross-section and profile drawings, notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include:
  - ▸ Location and size of the stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) must have labels that correspond to table 5-2;
  - ▸ Design water surface elevations (applicable storms);
  - ▸ Structural details of outlet structures, embankments, spillways, stilling basins, grade control structures, conveyance channels, etc.;
  - ▸ Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.);

- Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties or drainage that could be affected by work in the floodplain;
- Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting;
- Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables.

✓ Mapping of any OWM approved activities related to current/former site use areas for any known contamination and/or remedial clean-up efforts.

✓ Location of existing and proposed roads, buildings, and other structures including limits of disturbance;

- Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements;
- Location of existing and proposed conveyance systems such as grass channels, swales, and storm drains, as well as location(s) of final discharge point (wetland, waterbody);
- Cross sections of roadways, with edge details such as curbs and sidewalks;
- Location and dimensions of channel modifications, such as bridge or culvert crossings;
- Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

Exhibit 5
Email from Chuck Hobert

From: Horbert, Chuck (DEM) [mailto:chuck.horbert@dem.ri.gov]
Sent: Tuesday, September 5, 2017 2:52 PM
To: Niland, John <JNiland@invenergyllc.com>; Craig Wood <cwood@essgroup.com>; jamie.durand@powereng.com; chad.jacobs@hdrinc.com
Cc: Freeman, Nancy (DEM) <nancy.freeman@dem.ri.gov>
Subject: Application No. 17-0079; Algonquin Gas Transmission, LLC: "Clear River Energy Center"

Good afternoon,

We have completed our review of the most recently submitted wetland edge plans, and I thought that this e-mail would be the most expedient way to get our comments to you so you can incorporate them into your response to our other June 19, 2017 comments.

Note that, as discussed with Craig Wood prior to inspection, review concentrated on those new/unverified wetland flags that were within or adjacent to the currently understood limit of disturbance ("LOD"). The following pages or portions of pages on plans most recently received on August 29, 2017 were **not** reviewed: Page A2 (sheet 2 of 19); Page A3 (sheet 3 of 19); Page A5 (sheet 5 of 19); Page B1 (sheet 6 of 19); Page B2 (sheet 7 of 19; *note: flags here not considered critical, and had previously been inspected and considered adequate; Flags 2-103 to 2-105, and 2-68 to 2-60 located out of current LOD; note flag 2022d should connect to 2-102)*; Page B5 (sheet 10 of 19); Page C1 (sheet 11 of 19); Page C2 (Sheet 12 of 19; *note: Flags 2-58 to 2-61 located out of current LOD)*; Page C4 (sheet 14 of 19, *specifically flags 1-35b through 1-77b which flags an upland "island" located outside of the LOD)*; Page C5 (sheet 15 of 19, all out of LOD); Page D1 (sheet 16 of 19, all out of LOD); Page D2 (Sheet 17 of 19); Page D3 (sheet 18 of 19, *specifically flags 2-36 through 2-42, outside LOD)*; Page D4 (sheet 19 of 19, *specifically flags 1-53a through 1-69a, outside LOD)*.

All wetland flags reviewed were found to adequately depict the wetland edge, with the following exceptions:

1. Additional wetland is located northwest of flags 5-32 and 5-33, between flags 1-34, 1-35 and LOD stake 6252**.** This wetland was not flagged, but is located outside of the current LOD. It would extend the 50-foot perimeter wetland here, but not beyond the 100-foot riverbank wetland. Unless the LOD changes here, it is not critical that this additional wetland be depicted, but we recommend it be flagged nonetheless.

2. Flags 1-60d and 1-61d located NW of the laydown area both need to be moved east 20 feet to encompass additional wetland area.

3. A small additional area of forested wetland was noted west and northwest of flag 1-40, where overflow entered the swamp via an Area Subject to Storm Flowage approximately 10-feet south of flag 1-40. This wetland and ASSF is entirely outside the LOD and within the 100-foot riverbank wetland, so unless the LOD is revised it is not critical that this wetland be depicted, but we would recommend it be flagged nonetheless.

4. Flag 6-7 needs to be moved north 25-feet to encompass additional wetland.

The "5-xx" series flagging was confirmed to be contiguous to the swamp on the west side of the laydown area, but not the swamp to the east. It does have a 50-foot perimeter wetland.

The “6-xx” series flagging was confirmed to delineate a forested wetland less than 3 acres and therefore does not have a 50-foot perimeter wetland.

No additional wetland areas were noted within the project limits except as noted above.

Please feel free to contact me with any questions.

Chuck Horbert, Program Supervisor
RIDEM Office of Water Resources
Freshwater Wetlands Program
(401) 222-4700, ext. 7402