



PROJECT HICKORY  
BLUEOVAL BATTERY PARK MICHIGAN  
**STORMWATER IMPACT ANALYSIS**

February 15, 2024



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| Acronyms       |                                                             |
|----------------|-------------------------------------------------------------|
| CATL           | Contemporary Amperex Technology Co., Limited                |
| CFS            | Cubic feet per second                                       |
| CN             | Curve number                                                |
| EGLE           | Michigan Department of Environment, Great Lakes, and Energy |
| EV             | Electric vehicle                                            |
| FEMA           | Federal Emergency Management Agency                         |
| MDOT           | Michigan Department of Transportation                       |
| OCS            | Outlet control structure                                    |
| ROW            | Right-of-way                                                |
| SSA            | Autodesk Storm and Sanitary Analysis 2020                   |
| T <sub>c</sub> | Time of concentration                                       |
| USDA           | United States Department of Agriculture                     |
| USGS           | United States Geological Survey                             |



## 1.0 PROJECT NARRATIVE

The BlueOval Battery Park is a new greenfield site development project with the initial, primary space as the development area used for an Electric Vehicle Battery Manufacturing Facility by Ford Motor Company. A 731.40-acre parcel, as seen in Figure 1, has been identified on the Marshall Mega Site to develop the manufacturing facility.

Figure 1

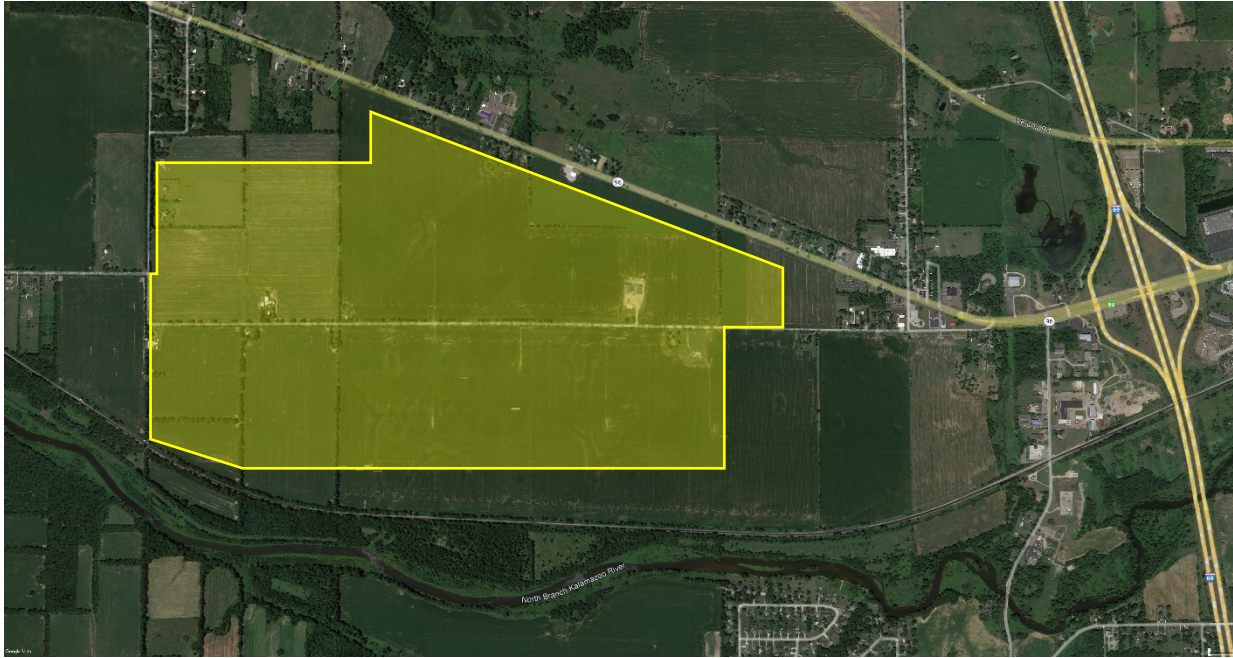


Figure 1: Approximate site area drawn and shaded in yellow.

This will include the main cell plant of approximately 2.3 million square feet, support utility buildings, internal roadways, truck access, parking lots, stormwater infiltration basins, and buffer zones.

### 1.1 Existing Conditions

The subject property is currently vacant, previously used for agriculture. Ground cover consists largely of tilled fields with minor impervious areas comprised of paving, houses, barns, sheds, and other auxiliary structures. There are no existing floodways or floodplains delineated on the property, and there are no wetlands present on the site.

The existing conditions drainage area map is provided in the site plan drawings on sheet C101.0. Existing topography divides the site into six sub-basins, with two major low points collecting runoff at the south of the site, along the northern edge of the railroad right-of-way. There are existing culverts at both locations. These existing drainage structures are in severe disrepair with highly compromised conveyance capacity. They are also outdated and undersized compared to the large amounts of

runoff directed to them. The other smaller sub-basins either drain towards the north or sheet flow south toward the river.

Existing soils classified using the United States Department of Agriculture (USDA) Web Soil Survey shows the site having a predominant hydrologic rating of Class C soils with smaller areas of Class A soils. For design purposes, a weighted curve number (CN) was calculated based on the hydrologic soil group and the existing agricultural land use. Infiltration rates were also studied at nine locations in the vicinity of the proposed infiltration basins, yielding a median infiltration rate of 0.50 inch/hour. Per the Michigan Department of Environment and Great Lakes and Energy (EGLE) stormwater requirements and the Calhoun County & Battle Creek Area Stormwater Management Program: Technical Reference Manual, an allowable infiltration rate of 0.25 inch/hour is being used for design calculations.

## 1.2 Proposed Conditions

This project proposes to remove the existing culverts and replacing with new and properly sized drainage culverts adjacent to them. These improvements are being submitted to the Michigan Department of Transportation (MDOT) and Amtrak for review and approval prior to construction.

The proposed conditions drainage area maps are provided in the site plan drawings on sheets C101.1 – C101.3. In post-development conditions, much of the runoff from sub-basins currently draining north will be redirected to flow south, towards the proposed infiltration basin. The remainder of these areas will be acquired by MDOT, and the associated runoff will be managed by the future roadway improvements to Michigan Avenue.

### 1.2.1 Temporary Stormwater

As stated, the two drainage culverts at the site's existing low points will need replacing. To temporarily manage stormwater during the construction phase while the new culverts are designed and installed, Infiltration Basin #1, an onsite permanent infiltration basin, will discharge into Infiltration Basin #2, an offsite temporary infiltration basin via a connecting drainage swale.

Infiltration Basin #2 is situated to the east of the project. All runoff up to and including the 100-year rainfall event will be captured and managed using storage provided in both Infiltration Basin #1 and Infiltration Basin #2. Infiltration Basin #2 will have an emergency spillway that discharges towards Bear Creek should rainfall exceed the 100-year storm event. Otherwise, all stormwater runoff will be entirely captured and allowed to infiltrate back into the ground using the basins provided during the temporary condition.

### 1.2.2 Permanent Stormwater

Once the new culverts at the railroad are constructed and can serve as permanent discharge points to the river, the connecting channel between Infiltration Basin #1 and Infiltration Basin #2 will be

taken offline and a permanent emergency overflow spillway will be created at Infiltration Basin #1. The eastern portion of the temporary channel will be filled in, with any denuded areas being brought to finish grade and stabilized to establish vegetation. The western portion of the temporary channel will be connected to Infiltration Basin #1 and to Culvert 2 to create a permanent channel for the emergency overflow spillway.

### **Water Quantity**

For all rainfall events up to and including the 100-year storm, runoff will be attenuated to be equal to or less than pre-development rates. The post-development condition accounts for runoff at the full buildout of the project, including any proposed impervious area that may be added in future development. Refer to the plan set for the limits of project area. Project area is considered fully developed in the current modeling calculations (CN number of 91 for urban industrial, 72% impervious with C soils).

Per EGLE requirements for point discharges into the Kalamazoo River, natural vegetative stabilization practices will be utilized to prevent erosion along the existing drainage course to the riverbank. This includes using stone, seeding, and stabilization matting downstream of the proposed stormwater conveyances.

The runoff analysis results for both analysis points are seen in Table 1. The analysis was performed for 2, 5, 10, 25, and 100-year storm events. Analysis point 1 includes both detained and un-detained runoff in the analysis. With the proposed basin, the post-development conditions have lower runoff peak discharge rates at analysis point 1. The results of the post-development modeling without the basin yield runoffs of 1,000 cfs and greater. These results illustrate the necessity of the proposed infiltration basin. Note, that because analysis point 2 is not subject to a permanent stormwater basin there is no difference in results for both post-development models. The full model results and hydrographs can be seen in Appendices A and B. Appendix B also includes separate weir calculations for the riser for each storm event that show the riser controlling the basin outflow for the 2-year, 5-year, 10-year and 25-year storm events. The 72-inch riser barrel controls flow for the 100-year storm event.

It is proposed that Infiltration Basin #2 will remain in place for future development, with the overflow spillway, if necessary, discharging to the east into Bear Creek. Therefore, a significant portion of the existing drainage area to analysis point 2 will be directed to Infiltration Basin #2 in the post-development condition.

| Table 1 Stormwater Runoff Peak Flow Analysis (cfs) |                       |         |         |         |          |
|----------------------------------------------------|-----------------------|---------|---------|---------|----------|
| Development Stage                                  | Storm Interval (year) |         |         |         |          |
| Cumulative Rainfall (inches)                       | 2.57                  | 3.38    | 3.60    | 4.30    | 5.60     |
| Pre-Development                                    | 2-year                | 5-year  | 10-year | 25-year | 100-year |
| Analysis Point 1 <sup>a</sup>                      | 95.76                 | 186.69  | 213.46  | 305.56  | 489.51   |
| Analysis Point 2 <sup>b</sup>                      | 60.38                 | 116.52  | 133.03  | 189.46  | 301.63   |
| Post-Development (no-Basin)                        | 2-year                | 5-year  | 10-year | 25-year | 100-year |
| Analysis Point 1 <sup>c</sup>                      | 1116.68               | 1632.58 | 1773.46 | 2228.55 | 3073.03  |
| Analysis Point 2 <sup>d</sup>                      | 15.50                 | 29.60   | 33.72   | 47.61   | 75.24    |
| Post-Development (With Basin)                      | 2-year                | 5-year  | 10-year | 25-year | 100-year |
| Analysis Point 1 <sup>e</sup>                      | 23.32                 | 81.40   | 105.81  | 206.38  | 435.49   |
| Analysis Point 2 <sup>d</sup>                      | 15.50                 | 29.60   | 33.72   | 47.61   | 75.24    |

Table 1: Comparison of stormwater runoff volumes (cfs) at each culvert analysis point. Analysis performed for pre-development, post-development (no basin), and post-development (with basin) conditions during the 2, 5, 10, 25, and 100-year storms.

a. From Subbasin Summary – Drainage\_Area\_3 in SSA report

b. From Subbasin Summary – Drainage\_Area\_4 in SSA report

c. From Node Summary – Infiltration\_Basin\_1 + Ditch\_Start\_East + Ditch\_Start\_West in SSA report

d. From Node Summary – Culvert\_2\_Inlet in SSA report

e. From Node Summary – 12'\_DIA\_MANHOLE in SSA report

Four of the six drainage areas included in the pre-development analysis have not been compared to post-development conditions. Those four areas were not analyzed because either there was no change in the post-development condition, or the drainage areas were greatly reduced by redirecting runoff to Infiltration Basin #1, eliminating the need for further analysis.

### **Water Quality**

To meet the City of Marshall Stormwater Management Plan requirements for stormwater treatment, dated 3-31-2016, Infiltration Basin #1 is designed to capture and infiltrate the greater of the following:

- First flush volume; the runoff from one inch of rain over the entire developed site as determined using the composite runoff coefficient for developed conditions. This is calculated as follows:
  - $VWQ = 1/12 * Am * C$ ;
  - Where:
  - VWQ = Water Quality Volume (cubic feet)

$A_m$  = Total Site Area (square feet)

$C$  = Weighted Runoff Coefficient

$$\circ \text{ VWQ} = 1/12 * 33,182,265 * 0.9 = 2,488,670 \text{ cubic feet}$$

- Channel Protection Volume (CPV); The difference between the pre-development 2-year/24-hour and post development 2-year/24-hour runoff volumes. The pre-development CN is 73 and the post-development CN is 91. From TR-55:

$$\circ \text{ Vr} = 1/12 * A * [P - (0.2 * S)]^2 / [P + (0.8 * S)]$$

Where:

$V_r$  = runoff (cf)

$A$  = Area of land use (ft<sup>2</sup>)

$P$  = rainfall (in.)

$S = (1000/CN) - 10$

$CN$  = Curve number

$$\begin{aligned} \circ \text{ Ve} &= 1/12 * 33,182,265 * [2.57 - (0.2 * 3.7)]^2 / [2.57 + (0.8 * 3.7)] = 1,675,398 \text{ cf} \\ \circ \text{ Vp} &= 1/12 * 33,182,265 * [2.57 - (0.2 * 1.0)]^2 / [2.57 + (0.8 * 1.0)] = 4,629,468 \text{ cf} \\ \circ \text{ CPV} &= V_p - V_e = 2,954,070 \text{ cubic feet} \end{aligned}$$

The Infiltration Basin #1 outlet structure riser is designed to treat the CPV with an outlet elevation set at 900.80' with a cumulative storage volume of 3,671,540 cubic feet at that elevation.

Infiltration test results have been provided in a letter from SME dated August 9, 2023. Six test pits and four infiltration tests were taken at Infiltration Basin #1. Test results varied widely with some results less than ¼ inches/hour and others greater than 10 inches/hour. Given the widely varying test results and the very large basin size, the assumed infiltration is conservatively selected to be 0.25 inches/hour. This rate is consistent with the USGS hydrologic group C soils where the basin is constructed. The Calhoun County Stormwater Management Program: Technical Resource Manual (TRM), dated May 2020, allows for underdrains to be used when the infiltration rate is less than 0.4 inches/hour to dewater the basin within 48 hours. An underdrain dewatering calculation is provided in Appendix I. The underdrain design flow is controlled by a 6-inch sand layer above the underdrain. The permeability of the sand is assumed to be 16 ft/day (8 in/hr). The resulting requirement for the length of the underdrain is 2,326 linear feet.

### 1.2.3 Stormwater Conveyance

Stormwater runoff from rooftops, roads, parking lots, and open spaces will be collected into a series of stormwater conveyance systems including open channels, curb-and-gutter, catch basins, pipe networks, and deep stormwater trunk lines, which ultimately discharge into Infiltration Basin 1. The stormwater pipe network is designed to convey the 10-year storm event within the of pipe. Channels and ditches are designed to contain the 25-year storm within the top of bank. The 25-year storm will also be retained within catch basin structures. The stormwater conveyance calculations include the



analysis of numerous catchment areas for each structure. A summary of the Autodesk Storm and Sanitary Analysis (SSA) model results for stormwater conveyance are located in Appendix C.

The results for inflow into Infiltration Basin #1 from the stormwater conveyance calculations vary from the results of the permanent stormwater calculations. This result is expected, given the numerous catchment areas used for the stormwater conveyance analysis and the resulting differences in times to peak at the study point. The analysis method used for permanent stormwater results in higher peak flows and is appropriately conservative for sizing of the infiltration basin.

### 1.3 Hydraulic Analysis at Wetland W-4

Analysis Point 1 is located approximately 500 feet upslope from Wetland W4. Additional runoff accumulating between Analysis Point 1 and Wetland W4 was determined to be negligible. The post-development condition with the basin was used for the analysis. Cross sections were taken at 100-foot intervals in the natural channel between Analysis Point 1 and Wetland W4. Wetland W4 is located approximately at cross section 1+00, as shown in Appendix J.

Manning's Equation was used to determine the hydraulic condition at Wetland W4 for the 2-year, 10-year, 25-year and 100-year, 24-hour storm events as detailed in reports provided to EGLE. Results are summarized in Table 2. It should be noted that Wetland W4 is in the Kalamazoo River FEMA 100-year floodplain and the hydraulic conditions at the wetland for the 100-year storm interval are controlled by the flood event, which is not included in this analysis. The allowable velocity in a grass lined channel is typically 5-8 ft/s depending on soil type and grass cover (Table 8-4 of USDA NRCS Part 654 Stream Restoration Design National Engineering Handbook). Based on the results provided in Table 2, the velocities at Wetland W4 are non-erosive for all analyzed storm events.

| Table 2 Hydraulic Condition at Wetland W4 |                 |                   |                 |
|-------------------------------------------|-----------------|-------------------|-----------------|
| Storm Interval (year)                     | Discharge (cfs) | Normal Depth (in) | Velocity (ft/s) |
| 2-year                                    | 23.32           | 4.1               | 1.46            |
| 10-year                                   | 105.81          | 7.3               | 2.65            |
| 25-year                                   | 206.38          | 10.0              | 3.44            |
| 100-year                                  | 448.17          | 13.0              | 4.62            |

Table 2: Hydraulic condition at Wetland W4 for the 2-year, 10-year, 25-year, and 100-year using Manning's equation.

## 2.0 MODELING VARIABLES

The hydrologic and hydraulic analysis was performed in Autodesk Storm and Sanitary Analysis 2020 (SSA). The modeling considered the existing topography, land cover, soil conditions, and storm patterns for the project site.

Based on existing topography, the pre-development site was divided into six subbasins. The post-development site was divided into five subbasins based on preliminary grading and use. The proposed developed area, the proposed infiltration basin area, the offsite undeveloped area, and culvert 1 rail crossing were all assigned individual subbasins. These areas can be seen in the stormwater plan submittal set. These drawings were then imported into SSA for modeling.

### 2.1 Time of Concentration (Tc)

The time of concentration is the sum of travel time through the upstream reaches. For this modeling, TR-55 was used which utilizes the following formula:  $T_c = \frac{[0.007(nL)^{0.8}]}{(P_2^{0.5}S^{0.4})}$

#### 2.1.1 Permanent Stormwater Analysis Methodology

In Civil 3D, the Tc path was drawn according to the contours and longest path within the subbasin to its drain. This length was entered into the respective SSA subbasin properties. Slope of the line was determined by identifying the elevations at the beginning and end of the Tc path. To increase accuracy, subareas were created along this Tc path by providing different line lengths and slopes in areas of significant grade change.

TR-55 method contains different flow types for its Tc path: sheet flow, shallow concentrated flow, and channel flow. Per the USDA “TR 55 Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)” document, flow length for sheet flow can only be 100 feet maximum. After the first 100 feet, the path lengths and slope were calculated using the shallow concentrated flow tab.

Additionally, the Tc analysis requires a storm input. For this modeling, a 2-year, 24-hour storm was used. Based on the storm, slope, and length inputs, SSA uses the TR-55 Tc calculation to output a Tc time. For subbasins divided into Tc subareas, these times are summed to generate a Tc time for the entire subbasin. These inputs are represented in Figure 2 below:

Figure 2

The figure displays two screenshots of the SSA subbasin Tc input menu. The left screenshot shows the 'Physical Properties' tab with 'SCS TR-55 TOC' selected. The right screenshot shows the 'Curve Number' tab with 'SCS TR-55 TOC' selected. Both screenshots show a table of subbasins with columns for Subbasin ID, Area, Peak Rate Factor, Wt. CN, TOC, and Rain Gage ID.

| Subbasin ID /     | Area    | Peak Rate Factor | Wt. CN | TOC   | Rain Gage ID |
|-------------------|---------|------------------|--------|-------|--------------|
| 1 Drainage_Area_1 | 48.760  | 484              | 73.00  | 23.62 | 24hr2yr      |
| 2 Drainage_Area_2 | 56.230  | 484              | 73.00  | 37.83 | 24hr2yr      |
| 3 Drainage_Area_3 | 452.080 | 484              | 74.08  | 98.88 | 24hr2yr      |
| 4 Drainage_Area_4 | 206.820 | 484              | 74.56  | 68.11 | 24hr2yr      |
| 5 Drainage_Area_5 | 63.550  | 484              | 73.00  | 41.93 | 24hr2yr      |
| 6 Drainage_Area_6 | 31.810  | 484              | 73.00  | 44.72 | 24hr2yr      |

Figure 2: SSA subbasin Tc input menu. The input storm, lengths, and slopes yield a total Tc for the site. Flow is designated as sheet flow for the first 100 feet of the path and then shallow concentrated flow for the remainder.

All assigned Tc values can be seen in Appendices A and B.

## 2.1.2 Stormwater Conveyance Analysis Methodology

The TR-55 minimum Tc of 6 minutes is assumed for the smaller catchment areas within the project areas that have been graded, which are largely impervious. For larger areas of future development and for offsite areas, a Tc of 10 minutes or 20 minutes was assumed based on the size of the catchment.

## 2.2 Curve Number (CN)

The curve number is a dimensionless variable used in predicting stormwater runoff for a drainage basin. This number is dependent on hydrologic soil group, soil condition, and land use.

### 2.2.1 Permanent Stormwater Analysis Methodology

Each individual subbasin in SSA allow for multiple CN number inputs with a corresponding area input. SSA provides a curve number selection menu. The system provides CN numbers for all hydrologic soil groups for uses and conditions that includes developed, agricultural, and undeveloped land. The subbasin CN and CN selection menu screens can be seen in Figure 3 below:



Figure 3

**Subbasins**

General  
Subbasin ID: Drainage\_Area\_5  
Connectivity: 24hr2yr  
Rain gage: DA\_5  
Outlet node: 484  
Peak rate factor: 484

Description:

Physical Properties: SCS TR-55 TOC Curve Number

Composite curve number

|   | Area (ac) | Area (%) | Curve Number | Soil Group | Description                  |
|---|-----------|----------|--------------|------------|------------------------------|
| 1 | 63.5500   | 100.00   | 73           | B          | Small grain, contoured, Good |
| 2 |           |          |              |            |                              |
| 3 |           |          |              |            |                              |
| 4 |           |          |              |            |                              |
| 5 |           |          |              |            |                              |
| 6 |           |          |              |            |                              |

Total area: 63.550 ac Total area: 100.00 % Weighted CN: 73.00

| Subbasin ID       | Area    | Peak Rate Factor | Wt. CN | TOC   | Rain Gage ID |
|-------------------|---------|------------------|--------|-------|--------------|
| 1 Drainage_Area_1 | 48.760  | 484              | 73.00  | 23.62 | 24hr2yr      |
| 2 Drainage_Area_2 | 56.230  | 484              | 73.00  | 37.83 | 24hr2yr      |
| 3 Drainage_Area_3 | 452.080 | 484              | 74.08  | 98.88 | 24hr2yr      |
| 4 Drainage_Area_4 | 206.820 | 484              | 74.56  | 68.11 | 24hr2yr      |
| 5 Drainage_Area_5 | 63.550  | 484              | 73.00  | 41.93 | 24hr2yr      |
| 6 Drainage_Area_6 | 31.810  | 484              | 73.00  | 44.72 | 24hr2yr      |

**Select Curve Number**

Select curve number from table

| Description                            | Condition | A  | B  | C  | D  | Condensed Description           |
|----------------------------------------|-----------|----|----|----|----|---------------------------------|
| 33 Crop residue (CR)                   | Good      | 74 | 83 | 88 | 90 | Fallow, crop residue, Good      |
| 34 Row crops                           |           |    |    |    |    |                                 |
| 35 Straight row (SR)                   | Poor      | 72 | 81 | 88 | 91 | Row crops, straight row, Poor   |
| 36 Straight row (SR)                   | Good      | 67 | 78 | 85 | 89 | Row crops, straight row, Good   |
| 37 SR + Crop residue                   | Poor      | 71 | 80 | 87 | 90 | Row crops, SR + CR, Poor        |
| 38 SR + Crop residue                   | Good      | 64 | 75 | 82 | 85 | Row crops, SR + CR, Good        |
| 39 Contoured (C)                       | Poor      | 70 | 79 | 84 | 88 | Row crops, contoured, Poor      |
| 40 Contoured (C)                       | Good      | 65 | 75 | 82 | 86 | Row crops, contoured, Good      |
| 41 C + Crop residue                    | Poor      | 69 | 78 | 83 | 87 | Row crops, C + CR, Poor         |
| 42 C + Crop residue                    | Good      | 64 | 74 | 81 | 85 | Row crops, C + CR, Good         |
| 43 Contoured & terraced (C&T)          | Poor      | 66 | 74 | 80 | 82 | Row crops, C&T, Poor            |
| 44 Contoured & terraced (C&T)          | Good      | 62 | 71 | 78 | 81 | Row crops, C&T, Good            |
| 45 C&T + Crop residue                  | Poor      | 65 | 73 | 79 | 81 | Row crops, C&T + CR, Poor       |
| 46 C&T + Crop residue                  | Good      | 61 | 70 | 77 | 80 | Row crops, C&T + CR, Good       |
| 47 Small grain                         |           |    |    |    |    |                                 |
| 48 Straight row (SR)                   | Poor      | 65 | 76 | 84 | 88 | Small grain, straight row, Poor |
| 49 Straight row (SR)                   | Good      | 63 | 75 | 83 | 87 | Small grain, straight row, Good |
| 50 SR + Crop residue                   | Poor      | 64 | 75 | 83 | 86 | Small grain, SR + CR, Poor      |
| 51 SR + Crop residue                   | Good      | 60 | 72 | 80 | 84 | Small grain, SR + CR, Good      |
| 52 Contoured (C)                       | Poor      | 63 | 74 | 82 | 85 | Small grain, contoured, Poor    |
| 53 Contoured (C)                       | Good      | 61 | 73 | 81 | 84 | Small grain, contoured, Good    |
| 54 C + Crop residue                    | Poor      | 62 | 73 | 81 | 84 | Small grain, C + CR, Poor       |
| 55 C + Crop residue                    | Good      | 60 | 72 | 80 | 83 | Small grain, C + CR, Good       |
| 56 Contoured & terraced (C&T)          | Poor      | 61 | 72 | 79 | 82 | Small grain, C&T, Poor          |
| 57 Contoured & terraced (C&T)          | Good      | 59 | 70 | 78 | 81 | Small grain, C&T, Good          |
| 58 C&T + Crop residue                  | Poor      | 60 | 71 | 78 | 81 | Small grain, C&T + CR, Poor     |
| 59 C&T + Crop residue                  | Good      | 58 | 69 | 77 | 80 | Small grain, C&T + CR, Good     |
| 60 Close-seeded legumes/rotated meadow |           |    |    |    |    |                                 |
| 61 Straight row                        | Poor      | 66 | 77 | 85 | 89 | Legumes, straight row, Poor     |
| 62 Straight row                        | Good      | 58 | 72 | 81 | 85 | Legumes, straight row, Good     |
| 63 Contoured                           | Poor      | 64 | 75 | 83 | 85 | Legumes, contoured, Poor        |
| 64 Contoured                           | Good      | 55 | 69 | 78 | 83 | Legumes, contoured, Good        |

Figure 3: CN selection menus. Selection is based on the soil group, soil condition, and land use.

To determine the soil group for the pre-development conditions, the soil report for the site was consulted, as seen in Appendix E. Based on the report, 86.9% of the site is comprised of soil group C. Due to this majority, and to provide a more conservative estimate, all subbasins in the pre-development modeling were assigned a curve number based on soil group C. An investigation of the site determined that the soil condition is good and that the use falls under “Cultivated Agricultural Land”, specifically the “Row Crops - C + Crop residue” as seen in Figure 3. These factors yielded a CN value of 81 for all pre-development subbasins.

The post-development CN values do not have the same values for all subbasins as the pre-development conditions do. Due to the proposed work, developed portions of the site are assumed to be C soil group, urban industrial use. This results in a CN of 91, reflecting more runoff. Another subbasin represents the proposed infiltration pond. This area will have a significant water surface and infiltration properties. Therefore, this area has been assigned a soil group of A and a use of >75% grass cover, good condition. The infiltration pond subbasin has a CN of 39. Remaining portions of the site that will be undeveloped are assigned the same properties as the pre-development subbasins.

All assigned CN values can be seen in Appendices A and B.

## 2.2.2 Stormwater Conveyance Analysis Methodology

Stormwater conveyance drainage areas are based on the proposed developed condition and are typically smaller in area. The CN values for the proposed development are based on the known land

cover and soil type. Outlying areas where future development is proposed are assumed to be C soil group, urban industrial use, resulting in an assumed CN of 91.

## 2.3 Hydrographs

The hydrograph is a visual representation of cumulative rainfall over time for a storm event. This information is dependent on location and duration of the storm event. The rainfall designer is the SSA menu to compute the subbasin storm input for modeling. The rainfall designer utilizes hydrographs, location, and desired return period.

### 2.3.1 Permanent Stormwater Analysis Methodology

This analysis used the SCS Type II 24-hour hydrographs. The highest peak discharges are usually caused by intense, brief rainfalls. The National Resource Conservation Service (NRCS) developed four rainfall distributions from local storm data. Type II is the most intense, short duration rainfall. Therefore, for conservative modeling, Type II was chosen for this model.

Figure 4 shows the source of the rainfall inputs assigned to the subbasins for both pre- and post-development modeling:

Figure 4

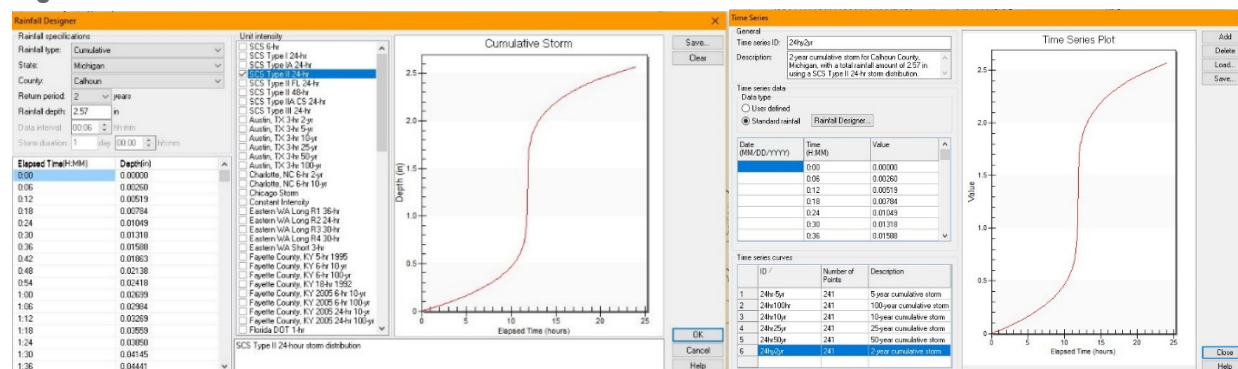


Figure 4: Rainfall designer menus. Output rainfall depth is assigned to all subbasins for both pre- and post-development conditions. SCS Type-II 24-hour selected for conservative modeling. Calhoun County, Michigan was set as the location, and 2-year was selected as the return period.

### 2.3.2 Stormwater Conveyance Analysis Methodology

The hydrograph methodology for the stormwater conveyance analysis is identical to the hydrograph methodology for the permanent stormwater analysis.

## 3.0 STORMWATER FACILITIES

### 3.1 Railroad Culvert Design

Culvert 1 and Culvert 2 will be replaced with new culverts. The proposed culverts were designed according to current Amtrak and MDOT design standards. The standards require pipes crossing under Amtrak tracks to carry the runoff from a 100-year storm. The Culvert 1 and Culvert 2 culvert replacements will be 72-inch inside diameter and made of CMP pipe, as specified by the Amtrak and MDOT design standards. This 72-inch diameter was sized to convey the 10-year storm event within the crown of the pipes, to convey the 25-year storm event below the rim elevation of the structures, and to maintain headwater for the 100-year storm below the railroad ties. Calculations for Culvert 1 and Culvert 2 are provided in Appendix F.

The length of pipes differs in Culverts 1 and 2. However, both will be installed by open-cut per Amtrak construction standards. The new culverts will be installed at the same location as the old culverts and the existing culverts will be removed.

Culvert 1 originates upstream at the proposed infiltration basin at an outlet control structure (OCS) that feeds into 201 feet of pipe sloped at 2.29% into a 12-foot diameter manhole. This manhole acts as inflow structure for the depressional area between the railroad tracks and Infiltration Basin #1 designated as Drainage Area 1-B (East & West). The culvert pipe then proceeds 117 feet at a slope of 2.06%. Culvert 1 ends at a headwall and transitions to the plunge pool. The culvert begins and terminates beyond the railway right-of-way (ROW) limits.

Culvert 2 begins and terminates ~5 feet outside of the railway ROW. This culvert is not directly connected to any permanent infiltration basin, therefore the structures starting and ending this culvert are headwalls. The culvert is 111 feet of pipe sloped at 1.45%.

### 3.2 Infiltration Basin Emergency Spillway

The TRM requires that all detention basins shall include an emergency overflow that can accommodate the 100-year peak detention basin inflow rate (i.e. 100-year peak flow calculated for developed conditions without detention). This analysis is provided for the City of Marshall and is not a requirement of MDOT or Amtrak. The analysis is for the purpose of sizing the spillway and protecting the basin embankment and the resulting flow rates are not appropriate for designing downstream culverts or other structures.

The emergency spillway for Infiltration Basin #1 is a 350-foot overflow weir on the east end of the basin connected to a channel that directs flow to Culvert 2. During the normal 100-year storm event, the maximum water surface elevation in the basin is below the spillway and no flow is directed to Culvert 2. The emergency spillway is sized to accommodate the peak flow from a 100-year storm event when the initial condition of the basin is full to the emergency spillway invert elevation (904.0'). A separate SSA model was created for this calculation and is located in Appendix H. The

spillway receiving channel calculation is also provided in Appendix H, with capacity evaluated for the 100-year un-detained storm event and erosion evaluated for the 25-year storm event.

Culvert 2 is adequately sized for the 100-year storm event. However, the HY-8 culvert calculations in Appendix F include an additional analysis of the impact beyond the standard 100-year storm event because of the emergency spillway flow being directed to Culvert 2. A separate SSA model is provided in Appendix F that calculates the peak flow through the emergency spillway for the 100-year storm event when the initial condition of the basin is full to the OCS inlet elevation (900.8'). The result is a peak flow through the spillway of 258.64 cfs, which approximates the scenario of a 1-year to 2-year storm event followed immediately by a 100-year storm event. This peak flow rate is added to the 100-year peak flow at Analysis Point 2 (75.24 cfs) and identified as the 200-year storm in the HY-8 report. The HY-8 analysis shows that Culvert 2 can adequately pass this additional storm event with 2.35 feet of freeboard to the railroad elevation.

### 3.3 Plunge Pool Sizing

Headwalls and plunge pools have been added to the outfall structures at Culverts 1 and 2. These devices will function to break up the flow regimes of the outfall pipes and their associated structures. This dispersion will more mimic the natural and historic flows through the existing channels to the Kalamazoo River channel. The minimum dimensions for each plunge pool were calculated following *USDOT FHA Hydraulic Engineering Circular No. 14, Third Edition Hydraulic Design of Energy Dissipators for Culverts and Channels* (HEC-14). The HEC-14 plunge pool calculations for both culverts are located in Appendix G.

### 3.4 Post Construction & Additional Stormwater Treatment Measures

In the permanent and final site condition, Infiltration Basin #1 will serve as the primary stormwater treatment and volume control measure. However, there are several additional stormwater control measures and practices that will be implemented throughout the site as the overall project design progresses. These additional measures will include infiltration ditches along roadways, landscape islands with bio-retention swales and sumps provided in catch basins throughout the stormwater pipe networks. These devices will provide measures of pre-treatment of the stormwater before it reaches the primary infiltration basin. They will also facilitate in an overall reduction of runoff by allowing stormwater to infiltrate into the ground.

Infiltration ditches will be constructed using grassy areas and shallow ditches that encourage stormwater infiltration. Where practical, they will be placed within the grass median of the ring-road and along the road shoulders. These infiltrating ditches will help to recharge groundwater and filter out sediment, reducing the volume and improving the quality of stormwater runoff.

Bio-retention swales will be provided throughout the parking lot landscaped islands and in some areas of the parking lot perimeter. Stormwater will be directed to sheet flow towards the bio-retention swales from the adjacent paved areas and evenly load runoff throughout the length of the device. As stormwater flows through the bio-retention swales, the soil and plants will help to remove sediments, improving the quality of the runoff before it enters the receiving groundwater. Excess flows from these areas will be captured using catch basins connected to the stormwater pipe drainage network, and ultimately conveyed to the primary infiltration basin. Bio-swales will be placed where practical in perimeter landscaped areas to aid in additional stormwater treatment, while conveying runoff to the stormwater network.

Catch basins used throughout the stormwater pipe network will have sumps provided at the base of each structure. Sumps help to provide additional storage capacity, allowing sediment to settle before the water is slowly released or directed to other treatment measures. This helps to prevent excessive stormwater runoff and minimize the transport of sediment downstream.

Collectively, these stormwater treatment measures will play a crucial role in improving the quality of stormwater runoff from the proposed buildings, parking lots, ring road, and other project areas. They aid in the removal of sediment and the recharge of groundwater. The specific design details for these measures will be developed as the project progresses and will be included in future construction drawing submittals to the City of Marshall for review and to ensure continued compliance with stormwater management regulations and standards.



**Appendix A.**  
**Autodesk Storm and Sanitary Analysis – Permanent Stormwater Existing**  
**Condition**

Project Description

File Name ..... PreDevelopment Condition\_9\_22\_2023.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 6  
Subbasins..... 6  
Nodes..... 6  
    *Junctions* ..... 0  
    *Outfalls* ..... 6  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 0  
Links..... 0  
    *Channels* ..... 0  
    *Pipes* ..... 0  
    *Pumps* ..... 0  
    *Orifices* ..... 0  
    *Weirs* ..... 0  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 24hr100yr    | Time Series | 24hr100hr      | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 2  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 3  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 4  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 5  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 6  | 24hy10yr     | Time Series | 24hr10yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |



Subbasin Summary

| SN | Subbasin<br>ID  | Area   | Peak Rate<br>Factor | Weighted<br>Curve<br>Number | Total<br>Rainfall | Total<br>Runoff | Total<br>Runoff<br>Volume | Peak<br>Runoff | Time of<br>Concentration |
|----|-----------------|--------|---------------------|-----------------------------|-------------------|-----------------|---------------------------|----------------|--------------------------|
|    |                 | (ac)   |                     |                             | (in)              | (in)            | (ac-in)                   | (cfs)          | (days hh:mm:ss)          |
| 1  | Drainage_Area_1 | 48.76  | 484.00              | 73.00                       | 2.57              | 0.61            | 29.55                     | 25.92          | 0 00:23:37               |
| 2  | Drainage_Area_2 | 56.23  | 484.00              | 73.00                       | 2.57              | 0.61            | 34.08                     | 21.85          | 0 00:37:49               |
| 3  | Drainage_Area_3 | 452.08 | 484.00              | 74.08                       | 2.57              | 0.65            | 294.30                    | 95.76          | 0 01:38:52               |
| 4  | Drainage_Area_4 | 206.82 | 484.00              | 74.56                       | 2.57              | 0.67            | 138.98                    | 60.38          | 0 01:08:06               |
| 5  | Drainage_Area_5 | 63.55  | 484.00              | 73.00                       | 2.57              | 0.61            | 38.51                     | 22.95          | 0 00:41:55               |
| 6  | Drainage_Area_6 | 31.81  | 484.00              | 73.00                       | 2.57              | 0.61            | 19.28                     | 10.94          | 0 00:44:43               |

Node Summary

| SN | Element<br>ID    | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min Freeboard<br>Peak<br>Attained | Time of<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------|
|    |                  |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                              | (days hh:mm)                      | (ac-in)                    | (min)                 |
| 1  | Analysis_Point_1 | Outfall         | 884.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 2  | Analysis_Point_2 | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 3  | DA_1             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 4  | DA_2             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 5  | DA_5             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 6  | DA_6             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |         |
|-----------------------|---------|
| Area (ac)             | 48.76   |
| Peak Rate Factor      | 484     |
| Weighted Curve Number | 73      |
| Rain Gage ID          | 24hr2yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Legumes, C&T, Poor           | 48.76   | B     | 73     |
| Composite Area & Weighted CN | 48.76   |       | 73     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

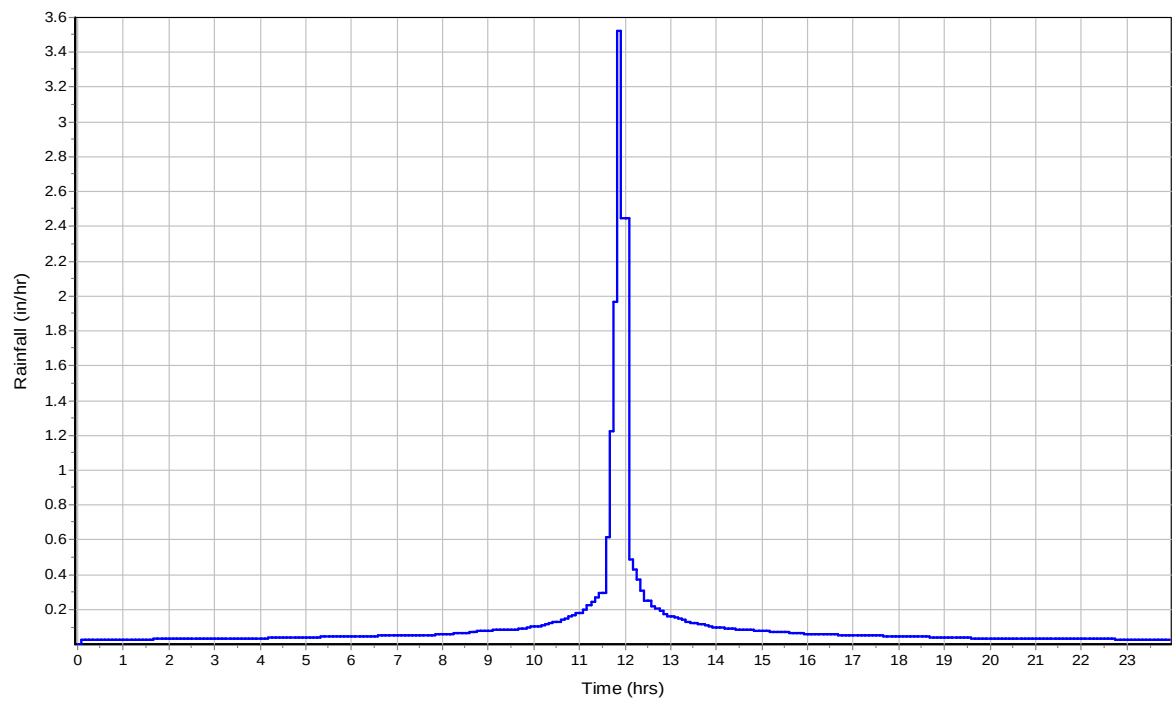
|                                        |              |              |              |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.1          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0            | 0            |
| Computed Flow Time (min) :             | 17.55        | 0            | 0            |
| Shallow Concentrated Flow Computations | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Flow Length (ft) :                     | 947          | 0            | 0            |
| Slope (%) :                            | 2.6          | 0            | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 2.6          | 0            | 0            |
| Computed Flow Time (min) :             | 6.07         | 0            | 0            |
| Total TOC (min) .....                  | 23.62        |              |              |

### Subbasin Runoff Results

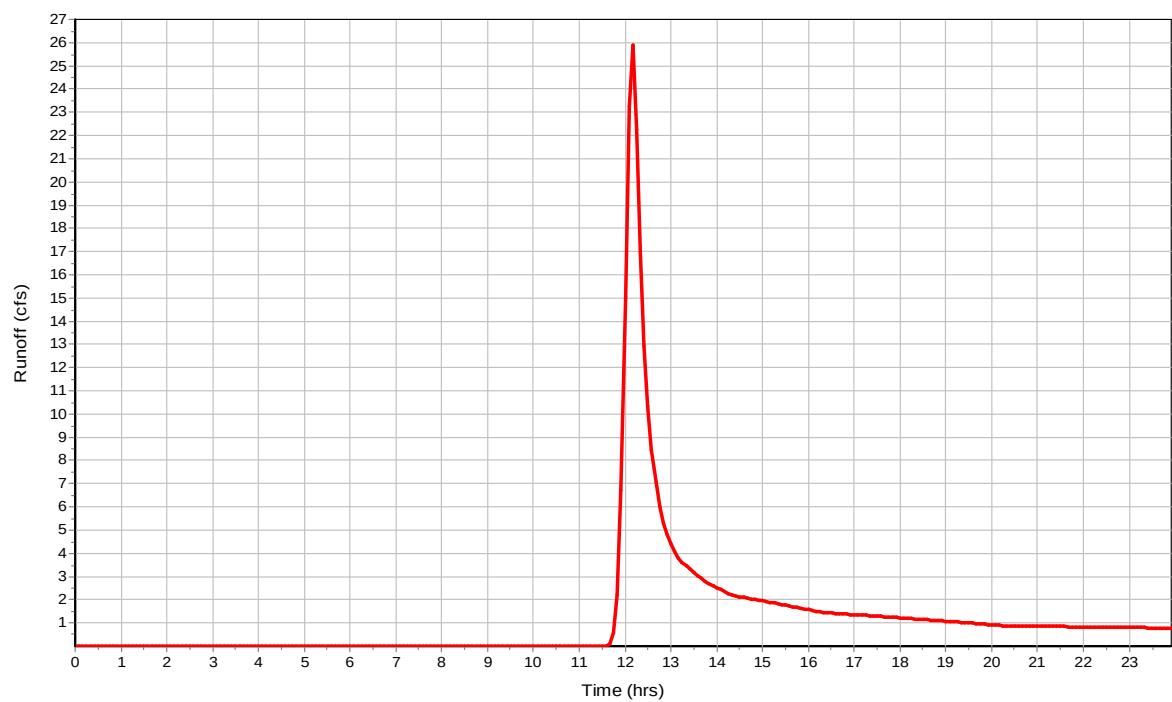
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 2.57       |
| Total Runoff (in) .....                     | 0.61       |
| Peak Runoff (cfs) .....                     | 25.92      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:23:37 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_2

Input Data

|                             |         |
|-----------------------------|---------|
| Area (ac) .....             | 56.23   |
| Peak Rate Factor .....      | 484     |
| Weighted Curve Number ..... | 73      |
| Rain Gage ID .....          | 24hr2yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Small grain, contoured, Good | 56.23   | B     | 73     |
| Composite Area & Weighted CN | 56.23   |       | 73     |

Time of Concentration

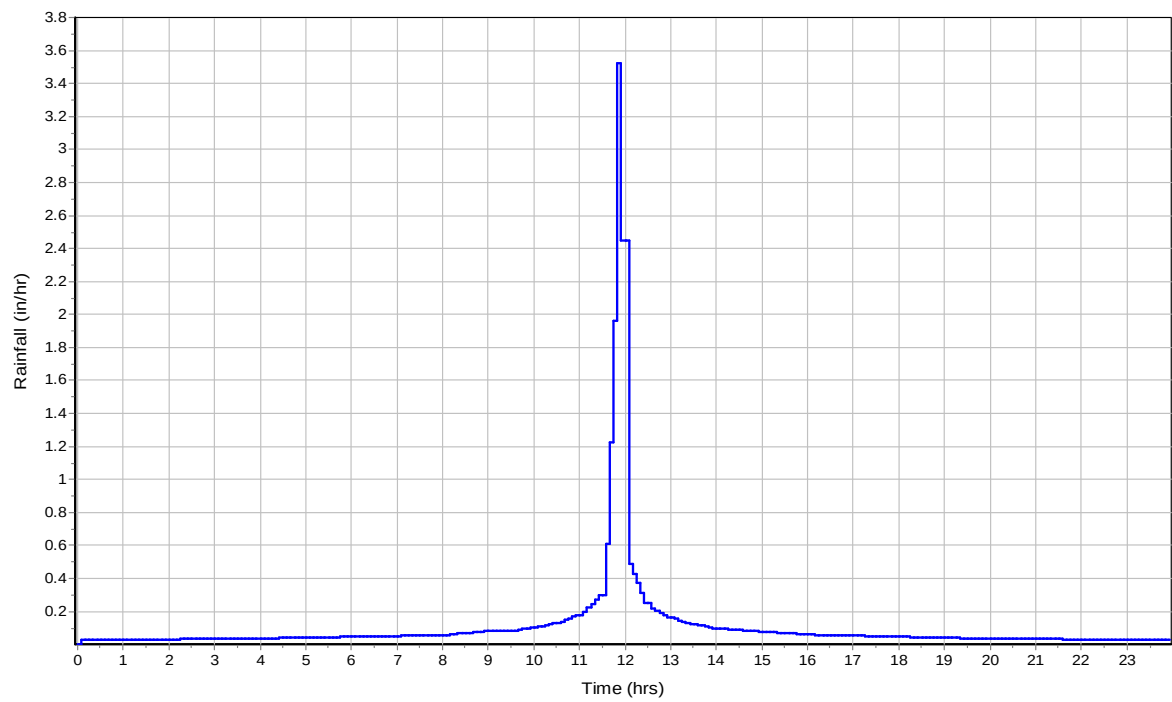
|                                        |         |         |         |
|----------------------------------------|---------|---------|---------|
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Sheet Flow Computations                |         |         |         |
| Manning's Roughness :                  | 0.06    | 0       | 0       |
| Flow Length (ft) :                     | 100     | 0       | 0       |
| Slope (%) :                            | 0.05    | 0       | 0       |
| 2 yr, 24 hr Rainfall (in) :            | 2.53    | 0       | 0       |
| Velocity (ft/sec) :                    | 0.07    | 0       | 0       |
| Computed Flow Time (min) :             | 23.15   | 0       | 0       |
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Shallow Concentrated Flow Computations |         |         |         |
| Flow Length (ft) :                     | 1198    | 245     | 0       |
| Slope (%) :                            | 0.83    | 5.4     | 0       |
| Surface Type :                         | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 1.47    | 3.75    | 0       |
| Computed Flow Time (min) :             | 13.58   | 1.09    | 0       |
| Total TOC (min) .....                  | 37.83   |         |         |

Subbasin Runoff Results

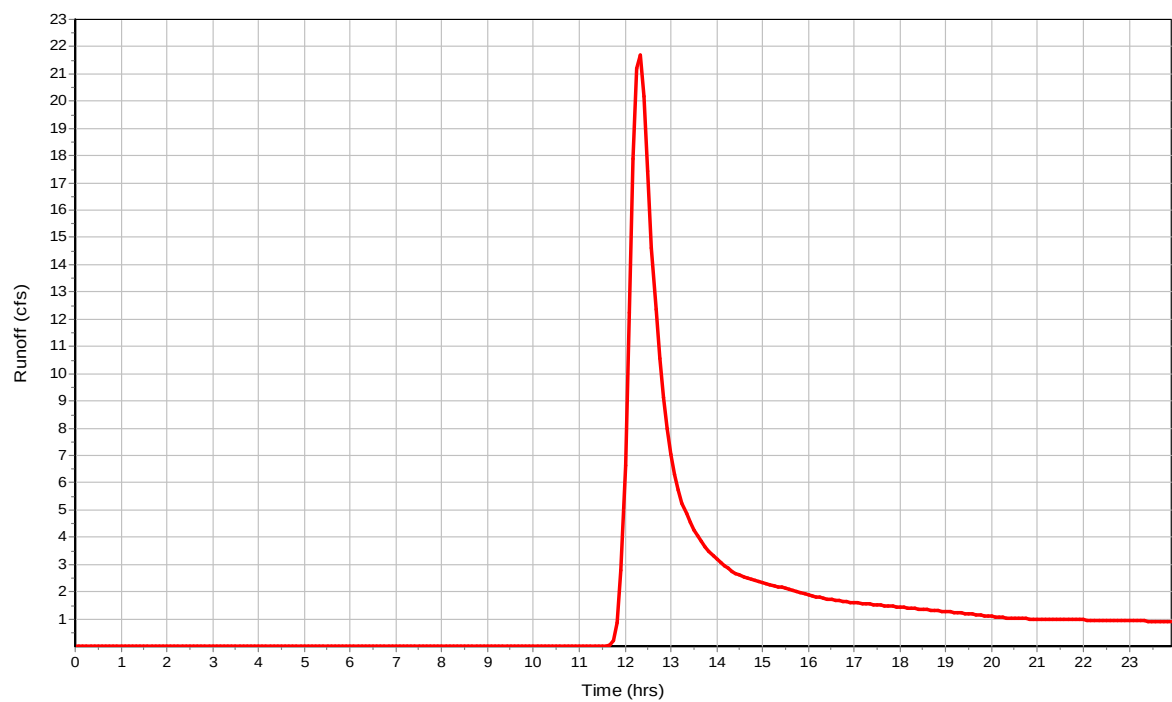
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 2.57       |
| Total Runoff (in) .....                     | 0.61       |
| Peak Runoff (cfs) .....                     | 21.85      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:37:50 |

Subbasin : Drainage\_Area\_2

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_3

### Input Data

Area (ac) ..... 452.08  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.08  
Rain Gage ID ..... 24hr2yr

### Composite Curve Number

| 32                           | Area    | Soil  | Curve  |
|------------------------------|---------|-------|--------|
| Soil/Surface Description     | (acres) | Group | Number |
| Row crops, C&T + CR, Good    | 410.4   | C     | 75     |
| Row crops, contoured, Good   | 9.81    | A     | 65     |
| Row crops, contoured, Good   | 31.88   | A     | 65     |
| Composite Area & Weighted CN | 452.09  |       | 74.08  |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.08         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.09         | 0            | 0            |
| Computed Flow Time (min) :  | 19.19        | 0            | 0            |

|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 4320         | 1322         | 0            |
| Slope (%) :                            | 0.42         | 1.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.05         | 1.98         | 0            |
| Computed Flow Time (min) :             | 68.57        | 11.13        | 0            |
| Total TOC (min) .....98.88             |              |              |              |

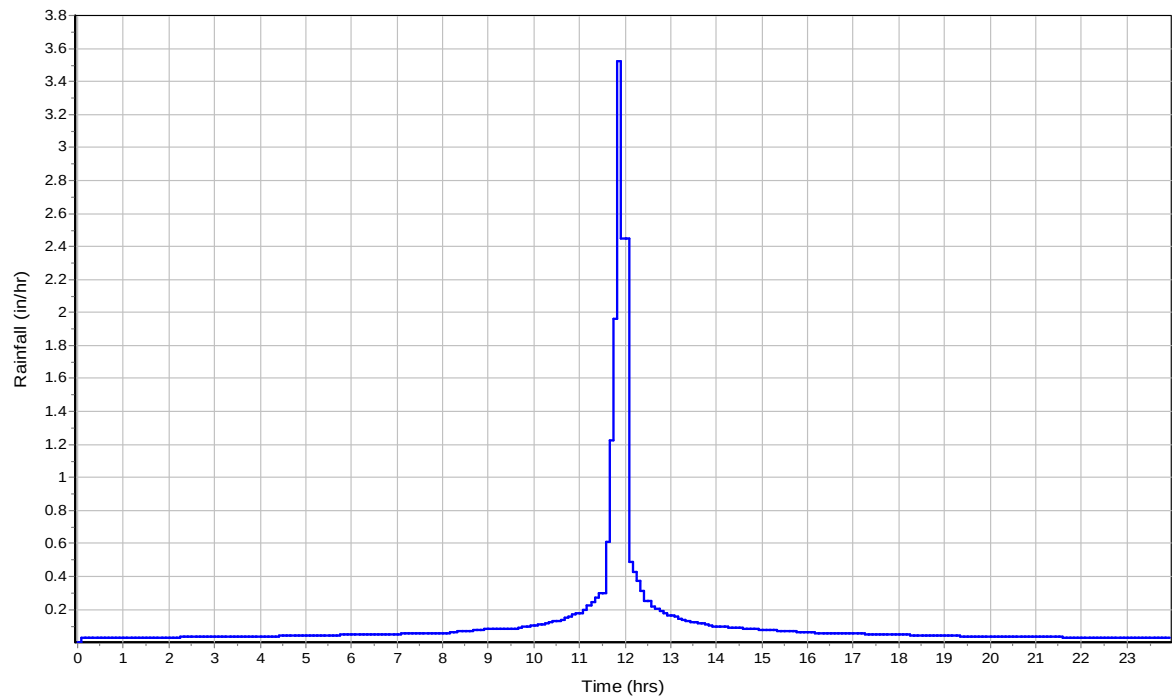
### Subbasin Runoff Results

Total Rainfall (in) ..... 2.57  
Total Runoff (in) ..... 0.65  
Peak Runoff (cfs) ..... 95.76  
Weighted Curve Number ..... 74.08  
Time of Concentration (days hh:mm:ss) ..... 0 01:38:53

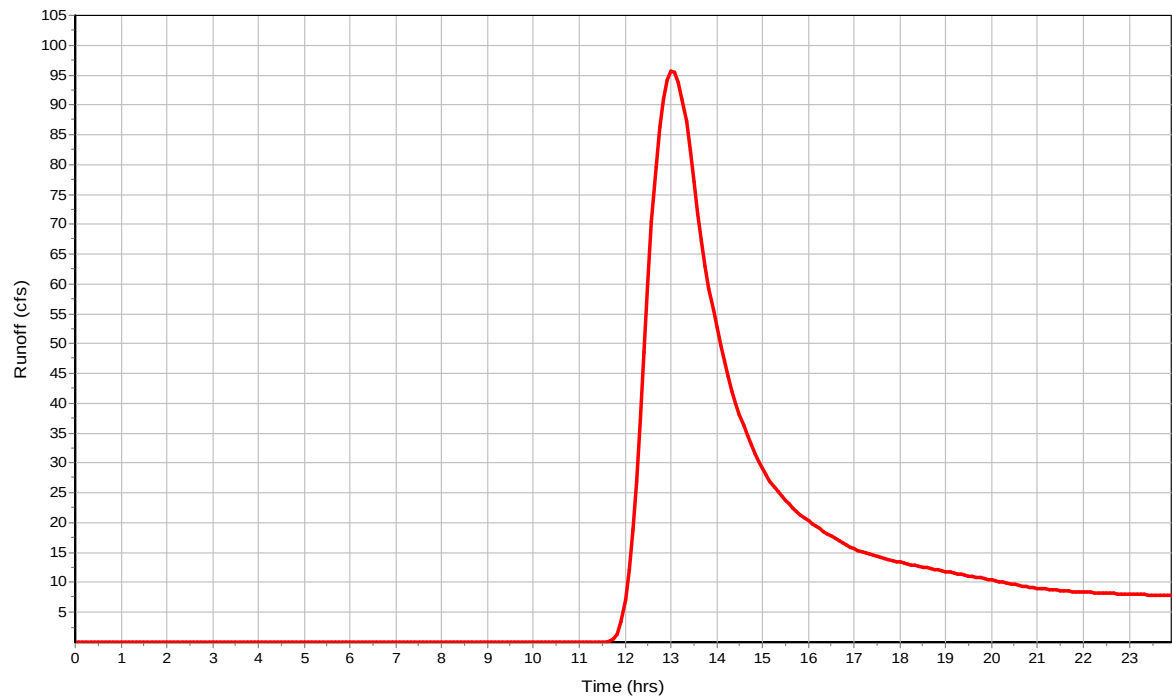


Subbasin : Drainage\_Area\_3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_4

Input Data

|                             |         |
|-----------------------------|---------|
| Area (ac) .....             | 206.82  |
| Peak Rate Factor .....      | 484     |
| Weighted Curve Number ..... | 74.56   |
| Rain Gage ID .....          | 24hr2yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Small grain, C&T + CR, Good  | 197.77  | C     | 75     |
| Row crops, contoured, Good   | 9.05    | A     | 65     |
| Composite Area & Weighted CN | 206.82  |       | 74.56  |

Time of Concentration

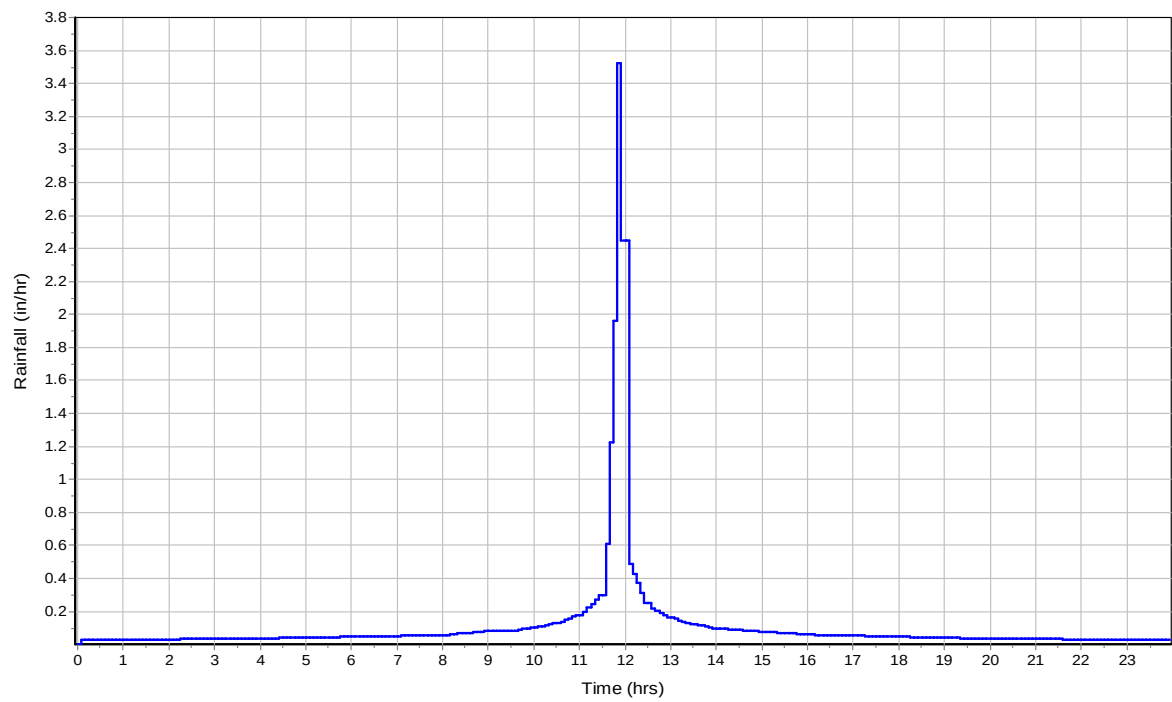
|                                        |         |         |         |
|----------------------------------------|---------|---------|---------|
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Sheet Flow Computations                |         |         |         |
| Manning's Roughness :                  | 0.06    | 0       | 0       |
| Flow Length (ft) :                     | 100     | 0       | 0       |
| Slope (%) :                            | 0.33    | 0       | 0       |
| 2 yr, 24 hr Rainfall (in) :            | 2.53    | 0       | 0       |
| Velocity (ft/sec) :                    | 0.15    | 0       | 0       |
| Computed Flow Time (min) :             | 10.88   | 0       | 0       |
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Shallow Concentrated Flow Computations |         |         |         |
| Flow Length (ft) :                     | 3100    | 809     | 0       |
| Slope (%) :                            | 0.39    | 1.9     | 0       |
| Surface Type :                         | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 1.01    | 2.22    | 0       |
| Computed Flow Time (min) :             | 51.16   | 6.07    | 0       |
| Total TOC (min) .....                  | 68.11   |         |         |

Subbasin Runoff Results

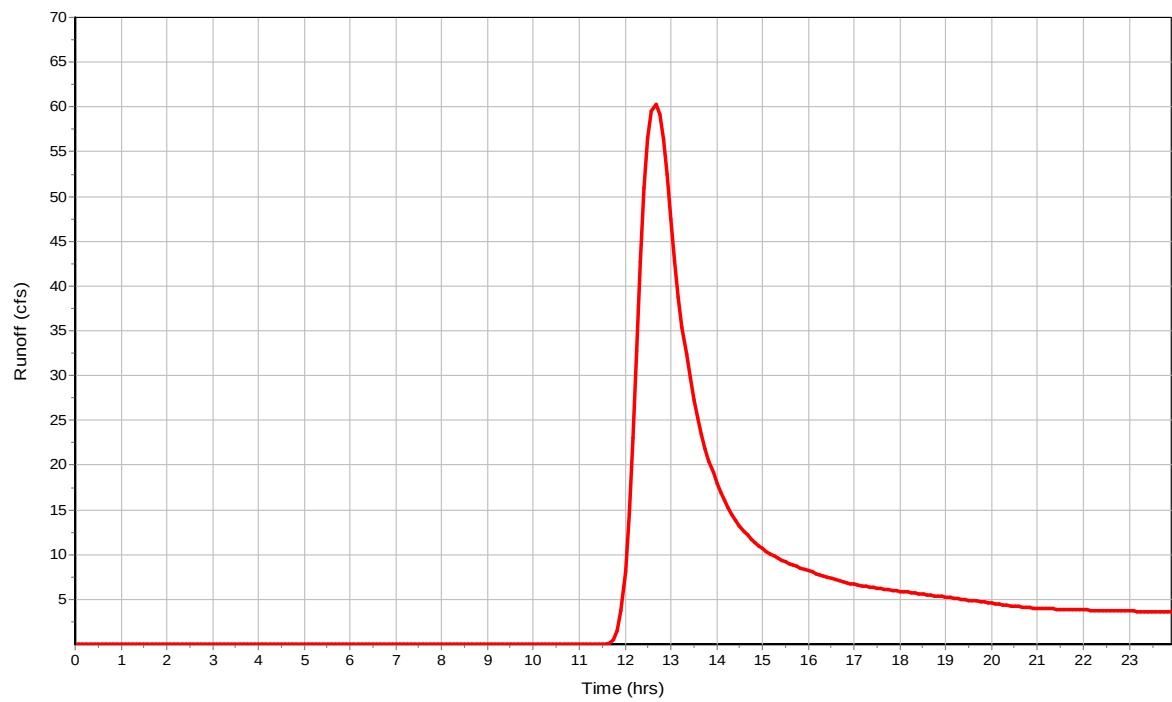
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 2.57       |
| Total Runoff (in) .....                     | 0.67       |
| Peak Runoff (cfs) .....                     | 60.38      |
| Weighted Curve Number .....                 | 74.56      |
| Time of Concentration (days hh:mm:ss) ..... | 0 01:08:07 |

Subbasin : Drainage\_Area\_4

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_5

### Input Data

Area (ac) ..... 63.55  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr2yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 63.55           | B             | 73              |
| Composite Area & Weighted CN | 63.55           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.4          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.17         | 0            | 0            |
| Computed Flow Time (min) :  | 10.08        | 0            | 0            |

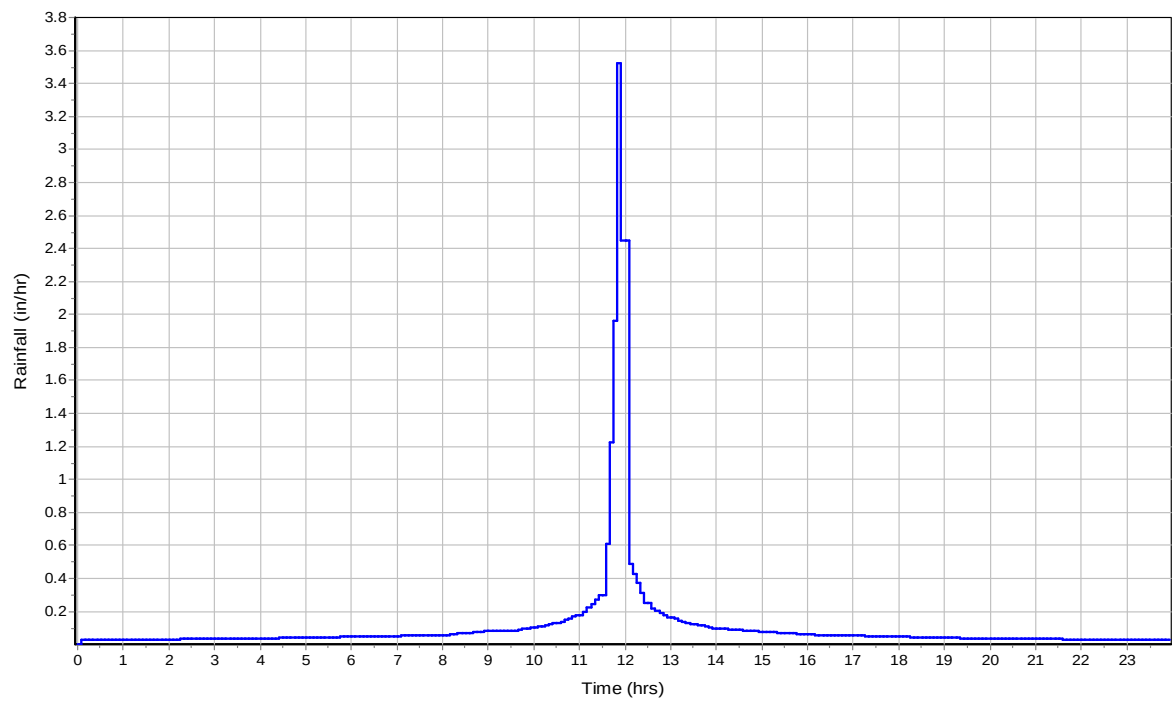
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1106         | 1008         | 0            |
| Slope (%) :                            | 0.38         | 0.62         | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.99         | 1.27         | 0            |
| Computed Flow Time (min) :             | 18.62        | 13.23        | 0            |
| Total TOC (min) .....                  | 41.93        |              |              |

### Subbasin Runoff Results

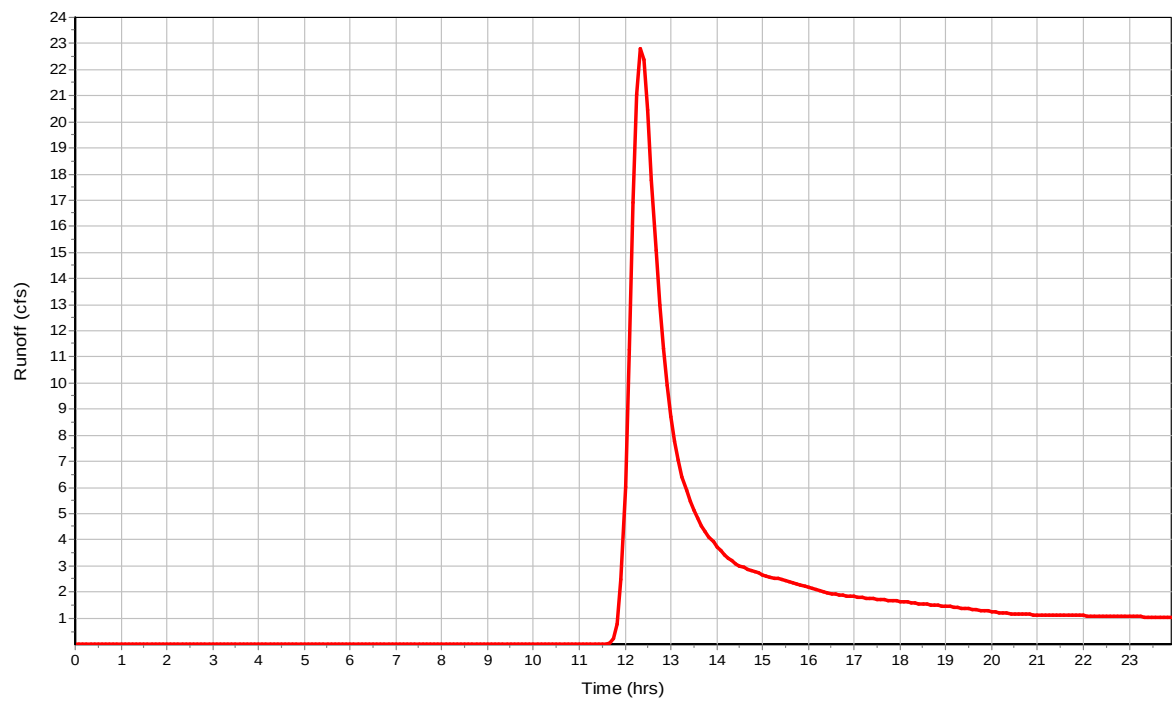
Total Rainfall (in) ..... 2.57  
Total Runoff (in) ..... 0.61  
Peak Runoff (cfs) ..... 22.95  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:41:56

Subbasin : Drainage\_Area\_5

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_6

### Input Data

Area (ac) ..... 31.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr2yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, C + CR, Poor    | 31.81           | B             | 73              |
| Composite Area & Weighted CN | 31.81           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.15         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.11         | 0            | 0            |
| Computed Flow Time (min) :  | 14.92        | 0            | 0            |

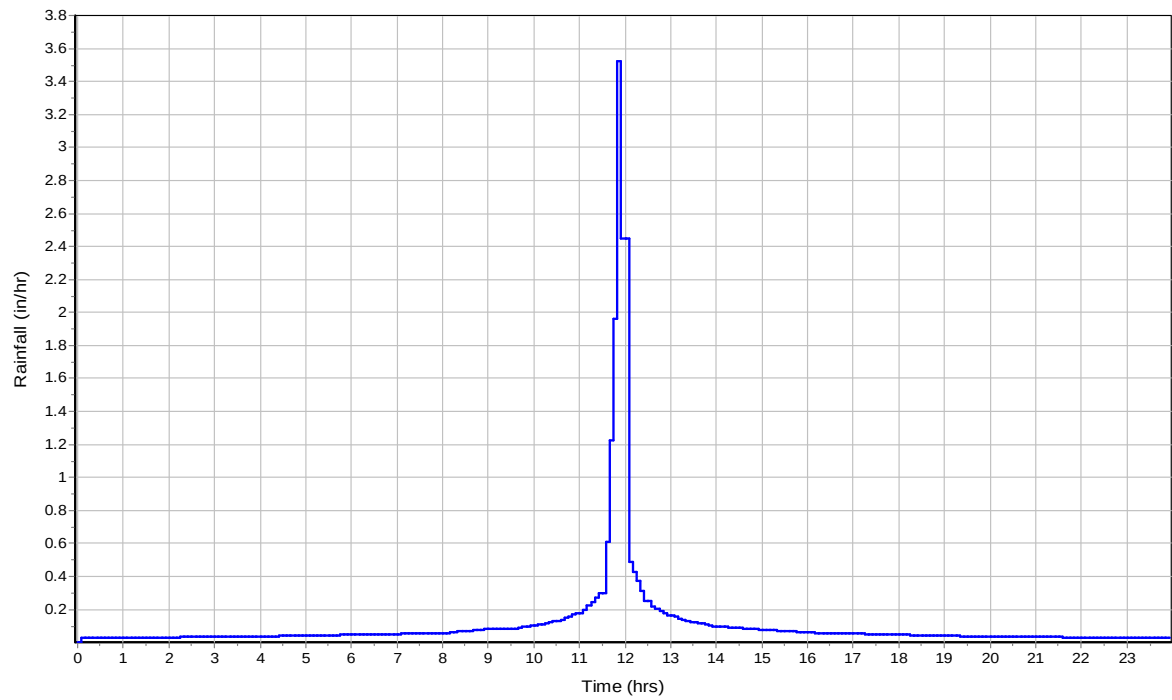
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1520         | 596          | 0            |
| Slope (%) :                            | 0.28         | 0.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.85         | 0            | 0            |
| Computed Flow Time (min) :             | 29.8         | 0            | 0            |
| Total TOC (min) .....                  | 44.72        |              |              |

### Subbasin Runoff Results

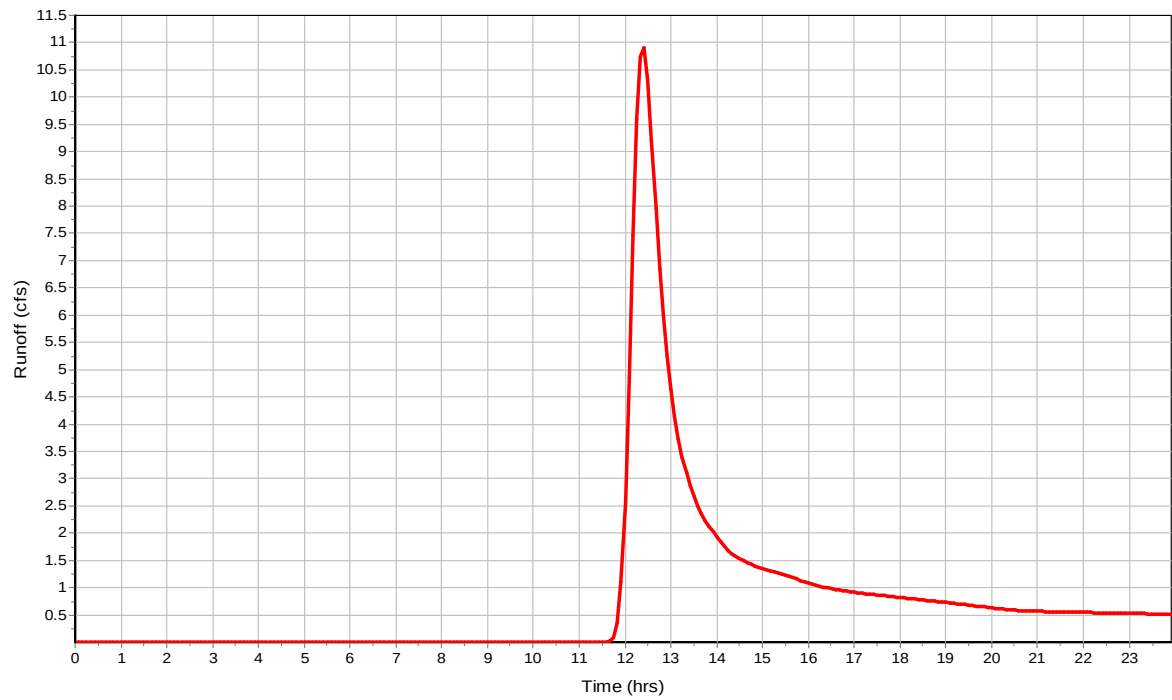
Total Rainfall (in) ..... 2.57  
Total Runoff (in) ..... 0.61  
Peak Runoff (cfs) ..... 10.94  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:44:43

Subbasin : Drainage\_Area\_6

Rainfall Intensity Graph



Runoff Hydrograph



Project Description

File Name ..... PreDevelopment Condition\_9\_22\_2023.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 6  
Subbasins..... 6  
Nodes..... 6  
    *Junctions* ..... 0  
    *Outfalls* ..... 6  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 0  
Links..... 0  
    *Channels* ..... 0  
    *Pipes* ..... 0  
    *Pumps* ..... 0  
    *Orifices* ..... 0  
    *Weirs* ..... 0  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 24hr100yr    | Time Series | 24hr100hr      | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 2  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 3  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 4  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 5  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 6  | 24hy10yr     | Time Series | 24hr10yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |



Subbasin Summary

| SN | Subbasin<br>ID  | Area   | Peak Rate | Weighted<br>Curve<br>Number | Total<br>Rainfall | Total<br>Runoff | Total<br>Runoff<br>Volume | Peak<br>Runoff | Time of<br>Concentration |
|----|-----------------|--------|-----------|-----------------------------|-------------------|-----------------|---------------------------|----------------|--------------------------|
|    |                 | (ac)   | Factor    |                             | (in)              | (in)            | (ac-in)                   | (cfs)          | (days hh:mm:ss)          |
| 1  | Drainage_Area_1 | 48.76  | 484.00    | 73.00                       | 3.38              | 1.10            | 53.64                     | 51.37          | 0 00:23:37               |
| 2  | Drainage_Area_2 | 56.23  | 484.00    | 73.00                       | 3.38              | 1.10            | 61.85                     | 43.79          | 0 00:37:49               |
| 3  | Drainage_Area_3 | 452.08 | 484.00    | 74.08                       | 3.38              | 1.16            | 525.77                    | 186.69         | 0 01:38:52               |
| 4  | Drainage_Area_4 | 206.82 | 484.00    | 74.56                       | 3.38              | 1.19            | 246.32                    | 116.52         | 0 01:08:06               |
| 5  | Drainage_Area_5 | 63.55  | 484.00    | 73.00                       | 3.38              | 1.10            | 69.91                     | 46.04          | 0 00:41:55               |
| 6  | Drainage_Area_6 | 31.81  | 484.00    | 73.00                       | 3.38              | 1.10            | 34.99                     | 22.06          | 0 00:44:43               |

Node Summary

| SN | Element<br>ID    | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min Freeboard<br>Peak<br>Attained | Time of<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------|
|    |                  |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                              | (days hh:mm)                      | (ac-in)                    | (min)                 |
| 1  | Analysis_Point_1 | Outfall         | 884.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 2  | Analysis_Point_2 | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 3  | DA_1             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 4  | DA_2             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 5  | DA_5             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 6  | DA_6             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 48.76    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 73       |
| Rain Gage ID          | 24hr-5yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Legumes, C&T, Poor           | 48.76   | B     | 73     |
| Composite Area & Weighted CN | 48.76   |       | 73     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

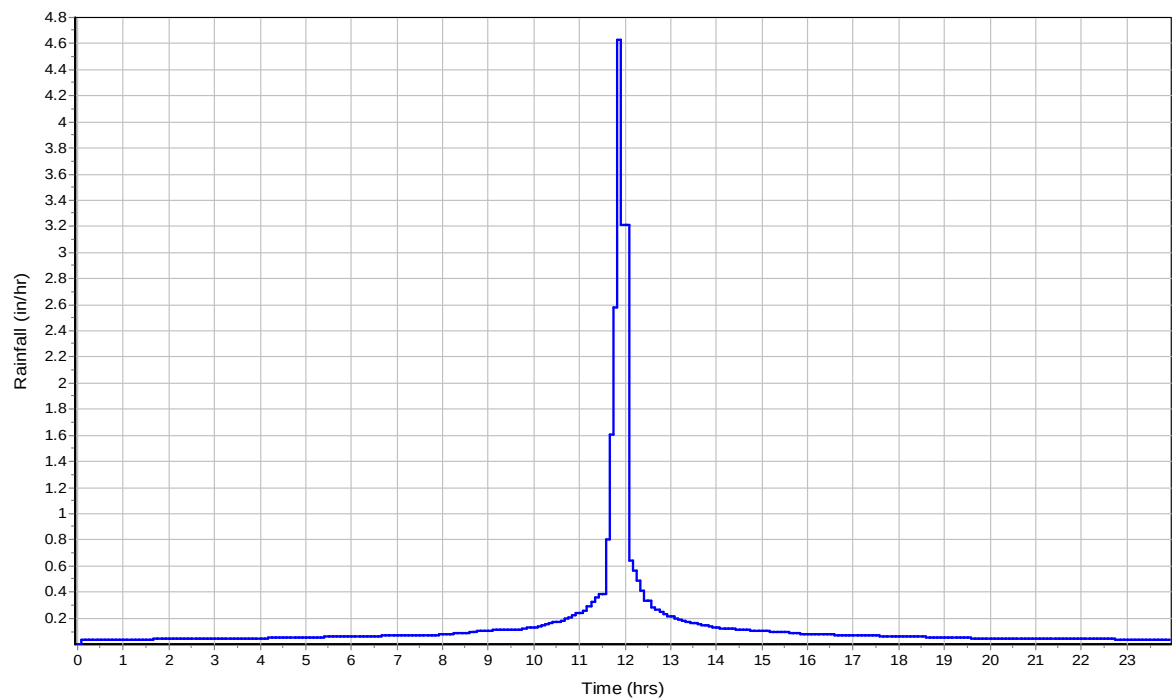
|                                        |              |              |              |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.1          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0            | 0            |
| Computed Flow Time (min) :             | 17.55        | 0            | 0            |
| Shallow Concentrated Flow Computations | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Flow Length (ft) :                     | 947          | 0            | 0            |
| Slope (%) :                            | 2.6          | 0            | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 2.6          | 0            | 0            |
| Computed Flow Time (min) :             | 6.07         | 0            | 0            |
| Total TOC (min) .....                  | 23.62        |              |              |

### Subbasin Runoff Results

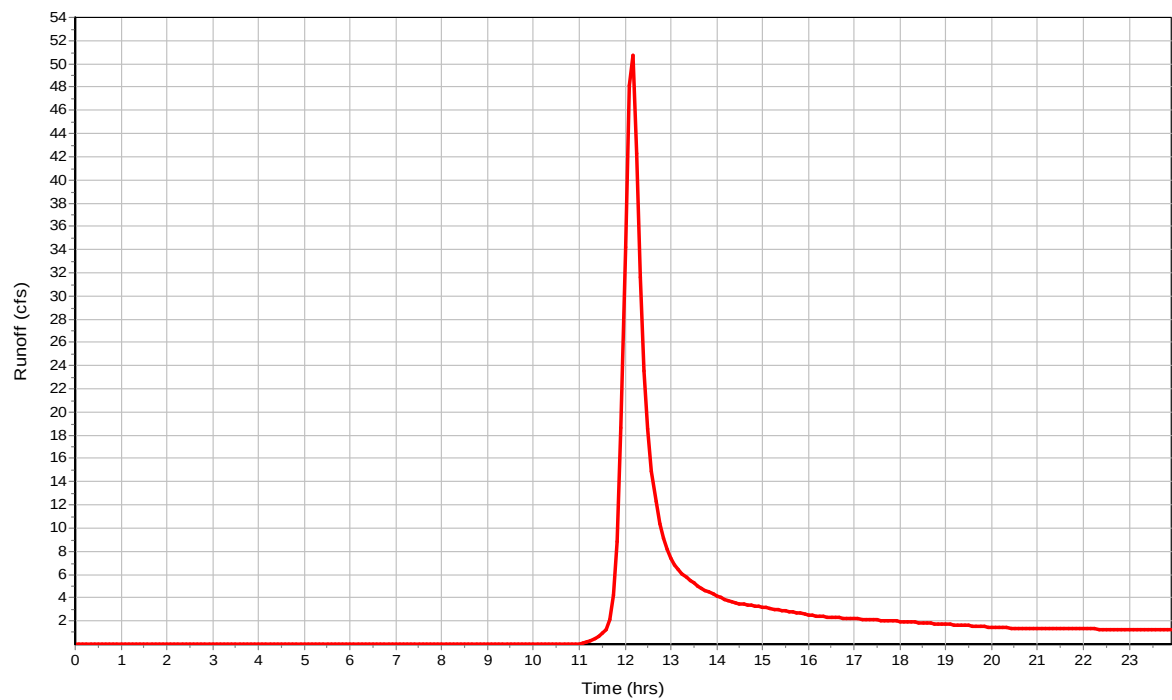
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.38       |
| Total Runoff (in) .....                     | 1.1        |
| Peak Runoff (cfs) .....                     | 51.37      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:23:37 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_2

### Input Data

Area (ac) ..... 56.23  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr-5yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 56.23           | B             | 73              |
| Composite Area & Weighted CN | 56.23           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.05         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.07         | 0            | 0            |
| Computed Flow Time (min) :  | 23.15        | 0            | 0            |

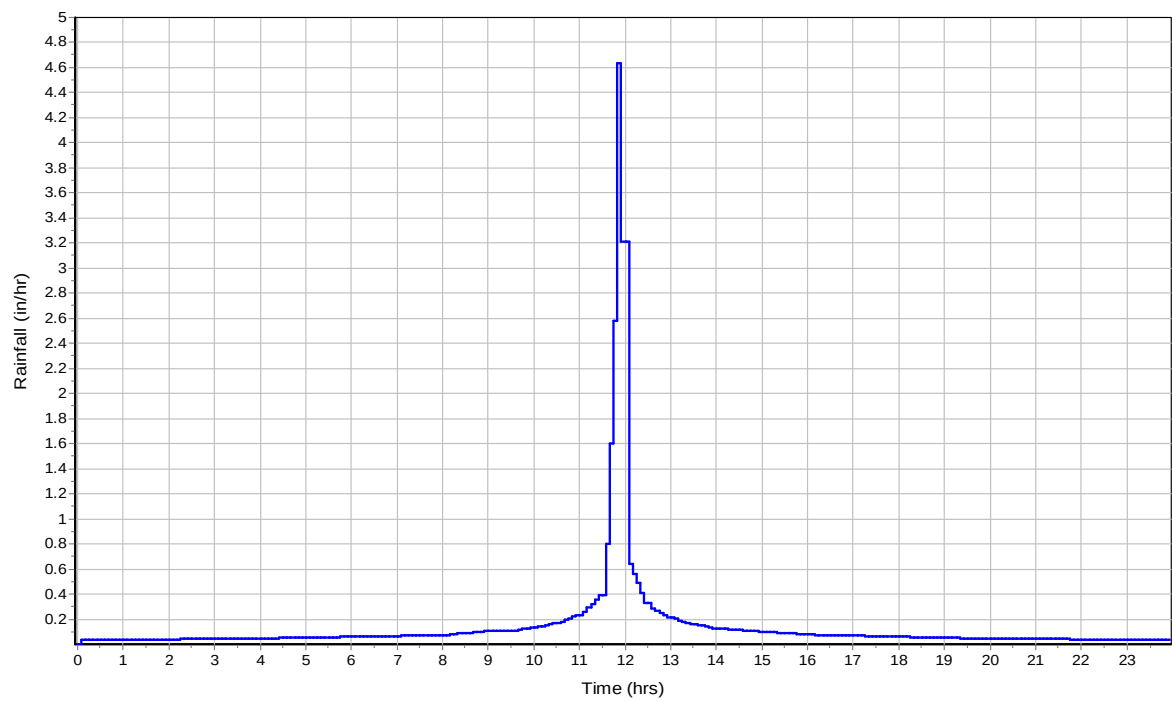
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1198         | 245          | 0            |
| Slope (%) :                            | 0.83         | 5.4          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.47         | 3.75         | 0            |
| Computed Flow Time (min) :             | 13.58        | 1.09         | 0            |
| Total TOC (min) .....37.83             |              |              |              |

### Subbasin Runoff Results

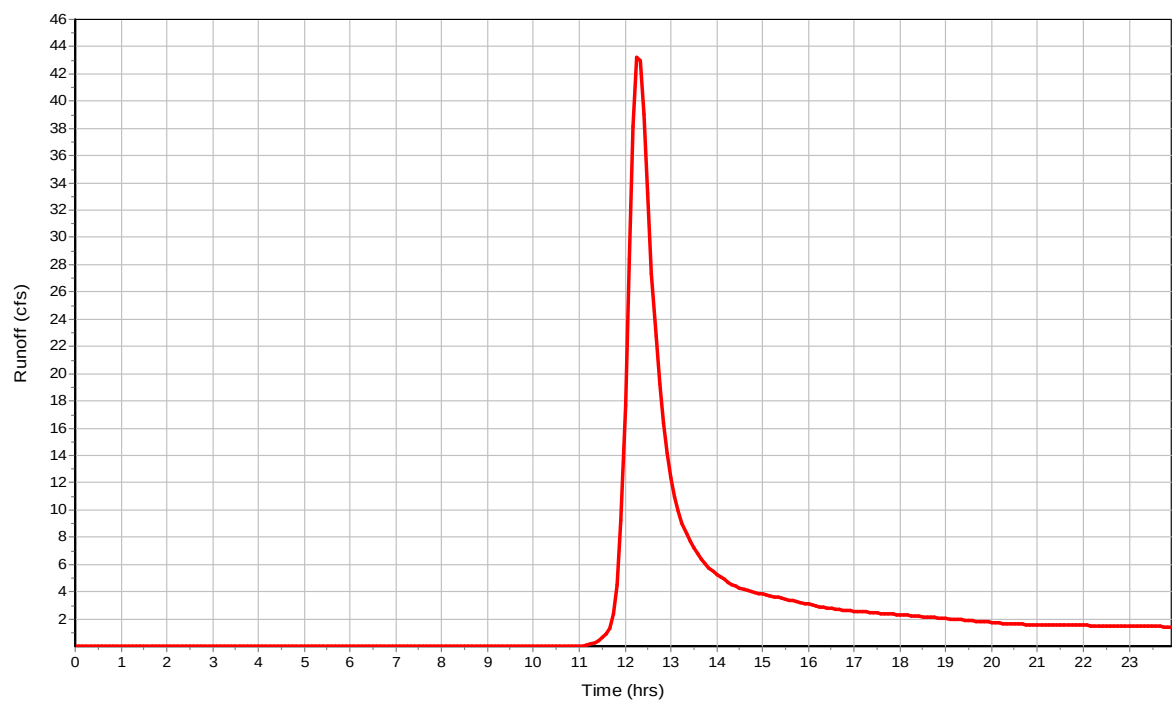
Total Rainfall (in) ..... 3.38  
Total Runoff (in) ..... 1.1  
Peak Runoff (cfs) ..... 43.79  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:37:50

Subbasin : Drainage\_Area\_2

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_3

### Input Data

Area (ac) ..... 452.08  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.08  
Rain Gage ID ..... 24hr-5yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Row crops, C&T + CR, Good    | 410.4           | C             | 75              |
| Row crops, contoured, Good   | 9.81            | A             | 65              |
| Row crops, contoured, Good   | 31.88           | A             | 65              |
| Composite Area & Weighted CN | 452.09          |               | 74.08           |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.08         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.09         | 0            | 0            |
| Computed Flow Time (min) :  | 19.19        | 0            | 0            |

|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 4320         | 1322         | 0            |
| Slope (%) :                            | 0.42         | 1.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.05         | 1.98         | 0            |
| Computed Flow Time (min) :             | 68.57        | 11.13        | 0            |
| Total TOC (min) .....98.88             |              |              |              |

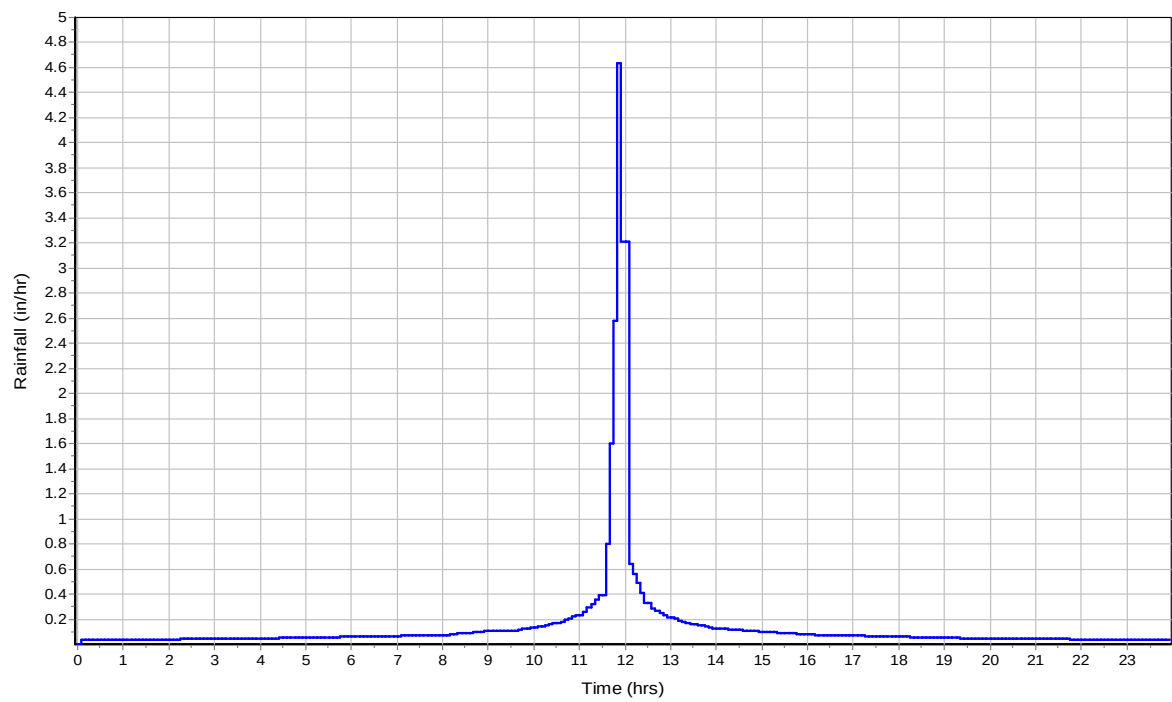
### Subbasin Runoff Results

Total Rainfall (in) ..... 3.38  
Total Runoff (in) ..... 1.16  
Peak Runoff (cfs) ..... 186.69  
Weighted Curve Number ..... 74.08  
Time of Concentration (days hh:mm:ss) ..... 0 01:38:53

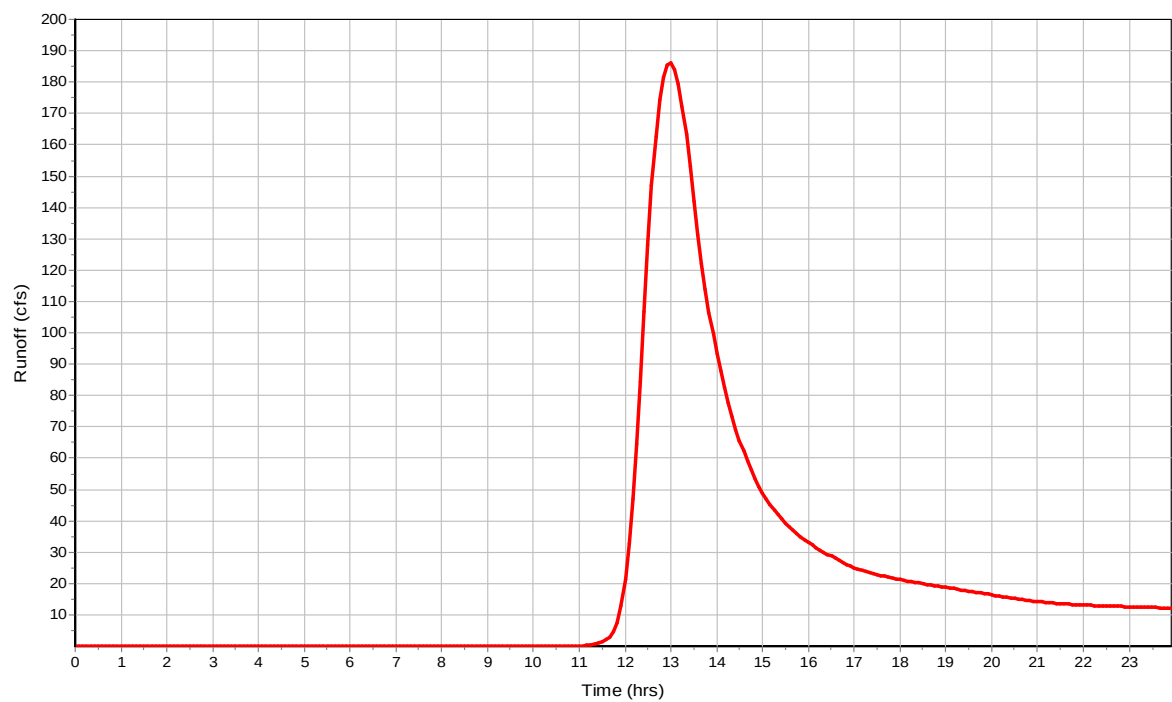


Subbasin : Drainage\_Area\_3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_4

Input Data

|                             |          |
|-----------------------------|----------|
| Area (ac) .....             | 206.82   |
| Peak Rate Factor .....      | 484      |
| Weighted Curve Number ..... | 74.56    |
| Rain Gage ID .....          | 24hr-5yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Small grain, C&T + CR, Good  | 197.77  | C     | 75     |
| Row crops, contoured, Good   | 9.05    | A     | 65     |
| Composite Area & Weighted CN | 206.82  |       | 74.56  |

Time of Concentration

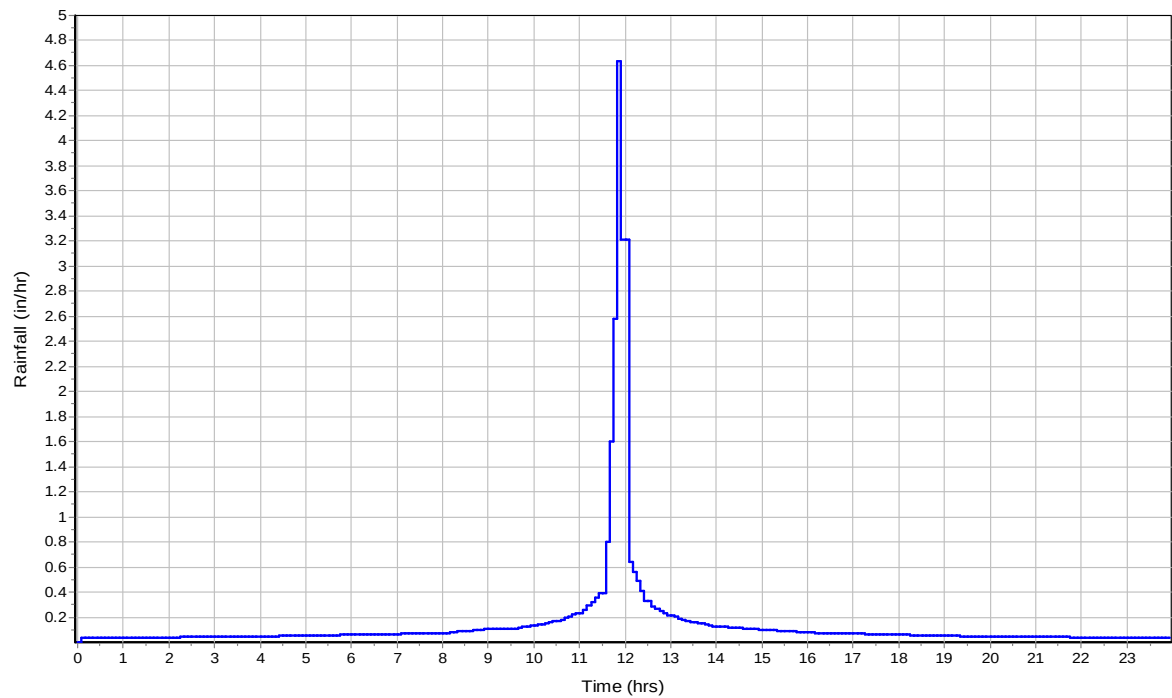
|                                        |         |         |         |
|----------------------------------------|---------|---------|---------|
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Sheet Flow Computations                |         |         |         |
| Manning's Roughness :                  | 0.06    | 0       | 0       |
| Flow Length (ft) :                     | 100     | 0       | 0       |
| Slope (%) :                            | 0.33    | 0       | 0       |
| 2 yr, 24 hr Rainfall (in) :            | 2.53    | 0       | 0       |
| Velocity (ft/sec) :                    | 0.15    | 0       | 0       |
| Computed Flow Time (min) :             | 10.88   | 0       | 0       |
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Shallow Concentrated Flow Computations |         |         |         |
| Flow Length (ft) :                     | 3100    | 809     | 0       |
| Slope (%) :                            | 0.39    | 1.9     | 0       |
| Surface Type :                         | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 1.01    | 2.22    | 0       |
| Computed Flow Time (min) :             | 51.16   | 6.07    | 0       |
| Total TOC (min) .....                  | 68.11   |         |         |

Subbasin Runoff Results

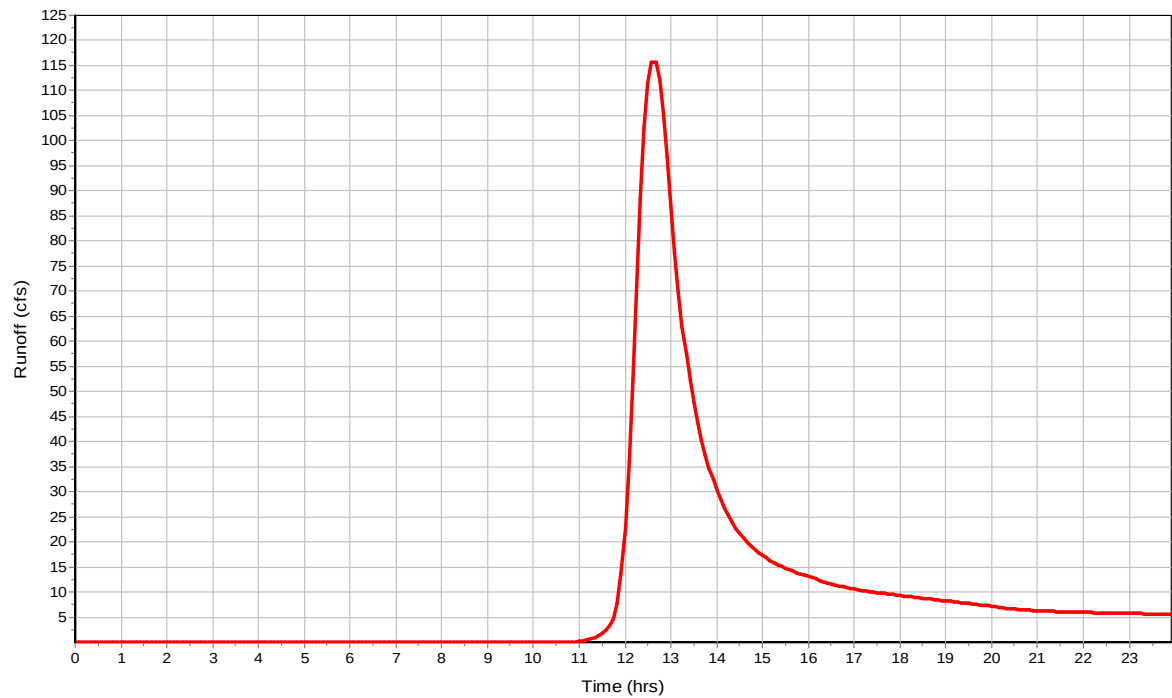
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.38       |
| Total Runoff (in) .....                     | 1.19       |
| Peak Runoff (cfs) .....                     | 116.52     |
| Weighted Curve Number .....                 | 74.56      |
| Time of Concentration (days hh:mm:ss) ..... | 0 01:08:07 |

Subbasin : Drainage\_Area\_4

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_5

### Input Data

Area (ac) ..... 63.55  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr-5yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 63.55           | B             | 73              |
| Composite Area & Weighted CN | 63.55           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.4          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.17         | 0            | 0            |
| Computed Flow Time (min) :  | 10.08        | 0            | 0            |

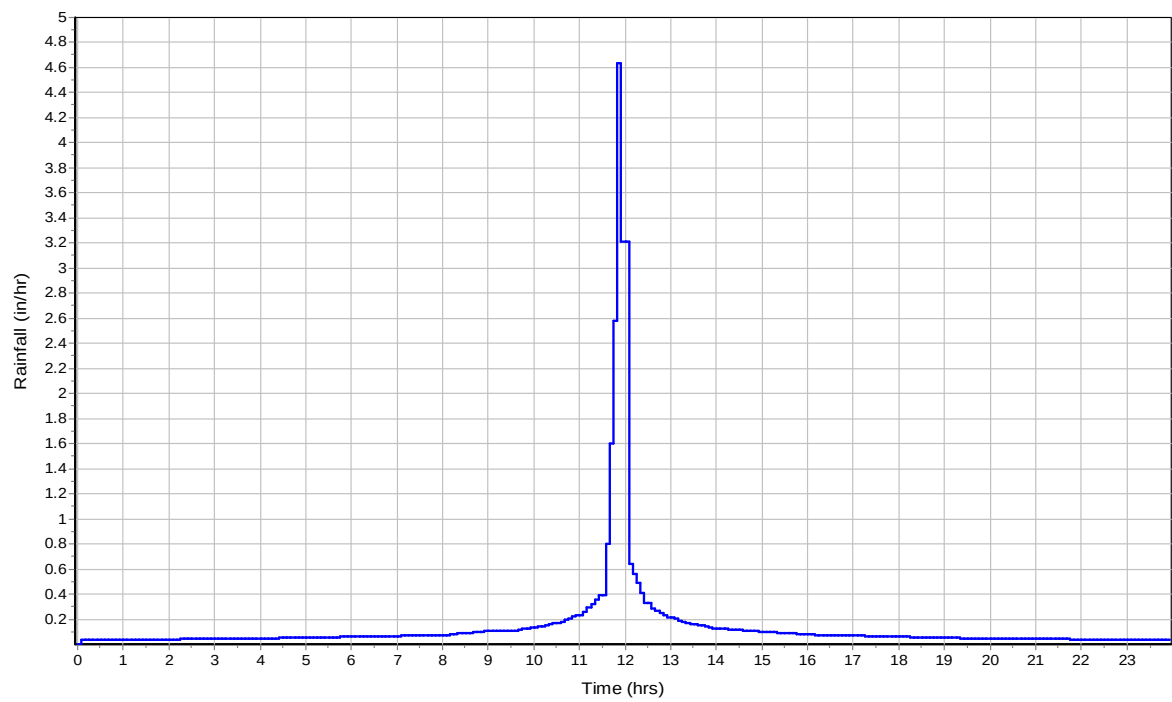
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1106         | 1008         | 0            |
| Slope (%) :                            | 0.38         | 0.62         | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.99         | 1.27         | 0            |
| Computed Flow Time (min) :             | 18.62        | 13.23        | 0            |
| Total TOC (min) .....                  | 41.93        |              |              |

### Subbasin Runoff Results

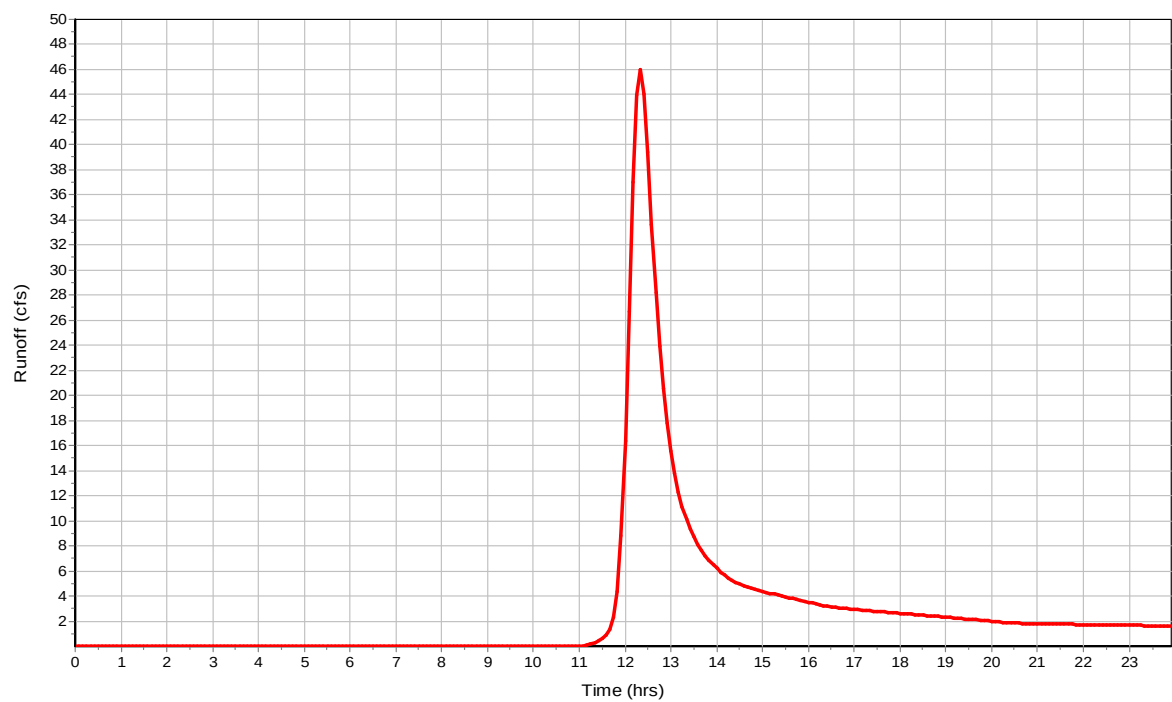
Total Rainfall (in) ..... 3.38  
Total Runoff (in) ..... 1.1  
Peak Runoff (cfs) ..... 46.04  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:41:56

Subbasin : Drainage\_Area\_5

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_6

Input Data

|                             |          |
|-----------------------------|----------|
| Area (ac) .....             | 31.81    |
| Peak Rate Factor .....      | 484      |
| Weighted Curve Number ..... | 73       |
| Rain Gage ID .....          | 24hr-5yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Small grain, C + CR, Poor    | 31.81   | B     | 73     |
| Composite Area & Weighted CN | 31.81   |       | 73     |

Time of Concentration

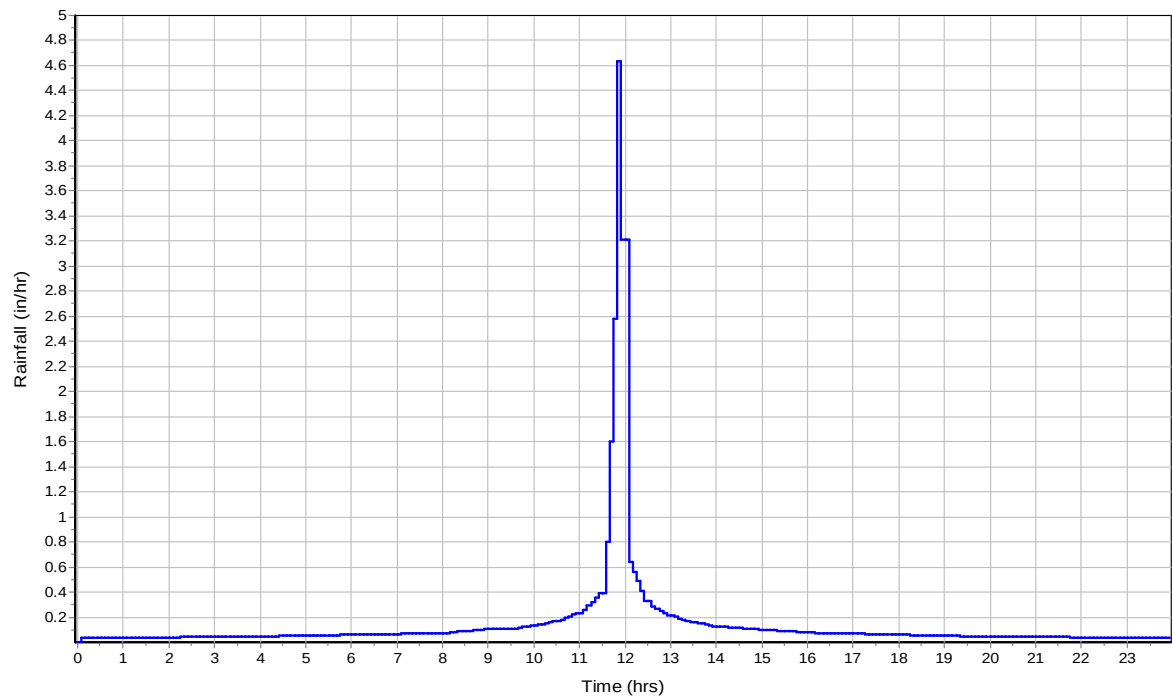
|                                        |         |         |         |
|----------------------------------------|---------|---------|---------|
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Sheet Flow Computations                |         |         |         |
| Manning's Roughness :                  | 0.06    | 0       | 0       |
| Flow Length (ft) :                     | 100     | 0       | 0       |
| Slope (%) :                            | 0.15    | 0       | 0       |
| 2 yr, 24 hr Rainfall (in) :            | 2.53    | 0       | 0       |
| Velocity (ft/sec) :                    | 0.11    | 0       | 0       |
| Computed Flow Time (min) :             | 14.92   | 0       | 0       |
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Shallow Concentrated Flow Computations |         |         |         |
| Flow Length (ft) :                     | 1520    | 596     | 0       |
| Slope (%) :                            | 0.28    | 0.5     | 0       |
| Surface Type :                         | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 0.85    | 0       | 0       |
| Computed Flow Time (min) :             | 29.8    | 0       | 0       |
| Total TOC (min) .....                  | 44.72   |         |         |

Subbasin Runoff Results

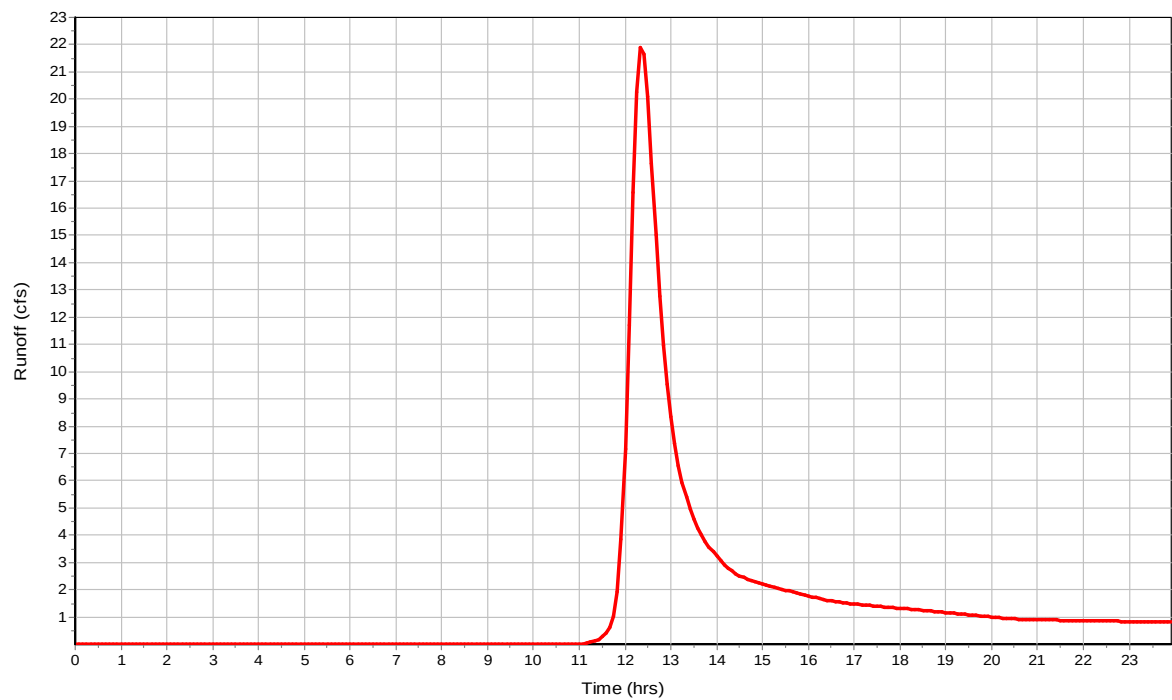
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.38       |
| Total Runoff (in) .....                     | 1.1        |
| Peak Runoff (cfs) .....                     | 22.06      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:44:43 |

Subbasin : Drainage\_Area\_6

Rainfall Intensity Graph



Runoff Hydrograph



Project Description

File Name ..... PreDevelopment Condition\_9\_22\_2023.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 6  
Subbasins..... 6  
Nodes..... 6  
    *Junctions* ..... 0  
    *Outfalls* ..... 6  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 0  
Links..... 0  
    *Channels* ..... 0  
    *Pipes* ..... 0  
    *Pumps* ..... 0  
    *Orifices* ..... 0  
    *Weirs* ..... 0  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 24hr100yr    | Time Series | 24hr100hr      | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 2  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 3  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 4  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 5  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 6  | 24hy10yr     | Time Series | 24hr10yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |



Subbasin Summary

| SN | Subbasin ID     | Area   | Peak Rate | Weighted Curve Number | Total Rainfall | Total Runoff | Total Runoff Volume | Peak Runoff | Time of Concentration |
|----|-----------------|--------|-----------|-----------------------|----------------|--------------|---------------------|-------------|-----------------------|
|    |                 | (ac)   | Factor    |                       | (in)           | (in)         | (ac-in)             | (cfs)       | (days hh:mm:ss)       |
| 1  | Drainage_Area_1 | 48.76  | 484.00    | 73.00                 | 3.60           | 1.25         | 60.80               | 59.01       | 0 00:23:37            |
| 2  | Drainage_Area_2 | 56.23  | 484.00    | 73.00                 | 3.60           | 1.25         | 70.12               | 50.51       | 0 00:37:49            |
| 3  | Drainage_Area_3 | 452.08 | 484.00    | 74.08                 | 3.60           | 1.31         | 594.03              | 213.46      | 0 01:38:52            |
| 4  | Drainage_Area_4 | 206.82 | 484.00    | 74.56                 | 3.60           | 1.35         | 278.17              | 133.03      | 0 01:08:06            |
| 5  | Drainage_Area_5 | 63.55  | 484.00    | 73.00                 | 3.60           | 1.25         | 79.25               | 53.03       | 0 00:41:55            |
| 6  | Drainage_Area_6 | 31.81  | 484.00    | 73.00                 | 3.60           | 1.25         | 39.67               | 25.40       | 0 00:44:43            |

Node Summary

| SN | Element<br>ID    | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min Freeboard<br>Peak<br>Attained | Time of<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------|
|    |                  |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                              | (days hh:mm)                      | (ac-in)                    | (min)                 |
| 1  | Analysis_Point_1 | Outfall         | 884.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 2  | Analysis_Point_2 | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 3  | DA_1             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 4  | DA_2             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 5  | DA_5             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 6  | DA_6             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 48.76    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 73       |
| Rain Gage ID          | 24hy10yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Legumes, C&T, Poor           | 48.76   | B     | 73     |
| Composite Area & Weighted CN | 48.76   |       | 73     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{(2/3)}) * (S_f^{0.5})) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

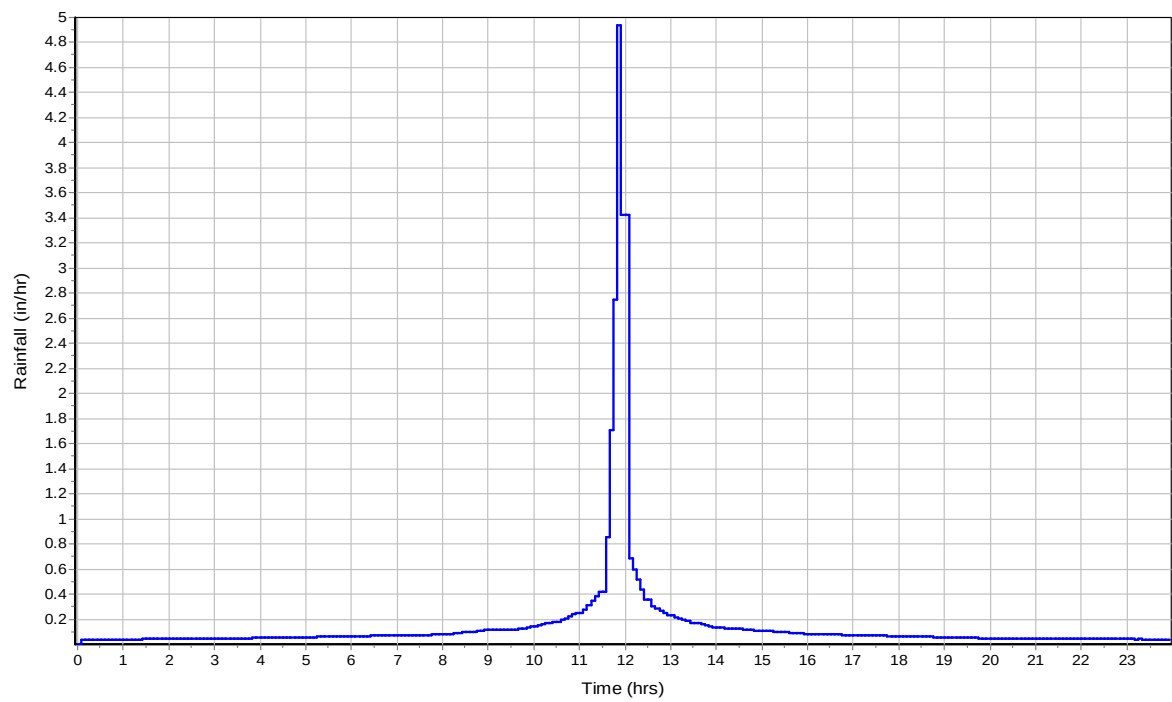
|                                        |              |              |              |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.1          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0            | 0            |
| Computed Flow Time (min) :             | 17.55        | 0            | 0            |
| Shallow Concentrated Flow Computations | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Flow Length (ft) :                     | 947          | 0            | 0            |
| Slope (%) :                            | 2.6          | 0            | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 2.6          | 0            | 0            |
| Computed Flow Time (min) :             | 6.07         | 0            | 0            |
| Total TOC (min) .....                  | 23.62        |              |              |

### Subbasin Runoff Results

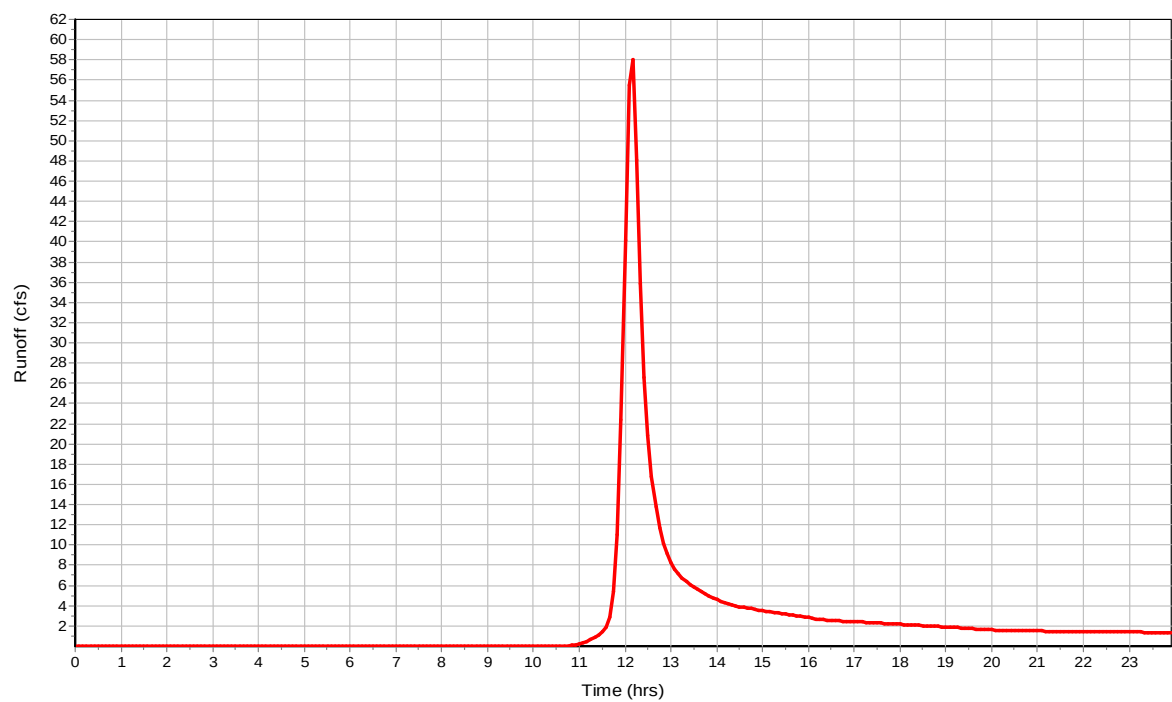
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.6        |
| Total Runoff (in) .....                     | 1.25       |
| Peak Runoff (cfs) .....                     | 59.01      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:23:37 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_2

### Input Data

Area (ac) ..... 56.23  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hy10yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 56.23           | B             | 73              |
| Composite Area & Weighted CN | 56.23           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.05         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.07         | 0            | 0            |
| Computed Flow Time (min) :  | 23.15        | 0            | 0            |

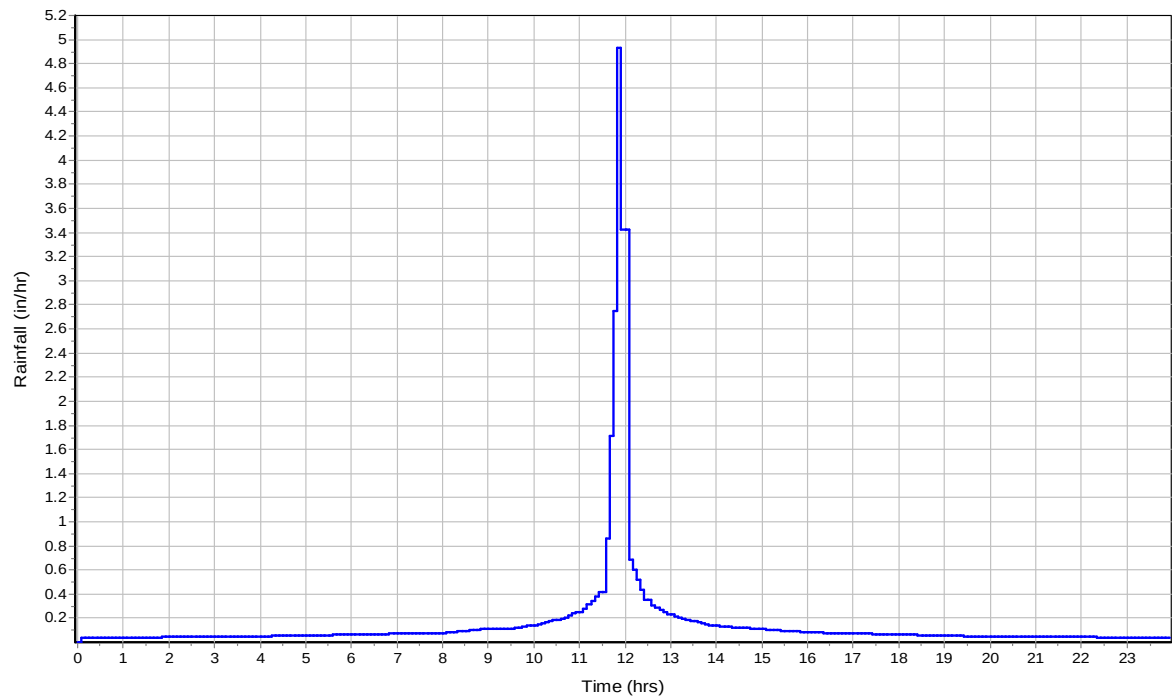
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1198         | 245          | 0            |
| Slope (%) :                            | 0.83         | 5.4          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.47         | 3.75         | 0            |
| Computed Flow Time (min) :             | 13.58        | 1.09         | 0            |
| Total TOC (min) .....37.83             |              |              |              |

### Subbasin Runoff Results

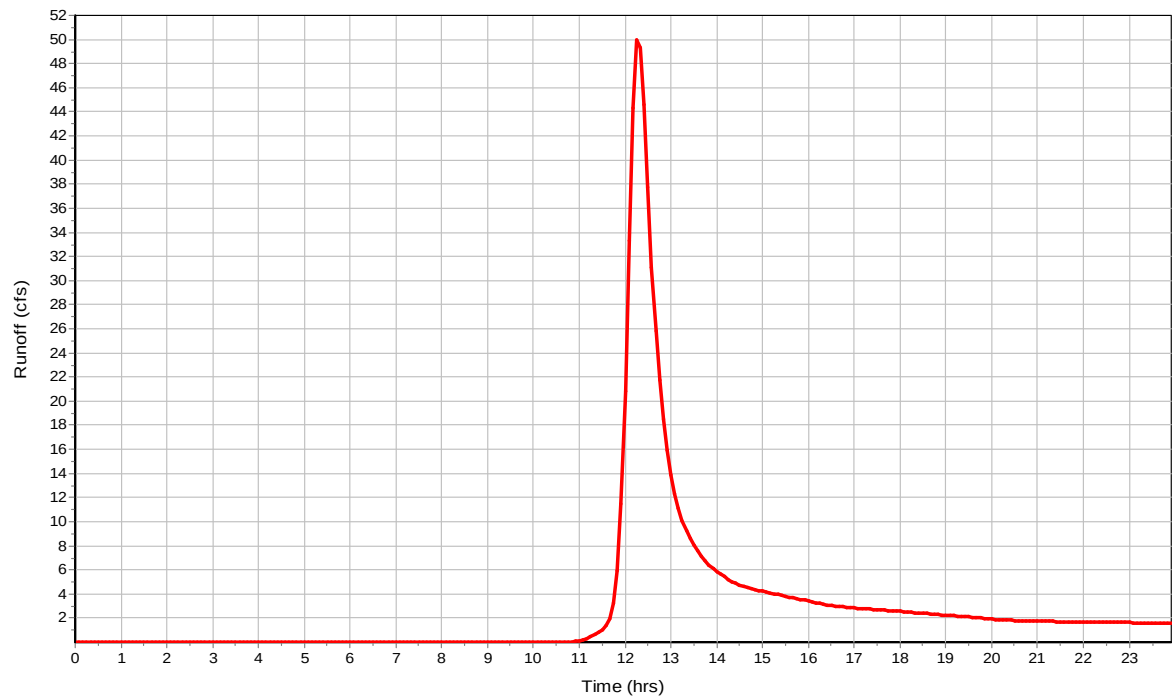
Total Rainfall (in) ..... 3.6  
Total Runoff (in) ..... 1.25  
Peak Runoff (cfs) ..... 50.51  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:37:50

Subbasin : Drainage\_Area\_2

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_3

### Input Data

Area (ac) ..... 452.08  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.08  
Rain Gage ID ..... 24hy10yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Row crops, C&T + CR, Good    | 410.4           | C             | 75              |
| Row crops, contoured, Good   | 9.81            | A             | 65              |
| Row crops, contoured, Good   | 31.88           | A             | 65              |
| Composite Area & Weighted CN | 452.09          |               | 74.08           |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.08         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.09         | 0            | 0            |
| Computed Flow Time (min) :  | 19.19        | 0            | 0            |

|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 4320         | 1322         | 0            |
| Slope (%) :                            | 0.42         | 1.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.05         | 1.98         | 0            |
| Computed Flow Time (min) :             | 68.57        | 11.13        | 0            |
| Total TOC (min) .....98.88             |              |              |              |

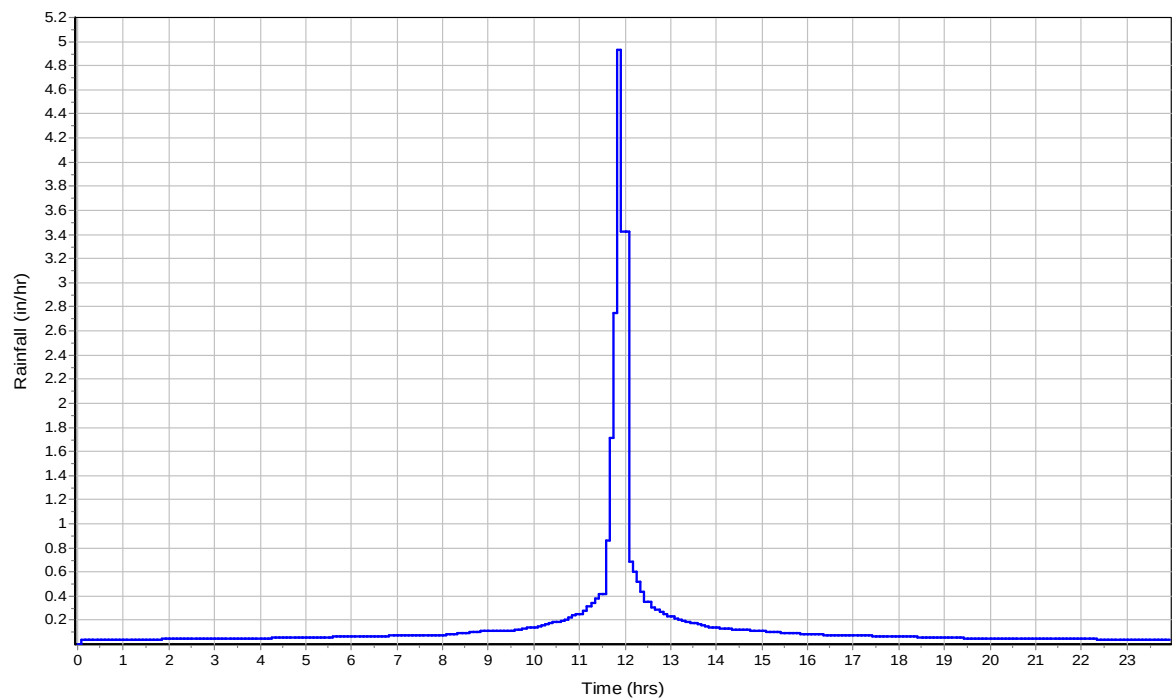
### Subbasin Runoff Results

Total Rainfall (in) ..... 3.6  
Total Runoff (in) ..... 1.31  
Peak Runoff (cfs) ..... 213.46  
Weighted Curve Number ..... 74.08  
Time of Concentration (days hh:mm:ss) ..... 0 01:38:53

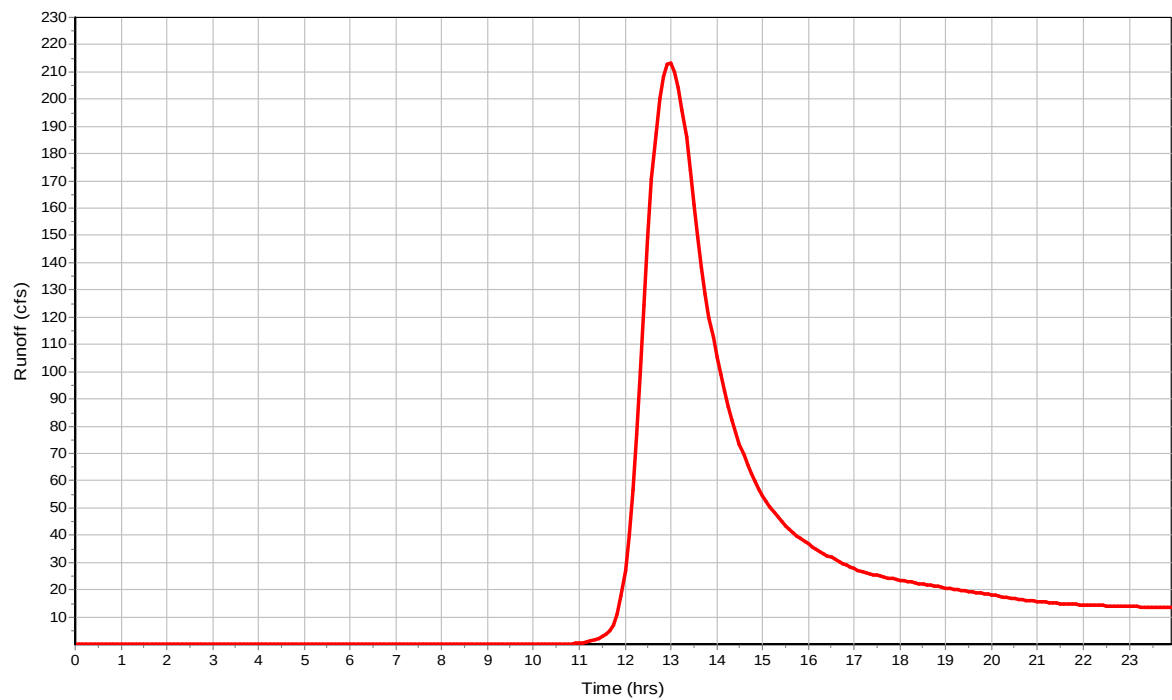


Subbasin : Drainage\_Area\_3

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_4

### Input Data

Area (ac) ..... 206.82  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.56  
Rain Gage ID ..... 24hy10yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, C&T + CR, Good  | 197.77          | C             | 75              |
| Row crops, contoured, Good   | 9.05            | A             | 65              |
| Composite Area & Weighted CN | 206.82          |               | 74.56           |

### Time of Concentration

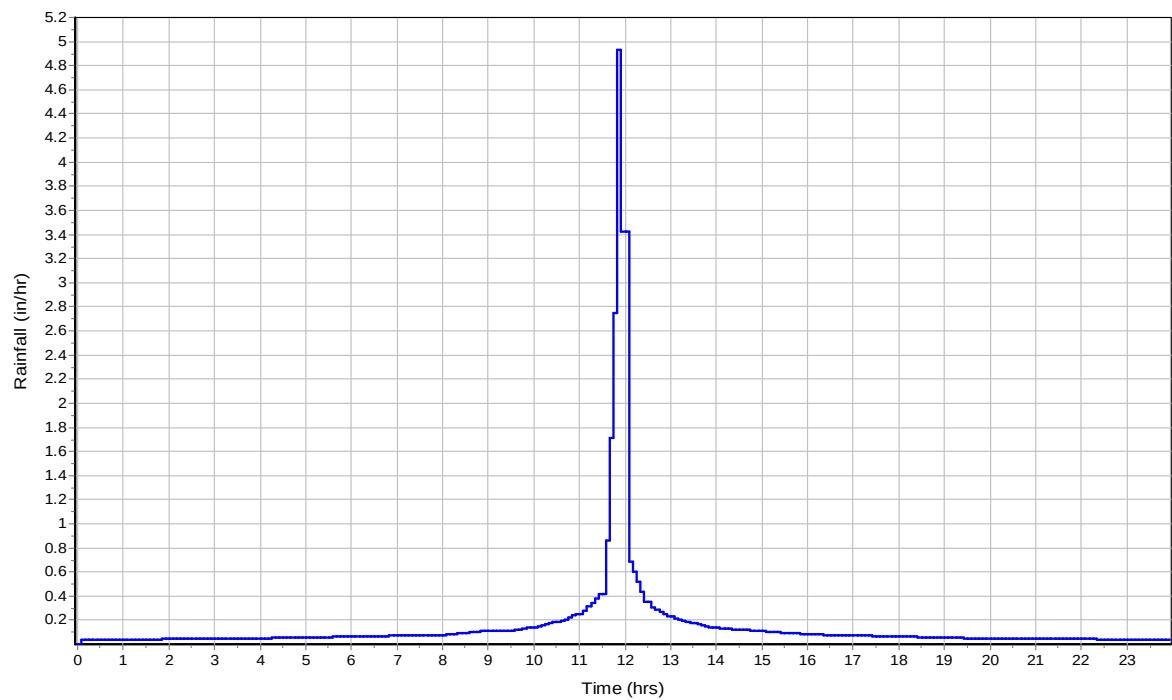
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.33         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.15         | 0            | 0            |
| Computed Flow Time (min) :             | 10.88        | 0            | 0            |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 3100         | 809          | 0            |
| Slope (%) :                            | 0.39         | 1.9          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.01         | 2.22         | 0            |
| Computed Flow Time (min) :             | 51.16        | 6.07         | 0            |
| Total TOC (min) .....                  | 68.11        |              |              |

### Subbasin Runoff Results

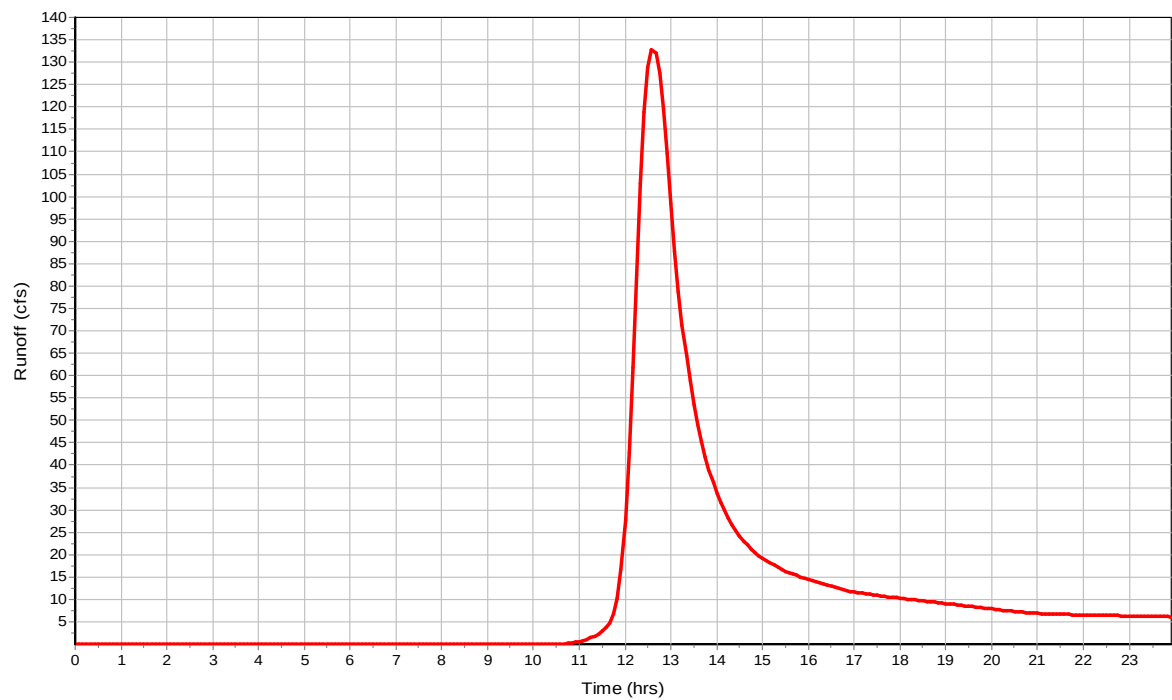
Total Rainfall (in) ..... 3.6  
Total Runoff (in) ..... 1.35  
Peak Runoff (cfs) ..... 133.03  
Weighted Curve Number ..... 74.56  
Time of Concentration (days hh:mm:ss) ..... 0 01:08:07

Subbasin : Drainage\_Area\_4

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_5

Input Data

|                             |          |
|-----------------------------|----------|
| Area (ac) .....             | 63.55    |
| Peak Rate Factor .....      | 484      |
| Weighted Curve Number ..... | 73       |
| Rain Gage ID .....          | 24hy10yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Small grain, contoured, Good | 63.55   | B     | 73     |
| Composite Area & Weighted CN | 63.55   |       | 73     |

Time of Concentration

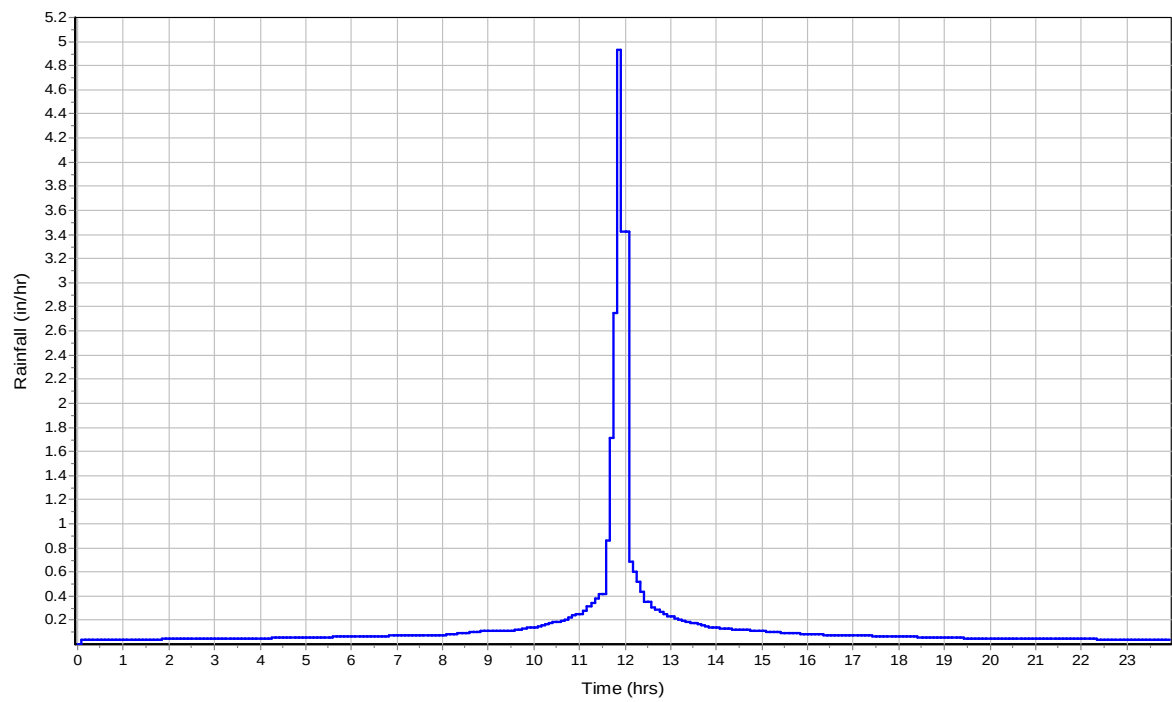
|                                        |         |         |         |
|----------------------------------------|---------|---------|---------|
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Sheet Flow Computations                |         |         |         |
| Manning's Roughness :                  | 0.06    | 0       | 0       |
| Flow Length (ft) :                     | 100     | 0       | 0       |
| Slope (%) :                            | 0.4     | 0       | 0       |
| 2 yr, 24 hr Rainfall (in) :            | 2.53    | 0       | 0       |
| Velocity (ft/sec) :                    | 0.17    | 0       | 0       |
| Computed Flow Time (min) :             | 10.08   | 0       | 0       |
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Shallow Concentrated Flow Computations |         |         |         |
| Flow Length (ft) :                     | 1106    | 1008    | 0       |
| Slope (%) :                            | 0.38    | 0.62    | 0       |
| Surface Type :                         | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 0.99    | 1.27    | 0       |
| Computed Flow Time (min) :             | 18.62   | 13.23   | 0       |
| Total TOC (min) .....                  | 41.93   |         |         |

Subbasin Runoff Results

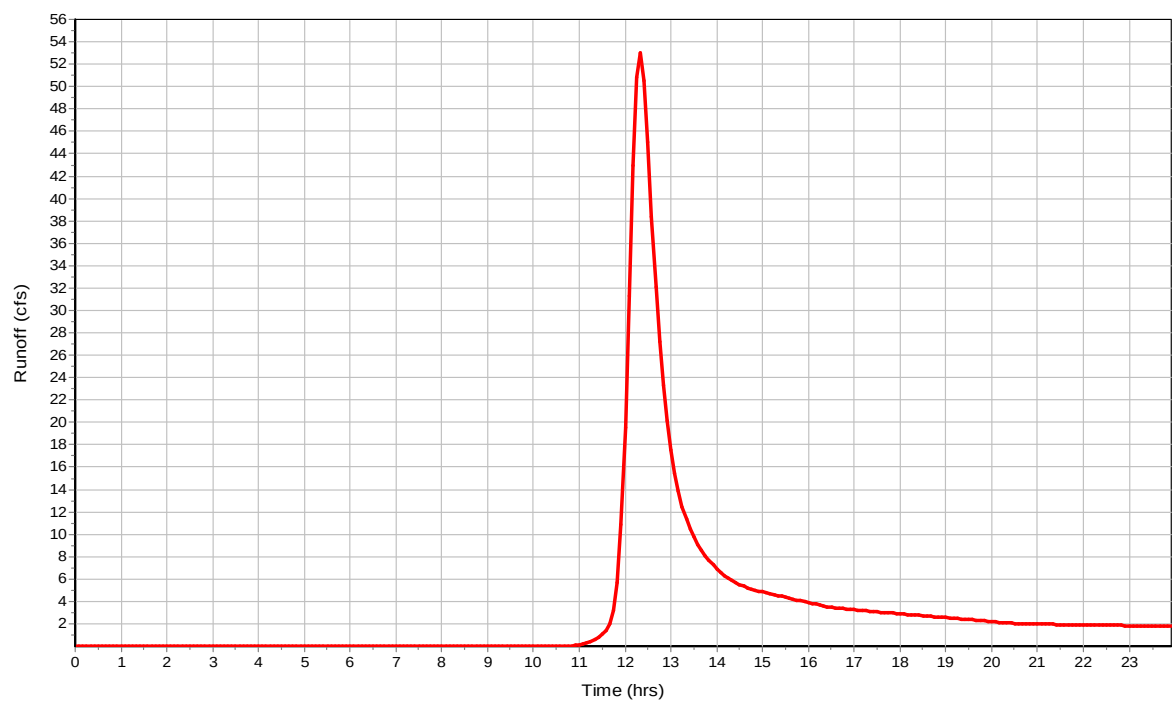
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.6        |
| Total Runoff (in) .....                     | 1.25       |
| Peak Runoff (cfs) .....                     | 53.03      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:41:56 |

Subbasin : Drainage\_Area\_5

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_6

### Input Data

Area (ac) ..... 31.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hy10yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, C + CR, Poor    | 31.81           | B             | 73              |
| Composite Area & Weighted CN | 31.81           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.15         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.11         | 0            | 0            |
| Computed Flow Time (min) :  | 14.92        | 0            | 0            |

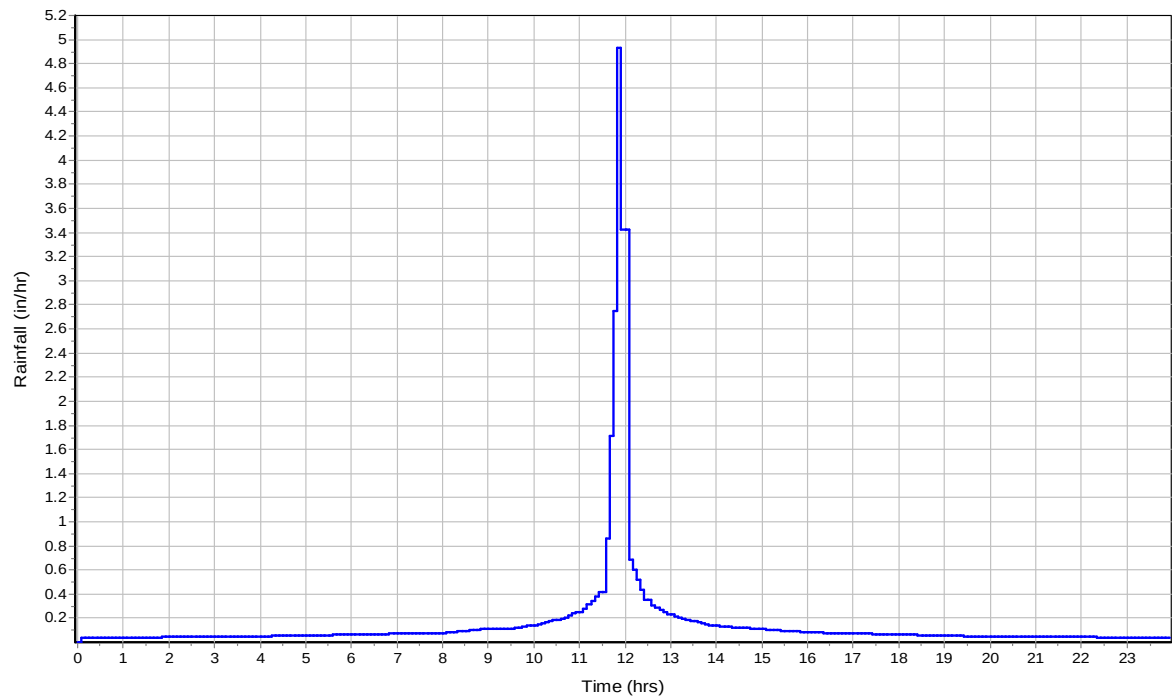
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1520         | 596          | 0            |
| Slope (%) :                            | 0.28         | 0.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.85         | 0            | 0            |
| Computed Flow Time (min) :             | 29.8         | 0            | 0            |
| Total TOC (min) .....                  | 44.72        |              |              |

### Subbasin Runoff Results

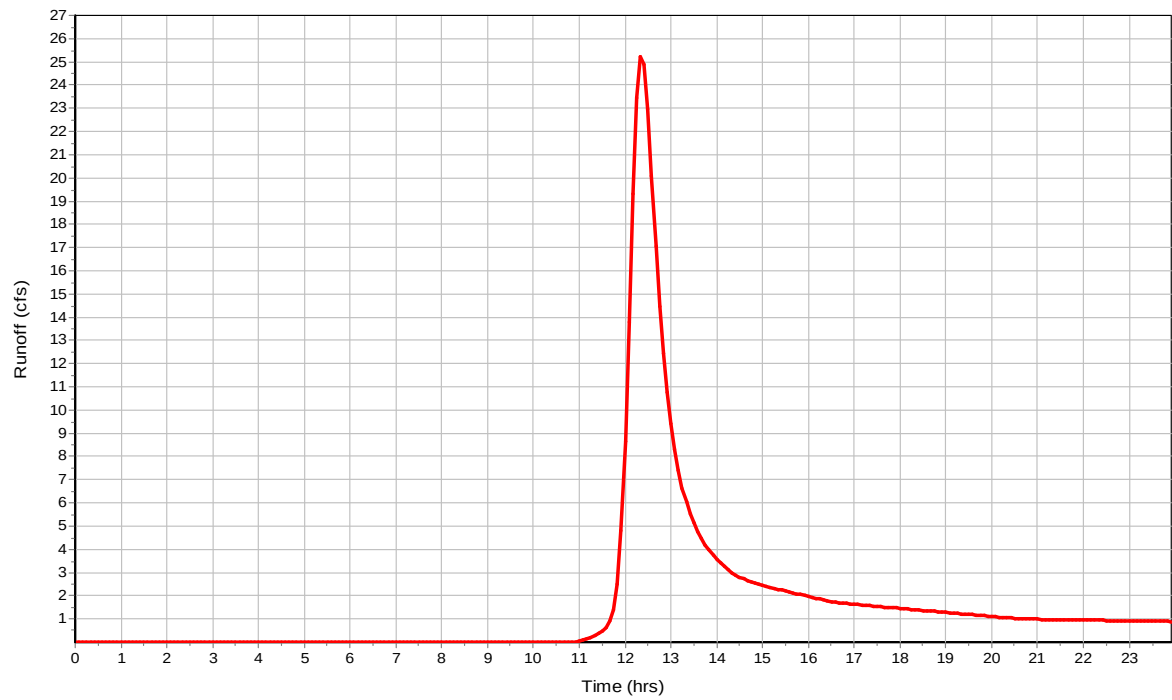
Total Rainfall (in) ..... 3.6  
Total Runoff (in) ..... 1.25  
Peak Runoff (cfs) ..... 25.4  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:44:43

Subbasin : Drainage\_Area\_6

Rainfall Intensity Graph



Runoff Hydrograph



Project Description

File Name ..... PreDevelopment Condition\_9\_22\_2023.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 6  
Subbasins..... 6  
Nodes..... 6  
    *Junctions* ..... 0  
    *Outfalls* ..... 6  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 0  
Links..... 0  
    *Channels* ..... 0  
    *Pipes* ..... 0  
    *Pumps* ..... 0  
    *Orifices* ..... 0  
    *Weirs* ..... 0  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 24hr100yr    | Time Series | 24hr100hr      | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 2  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 3  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 4  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 5  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 6  | 24hy10yr     | Time Series | 24hr10yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |



Subbasin Summary

| SN | Subbasin ID     | Area   | Peak Rate | Weighted Curve Number | Total Rainfall | Total Runoff | Total Runoff Volume | Peak Runoff | Time of Concentration |
|----|-----------------|--------|-----------|-----------------------|----------------|--------------|---------------------|-------------|-----------------------|
|    |                 | (ac)   | Factor    |                       | (in)           | (in)         | (ac-in)             | (cfs)       | (days hh:mm:ss)       |
| 1  | Drainage_Area_1 | 48.76  | 484.00    | 73.00                 | 4.30           | 1.75         | 85.13               | 84.59       | 0 00:23:37            |
| 2  | Drainage_Area_2 | 56.23  | 484.00    | 73.00                 | 4.30           | 1.75         | 98.18               | 72.70       | 0 00:37:49            |
| 3  | Drainage_Area_3 | 452.08 | 484.00    | 74.08                 | 4.30           | 1.83         | 825.50              | 305.56      | 0 01:38:52            |
| 4  | Drainage_Area_4 | 206.82 | 484.00    | 74.56                 | 4.30           | 1.86         | 385.10              | 189.46      | 0 01:08:06            |
| 5  | Drainage_Area_5 | 63.55  | 484.00    | 73.00                 | 4.30           | 1.75         | 110.96              | 76.55       | 0 00:41:55            |
| 6  | Drainage_Area_6 | 31.81  | 484.00    | 73.00                 | 4.30           | 1.75         | 55.54               | 36.63       | 0 00:44:43            |

Node Summary

| SN | Element<br>ID    | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min Freeboard<br>Peak<br>Attained | Time of<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------|
|    |                  |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                              | (days hh:mm)                      | (ac-in)                    | (min)                 |
| 1  | Analysis_Point_1 | Outfall         | 884.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 2  | Analysis_Point_2 | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 3  | DA_1             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 4  | DA_2             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 5  | DA_5             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 6  | DA_6             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 48.76    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 73       |
| Rain Gage ID          | 24hr25yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Legumes, C&T, Poor           | 48.76   | B     | 73     |
| Composite Area & Weighted CN | 48.76   |       | 73     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{(2/3)}) * (S_f^{0.5})) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

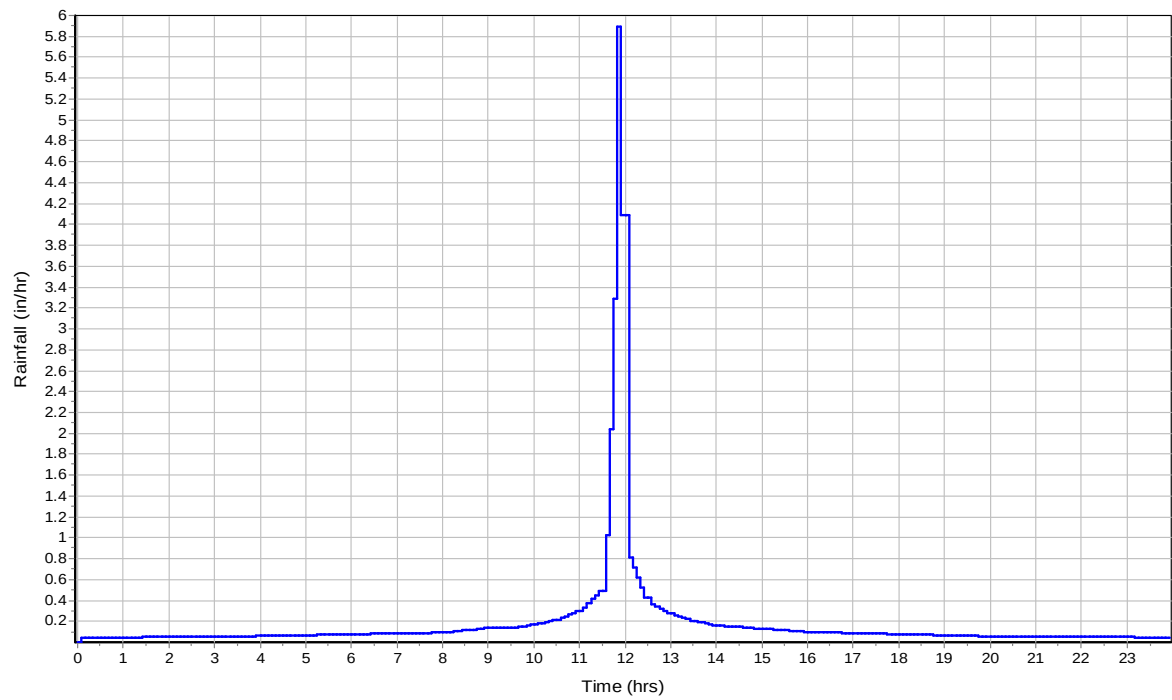
|                                        |              |              |              |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.1          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0            | 0            |
| Computed Flow Time (min) :             | 17.55        | 0            | 0            |
| Shallow Concentrated Flow Computations | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Flow Length (ft) :                     | 947          | 0            | 0            |
| Slope (%) :                            | 2.6          | 0            | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 2.6          | 0            | 0            |
| Computed Flow Time (min) :             | 6.07         | 0            | 0            |
| Total TOC (min) .....                  | 23.62        |              |              |

### Subbasin Runoff Results

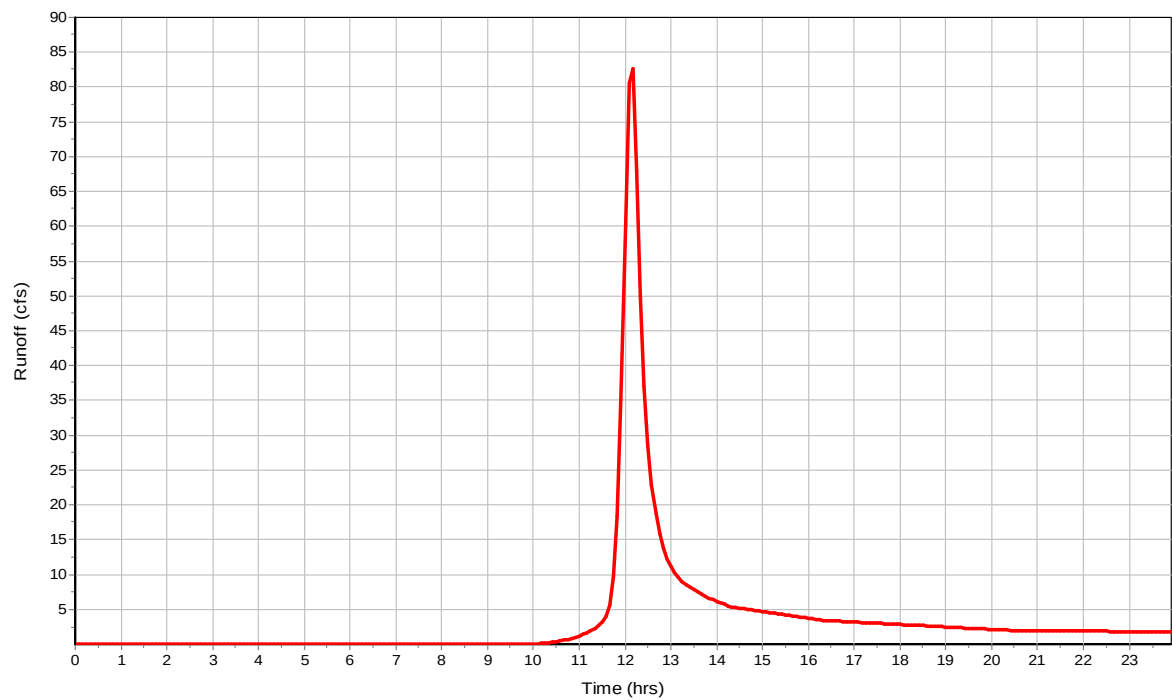
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 4.3        |
| Total Runoff (in) .....                     | 1.75       |
| Peak Runoff (cfs) .....                     | 84.59      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:23:37 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_2

### Input Data

Area (ac) ..... 56.23  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr25yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 56.23           | B             | 73              |
| Composite Area & Weighted CN | 56.23           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.05         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.07         | 0            | 0            |
| Computed Flow Time (min) :  | 23.15        | 0            | 0            |

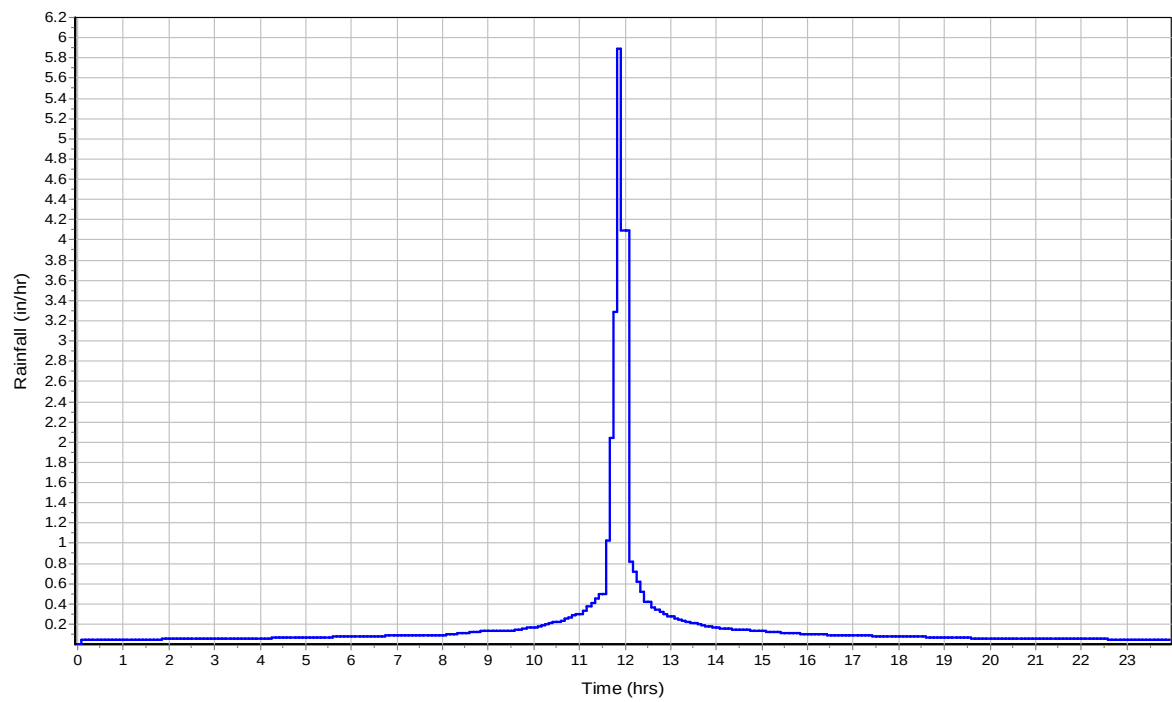
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1198         | 245          | 0            |
| Slope (%) :                            | 0.83         | 5.4          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.47         | 3.75         | 0            |
| Computed Flow Time (min) :             | 13.58        | 1.09         | 0            |
| Total TOC (min) .....37.83             |              |              |              |

### Subbasin Runoff Results

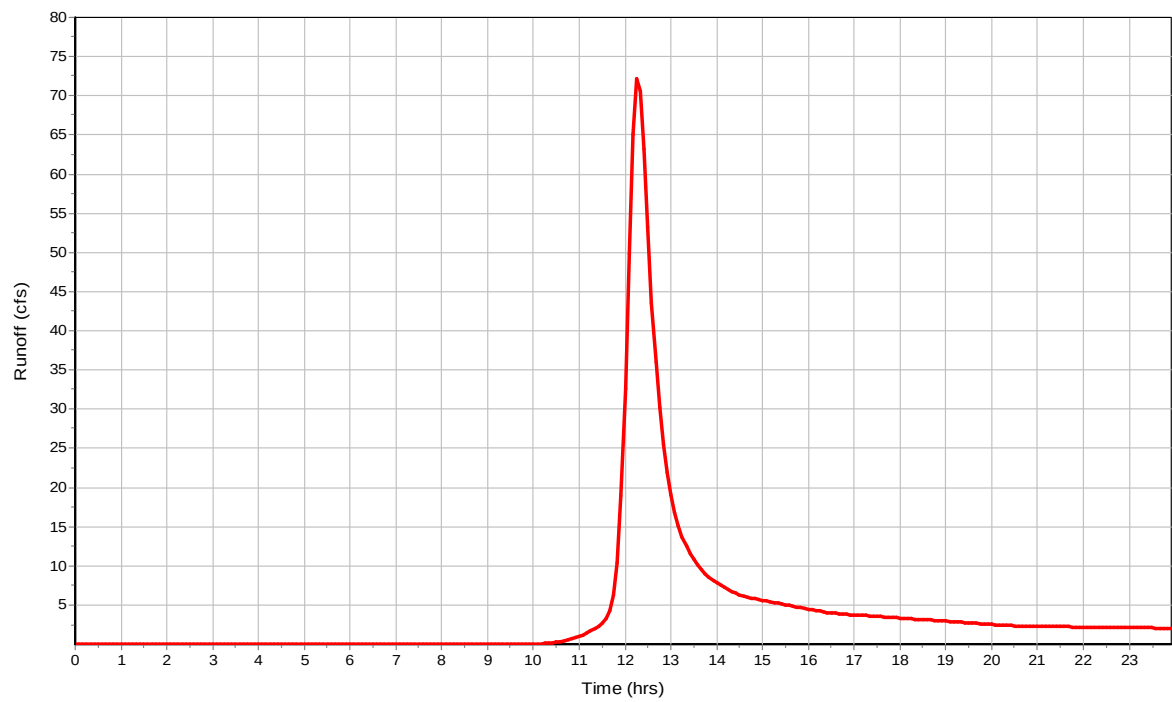
Total Rainfall (in) ..... 4.3  
Total Runoff (in) ..... 1.75  
Peak Runoff (cfs) ..... 72.7  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:37:50

Subbasin : Drainage\_Area\_2

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_3

### Input Data

Area (ac) ..... 452.08  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.08  
Rain Gage ID ..... 24hr25yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Row crops, C&T + CR, Good    | 410.4           | C             | 75              |
| Row crops, contoured, Good   | 9.81            | A             | 65              |
| Row crops, contoured, Good   | 31.88           | A             | 65              |
| Composite Area & Weighted CN | 452.09          |               | 74.08           |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.08         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.09         | 0            | 0            |
| Computed Flow Time (min) :  | 19.19        | 0            | 0            |

|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 4320         | 1322         | 0            |
| Slope (%) :                            | 0.42         | 1.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.05         | 1.98         | 0            |
| Computed Flow Time (min) :             | 68.57        | 11.13        | 0            |
| Total TOC (min) .....98.88             |              |              |              |

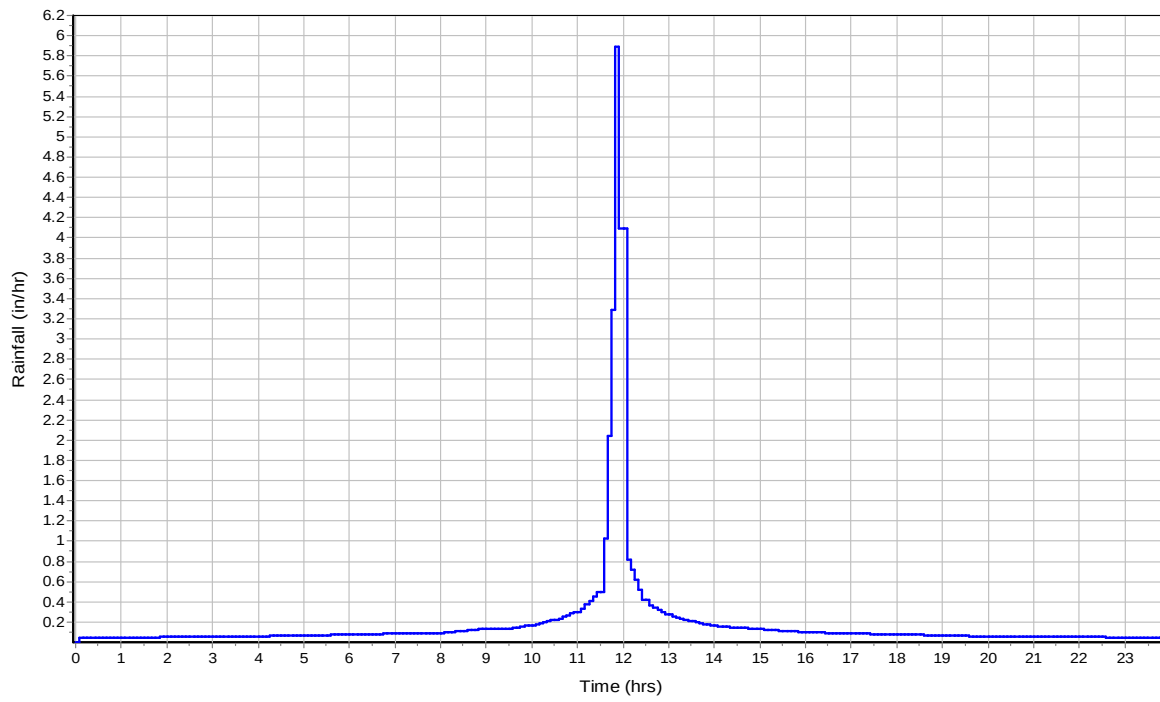
### Subbasin Runoff Results

Total Rainfall (in) ..... 4.3  
Total Runoff (in) ..... 1.83  
Peak Runoff (cfs) ..... 305.56  
Weighted Curve Number ..... 74.08  
Time of Concentration (days hh:mm:ss) ..... 0 01:38:53

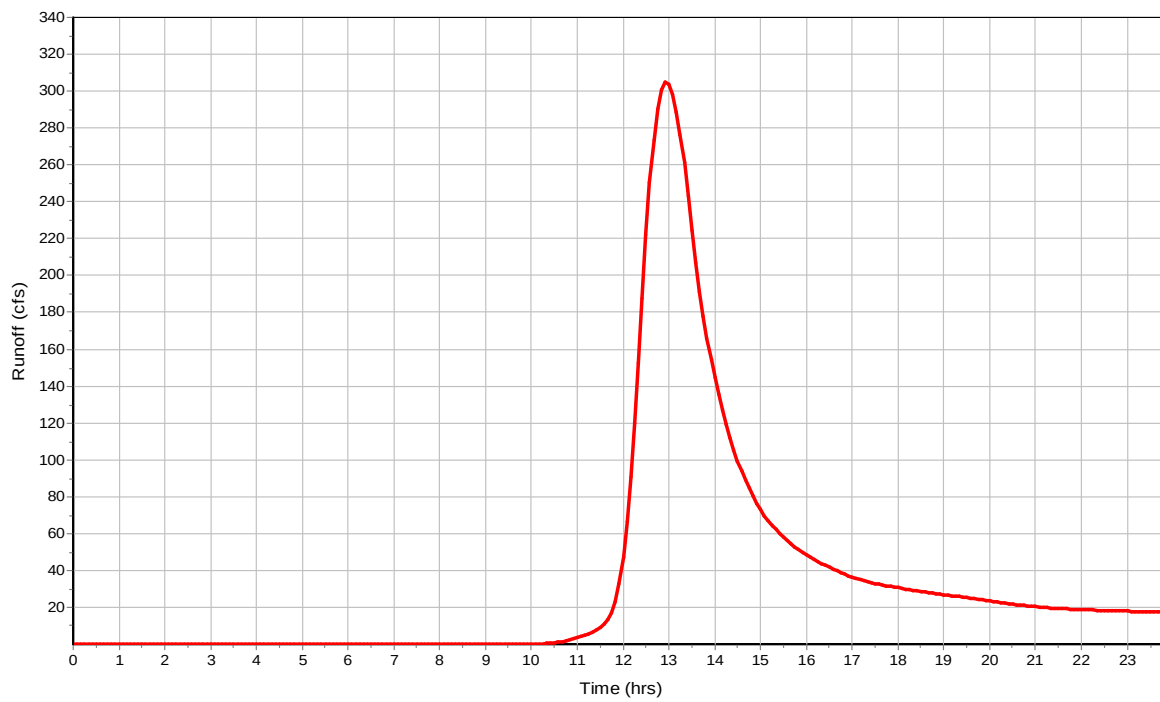


Subbasin : Drainage\_Area\_3

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_4

### Input Data

Area (ac) ..... 206.82  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.56  
Rain Gage ID ..... 24hr25yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, C&T + CR, Good  | 197.77          | C             | 75              |
| Row crops, contoured, Good   | 9.05            | A             | 65              |
| Composite Area & Weighted CN | 206.82          |               | 74.56           |

### Time of Concentration

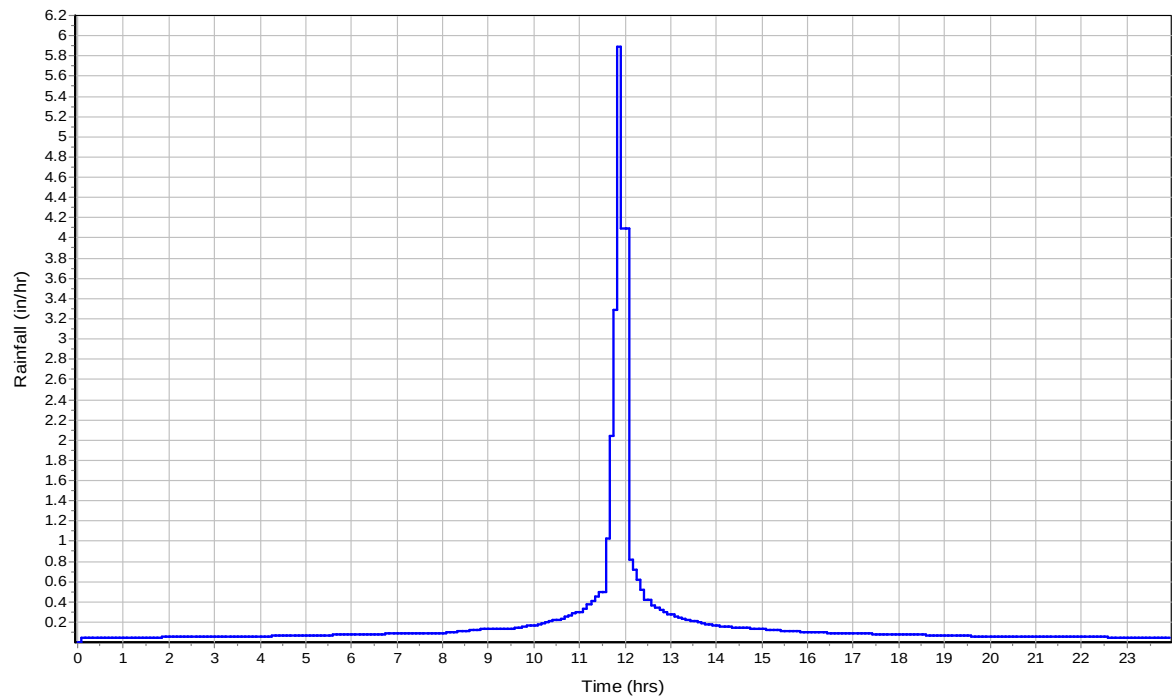
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.33         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.15         | 0            | 0            |
| Computed Flow Time (min) :             | 10.88        | 0            | 0            |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 3100         | 809          | 0            |
| Slope (%) :                            | 0.39         | 1.9          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.01         | 2.22         | 0            |
| Computed Flow Time (min) :             | 51.16        | 6.07         | 0            |
| Total TOC (min) .....                  | 68.11        |              |              |

### Subbasin Runoff Results

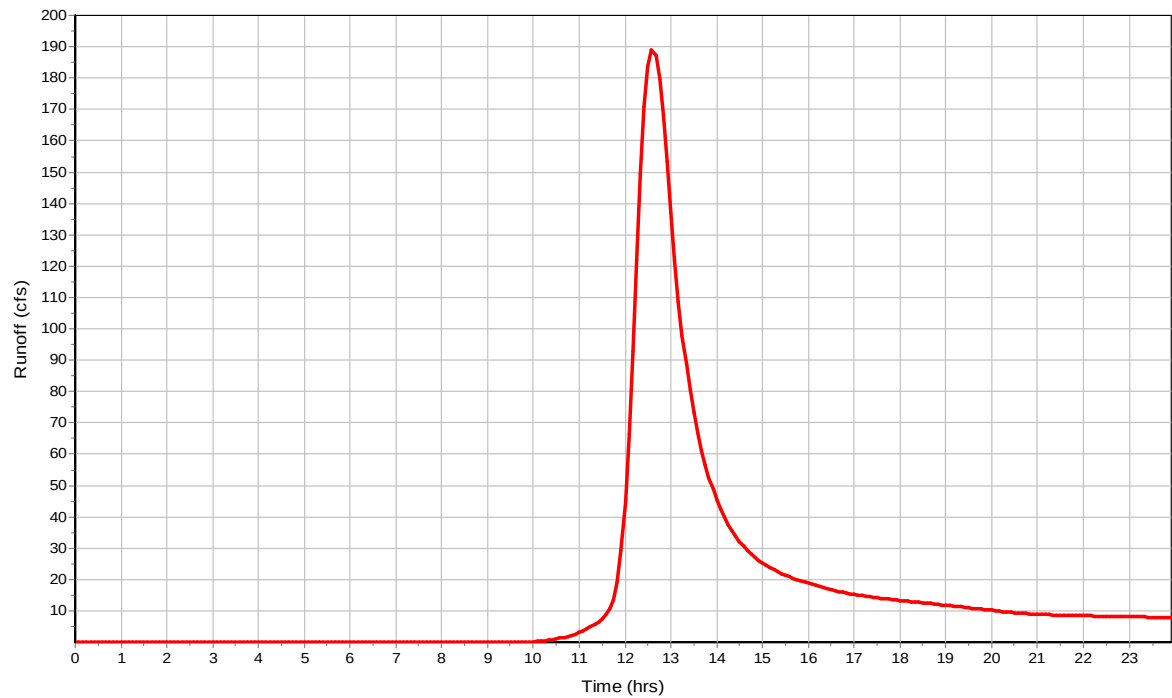
Total Rainfall (in) ..... 4.3  
Total Runoff (in) ..... 1.86  
Peak Runoff (cfs) ..... 189.46  
Weighted Curve Number ..... 74.56  
Time of Concentration (days hh:mm:ss) ..... 0 01:08:07

Subbasin : Drainage\_Area\_4

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_5

### Input Data

Area (ac) ..... 63.55  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr25yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 63.55           | B             | 73              |
| Composite Area & Weighted CN | 63.55           |               | 73              |

### Time of Concentration

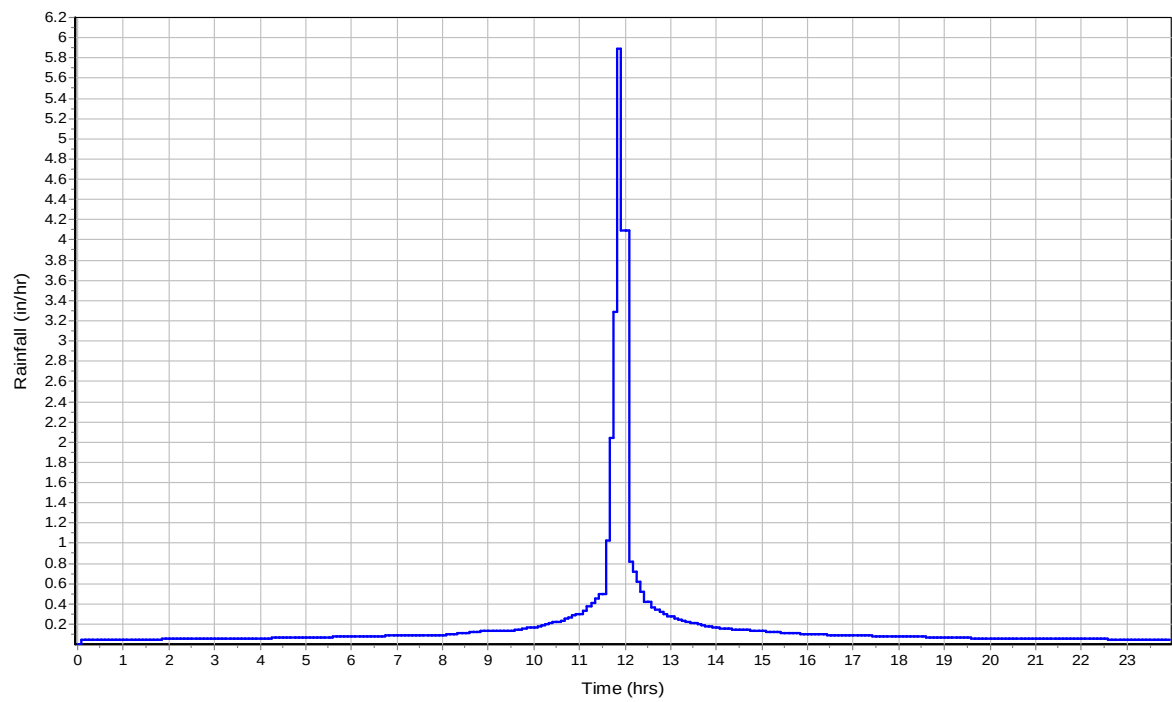
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.4          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.17         | 0            | 0            |
| Computed Flow Time (min) :             | 10.08        | 0            | 0            |
|                                        |              |              |              |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1106         | 1008         | 0            |
| Slope (%) :                            | 0.38         | 0.62         | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.99         | 1.27         | 0            |
| Computed Flow Time (min) :             | 18.62        | 13.23        | 0            |
| Total TOC (min) .....                  |              |              | 41.93        |

### Subbasin Runoff Results

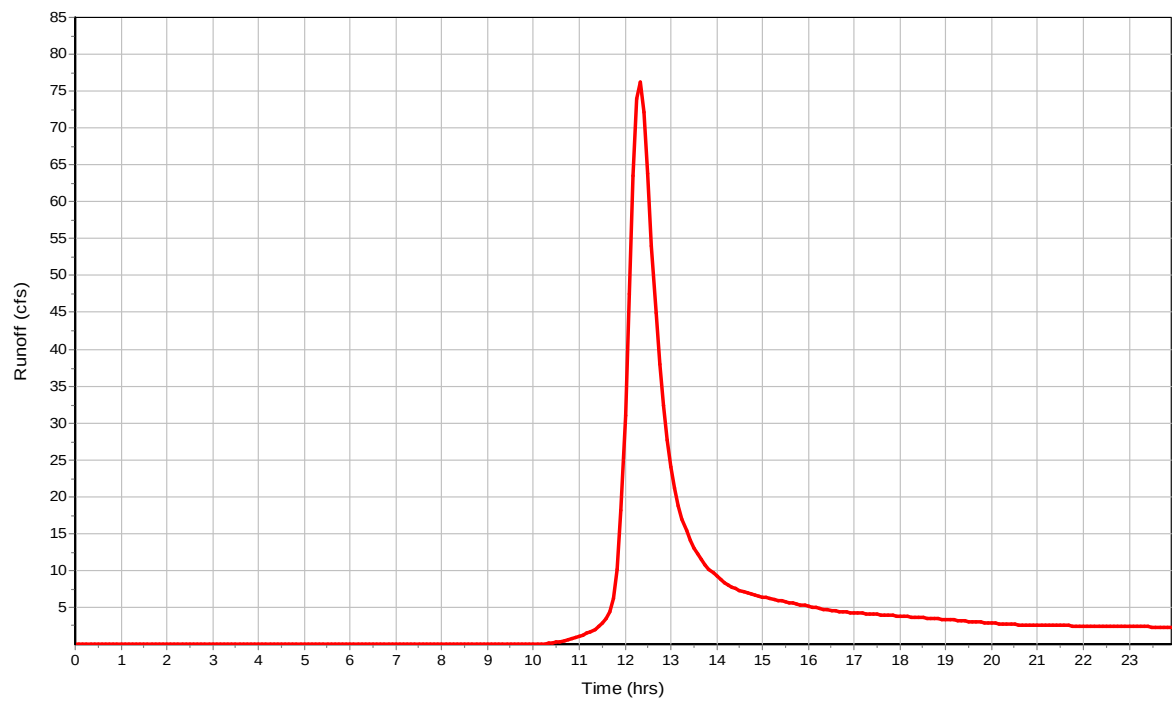
Total Rainfall (in) ..... 4.3  
Total Runoff (in) ..... 1.75  
Peak Runoff (cfs) ..... 76.55  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:41:56

Subbasin : Drainage\_Area\_5

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_6

### Input Data

Area (ac) ..... 31.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr25yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, C + CR, Poor    | 31.81           | B             | 73              |
| Composite Area & Weighted CN | 31.81           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.15         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.11         | 0            | 0            |
| Computed Flow Time (min) :  | 14.92        | 0            | 0            |

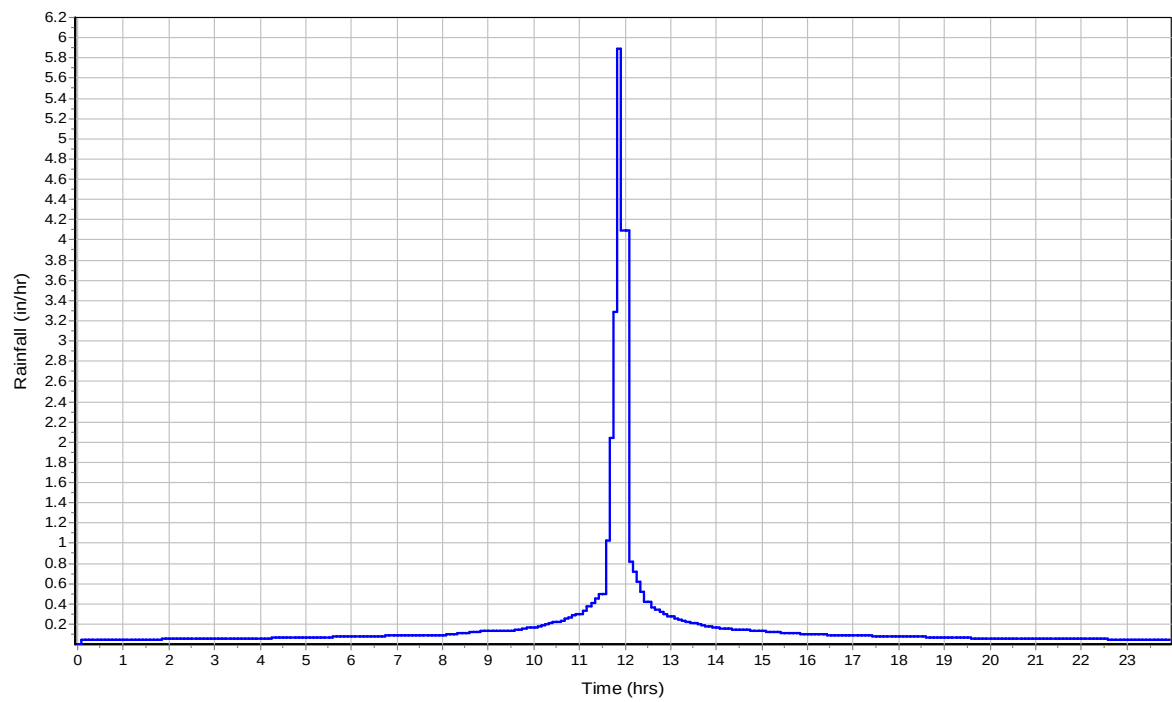
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1520         | 596          | 0            |
| Slope (%) :                            | 0.28         | 0.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.85         | 0            | 0            |
| Computed Flow Time (min) :             | 29.8         | 0            | 0            |
| Total TOC (min) .....                  | 44.72        |              |              |

### Subbasin Runoff Results

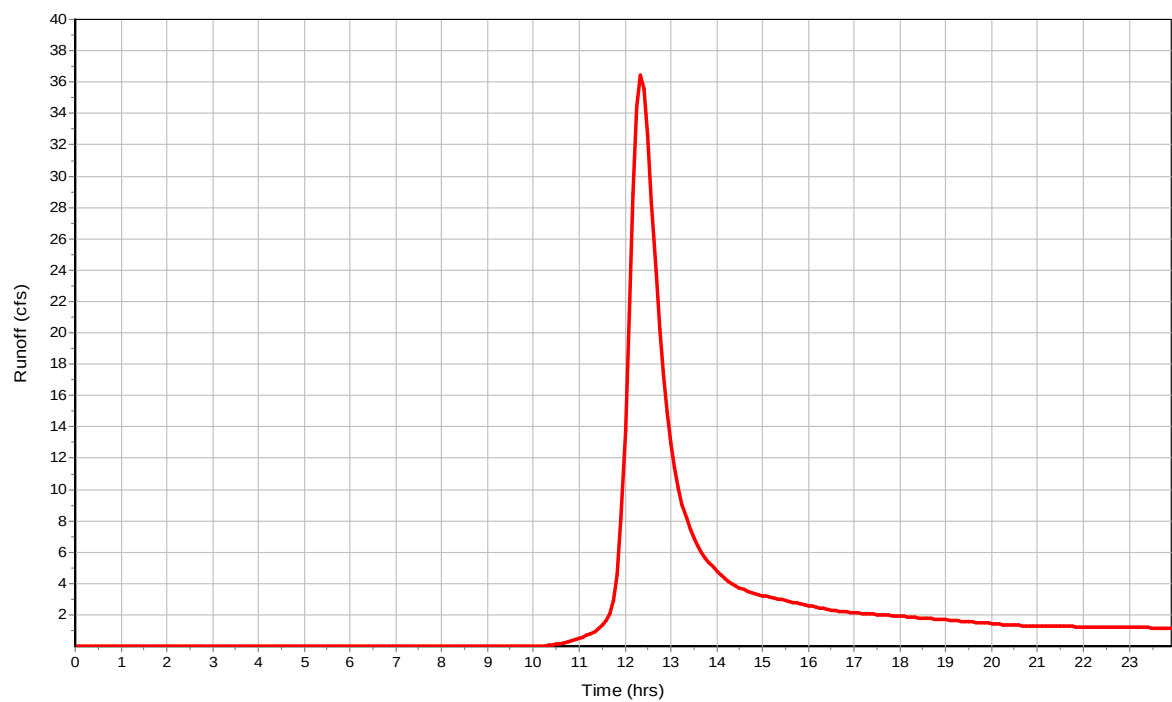
Total Rainfall (in) ..... 4.3  
Total Runoff (in) ..... 1.75  
Peak Runoff (cfs) ..... 36.63  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:44:43

Subbasin : Drainage\_Area\_6

Rainfall Intensity Graph



Runoff Hydrograph



Project Description

File Name ..... PreDevelopment Condition\_9\_22\_2023.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 6  
Subbasins..... 6  
Nodes..... 6  
    *Junctions* ..... 0  
    *Outfalls* ..... 6  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 0  
Links..... 0  
    *Channels* ..... 0  
    *Pipes* ..... 0  
    *Pumps* ..... 0  
    *Orifices* ..... 0  
    *Weirs* ..... 0  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 24hr100yr    | Time Series | 24hr100hr      | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 2  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 3  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 4  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 5  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 6  | 24hy10yr     | Time Series | 24hr10yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |



Subbasin Summary

| SN | Subbasin<br>ID  | Area   | Peak Rate<br>Factor | Weighted<br>Curve<br>Number | Total<br>Rainfall | Total<br>Runoff | Total<br>Runoff<br>Volume | Peak<br>Runoff | Time of<br>Concentration |
|----|-----------------|--------|---------------------|-----------------------------|-------------------|-----------------|---------------------------|----------------|--------------------------|
|    |                 | (ac)   |                     |                             | (in)              | (in)            | (ac-in)                   | (cfs)          | (days hh:mm:ss)          |
| 1  | Drainage_Area_1 | 48.76  | 484.00              | 73.00                       | 4.91              | 2.21            | 107.76                    | 108.21         | 0 00:23:37               |
| 2  | Drainage_Area_2 | 56.23  | 484.00              | 73.00                       | 4.91              | 2.21            | 124.27                    | 93.17          | 0 00:37:49               |
| 3  | Drainage_Area_3 | 452.08 | 484.00              | 74.08                       | 4.91              | 2.30            | 1039.33                   | 390.19         | 0 01:38:52               |
| 4  | Drainage_Area_4 | 206.82 | 484.00              | 74.56                       | 4.91              | 2.34            | 483.75                    | 240.79         | 0 01:08:06               |
| 5  | Drainage_Area_5 | 63.55  | 484.00              | 73.00                       | 4.91              | 2.21            | 140.45                    | 98.02          | 0 00:41:55               |
| 6  | Drainage_Area_6 | 31.81  | 484.00              | 73.00                       | 4.91              | 2.21            | 70.30                     | 46.95          | 0 00:44:43               |

Node Summary

| SN | Element<br>ID    | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min Freeboard<br>Peak<br>Attained | Time of<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------|
|    |                  |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                              | (days hh:mm)                      | (ac-in)                    | (min)                 |
| 1  | Analysis_Point_1 | Outfall         | 884.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 2  | Analysis_Point_2 | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 3  | DA_1             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 4  | DA_2             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 5  | DA_5             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 6  | DA_6             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 48.76    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 73       |
| Rain Gage ID          | 24hr50yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Legumes, C&T, Poor           | 48.76   | B     | 73     |
| Composite Area & Weighted CN | 48.76   |       | 73     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{(2/3)})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

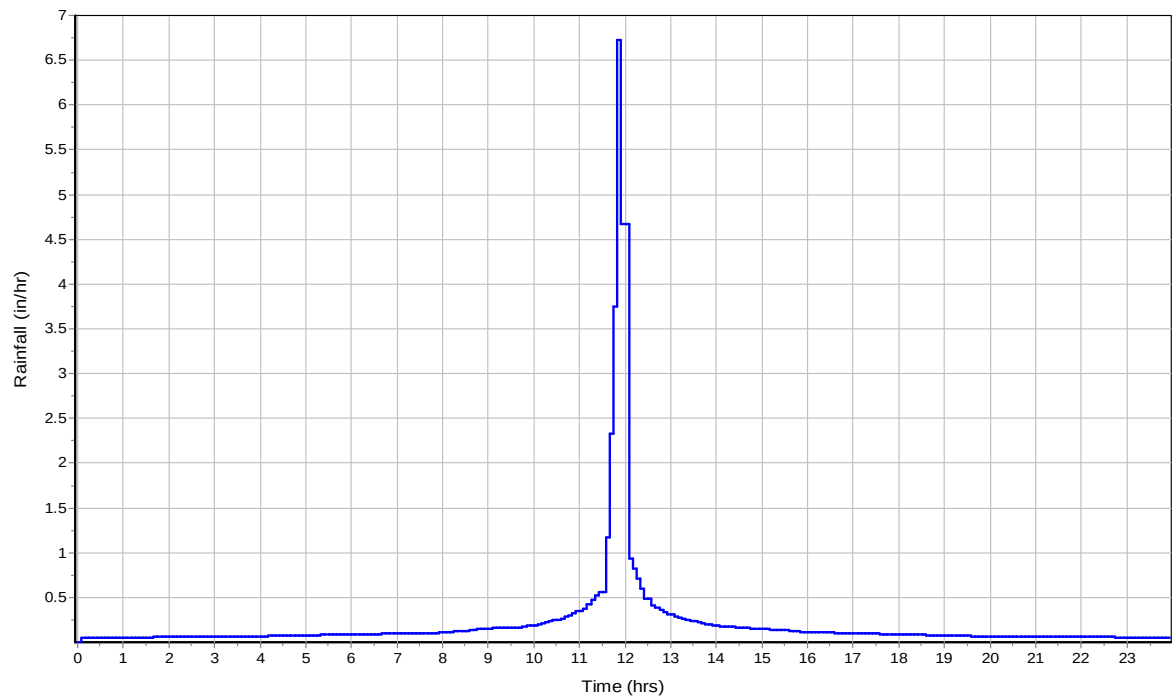
|                                        |              |              |              |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.1          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0            | 0            |
| Computed Flow Time (min) :             | 17.55        | 0            | 0            |
| Shallow Concentrated Flow Computations | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Flow Length (ft) :                     | 947          | 0            | 0            |
| Slope (%) :                            | 2.6          | 0            | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 2.6          | 0            | 0            |
| Computed Flow Time (min) :             | 6.07         | 0            | 0            |
| Total TOC (min) .....                  | 23.62        |              |              |

### Subbasin Runoff Results

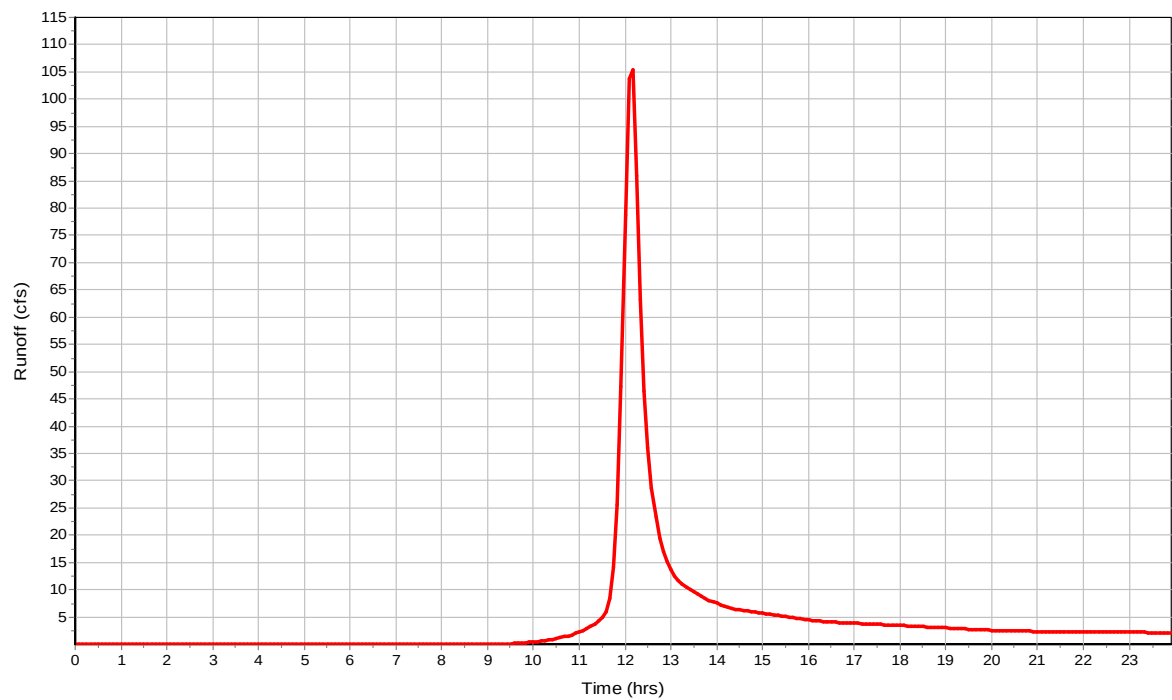
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 4.91       |
| Total Runoff (in) .....                     | 2.21       |
| Peak Runoff (cfs) .....                     | 108.21     |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:23:37 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_2

### Input Data

Area (ac) ..... 56.23  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr50yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 56.23           | B             | 73              |
| Composite Area & Weighted CN | 56.23           |               | 73              |

### Time of Concentration

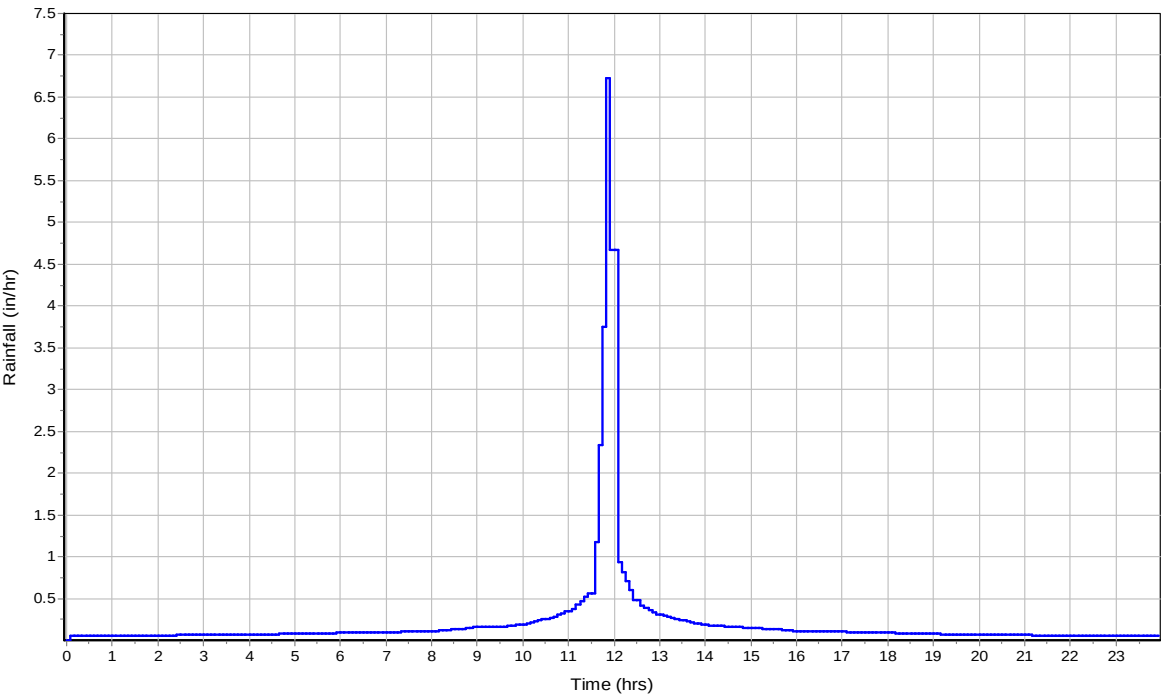
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.05         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.07         | 0            | 0            |
| Computed Flow Time (min) :             | 23.15        | 0            | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1198         | 245          | 0            |
| Slope (%) :                            | 0.83         | 5.4          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.47         | 3.75         | 0            |
| Computed Flow Time (min) :             | 13.58        | 1.09         | 0            |
| Total TOC (min) .....37.83             |              |              |              |

### Subbasin Runoff Results

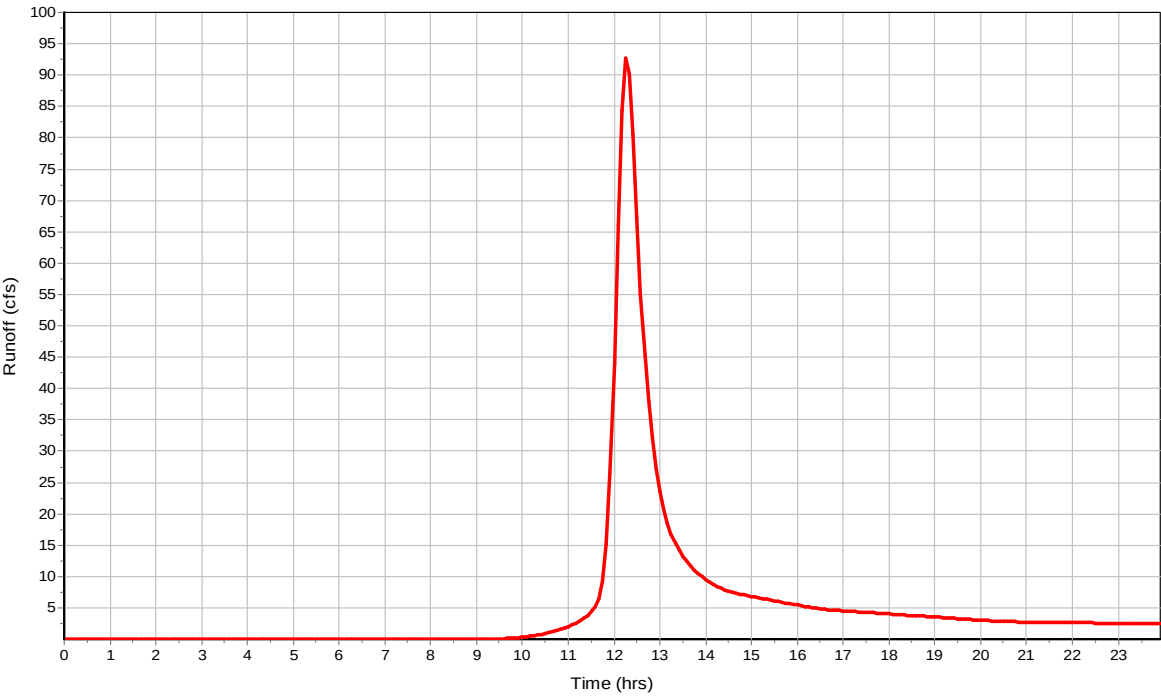
Total Rainfall (in) ..... 4.91  
Total Runoff (in) ..... 2.21  
Peak Runoff (cfs) ..... 93.17  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:37:50

Subbasin : Drainage\_Area\_2

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_3

### Input Data

Area (ac) ..... 452.08  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.08  
Rain Gage ID ..... 24hr50yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Row crops, C&T + CR, Good    | 410.4           | C             | 75              |
| Row crops, contoured, Good   | 9.81            | A             | 65              |
| Row crops, contoured, Good   | 31.88           | A             | 65              |
| Composite Area & Weighted CN | 452.09          |               | 74.08           |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.08         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.09         | 0            | 0            |
| Computed Flow Time (min) :  | 19.19        | 0            | 0            |

|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 4320         | 1322         | 0            |
| Slope (%) :                            | 0.42         | 1.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.05         | 1.98         | 0            |
| Computed Flow Time (min) :             | 68.57        | 11.13        | 0            |
| Total TOC (min) .....98.88             |              |              |              |

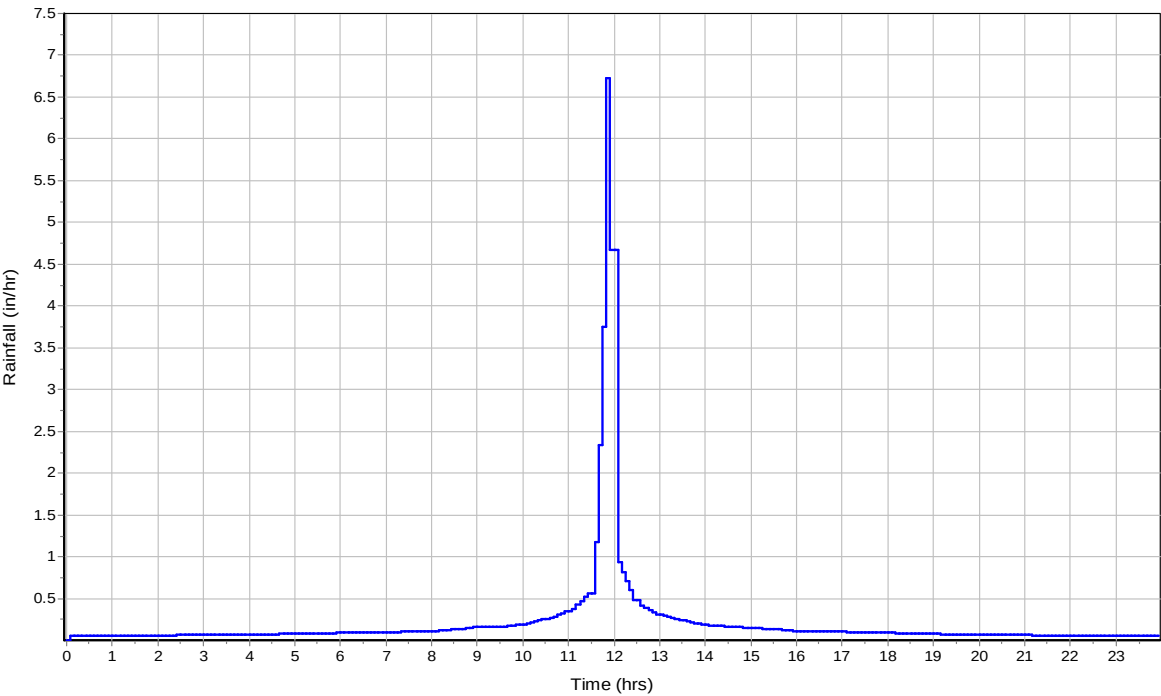
### Subbasin Runoff Results

Total Rainfall (in) ..... 4.91  
Total Runoff (in) ..... 2.3  
Peak Runoff (cfs) ..... 390.19  
Weighted Curve Number ..... 74.08  
Time of Concentration (days hh:mm:ss) ..... 0 01:38:53

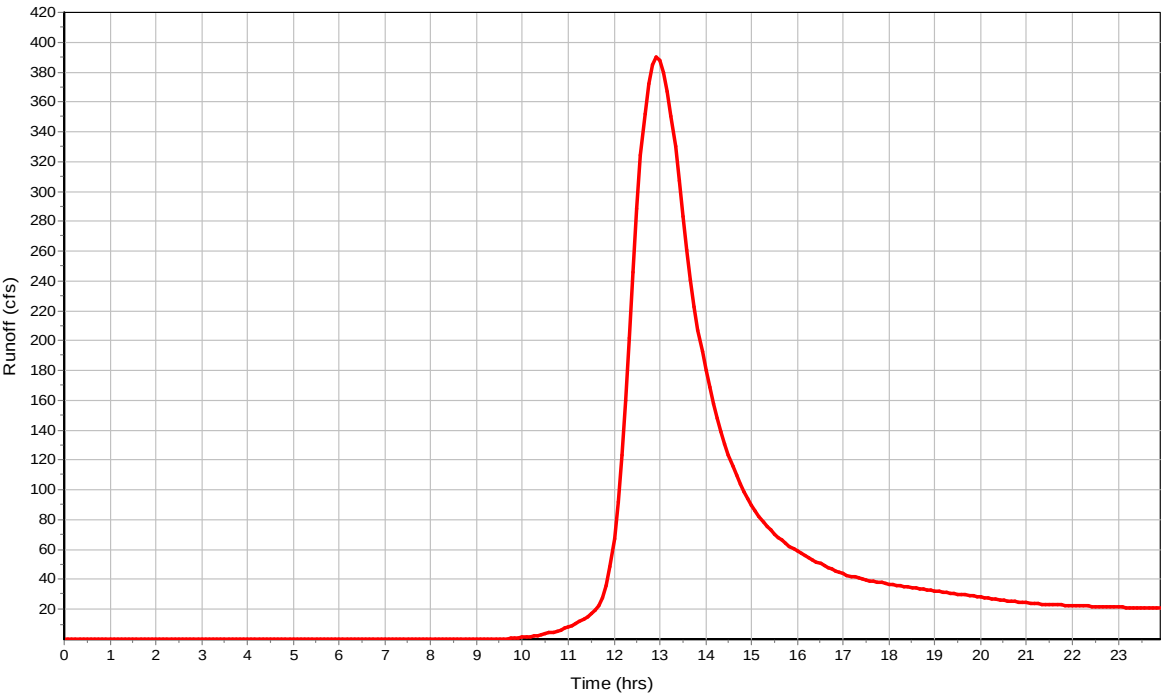


Subbasin : Drainage\_Area\_3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_4

Input Data

|                             |          |
|-----------------------------|----------|
| Area (ac) .....             | 206.82   |
| Peak Rate Factor .....      | 484      |
| Weighted Curve Number ..... | 74.56    |
| Rain Gage ID .....          | 24hr50yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Small grain, C&T + CR, Good  | 197.77  | C     | 75     |
| Row crops, contoured, Good   | 9.05    | A     | 65     |
| Composite Area & Weighted CN | 206.82  |       | 74.56  |

Time of Concentration

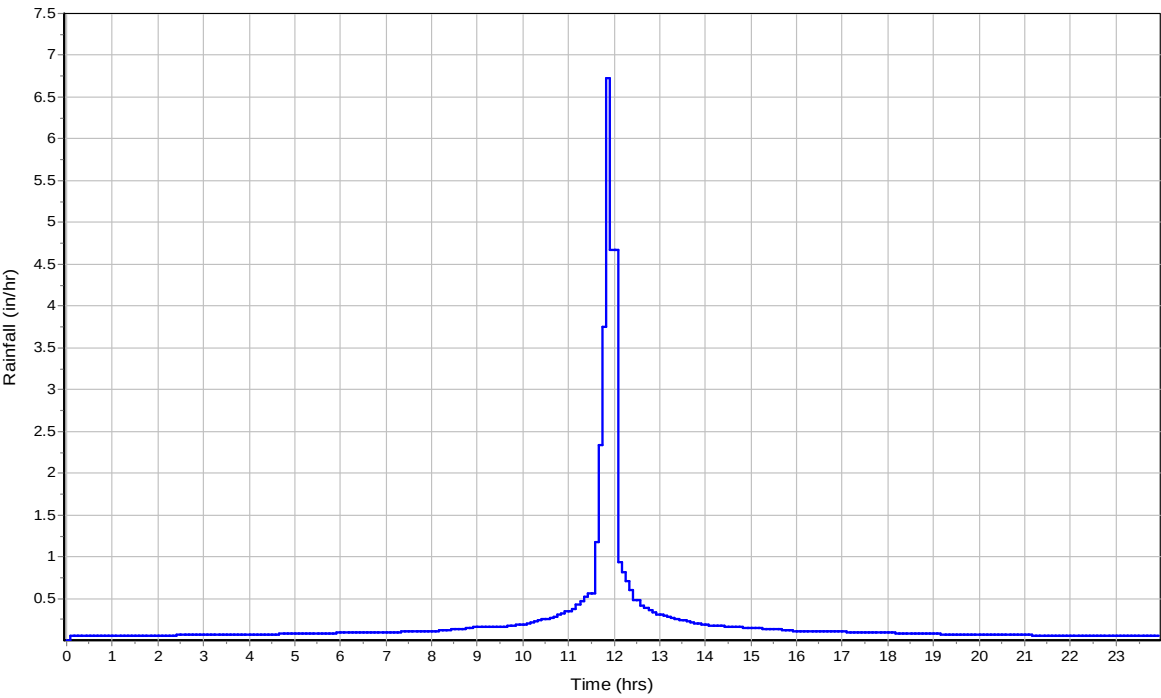
|                                        |         |         |         |
|----------------------------------------|---------|---------|---------|
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Sheet Flow Computations                |         |         |         |
| Manning's Roughness :                  | 0.06    | 0       | 0       |
| Flow Length (ft) :                     | 100     | 0       | 0       |
| Slope (%) :                            | 0.33    | 0       | 0       |
| 2 yr, 24 hr Rainfall (in) :            | 2.53    | 0       | 0       |
| Velocity (ft/sec) :                    | 0.15    | 0       | 0       |
| Computed Flow Time (min) :             | 10.88   | 0       | 0       |
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Shallow Concentrated Flow Computations |         |         |         |
| Flow Length (ft) :                     | 3100    | 809     | 0       |
| Slope (%) :                            | 0.39    | 1.9     | 0       |
| Surface Type :                         | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 1.01    | 2.22    | 0       |
| Computed Flow Time (min) :             | 51.16   | 6.07    | 0       |
| Total TOC (min) .....                  | 68.11   |         |         |

Subbasin Runoff Results

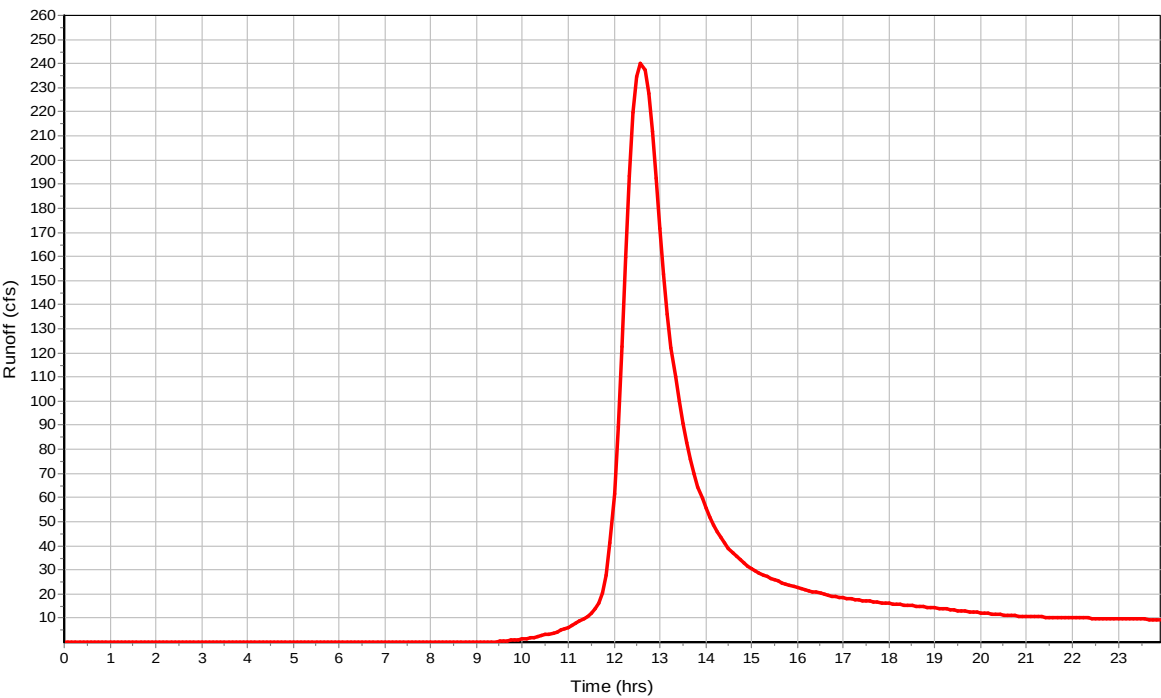
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 4.91       |
| Total Runoff (in) .....                     | 2.34       |
| Peak Runoff (cfs) .....                     | 240.79     |
| Weighted Curve Number .....                 | 74.56      |
| Time of Concentration (days hh:mm:ss) ..... | 0 01:08:07 |

Subbasin : Drainage\_Area\_4

Rainfall Intensity Graph



Runoff Hydrograph



**Subbasin : Drainage\_Area\_5**

### Input Data

|                             |          |
|-----------------------------|----------|
| Area (ac) .....             | 63.55    |
| Peak Rate Factor .....      | 484      |
| Weighted Curve Number ..... | 73       |
| Rain Gage ID .....          | 24hr50yr |

**Composite Curve Number**

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Small grain, contoured, Good | 63.55           | B             | 73              |
| Composite Area & Weighted CN | 63.55           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.4          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.17         | 0            | 0            |
| Computed Flow Time (min) :  | 10.08        | 0            | 0            |

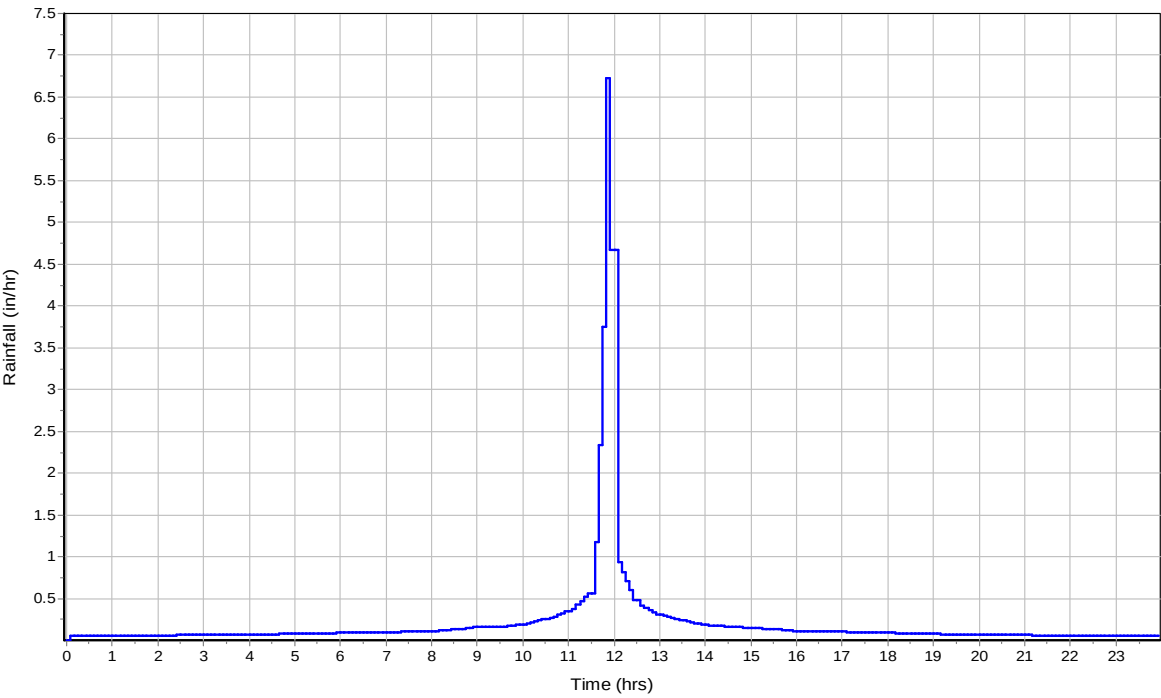
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1106         | 1008         | 0            |
| Slope (%) :                            | 0.38         | 0.62         | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.99         | 1.27         | 0            |
| Computed Flow Time (min) :             | 18.62        | 13.23        | 0            |
| <b>Total TOC (min) .....41.93</b>      |              |              |              |

### Subbasin Runoff Results

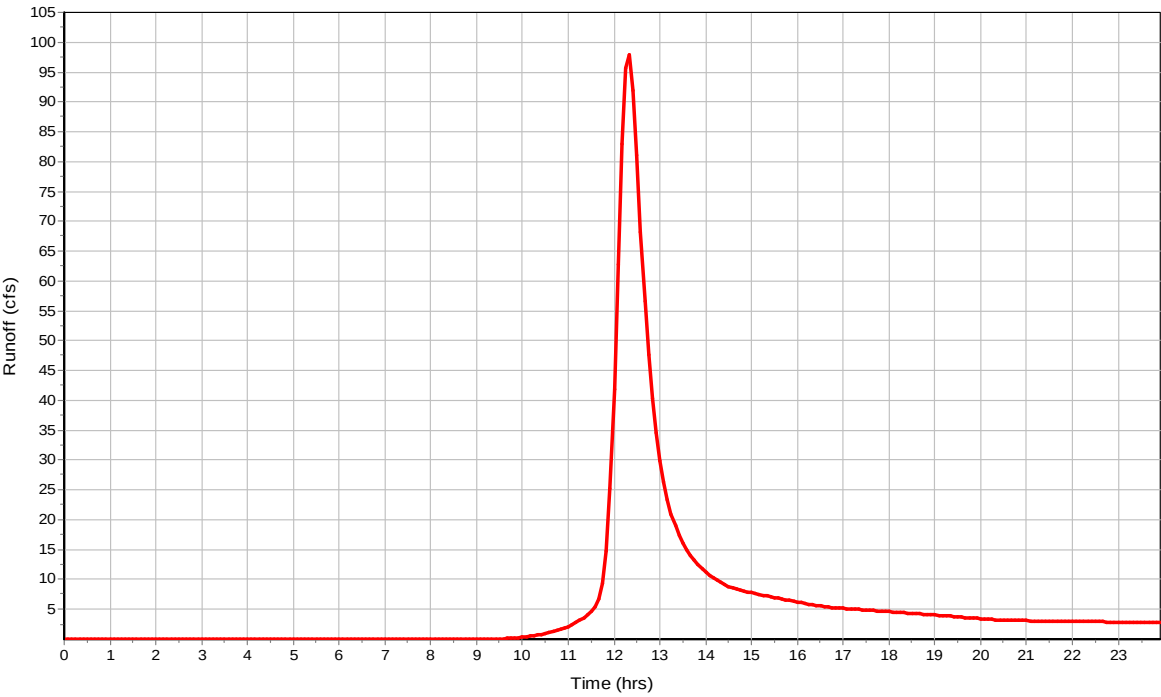
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 4.91       |
| Total Runoff (in) .....                     | 2.21       |
| Peak Runoff (cfs) .....                     | 98.02      |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:41:56 |

Subbasin : Drainage\_Area\_5

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_6

### Input Data

Area (ac) ..... 31.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr50yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, C + CR, Poor    | 31.81           | B             | 73              |
| Composite Area & Weighted CN | 31.81           |               | 73              |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.15         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.11         | 0            | 0            |
| Computed Flow Time (min) :  | 14.92        | 0            | 0            |

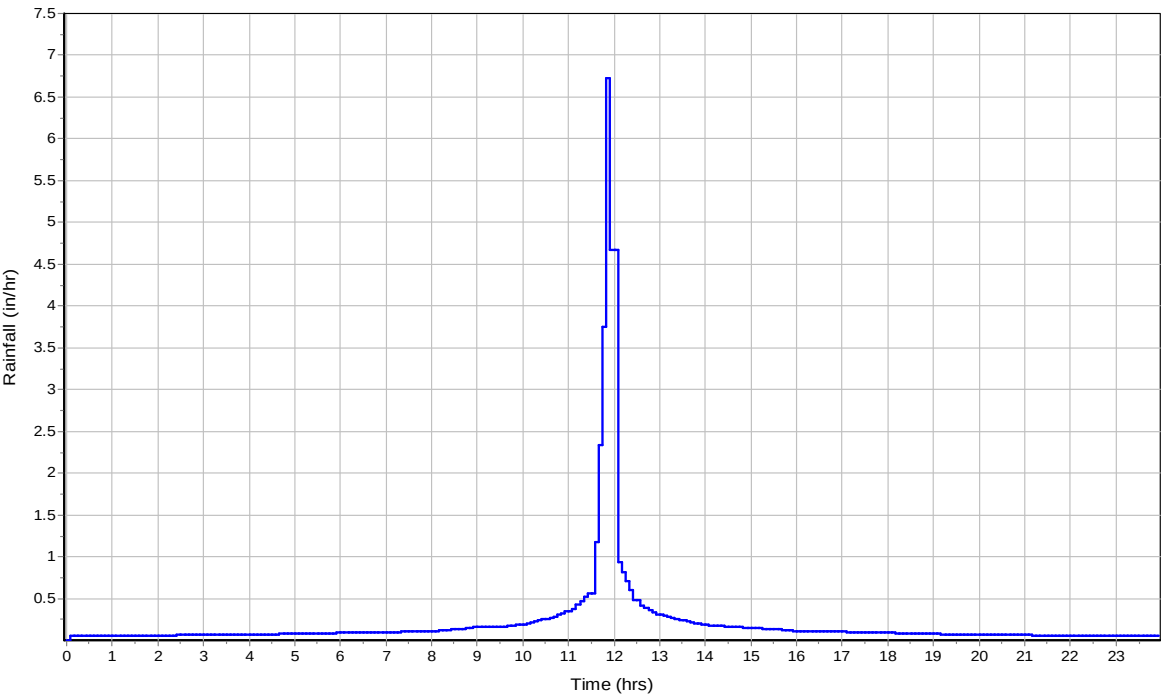
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1520         | 596          | 0            |
| Slope (%) :                            | 0.28         | 0.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.85         | 0            | 0            |
| Computed Flow Time (min) :             | 29.8         | 0            | 0            |
| Total TOC (min) .....                  | 44.72        |              |              |

### Subbasin Runoff Results

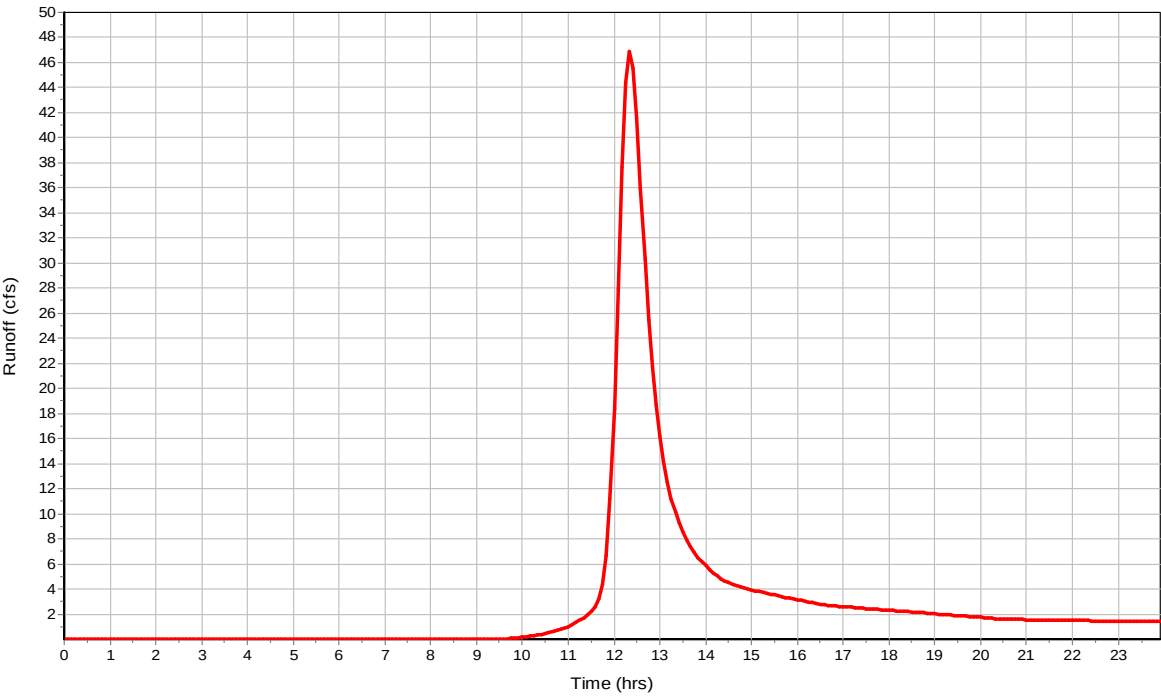
Total Rainfall (in) ..... 4.91  
Total Runoff (in) ..... 2.21  
Peak Runoff (cfs) ..... 46.95  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:44:43

Subbasin : Drainage\_Area\_6

Rainfall Intensity Graph



Runoff Hydrograph



Project Description

File Name ..... PreDevelopment Condition\_9\_22\_2023.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 6  
Subbasins..... 6  
Nodes..... 6  
    *Junctions* ..... 0  
    *Outfalls* ..... 6  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 0  
Links..... 0  
    *Channels* ..... 0  
    *Pipes* ..... 0  
    *Pumps* ..... 0  
    *Orifices* ..... 0  
    *Weirs* ..... 0  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 24hr100yr    | Time Series | 24hr100hr      | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 2  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 3  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 4  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 5  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |
| 6  | 24hy10yr     | Time Series | 24hr10yr       | Cumulative    | inches     |          |         |                       |                         | User Defined          |



Subbasin Summary

| SN | Subbasin<br>ID  | Area   | Peak Rate<br>Factor | Weighted<br>Curve<br>Number | Total<br>Rainfall | Total<br>Runoff | Total<br>Runoff<br>Volume | Peak<br>Runoff | Time of<br>Concentration |
|----|-----------------|--------|---------------------|-----------------------------|-------------------|-----------------|---------------------------|----------------|--------------------------|
|    |                 | (ac)   |                     |                             | (in)              | (in)            | (ac-in)                   | (cfs)          | (days hh:mm:ss)          |
| 1  | Drainage_Area_1 | 48.76  | 484.00              | 73.00                       | 5.60              | 2.76            | 134.58                    | 136.08         | 0 00:23:37               |
| 2  | Drainage_Area_2 | 56.23  | 484.00              | 73.00                       | 5.60              | 2.76            | 155.19                    | 117.52         | 0 00:37:49               |
| 3  | Drainage_Area_3 | 452.08 | 484.00              | 74.08                       | 5.60              | 2.86            | 1292.50                   | 489.51         | 0 01:38:52               |
| 4  | Drainage_Area_4 | 206.82 | 484.00              | 74.56                       | 5.60              | 2.90            | 600.40                    | 301.63         | 0 01:08:06               |
| 5  | Drainage_Area_5 | 63.55  | 484.00              | 73.00                       | 5.60              | 2.76            | 175.40                    | 123.67         | 0 00:41:55               |
| 6  | Drainage_Area_6 | 31.81  | 484.00              | 73.00                       | 5.60              | 2.76            | 87.80                     | 59.24          | 0 00:44:43               |

Node Summary

| SN | Element<br>ID    | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min Freeboard<br>Peak<br>Attained | Time of<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|----------------------------|-----------------------|
|    |                  |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                              | (days hh:mm)                      | (ac-in)                    | (min)                 |
| 1  | Analysis_Point_1 | Outfall         | 884.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 2  | Analysis_Point_2 | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 3  | DA_1             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 4  | DA_2             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 5  | DA_5             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |
| 6  | DA_6             | Outfall         | 900.00              |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                                   |                                   |                            |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 48.76     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 73        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Legumes, C&T, Poor           | 48.76   | B     | 73     |
| Composite Area & Weighted CN | 48.76   |       | 73     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 \* ((n \* Lf)^0.8)) / ((P^0.5) \* (Sf^0.4))

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R^(2/3)) \* (Sf^0.5)) / n

R = Aq / Wp

Tc = (Lf / V) / (3600 sec/hr)

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

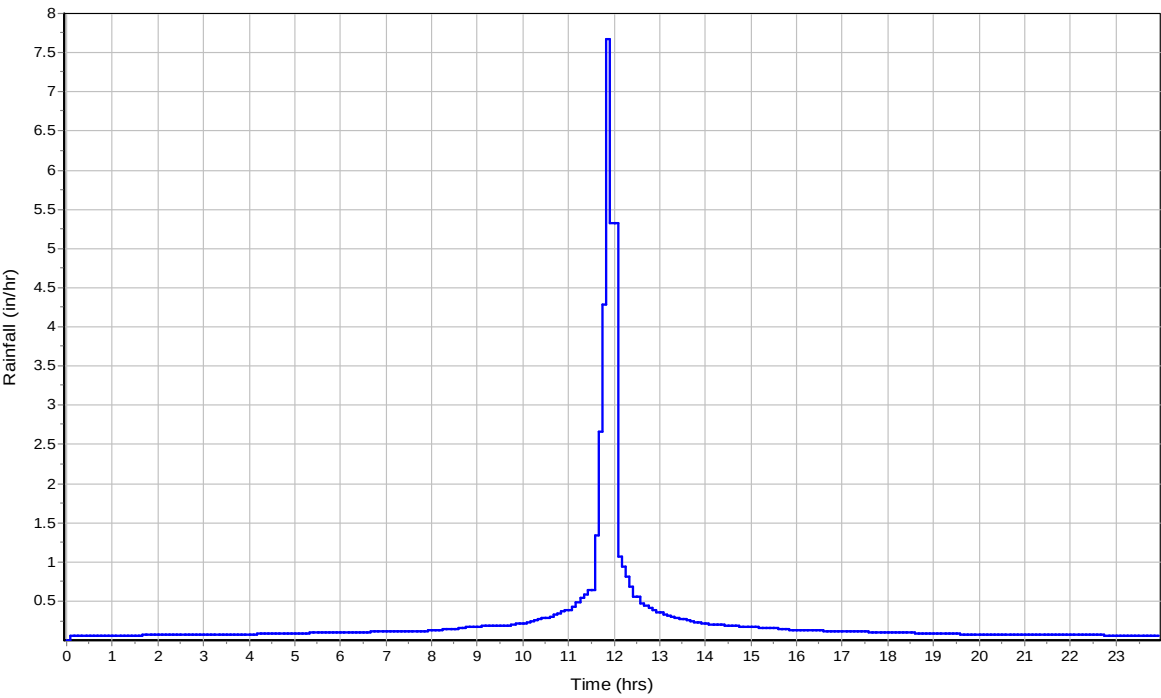
|                                        |              |              |              |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.1          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0            | 0            |
| Computed Flow Time (min) :             | 17.55        | 0            | 0            |
| Shallow Concentrated Flow Computations | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Flow Length (ft) :                     | 947          | 0            | 0            |
| Slope (%) :                            | 2.6          | 0            | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 2.6          | 0            | 0            |
| Computed Flow Time (min) :             | 6.07         | 0            | 0            |
| Total TOC (min) .....                  | 23.62        |              |              |

### Subbasin Runoff Results

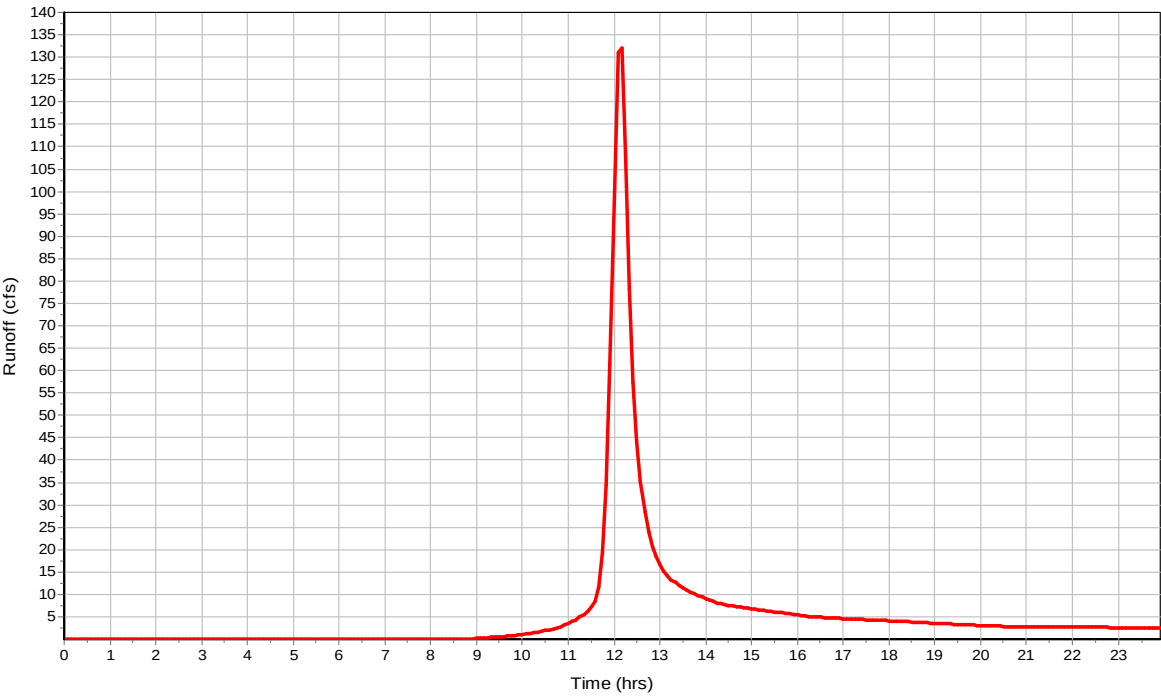
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 5.6        |
| Total Runoff (in) .....                     | 2.76       |
| Peak Runoff (cfs) .....                     | 136.08     |
| Weighted Curve Number .....                 | 73         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:23:37 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_2

### Input Data

Area (ac) ..... 56.23  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr100yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 56.23           | B             | 73              |
| Composite Area & Weighted CN | 56.23           |               | 73              |

### Time of Concentration

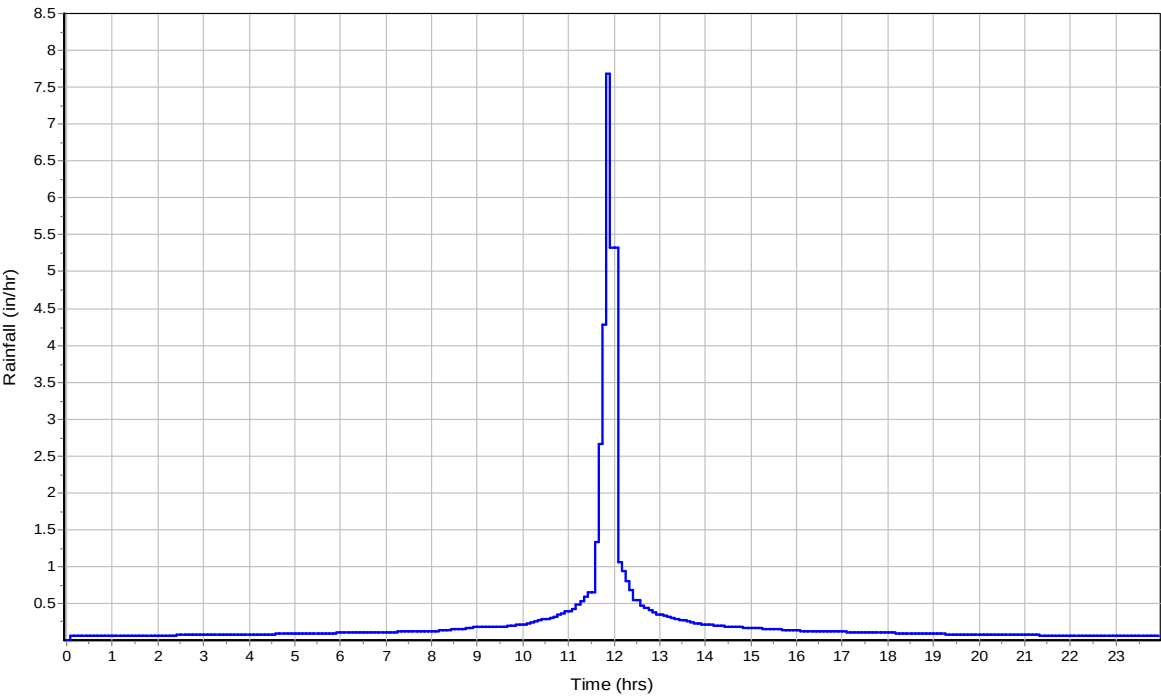
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.05         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.07         | 0            | 0            |
| Computed Flow Time (min) :             | 23.15        | 0            | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1198         | 245          | 0            |
| Slope (%) :                            | 0.83         | 5.4          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.47         | 3.75         | 0            |
| Computed Flow Time (min) :             | 13.58        | 1.09         | 0            |
| Total TOC (min) .....37.83             |              |              |              |

### Subbasin Runoff Results

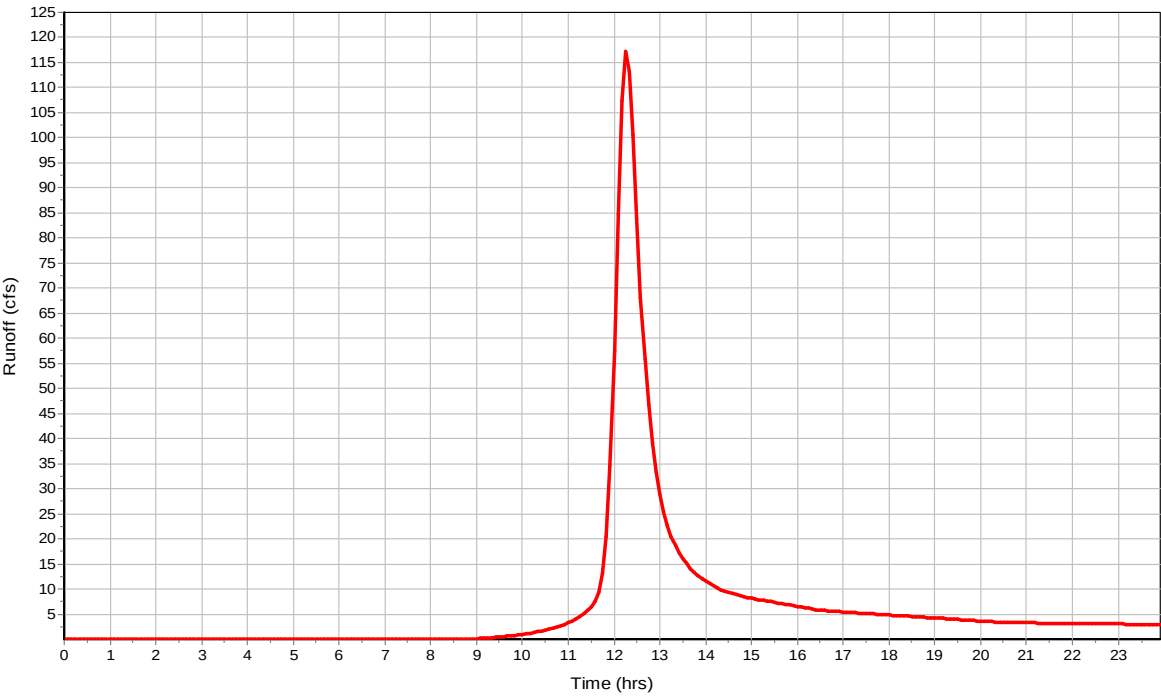
Total Rainfall (in) ..... 5.6  
Total Runoff (in) ..... 2.76  
Peak Runoff (cfs) ..... 117.52  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:37:50

Subbasin : Drainage\_Area\_2

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_3

### Input Data

Area (ac) ..... 452.08  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.08  
Rain Gage ID ..... 24hr100yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Row crops, C&T + CR, Good    | 410.4           | C             | 75              |
| Row crops, contoured, Good   | 9.81            | A             | 65              |
| Row crops, contoured, Good   | 31.88           | A             | 65              |
| Composite Area & Weighted CN | 452.09          |               | 74.08           |

### Time of Concentration

|                             | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|-----------------------------|--------------|--------------|--------------|
| Sheet Flow Computations     |              |              |              |
| Manning's Roughness :       | 0.06         | 0            | 0            |
| Flow Length (ft) :          | 100          | 0            | 0            |
| Slope (%) :                 | 0.08         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) : | 2.53         | 0            | 0            |
| Velocity (ft/sec) :         | 0.09         | 0            | 0            |
| Computed Flow Time (min) :  | 19.19        | 0            | 0            |

|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 4320         | 1322         | 0            |
| Slope (%) :                            | 0.42         | 1.5          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.05         | 1.98         | 0            |
| Computed Flow Time (min) :             | 68.57        | 11.13        | 0            |
| Total TOC (min) .....98.88             |              |              |              |

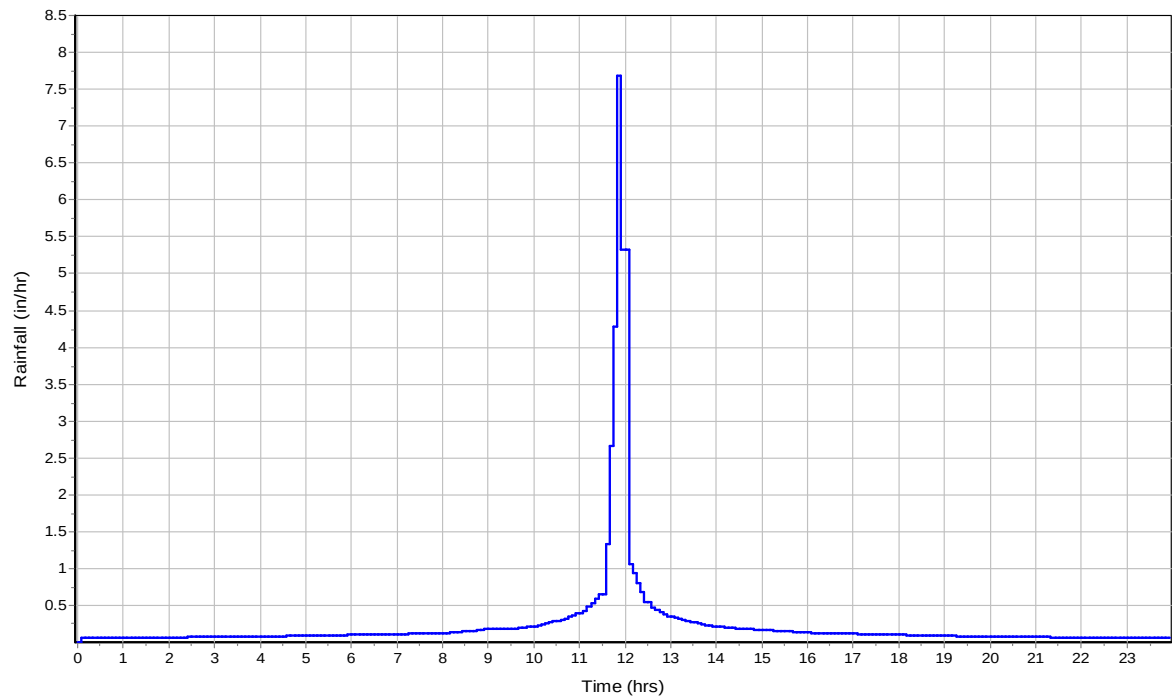
### Subbasin Runoff Results

Total Rainfall (in) ..... 5.6  
Total Runoff (in) ..... 2.86  
Peak Runoff (cfs) ..... 489.51  
Weighted Curve Number ..... 74.08  
Time of Concentration (days hh:mm:ss) ..... 0 01:38:53

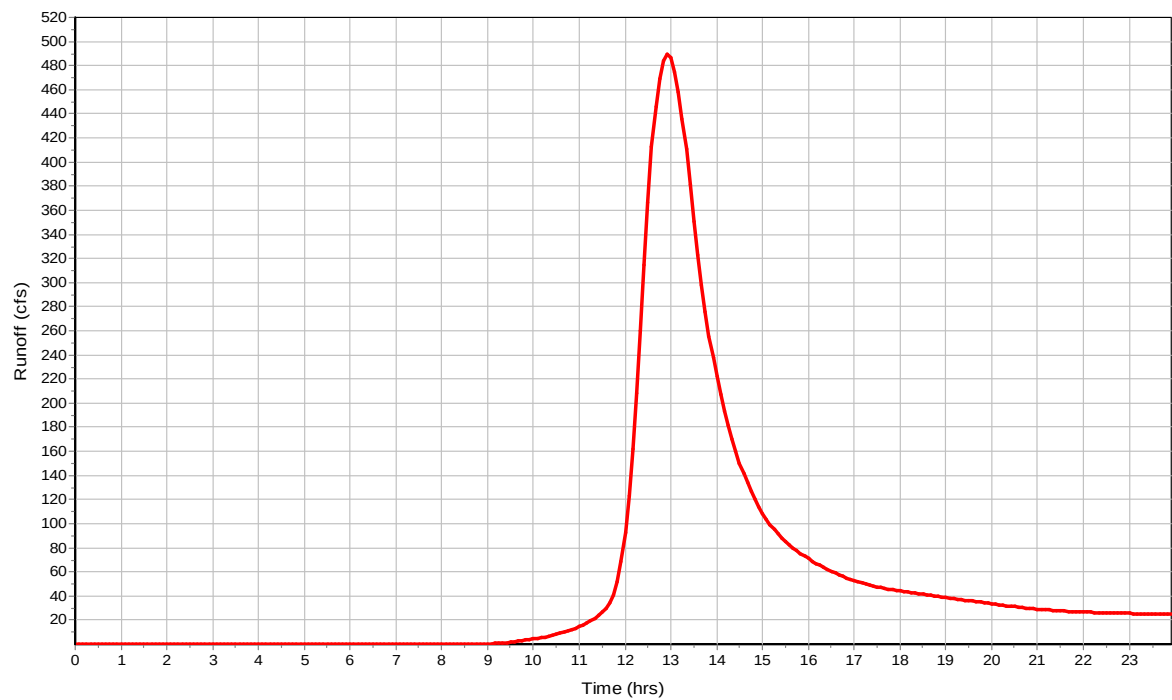


Subbasin : Drainage\_Area\_3

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_4

### Input Data

Area (ac) ..... 206.82  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74.56  
Rain Gage ID ..... 24hr100yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, C&T + CR, Good  | 197.77          | C             | 75              |
| Row crops, contoured, Good   | 9.05            | A             | 65              |
| Composite Area & Weighted CN | 206.82          |               | 74.56           |

### Time of Concentration

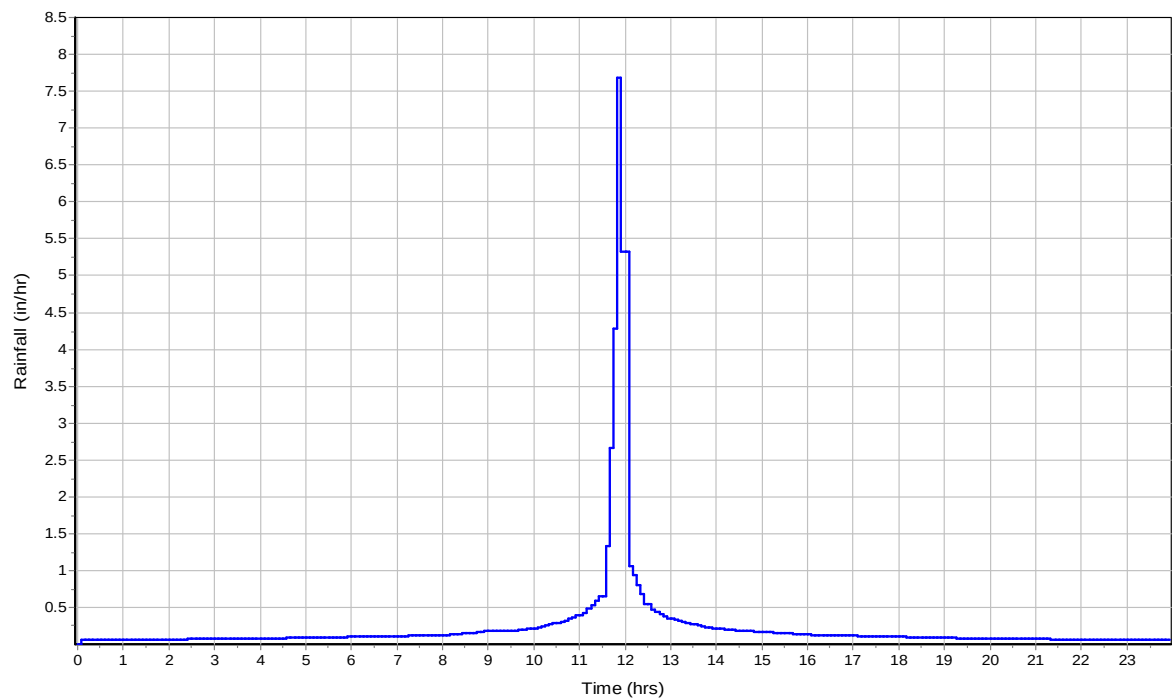
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.33         | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.15         | 0            | 0            |
| Computed Flow Time (min) :             | 10.88        | 0            | 0            |
|                                        |              |              |              |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 3100         | 809          | 0            |
| Slope (%) :                            | 0.39         | 1.9          | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.01         | 2.22         | 0            |
| Computed Flow Time (min) :             | 51.16        | 6.07         | 0            |
| Total TOC (min) .....68.11             |              |              |              |

### Subbasin Runoff Results

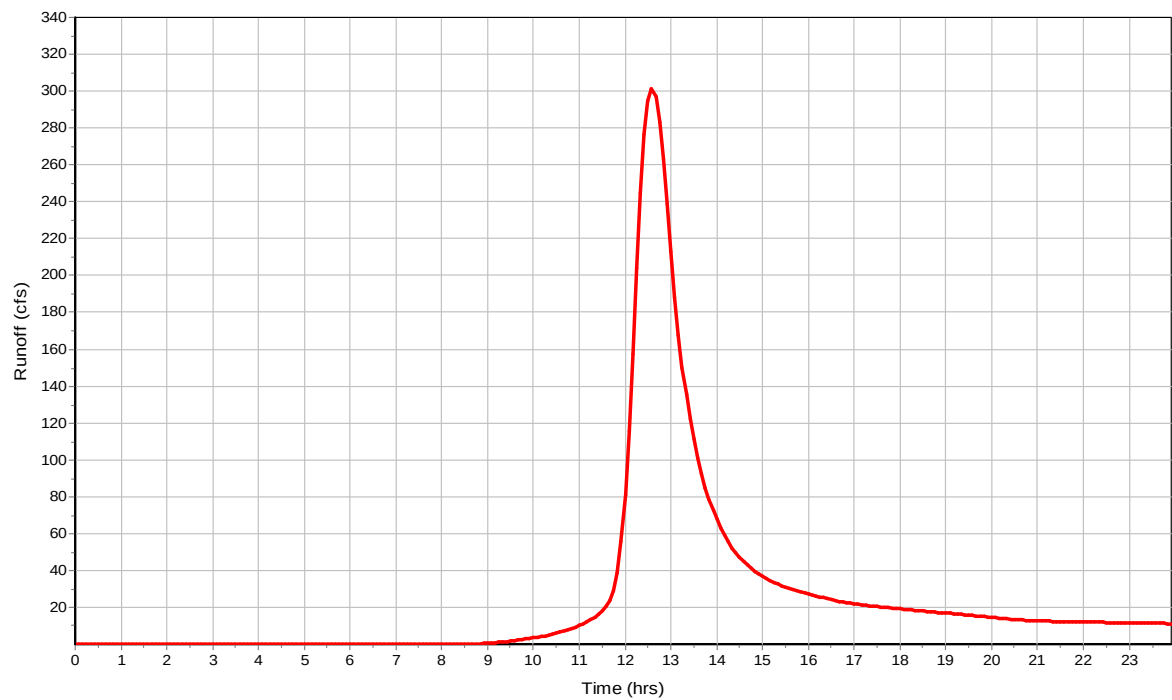
Total Rainfall (in) ..... 5.6  
Total Runoff (in) ..... 2.9  
Peak Runoff (cfs) ..... 301.63  
Weighted Curve Number ..... 74.56  
Time of Concentration (days hh:mm:ss) ..... 0 01:08:07

Subbasin : Drainage\_Area\_4

Rainfall Intensity Graph



Runoff Hydrograph



## Subbasin : Drainage\_Area\_5

### Input Data

Area (ac) ..... 63.55  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 73  
Rain Gage ID ..... 24hr100yr

### Composite Curve Number

| 32                           | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Soil/Surface Description     |                 |               |                 |
| Small grain, contoured, Good | 63.55           | B             | 73              |
| Composite Area & Weighted CN | 63.55           |               | 73              |

### Time of Concentration

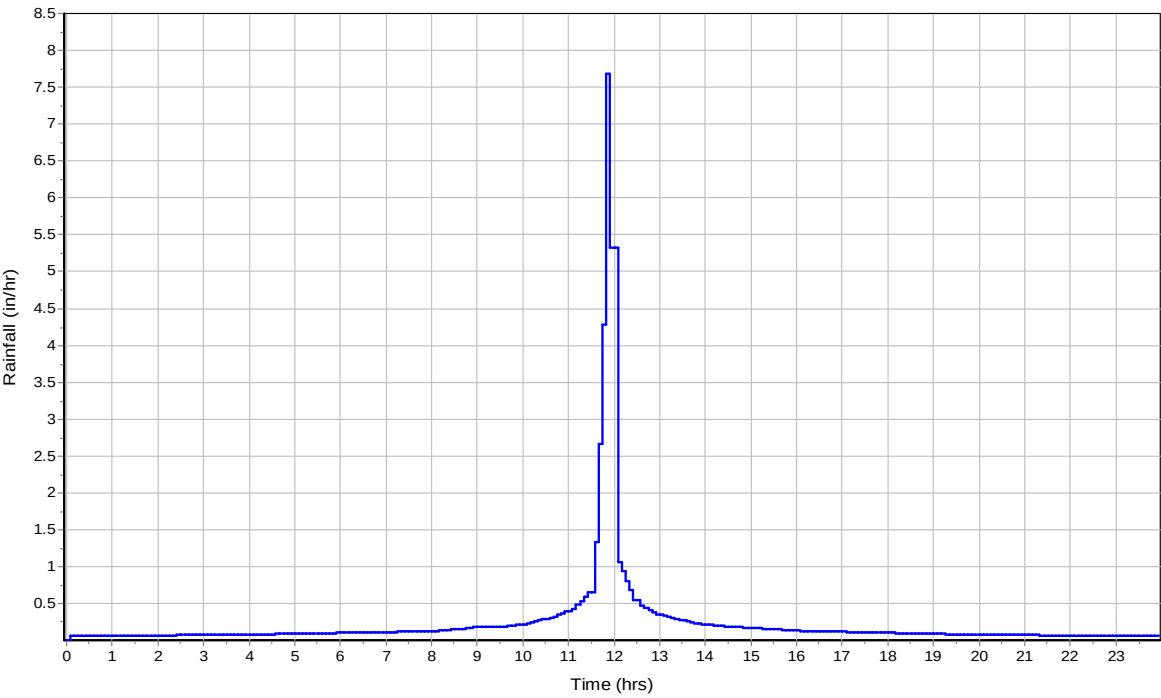
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.06         | 0            | 0            |
| Flow Length (ft) :                     | 100          | 0            | 0            |
| Slope (%) :                            | 0.4          | 0            | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 0            | 0            |
| Velocity (ft/sec) :                    | 0.17         | 0            | 0            |
| Computed Flow Time (min) :             | 10.08        | 0            | 0            |
|                                        |              |              |              |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 1106         | 1008         | 0            |
| Slope (%) :                            | 0.38         | 0.62         | 0            |
| Surface Type :                         | Unpaved      | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 0.99         | 1.27         | 0            |
| Computed Flow Time (min) :             | 18.62        | 13.23        | 0            |
| Total TOC (min) .....                  | 41.93        |              |              |

### Subbasin Runoff Results

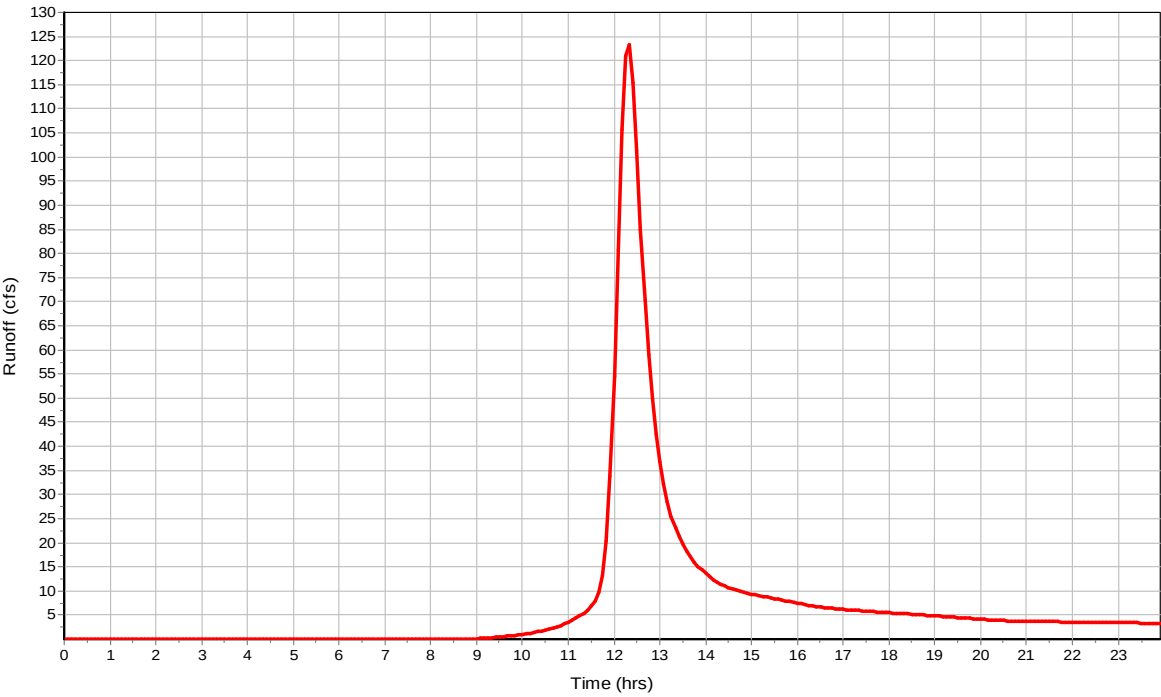
Total Rainfall (in) ..... 5.6  
Total Runoff (in) ..... 2.76  
Peak Runoff (cfs) ..... 123.67  
Weighted Curve Number ..... 73  
Time of Concentration (days hh:mm:ss) ..... 0 00:41:56

Subbasin : Drainage\_Area\_5

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_6

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 31.81     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 73        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Small grain, C + CR, Poor    | 31.81   | B     | 73     |
| Composite Area & Weighted CN | 31.81   |       | 73     |

Time of Concentration

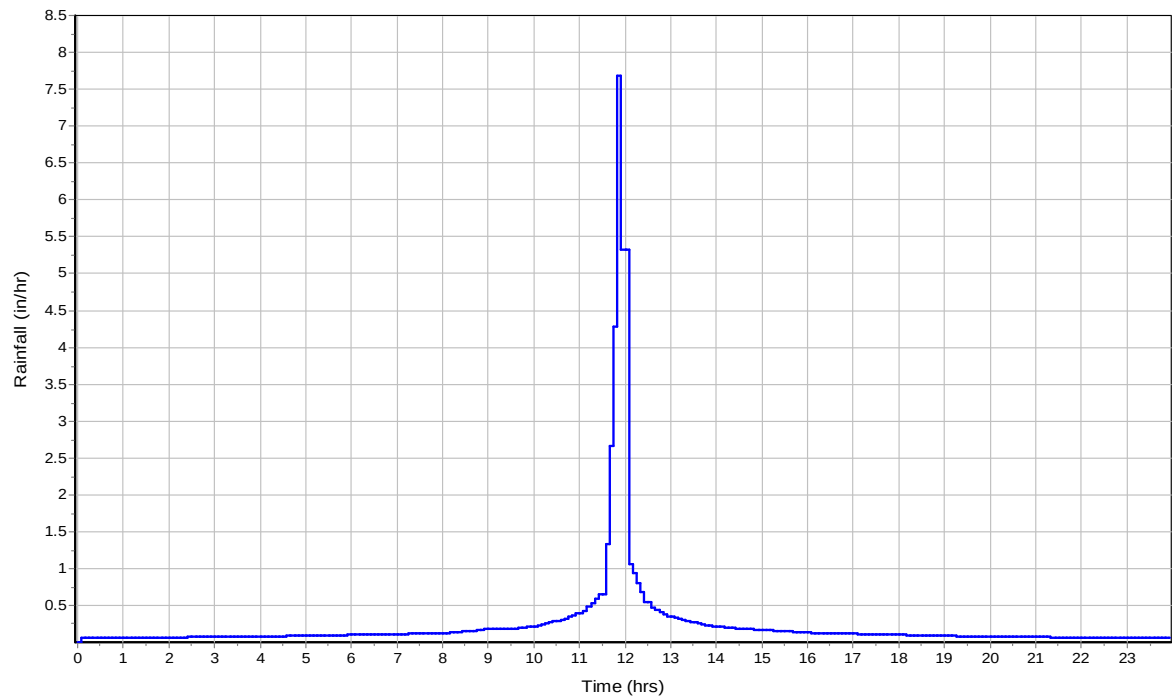
|                                        |         |         |         |
|----------------------------------------|---------|---------|---------|
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Sheet Flow Computations                |         |         |         |
| Manning's Roughness :                  | 0.06    | 0       | 0       |
| Flow Length (ft) :                     | 100     | 0       | 0       |
| Slope (%) :                            | 0.15    | 0       | 0       |
| 2 yr, 24 hr Rainfall (in) :            | 2.53    | 0       | 0       |
| Velocity (ft/sec) :                    | 0.11    | 0       | 0       |
| Computed Flow Time (min) :             | 14.92   | 0       | 0       |
|                                        | Subarea | Subarea | Subarea |
|                                        | A       | B       | C       |
| Shallow Concentrated Flow Computations |         |         |         |
| Flow Length (ft) :                     | 1520    | 596     | 0       |
| Slope (%) :                            | 0.28    | 0.5     | 0       |
| Surface Type :                         | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 0.85    | 0       | 0       |
| Computed Flow Time (min) :             | 29.8    | 0       | 0       |
| Total TOC (min)                        | 44.72   |         |         |

Subbasin Runoff Results

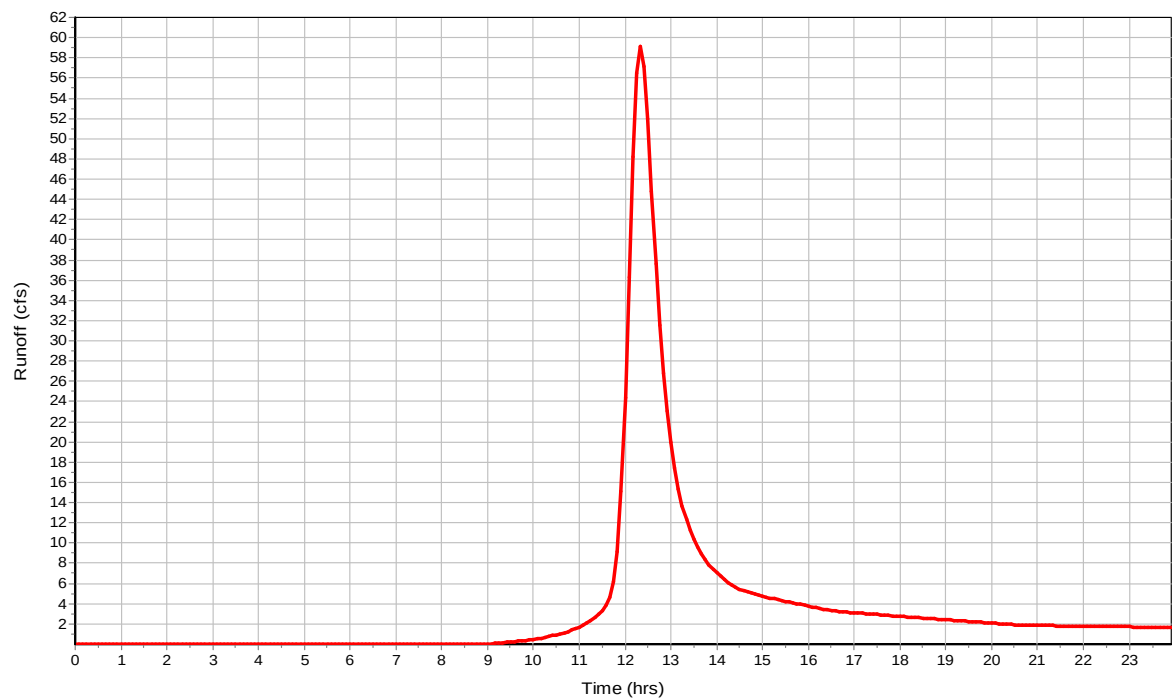
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.76       |
| Peak Runoff (cfs)                     | 59.24      |
| Weighted Curve Number                 | 73         |
| Time of Concentration (days hh:mm:ss) | 0 00:44:43 |

Subbasin : Drainage\_Area\_6

Rainfall Intensity Graph



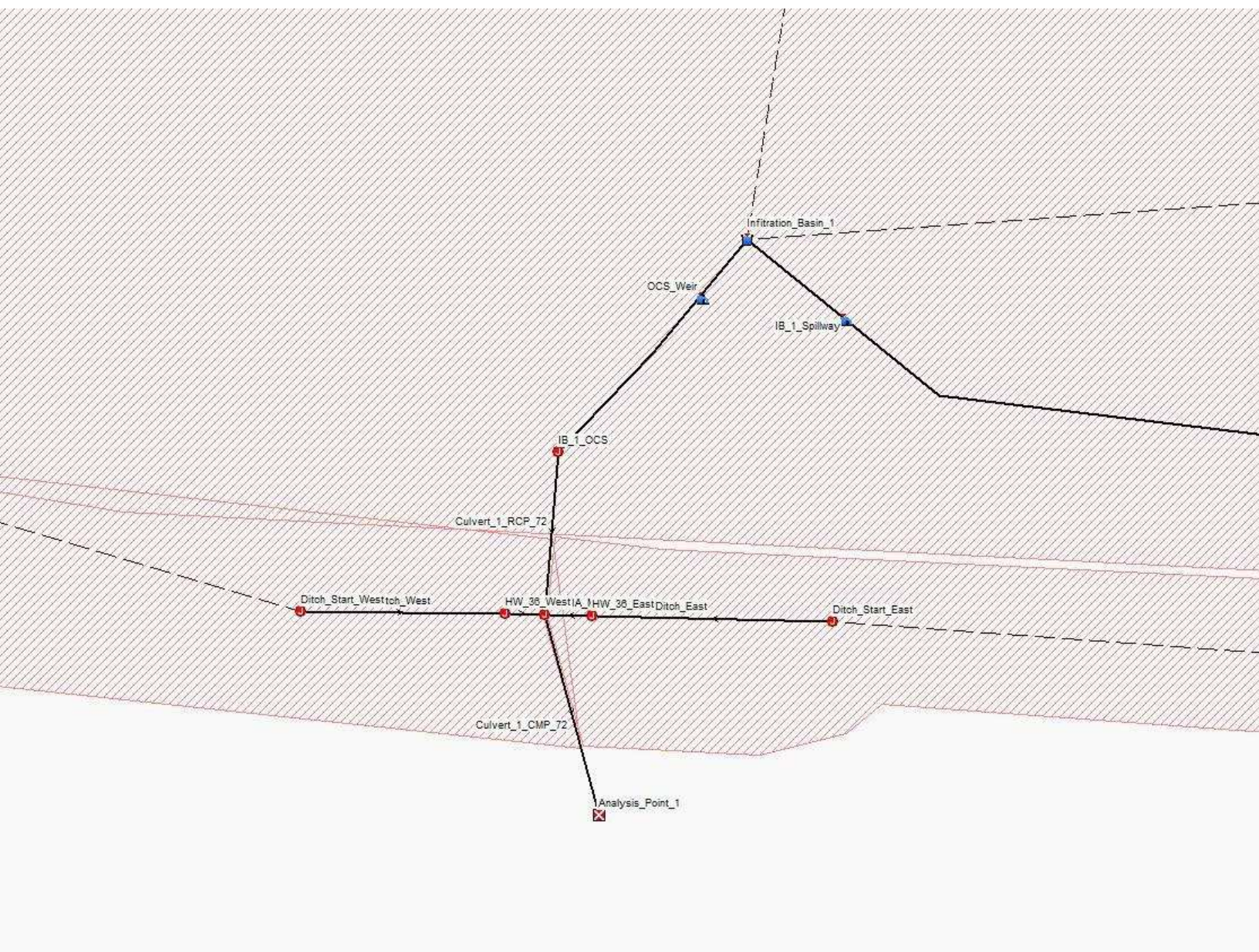
Runoff Hydrograph





**Appendix B.**  
**Autodesk Storm and Sanitary Analysis – Permanent Stormwater Proposed Condition**





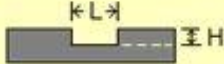
Top of Riser Elevation = 900.80'  
 2-year storm elevation = 901.16'  
 H = 0.36'  
 Q ~ 22 cfs

Thin Blue Numbers = Input data  
 Bold Red Numbers = Answers

## Weir Notch Bleed Down Calculations

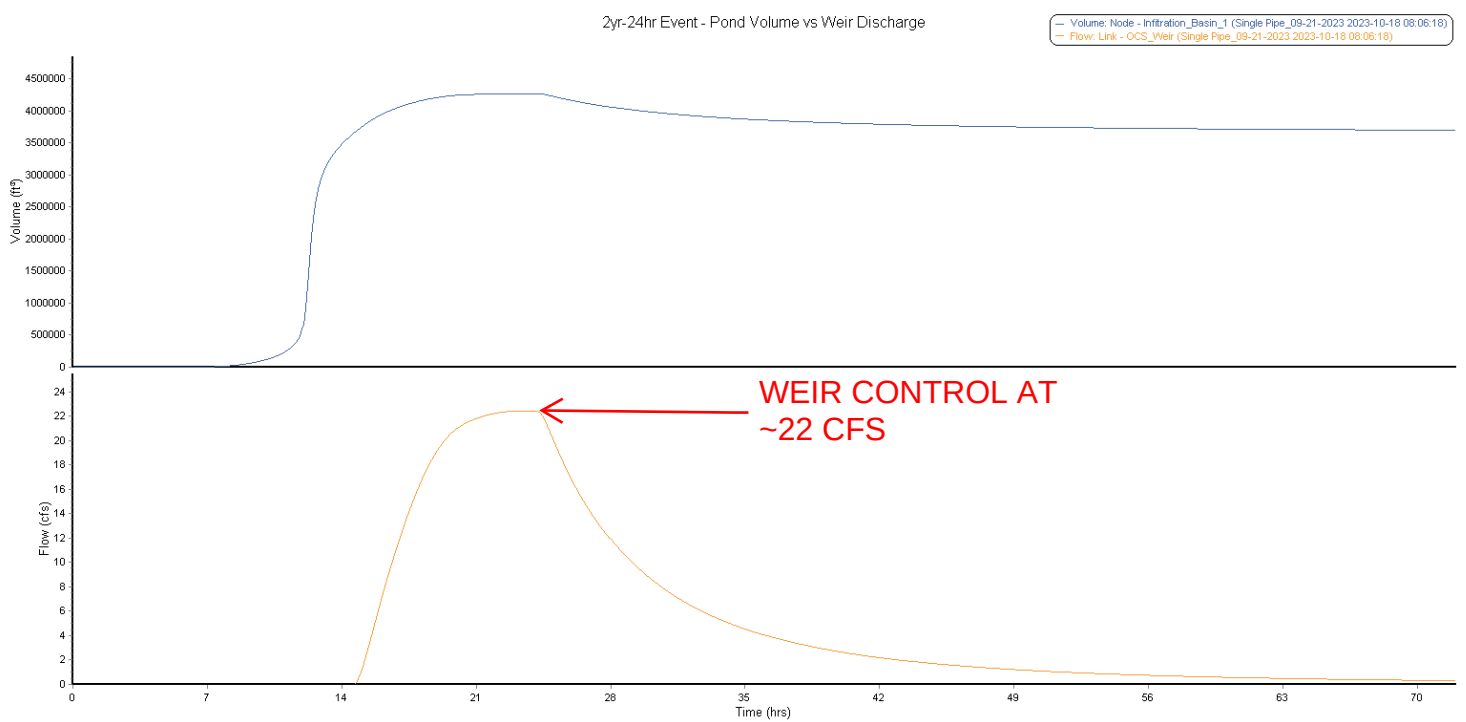
Pond Surface Area at SHW = 0 Sq. Ft.  
 Pond Surface Area at NWL = 0 Sq. Ft.  
 Notch Height (H) = 0.36 Feet  
 Notch Width (L) = 31.40 Feet  
 C = 3.25 Coefficient of discharge

½ Volume Time = 0.00 Hours  
 Total Time = 0.00 Hours

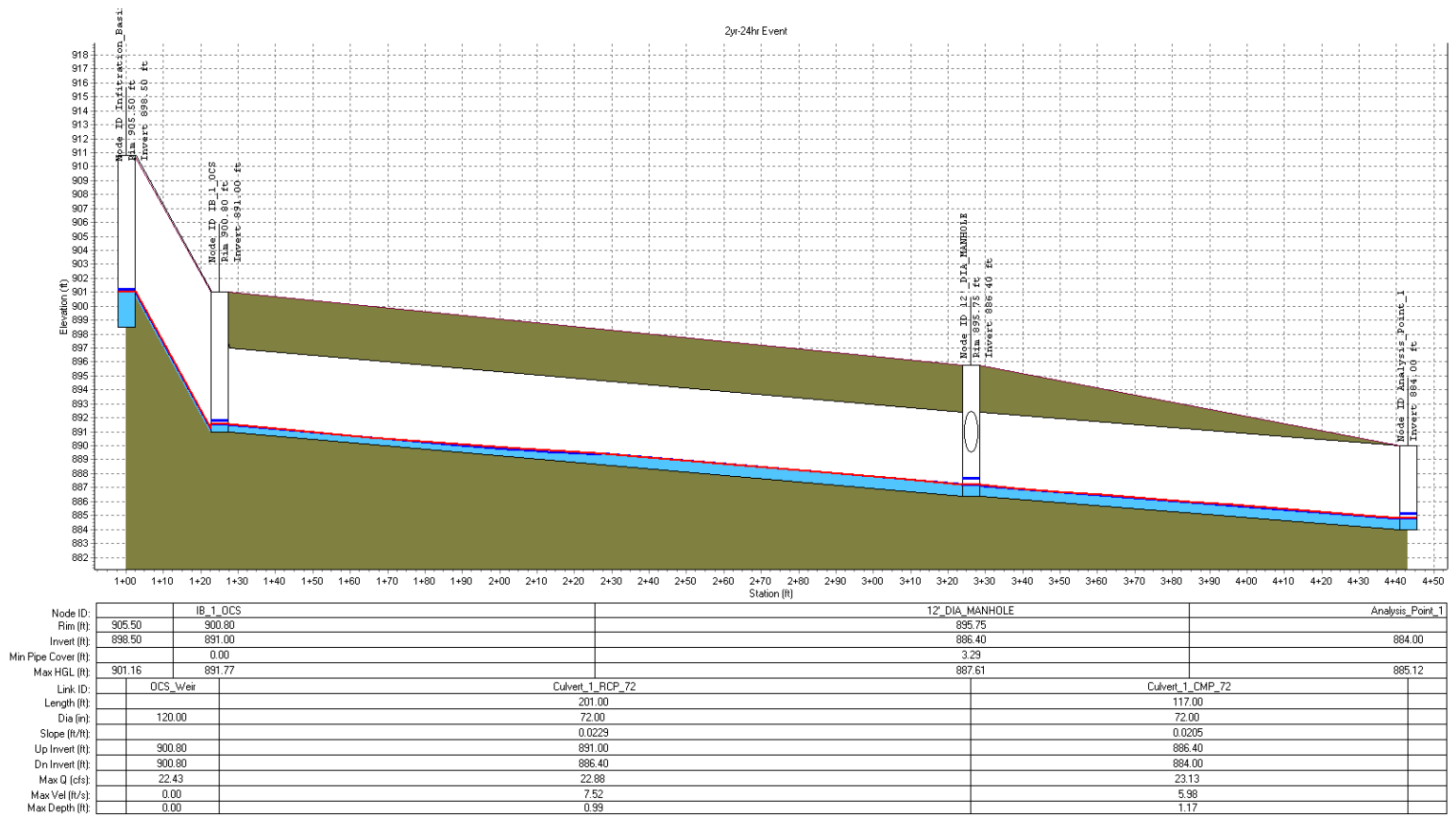


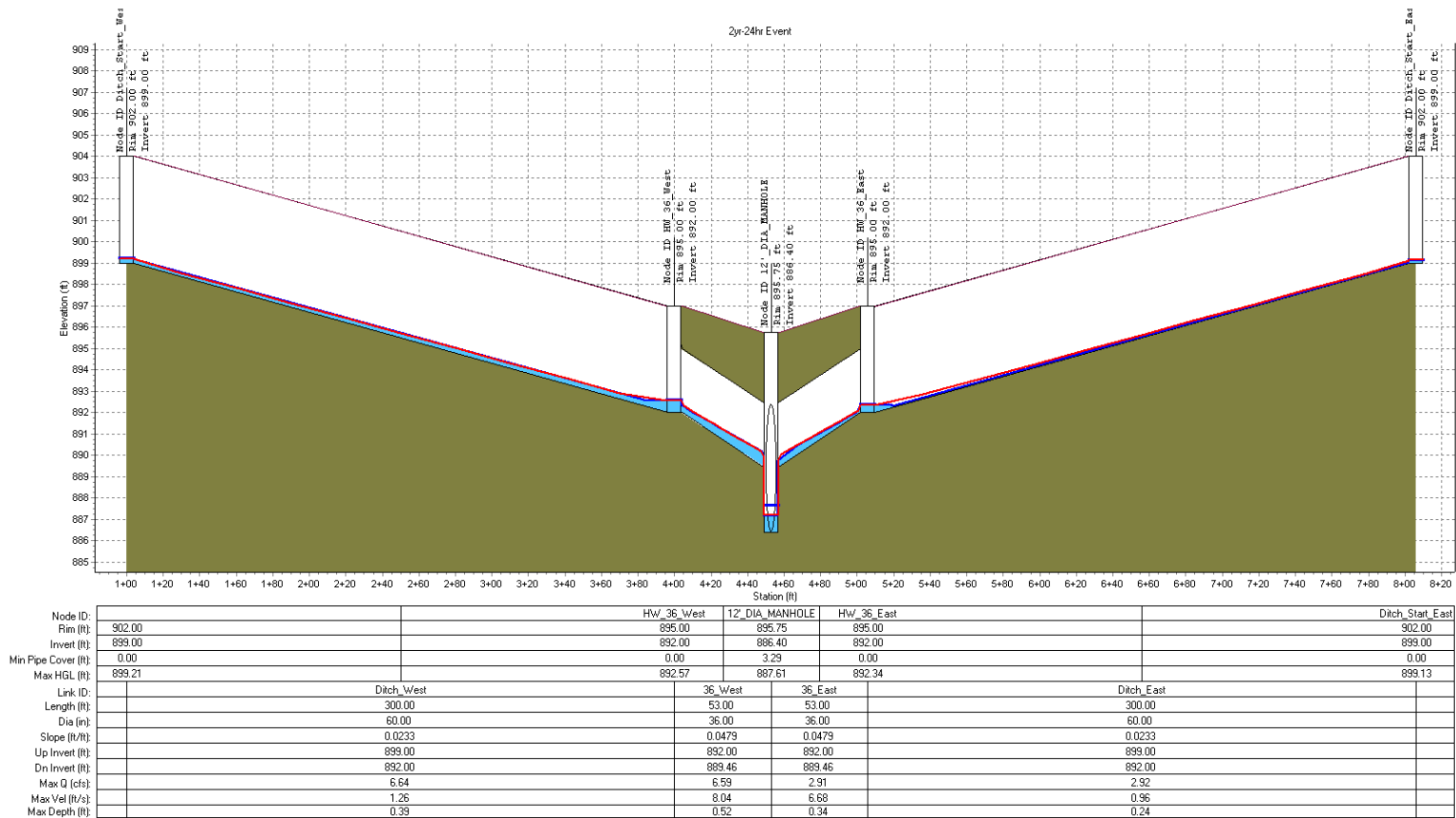
Horizontal Broad Crested W  
 $Q = C L H^{3/2}$

| Total<br>H (Ft) | Increm.<br>H (Ft) | Flow<br>Q (cfs) | Q Avg. | Delta<br>Volume | Cum.<br>Volume | Delta<br>Hours | Cum.<br>Hours |
|-----------------|-------------------|-----------------|--------|-----------------|----------------|----------------|---------------|
| 0.36            |                   | 22.02           |        |                 |                |                |               |
|                 | 0.01              |                 | 21.694 | 0               | 0              | 0.0            |               |
| 0.35            |                   | 21.37           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 21.040 | 0               | 0              | 0.0            |               |
| 0.35            |                   | 20.71           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 20.392 | 0               | 0              | 0.0            |               |
| 0.34            |                   | 20.07           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 19.752 | 0               | 0              | 0.0            |               |
| 0.33            |                   | 19.43           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 19.118 | 0               | 0              | 0.0            |               |
| 0.32            |                   | 18.80           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 18.491 | 0               | 0              | 0.0            |               |
| 0.32            |                   | 18.18           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 17.872 | 0               | 0              | 0.0            |               |
| 0.31            |                   | 17.56           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 17.259 | 0               | 0              | 0.0            |               |
| 0.30            |                   | 16.95           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 16.654 | 0               | 0              | 0.0            |               |
| 0.30            |                   | 16.35           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 16.055 | 0               | 0              | 0.0            |               |
| 0.29            |                   | 15.76           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 15.464 | 0               | 0              | 0.0            |               |
| 0.28            |                   | 15.17           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 14.881 | 0               | 0              | 0.0            |               |
| 0.27            |                   | 14.59           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 14.305 | 0               | 0              | 0.0            |               |
| 0.27            |                   | 14.02           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 13.737 | 0               | 0              | 0.0            |               |
| 0.26            |                   | 13.45           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 13.176 | 0               | 0              | 0.0            |               |
| 0.25            |                   | 12.90           |        |                 |                |                | 0.0           |
|                 | 0.01              |                 | 12.623 | 0               | 0              | 0.0            |               |
| 0.24            |                   | 12.35           |        |                 |                |                | 0.0           |









Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 10  
    *Junctions* ..... 6  
    *Outfalls* ..... 2  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin<br>ID          | Area   | Peak Rate | Weighted | Total    | Total  | Total   | Peak    | Time of         |
|----------------------------|--------|-----------|----------|----------|--------|---------|---------|-----------------|
|                            |        | Factor    | Curve    | Rainfall | Runoff | Runoff  | Runoff  | Concentration   |
|                            | (ac)   |           | Number   | (in)     | (in)   | (ac-in) | (cfs)   | (days hh:mm:ss) |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00    | 2.57     | 1.67   | 1275.19 | 1056.44 | 0 00:33:17      |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00    | 2.57     | 0.65   | 5.06    | 2.93    | 0 00:45:00      |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00    | 2.57     | 0.65   | 11.49   | 6.66    | 0 00:45:00      |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00    | 2.57     | 0.69   | 26.23   | 15.59   | 0 00:45:00      |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00    | 2.57     | 0.65   | 63.82   | 63.31   | 0 00:20:00      |

Node Summary

| SN | Element<br>ID        | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|----------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|------------------------------|-------------------------------------------|----------------------------|-----------------------|
|    |                      |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                         | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1  | 12'_DIA_MANHOLE      | Junction        | 886.40              | 895.75                           | 886.40                        | 895.75                 | 0.00           | 23.32          | 887.61                           | 0.00                                  | 8.14                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 2  | Ditch_Start_East     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 2.93           | 899.13                           | 0.00                                  | 4.87                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 3  | Ditch_Start_West     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 6.65           | 899.21                           | 0.00                                  | 4.79                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 4  | HW_36_East           | Junction        | 892.00              | 895.00                           | 892.00                        | 895.00                 | 0.00           | 2.92           | 892.34                           | 0.00                                  | 4.66                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 5  | HW_36_West           | Junction        | 892.00              | 895.00                           | 892.00                        | 899.00                 | 0.00           | 6.64           | 892.57                           | 0.00                                  | 4.43                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 6  | IB_1_OCS             | Junction        | 891.00              | 900.80                           | 891.00                        | 900.80                 | 0.00           | 22.43          | 891.77                           | 0.00                                  | 9.03                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 7  | Analysis_Point_1     | Outfall         | 884.00              |                                  |                               |                        |                | 23.13          | 885.12                           |                                       |                              |                                           |                            |                       |
| 8  | Analysis_Point_2     | Outfall         | 890.65              |                                  |                               |                        |                | 14.21          | 891.61                           |                                       |                              |                                           |                            |                       |
| 9  | Culvert_2_Inlet      | Storage Node    | 892.00              | 900.00                           | 892.00                        |                        | 8168.00        | 15.50          | 893.28                           |                                       |                              |                                           | 0.00                       | 0.00                  |
| 10 | Infiltration_Basin_1 | Storage Node    | 898.50              | 905.50                           | 895.50                        |                        | 1512370.00     | 1107.10        | 901.16                           |                                       |                              |                                           | 0.00                       | 0.00                  |



Link Summary

| SN Element<br>ID   | Element<br>Type | From<br>(Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Elevation | Average<br>Slope | Diameter or<br>Height | Manning's<br>Roughness | Peak<br>Flow | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time Reported<br>Surcharged Condition |
|--------------------|-----------------|-------------------------|---------------------|--------|------------------------------|-------------------------------|------------------|-----------------------|------------------------|--------------|-------------------------|------------------------------------|-----------------------|--------------------|---------------------------------------------|---------------------------------------------|
|                    |                 |                         |                     | (ft)   | (ft)                         | (ft)                          | (%)              | (in)                  |                        | (cfs)        | (cfs)                   |                                    | (ft/sec)              | (ft)               |                                             | (min)                                       |
| 1 36_East          | Pipe            | HW_36_East              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 2.91         | 126.55                  | 0.02                               | 6.68                  | 0.34               | 0.11                                        | 0.00 Calculated                             |
| 2 36_West          | Pipe            | HW_36_West              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 6.59         | 126.55                  | 0.05                               | 8.04                  | 0.52               | 0.17                                        | 0.00 Calculated                             |
| 3 Culvert_1_CMP_72 | Pipe            | 12'_DIA_MANHOLE         | Analysis_Point_1    | 117.00 | 886.40                       | 884.00                        | 2.0500           | 72.000                | 0.0260                 | 23.13        | 303.28                  | 0.08                               | 5.98                  | 1.17               | 0.19                                        | 0.00 Calculated                             |
| 4 Culvert_1_RCP_72 | Pipe            | IB_1_OCS                | 12'_DIA_MANHOLE     | 201.00 | 891.00                       | 886.40                        | 2.2900           | 72.000                | 0.0130                 | 22.88        | 640.68                  | 0.04                               | 7.52                  | 0.99               | 0.16                                        | 0.00 Calculated                             |
| 5 Culvert_2        | Pipe            | Culvert_2_Inlet         | Analysis_Point_2    | 111.00 | 892.25                       | 890.65                        | 1.4400           | 72.000                | 0.0260                 | 14.21        | 254.23                  | 0.06                               | 4.61                  | 0.99               | 0.17                                        | 0.00 Calculated                             |
| 6 Ditch_East       | Channel         | Ditch_Start_East        | HW_36_East          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 2.92         | 2363.82                 | 0.00                               | 0.96                  | 0.24               | 0.05                                        | 0.00                                        |
| 7 Ditch_West       | Channel         | Ditch_Start_West        | HW_36_West          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 6.64         | 2363.82                 | 0.00                               | 1.26                  | 0.39               | 0.08                                        | 0.00                                        |
| 8 OCS_Weir         | Orifice         | Infiltration_Basin_1    | IB_1_OCS            |        | 898.50                       | 891.00                        |                  | 120.000               |                        | 22.43        |                         |                                    |                       |                    |                                             |                                             |
| 9 IB_1_Spillway    | Weir            | Infiltration_Basin_1    | Culvert_2_Inlet     |        | 898.50                       | 892.00                        |                  |                       |                        | 0.00         |                         |                                    |                       |                    |                                             |                                             |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |         |
|-----------------------|---------|
| Area (ac)             | 761.76  |
| Peak Rate Factor      | 484     |
| Weighted Curve Number | 91      |
| Rain Gage ID          | 24hr2yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

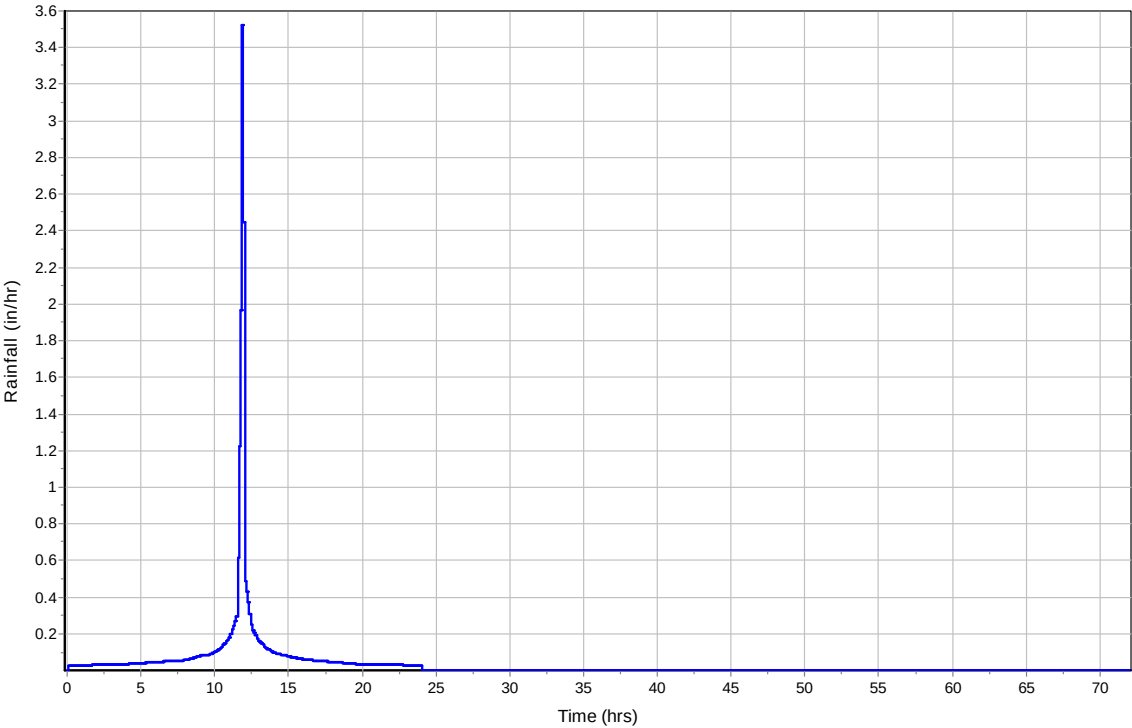
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

### Subbasin Runoff Results

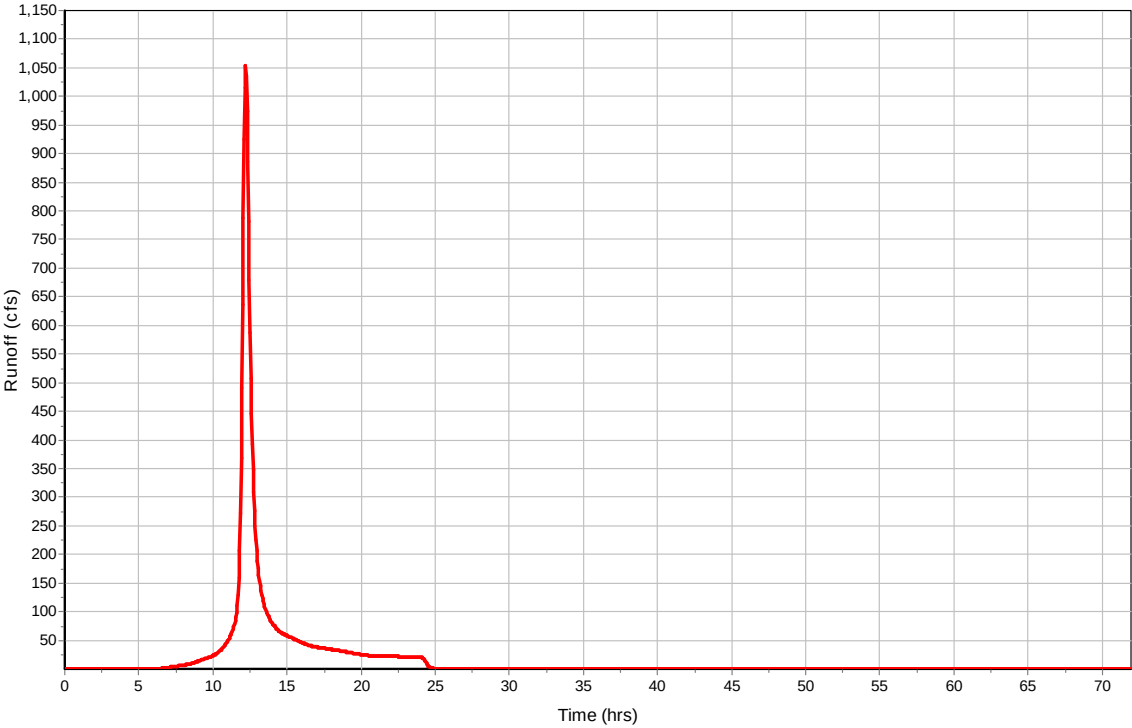
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 2.57       |
| Total Runoff (in) .....                     | 1.67       |
| Peak Runoff (cfs) .....                     | 1056.44    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr2yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

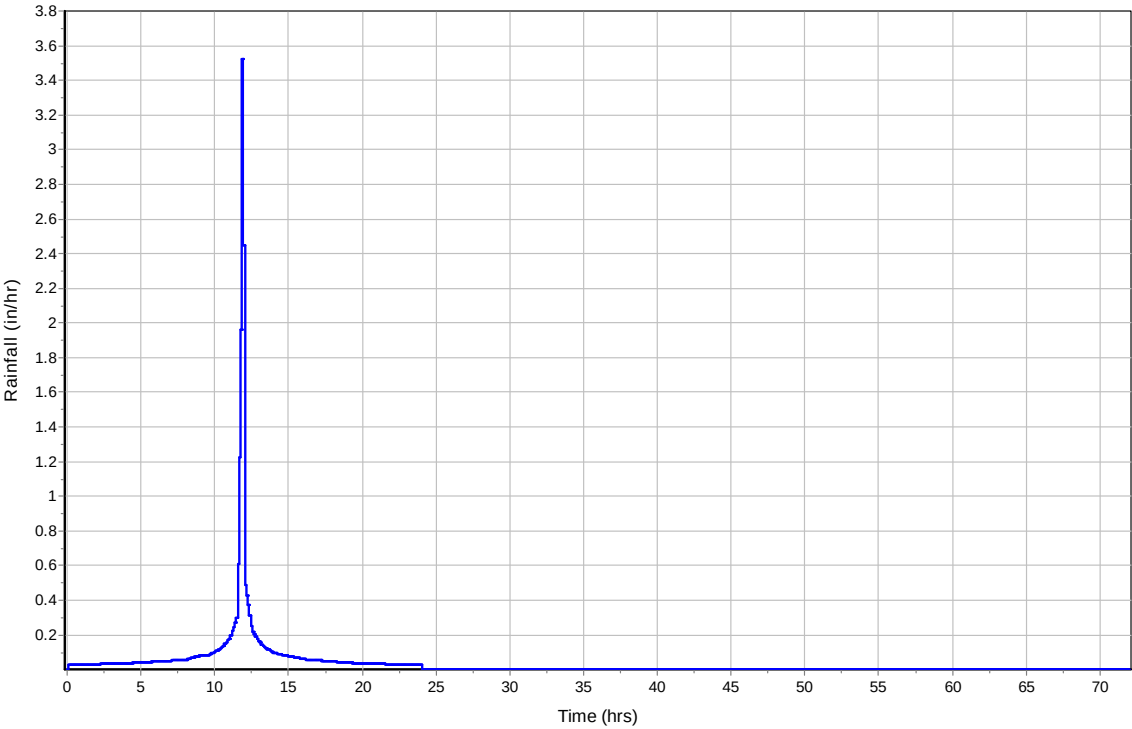
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

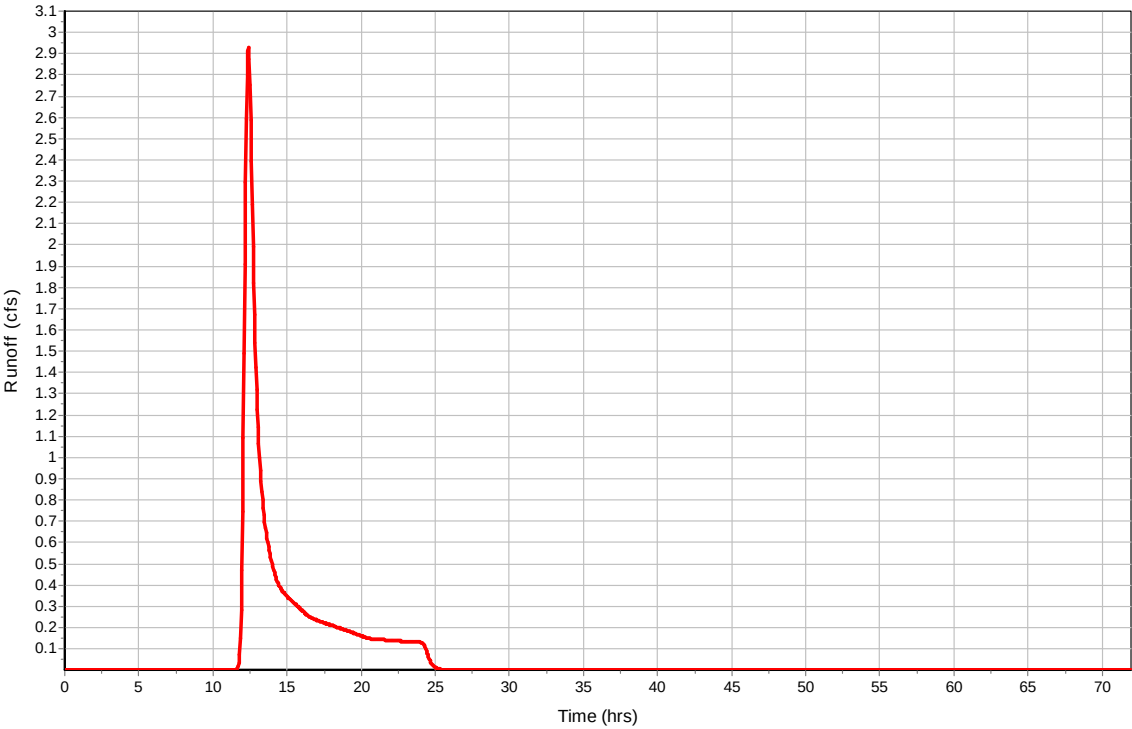
Total Rainfall (in) ..... 2.57  
Total Runoff (in) ..... 0.65  
Peak Runoff (cfs) ..... 2.93  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |         |
|-----------------------|---------|
| Area (ac)             | 17.73   |
| Peak Rate Factor      | 484     |
| Weighted Curve Number | 74      |
| Rain Gage ID          | 24hr2yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

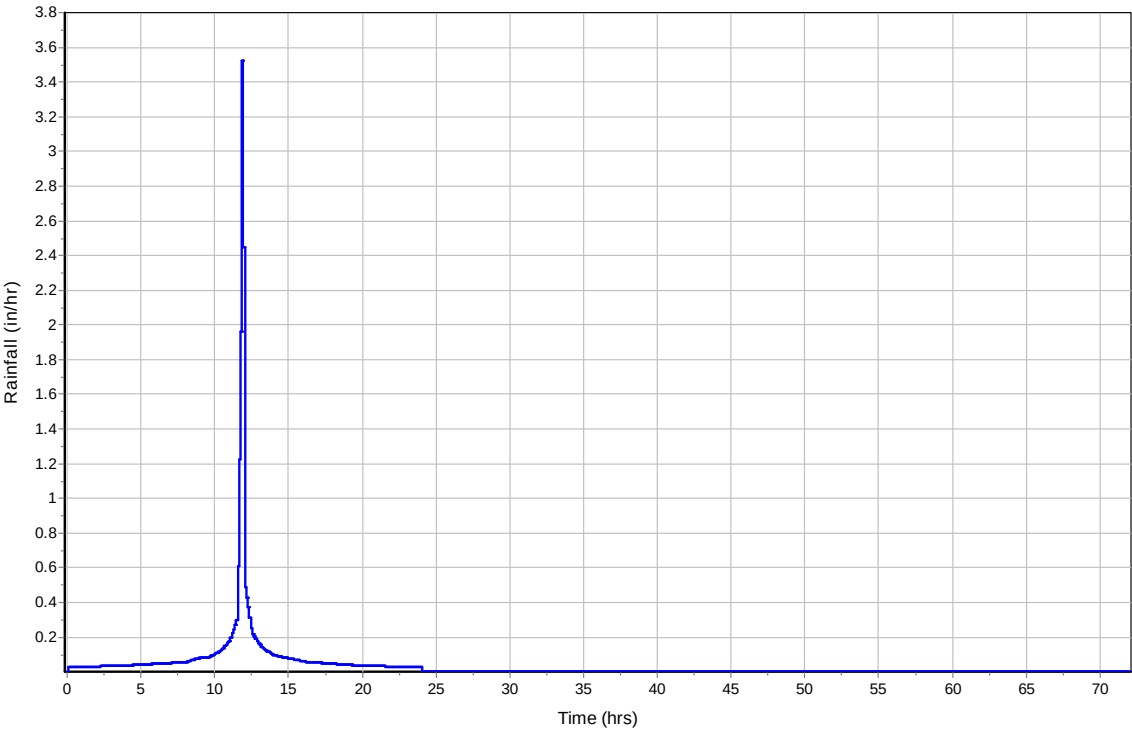
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

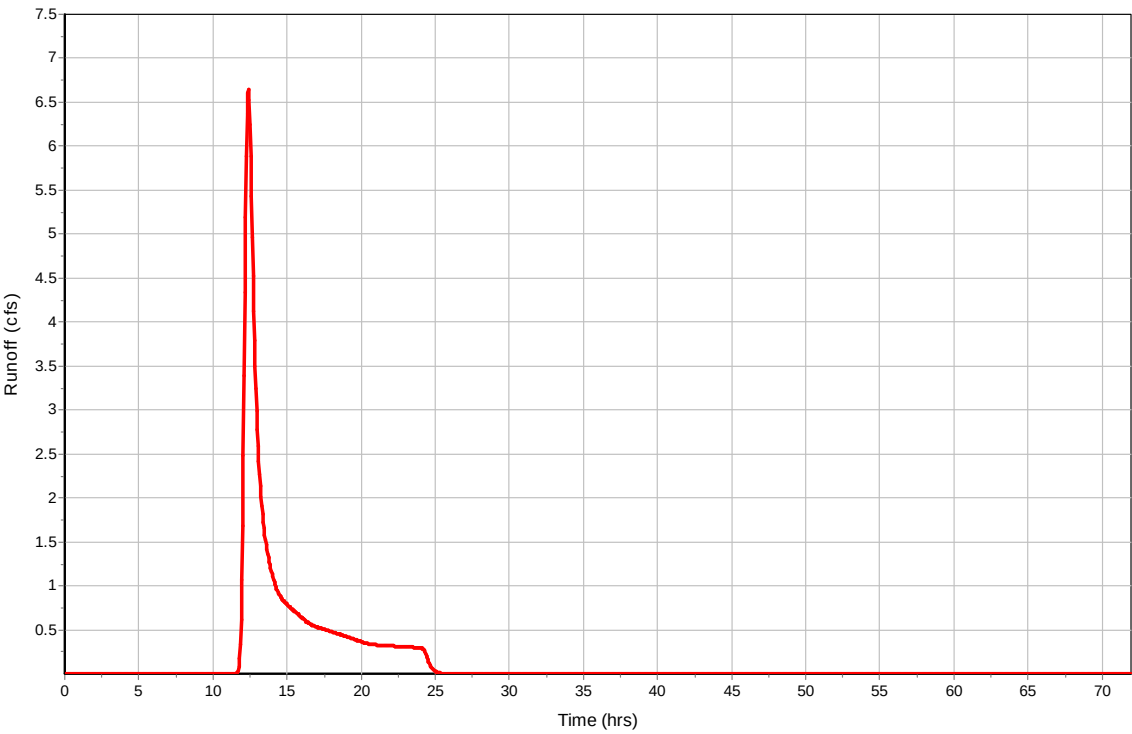
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 2.57       |
| Total Runoff (in)                     | 0.65       |
| Peak Runoff (cfs)                     | 6.66       |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph





Subbasin : Drainage\_Area\_2b

Input Data

|                       |         |
|-----------------------|---------|
| Area (ac)             | 37.9    |
| Peak Rate Factor      | 484     |
| Weighted Curve Number | 75      |
| Rain Gage ID          | 24hr2yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

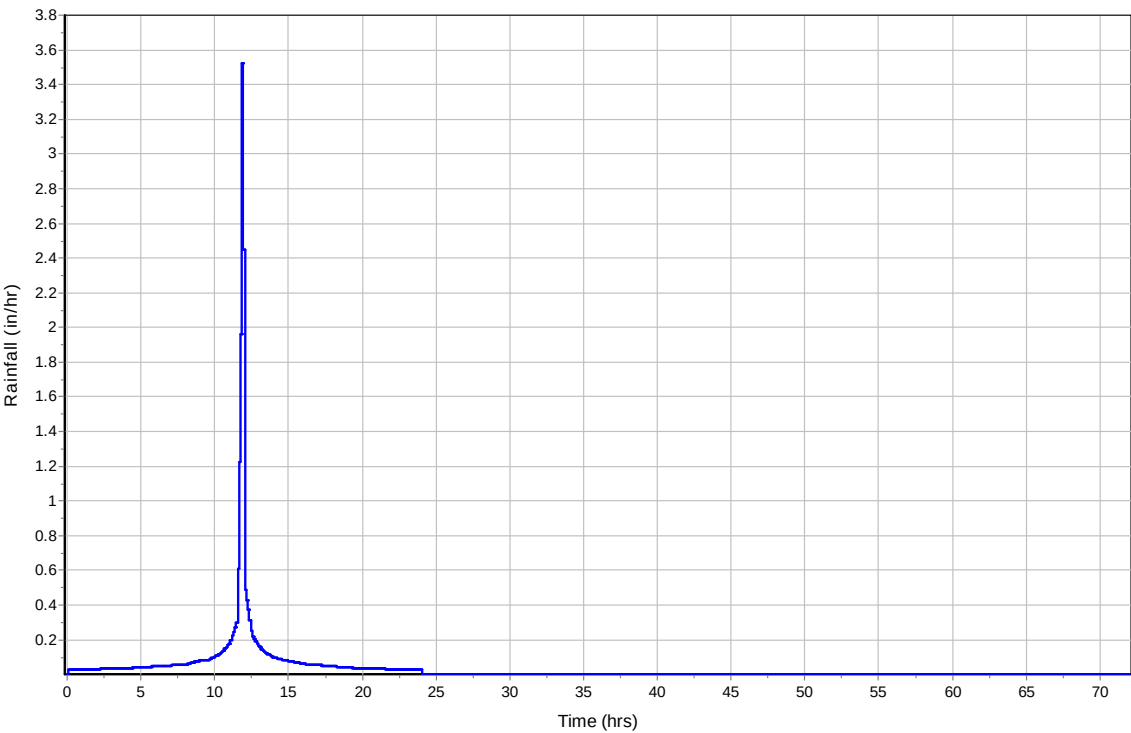
Time of Concentration

User-Defined TOC override (minutes): 45.00

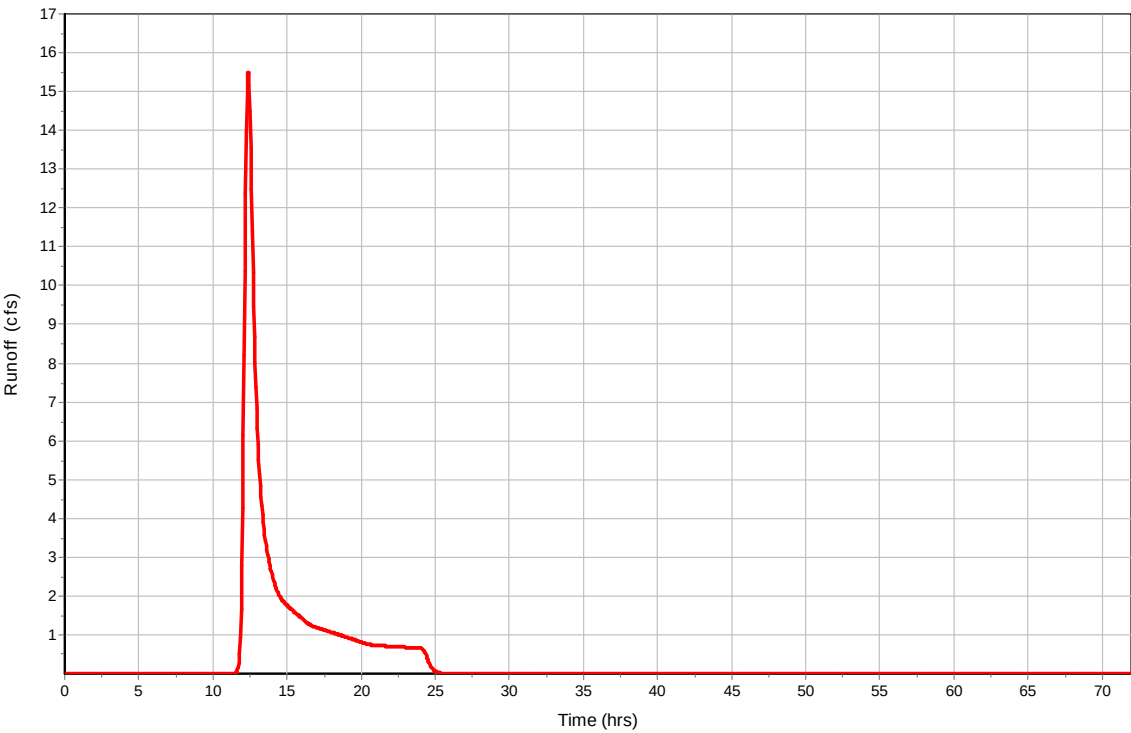
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 2.57       |
| Total Runoff (in)                     | 0.69       |
| Peak Runoff (cfs)                     | 15.59      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |         |
|-----------------------|---------|
| Area (ac)             | 98.48   |
| Peak Rate Factor      | 484     |
| Weighted Curve Number | 74      |
| Rain Gage ID          | 24hr2yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

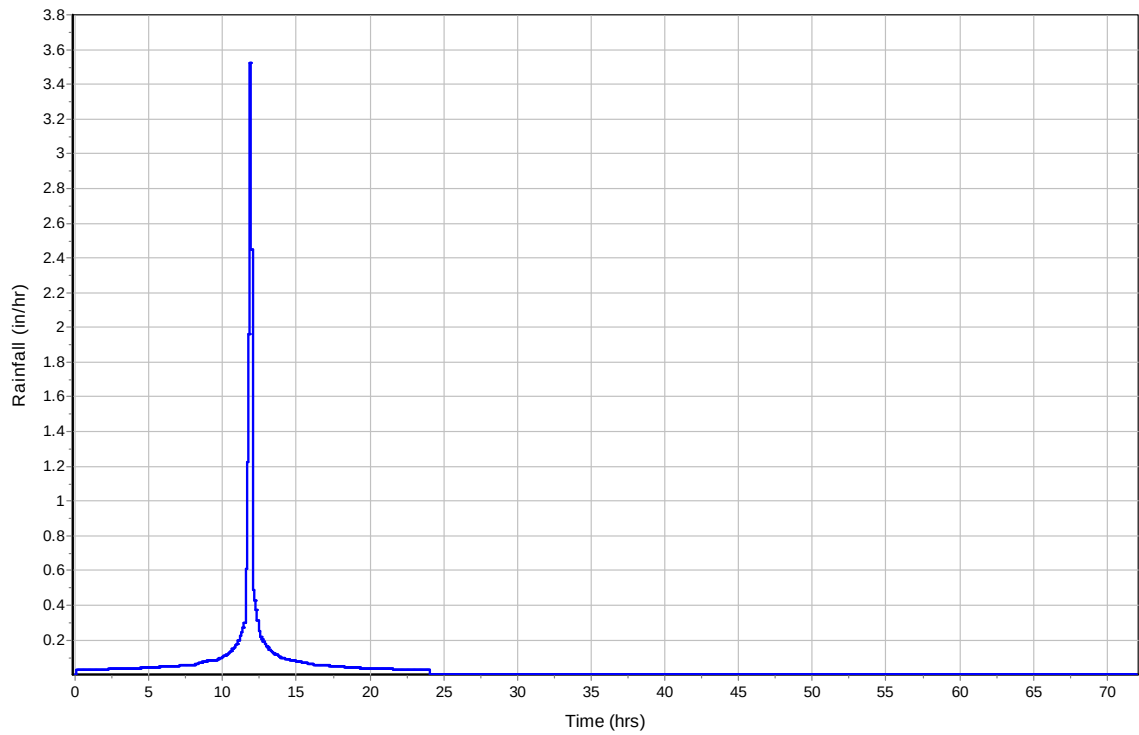
Time of Concentration

User-Defined TOC override (minutes): 20.00

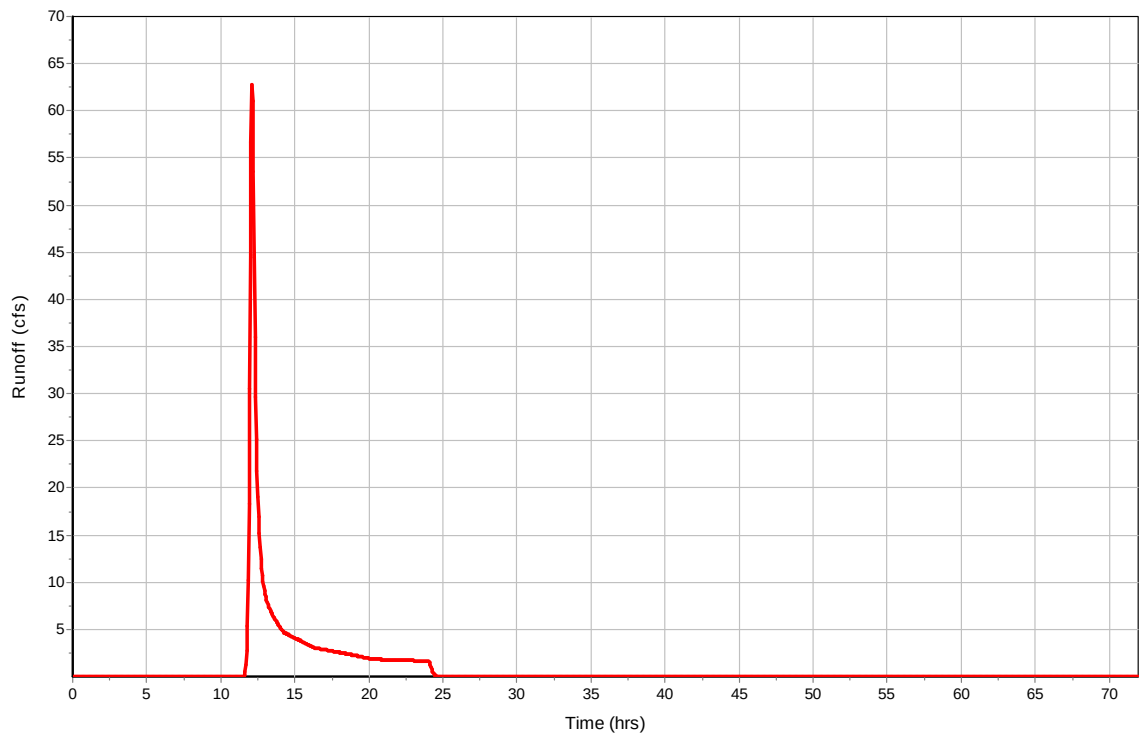
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 2.57       |
| Total Runoff (in)                     | 0.65       |
| Peak Runoff (cfs)                     | 63.31      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

| SN | Element<br>ID    | Invert<br>Elevation<br><br>(ft) | Ground/Rim<br>(Max)<br>Elevation<br>(ft) | Ground/Rim<br>(Max)<br>Offset<br>(ft) | Initial<br>Water<br>Elevation<br>(ft) | Initial<br>Water<br>Depth<br>(ft) | Surcharge<br>Elevation<br>(ft) | Surcharge<br>Depth<br>(ft) | Ponded<br>Area<br>(ft²) | Minimum<br>Pipe<br>Cover<br>(in) |
|----|------------------|---------------------------------|------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------|--------------------------------|----------------------------|-------------------------|----------------------------------|
| 1  | 12" DIA MANHOLE  | 886.40                          | 895.75                                   | 9.35                                  | 886.40                                | 0.00                              | 895.75                         | 0.00                       | 0.00                    | 0.00                             |
| 2  | Ditch_Start_East | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 3  | Ditch_Start_West | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 4  | HW_36_East       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 895.00                         | 0.00                       | 0.00                    | 0.00                             |
| 5  | HW_36_West       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 899.00                         | 4.00                       | 0.00                    | 0.00                             |
| 6  | IB_1_OCS         | 891.00                          | 900.80                                   | 9.80                                  | 891.00                                | 0.00                              | 900.80                         | 0.00                       | 0.00                    | 0.00                             |

Junction Results

| SN | Element<br>ID    | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|    |                  | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1  | 12'_DIA_MANHOLE  | 23.32          | 0.00                      | 887.61                           | 1.21                         | 0.00                                  | 8.14                         | 886.81                               | 0.41                             | 0 23:28                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 2  | Ditch_Start_East | 2.93           | 2.93                      | 899.13                           | 0.13                         | 0.00                                  | 4.87                         | 899.01                               | 0.01                             | 0 12:27                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3  | Ditch_Start_West | 6.65           | 6.65                      | 899.21                           | 0.21                         | 0.00                                  | 4.79                         | 899.01                               | 0.01                             | 0 12:27                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4  | HW_36_East       | 2.92           | 0.00                      | 892.34                           | 0.34                         | 0.00                                  | 4.66                         | 892.02                               | 0.02                             | 0 12:29                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5  | HW_36_West       | 6.64           | 0.00                      | 892.57                           | 0.57                         | 0.00                                  | 4.43                         | 892.03                               | 0.03                             | 0 12:29                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6  | IB_1_OCS         | 22.43          | 0.00                      | 891.77                           | 0.77                         | 0.00                                  | 9.03                         | 891.26                               | 0.26                             | 0 23:19                          | 0 00:00                                   | 0.00                       | 0.00                  |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

Channel Results

| SN | Element ID | Peak Flow | Time of Peak Flow Occurrence | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Travel Time | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Froude Number | Reported Condition |
|----|------------|-----------|------------------------------|----------------------|------------------------------|--------------------|-------------|-----------------|------------------------------------|-----------------------|---------------|--------------------|
|    |            | (cfs)     | (days hh:mm)                 | (cfs)                |                              | (ft/sec)           | (min)       | (ft)            |                                    | (min)                 |               |                    |
| 1  | Ditch_East | 2.92      | 0 12:27                      | 2363.82              | 0.00                         | 0.96               | 5.21        | 0.24            | 0.05                               | 0.00                  |               |                    |
| 2  | Ditch_West | 6.64      | 0 12:27                      | 2363.82              | 0.00                         | 1.26               | 3.97        | 0.39            | 0.08                               | 0.00                  |               |                    |



Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude<br>Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|------------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |                  |                       |
| 1 36_East          | 2.91         | 0 12:29                            | 126.55                  | 0.02                               | 6.68                  | 0.13           | 0.34               | 0.11                                        | 0.00                     |                  | Calculated            |
| 2 36_West          | 6.59         | 0 12:29                            | 126.55                  | 0.05                               | 8.04                  | 0.11           | 0.52               | 0.17                                        | 0.00                     |                  | Calculated            |
| 3 Culvert_1_CMP_72 | 23.13        | 0 23:19                            | 303.28                  | 0.08                               | 5.98                  | 0.33           | 1.17               | 0.19                                        | 0.00                     |                  | Calculated            |
| 4 Culvert_1_RCP_72 | 22.88        | 0 23:27                            | 640.68                  | 0.04                               | 7.52                  | 0.45           | 0.99               | 0.16                                        | 0.00                     |                  | Calculated            |
| 5 Culvert_2        | 14.21        | 0 12:34                            | 254.23                  | 0.06                               | 4.61                  | 0.40           | 0.99               | 0.17                                        | 0.00                     |                  | Calculated            |

Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

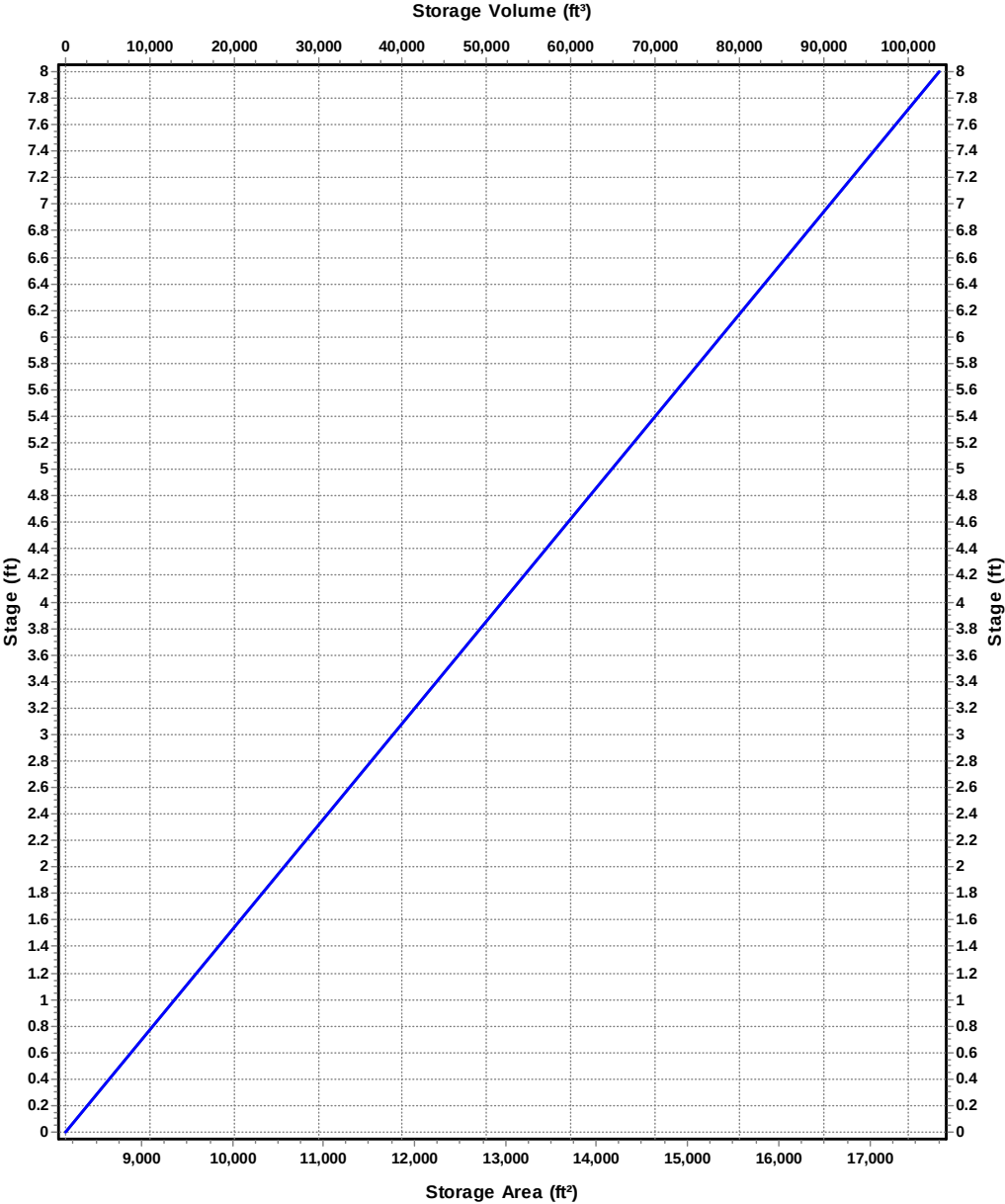
|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage | Storage |
|-------|---------|---------|
| (ft)  | Area    | Volume  |
|       | (ft²)   | (ft³)   |
| 0     | 8168    | 0       |
| 8     | 17763   | 103724  |

Storage Area Volume Curves



Storage Area      Storage Volume

## Storage Node : Culvert\_2\_Inlet (continued)

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 15.5    |
| Peak Lateral Inflow (cfs) .....               | 15.5    |
| Peak Outflow (cfs) .....                      | 14.21   |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 893.28  |
| Max HGL Depth Attained (ft) .....             | 1.28    |
| Average HGL Elevation Attained (ft) .....     | 892.28  |
| Average HGL Depth Attained (ft) .....         | 0.28    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:34 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

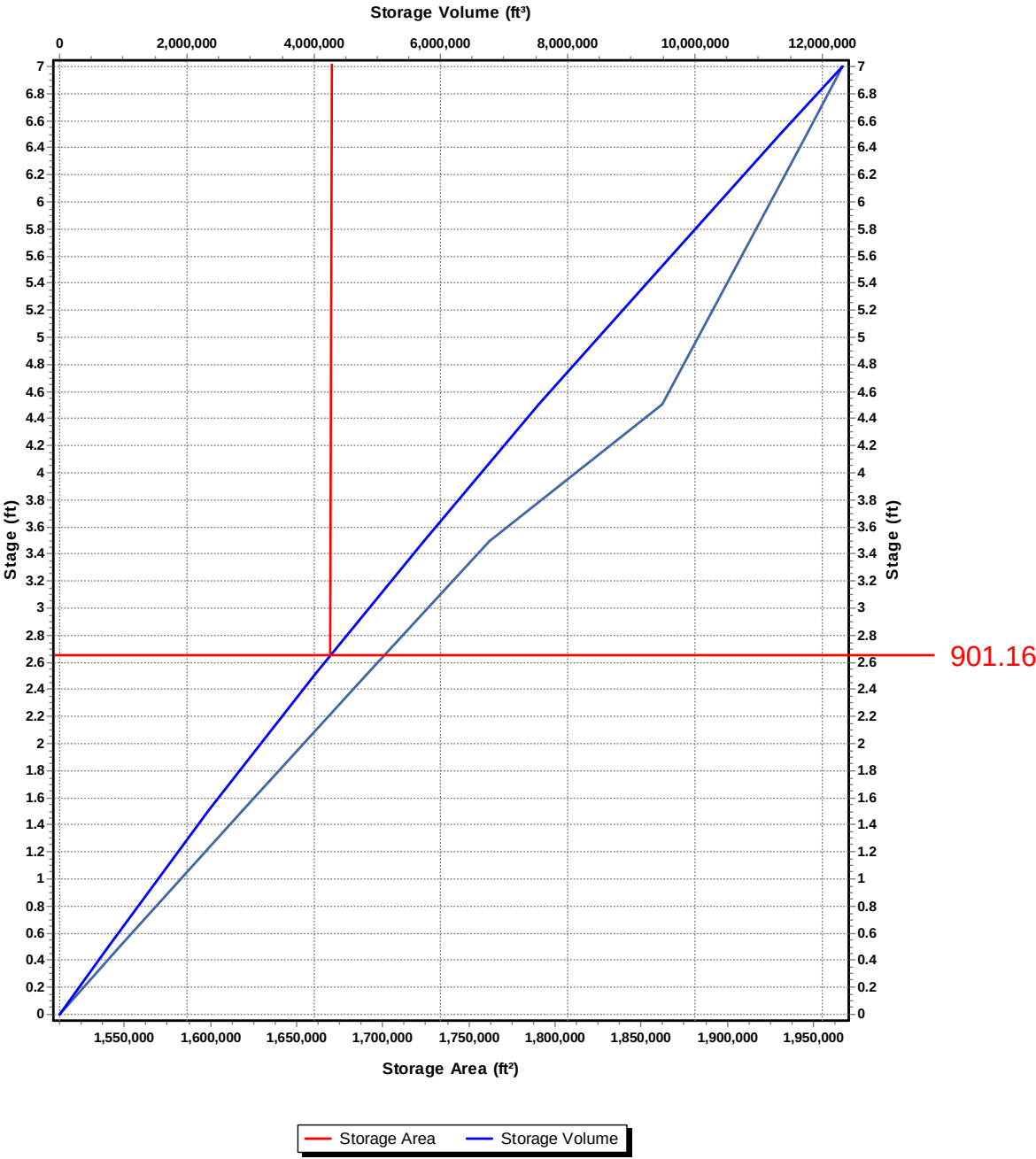
|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 895.50     |
| Initial Water Depth (ft)     | -3.00      |
| Ponded Area (ft²)            | 1512370.00 |
| Evaporation Loss             | 0.00       |

Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |

Storage Area Volume Curves





## Storage Node : Infiltration\_Basin\_1 (continued)

### Outflow Weirs

| SN Element<br>ID | Weir<br>Type | Flap<br>Gate | Crest<br>Elevation<br>(ft) | Crest<br>Offset<br>(ft) | Length<br>(ft) | Weir Total<br>Height<br>(ft) | Discharge<br>Coefficient |
|------------------|--------------|--------------|----------------------------|-------------------------|----------------|------------------------------|--------------------------|
| 1 IB_1_Spillway  | Trapezoidal  | No           | 904.00                     | 5.50                    | 350.00         | 1.50                         | 3.40                     |

### Outflow Orifices

| SN Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|------------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1 OCS_Weir       | Bottom          | CIRCULAR         | No           | 120.00                                  |                                          |                                         | 900.80                                 | 0.61                   |

### Output Summary Results

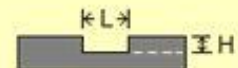
|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 1107.1  |
| Peak Lateral Inflow (cfs) .....               | 1107.1  |
| Peak Outflow (cfs) .....                      | 22.43   |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 901.16  |
| Max HGL Depth Attained (ft) .....             | 2.66    |
| Average HGL Elevation Attained (ft) .....     | 900.5   |
| Average HGL Depth Attained (ft) .....         | 2       |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 23:24 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Top of Riser Elevation = 900.80'  
 5-year storm elevation = 901.63'  
 H = 0.83'  
 Q ~ 77 cfs

Thin Blue Numbers = Input data  
 Bold Red Numbers = Answers

## Weir Notch Bleed Down Calculations

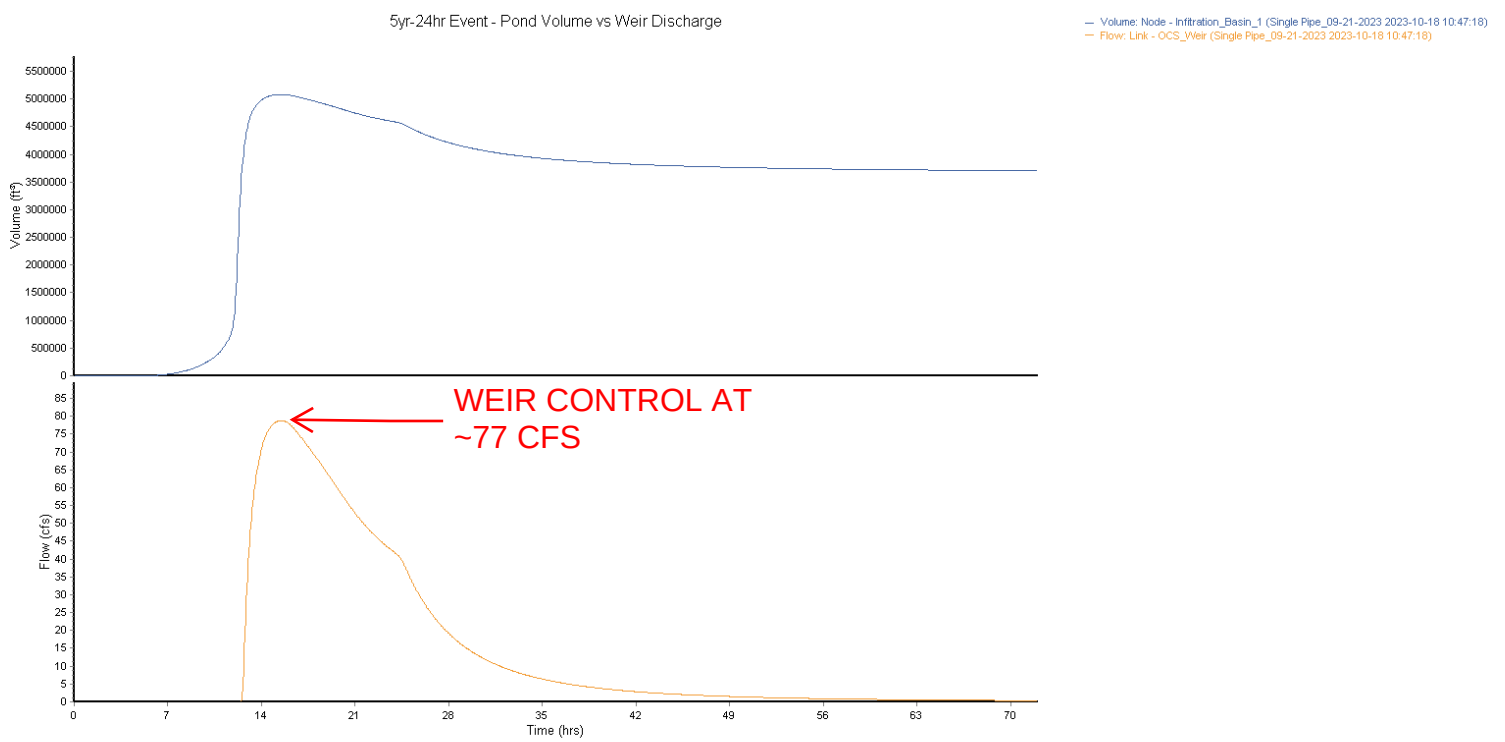
Pond Surface Area at SHW = 0 Sq. Ft.  
 Pond Surface Area at NWL = 0 Sq. Ft.  
 Notch Height (H) = 0.83 Feet  
 Notch Width (L) = 31.40 Feet  
 C = 3.25 Coefficient of discharge

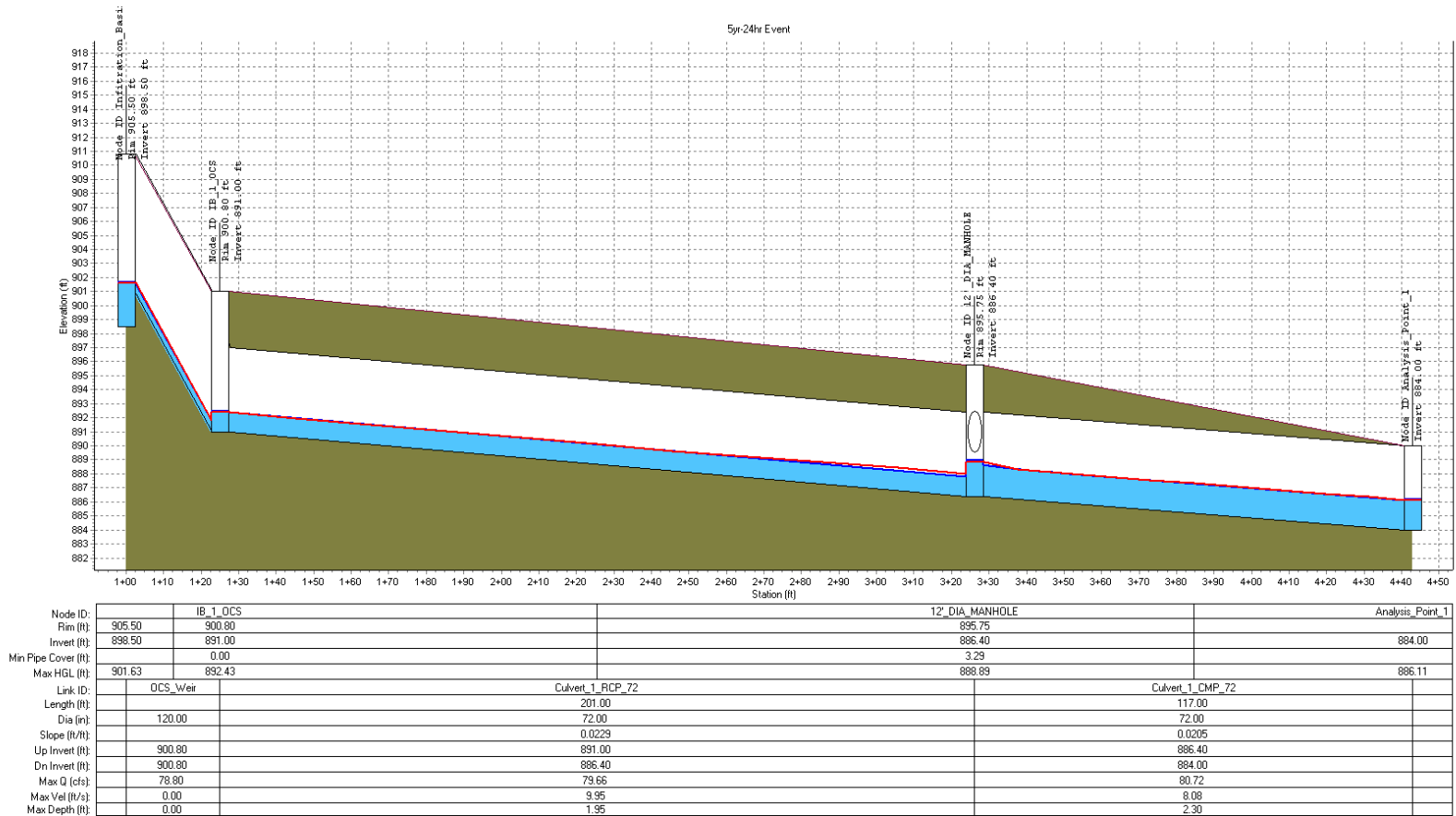


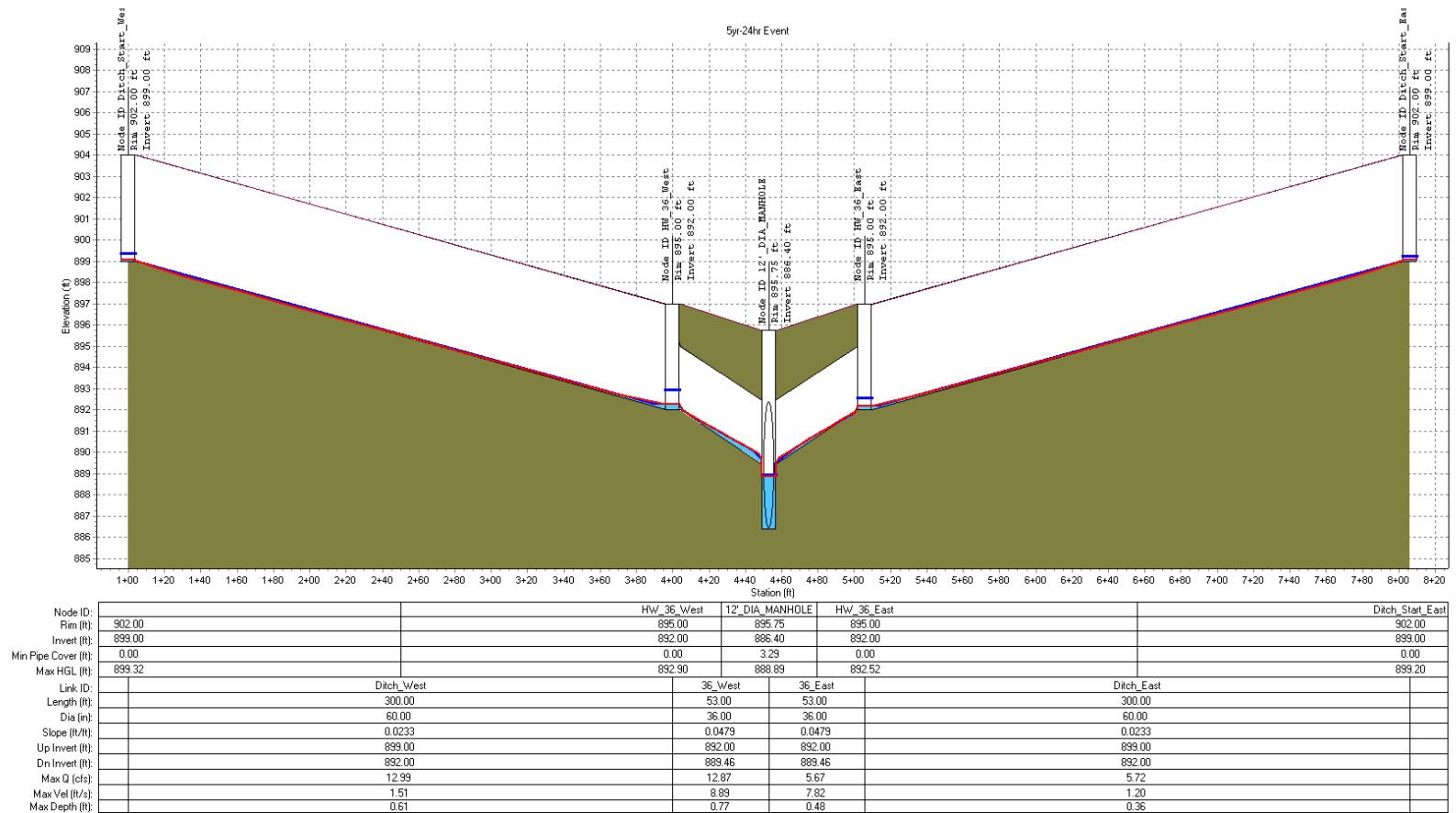
Horizontal Broad Crested W  
 $Q = C L H^{3/2}$

1/2 Volume Time = 0.00 Hours  
 Total Time = 0.00 Hours

| Total<br>H (Ft) | Increm.<br>H (Ft) | Flow<br>Q (cfs) | Q Avg. | Delta<br>Volume | Cum.<br>Volume | Delta<br>Hours | Cum.<br>Hours |
|-----------------|-------------------|-----------------|--------|-----------------|----------------|----------------|---------------|
| 0.83            |                   | 77.10           |        |                 |                |                |               |
|                 | 0.02              |                 | 75.945 | 0               | 0              | 0.0            |               |
| 0.81            |                   | 74.79           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 73.655 | 0               | 0              | 0.0            |               |
| 0.80            |                   | 72.52           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 71.389 | 0               | 0              | 0.0            |               |
| 0.78            |                   | 70.26           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 69.147 | 0               | 0              | 0.0            |               |
| 0.76            |                   | 68.03           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 66.928 | 0               | 0              | 0.0            |               |
| 0.75            |                   | 65.83           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 64.734 | 0               | 0              | 0.0            |               |
| 0.73            |                   | 63.64           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 62.565 | 0               | 0              | 0.0            |               |
| 0.71            |                   | 61.49           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 60.420 | 0               | 0              | 0.0            |               |
| 0.70            |                   | 59.35           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 58.300 | 0               | 0              | 0.0            |               |
| 0.68            |                   | 57.25           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 56.206 | 0               | 0              | 0.0            |               |
| 0.66            |                   | 55.17           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 54.137 | 0               | 0              | 0.0            |               |
| 0.65            |                   | 53.11           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 52.095 | 0               | 0              | 0.0            |               |
| 0.63            |                   | 51.08           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 50.078 | 0               | 0              | 0.0            |               |
| 0.61            |                   | 49.08           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 48.089 | 0               | 0              | 0.0            |               |
| 0.60            |                   | 47.10           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 46.126 | 0               | 0              | 0.0            |               |
| 0.58            |                   | 45.15           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 44.191 | 0               | 0              | 0.0            |               |
| 0.56            |                   | 43.23           |        |                 |                |                | 0.0           |







Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 10  
    *Junctions* ..... 6  
    *Outfalls* ..... 2  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin<br>ID          | Area   | Peak Rate | Weighted | Total    | Total  | Total   | Peak    | Time of         |
|----------------------------|--------|-----------|----------|----------|--------|---------|---------|-----------------|
|                            |        | Factor    | Curve    | Rainfall | Runoff | Runoff  | Runoff  | Concentration   |
|                            | (ac)   |           | Number   | (in)     | (in)   | (ac-in) | (cfs)   | (days hh:mm:ss) |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00    | 3.38     | 2.43   | 1849.55 | 1518.05 | 0 00:33:17      |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00    | 3.38     | 1.16   | 9.04    | 5.74    | 0 00:45:00      |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00    | 3.38     | 1.16   | 20.53   | 13.04   | 0 00:45:00      |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00    | 3.38     | 1.22   | 46.16   | 29.64   | 0 00:45:00      |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00    | 3.38     | 1.16   | 114.04  | 121.03  | 0 00:20:00      |

Node Summary

| SN | Element<br>ID        | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|----------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|------------------------------|-------------------------------------------|----------------------------|-----------------------|
|    |                      |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                         | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1  | 12'_DIA_MANHOLE      | Junction        | 886.40              | 895.75                           | 886.40                        | 895.75                 | 0.00           | 81.40          | 888.89                           | 0.00                                  | 6.86                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 2  | Ditch_Start_East     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 5.73           | 899.20                           | 0.00                                  | 4.80                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 3  | Ditch_Start_West     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 13.01          | 899.32                           | 0.00                                  | 4.68                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 4  | HW_36_East           | Junction        | 892.00              | 895.00                           | 892.00                        | 895.00                 | 0.00           | 5.72           | 892.52                           | 0.00                                  | 4.48                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 5  | HW_36_West           | Junction        | 892.00              | 895.00                           | 892.00                        | 899.00                 | 0.00           | 12.99          | 892.90                           | 0.00                                  | 4.10                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 6  | IB_1_OCS             | Junction        | 891.00              | 900.80                           | 891.00                        | 900.80                 | 0.00           | 78.80          | 892.43                           | 0.00                                  | 8.37                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 7  | Analysis_Point_1     | Outfall         | 884.00              |                                  |                               |                        |                | 80.72          | 886.11                           |                                       |                              |                                           |                            |                       |
| 8  | Analysis_Point_2     | Outfall         | 890.65              |                                  |                               |                        |                | 28.21          | 892.00                           |                                       |                              |                                           |                            |                       |
| 9  | Culvert_2_Inlet      | Storage Node    | 892.00              | 900.00                           | 892.00                        |                        | 8168.00        | 29.60          | 893.74                           |                                       |                              |                                           | 0.00                       | 0.00                  |
| 10 | Infiltration_Basin_1 | Storage Node    | 898.50              | 905.50                           | 895.50                        |                        | 1512370.00     | 1613.84        | 901.63                           |                                       |                              |                                           | 0.00                       | 0.00                  |



Link Summary

| SN Element<br>ID   | Element<br>Type | From<br>(Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Elevation | Average<br>Slope | Diameter or<br>Height | Manning's<br>Roughness | Peak<br>Flow | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time Reported<br>Surcharged Condition |
|--------------------|-----------------|-------------------------|---------------------|--------|------------------------------|-------------------------------|------------------|-----------------------|------------------------|--------------|-------------------------|------------------------------------|-----------------------|--------------------|---------------------------------------------|---------------------------------------------|
|                    |                 |                         |                     | (ft)   | (ft)                         | (ft)                          | (%)              | (in)                  |                        | (cfs)        | (cfs)                   |                                    | (ft/sec)              | (ft)               |                                             | (min)                                       |
| 1 36_East          | Pipe            | HW_36_East              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 5.67         | 126.55                  | 0.04                               | 7.82                  | 0.48               | 0.16                                        | 0.00 Calculated                             |
| 2 36_West          | Pipe            | HW_36_West              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 12.87        | 126.55                  | 0.10                               | 8.89                  | 0.77               | 0.26                                        | 0.00 Calculated                             |
| 3 Culvert_1_CMP_72 | Pipe            | 12'_DIA_MANHOLE         | Analysis_Point_1    | 117.00 | 886.40                       | 884.00                        | 2.0500           | 72.000                | 0.0260                 | 80.72        | 303.28                  | 0.27                               | 8.08                  | 2.30               | 0.38                                        | 0.00 Calculated                             |
| 4 Culvert_1_RCP_72 | Pipe            | IB_1_OCS                | 12'_DIA_MANHOLE     | 201.00 | 891.00                       | 886.40                        | 2.2900           | 72.000                | 0.0130                 | 79.66        | 640.68                  | 0.12                               | 9.95                  | 1.95               | 0.33                                        | 0.00 Calculated                             |
| 5 Culvert_2        | Pipe            | Culvert_2_Inlet         | Analysis_Point_2    | 111.00 | 892.25                       | 890.65                        | 1.4400           | 72.000                | 0.0260                 | 28.21        | 254.23                  | 0.11                               | 5.52                  | 1.42               | 0.24                                        | 0.00 Calculated                             |
| 6 Ditch_East       | Channel         | Ditch_Start_East        | HW_36_East          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 5.72         | 2363.82                 | 0.00                               | 1.20                  | 0.36               | 0.07                                        | 0.00                                        |
| 7 Ditch_West       | Channel         | Ditch_Start_West        | HW_36_West          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 12.99        | 2363.82                 | 0.01                               | 1.51                  | 0.61               | 0.12                                        | 0.00                                        |
| 8 OCS_Weir         | Orifice         | Infiltration_Basin_1    | IB_1_OCS            |        | 898.50                       | 891.00                        |                  | 120.000               |                        | 78.80        |                         |                                    |                       |                    |                                             |                                             |
| 9 IB_1_Spillway    | Weir            | Infiltration_Basin_1    | Culvert_2_Inlet     |        | 898.50                       | 892.00                        |                  |                       |                        | 0.00         |                         |                                    |                       |                    |                                             |                                             |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 761.76   |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 91       |
| Rain Gage ID          | 24hr-5yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 \* ((n \* Lf)^0.8)) / ((P^0.5) \* (Sf^0.4))

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R^(2/3)) \* (Sf^0.5)) / n

R = Aq / Wp

Tc = (Lf / V) / (3600 sec/hr)

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

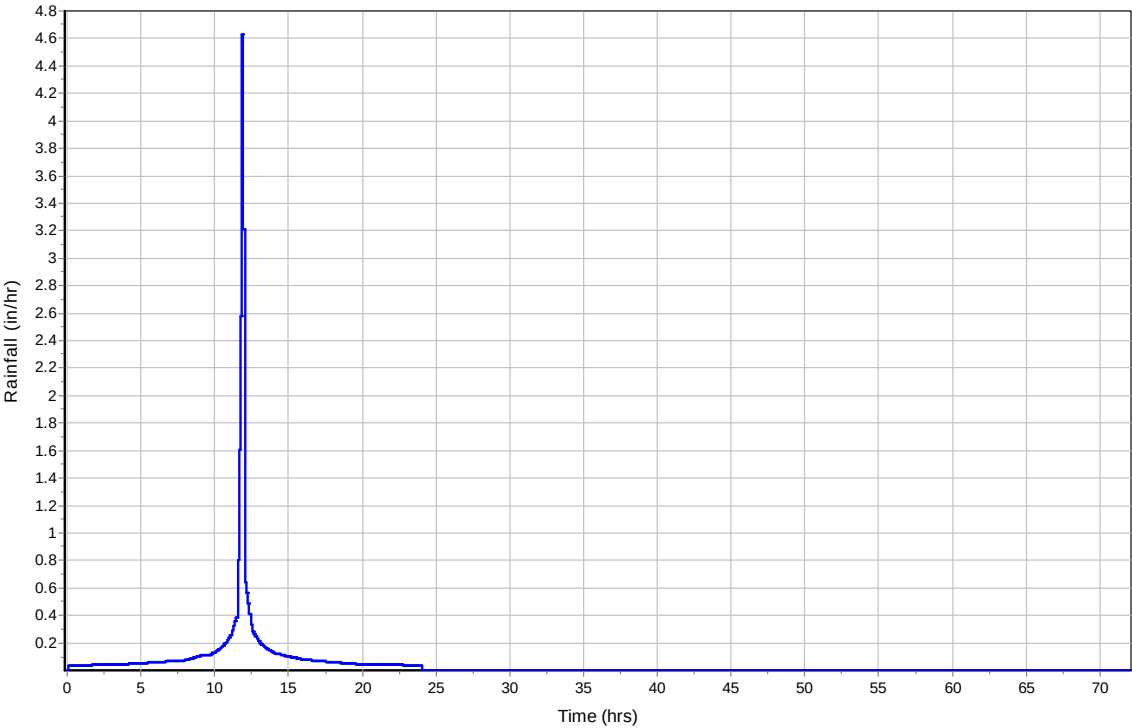
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

### Subbasin Runoff Results

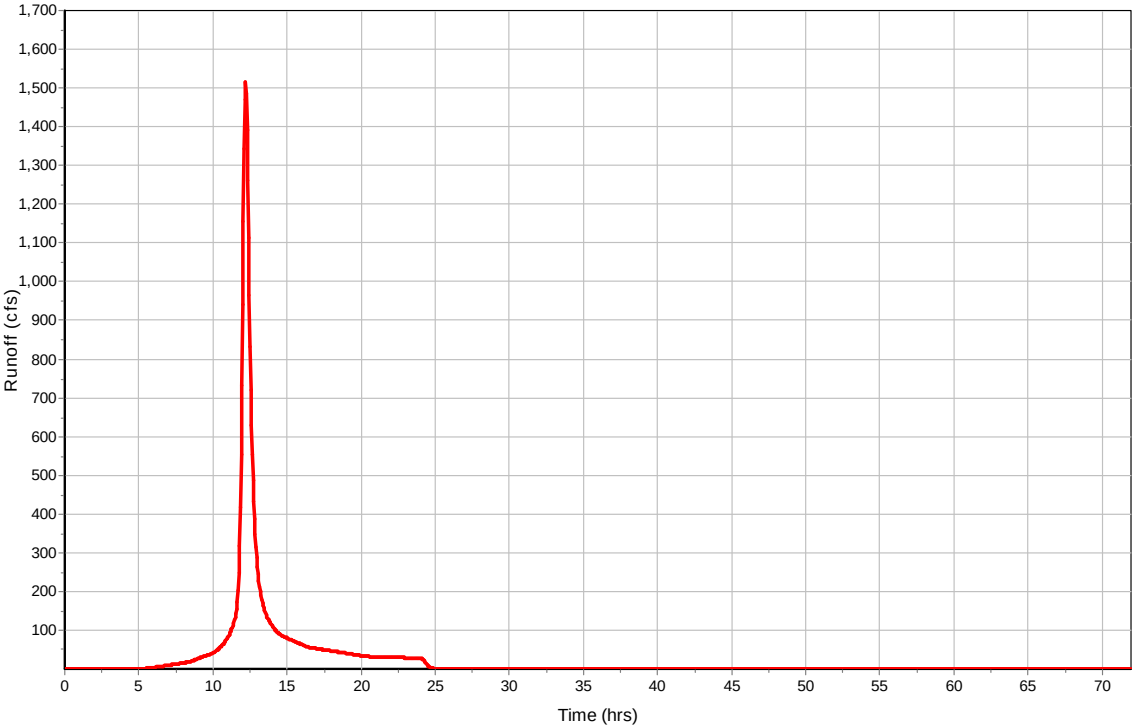
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.38       |
| Total Runoff (in) .....                     | 2.43       |
| Peak Runoff (cfs) .....                     | 1518.05    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr-5yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

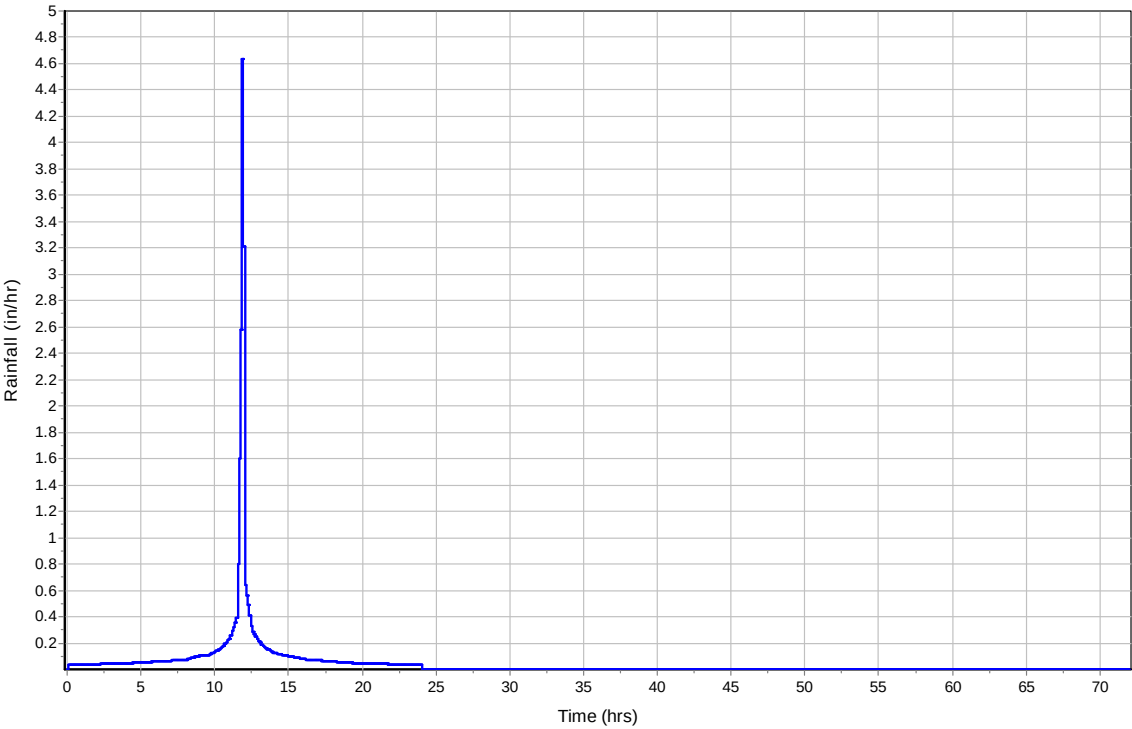
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

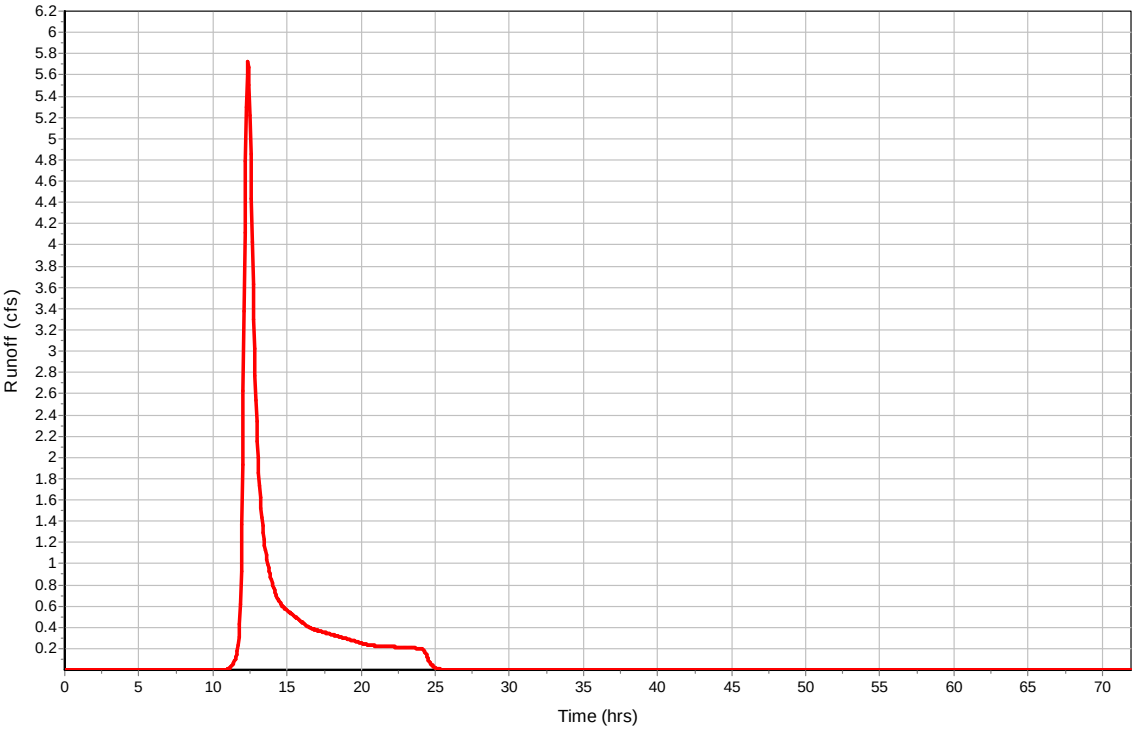
Total Rainfall (in) ..... 3.38  
Total Runoff (in) ..... 1.16  
Peak Runoff (cfs) ..... 5.74  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 17.73    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr-5yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

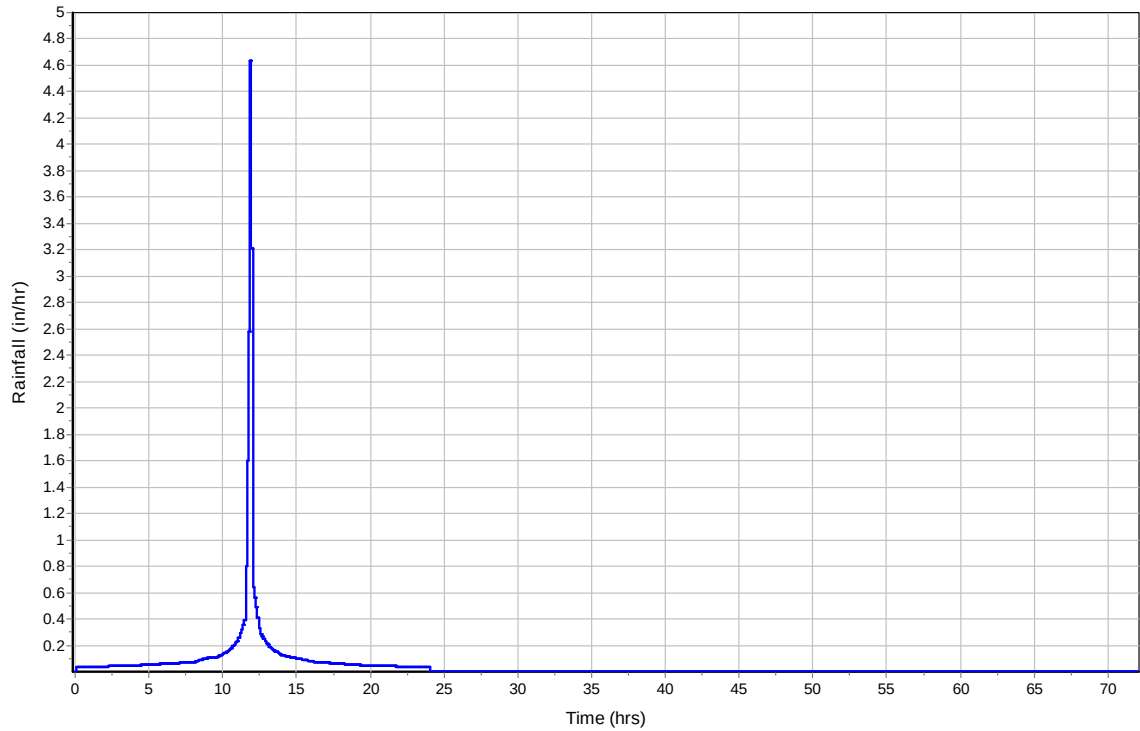
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

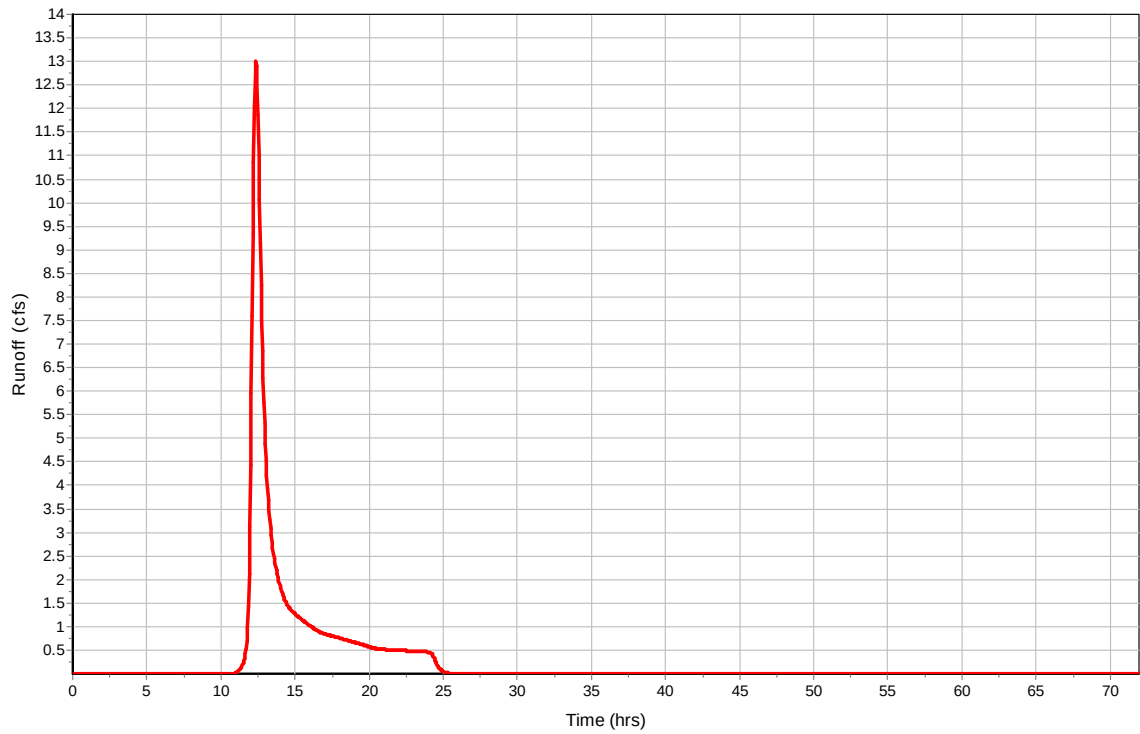
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 3.38       |
| Total Runoff (in)                     | 1.16       |
| Peak Runoff (cfs)                     | 13.04      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph





Subbasin : Drainage\_Area\_2b

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 37.9     |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 75       |
| Rain Gage ID          | 24hr-5yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

Time of Concentration

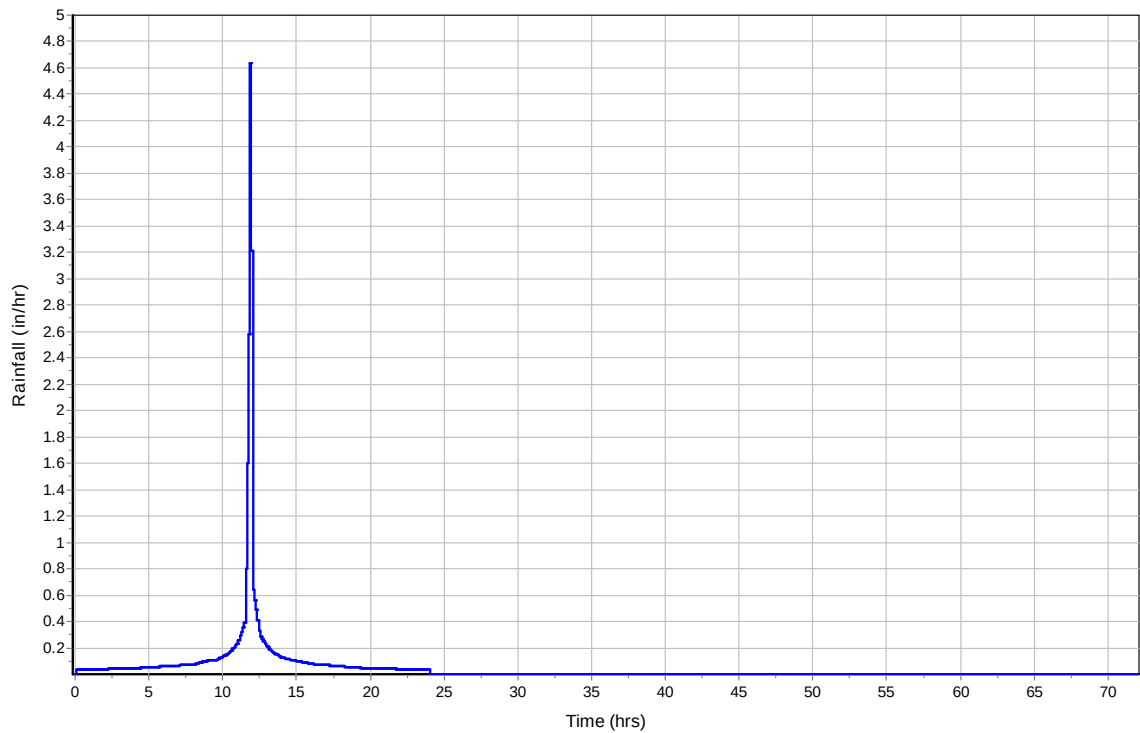
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

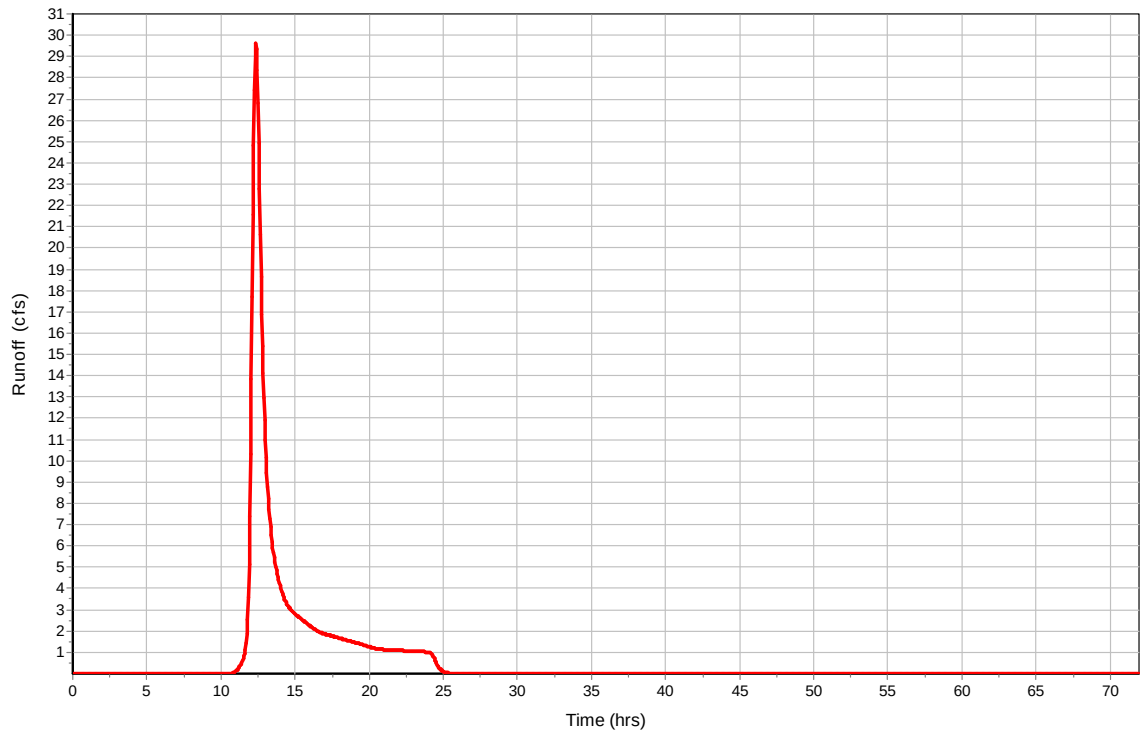
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 3.38       |
| Total Runoff (in)                     | 1.22       |
| Peak Runoff (cfs)                     | 29.64      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_2b

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 98.48    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr-5yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

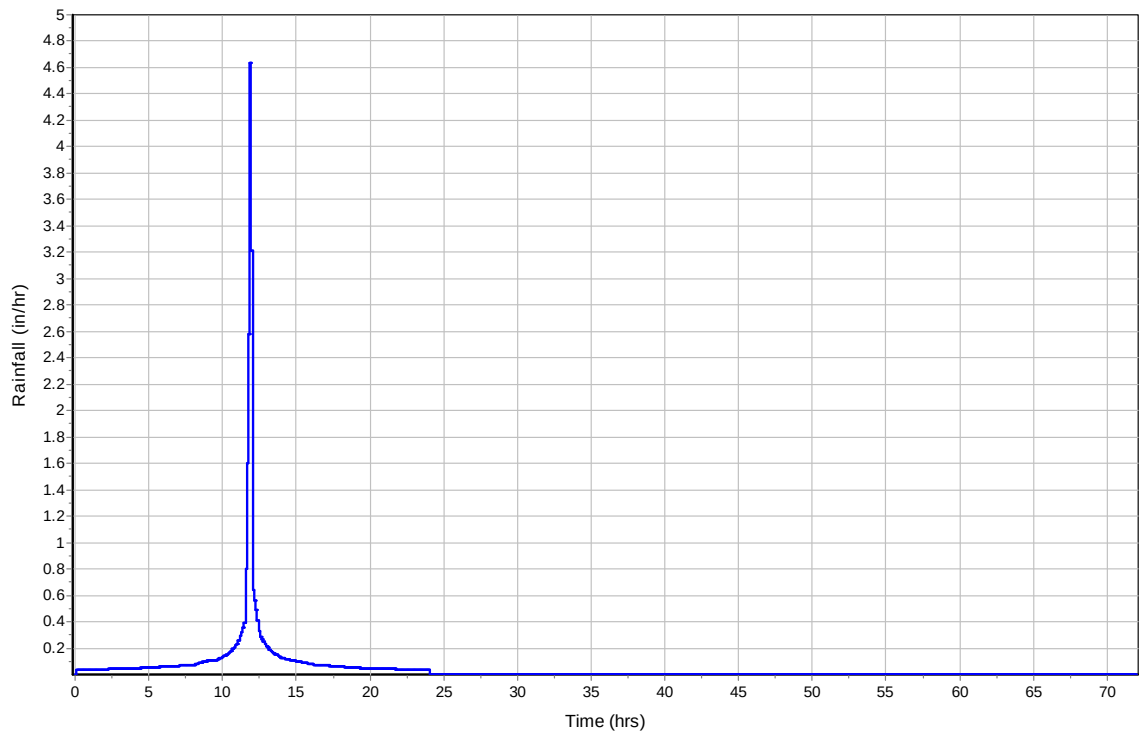
Time of Concentration

User-Defined TOC override (minutes): 20.00

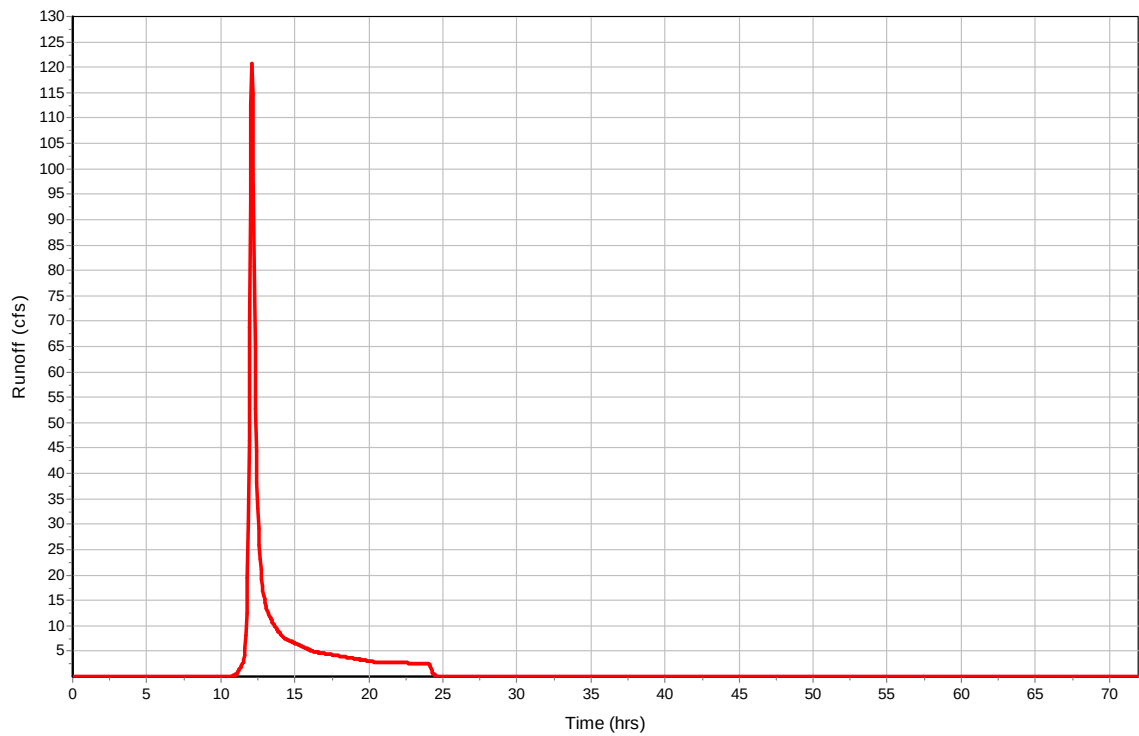
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 3.38       |
| Total Runoff (in)                     | 1.16       |
| Peak Runoff (cfs)                     | 121.03     |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

| SN | Element<br>ID    | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation<br>(ft) | Ground/Rim<br>(Max)<br>Offset<br>(ft) | Initial<br>Water<br>Elevation<br>(ft) | Initial<br>Water<br>Depth<br>(ft) | Surcharge<br>Elevation<br>(ft) | Surcharge<br>Depth<br>(ft) | Ponded<br>Area<br>(ft²) | Minimum<br>Pipe<br>Cover<br>(in) |
|----|------------------|---------------------|------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------|--------------------------------|----------------------------|-------------------------|----------------------------------|
| 1  | 12" DIA MANHOLE  | 886.40              | 895.75                                   | 9.35                                  | 886.40                                | 0.00                              | 895.75                         | 0.00                       | 0.00                    | 0.00                             |
| 2  | Ditch_Start_East | 899.00              | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 3  | Ditch_Start_West | 899.00              | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 4  | HW_36_East       | 892.00              | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 895.00                         | 0.00                       | 0.00                    | 0.00                             |
| 5  | HW_36_West       | 892.00              | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 899.00                         | 4.00                       | 0.00                    | 0.00                             |
| 6  | IB_1_OCS         | 891.00              | 900.80                                   | 9.80                                  | 891.00                                | 0.00                              | 900.80                         | 0.00                       | 0.00                    | 0.00                             |

Junction Results

| SN Element<br>ID   | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|--------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|                    | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1 12" DIA MANHOLE  | 81.40          | 0.00                      | 888.89                           | 2.49                         | 0.00                                  | 6.86                         | 887.06                               | 0.66                             | 0 15:22                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 2 Ditch_Start_East | 5.73           | 5.73                      | 899.20                           | 0.20                         | 0.00                                  | 4.80                         | 899.01                               | 0.01                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3 Ditch_Start_West | 13.01          | 13.01                     | 899.32                           | 0.32                         | 0.00                                  | 4.68                         | 899.01                               | 0.01                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4 HW_36_East       | 5.72           | 0.00                      | 892.52                           | 0.52                         | 0.00                                  | 4.48                         | 892.03                               | 0.03                             | 0 12:28                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5 HW_36_West       | 12.99          | 0.00                      | 892.90                           | 0.90                         | 0.00                                  | 4.10                         | 892.04                               | 0.04                             | 0 12:27                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6 IB_1_OCS         | 78.80          | 0.00                      | 892.43                           | 1.43                         | 0.00                                  | 8.37                         | 891.40                               | 0.40                             | 0 15:34                          | 0 00:00                                   | 0.00                       | 0.00                  |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

Channel Results

| SN | Element ID | Peak Flow | Time of Peak Flow Occurrence | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Travel Time | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Froude Number | Reported Condition |
|----|------------|-----------|------------------------------|----------------------|------------------------------|--------------------|-------------|-----------------|------------------------------------|-----------------------|---------------|--------------------|
|    |            | (cfs)     | (days hh:mm)                 | (cfs)                |                              | (ft/sec)           | (min)       | (ft)            |                                    | (min)                 |               |                    |
| 1  | Ditch_East | 5.72      | 0 12:25                      | 2363.82              | 0.00                         | 1.20               | 4.17        | 0.36            | 0.07                               | 0.00                  |               |                    |
| 2  | Ditch_West | 12.99     | 0 12:25                      | 2363.82              | 0.01                         | 1.51               | 3.31        | 0.61            | 0.12                               | 0.00                  |               |                    |



Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude<br>Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|------------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |                  |                       |
| 1 36_East          | 5.67         | 0 12:28                            | 126.55                  | 0.04                               | 7.82                  | 0.11           | 0.48               | 0.16                                        | 0.00                     |                  | Calculated            |
| 2 36_West          | 12.87        | 0 12:27                            | 126.55                  | 0.10                               | 8.89                  | 0.10           | 0.77               | 0.26                                        | 0.00                     |                  | Calculated            |
| 3 Culvert_1_CMP_72 | 80.72        | 0 15:21                            | 303.28                  | 0.27                               | 8.08                  | 0.24           | 2.30               | 0.38                                        | 0.00                     |                  | Calculated            |
| 4 Culvert_1_RCP_72 | 79.66        | 0 15:27                            | 640.68                  | 0.12                               | 9.95                  | 0.34           | 1.95               | 0.33                                        | 0.00                     |                  | Calculated            |
| 5 Culvert_2        | 28.21        | 0 12:30                            | 254.23                  | 0.11                               | 5.52                  | 0.34           | 1.42               | 0.24                                        | 0.00                     |                  | Calculated            |

Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

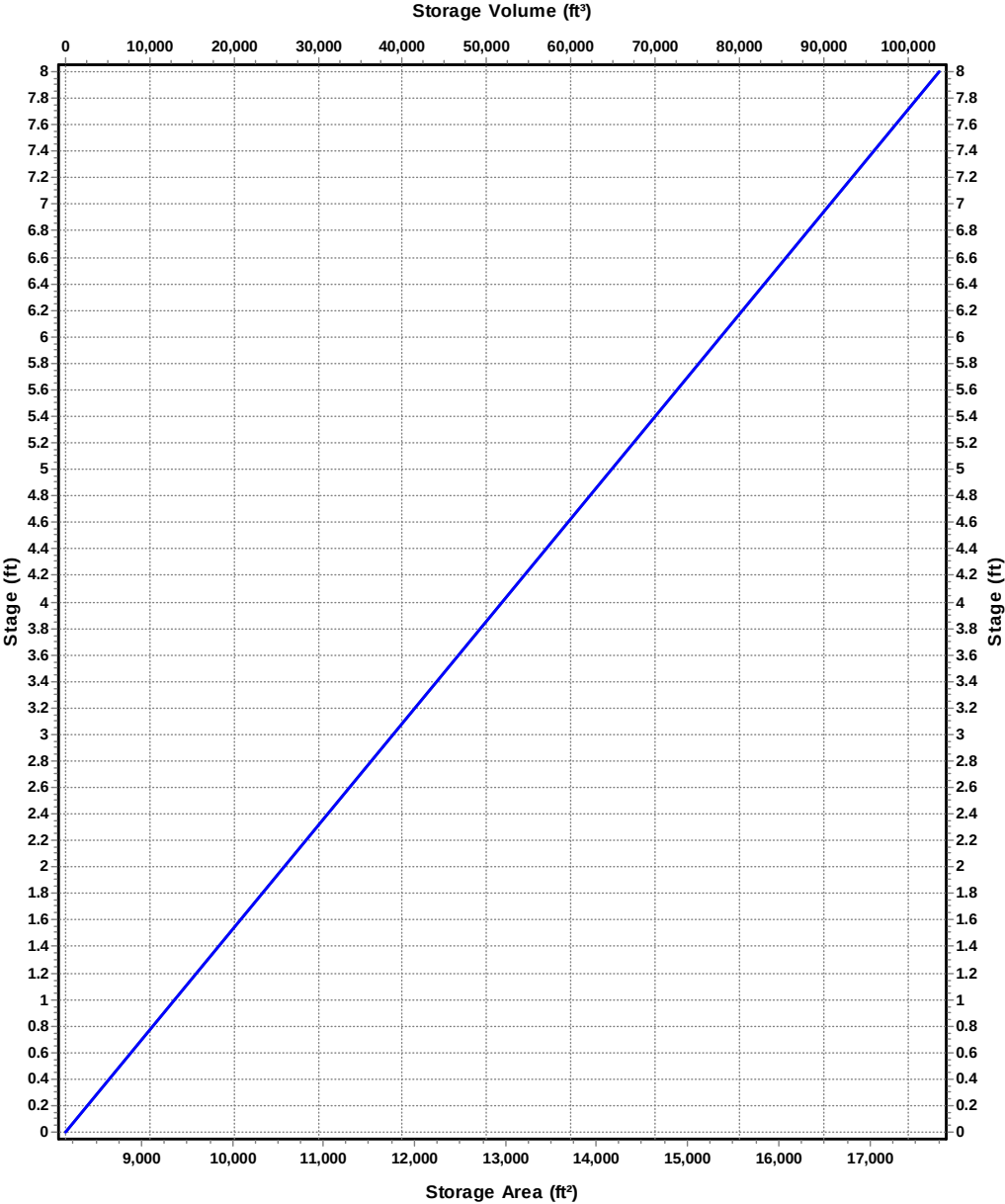
|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage | Storage |
|-------|---------|---------|
| (ft)  | Area    | Volume  |
|       | (ft²)   | (ft³)   |
| 0     | 8168    | 0       |
| 8     | 17763   | 103724  |

Storage Area Volume Curves



Storage Area    Storage Volume

**Storage Node : Culvert\_2\_Inlet (continued)**

**Output Summary Results**

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 29.6    |
| Peak Lateral Inflow (cfs) .....               | 29.6    |
| Peak Outflow (cfs) .....                      | 28.21   |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 893.74  |
| Max HGL Depth Attained (ft) .....             | 1.74    |
| Average HGL Elevation Attained (ft) .....     | 892.3   |
| Average HGL Depth Attained (ft) .....         | 0.3     |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:30 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

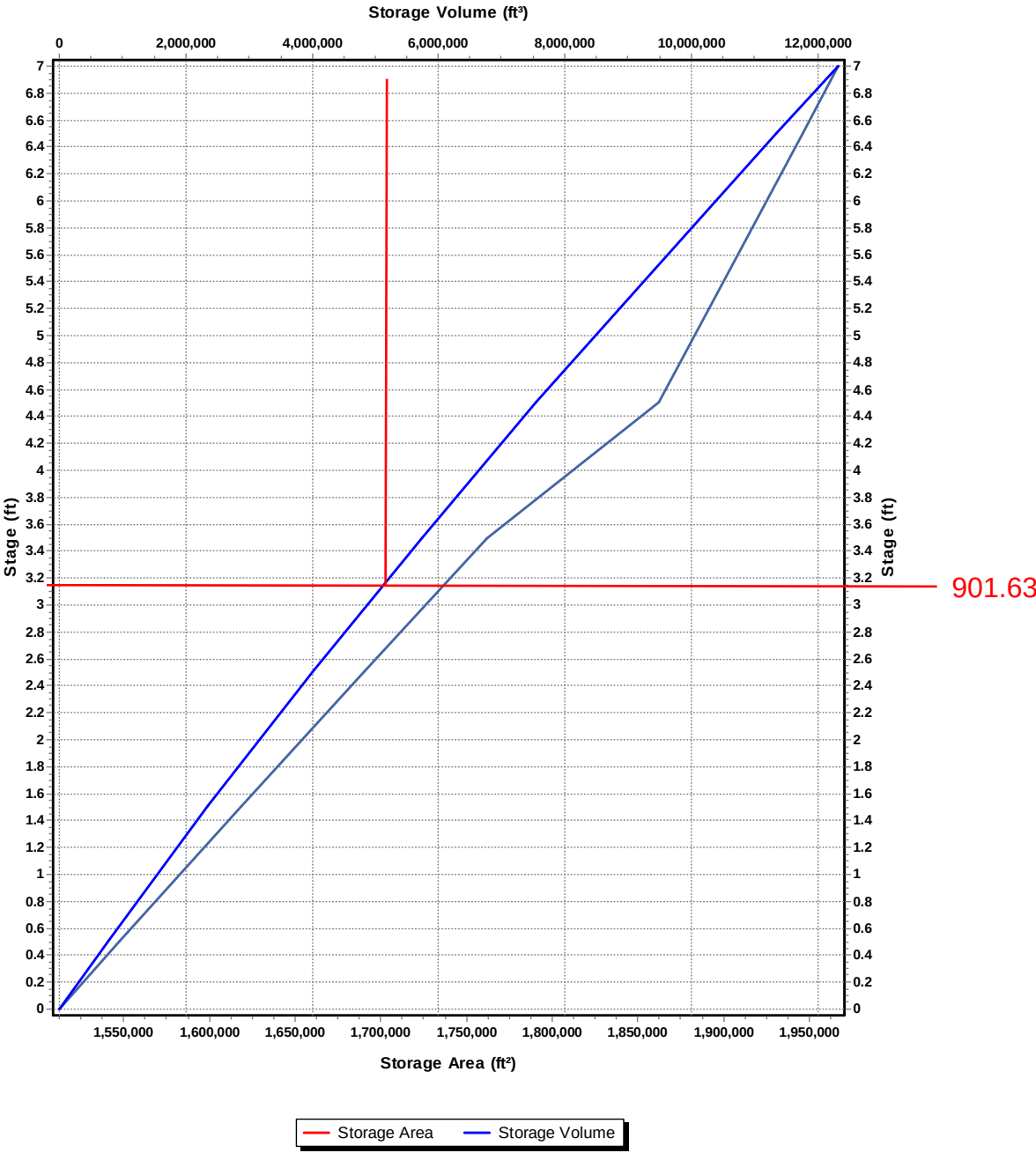
|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 895.50     |
| Initial Water Depth (ft)     | -3.00      |
| Ponded Area (ft²)            | 1512370.00 |
| Evaporation Loss             | 0.00       |

Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |

Storage Area Volume Curves





## Storage Node : Infiltration\_Basin\_1 (continued)

### Outflow Weirs

| SN Element<br>ID | Weir<br>Type | Flap<br>Gate | Crest<br>Elevation<br>(ft) | Crest<br>Offset<br>(ft) | Length<br>(ft) | Weir Total<br>Height<br>(ft) | Discharge<br>Coefficient |
|------------------|--------------|--------------|----------------------------|-------------------------|----------------|------------------------------|--------------------------|
| 1 IB_1_Spillway  | Trapezoidal  | No           | 904.00                     | 5.50                    | 350.00         | 1.50                         | 3.40                     |

### Outflow Orifices

| SN Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|------------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1 OCS_Weir       | Bottom          | CIRCULAR         | No           | 120.00                                  |                                          |                                         | 900.80                                 | 0.61                   |

### Output Summary Results

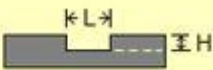
|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 1613.84 |
| Peak Lateral Inflow (cfs) .....               | 1613.84 |
| Peak Outflow (cfs) .....                      | 78.8    |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 901.63  |
| Max HGL Depth Attained (ft) .....             | 3.13    |
| Average HGL Elevation Attained (ft) .....     | 900.61  |
| Average HGL Depth Attained (ft) .....         | 2.11    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 15:27 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Top of Riser Elevation = 900.80'  
 10-year storm elevation = 901.79'  
 H = 0.99'  
 Q ~ 100 cfs

Thin Blue Numbers = Input data  
 Bold Red Numbers = Answers

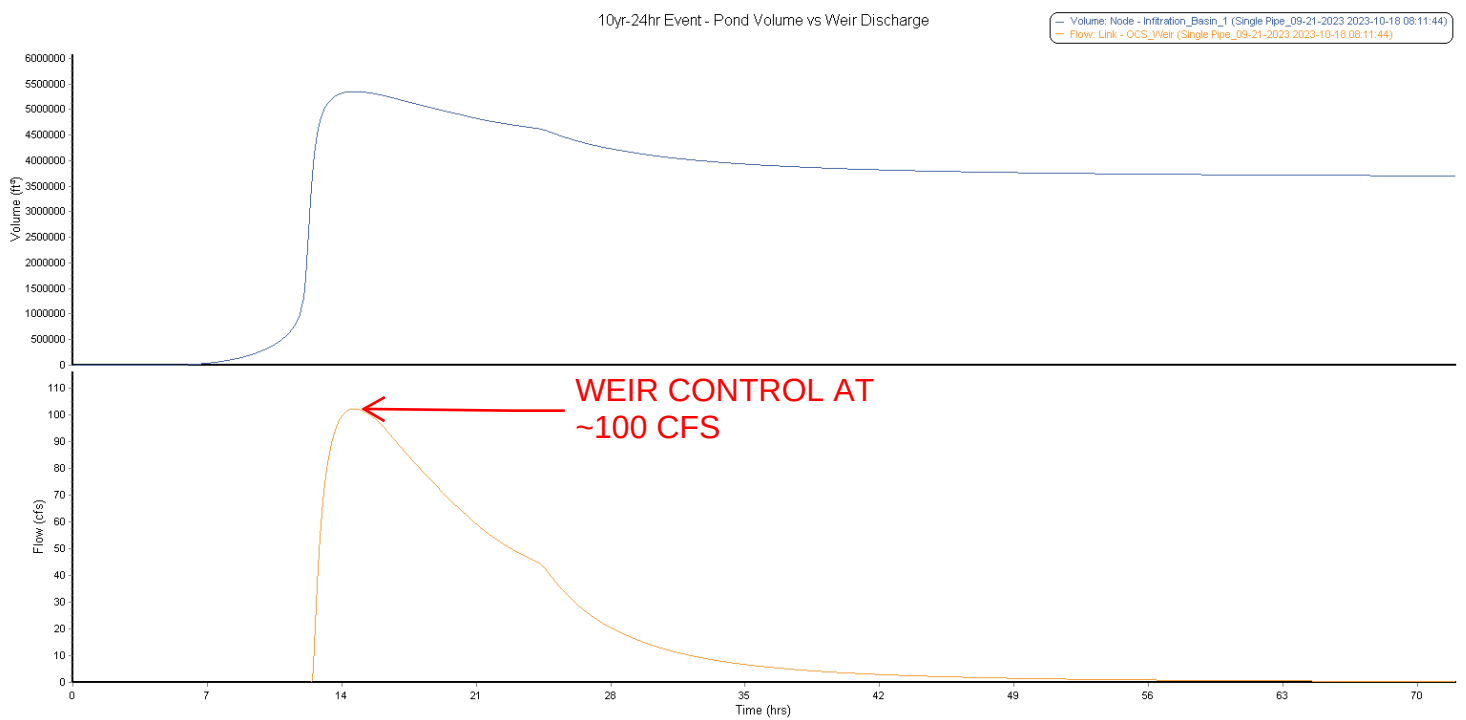
## Weir Notch Bleed Down Calculations

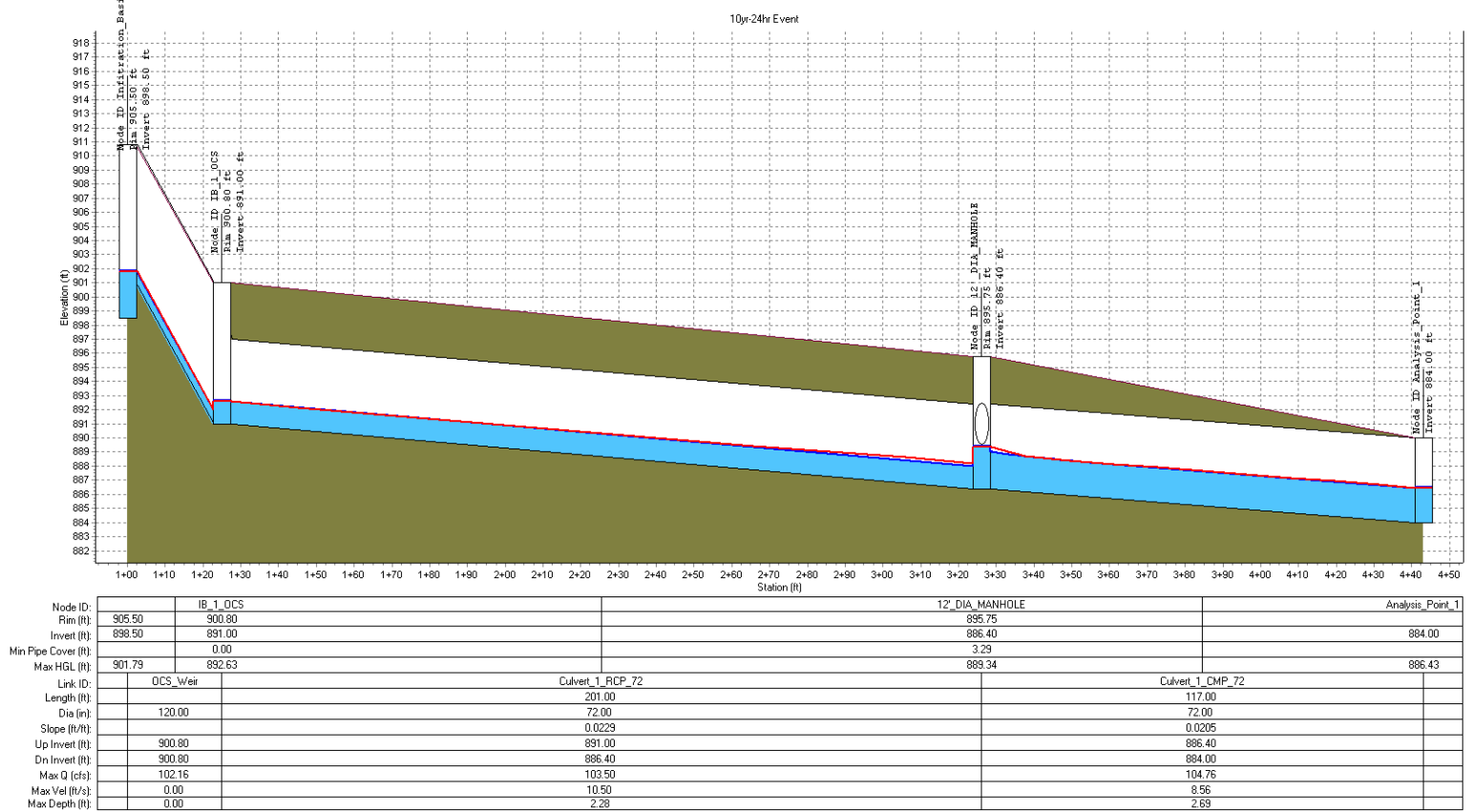
Pond Surface Area at SHW = 0 Sq. Ft.  
 Pond Surface Area at NWL = 0 Sq. Ft.  
 Notch Height (H) = 0.99 Feet  
 Notch Width (L) = 31.40 Feet  
 C = 3.25 Coefficient of discharge

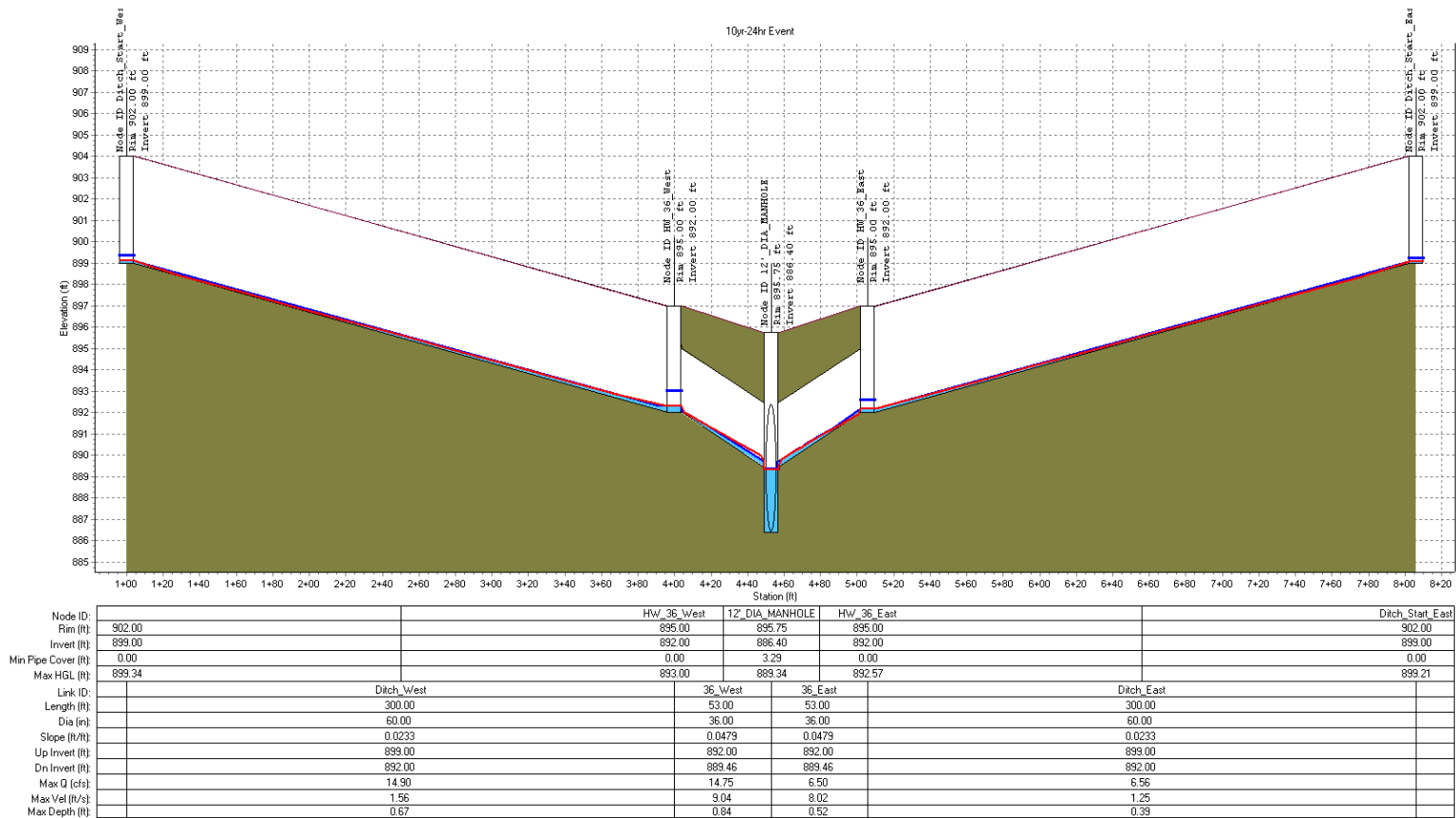
  
 Horizontal Broad Crested W  
 $Q = C L H^{3/2}$

1/2 Volume Time = 0.00 Hours  
 Total Time = 0.00 Hours

| Total<br>H (Ft) | Increm.<br>H (Ft) | Flow<br>Q (cfs) | Q Avg. | Delta<br>Volume | Cum.<br>Volume | Delta<br>Hours | Cum.<br>Hours |
|-----------------|-------------------|-----------------|--------|-----------------|----------------|----------------|---------------|
| 0.99            |                   | 100.43          |        |                 |                |                |               |
|                 | 0.02              |                 | 98.931 | 0               | 0              | 0.0            |               |
| 0.97            |                   | 97.43           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 95.949 | 0               | 0              | 0.0            |               |
| 0.95            |                   | 94.47           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 92.997 | 0               | 0              | 0.0            |               |
| 0.93            |                   | 91.53           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 90.076 | 0               | 0              | 0.0            |               |
| 0.91            |                   | 88.62           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 87.186 | 0               | 0              | 0.0            |               |
| 0.89            |                   | 85.75           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 84.328 | 0               | 0              | 0.0            |               |
| 0.87            |                   | 82.91           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 81.501 | 0               | 0              | 0.0            |               |
| 0.85            |                   | 80.10           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 78.707 | 0               | 0              | 0.0            |               |
| 0.83            |                   | 77.32           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 75.946 | 0               | 0              | 0.0            |               |
| 0.81            |                   | 74.57           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 73.218 | 0               | 0              | 0.0            |               |
| 0.79            |                   | 71.86           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 70.523 | 0               | 0              | 0.0            |               |
| 0.77            |                   | 69.18           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 67.862 | 0               | 0              | 0.0            |               |
| 0.75            |                   | 66.54           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 65.236 | 0               | 0              | 0.0            |               |
| 0.73            |                   | 63.93           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 62.644 | 0               | 0              | 0.0            |               |
| 0.71            |                   | 61.36           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 60.088 | 0               | 0              | 0.0            |               |
| 0.69            |                   | 58.82           |        |                 |                |                | 0.0           |
|                 | 0.02              |                 | 57.567 | 0               | 0              | 0.0            |               |
| 0.67            |                   | 56.32           |        |                 |                |                | 0.0           |







Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 10  
    *Junctions* ..... 6  
    *Outfalls* ..... 2  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin<br>ID          | Area   | Peak Rate | Weighted | Total    | Total  | Total   | Peak    | Time of         |
|----------------------------|--------|-----------|----------|----------|--------|---------|---------|-----------------|
|                            |        | Factor    | Curve    | Rainfall | Runoff | Runoff  | Runoff  | Concentration   |
|                            | (ac)   |           | Number   | (in)     | (in)   | (ac-in) | (cfs)   | (days hh:mm:ss) |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00    | 3.60     | 2.64   | 2008.00 | 1641.14 | 0 00:33:17      |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00    | 3.60     | 1.31   | 10.22   | 6.58    | 0 00:45:00      |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00    | 3.60     | 1.31   | 23.21   | 14.94   | 0 00:45:00      |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00    | 3.60     | 1.37   | 52.04   | 33.74   | 0 00:45:00      |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00    | 3.60     | 1.31   | 128.91  | 137.77  | 0 00:20:00      |

Node Summary

| SN | Element<br>ID        | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|----------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|------------------------------|-------------------------------------------|----------------------------|-----------------------|
|    |                      |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                         | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1  | 12'_DIA_MANHOLE      | Junction        | 886.40              | 895.75                           | 886.40                        | 895.75                 | 0.00           | 105.81         | 889.34                           | 0.00                                  | 6.41                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 2  | Ditch_Start_East     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 6.57           | 899.21                           | 0.00                                  | 4.79                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 3  | Ditch_Start_West     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 14.91          | 899.34                           | 0.00                                  | 4.66                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 4  | HW_36_East           | Junction        | 892.00              | 895.00                           | 892.00                        | 895.00                 | 0.00           | 6.56           | 892.57                           | 0.00                                  | 4.43                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 5  | HW_36_West           | Junction        | 892.00              | 895.00                           | 892.00                        | 899.00                 | 0.00           | 14.90          | 893.00                           | 0.00                                  | 4.00                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 6  | IB_1_OCS             | Junction        | 891.00              | 900.80                           | 891.00                        | 900.80                 | 0.00           | 102.16         | 892.63                           | 0.00                                  | 8.17                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 7  | Analysis_Point_1     | Outfall         | 884.00              |                                  |                               |                        |                | 104.76         | 886.43                           |                                       |                              |                                           |                            |                       |
| 8  | Analysis_Point_2     | Outfall         | 890.65              |                                  |                               |                        |                | 32.23          | 892.09                           |                                       |                              |                                           |                            |                       |
| 9  | Culvert_2_Inlet      | Storage Node    | 892.00              | 900.00                           | 892.00                        |                        | 8168.00        | 33.72          | 893.85                           |                                       |                              |                                           | 0.00                       | 0.00                  |
| 10 | Infiltration_Basin_1 | Storage Node    | 898.50              | 905.50                           | 895.50                        |                        | 1512370.00     | 1751.98        | 901.79                           |                                       |                              |                                           | 0.00                       | 0.00                  |



Link Summary

| SN Element<br>ID   | Element<br>Type | From<br>(Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Elevation | Average<br>Slope | Diameter or<br>Height | Manning's<br>Roughness | Peak<br>Flow | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time Reported<br>Surcharged | Reported<br>Condition |
|--------------------|-----------------|-------------------------|---------------------|--------|------------------------------|-------------------------------|------------------|-----------------------|------------------------|--------------|-------------------------|------------------------------------|-----------------------|--------------------|---------------------------------------------|-----------------------------------|-----------------------|
|                    |                 |                         |                     | (ft)   | (ft)                         | (ft)                          | (%)              | (in)                  |                        | (cfs)        | (cfs)                   |                                    | (ft/sec)              | (ft)               |                                             | (min)                             |                       |
| 1 36_East          | Pipe            | HW_36_East              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 6.50         | 126.55                  | 0.05                               | 8.02                  | 0.52               | 0.17                                        | 0.00                              | Calculated            |
| 2 36_West          | Pipe            | HW_36_West              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 14.75        | 126.55                  | 0.12                               | 9.04                  | 0.84               | 0.28                                        | 0.00                              | Calculated            |
| 3 Culvert_1_CMP_72 | Pipe            | 12'_DIA_MANHOLE         | Analysis_Point_1    | 117.00 | 886.40                       | 884.00                        | 2.0500           | 72.000                | 0.0260                 | 104.76       | 303.28                  | 0.35                               | 8.56                  | 2.69               | 0.45                                        | 0.00                              | Calculated            |
| 4 Culvert_1_RCP_72 | Pipe            | IB_1_OCS                | 12'_DIA_MANHOLE     | 201.00 | 891.00                       | 886.40                        | 2.2900           | 72.000                | 0.0130                 | 103.50       | 640.68                  | 0.16                               | 10.50                 | 2.28               | 0.38                                        | 0.00                              | Calculated            |
| 5 Culvert_2        | Pipe            | Culvert_2_Inlet         | Analysis_Point_2    | 111.00 | 892.25                       | 890.65                        | 1.4400           | 72.000                | 0.0260                 | 32.23        | 254.23                  | 0.13                               | 5.71                  | 1.52               | 0.25                                        | 0.00                              | Calculated            |
| 6 Ditch_East       | Channel         | Ditch_Start_East        | HW_36_East          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 6.56         | 2363.82                 | 0.00                               | 1.25                  | 0.39               | 0.08                                        | 0.00                              |                       |
| 7 Ditch_West       | Channel         | Ditch_Start_West        | HW_36_West          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 14.90        | 2363.82                 | 0.01                               | 1.56                  | 0.67               | 0.13                                        | 0.00                              |                       |
| 8 OCS_Weir         | Orifice         | Infiltration_Basin_1    | IB_1_OCS            |        | 898.50                       | 891.00                        |                  | 120.000               |                        | 102.16       |                         |                                    |                       |                    |                                             |                                   |                       |
| 9 IB_1_Spillway    | Weir            | Infiltration_Basin_1    | Culvert_2_Inlet     |        | 898.50                       | 892.00                        |                  |                       |                        | 0.00         |                         |                                    |                       |                    |                                             |                                   |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 761.76   |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 91       |
| Rain Gage ID          | 24hr10yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 \* ((n \* Lf)^0.8)) / ((P^0.5) \* (Sf^0.4))

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R^(2/3)) \* (Sf^0.5)) / n

R = Aq / Wp

Tc = (Lf / V) / (3600 sec/hr)

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

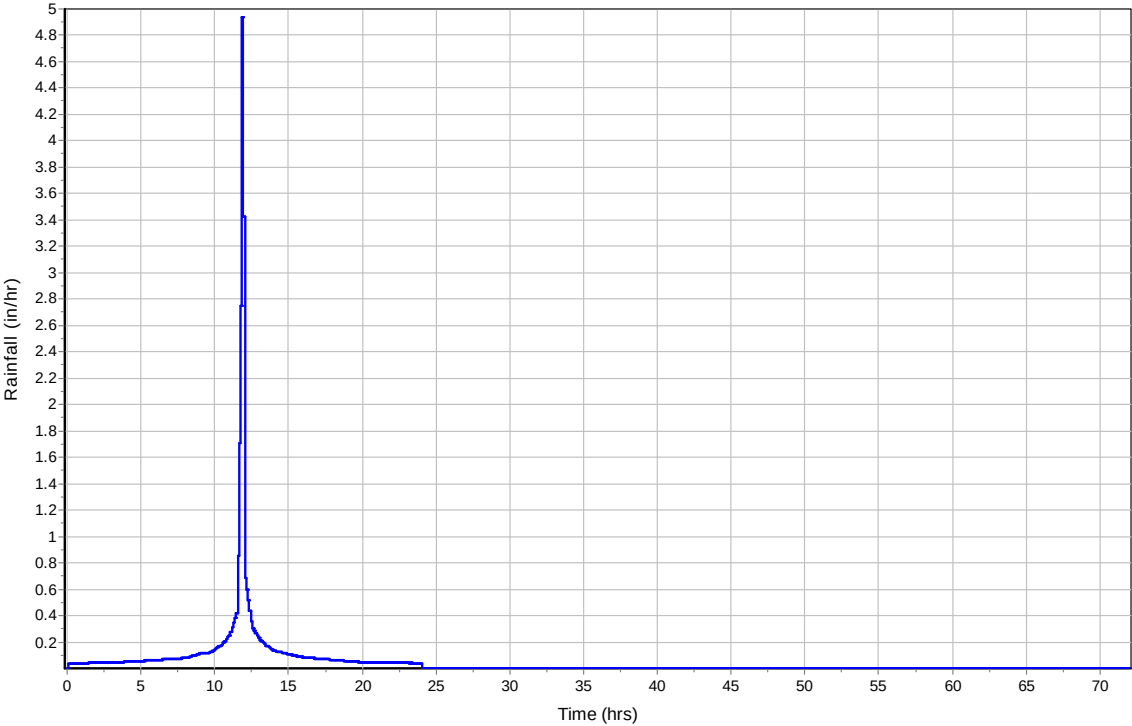
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

### Subbasin Runoff Results

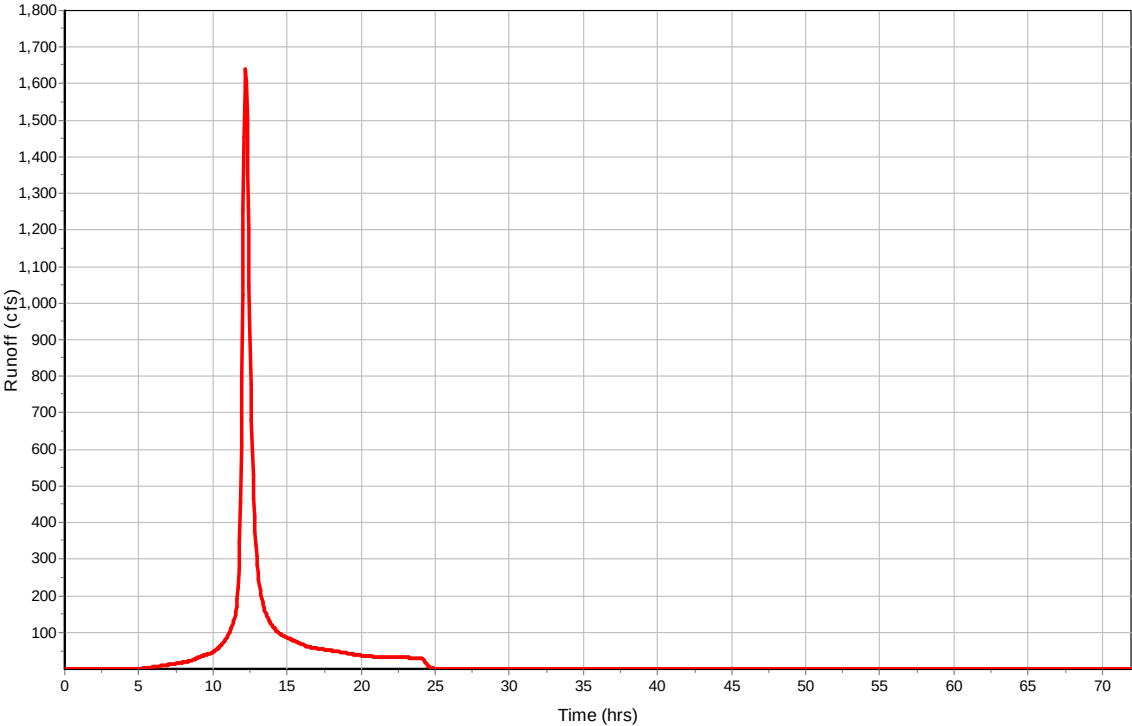
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.6        |
| Total Runoff (in) .....                     | 2.64       |
| Peak Runoff (cfs) .....                     | 1641.14    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr10yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

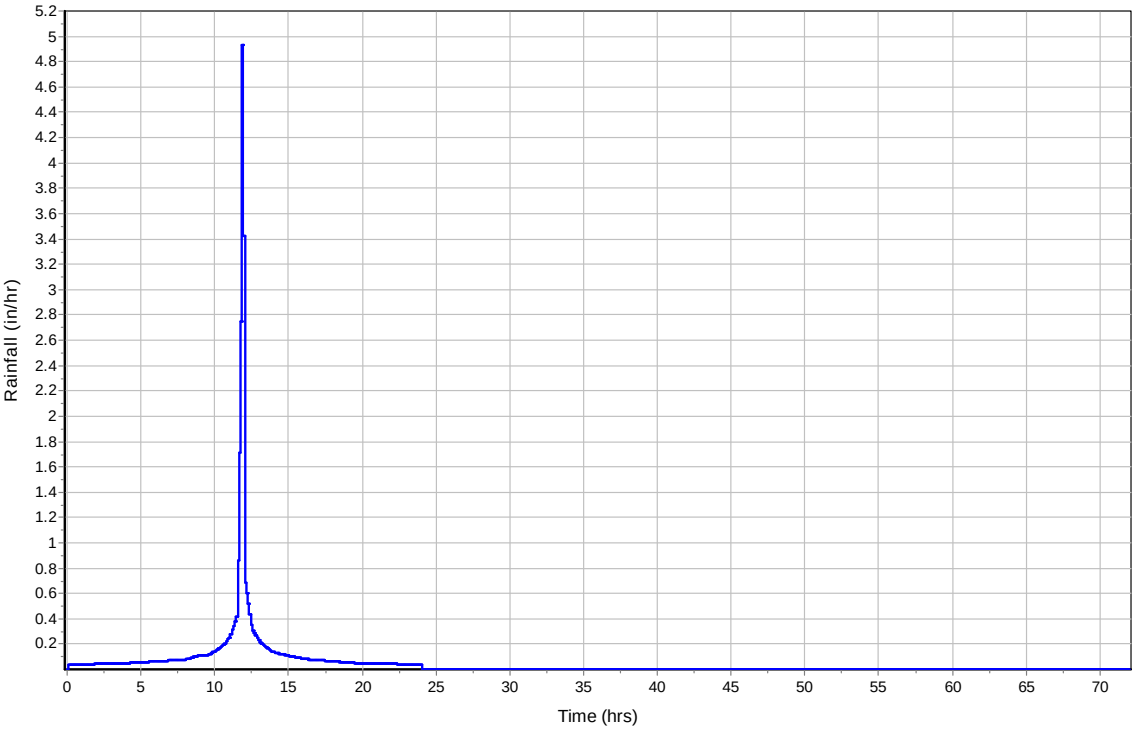
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

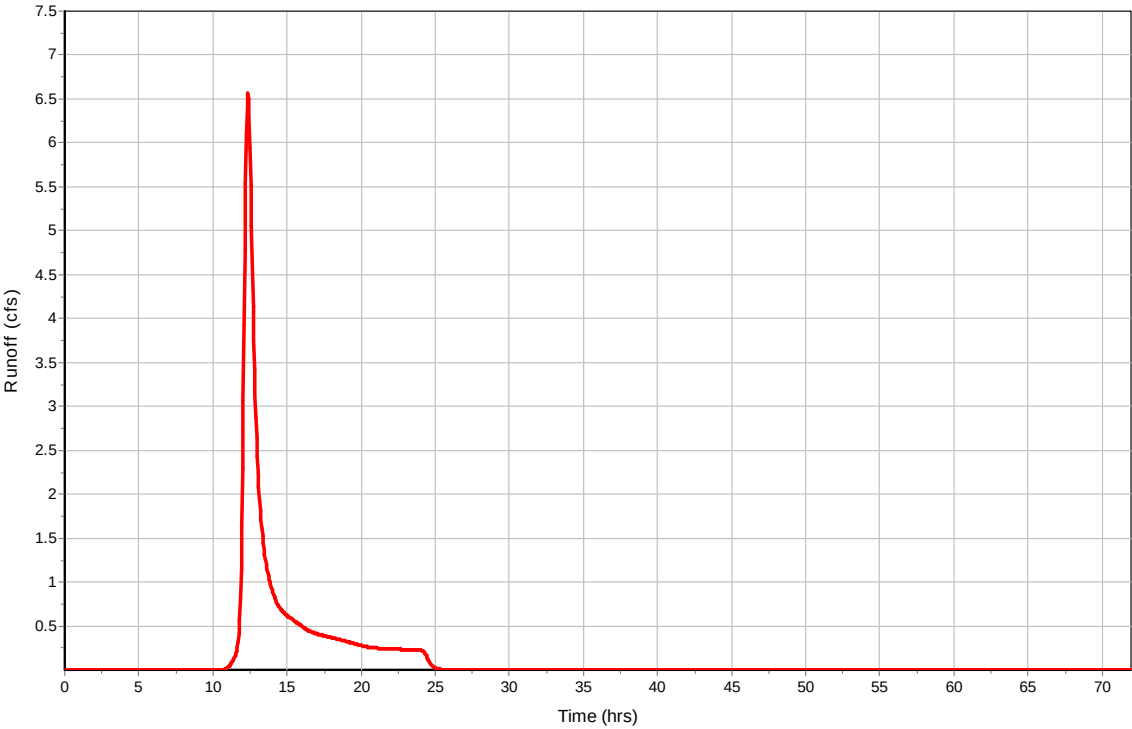
Total Rainfall (in) ..... 3.6  
Total Runoff (in) ..... 1.31  
Peak Runoff (cfs) ..... 6.58  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 17.73    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr10yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

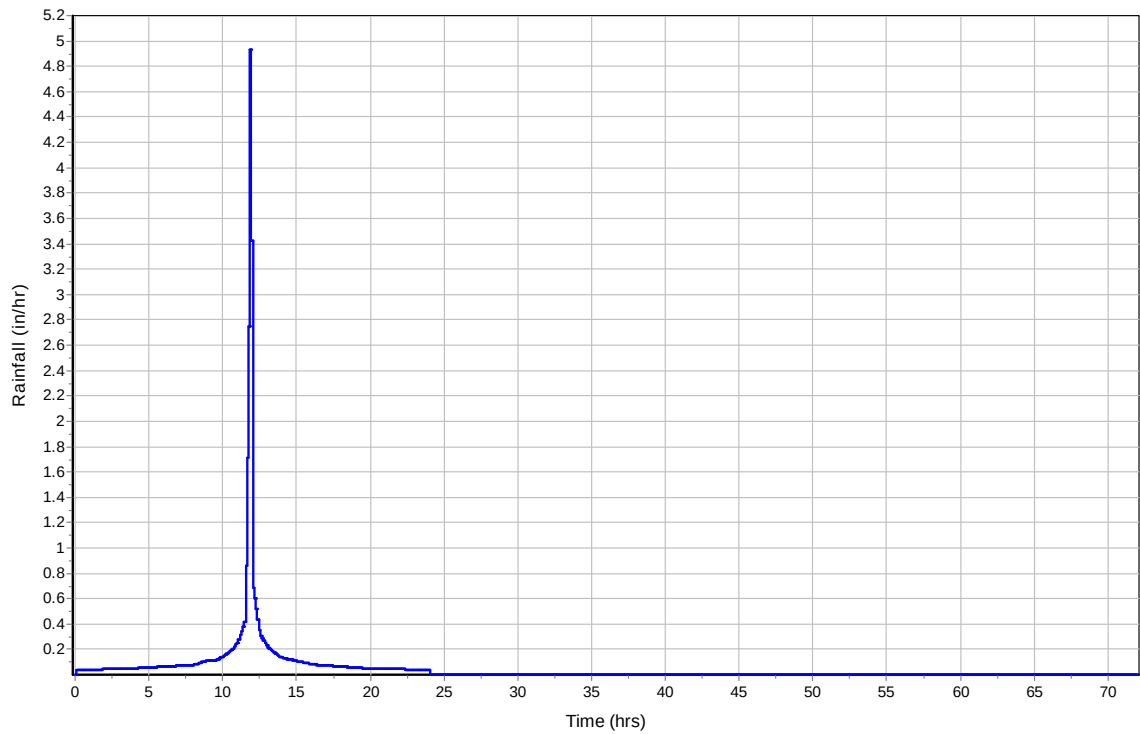
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

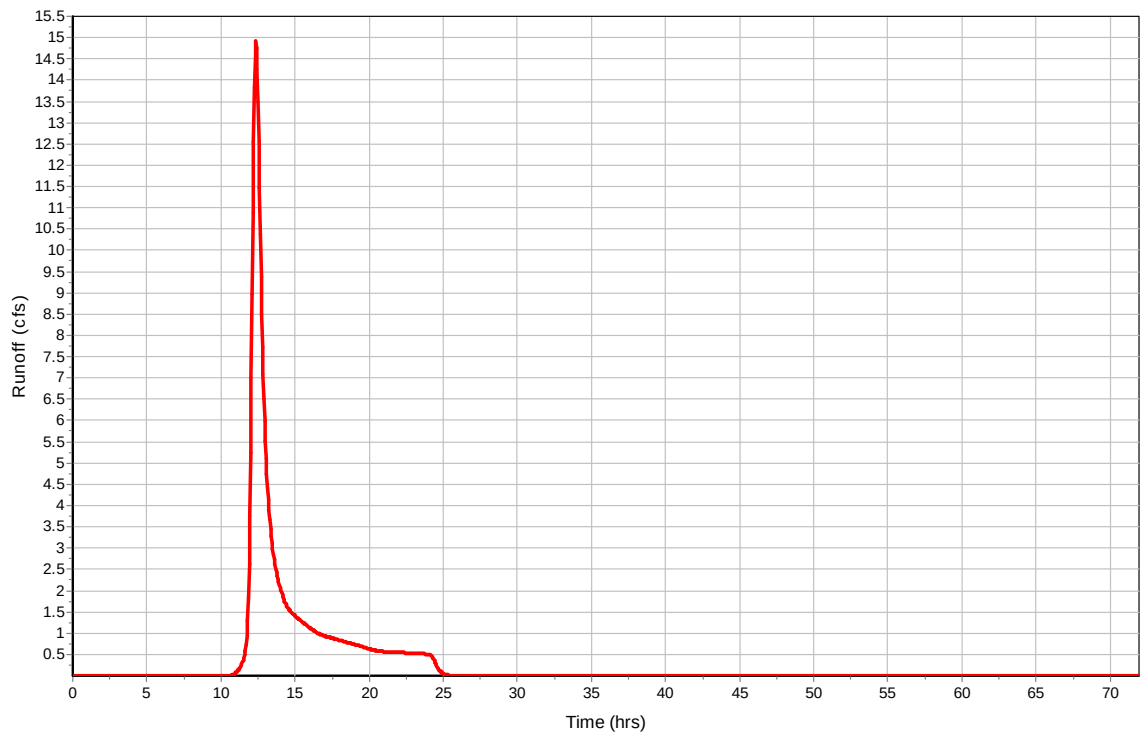
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 3.6        |
| Total Runoff (in)                     | 1.31       |
| Peak Runoff (cfs)                     | 14.94      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph





Subbasin : Drainage\_Area\_2b

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 37.9     |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 75       |
| Rain Gage ID          | 24hr10yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

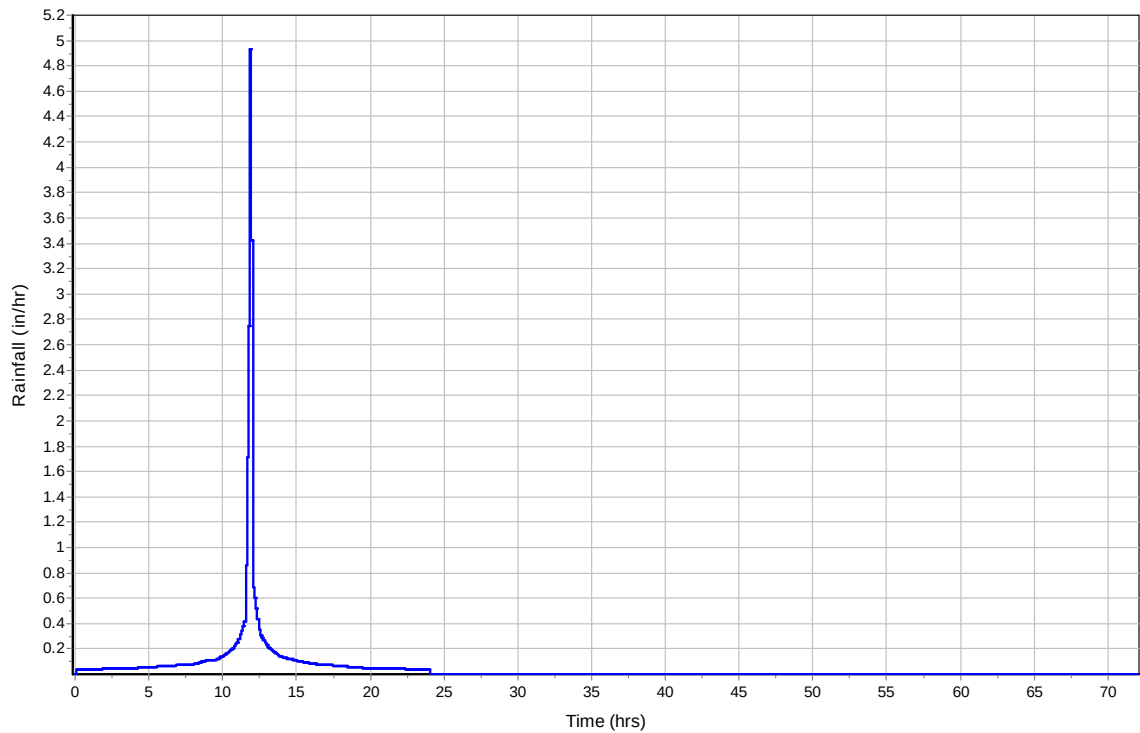
Time of Concentration

User-Defined TOC override (minutes): 45.00

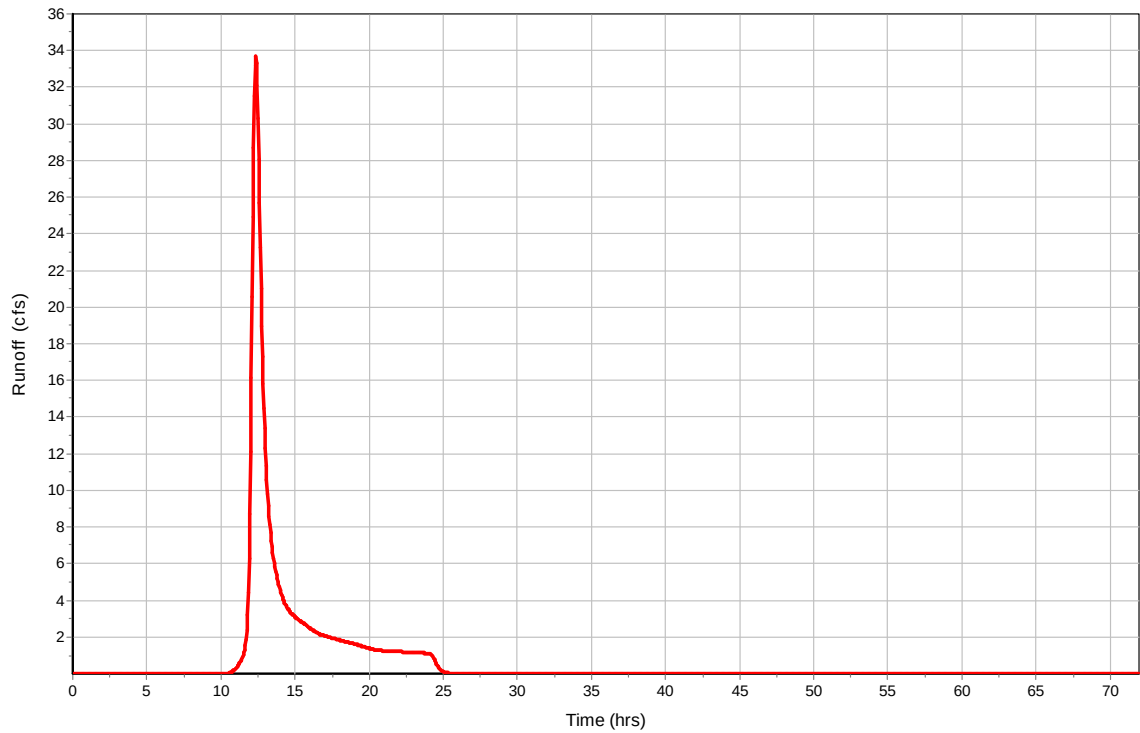
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 3.6        |
| Total Runoff (in)                     | 1.37       |
| Peak Runoff (cfs)                     | 33.74      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 98.48    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr10yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

Time of Concentration

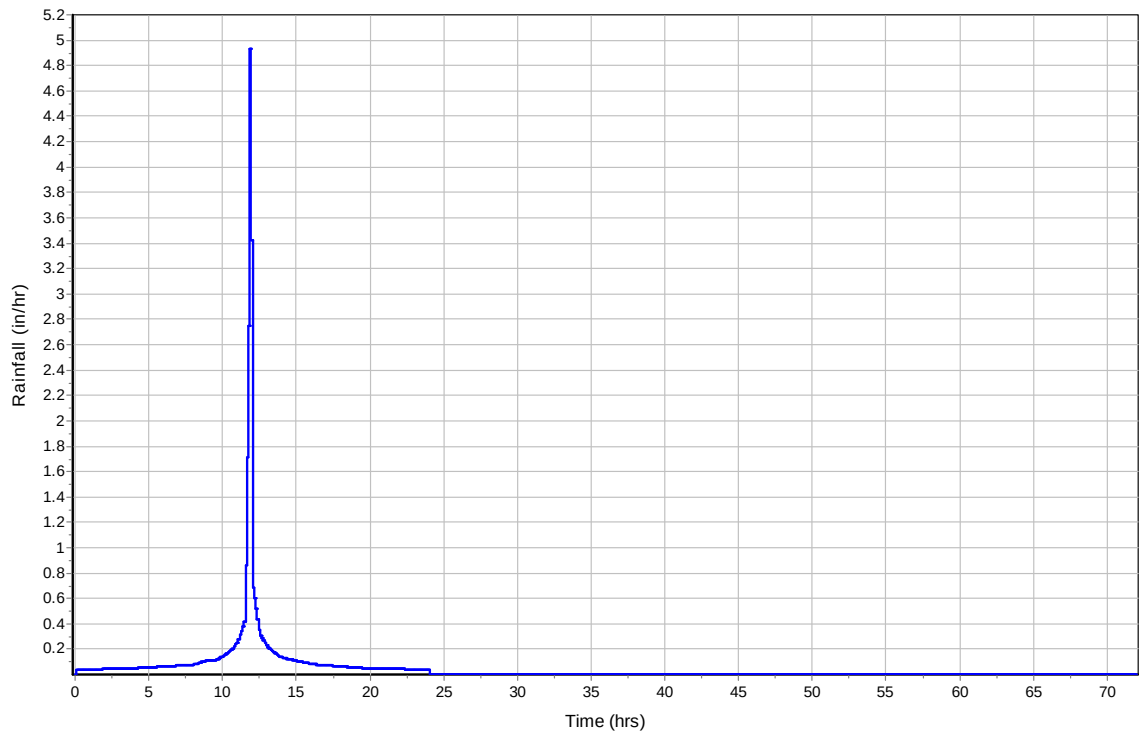
User-Defined TOC override (minutes): 20.00

Subbasin Runoff Results

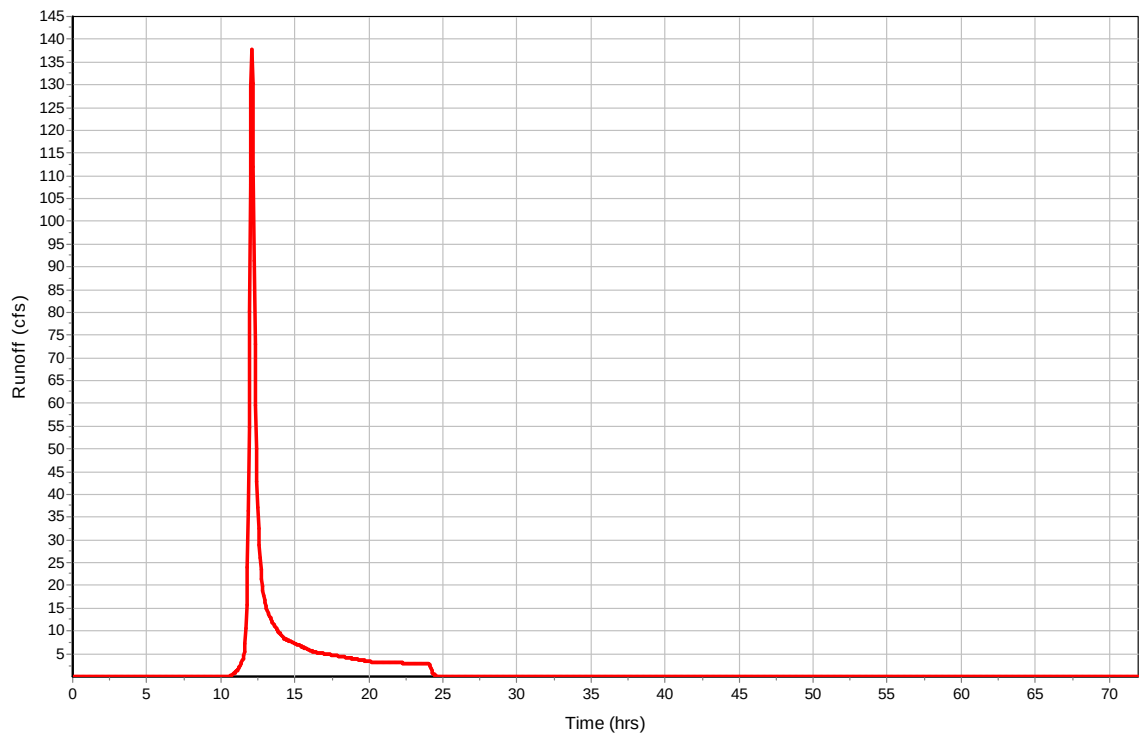
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 3.6        |
| Total Runoff (in)                     | 1.31       |
| Peak Runoff (cfs)                     | 137.77     |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |

Subbasin : Sub\_Infiltration\_Basin\_1

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

| SN | Element<br>ID    | Invert<br>Elevation<br><br>(ft) | Ground/Rim<br>(Max)<br>Elevation<br>(ft) | Ground/Rim<br>(Max)<br>Offset<br>(ft) | Initial<br>Water<br>Elevation<br>(ft) | Initial<br>Water<br>Depth<br>(ft) | Surcharge<br>Elevation<br>(ft) | Surcharge<br>Depth<br>(ft) | Ponded<br>Area<br>(ft²) | Minimum<br>Pipe<br>Cover<br>(in) |
|----|------------------|---------------------------------|------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------|--------------------------------|----------------------------|-------------------------|----------------------------------|
| 1  | 12" DIA MANHOLE  | 886.40                          | 895.75                                   | 9.35                                  | 886.40                                | 0.00                              | 895.75                         | 0.00                       | 0.00                    | 0.00                             |
| 2  | Ditch_Start_East | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 3  | Ditch_Start_West | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 4  | HW_36_East       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 895.00                         | 0.00                       | 0.00                    | 0.00                             |
| 5  | HW_36_West       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 899.00                         | 4.00                       | 0.00                    | 0.00                             |
| 6  | IB_1_OCS         | 891.00                          | 900.80                                   | 9.80                                  | 891.00                                | 0.00                              | 900.80                         | 0.00                       | 0.00                    | 0.00                             |

Junction Results

| SN Element<br>ID   | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|--------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|                    | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1 12" DIA MANHOLE  | 105.81         | 0.00                      | 889.34                           | 2.94                         | 0.00                                  | 6.41                         | 887.11                               | 0.71                             | 0 14:39                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 2 Ditch_Start_East | 6.57           | 6.57                      | 899.21                           | 0.21                         | 0.00                                  | 4.79                         | 899.01                               | 0.01                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3 Ditch_Start_West | 14.91          | 14.91                     | 899.34                           | 0.34                         | 0.00                                  | 4.66                         | 899.02                               | 0.02                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4 HW_36_East       | 6.56           | 0.00                      | 892.57                           | 0.57                         | 0.00                                  | 4.43                         | 892.03                               | 0.03                             | 0 12:27                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5 HW_36_West       | 14.90          | 0.00                      | 893.00                           | 1.00                         | 0.00                                  | 4.00                         | 892.05                               | 0.05                             | 0 12:27                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6 IB_1_OCS         | 102.16         | 0.00                      | 892.63                           | 1.63                         | 0.00                                  | 8.17                         | 891.43                               | 0.43                             | 0 14:39                          | 0 00:00                                   | 0.00                       | 0.00                  |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

Channel Results

| SN | Element<br>ID | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude<br>Number | Reported<br>Condition |
|----|---------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|------------------|-----------------------|
|    |               | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |                  |                       |
| 1  | Ditch_East    | 6.56         | 0 12:25                            | 2363.82                 | 0.00                               | 1.25                  | 4.00           | 0.39               | 0.08                                        | 0.00                     |                  |                       |
| 2  | Ditch_West    | 14.90        | 0 12:24                            | 2363.82                 | 0.01                               | 1.56                  | 3.21           | 0.67               | 0.13                                        | 0.00                     |                  |                       |



Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|---------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |               |                       |
| 1 36_East          | 6.50         | 0 12:27                            | 126.55                  | 0.05                               | 8.02                  | 0.11           | 0.52               | 0.17                                        | 0.00                     |               | Calculated            |
| 2 36_West          | 14.75        | 0 12:27                            | 126.55                  | 0.12                               | 9.04                  | 0.10           | 0.84               | 0.28                                        | 0.00                     |               | Calculated            |
| 3 Culvert_1_CMP_72 | 104.76       | 0 14:39                            | 303.28                  | 0.35                               | 8.56                  | 0.23           | 2.69               | 0.45                                        | 0.00                     |               | Calculated            |
| 4 Culvert_1_RCP_72 | 103.50       | 0 14:38                            | 640.68                  | 0.16                               | 10.50                 | 0.32           | 2.28               | 0.38                                        | 0.00                     |               | Calculated            |
| 5 Culvert_2        | 32.23        | 0 12:30                            | 254.23                  | 0.13                               | 5.71                  | 0.32           | 1.52               | 0.25                                        | 0.00                     |               | Calculated            |

Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

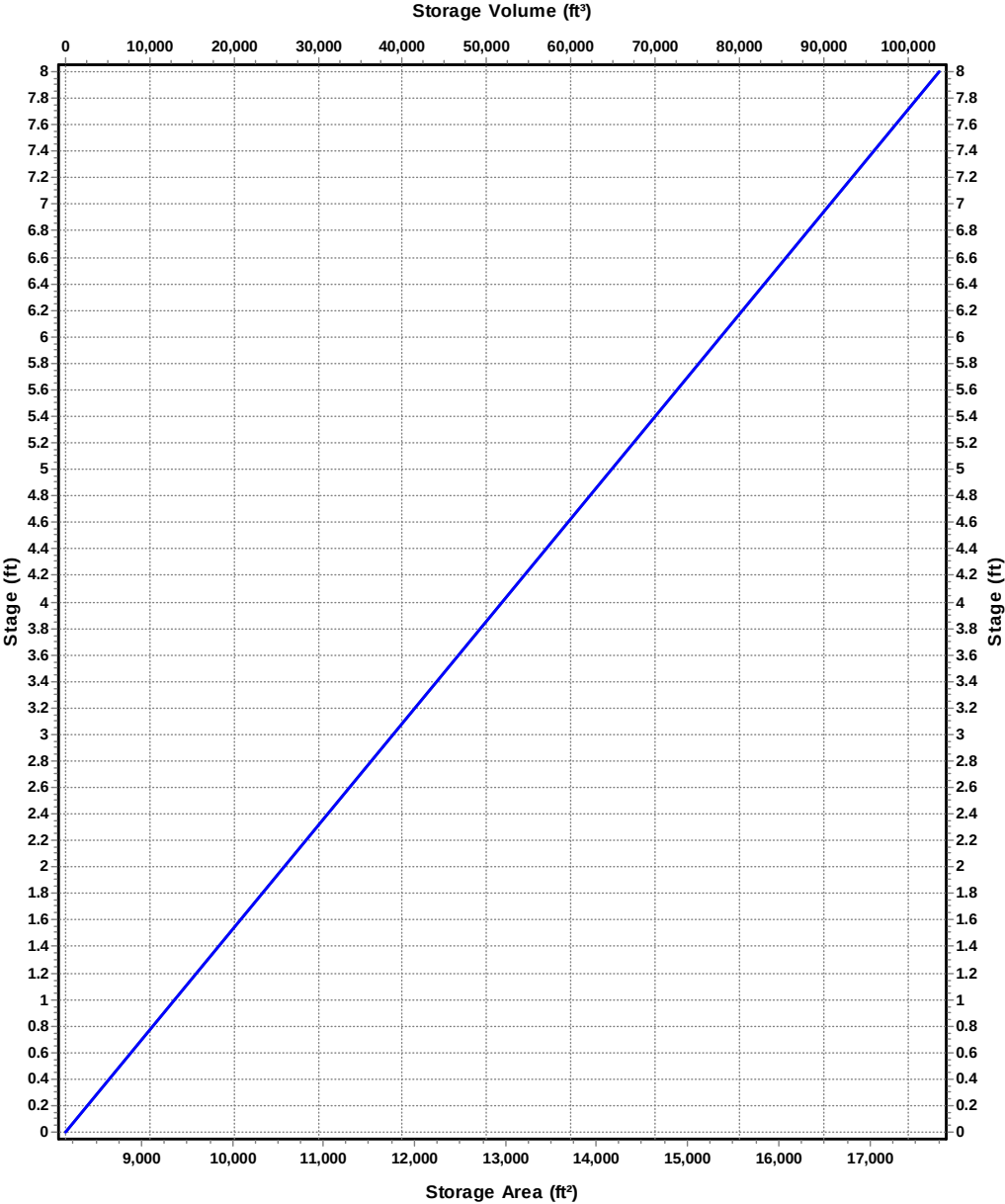
|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage | Storage |
|-------|---------|---------|
| (ft)  | Area    | Volume  |
|       | (ft²)   | (ft³)   |
| 0     | 8168    | 0       |
| 8     | 17763   | 103724  |

Storage Area Volume Curves



Storage Area      Storage Volume

## Storage Node : Culvert\_2\_Inlet (continued)

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 33.72   |
| Peak Lateral Inflow (cfs) .....               | 33.72   |
| Peak Outflow (cfs) .....                      | 32.23   |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 893.85  |
| Max HGL Depth Attained (ft) .....             | 1.85    |
| Average HGL Elevation Attained (ft) .....     | 892.31  |
| Average HGL Depth Attained (ft) .....         | 0.31    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:29 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

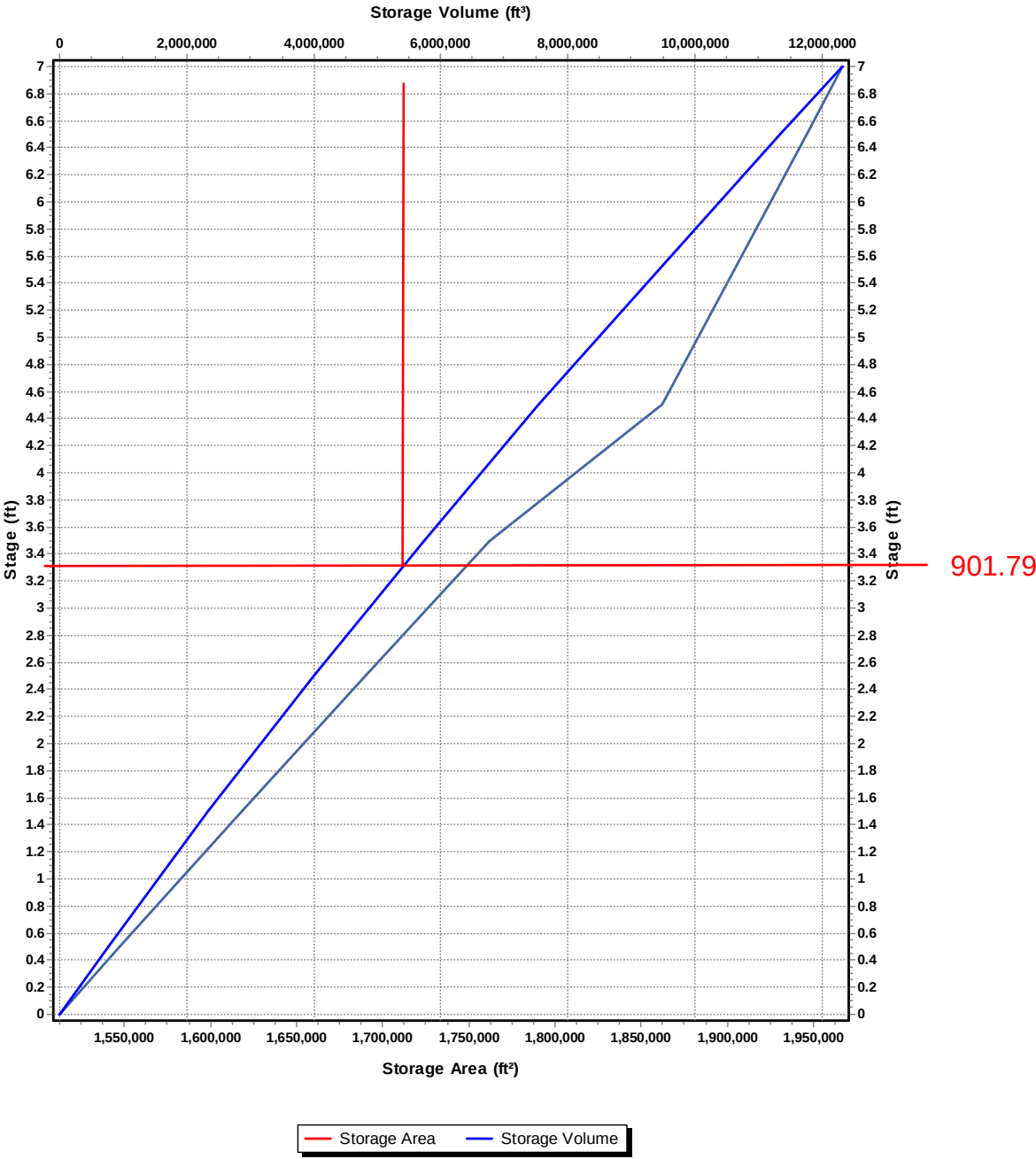
|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 895.50     |
| Initial Water Depth (ft)     | -3.00      |
| Ponded Area (ft²)            | 1512370.00 |
| Evaporation Loss             | 0.00       |

Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |

Storage Area Volume Curves





## Storage Node : Infiltration\_Basin\_1 (continued)

### Outflow Weirs

| SN Element<br>ID | Weir<br>Type | Flap<br>Gate | Crest<br>Elevation<br>(ft) | Crest<br>Offset<br>(ft) | Length<br>(ft) | Weir Total<br>Height<br>(ft) | Discharge<br>Coefficient |
|------------------|--------------|--------------|----------------------------|-------------------------|----------------|------------------------------|--------------------------|
| 1 IB_1_Spillway  | Trapezoidal  | No           | 904.00                     | 5.50                    | 350.00         | 1.50                         | 3.40                     |

### Outflow Orifices

| SN Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|------------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1 OCS_Weir       | Bottom          | CIRCULAR         | No           | 120.00                                  |                                          |                                         | 900.80                                 | 0.61                   |

### Output Summary Results

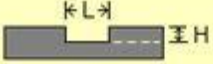
|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 1751.98 |
| Peak Lateral Inflow (cfs) .....               | 1751.98 |
| Peak Outflow (cfs) .....                      | 102.16  |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 901.79  |
| Max HGL Depth Attained (ft) .....             | 3.29    |
| Average HGL Elevation Attained (ft) .....     | 900.63  |
| Average HGL Depth Attained (ft) .....         | 2.13    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 14:37 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Top of Riser Elevation = 900.80'  
 25-year storm elevation = 902.34'  
 H = 1.54'  
 Q ~ 195 cfs

Thin Blue Numbers = Input data  
 Bold Red Numbers = Answers

### Weir Notch Bleed Down Calculations

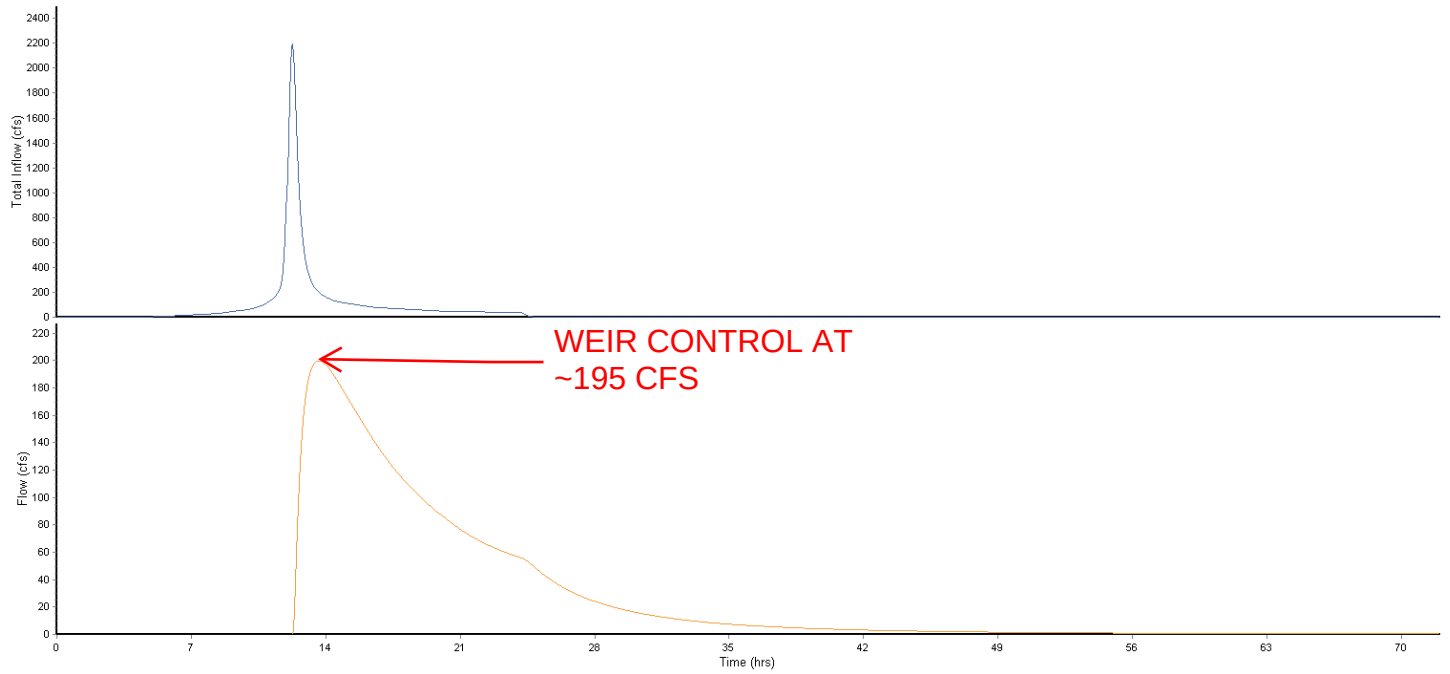
Pond Surface Area at SHW = 0 Sq. Ft.  
 Pond Surface Area at NWL = 0 Sq. Ft.  
 Notch Height (H) = 1.54 Feet  
 Notch Width (L) = 31.40 Feet  
 C = 3.25 Coefficient of discharge  
 1/2 Volume Time = 0.00 Hours  
 Total Time = 0.00 Hours

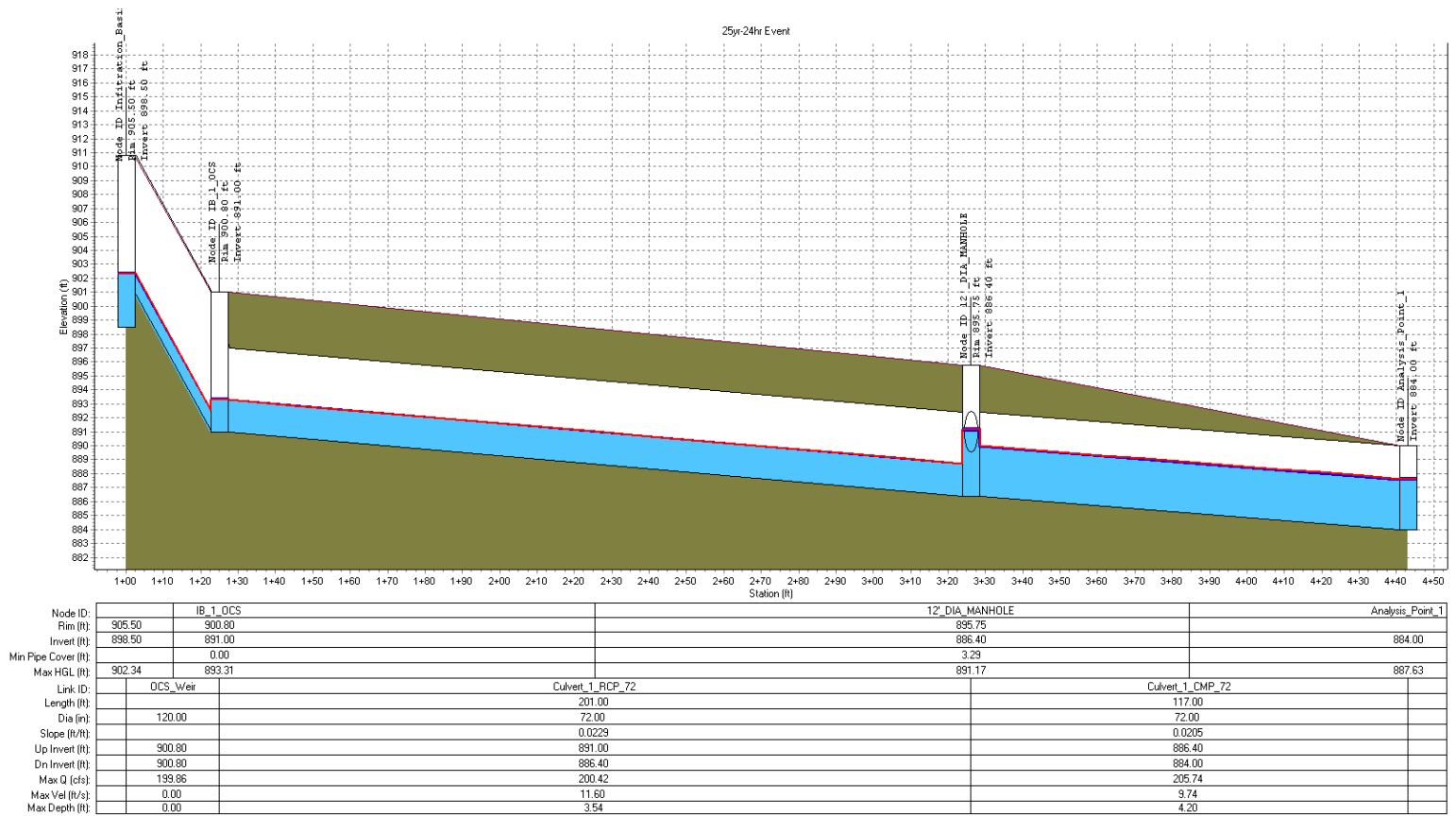
  
 Horizontal Broad Crested W  
 $Q = C L H^{3/2}$

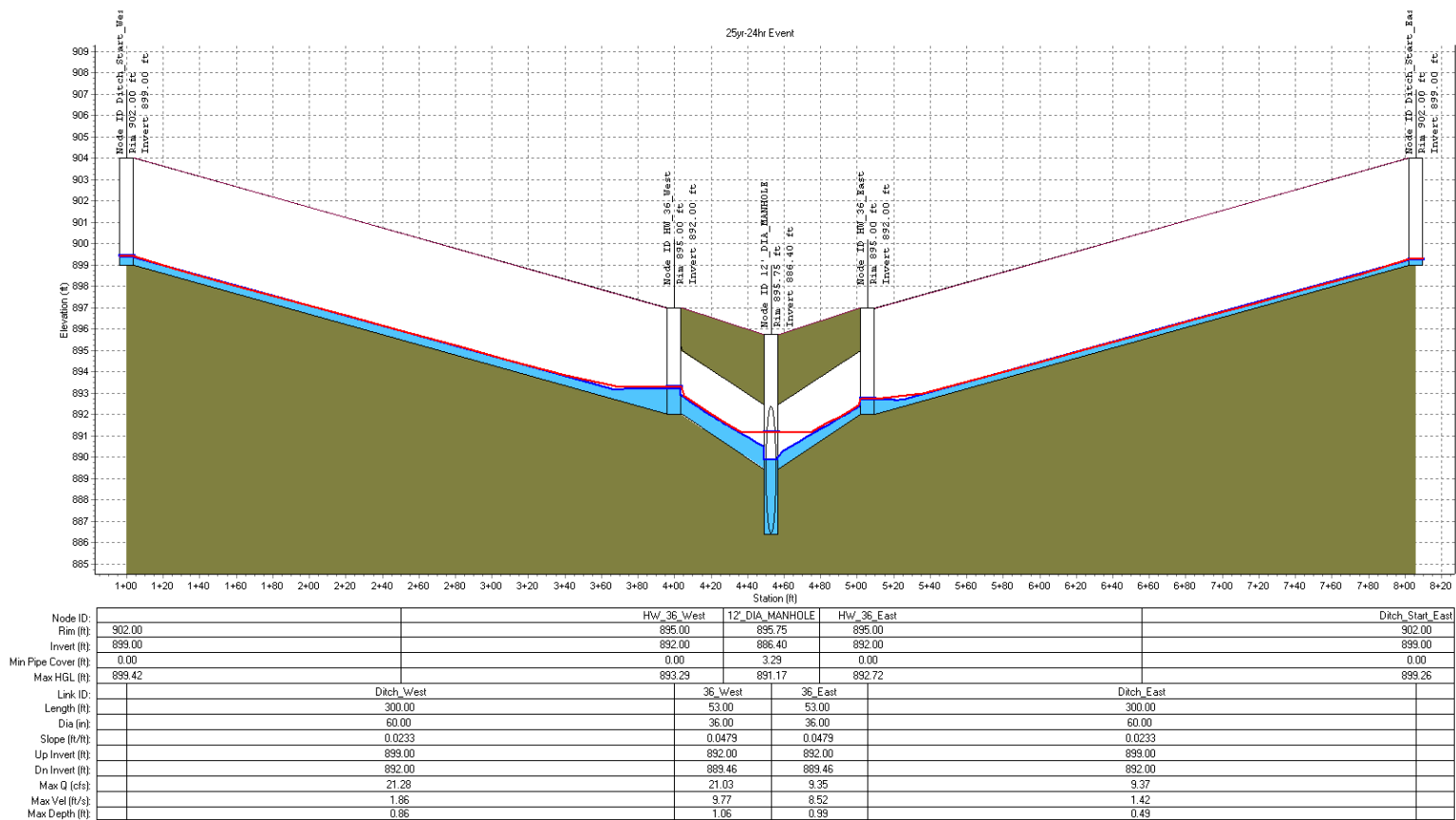
| Total<br>H (Ft) | Increm.<br>H (Ft) | Flow<br>Q (cfs) | Q Avg.  | Delta<br>Volume | Cum.<br>Volume | Delta<br>Hours | Cum.<br>Hours |
|-----------------|-------------------|-----------------|---------|-----------------|----------------|----------------|---------------|
| 1.54            |                   | 194.85          |         |                 |                |                |               |
|                 | 0.03              |                 | 191.939 | 0               | 0              | 0.0            |               |
| 1.51            |                   | 189.03          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 186.152 | 0               | 0              | 0.0            |               |
| 1.48            |                   | 183.27          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 180.425 | 0               | 0              | 0.0            |               |
| 1.45            |                   | 177.58          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 174.758 | 0               | 0              | 0.0            |               |
| 1.42            |                   | 171.94          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 169.151 | 0               | 0              | 0.0            |               |
| 1.39            |                   | 166.36          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 163.606 | 0               | 0              | 0.0            |               |
| 1.36            |                   | 160.85          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 158.122 | 0               | 0              | 0.0            |               |
| 1.32            |                   | 155.40          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 152.702 | 0               | 0              | 0.0            |               |
| 1.29            |                   | 150.01          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 147.344 | 0               | 0              | 0.0            |               |
| 1.26            |                   | 144.68          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 142.051 | 0               | 0              | 0.0            |               |
| 1.23            |                   | 139.42          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 136.823 | 0               | 0              | 0.0            |               |
| 1.20            |                   | 134.23          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 131.661 | 0               | 0              | 0.0            |               |
| 1.17            |                   | 129.10          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 126.565 | 0               | 0              | 0.0            |               |
| 1.14            |                   | 124.03          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 121.537 | 0               | 0              | 0.0            |               |
| 1.11            |                   | 119.04          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 116.577 | 0               | 0              | 0.0            |               |
| 1.08            |                   | 114.11          |         |                 |                |                | 0.0           |
|                 | 0.03              |                 | 111.687 | 0               | 0              | 0.0            |               |
| 1.05            |                   | 109.26          |         |                 |                |                | 0.0           |

25yr-24hr Event - Pond Volume vs Weir Discharge

— Total Inflow: Node - Infiltration\_Basin\_1 (Single Pipe\_09-21-2023 2023-10-18 07:59:50)  
— Flow: Link - OCS\_Weir (Single Pipe\_09-21-2023 2023-10-18 07:59:50)







Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 10  
    *Junctions* ..... 6  
    *Outfalls* ..... 2  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin<br>ID          | Area   | Peak Rate | Weighted | Total    | Total  | Total   | Peak    | Time of         |
|----------------------------|--------|-----------|----------|----------|--------|---------|---------|-----------------|
|                            |        | Factor    | Curve    | Rainfall | Runoff | Runoff  | Runoff  | Concentration   |
|                            | (ac)   |           | Number   | (in)     | (in)   | (ac-in) | (cfs)   | (days hh:mm:ss) |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00    | 4.30     | 3.31   | 2517.62 | 2044.29 | 0 00:33:17      |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00    | 4.30     | 1.82   | 14.21   | 9.39    | 0 00:45:00      |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00    | 4.30     | 1.82   | 32.27   | 21.31   | 0 00:45:00      |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00    | 4.30     | 1.90   | 71.82   | 47.73   | 0 00:45:00      |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00    | 4.30     | 1.82   | 179.23  | 195.26  | 0 00:20:00      |

Node Summary

| SN | Element ID           | Element Type | Invert Elevation | Ground/Rim (Max) Elevation | Initial Water Elevation | Surcharge Elevation | Ponded Area | Peak Inflow | Max HGL Elevation Attained | Max Surcharge Depth Attained | Min Freeboard Attained | Time of Peak Flooding Occurrence | Total Flooded Volume | Total Time Flooded |
|----|----------------------|--------------|------------------|----------------------------|-------------------------|---------------------|-------------|-------------|----------------------------|------------------------------|------------------------|----------------------------------|----------------------|--------------------|
|    |                      |              | (ft)             | (ft)                       | (ft)                    | (ft)                | (ft²)       | (cfs)       | (ft)                       | (ft)                         | (ft)                   | (days hh:mm)                     | (ac-in)              | (min)              |
| 1  | 12'_DIA_MANHOLE      | Junction     | 886.40           | 895.75                     | 886.40                  | 895.75              | 0.00        | 206.38      | 891.17                     | 0.00                         | 4.58                   | 0 00:00                          | 0.00                 | 0.00               |
| 2  | Ditch_Start_East     | Junction     | 899.00           | 902.00                     | 899.00                  | 902.00              | 0.00        | 9.38        | 899.26                     | 0.00                         | 4.74                   | 0 00:00                          | 0.00                 | 0.00               |
| 3  | Ditch_Start_West     | Junction     | 899.00           | 902.00                     | 899.00                  | 902.00              | 0.00        | 21.30       | 899.42                     | 0.00                         | 4.58                   | 0 00:00                          | 0.00                 | 0.00               |
| 4  | HW_36_East           | Junction     | 892.00           | 895.00                     | 892.00                  | 895.00              | 0.00        | 9.37        | 892.72                     | 0.00                         | 4.28                   | 0 00:00                          | 0.00                 | 0.00               |
| 5  | HW_36_West           | Junction     | 892.00           | 895.00                     | 892.00                  | 899.00              | 0.00        | 21.28       | 893.29                     | 0.00                         | 3.71                   | 0 00:00                          | 0.00                 | 0.00               |
| 6  | IB_1_OCS             | Junction     | 891.00           | 900.80                     | 891.00                  | 900.80              | 0.00        | 199.86      | 893.31                     | 0.00                         | 7.49                   | 0 00:00                          | 0.00                 | 0.00               |
| 7  | Analysis_Point_1     | Outfall      | 884.00           |                            |                         |                     |             | 205.74      | 887.63                     |                              |                        |                                  |                      |                    |
| 8  | Analysis_Point_2     | Outfall      | 890.65           |                            |                         |                     |             | 45.83       | 892.38                     |                              |                        |                                  |                      |                    |
| 9  | Culvert_2_Inlet      | Storage Node | 892.00           | 900.00                     | 892.00                  |                     | 8168.00     | 47.61       | 894.21                     |                              |                        |                                  | 0.00                 | 0.00               |
| 10 | Infiltration_Basin_1 | Storage Node | 898.50           | 905.50                     | 895.50                  |                     | 1512370.00  | 2197.87     | 902.34                     |                              |                        |                                  | 0.00                 | 0.00               |



Link Summary

| SN Element ID      | Element Type | From (Inlet) Node    | To (Outlet) Node | Length | Inlet Invert Elevation | Outlet Invert Elevation | Average Slope | Diameter or Height | Manning's Roughness | Peak Flow | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Reported Surcharged | Reported Condition |
|--------------------|--------------|----------------------|------------------|--------|------------------------|-------------------------|---------------|--------------------|---------------------|-----------|----------------------|------------------------------|--------------------|-----------------|------------------------------------|--------------------------------|--------------------|
|                    |              |                      |                  | (ft)   | (ft)                   | (ft)                    | (%)           | (in)               |                     | (cfs)     | (cfs)                |                              | (ft/sec)           | (ft)            |                                    | (min)                          |                    |
| 1 36_East          | Pipe         | HW_36_East           | 12'_DIA_MANHOLE  | 53.00  | 892.00                 | 889.46                  | 4.7900        | 36.000             | 0.0150              | 9.35      | 126.55               | 0.07                         | 8.52               | 0.99            | 0.33                               | 0.00                           | Calculated         |
| 2 36_West          | Pipe         | HW_36_West           | 12'_DIA_MANHOLE  | 53.00  | 892.00                 | 889.46                  | 4.7900        | 36.000             | 0.0150              | 21.03     | 126.55               | 0.17                         | 9.77               | 1.06            | 0.35                               | 0.00                           | Calculated         |
| 3 Culvert_1_CMP_72 | Pipe         | 12'_DIA_MANHOLE      | Analysis_Point_1 | 117.00 | 886.40                 | 884.00                  | 2.0500        | 72.000             | 0.0260              | 205.74    | 303.28               | 0.68                         | 9.74               | 4.20            | 0.70                               | 0.00                           | Calculated         |
| 4 Culvert_1_RCP_72 | Pipe         | IB_1_OCS             | 12'_DIA_MANHOLE  | 201.00 | 891.00                 | 886.40                  | 2.2900        | 72.000             | 0.0130              | 200.42    | 640.68               | 0.31                         | 11.60              | 3.54            | 0.59                               | 0.00                           | Calculated         |
| 5 Culvert_2        | Pipe         | Culvert_2_Inlet      | Analysis_Point_2 | 111.00 | 892.25                 | 890.65                  | 1.4400        | 72.000             | 0.0260              | 45.83     | 254.23               | 0.18                         | 6.21               | 1.84            | 0.31                               | 0.00                           | Calculated         |
| 6 Ditch_East       | Channel      | Ditch_Start_East     | HW_36_East       | 300.00 | 899.00                 | 892.00                  | 2.3300        | 60.000             | 0.0320              | 9.37      | 2363.82              | 0.00                         | 1.42               | 0.49            | 0.10                               | 0.00                           |                    |
| 7 Ditch_West       | Channel      | Ditch_Start_West     | HW_36_West       | 300.00 | 899.00                 | 892.00                  | 2.3300        | 60.000             | 0.0320              | 21.28     | 2363.82              | 0.01                         | 1.86               | 0.86            | 0.17                               | 0.00                           |                    |
| 8 OCS_Weir         | Orifice      | Infiltration_Basin_1 | IB_1_OCS         |        | 898.50                 | 891.00                  |               | 120.000            |                     | 199.86    |                      |                              |                    |                 |                                    |                                |                    |
| 9 IB_1_Spillway    | Weir         | Infiltration_Basin_1 | Culvert_2_Inlet  |        | 898.50                 | 892.00                  |               |                    |                     | 0.00      |                      |                              |                    |                 |                                    |                                |                    |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 761.76   |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 91       |
| Rain Gage ID          | 24hr25yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

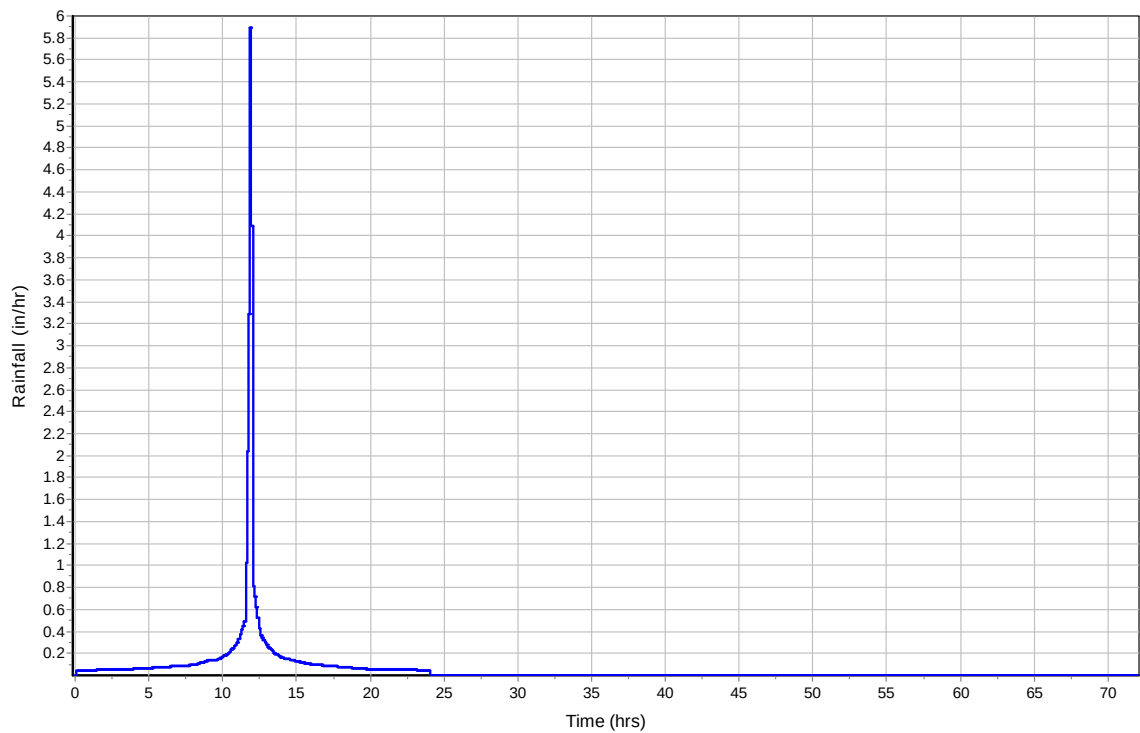
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

### Subbasin Runoff Results

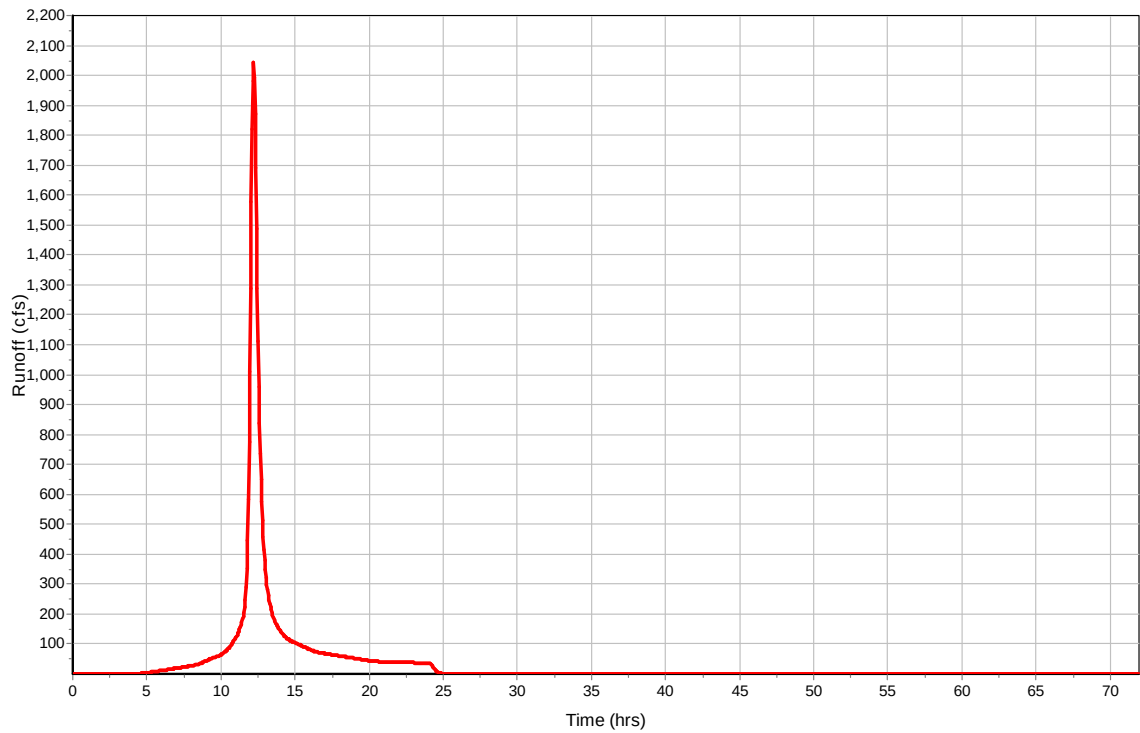
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 4.3        |
| Total Runoff (in) .....                     | 3.31       |
| Peak Runoff (cfs) .....                     | 2044.29    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr25yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

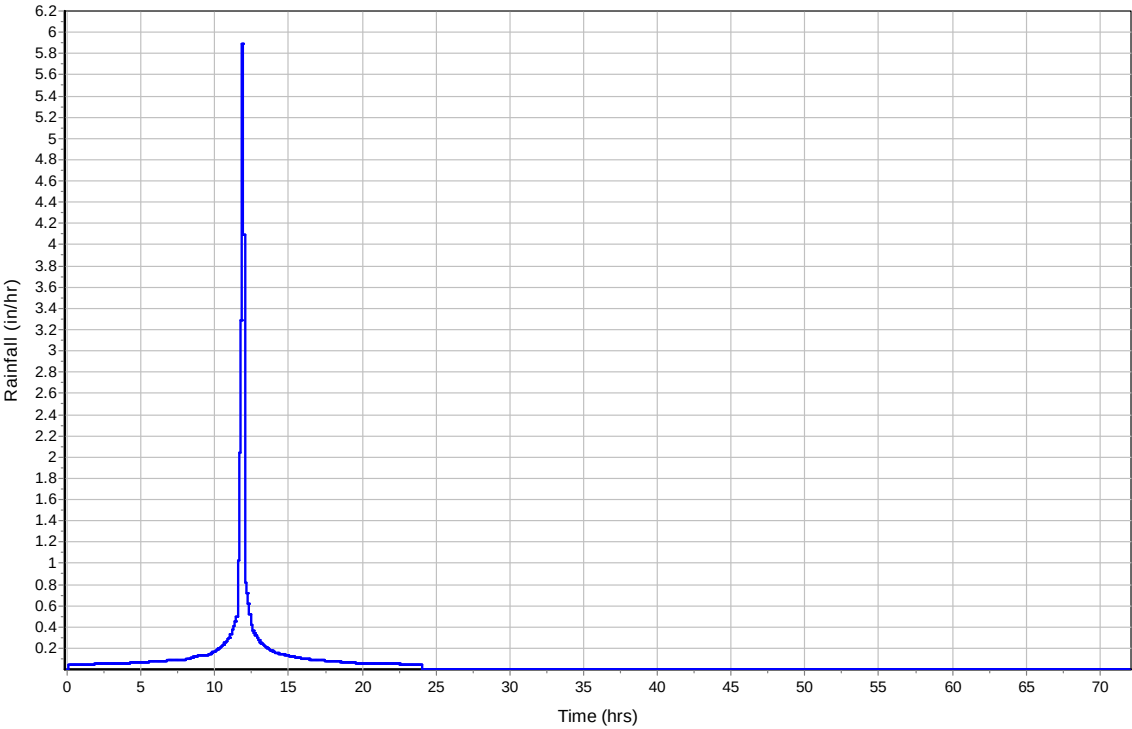
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

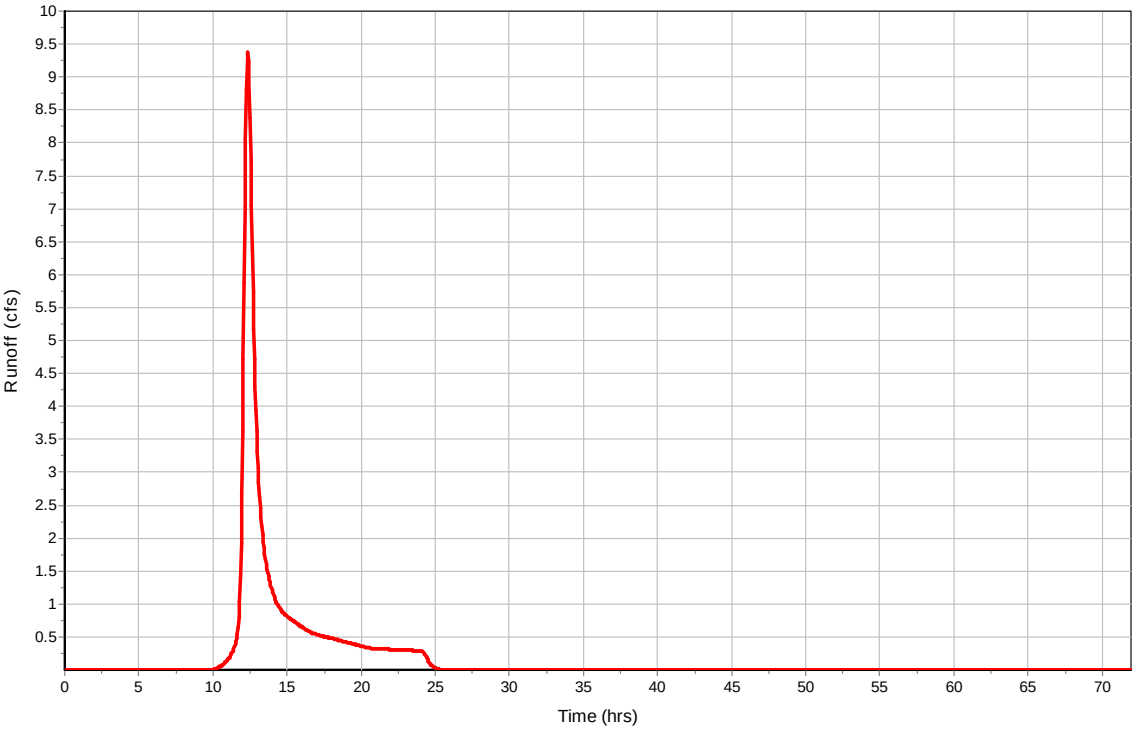
Total Rainfall (in) ..... 4.3  
Total Runoff (in) ..... 1.82  
Peak Runoff (cfs) ..... 9.39  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 17.73    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr25yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

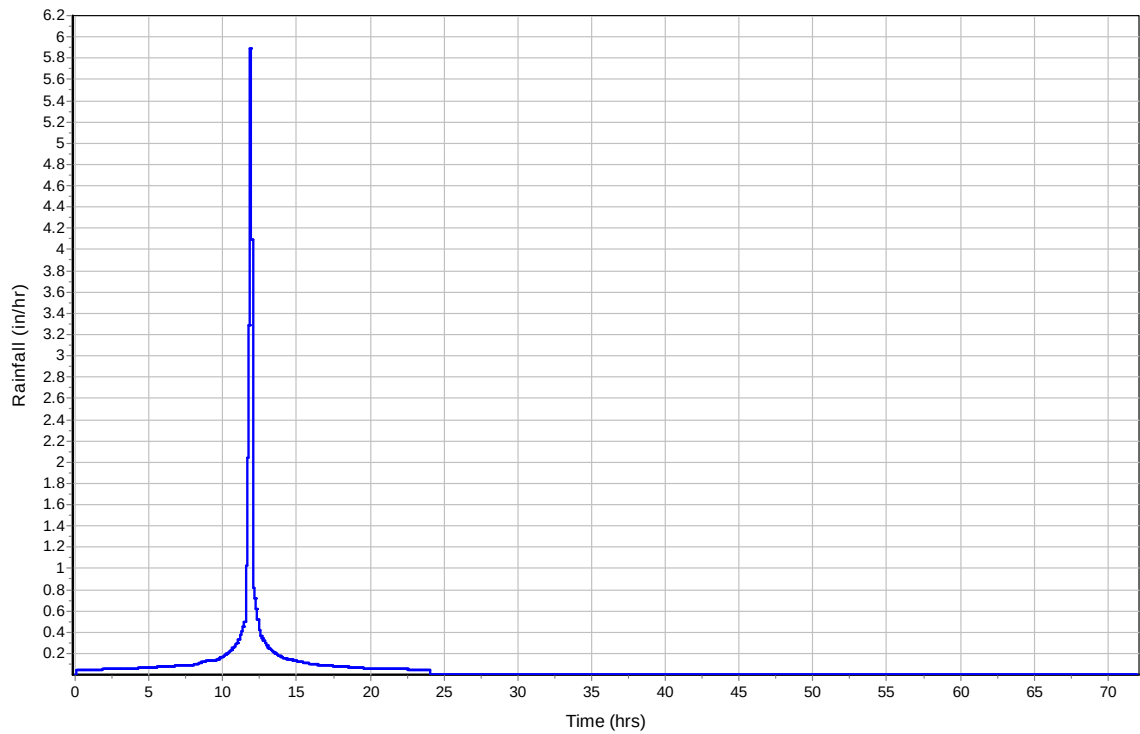
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

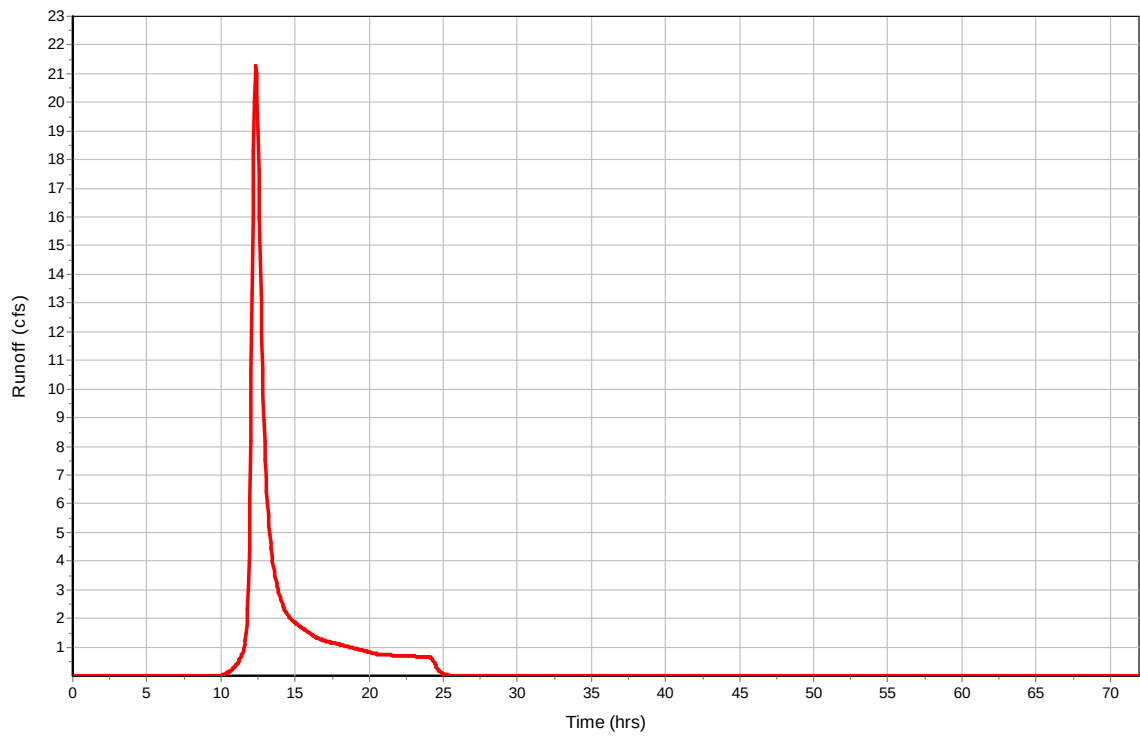
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 4.3        |
| Total Runoff (in)                     | 1.82       |
| Peak Runoff (cfs)                     | 21.31      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph





Subbasin : Drainage\_Area\_2b

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 37.9     |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 75       |
| Rain Gage ID          | 24hr25yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

Time of Concentration

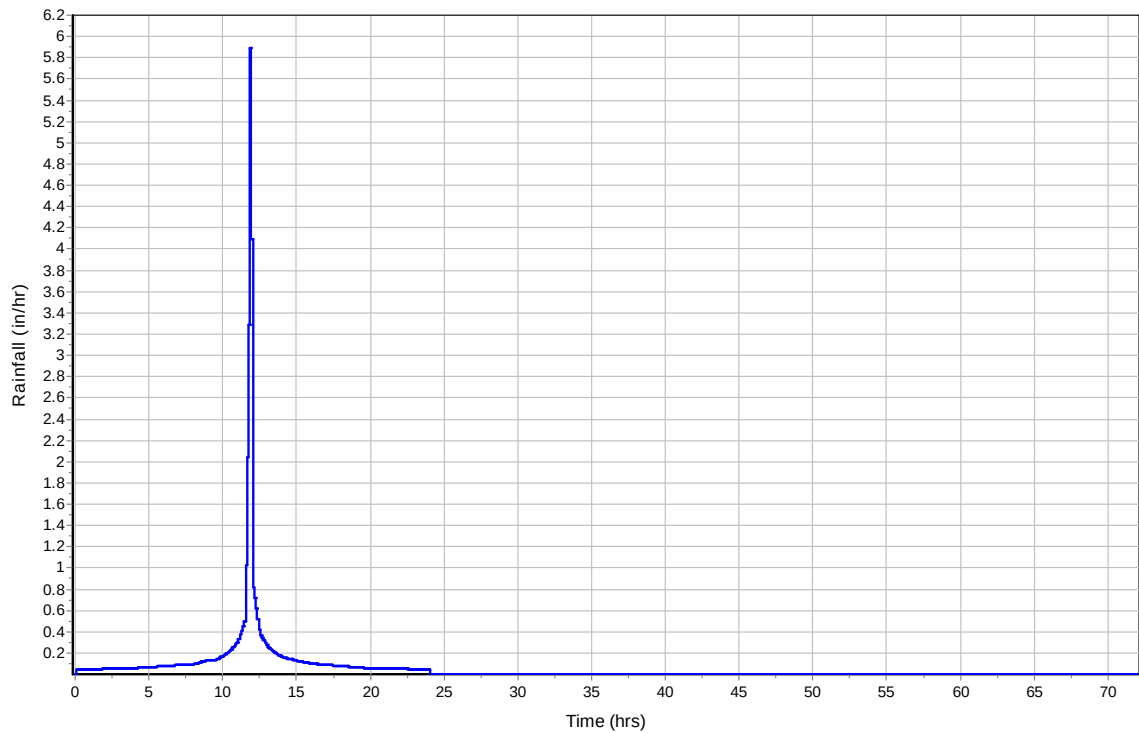
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

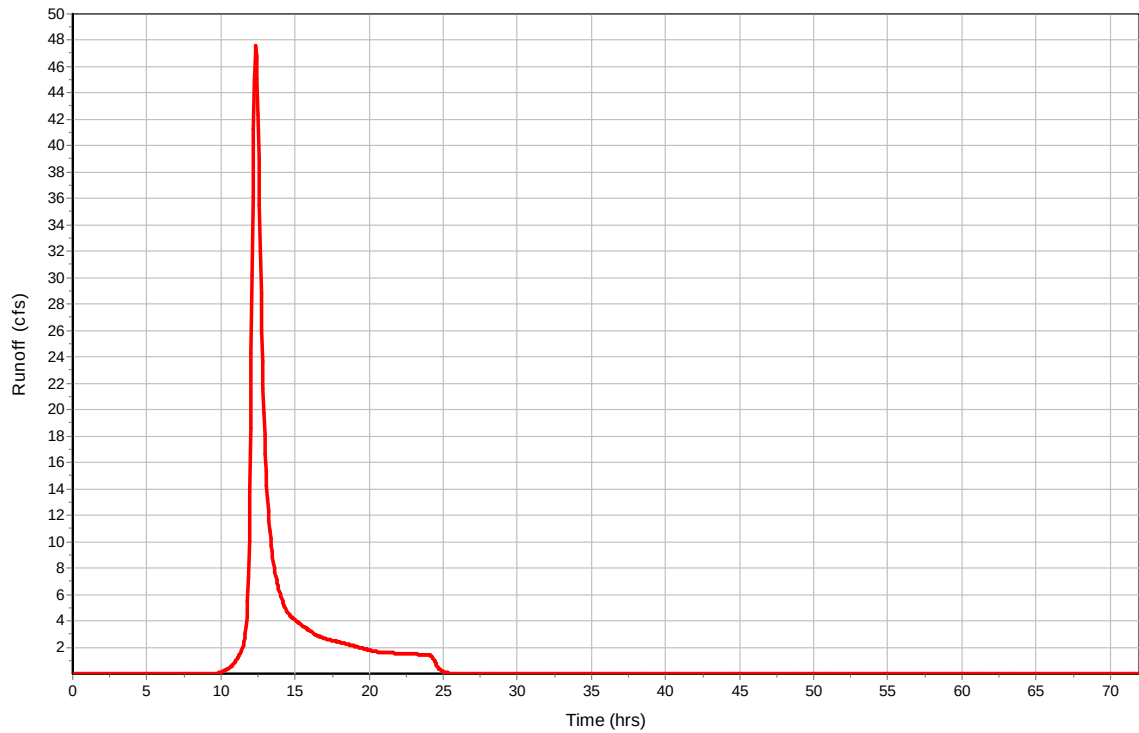
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 4.3        |
| Total Runoff (in)                     | 1.9        |
| Peak Runoff (cfs)                     | 47.73      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_2b

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 98.48    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr25yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

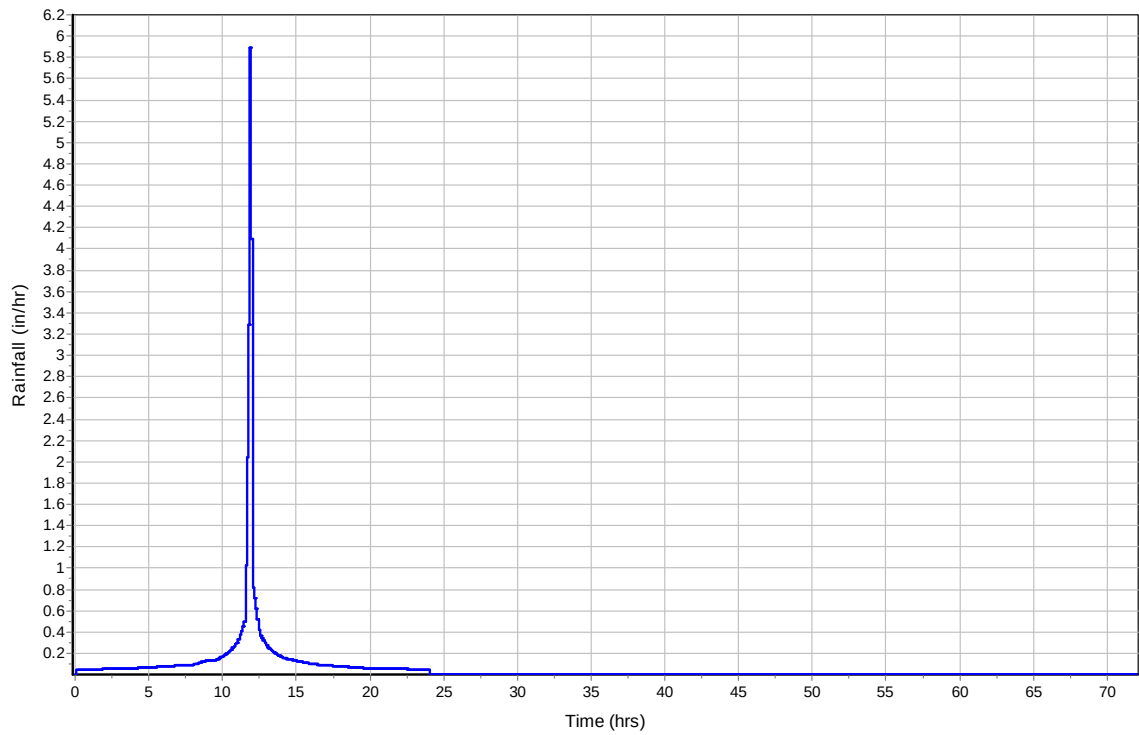
Time of Concentration

User-Defined TOC override (minutes): 20.00

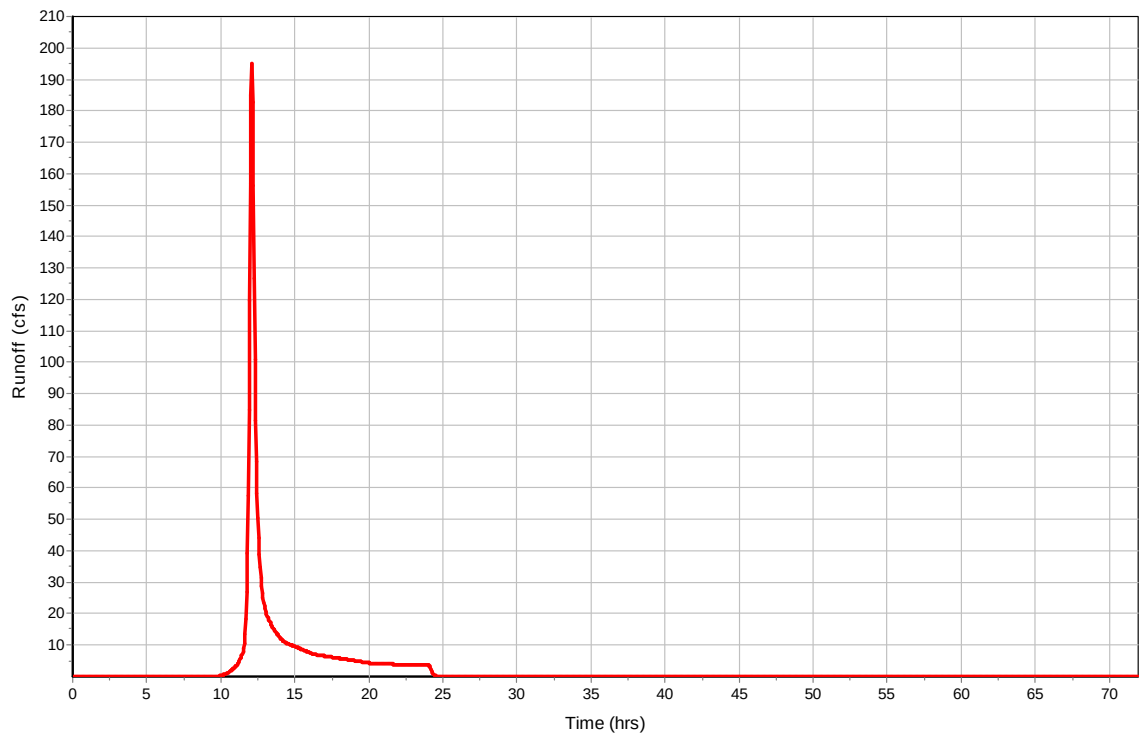
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 4.3        |
| Total Runoff (in)                     | 1.82       |
| Peak Runoff (cfs)                     | 195.26     |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

| SN | Element<br>ID    | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe<br>Cover |
|----|------------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|--------------------------|
|    |                  | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (in)                     |
| 1  | 12" DIA MANHOLE  | 886.40              | 895.75                           | 9.35                          | 886.40                        | 0.00                      | 895.75                 | 0.00               | 0.00           | 0.00                     |
| 2  | Ditch_Start_East | 899.00              | 902.00                           | 3.00                          | 899.00                        | 0.00                      | 902.00                 | 0.00               | 0.00           | 0.00                     |
| 3  | Ditch_Start_West | 899.00              | 902.00                           | 3.00                          | 899.00                        | 0.00                      | 902.00                 | 0.00               | 0.00           | 0.00                     |
| 4  | HW_36_East       | 892.00              | 895.00                           | 3.00                          | 892.00                        | 0.00                      | 895.00                 | 0.00               | 0.00           | 0.00                     |
| 5  | HW_36_West       | 892.00              | 895.00                           | 3.00                          | 892.00                        | 0.00                      | 899.00                 | 4.00               | 0.00           | 0.00                     |
| 6  | IB_1_OCS         | 891.00              | 900.80                           | 9.80                          | 891.00                        | 0.00                      | 900.80                 | 0.00               | 0.00           | 0.00                     |

Junction Results

| SN Element<br>ID   | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|--------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|                    | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1 12" DIA MANHOLE  | 206.38         | 0.00                      | 891.17                           | 4.77                         | 0.00                                  | 4.58                         | 887.27                               | 0.87                             | 0 13:32                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 2 Ditch_Start_East | 9.38           | 9.38                      | 899.26                           | 0.26                         | 0.00                                  | 4.74                         | 899.01                               | 0.01                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3 Ditch_Start_West | 21.30          | 21.30                     | 899.42                           | 0.42                         | 0.00                                  | 4.58                         | 899.02                               | 0.02                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4 HW_36_East       | 9.37           | 0.00                      | 892.72                           | 0.72                         | 0.00                                  | 4.28                         | 892.03                               | 0.03                             | 0 12:27                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5 HW_36_West       | 21.28          | 0.00                      | 893.29                           | 1.29                         | 0.00                                  | 3.71                         | 892.05                               | 0.05                             | 0 12:27                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6 IB_1_OCS         | 199.86         | 0.00                      | 893.31                           | 2.31                         | 0.00                                  | 7.49                         | 891.50                               | 0.50                             | 0 13:37                          | 0 00:00                                   | 0.00                       | 0.00                  |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

Channel Results

| SN | Element ID | Peak Flow | Time of Peak Flow Occurrence | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Travel Time | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Froude Number | Reported Condition |
|----|------------|-----------|------------------------------|----------------------|------------------------------|--------------------|-------------|-----------------|------------------------------------|-----------------------|---------------|--------------------|
|    |            | (cfs)     | (days hh:mm)                 | (cfs)                |                              | (ft/sec)           | (min)       | (ft)            |                                    | (min)                 |               |                    |
| 1  | Ditch_East | 9.37      | 0 12:24                      | 2363.82              | 0.00                         | 1.42               | 3.52        | 0.49            | 0.10                               | 0.00                  |               |                    |
| 2  | Ditch_West | 21.28     | 0 12:24                      | 2363.82              | 0.01                         | 1.86               | 2.69        | 0.86            | 0.17                               | 0.00                  |               |                    |



Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|---------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |               |                       |
| 1 36_East          | 9.35         | 0 12:39                            | 126.55                  | 0.07                               | 8.52                  | 0.10           | 0.99               | 0.33                                        | 0.00                     |               | Calculated            |
| 2 36_West          | 21.03        | 0 12:27                            | 126.55                  | 0.17                               | 9.77                  | 0.09           | 1.06               | 0.35                                        | 0.00                     |               | Calculated            |
| 3 Culvert_1_CMP_72 | 205.74       | 0 13:34                            | 303.28                  | 0.68                               | 9.74                  | 0.20           | 4.20               | 0.70                                        | 0.00                     |               | Calculated            |
| 4 Culvert_1_RCP_72 | 200.42       | 0 13:38                            | 640.68                  | 0.31                               | 11.60                 | 0.29           | 3.54               | 0.59                                        | 0.00                     |               | Calculated            |
| 5 Culvert_2        | 45.83        | 0 12:28                            | 254.23                  | 0.18                               | 6.21                  | 0.30           | 1.84               | 0.31                                        | 0.00                     |               | Calculated            |

Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

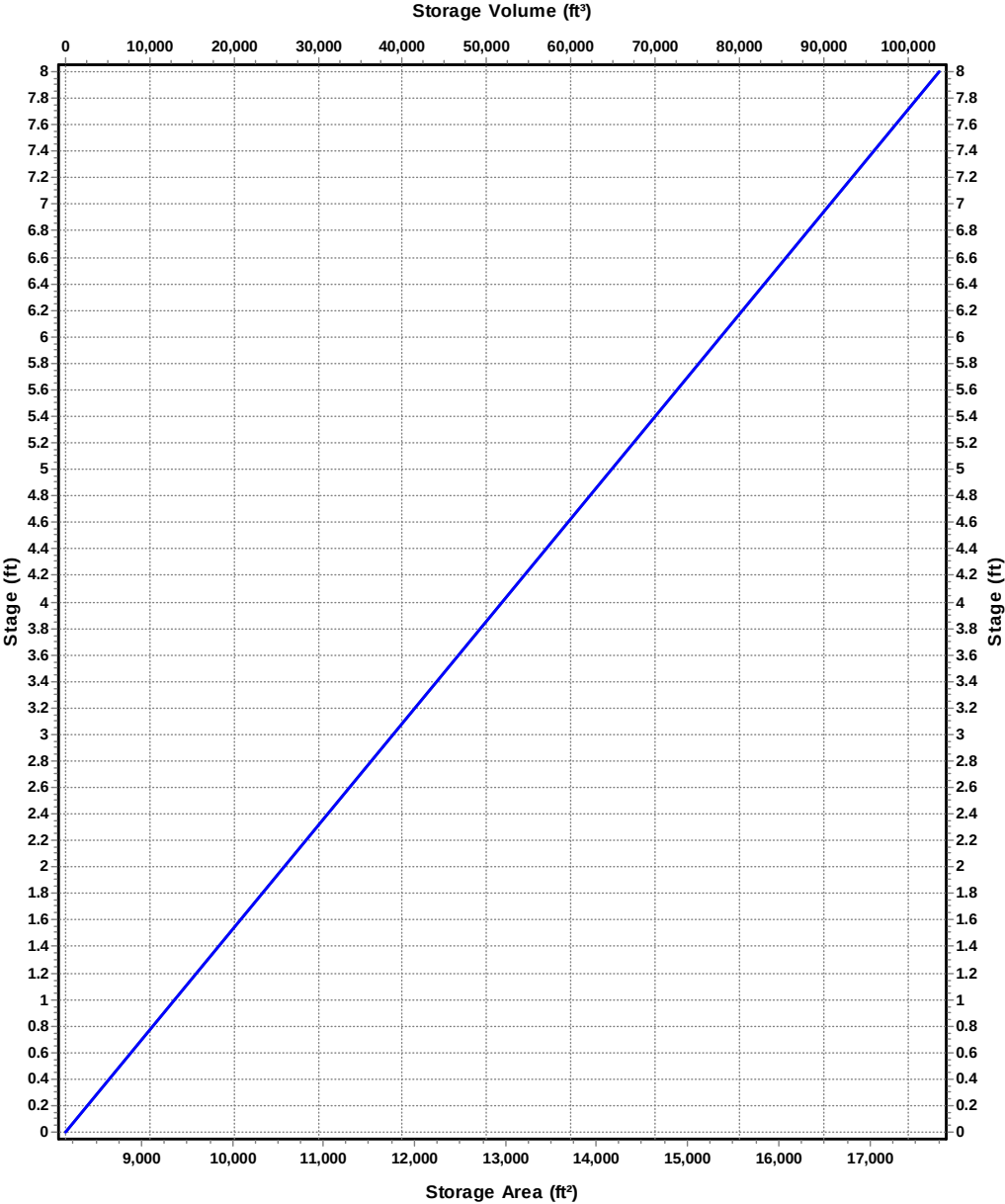
|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage | Storage |
|-------|---------|---------|
| (ft)  | Area    | Volume  |
|       | (ft²)   | (ft³)   |
| 0     | 8168    | 0       |
| 8     | 17763   | 103724  |

Storage Area Volume Curves



Storage Area      Storage Volume

## Storage Node : Culvert\_2\_Inlet (continued)

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 47.61   |
| Peak Lateral Inflow (cfs) .....               | 47.61   |
| Peak Outflow (cfs) .....                      | 45.83   |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 894.21  |
| Max HGL Depth Attained (ft) .....             | 2.21    |
| Average HGL Elevation Attained (ft) .....     | 892.33  |
| Average HGL Depth Attained (ft) .....         | 0.33    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:28 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

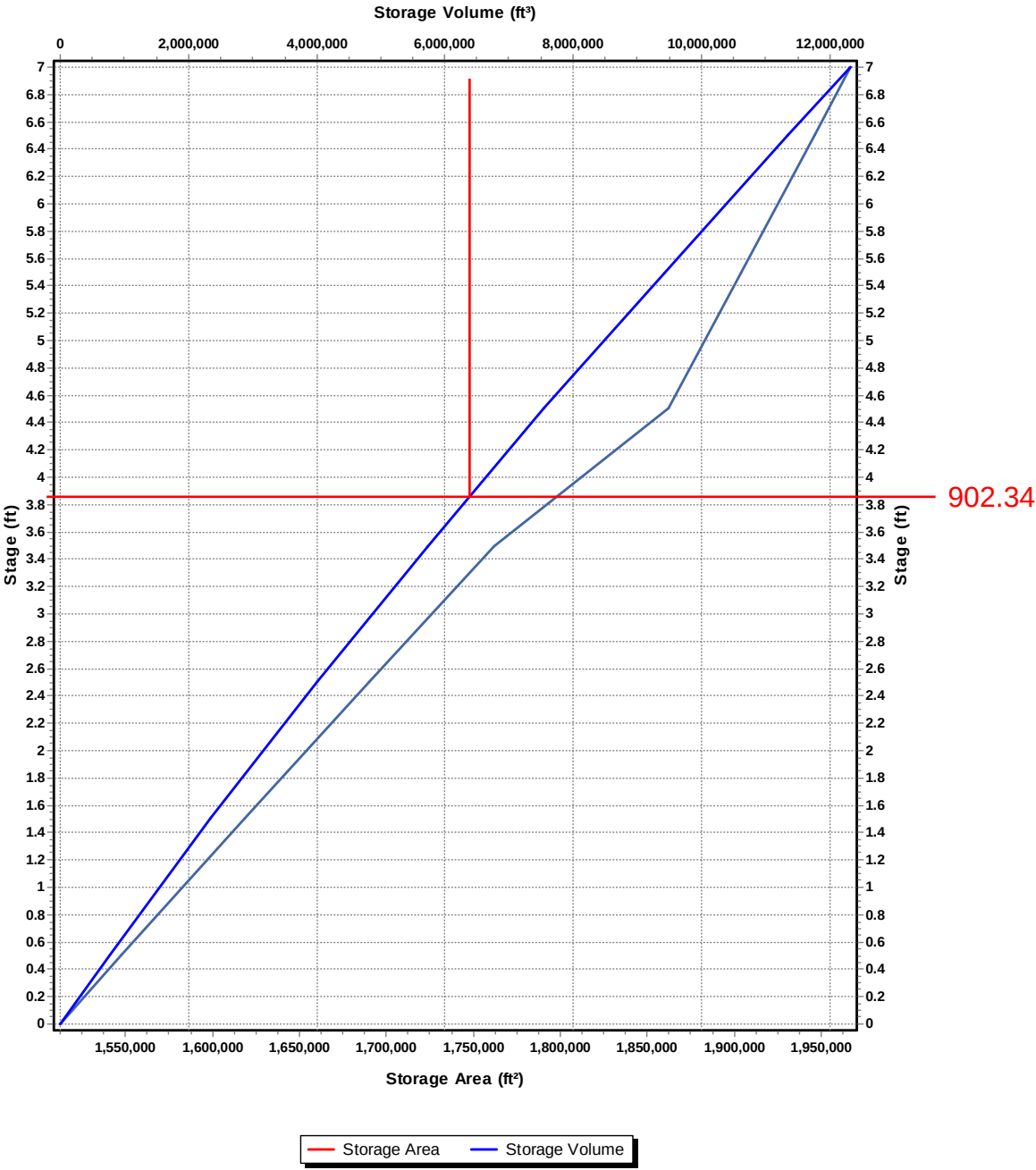
|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 895.50     |
| Initial Water Depth (ft)     | -3.00      |
| Ponded Area (ft²)            | 1512370.00 |
| Evaporation Loss             | 0.00       |

Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |

Storage Area Volume Curves





## Storage Node : Infiltration\_Basin\_1 (continued)

### Outflow Weirs

| SN Element<br>ID | Weir<br>Type | Flap<br>Gate | Crest<br>Elevation<br>(ft) | Crest<br>Offset<br>(ft) | Length<br>(ft) | Weir Total<br>Height<br>(ft) | Discharge<br>Coefficient |
|------------------|--------------|--------------|----------------------------|-------------------------|----------------|------------------------------|--------------------------|
| 1 IB_1_Spillway  | Trapezoidal  | No           | 904.00                     | 5.50                    | 350.00         | 1.50                         | 3.40                     |

### Outflow Orifices

| SN Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|------------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1 OCS_Weir       | Bottom          | CIRCULAR         | No           | 120.00                                  |                                          |                                         | 900.80                                 | 0.61                   |

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 2197.87 |
| Peak Lateral Inflow (cfs) .....               | 2197.87 |
| Peak Outflow (cfs) .....                      | 199.86  |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 902.34  |
| Max HGL Depth Attained (ft) .....             | 3.84    |
| Average HGL Elevation Attained (ft) .....     | 900.7   |
| Average HGL Depth Attained (ft) .....         | 2.2     |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 13:37 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 10  
    *Junctions* ..... 6  
    *Outfalls* ..... 2  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin<br>ID          | Area   | Peak Rate | Weighted | Total    | Total  | Total   | Peak    | Time of         |
|----------------------------|--------|-----------|----------|----------|--------|---------|---------|-----------------|
|                            |        | Factor    | Curve    | Rainfall | Runoff | Runoff  | Runoff  | Concentration   |
|                            | (ac)   |           | Number   | (in)     | (in)   | (ac-in) | (cfs)   | (days hh:mm:ss) |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00    | 4.91     | 3.90   | 2967.06 | 2392.89 | 0 00:33:17      |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00    | 4.91     | 2.29   | 17.91   | 11.99   | 0 00:45:00      |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00    | 4.91     | 2.29   | 40.65   | 27.22   | 0 00:45:00      |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00    | 4.91     | 2.38   | 90.05   | 60.44   | 0 00:45:00      |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00    | 4.91     | 2.29   | 225.81  | 247.67  | 0 00:20:00      |

Node Summary

| SN | Element<br>ID        | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|----------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|------------------------------|-------------------------------------------|----------------------------|-----------------------|
|    |                      |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                         | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1  | 12'_DIA_MANHOLE      | Junction        | 886.40              | 895.75                           | 886.40                        | 895.75                 | 0.00           | 313.80         | 894.00                           | 0.00                                  | 1.75                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 2  | Ditch_Start_East     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 11.95          | 899.30                           | 0.00                                  | 4.70                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 3  | Ditch_Start_West     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 27.13          | 899.49                           | 0.00                                  | 4.51                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 4  | HW_36_East           | Junction        | 892.00              | 895.00                           | 892.00                        | 895.00                 | 0.00           | 11.93          | 894.00                           | 0.00                                  | 3.00                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 5  | HW_36_West           | Junction        | 892.00              | 895.00                           | 892.00                        | 899.00                 | 0.00           | 27.10          | 894.01                           | 0.00                                  | 2.99                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 6  | IB_1_OCS             | Junction        | 891.00              | 900.80                           | 891.00                        | 900.80                 | 0.00           | 304.58         | 896.68                           | 0.00                                  | 4.12                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 7  | Analysis_Point_1     | Outfall         | 884.00              |                                  |                               |                        |                | 313.66         | 888.83                           |                                       |                              |                                           |                            |                       |
| 8  | Analysis_Point_2     | Outfall         | 890.65              |                                  |                               |                        |                | 58.20          | 892.60                           |                                       |                              |                                           |                            |                       |
| 9  | Culvert_2_Inlet      | Storage Node    | 892.00              | 900.00                           | 892.00                        |                        | 8168.00        | 60.32          | 894.51                           |                                       |                              |                                           | 0.00                       | 0.00                  |
| 10 | Infiltration_Basin_1 | Storage Node    | 898.50              | 905.50                           | 895.50                        |                        | 1512370.00     | 2587.08        | 902.84                           |                                       |                              |                                           | 0.00                       | 0.00                  |

Link Summary

| SN Element ID      | Element Type | From (Inlet) Node    | To (Outlet) Node | Length | Inlet Invert Elevation | Outlet Invert Elevation | Average Slope | Diameter or Height | Manning's Roughness | Peak Flow | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Reported Surcharged | Condition  |
|--------------------|--------------|----------------------|------------------|--------|------------------------|-------------------------|---------------|--------------------|---------------------|-----------|----------------------|------------------------------|--------------------|-----------------|------------------------------------|--------------------------------|------------|
|                    |              |                      |                  | (ft)   | (ft)                   | (ft)                    | (%)           | (in)               |                     | (cfs)     | (cfs)                |                              | (ft/sec)           | (ft)            |                                    | (min)                          |            |
| 1 36_East          | Pipe         | HW_36_East           | 12'_DIA_MANHOLE  | 53.00  | 892.00                 | 889.46                  | 4.7900        | 36.000             | 0.0150              | 17.09     | 126.55               | 0.14                         | 9.64               | 2.50            | 0.83                               | 0.00                           | Calculated |
| 2 36_West          | Pipe         | HW_36_West           | 12'_DIA_MANHOLE  | 53.00  | 892.00                 | 889.46                  | 4.7900        | 36.000             | 0.0150              | 37.26     | 126.55               | 0.29                         | 11.14              | 2.51            | 0.84                               | 0.00                           | Calculated |
| 3 Culvert_1_CMP_72 | Pipe         | 12'_DIA_MANHOLE      | Analysis_Point_1 | 117.00 | 886.40                 | 884.00                  | 2.0500        | 72.000             | 0.0260              | 313.66    | 303.28               | 1.03                         | 11.68              | 5.41            | 0.90                               | 0.00                           | > CAPACITY |
| 4 Culvert_1_RCP_72 | Pipe         | IB_1_OCS             | 12'_DIA_MANHOLE  | 201.00 | 891.00                 | 886.40                  | 2.2900        | 72.000             | 0.0130              | 304.66    | 640.68               | 0.48                         | 11.84              | 5.84            | 0.97                               | 0.00                           | Calculated |
| 5 Culvert_2        | Pipe         | Culvert_2_Inlet      | Analysis_Point_2 | 111.00 | 892.25                 | 890.65                  | 1.4400        | 72.000             | 0.0260              | 58.20     | 254.23               | 0.23                         | 6.57               | 2.10            | 0.35                               | 0.00                           | Calculated |
| 6 Ditch_East       | Channel      | Ditch_Start_East     | HW_36_East       | 300.00 | 899.00                 | 892.00                  | 2.3300        | 60.000             | 0.0320              | 11.93     | 2363.82              | 0.01                         | 1.82               | 1.07            | 0.21                               | 0.00                           |            |
| 7 Ditch_West       | Channel      | Ditch_Start_West     | HW_36_West       | 300.00 | 899.00                 | 892.00                  | 2.3300        | 60.000             | 0.0320              | 27.10     | 2363.82              | 0.01                         | 2.45               | 1.11            | 0.22                               | 0.00                           |            |
| 8 OCS_Weir         | Orifice      | Infiltration_Basin_1 | IB_1_OCS         |        | 898.50                 | 891.00                  |               | 120.000            |                     | 304.58    |                      |                              |                    |                 |                                    |                                |            |
| 9 IB_1_Spillway    | Weir         | Infiltration_Basin_1 | Culvert_2_Inlet  |        | 898.50                 | 892.00                  |               |                    |                     | 0.00      |                      |                              |                    |                 |                                    |                                |            |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 761.76   |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 91       |
| Rain Gage ID          | 24hr50yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 \* ((n \* Lf)^0.8)) / ((P^0.5) \* (Sf^0.4))

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R^(2/3)) \* (Sf^0.5)) / n

R = Aq / Wp

Tc = (Lf / V) / (3600 sec/hr)

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

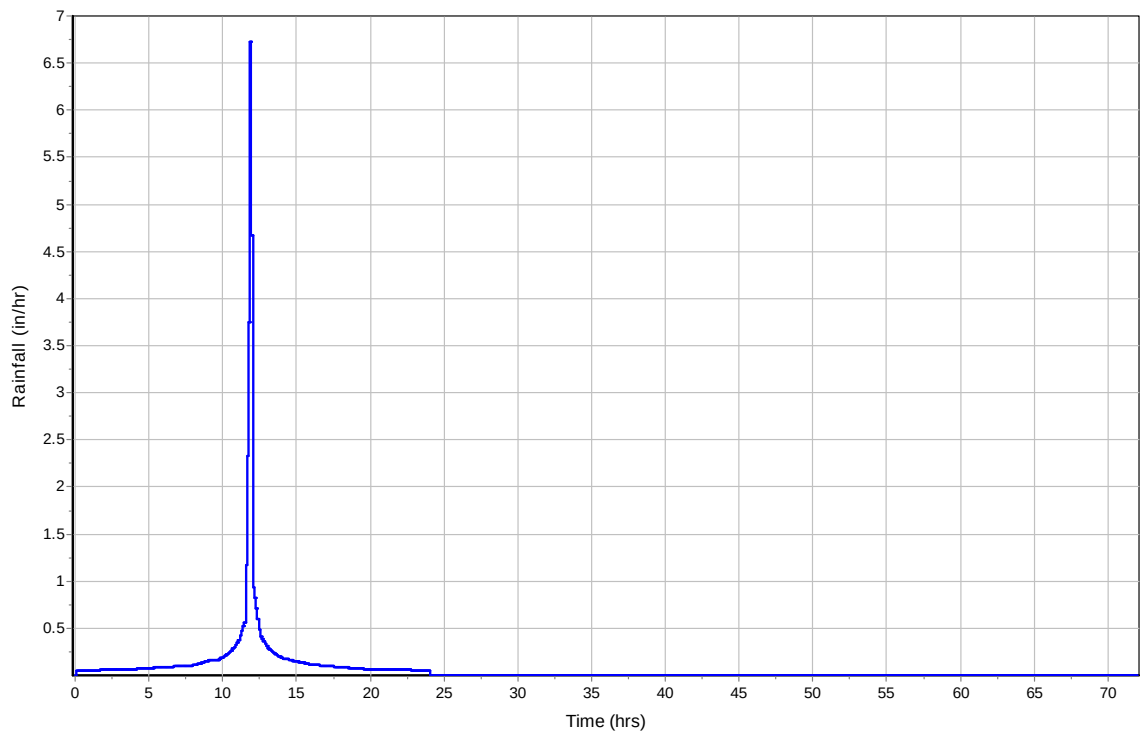
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

### Subbasin Runoff Results

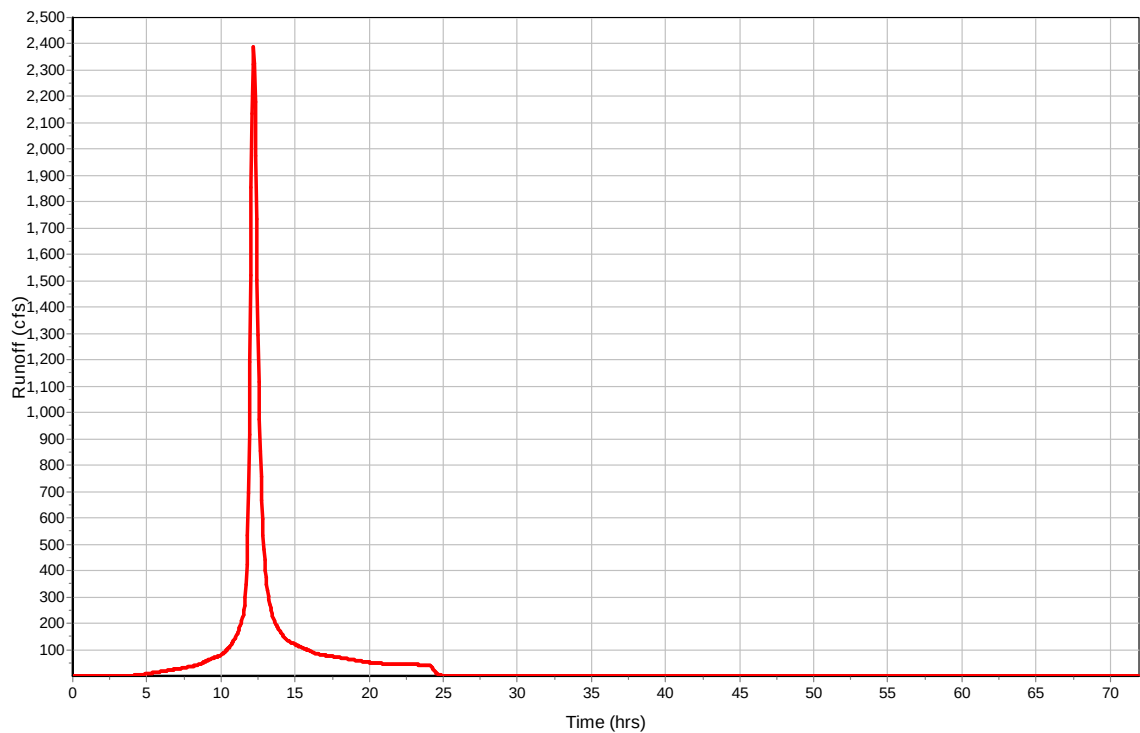
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 4.91       |
| Total Runoff (in) .....                     | 3.9        |
| Peak Runoff (cfs) .....                     | 2392.89    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph





Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr50yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

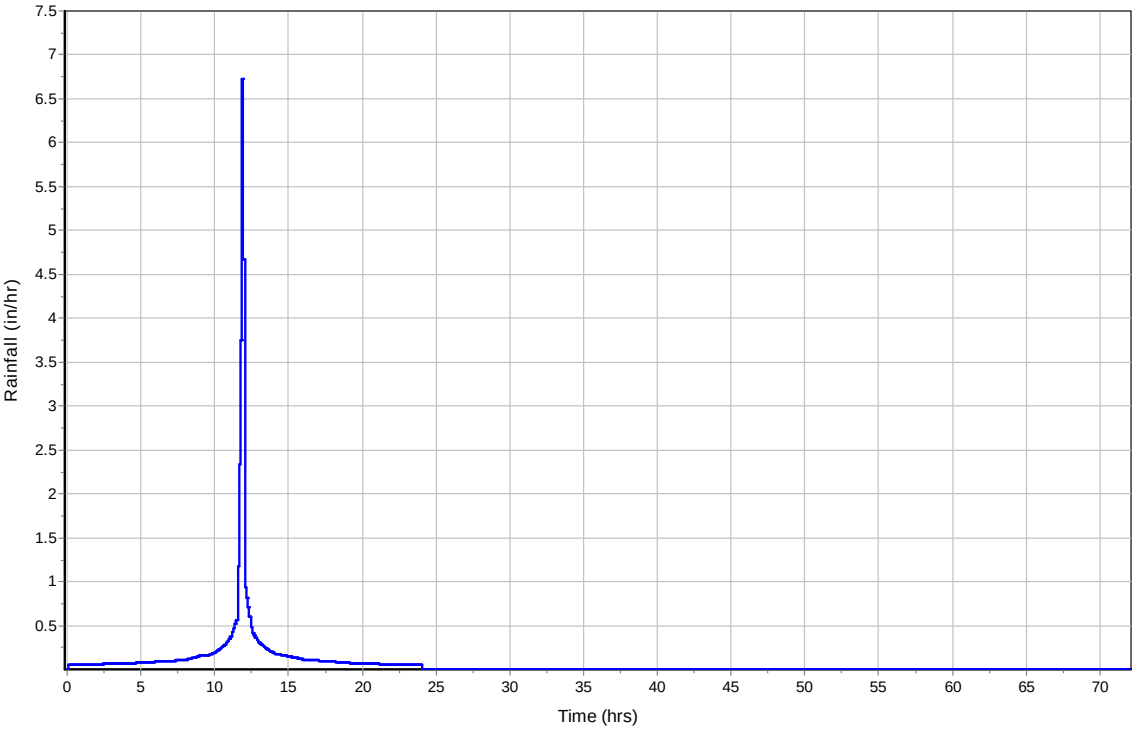
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

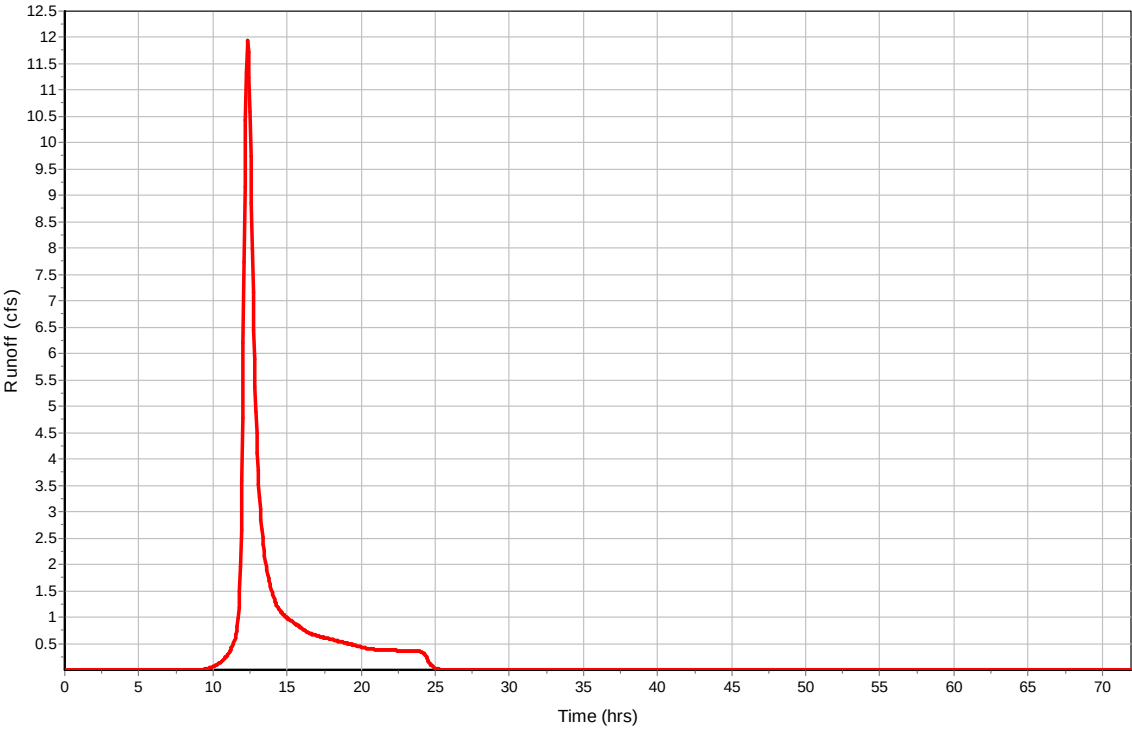
Total Rainfall (in) ..... 4.91  
Total Runoff (in) ..... 2.29  
Peak Runoff (cfs) ..... 11.99  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 17.73    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr50yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

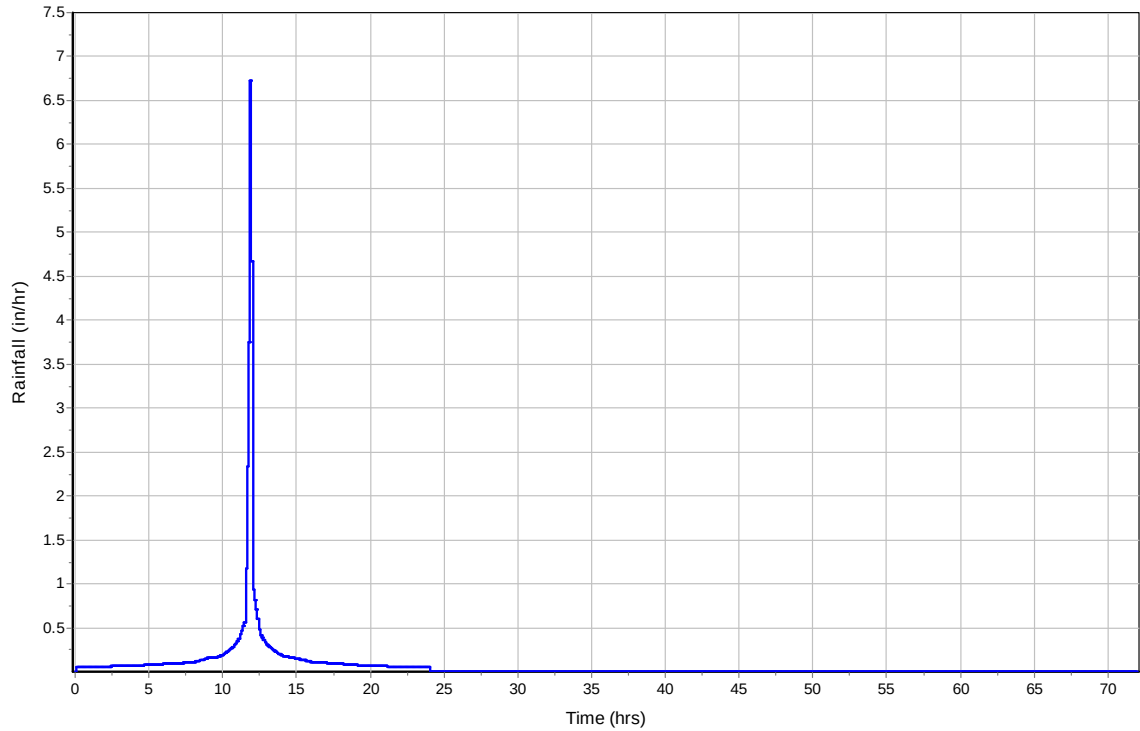
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

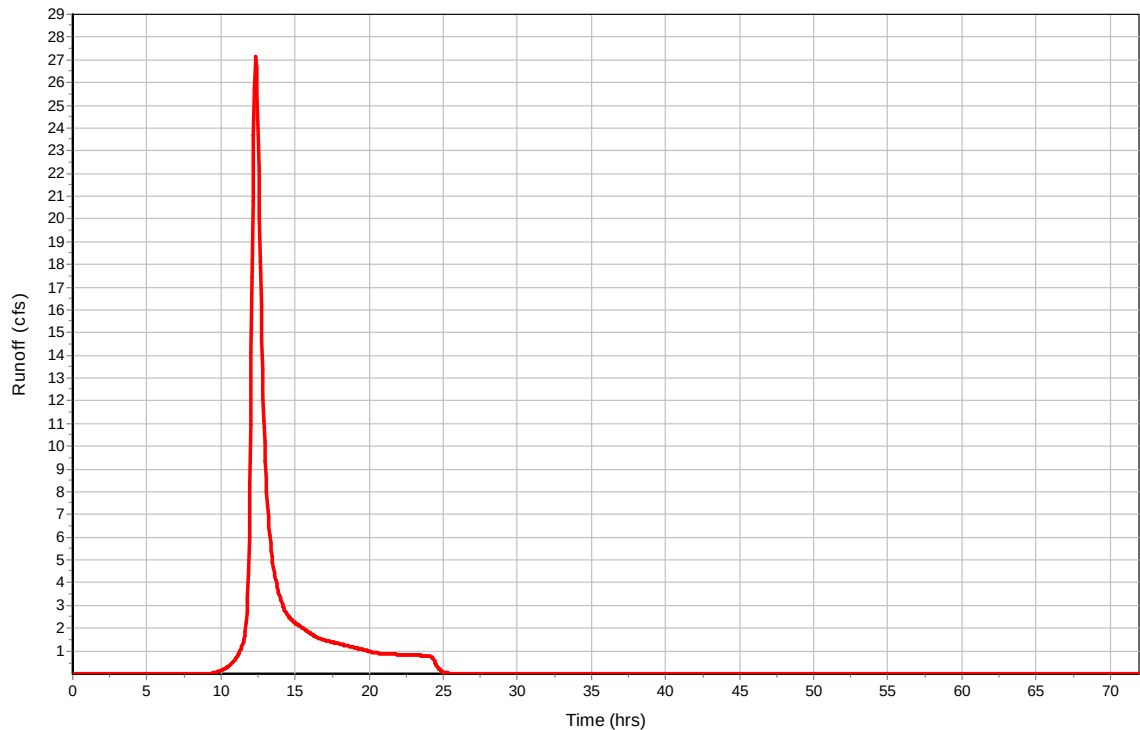
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 4.91       |
| Total Runoff (in)                     | 2.29       |
| Peak Runoff (cfs)                     | 27.22      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_2b

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 37.9     |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 75       |
| Rain Gage ID          | 24hr50yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

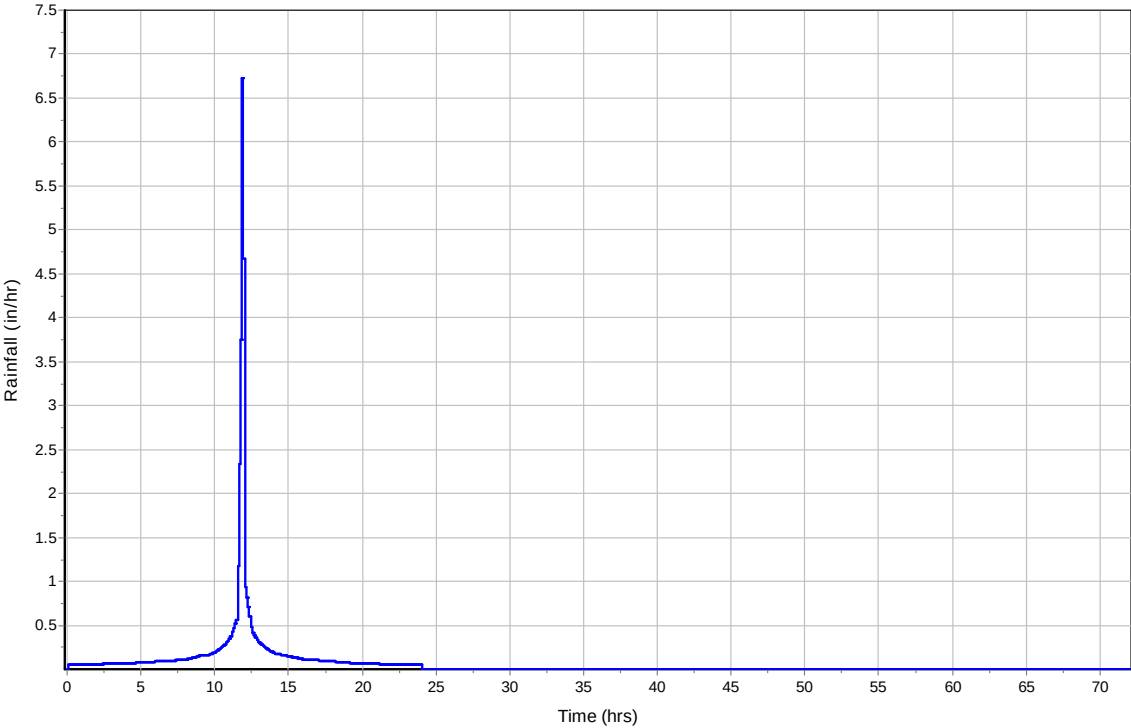
Time of Concentration

User-Defined TOC override (minutes): 45.00

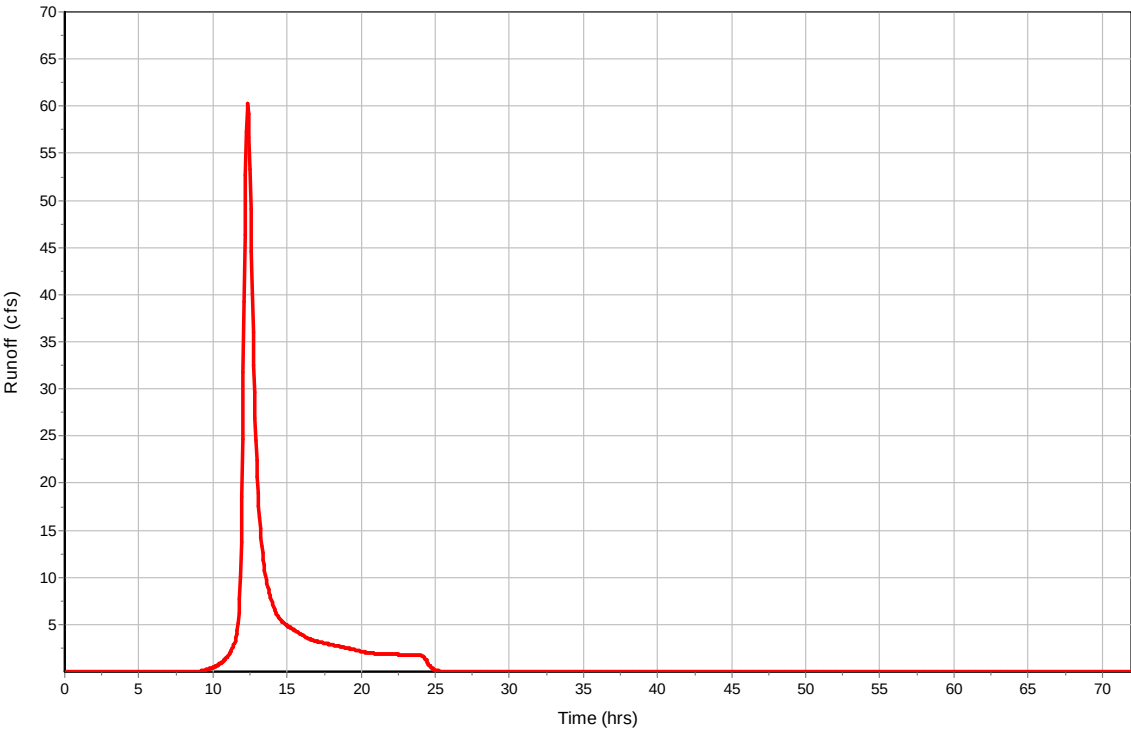
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 4.91       |
| Total Runoff (in)                     | 2.38       |
| Peak Runoff (cfs)                     | 60.44      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |          |
|-----------------------|----------|
| Area (ac)             | 98.48    |
| Peak Rate Factor      | 484      |
| Weighted Curve Number | 74       |
| Rain Gage ID          | 24hr50yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

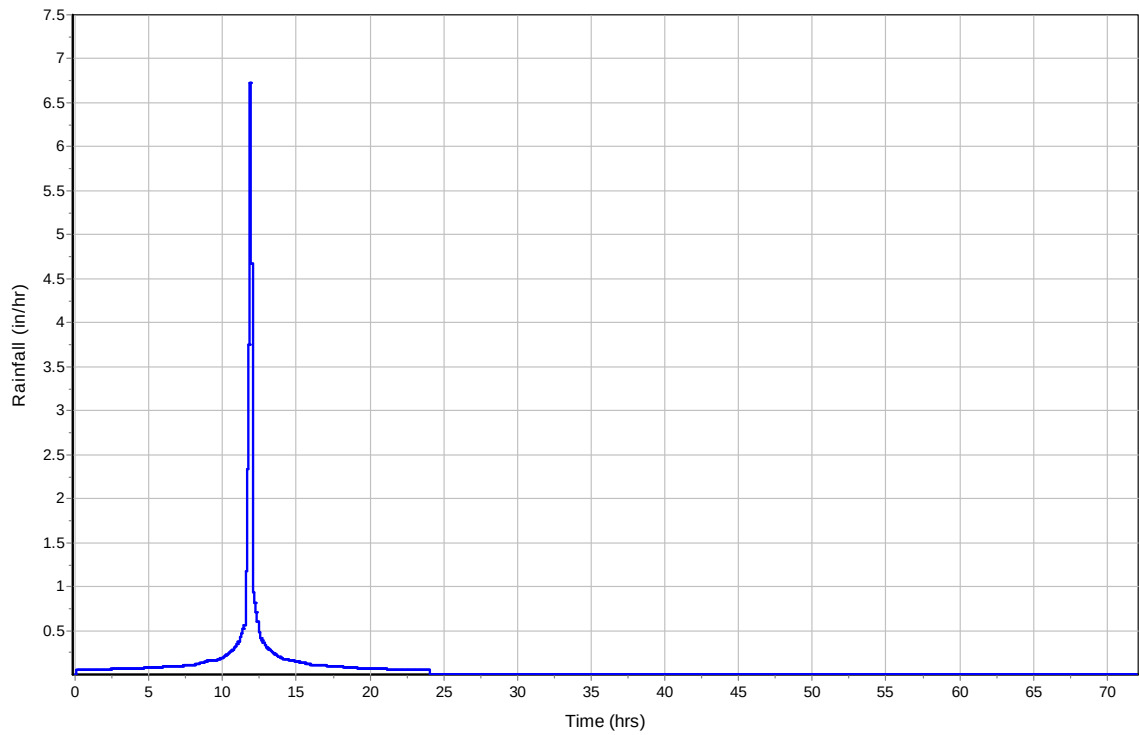
Time of Concentration

User-Defined TOC override (minutes): 20.00

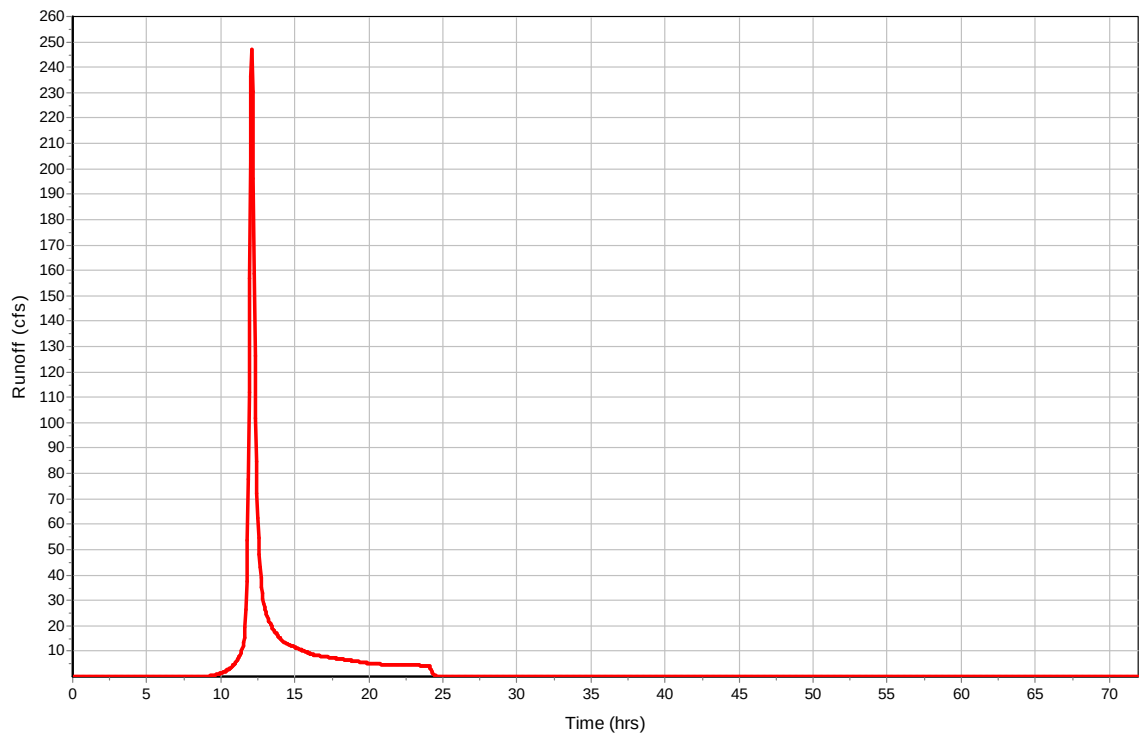
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 4.91       |
| Total Runoff (in)                     | 2.29       |
| Peak Runoff (cfs)                     | 247.67     |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |

Rainfall Intensity Graph



Runoff Hydrograph





Junction Input

| SN | Element<br>ID    | Invert<br>Elevation<br><br>(ft) | Ground/Rim<br>(Max)<br>Elevation<br>(ft) | Ground/Rim<br>(Max)<br>Offset<br>(ft) | Initial<br>Water<br>Elevation<br>(ft) | Initial<br>Water<br>Depth<br>(ft) | Surcharge<br>Elevation<br>(ft) | Surcharge<br>Depth<br>(ft) | Ponded<br>Area<br>(ft²) | Minimum<br>Pipe<br>Cover<br>(in) |
|----|------------------|---------------------------------|------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------|--------------------------------|----------------------------|-------------------------|----------------------------------|
| 1  | 12" DIA MANHOLE  | 886.40                          | 895.75                                   | 9.35                                  | 886.40                                | 0.00                              | 895.75                         | 0.00                       | 0.00                    | 0.00                             |
| 2  | Ditch_Start_East | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 3  | Ditch_Start_West | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 4  | HW_36_East       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 895.00                         | 0.00                       | 0.00                    | 0.00                             |
| 5  | HW_36_West       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 899.00                         | 4.00                       | 0.00                    | 0.00                             |
| 6  | IB_1_OCS         | 891.00                          | 900.80                                   | 9.80                                  | 891.00                                | 0.00                              | 900.80                         | 0.00                       | 0.00                    | 0.00                             |

Junction Results

| SN Element<br>ID   | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|--------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|                    | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1 12" DIA MANHOLE  | 313.80         | 0.00                      | 894.00                           | 7.60                         | 0.00                                  | 1.75                         | 887.43                               | 1.03                             | 0 13:20                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 2 Ditch_Start_East | 11.95          | 11.95                     | 899.30                           | 0.30                         | 0.00                                  | 4.70                         | 899.01                               | 0.01                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3 Ditch_Start_West | 27.13          | 27.13                     | 899.49                           | 0.49                         | 0.00                                  | 4.51                         | 899.02                               | 0.02                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4 HW_36_East       | 11.93          | 0.00                      | 894.00                           | 2.00                         | 0.00                                  | 3.00                         | 892.07                               | 0.07                             | 0 13:20                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5 HW_36_West       | 27.10          | 0.00                      | 894.01                           | 2.01                         | 0.00                                  | 2.99                         | 892.09                               | 0.09                             | 0 13:20                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6 IB_1_OCS         | 304.58         | 0.00                      | 896.68                           | 5.68                         | 0.00                                  | 4.12                         | 891.61                               | 0.61                             | 0 13:19                          | 0 00:00                                   | 0.00                       | 0.00                  |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

Channel Results

| SN | Element ID | Peak Flow | Time of Peak Flow Occurrence | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Travel Time | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Froude Number | Reported Condition |
|----|------------|-----------|------------------------------|----------------------|------------------------------|--------------------|-------------|-----------------|------------------------------------|-----------------------|---------------|--------------------|
|    |            | (cfs)     | (days hh:mm)                 | (cfs)                |                              | (ft/sec)           | (min)       | (ft)            |                                    | (min)                 |               |                    |
| 1  | Ditch_East | 11.93     | 0 12:24                      | 2363.82              | 0.01                         | 1.82               | 2.75        | 1.07            | 0.21                               | 0.00                  |               |                    |
| 2  | Ditch_West | 27.10     | 0 12:24                      | 2363.82              | 0.01                         | 2.45               | 2.04        | 1.11            | 0.22                               | 0.00                  |               |                    |

Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|---------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |               |                       |
| 1 36_East          | 17.09        | 0 12:26                            | 126.55                  | 0.14                               | 9.64                  | 0.09           | 2.50               | 0.83                                        | 0.00                     |               | Calculated            |
| 2 36_West          | 37.26        | 0 12:29                            | 126.55                  | 0.29                               | 11.14                 | 0.08           | 2.51               | 0.84                                        | 0.00                     |               | Calculated            |
| 3 Culvert_1_CMP_72 | 313.66       | 0 13:20                            | 303.28                  | 1.03                               | 11.68                 | 0.17           | 5.41               | 0.90                                        | 0.00                     |               | > CAPACITY            |
| 4 Culvert_1_RCP_72 | 304.66       | 0 13:19                            | 640.68                  | 0.48                               | 11.84                 | 0.28           | 5.84               | 0.97                                        | 0.00                     |               | Calculated            |
| 5 Culvert_2        | 58.20        | 0 12:28                            | 254.23                  | 0.23                               | 6.57                  | 0.28           | 2.10               | 0.35                                        | 0.00                     |               | Calculated            |

Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

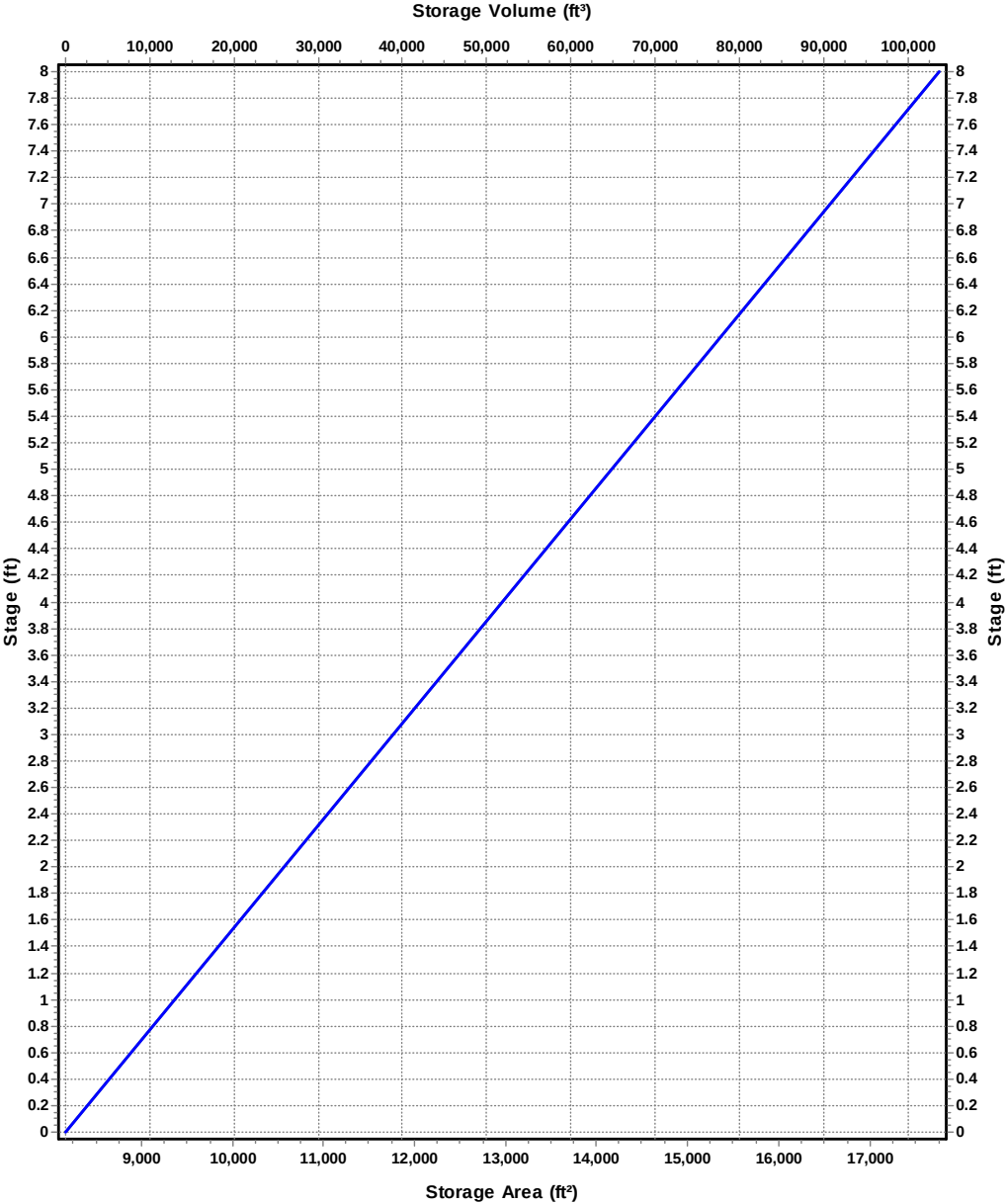
Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage | Storage |
|-------|---------|---------|
| (ft)  | Area    | Volume  |
|       | (ft²)   | (ft³)   |
| 0     | 8168    | 0       |
| 8     | 17763   | 103724  |



Storage Area Volume Curves



Storage Area Storage Volume

**Storage Node : Culvert\_2\_Inlet (continued)**

**Output Summary Results**

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 60.32   |
| Peak Lateral Inflow (cfs) .....               | 60.32   |
| Peak Outflow (cfs) .....                      | 58.2    |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 894.51  |
| Max HGL Depth Attained (ft) .....             | 2.51    |
| Average HGL Elevation Attained (ft) .....     | 892.34  |
| Average HGL Depth Attained (ft) .....         | 0.34    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:28 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

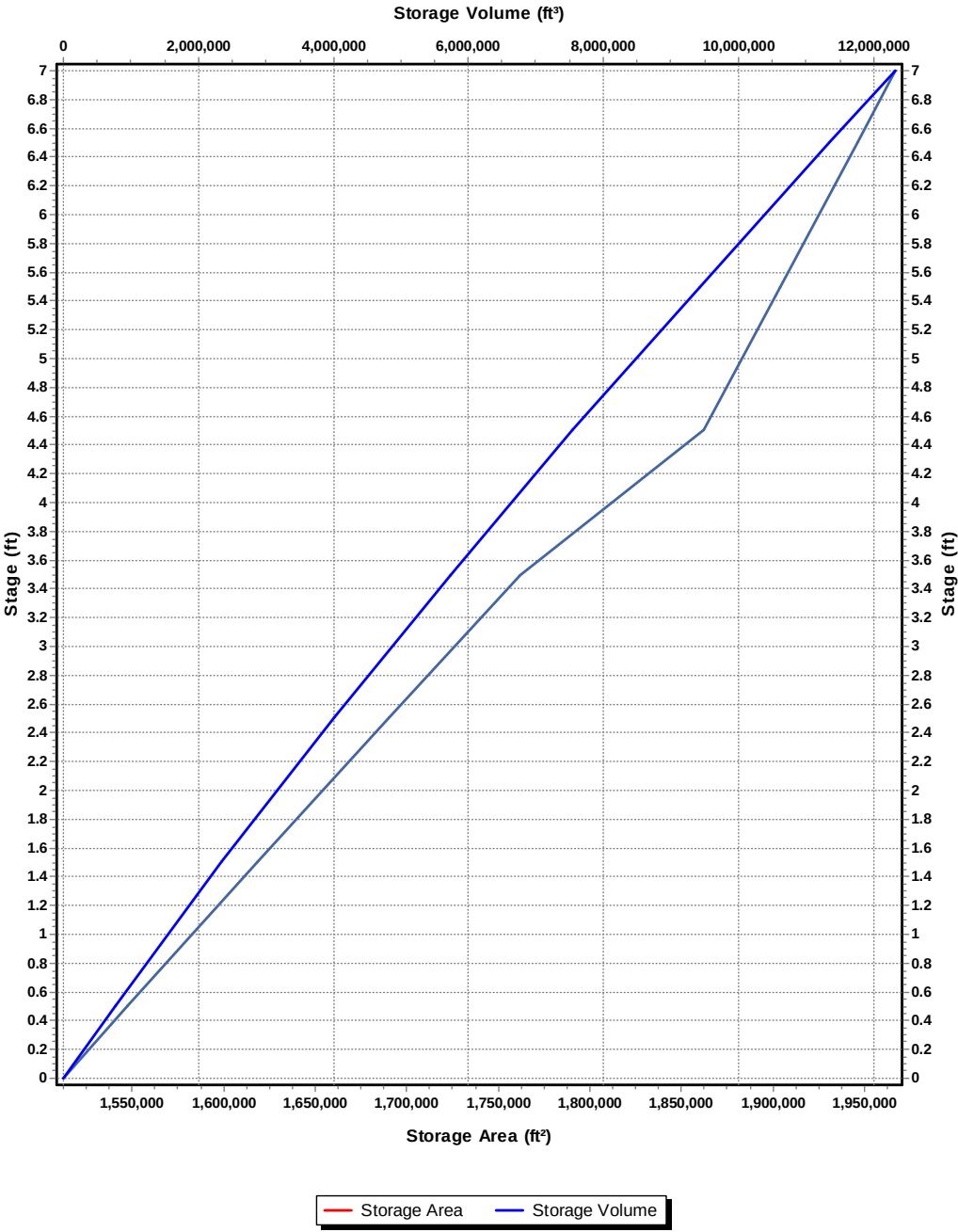
|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 895.50     |
| Initial Water Depth (ft)     | -3.00      |
| Ponded Area (ft²)            | 1512370.00 |
| Evaporation Loss             | 0.00       |

Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |

Storage Area Volume Curves



Storage Node : Infiltration\_Basin\_1 (continued)

Outflow Weirs

| SN | Element<br>ID | Weir<br>Type | Flap<br>Gate | Crest<br>Elevation<br>(ft) | Crest<br>Offset<br>(ft) | Length<br>(ft) | Weir Total<br>Height<br>(ft) | Discharge<br>Coefficient |
|----|---------------|--------------|--------------|----------------------------|-------------------------|----------------|------------------------------|--------------------------|
| 1  | IB_1_Spillway | Trapezoidal  | No           | 904.00                     | 5.50                    | 350.00         | 1.50                         | 3.40                     |

Outflow Orifices

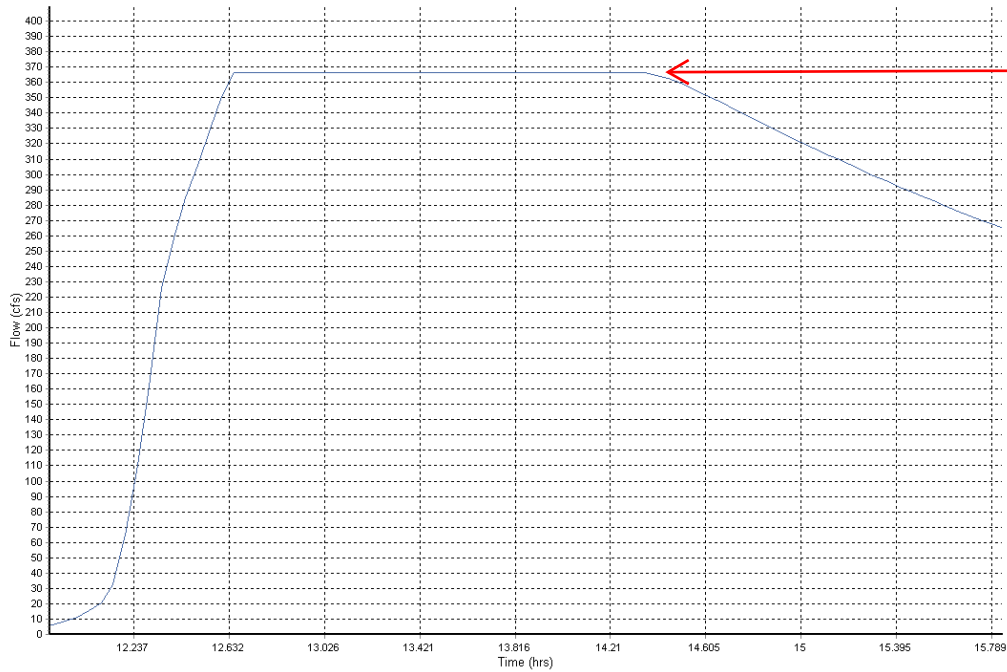
| SN | Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|----|---------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1  | OCS_Weir      | Bottom          | CIRCULAR         | No           | 120.00                                  |                                          |                                         | 900.80                                 | 0.61                   |

Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 2587.08 |
| Peak Lateral Inflow (cfs) .....               | 2587.08 |
| Peak Outflow (cfs) .....                      | 304.58  |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 902.84  |
| Max HGL Depth Attained (ft) .....             | 4.34    |
| Average HGL Elevation Attained (ft) .....     | 900.75  |
| Average HGL Depth Attained (ft) .....         | 2.25    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 13:19 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

100yr 72" CMP FLOW VS TIME

— Flow: Link - Culvert\_1\_CMP\_72 (Single Pipe\_09-21-2023 2023-10-18 09:54:46)



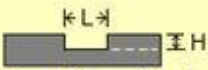
PIPE BARREL CONTROLS  
FLOW AT ~366 CFS

Top of Riser Elevation = 900.80'  
 100-year storm elevation = 903.46'  
 H = 2.66'  
 Q ~ 430 cfs

Thin Blue Numbers = Input data  
 Bold Red Numbers = Answers

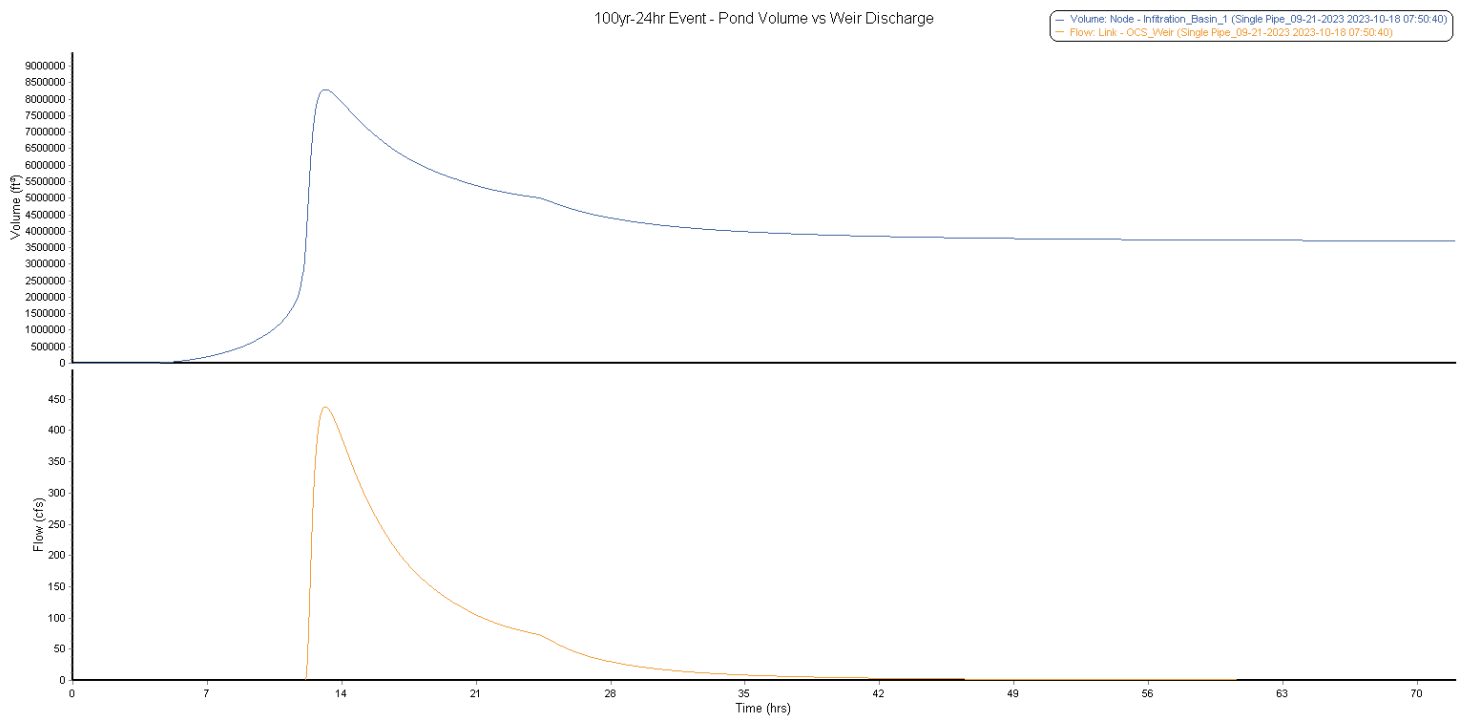
### Weir Notch Bleed Down Calculations

Pond Surface Area at SHW = 0 Sq. Ft.  
 Pond Surface Area at NWL = 0 Sq. Ft.  
 Notch Height (H) = 2.60 Feet  
 Notch Width (L) = 31.40 Feet  
 C = 3.25 Coefficient of discharge  
 1/2 Volume Time = 0.00 Hours  
 Total Time = 0.00 Hours

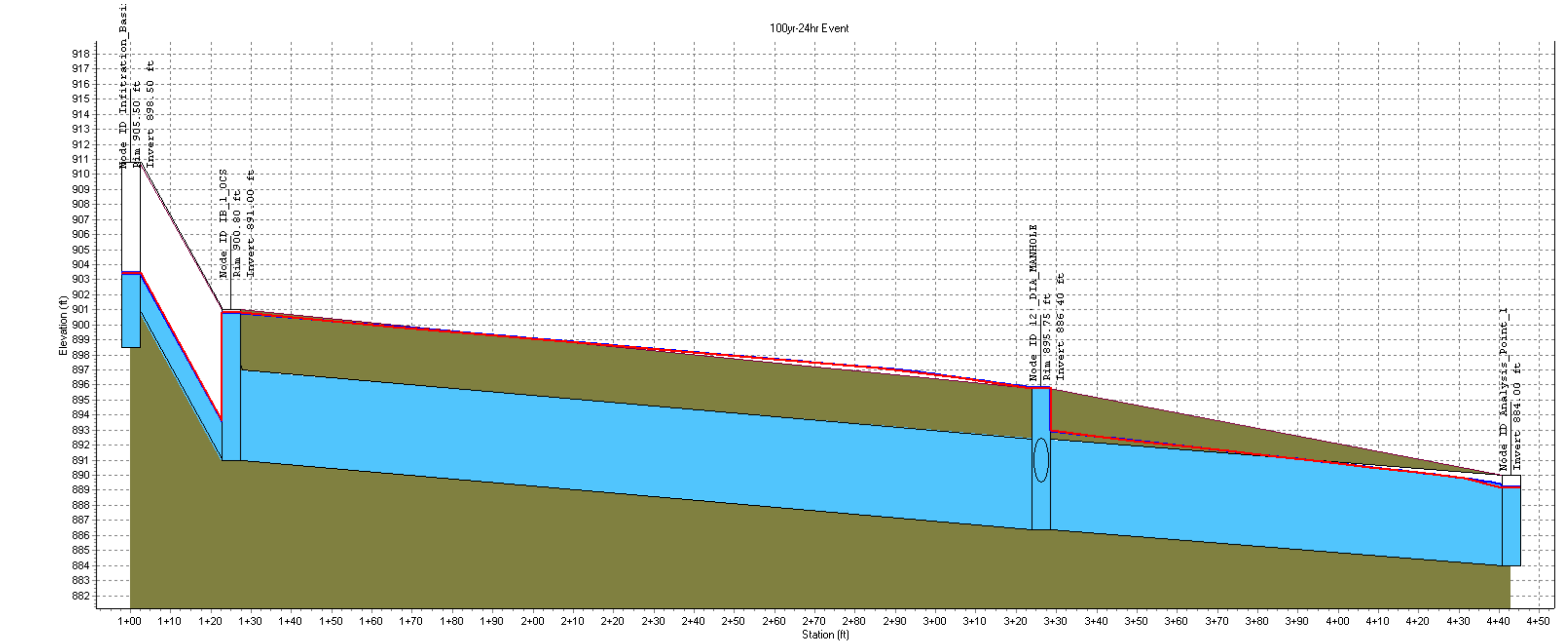
  
 Horizontal Broad Crested W  
 $Q = C L H^{3/2}$

| Total<br>H (Ft) | Increm.<br>H (Ft) | Flow<br>Q (cfs) | Q Avg.  | Delta<br>Volume | Cum.<br>Volume | Delta<br>Hours | Cum.<br>Hours |
|-----------------|-------------------|-----------------|---------|-----------------|----------------|----------------|---------------|
| 2.60            |                   | 427.44          |         |                 |                |                |               |
|                 | 0.05              |                 | 421.057 | 0               | 0              | 0.0            |               |
| 2.55            |                   | 414.68          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 408.363 | 0               | 0              | 0.0            |               |
| 2.50            |                   | 402.05          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 395.800 | 0               | 0              | 0.0            |               |
| 2.44            |                   | 389.55          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 383.367 | 0               | 0              | 0.0            |               |
| 2.39            |                   | 377.18          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 371.068 | 0               | 0              | 0.0            |               |
| 2.34            |                   | 364.95          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 358.903 | 0               | 0              | 0.0            |               |
| 2.29            |                   | 352.85          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 346.874 | 0               | 0              | 0.0            |               |
| 2.24            |                   | 340.89          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 334.983 | 0               | 0              | 0.0            |               |
| 2.18            |                   | 329.07          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 323.231 | 0               | 0              | 0.0            |               |
| 2.13            |                   | 317.39          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 311.619 | 0               | 0              | 0.0            |               |
| 2.08            |                   | 305.85          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 300.150 | 0               | 0              | 0.0            |               |
| 2.03            |                   | 294.45          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 288.825 | 0               | 0              | 0.0            |               |
| 1.98            |                   | 283.20          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 277.647 | 0               | 0              | 0.0            |               |
| 1.92            |                   | 272.09          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 266.616 | 0               | 0              | 0.0            |               |
| 1.87            |                   | 261.14          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 255.736 | 0               | 0              | 0.0            |               |
| 1.82            |                   | 250.33          |         |                 |                |                | 0.0           |
|                 | 0.05              |                 | 245.008 | 0               | 0              | 0.0            |               |
| 1.77            |                   | 239.68          |         |                 |                |                | 0.0           |

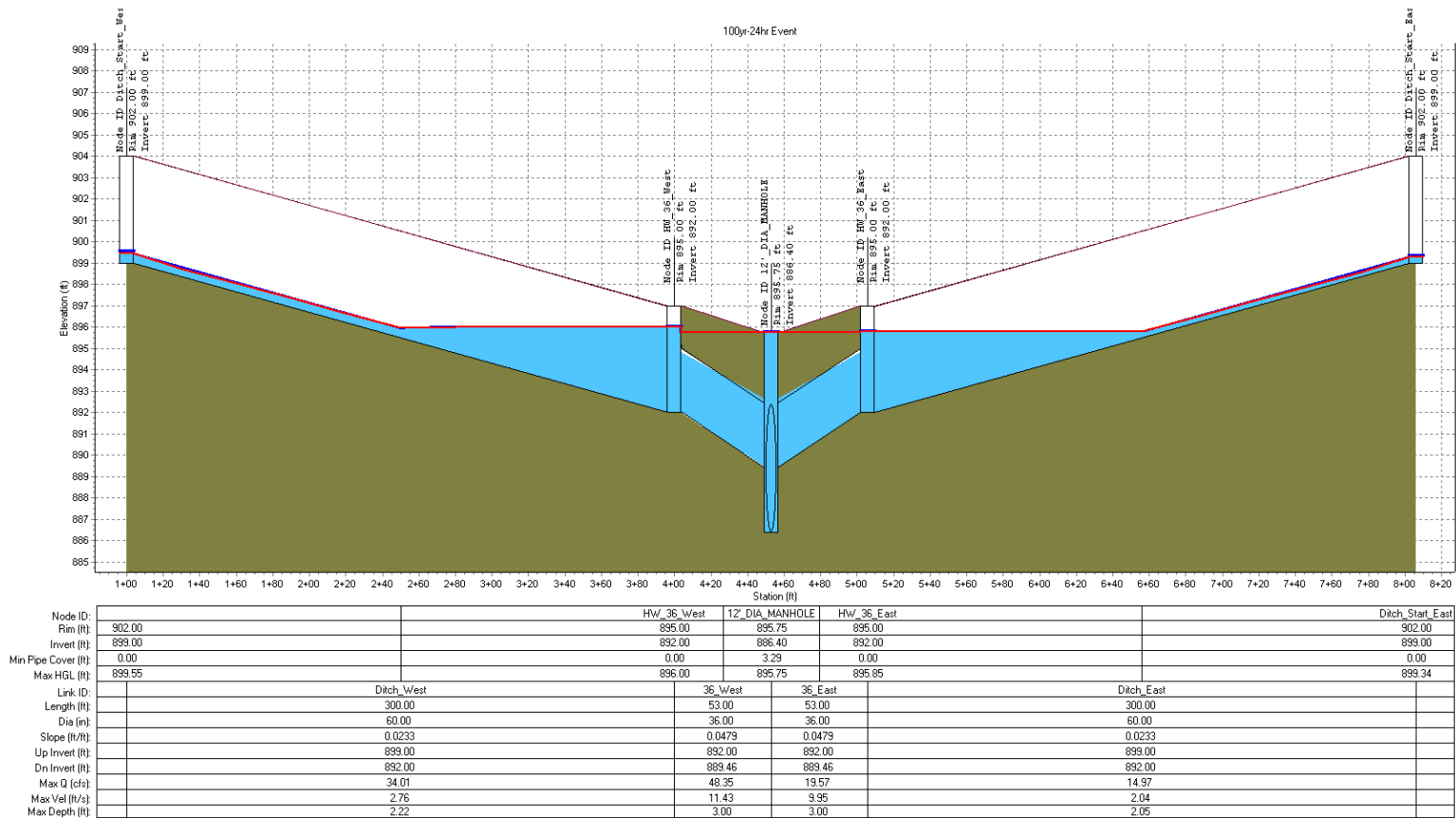
100yr-24hr Event - Pond Volume vs Weir Discharge







|                      |          |                  |                |                  |                  |
|----------------------|----------|------------------|----------------|------------------|------------------|
| Node ID:             | IB_1_OCS |                  | 12_DIA_MANHOLE |                  | Analysis_Point_1 |
| Rim (ft):            | 905.50   | 900.80           | 895.75         |                  |                  |
| Invert (ft):         | 898.50   | 891.00           | 886.40         |                  | 884.00           |
| Min Pipe Cover (ft): | 0.00     |                  | 3.29           |                  |                  |
| Max HGL (ft):        | 903.40   | 900.80           | 895.75         |                  | 889.16           |
| Link ID:             | OCS_Weir | Culvert_1_RCP_72 |                | Culvert_1_CMP_72 |                  |
| Length (ft):         |          | 201.00           |                | 117.00           |                  |
| Dia (in):            | 120.00   | 72.00            |                | 72.00            |                  |
| Slope (ft/ft):       |          | 0.0229           |                | 0.0205           |                  |
| Up Invert (ft):      | 900.80   | 891.00           |                | 886.40           |                  |
| Dn Invert (ft):      | 900.80   | 886.40           |                | 884.00           |                  |
| Max Q (cfs):         | 438.00   | 406.04           |                | 366.52           |                  |
| Max Vel (ft/s):      | 0.00     | 14.36            |                | 13.38            |                  |
| Max Depth (ft):      | 0.00     | 6.00             |                | 5.58             |                  |



Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 10  
    *Junctions* ..... 6  
    *Outfalls* ..... 2  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin ID             | Area   | Peak Rate | Weighted | Total    | Total  | Total   | Peak    | Time of         |
|----------------------------|--------|-----------|----------|----------|--------|---------|---------|-----------------|
|                            |        | Factor    | Curve    | Rainfall | Runoff | Runoff  | Runoff  | Concentration   |
|                            | (ac)   |           | Number   | (in)     | (in)   | (ac-in) | (cfs)   | (days hh:mm:ss) |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00    | 5.60     | 4.57   | 3478.20 | 2785.54 | 0 00:33:17      |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00    | 5.60     | 2.85   | 22.27   | 14.99   | 0 00:45:00      |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00    | 5.60     | 2.85   | 50.55   | 34.04   | 0 00:45:00      |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00    | 5.60     | 2.94   | 111.58  | 75.32   | 0 00:45:00      |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00    | 5.60     | 2.85   | 280.77  | 309.01  | 0 00:20:00      |

Node Summary

| SN | Element<br>ID        | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|----------------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|------------------------------|-------------------------------------------|----------------------------|-----------------------|
|    |                      |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                         | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1  | 12'_DIA_MANHOLE      | Junction        | 886.40              | 895.75                           | 886.40                        | 895.75                 | 0.00           | 435.49         | 895.75                           | 0.00                                  | 0.00                         | 0 12:47                                   | 72.67                      | 101.00                |
| 2  | Ditch_Start_East     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 14.99          | 899.34                           | 0.00                                  | 4.66                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 3  | Ditch_Start_West     | Junction        | 899.00              | 902.00                           | 899.00                        | 902.00                 | 0.00           | 34.04          | 899.55                           | 0.00                                  | 4.45                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 4  | HW_36_East           | Junction        | 892.00              | 895.00                           | 892.00                        | 895.00                 | 0.00           | 18.75          | 895.85                           | 0.00                                  | 1.15                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 5  | HW_36_West           | Junction        | 892.00              | 895.00                           | 892.00                        | 899.00                 | 0.00           | 34.01          | 896.00                           | 0.00                                  | 1.00                         | 0 00:00                                   | 0.00                       | 0.00                  |
| 6  | IB_1_OCS             | Junction        | 891.00              | 900.80                           | 891.00                        | 900.80                 | 0.00           | 438.01         | 900.80                           | 0.00                                  | 0.00                         | 0 13:08                                   | 20.44                      | 60.00                 |
| 7  | Analysis_Point_1     | Outfall         | 884.00              |                                  |                               |                        |                | 366.52         | 889.16                           |                                       |                              |                                           |                            |                       |
| 8  | Analysis_Point_2     | Outfall         | 890.65              |                                  |                               |                        |                | 72.74          | 892.85                           |                                       |                              |                                           |                            |                       |
| 9  | Culvert_2_Inlet      | Storage Node    | 892.00              | 900.00                           | 892.00                        |                        | 8168.00        | 75.24          | 894.84                           |                                       |                              |                                           | 0.00                       | 0.00                  |
| 10 | Infiltration_Basin_1 | Storage Node    | 898.50              | 905.50                           | 898.50                        |                        | 1512370.00     | 3024.00        | 903.40                           |                                       |                              |                                           | 0.00                       | 0.00                  |

Link Summary

| SN Element<br>ID   | Element<br>Type | From<br>(Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Elevation | Average<br>Slope | Diameter or<br>Height | Manning's<br>Roughness | Peak<br>Flow | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time Reported<br>Surcharged | Reported<br>Condition |
|--------------------|-----------------|-------------------------|---------------------|--------|------------------------------|-------------------------------|------------------|-----------------------|------------------------|--------------|-------------------------|------------------------------------|-----------------------|--------------------|---------------------------------------------|-----------------------------------|-----------------------|
|                    |                 |                         |                     | (ft)   | (ft)                         | (ft)                          | (%)              | (in)                  |                        | (cfs)        | (cfs)                   |                                    | (ft/sec)              | (ft)               |                                             | (min)                             |                       |
| 1 36_East          | Pipe            | HW_36_East              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 19.57        | 126.55                  | 0.15                               | 9.96                  | 3.00               | 1.00                                        | 127.00                            | SURCHARGED            |
| 2 36_West          | Pipe            | HW_36_West              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 48.36        | 126.55                  | 0.38                               | 11.43                 | 3.00               | 1.00                                        | 128.00                            | SURCHARGED            |
| 3 Culvert_1_CMP_72 | Pipe            | 12'_DIA_MANHOLE         | Analysis_Point_1    | 117.00 | 886.40                       | 884.00                        | 2.0500           | 72.000                | 0.0260                 | 366.52       | 303.28                  | 1.21                               | 13.38                 | 5.58               | 0.93                                        | 0.00                              | > CAPACITY            |
| 4 Culvert_1_RCP_72 | Pipe            | IB_1_OCS                | 12'_DIA_MANHOLE     | 201.00 | 891.00                       | 886.40                        | 2.2900           | 72.000                | 0.0130                 | 406.04       | 640.68                  | 0.63                               | 14.36                 | 6.00               | 1.00                                        | 152.00                            | SURCHARGED            |
| 5 Culvert_2        | Pipe            | Culvert_2_Inlet         | Analysis_Point_2    | 111.00 | 892.25                       | 890.65                        | 1.4400           | 72.000                | 0.0260                 | 72.74        | 254.23                  | 0.29                               | 6.92                  | 2.39               | 0.40                                        | 0.00                              | Calculated            |
| 6 Ditch_East       | Channel         | Ditch_Start_East        | HW_36_East          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 14.97        | 2363.82                 | 0.01                               | 2.04                  | 2.05               | 0.41                                        | 0.00                              |                       |
| 7 Ditch_West       | Channel         | Ditch_Start_West        | HW_36_West          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 34.01        | 2363.82                 | 0.01                               | 2.76                  | 2.22               | 0.44                                        | 0.00                              |                       |
| 8 OCS_Weir         | Orifice         | Infiltration_Basin_1    | IB_1_OCS            |        | 898.50                       | 891.00                        |                  | 120.000               |                        | 438.01       |                         |                                    |                       |                    |                                             |                                   |                       |
| 9 IB_1_Spillway    | Weir            | Infiltration_Basin_1    | Culvert_2_Inlet     |        | 898.50                       | 892.00                        |                  |                       |                        | 0.00         |                         |                                    |                       |                    |                                             |                                   |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 761.76    |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 91        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

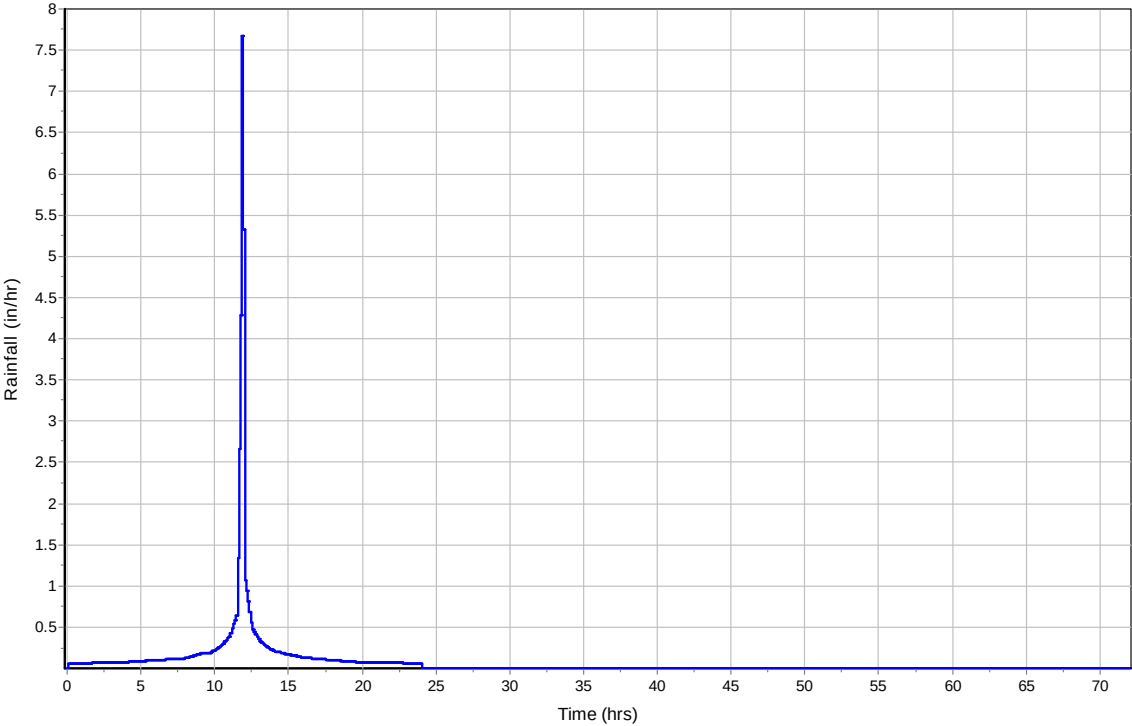
### Subbasin Runoff Results

|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 5.6        |
| Total Runoff (in) .....                     | 4.57       |
| Peak Runoff (cfs) .....                     | 2785.54    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

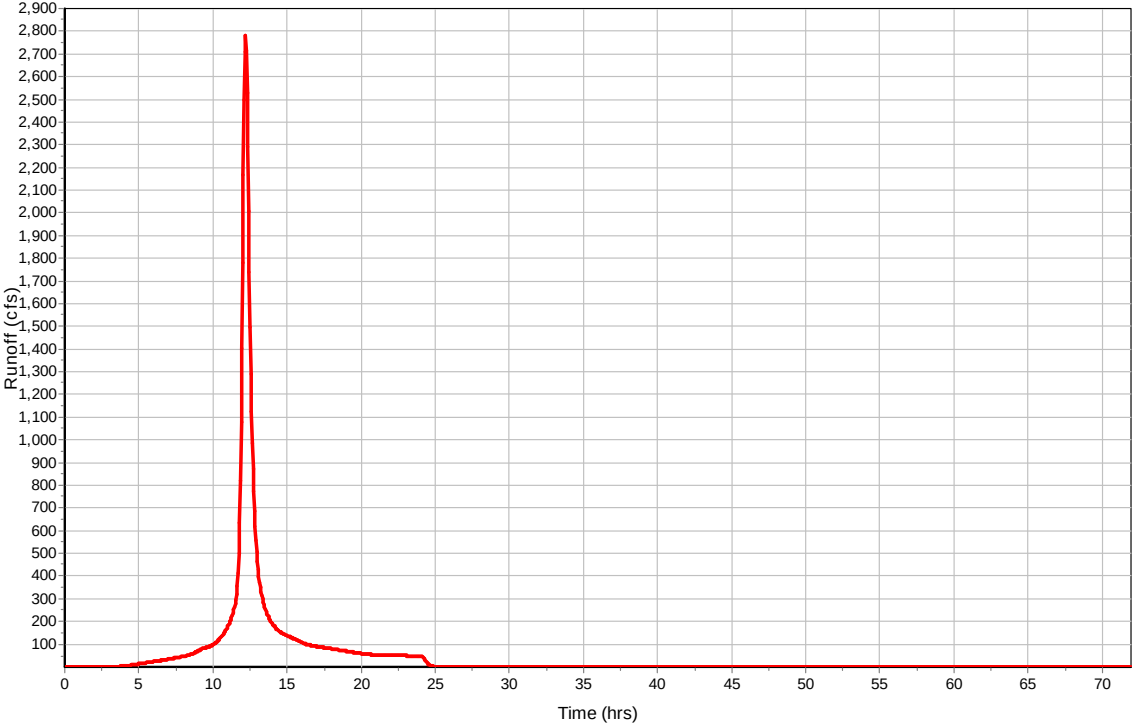


Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr100yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

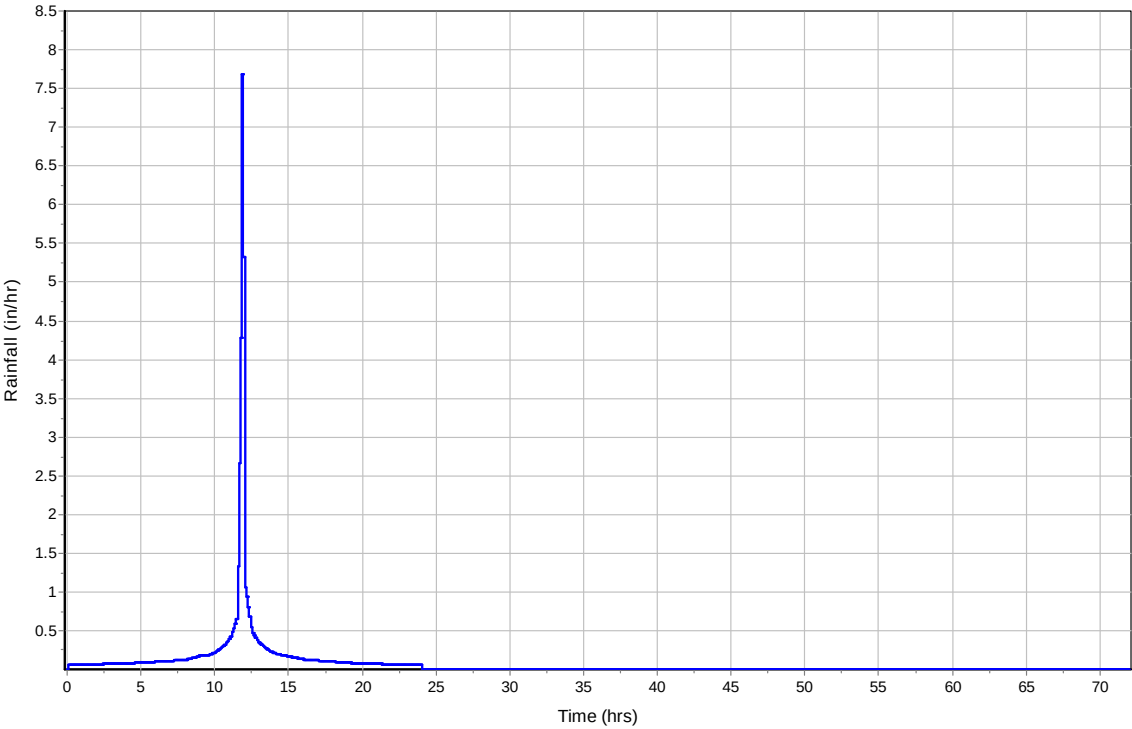
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

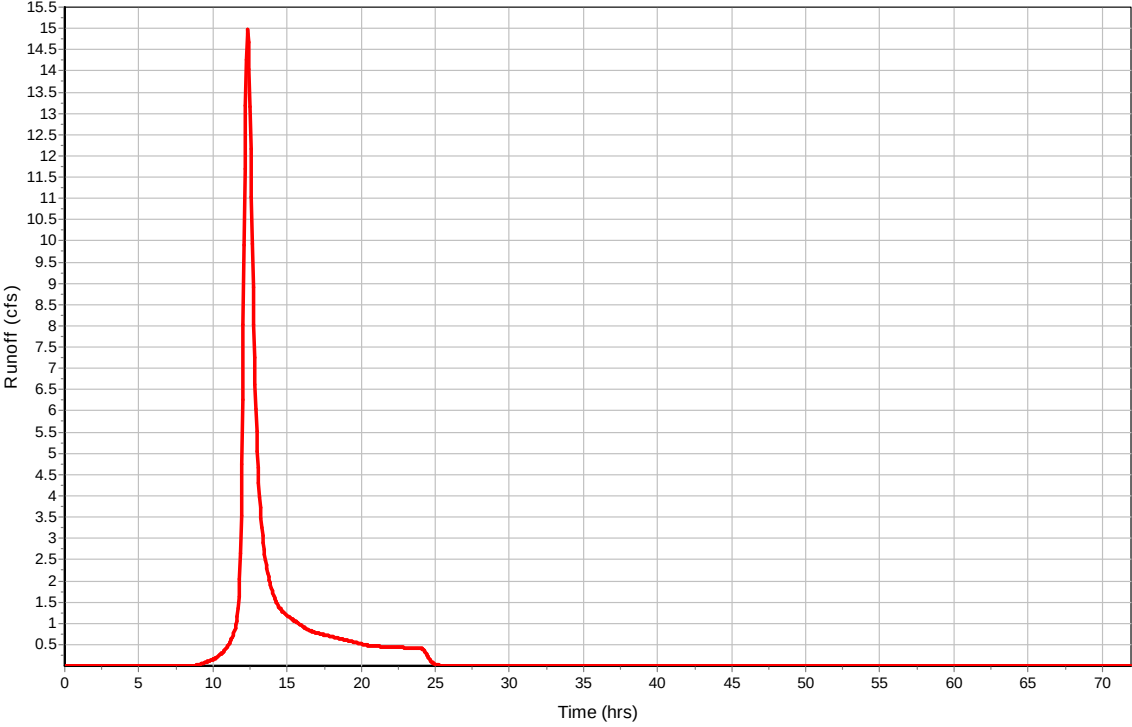
Total Rainfall (in) ..... 5.6  
Total Runoff (in) ..... 2.85  
Peak Runoff (cfs) ..... 14.99  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 17.73     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 74        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

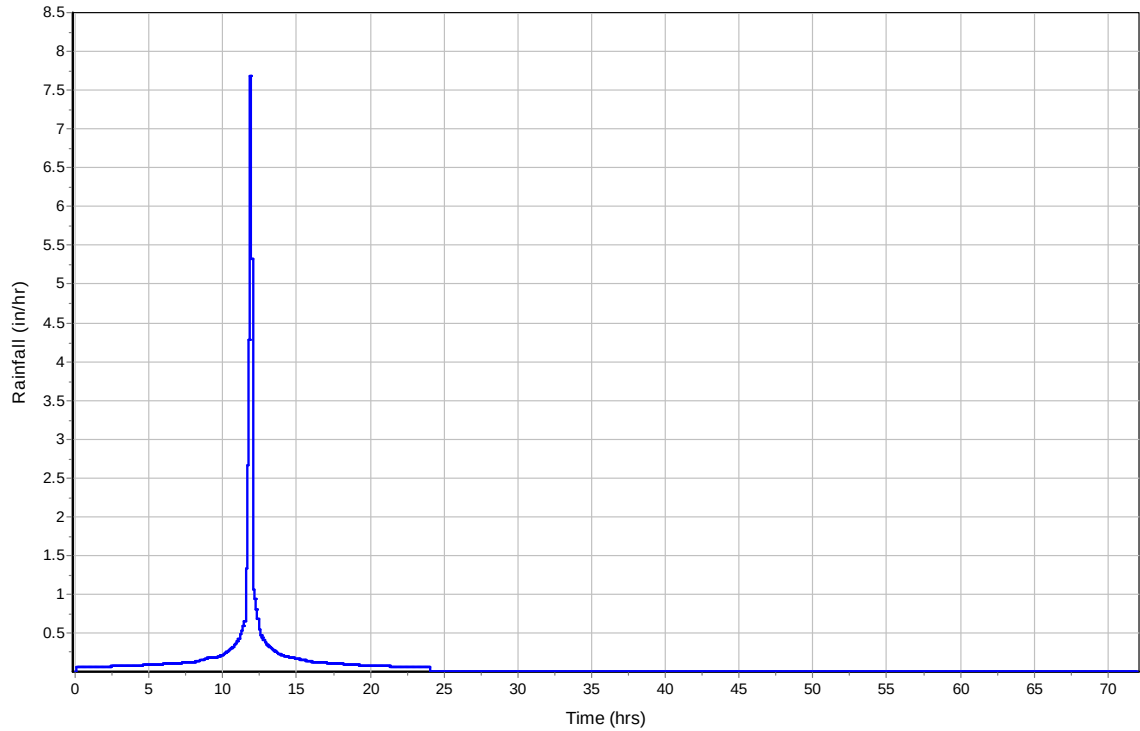
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

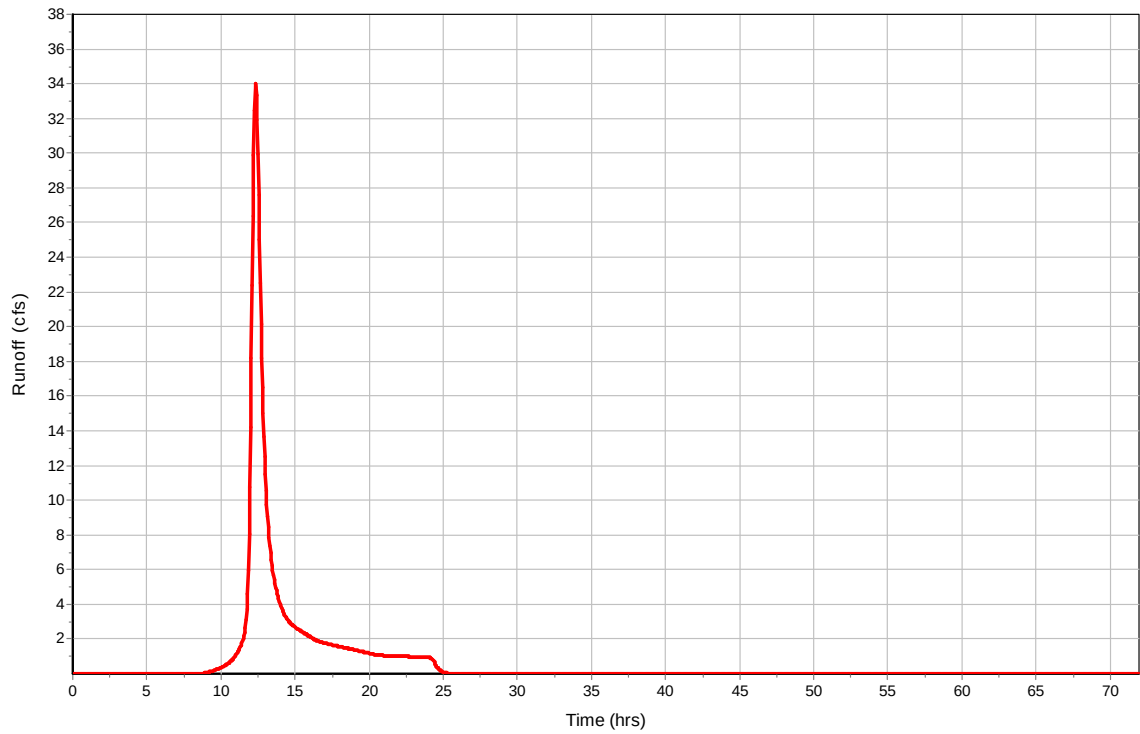
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.85       |
| Peak Runoff (cfs)                     | 34.04      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_2b

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 37.9      |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 75        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

Time of Concentration

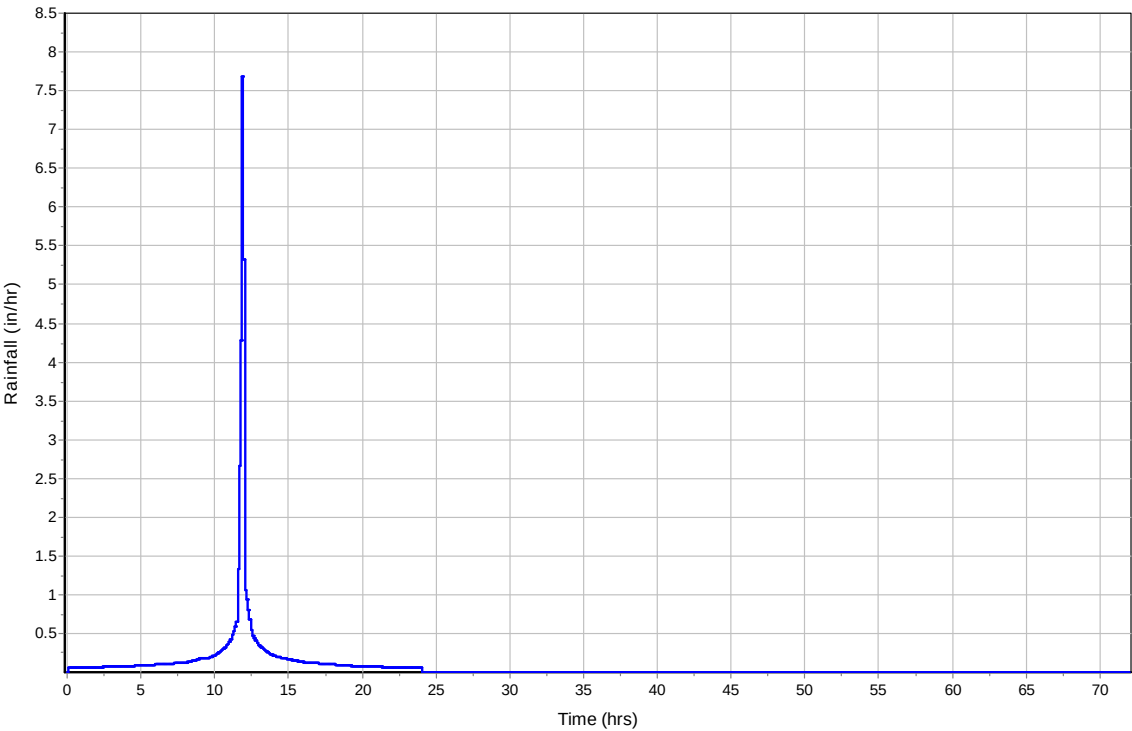
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

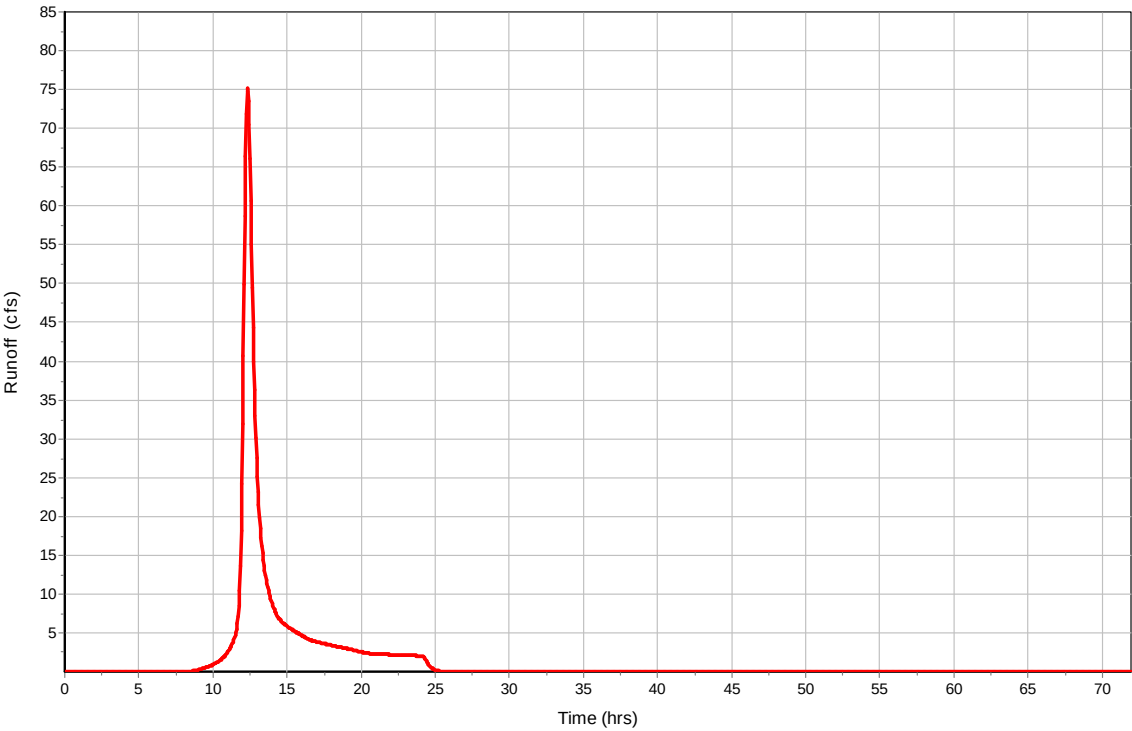
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.94       |
| Peak Runoff (cfs)                     | 75.32      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_2b

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 98.48     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 74        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

Time of Concentration

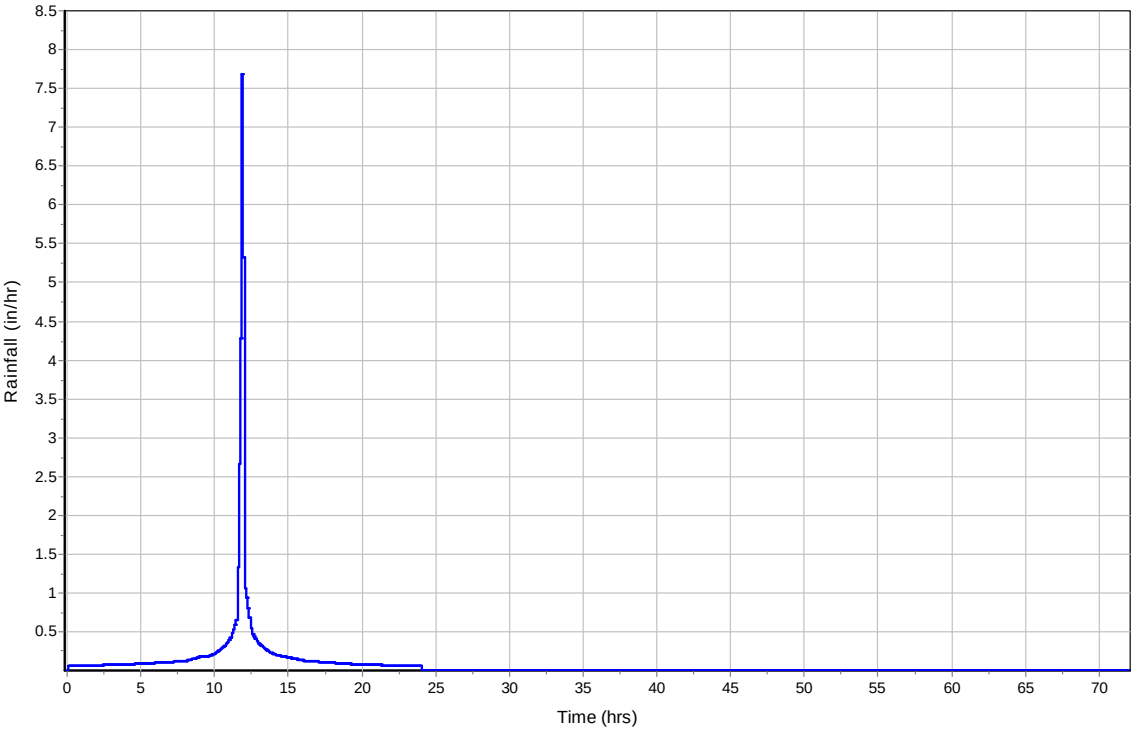
User-Defined TOC override (minutes): 20.00

Subbasin Runoff Results

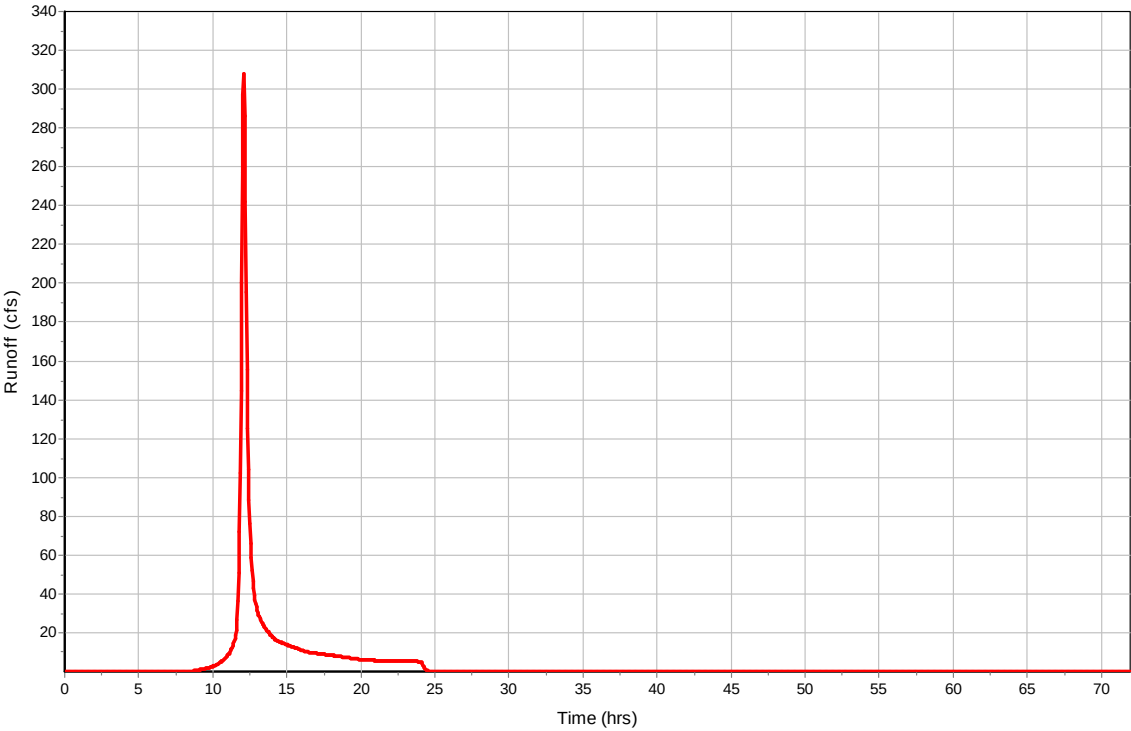
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.85       |
| Peak Runoff (cfs)                     | 309.01     |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |



Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

| SN | Element<br>ID    | Invert<br>Elevation<br><br>(ft) | Ground/Rim<br>(Max)<br>Elevation<br>(ft) | Ground/Rim<br>(Max)<br>Offset<br>(ft) | Initial<br>Water<br>Elevation<br>(ft) | Initial<br>Water<br>Depth<br>(ft) | Surcharge<br>Elevation<br>(ft) | Surcharge<br>Depth<br>(ft) | Ponded<br>Area<br>(ft²) | Minimum<br>Pipe<br>Cover<br>(in) |
|----|------------------|---------------------------------|------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------|--------------------------------|----------------------------|-------------------------|----------------------------------|
| 1  | 12" DIA MANHOLE  | 886.40                          | 895.75                                   | 9.35                                  | 886.40                                | 0.00                              | 895.75                         | 0.00                       | 0.00                    | 0.00                             |
| 2  | Ditch_Start_East | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 3  | Ditch_Start_West | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 4  | HW_36_East       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 895.00                         | 0.00                       | 0.00                    | 0.00                             |
| 5  | HW_36_West       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 899.00                         | 4.00                       | 0.00                    | 0.00                             |
| 6  | IB_1_OCS         | 891.00                          | 900.80                                   | 9.80                                  | 891.00                                | 0.00                              | 900.80                         | 0.00                       | 0.00                    | 0.00                             |

Junction Results

| SN Element<br>ID   | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|--------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|                    | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1 12' DIA MANHOLE  | 435.49         | 0.00                      | 895.75                           | 9.35                         | 0.00                                  | 0.00                         | 887.61                               | 1.21                             | 0 12:38                          | 0 12:47                                   | 72.67                      | 101.00                |
| 2 Ditch_Start_East | 14.99          | 14.99                     | 899.34                           | 0.34                         | 0.00                                  | 4.66                         | 899.02                               | 0.02                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3 Ditch_Start_West | 34.04          | 34.04                     | 899.55                           | 0.55                         | 0.00                                  | 4.45                         | 899.03                               | 0.03                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4 HW_36_East       | 18.75          | 0.00                      | 895.85                           | 3.85                         | 0.00                                  | 1.15                         | 892.17                               | 0.17                             | 0 12:40                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5 HW_36_West       | 34.01          | 0.00                      | 896.00                           | 4.00                         | 0.00                                  | 1.00                         | 892.18                               | 0.18                             | 0 12:42                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6 IB_1_OCS         | 438.01         | 0.00                      | 900.80                           | 9.80                         | 0.00                                  | 0.00                         | 891.82                               | 0.82                             | 0 12:46                          | 0 13:08                                   | 20.44                      | 60.00                 |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

Channel Results

| SN | Element ID | Peak Flow | Time of Peak Flow Occurrence | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Travel Time | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Froude Number | Reported Condition |
|----|------------|-----------|------------------------------|----------------------|------------------------------|--------------------|-------------|-----------------|------------------------------------|-----------------------|---------------|--------------------|
|    |            | (cfs)     | (days hh:mm)                 | (cfs)                |                              | (ft/sec)           | (min)       | (ft)            |                                    | (min)                 |               |                    |
| 1  | Ditch_East | 14.97     | 0 12:24                      | 2363.82              | 0.01                         | 2.04               | 2.45        | 2.05            | 0.41                               | 0.00                  |               |                    |
| 2  | Ditch_West | 34.01     | 0 12:24                      | 2363.82              | 0.01                         | 2.76               | 1.81        | 2.22            | 0.44                               | 0.00                  |               |                    |

Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|---------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |               |                       |
| 1 36_East          | 19.57        | 0 12:18                            | 126.55                  | 0.15                               | 9.96                  | 0.09           | 3.00               | 1.00                                        | 127.00                   |               | SURCHARGED            |
| 2 36_West          | 48.36        | 0 12:21                            | 126.55                  | 0.38                               | 11.43                 | 0.08           | 3.00               | 1.00                                        | 128.00                   |               | SURCHARGED            |
| 3 Culvert_1_CMP_72 | 366.52       | 0 12:45                            | 303.28                  | 1.21                               | 13.38                 | 0.15           | 5.58               | 0.93                                        | 0.00                     |               | > CAPACITY            |
| 4 Culvert_1_RCP_72 | 406.04       | 0 12:54                            | 640.68                  | 0.63                               | 14.36                 | 0.23           | 6.00               | 1.00                                        | 152.00                   |               | SURCHARGED            |
| 5 Culvert_2        | 72.74        | 0 12:27                            | 254.23                  | 0.29                               | 6.92                  | 0.27           | 2.39               | 0.40                                        | 0.00                     |               | Calculated            |



Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

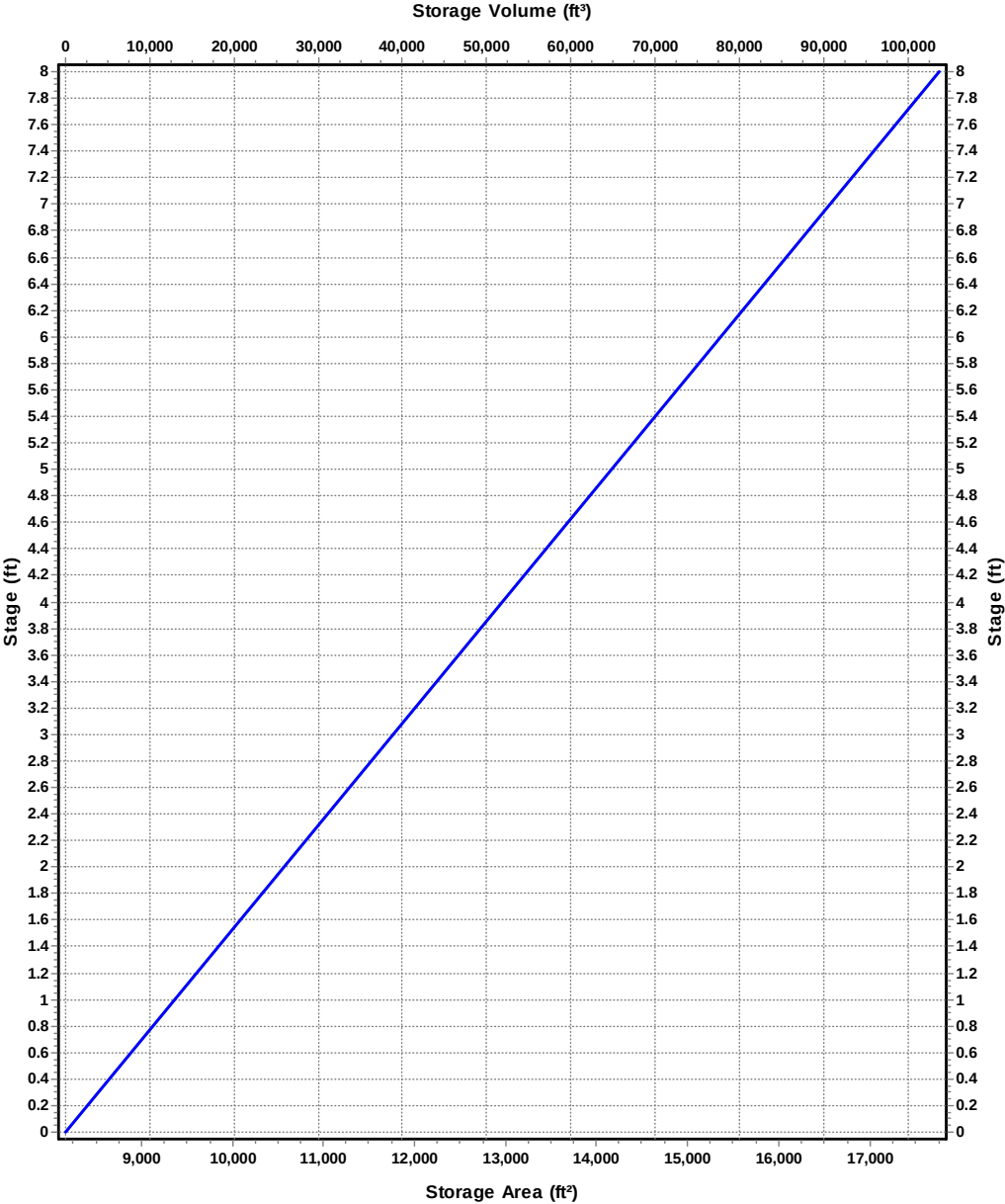
|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 8168         | 0              |
| 8     | 17763        | 103724         |

Storage Area Volume Curves



## Storage Node : Culvert\_2\_Inlet (continued)

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 75.24   |
| Peak Lateral Inflow (cfs) .....               | 75.24   |
| Peak Outflow (cfs) .....                      | 72.74   |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 894.84  |
| Max HGL Depth Attained (ft) .....             | 2.84    |
| Average HGL Elevation Attained (ft) .....     | 892.36  |
| Average HGL Depth Attained (ft) .....         | 0.36    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:28 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

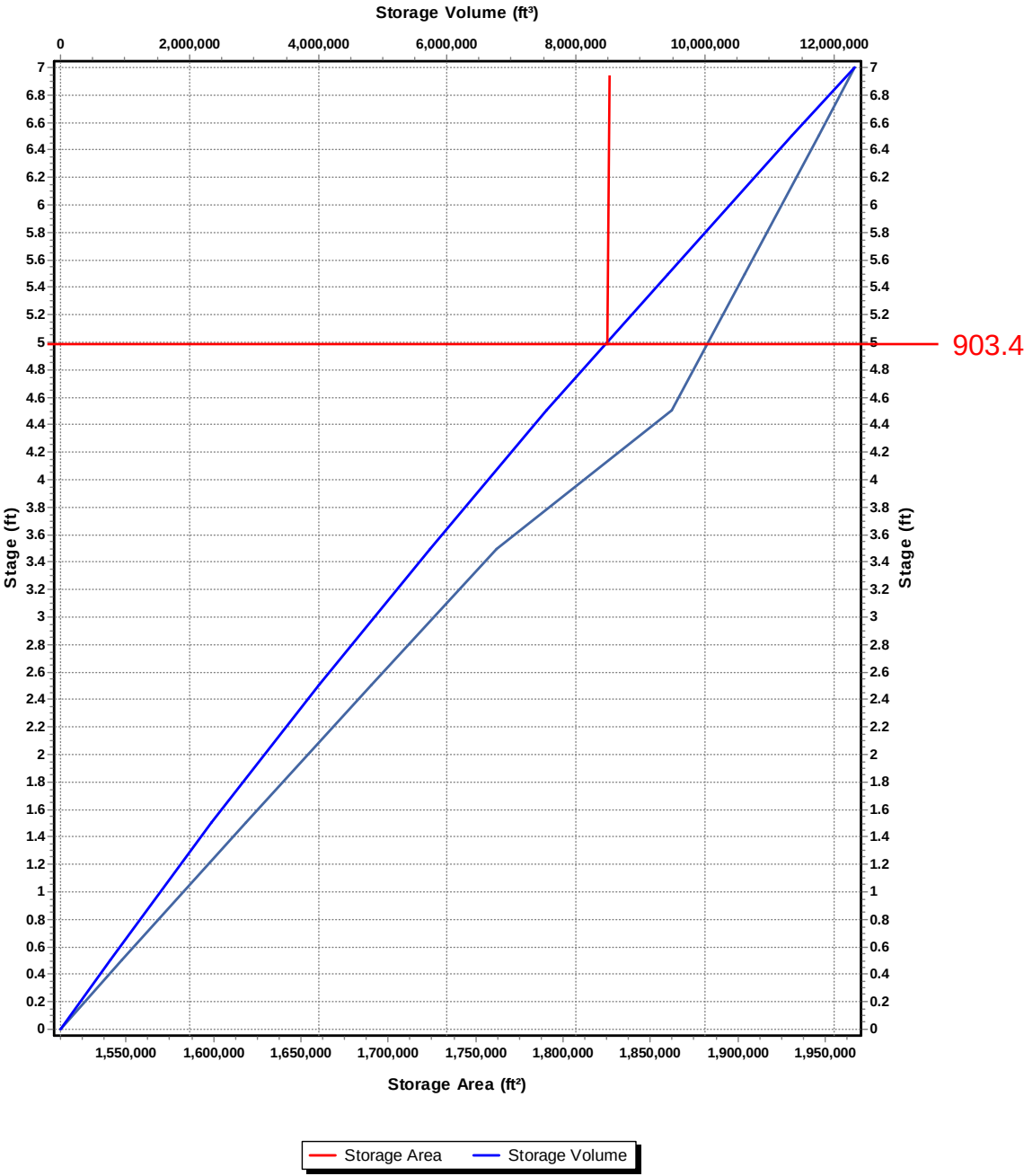
|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 898.50     |
| Initial Water Depth (ft)     | 0.00       |
| Ponded Area (ft²)            | 1512370.00 |
| Evaporation Loss             | 0.00       |

Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |

Storage Area Volume Curves



Storage Node : Infiltration\_Basin\_1 (continued)

Outflow Weirs

| SN | Element ID    | Weir Type   | Flap Gate | Crest Elevation (ft) | Crest Offset (ft) | Length (ft) | Weir Total Height (ft) | Discharge Coefficient |
|----|---------------|-------------|-----------|----------------------|-------------------|-------------|------------------------|-----------------------|
| 1  | IB_1_Spillway | Trapezoidal | No        | 904.00               | 5.50              | 350.00      | 1.50                   | 3.40                  |

Outflow Orifices

| SN | Element ID | Orifice Type | Orifice Shape | Flap Gate | Circular Orifice Diameter (in) | Rectangular Orifice Height (in) | Rectangular Orifice Width (in) | Orifice Invert Elevation (ft) | Orifice Coefficient |
|----|------------|--------------|---------------|-----------|--------------------------------|---------------------------------|--------------------------------|-------------------------------|---------------------|
| 1  | OCS_Weir   | Bottom       | CIRCULAR      | No        | 120.00                         |                                 |                                | 900.80                        | 0.61                |

Output Summary Results

|                                         |         |
|-----------------------------------------|---------|
| Peak Inflow (cfs)                       | 3024    |
| Peak Lateral Inflow (cfs)               | 3024    |
| Peak Outflow (cfs)                      | 438.01  |
| Peak Exfiltration Flow Rate (cfm)       | 0       |
| Max HGL Elevation Attained (ft)         | 903.4   |
| Max HGL Depth Attained (ft)             | 4.9     |
| Average HGL Elevation Attained (ft)     | 900.8   |
| Average HGL Depth Attained (ft)         | 2.3     |
| Time of Max HGL Occurrence (days hh:mm) | 0 13:08 |
| Total Exfiltration Volume (1000-ft³)    | 0       |
| Total Flooded Volume (ac-in)            | 0       |
| Total Time Flooded (min)                | 0       |
| Total Retention Time (sec)              | 0       |



## **Appendix C.**

### **Autodesk Storm and Sanitary Analysis – Stormwater Conveyance**

10-year Storm Event Analysis

| SN | Phase 1<br>Deep<br>Stormwater | Element<br>ID | From (Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Inlet<br>Invert<br>Offset | Outlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Offset | Total<br>Drop | Average<br>Slope | Pipe<br>Shape | Pipe<br>Diameter<br>or Height | Pipe<br>Width | Manning's<br>Roughness | Peak<br>Flow | Time of<br>Peak<br>Flow<br>Occurrence | Max<br>Flow<br>Velocity | Travel<br>Time | Design<br>Flow<br>Capacity | Max Flow /<br>Design Flow<br>Ratio | Max<br>Flow Depth /<br>Total Depth<br>Ratio | Total<br>Time<br>Surcharged | Max<br>Flow<br>Depth | Reported<br>Condition |
|----|-------------------------------|---------------|----------------------|---------------------|--------|------------------------------|---------------------------|-------------------------------|----------------------------|---------------|------------------|---------------|-------------------------------|---------------|------------------------|--------------|---------------------------------------|-------------------------|----------------|----------------------------|------------------------------------|---------------------------------------------|-----------------------------|----------------------|-----------------------|
|    | Yes/No                        |               |                      |                     | (ft)   | (ft)                         | (ft)                      | (ft)                          | (ft)                       | (ft)          | (%)              |               | (inches)                      | (inches)      |                        | (cfs)        | (days hh:mm)                          | (ft/sec)                | (min)          | (cfs)                      |                                    |                                             | (min)                       | (ft)                 |                       |
| 1  |                               | Link-01       | OCS                  | ST-1                | 201.00 | 891.00                       | 3.24                      | 886.40                        | 0.71                       | 4.60          | 2.2900           | CIRCULAR      | 72.000                        | 72.00         | 0.0130                 | 104.90       | 0 14:36                               | 11.50                   | 0.29           | 640.68                     | 0.16                               | 0.36                                        | 0.00                        | 2.15                 | Calculated            |
| 2  |                               | Link-02       | ST-1                 | Analysis_Point_1    | 115.00 | 886.40                       | 0.71                      | 884.00                        | 0.00                       | 2.40          | 2.0900           | CIRCULAR      | 72.000                        | 72.00         | 0.0130                 | 105.19       | 0 14:36                               | 12.75                   | 0.15           | 611.81                     | 0.17                               | 0.33                                        | 0.00                        | 2.00                 | Calculated            |
| 3  | Yes                           | Link-105      | MH-F05-03            | MH-F06-01           | 268.53 | 910.05                       | 0.00                      | 909.40                        | 0.50                       | 0.65          | 0.2400           | CIRCULAR      | 36.000                        | 36.00         | 0.0130                 | 13.31        | 0 12:05                               | 3.47                    | 1.29           | 32.82                      | 0.41                               | 0.67                                        | 0.00                        | 1.96                 | Calculated            |
| 4  | Yes                           | Link-106      | MH-F06-01            | MH-F06-02           | 273.87 | 908.90                       | 0.00                      | 908.35                        | 0.50                       | 0.55          | 0.2000           | CIRCULAR      | 42.000                        | 42.00         | 0.0130                 | 25.61        | 0 12:06                               | 4.02                    | 1.14           | 45.09                      | 0.57                               | 0.82                                        | 0.00                        | 2.81                 | Calculated            |
| 5  | Yes                           | Link-107      | MH-F05-02            | MH-F05-01           | 266.56 | 910.75                       | 0.00                      | 910.22                        | 0.00                       | 0.53          | 0.2000           | CIRCULAR      | 42.000                        | 42.00         | 0.0130                 | 13.75        | 0 12:05                               | 2.33                    | 1.91           | 44.86                      | 0.31                               | 0.69                                        | 0.00                        | 2.38                 | Calculated            |
| 6  | Yes                           | Link-108      | MH-F05-01            | CB-F04-03           | 388.00 | 910.22                       | 0.00                      | 909.44                        | 0.50                       | 0.78          | 0.2000           | CIRCULAR      | 48.000                        | 48.00         | 0.0130                 | 31.52        | 0 12:06                               | 4.29                    | 1.51           | 64.40                      | 0.49                               | 0.72                                        | 0.00                        | 2.85                 | Calculated            |
| 7  |                               | Link-109      | CB-G08-01            | CB-G08-02           | 275.86 | 904.66                       | 0.00                      | 904.38                        | 0.00                       | 0.28          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 97.26        | 0 12:13                               | 3.55                    | 1.30           | 220.49                     | 0.44                               | 0.79                                        | 0.00                        | 5.52                 | Calculated            |
| 8  |                               | Link-110      | CB-G07-02            | CB-G07-03           | 275.30 | 905.21                       | 0.00                      | 904.93                        | 0.00                       | 0.28          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 93.16        | 0 12:10                               | 3.64                    | 1.26           | 220.71                     | 0.42                               | 0.76                                        | 0.00                        | 5.32                 | Calculated            |
| 9  |                               | Link-111      | CB-G06-02            | CB-G06-03           | 275.02 | 907.60                       | 0.00                      | 907.32                        | 0.00                       | 0.28          | 0.1000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 59.07        | 0 12:10                               | 3.48                    | 1.32           | 146.39                     | 0.40                               | 0.61                                        | 0.00                        | 3.65                 | Calculated            |
| 10 |                               | Link-112      | CB-G05-02            | CB-G05-03           | 274.46 | 909.47                       | 0.00                      | 908.92                        | 0.50                       | 0.55          | 0.2000           | CIRCULAR      | 54.000                        | 54.00         | 0.0120                 | 18.71        | 0 12:05                               | 3.63                    | 1.26           | 95.37                      | 0.20                               | 0.52                                        | 0.00                        | 2.33                 | Calculated            |
| 11 |                               | Link-113      | CB-G05-03            | CB-G06-01           | 275.02 | 908.42                       | 0.00                      | 907.87                        | 0.00                       | 0.55          | 0.2000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 23.89        | 0 12:10                               | 2.26                    | 2.03           | 126.18                     | 0.19                               | 0.67                                        | 0.00                        | 3.30                 | Calculated            |
| 12 |                               | Link-114      | CB-G05-01            | CB-F05-25           | 252.14 | 911.36                       | 0.00                      | 910.86                        | 0.00                       | 0.50          | 0.2000           | CIRCULAR      | 30.000                        | 30.00         | 0.0130                 | 9.01         | 0 12:14                               | 2.65                    | 1.59           | 18.27                      | 0.49                               | 0.79                                        | 0.00                        | 1.95                 | Calculated            |
| 13 |                               | Link-115      | CB-F05-25            | MH-F05-01           | 137.38 | 910.86                       | 0.00                      | 910.59                        | 0.37                       | 0.27          | 0.2000           | CIRCULAR      | 30.000                        | 30.00         | 0.0130                 | 10.56        | 0 12:13                               | 3.12                    | 0.73           | 18.18                      | 0.58                               | 0.88                                        | 0.00                        | 2.18                 | Calculated            |
| 14 |                               | Link-116      | CB-G04-11            | CB-G05-01           | 287.56 | 911.93                       | 0.00                      | 911.36                        | 0.00                       | 0.57          | 0.2000           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 3.31         | 0 12:13                               | 1.63                    | 2.94           | 10.07                      | 0.33                               | 0.78                                        | 0.00                        | 1.54                 | Calculated            |
| 15 |                               | Link-118      | CB-F05-26            | MH-F05-03           | 130.99 | 911.45                       | 0.00                      | 911.05                        | 1.00                       | 0.40          | 0.3100           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 3.53         | 0 12:10                               | 3.40                    | 0.64           | 12.50                      | 0.28                               | 0.39                                        | 0.00                        | 0.78                 | Calculated            |
| 16 |                               | Link-119      | CB-F06-27            | MH-F06-01           | 145.71 | 911.00                       | 0.00                      | 910.50                        | 1.60                       | 0.50          | 0.3400           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 3.51         | 0 12:10                               | 3.55                    | 0.68           | 6.15                       | 0.57                               | 0.68                                        | 0.00                        | 1.01                 | Calculated            |
| 17 |                               | Link-120      | CB-F07-26            | MH-F07-01           | 86.57  | 913.50                       | 0.00                      | 912.50                        | 5.75                       | 1.00          | 1.1600           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 3.84         | 0 12:05                               | 4.84                    | 0.30           | 9.78                       | 0.39                               | 0.46                                        | 0.00                        | 0.69                 | Calculated            |
| 18 |                               | Link-156      | MH-09-02             | MH-H09-01           | 371.00 | 904.84                       | 0.00                      | 904.10                        | 0.00                       | 0.74          | 0.2000           | Rectangular   | 84.000                        | 96.00         | 0.0120                 | 263.38       | 0 12:19                               | 5.81                    | 1.06           | 469.53                     | 0.56                               | 0.87                                        | 0.00                        | 6.05                 | Calculated            |
| 19 |                               | Link-157      | MH-09-01             | MH-09-02            | 628.61 | 905.70                       | 0.00                      | 904.84                        | 0.00                       | 0.86          | 0.1400           | Rectangular   | 84.000                        | 96.00         | 0.0120                 | 261.56       | 0 12:18                               | 5.59                    | 1.87           | 388.86                     | 0.67                               | 0.86                                        | 0.00                        | 6.01                 | Calculated            |
| 20 | Yes                           | Link-161      | CB-E05-01            | CB-E04-03           | 200.50 | 906.67                       | 0.00                      | 906.27                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 48.000                        | 48.00         | 0.0130                 | 45.99        | 0 12:06                               | 4.16                    | 0.80           | 64.16                      | 0.72                               | 0.88                                        | 0.00                        | 3.48                 | Calculated            |
| 21 |                               | Link-164      | CB-J02-04            | CB-J02-03           | 84.71  | 907.00                       | 0.00                      | 906.80                        | 0.00                       | 0.20          | 0.2400           | Rectangular   | 48.000                        | 120.00        | 0.0120                 | 226.87       | 0 12:15                               | 5.67                    | 0.25           | 305.29                     | 0.74                               | 1.00                                        | 41.00                       | 4.00                 | SURCHARGED            |
| 22 |                               | Link-165      | CB-J02-03            | CB-J02-01           | 73.84  | 906.80                       | 0.00                      | 906.60                        | 0.00                       | 0.20          | 0.2700           | Rectangular   | 48.000                        | 120.00        | 0.0120                 | 233.95       | 0 12:15                               | 5.85                    | 0.21           | 326.99                     | 0.72                               | 1.00                                        | 42.00                       | 4.00                 | SURCHARGED            |
| 23 |                               | Link-166      | CB-J02-01            | MH-J02-01           | 37.76  | 906.60                       | 0.00                      | 906.47                        | 0.00                       | 0.13          | 0.3400           | Rectangular   | 48.000                        | 120.00        | 0.0120                 | 304.67       | 0 12:14                               | 7.62                    | 0.08           | 368.66                     | 0.83                               | 1.00                                        | 41.00                       | 4.00                 | SURCHARGED            |
| 24 |                               | Link-170      | MH-H01-02            | MH-H01-01           | 499.68 | 905.77                       | 0.00                      | 905.27                        | 0.00                       | 0.50          | 0.1000           | Rectangular   | 84.000                        | 108.00        | 0.0120                 | 313.15       | 0 12:15                               | 6.19                    | 1.35           | 387.65                     | 0.81                               | 0.80                                        | 0.00                        | 5.62                 | Calculated            |
| 25 |                               | Link-171      | CB-E08-26            | CB-E08-04           | 125.64 | 911.00                       | 0.00                      | 910.00                        | 8.87                       | 1.00          | 0.8000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 7.50         | 0 12:05                               | 5.37                    | 0.39           | 9.37                       | 0.80                               | 0.74                                        | 0.00                        | 1.10                 | Calculated            |
| 26 |                               | Link-172      | CB-E08-17            | CB-E08-03           | 122.47 | 911.00                       | 0.00                      | 910.00                        | 8.15                       | 1.00          | 0.8200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.75         | 0 12:05                               | 5.36                    | 0.38           | 9.49                       | 0.71                               | 0.67                                        | 0.00                        | 1.00                 | Calculated            |
| 27 |                               | Link-173      | CB-E08-12            | CB-E08-02           | 122.88 | 911.00                       | 0.00                      | 910.00                        | 7.75                       | 1.00          | 0.8100           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 5.36         | 0 12:05                               | 5.11                    | 0.40           | 9.48                       | 0.57                               | 0.57                                        | 0.00                        | 0.86                 | Calculated            |
| 28 |                               | Link-174      | CB-E08-07            | CB-E08-01           | 123.48 | 911.00                       | 0.00                      | 910.00                        | 7.35                       | 1.00          | 0.8100           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 5.71         | 0 12:05                               | 5.17                    | 0.40           | 9.45                       | 0.60                               | 0.60                                        | 0.00                        | 0.90                 | Calculated            |
| 29 |                               | Link-175      | CB-E07-25            | CB-E07-05           | 125.16 | 911.00                       | 0.00                      | 910.00                        | 6.45                       | 1.00          | 0.8000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 9.33         | 0 00:00                               | 6.02                    | 0.35           | 9.39                       | 0.99                               | 0.89                                        | 0.00                        | 0.95                 | Calculated            |
| 30 |                               | Link-176      | CB-E07-20            | CB-E07-04           | 126.11 | 911.00                       | 0.00                      | 910.00                        | 6.05                       | 1.00          | 0.7900           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 6.13         | 0 12:05                               | 4.73                    | 0.44           | 8.11                       | 0.76                               | 0.69                                        | 0.00                        | 1.03                 | Calculated            |
| 31 |                               | Link-177      | CB-E07-15            | CB-E07-03           | 125.51 | 911.00                       | 0.00                      | 910.00                        | 5.65                       | 1.00          | 0.8000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.04         | 0 12:05                               | 5.20                    | 0.40           | 9.38                       | 0.64                               | 0.63                                        | 0.00                        | 0.94                 | Calculated            |
| 32 |                               | Link-178      | CB-E07-10            | CB-E07-02           | 122.66 | 911.00                       | 0.00                      | 910.00                        | 4.65                       | 1.00          | 0.8200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.66         | 0 12:05                               | 5.34                    | 0.38           | 9.48                       | 0.70                               | 0.67                                        | 0.00                        | 0.99                 | Calculated            |
| 33 |                               | Link-180      | CB-E06-13            | CB-E06-02           | 122.04 | 911.00                       | -3.00                     | 910.00                        | 1.93                       | 1.00          | 0.8200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 4.93         | 0 12:05                               | 8.47                    | 0.24           | 19.02                      | 0.26                               | 0.36                                        | 0.00                        | 0.55                 | Calculated            |
| 34 |                               | Link-181      | CB-E06-18            | CB-E06-03           | 122.06 | 911.00                       | -1.50                     | 910.00                        | 2.33                       | 1.00          | 0.8200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.00         | 0 12:05                               | 7.42                    | 0.27           | 15.03                      | 0.40                               | 0.47                                        | 0.00                        | 0.70                 | Calculated            |
| 35 |                               | Link-182      | CB-E06-22            | CB-E06-04           | 125.00 | 911.00                       | 0.00                      | 910.00                        | 2.73                       | 1.00          | 0.8000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.11         | 0 12:05                               | 5.22                    | 0.40           | 9.40                       | 0.65                               | 0.63                                        | 0.00                        | 0.94                 | Calculated            |
| 36 |                               | Link-183      | CB-E06-27            | CB-E07-01           | 132.20 | 911.00                       | 0.00                      | 910.00                        | 4.13                       | 1.00          | 0.7600           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 5.98         | 0 12:05                               | 5.10                    | 0.43           | 9.14                       | 0.65                               | 0.63                                        | 0.00                        | 0.94                 | Calculated            |
| 37 |                               | Link-184      | CB-E05-24            | CB-E05-04           | 125.20 | 911.00                       | -3.00                     | 910.00                        | 1.81                       | 1.00          | 0.8000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.55         | 0 12:05                               | 8.98                    | 0.23           | 18.78                      | 0.35                               | 0.44                                        | 0.00                        | 0.65                 | Calculated            |
| 38 |                               | Link-185      | CB-E05-18            | CB-E05-03           | 121.75 | 911.00                       | -3.00                     | 910.00                        | 2.21                       | 1.00          | 0.8200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.74         | 0 12:05                               | 9.12                    | 0.22           | 19.04                      | 0.35                               | 0.44                                        | 0.00                        | 0.65                 | Calculated            |
| 39 |                               | Link-186      | CB-E05-13            | CB-E05-02           | 121.67 | 911.00                       | -3.00                     | 910.00                        | 2.61                       | 1.00          | 0.8200           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 9.88         | 0 12:05                               | 9.82                    | 0.21           | 41.02                      | 0.24                               | 0.36                                        | 0.00                        | 0.71                 | Calculated            |
| 40 |                               | Link-187      | CB-E05-05            | CB-E05-01           | 119.37 | 911.00                       | -3.00                     | 910.00                        | 3.33                       | 1.00          | 0.8400           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 5.52         | 0 12:05                               | 8.76                    | 0.23           | 19.23                      | 0.29                               | 0.39                                        | 0.00                        | 0.58                 | Calculated            |
| 41 |                               | Link-189      | CB-E08-21            | CB-E08-22           | 39.88  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.79                    | 0.24           | 3.99                       | 0.30                               | 0.54                                        | 0.00                        | 0.54                 | Calculated            |
| 42 |                               | Link-190      | CB-E08-22            | CB-E08-23           | 32.59  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.5300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.24         | 0 12:05                               | 3.62                    | 0.15           | 4.41                       | 0.51                               | 0.73                                        | 0.00                        | 0.73                 | Calculated            |
| 43 |                               | Link-191      | CB-E08-23            | CB-E08-24           | 39.88  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 3.39         | 0 12:05                               | 3.65                    | 0.18           | 7.23                       | 0.47                               | 0.73                                        | 0.00                        | 0.91                 | Calculated            |
| 44 |                               | Link-192      | CB-E08-27            | CB-E08-26           | 39.88  | 915.50                       | 0.00                      | 915.00                        | 4.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 0.68         | 0 12:05                               | 3.51                    | 0.19           | 3.99                       | 0.17                               | 0.30                                        | 0.00                        | 0.30                 | Calculated            |
| 45 |                               | Link-193      | CB-E08-25            | CB-E08-26           | 40.37  | 913.50                       | 0.00                      | 913.00                        | 2.00                       | 0.50          | 1.2400           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 5.65         | 0 12:05                               | 5.57                    | 0.12           | 7.19                       | 0.79                               | 0.77                                        | 0.00                        | 0.96                 | Calculated            |
| 46 |                               | Link-194      | CB-E08-24            | CB-E08-25           | 39.40  | 914.00                       | 0.00                      | 913.50                        | 0.00                       | 0.50          | 1.2700           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 4.47         | 0 12:05                               | 4.05                    | 0.16           | 7.28                       | 0.61                               | 0.84                                        | 0.00                        | 1.05                 | Calculated            |
| 47 |                               | Link-195      | CB-F08-23            | CB-F08-24           | 40.07  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0120                 | 1.15         | 0 12:05                               | 2.61                    | 0.26           | 4.31                       | 0.27                               | 0.61                                        | 0.00                        | 0.60                 | Calculated            |
| 48 |                               | Link-196      | CB-F08-24            | CB-F08-25           | 40.06  |                              |                           |                               |                            |               |                  |               |                               |               |                        |              |                                       |                         |                |                            |                                    |                                             |                             |                      |                       |



10-year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | From (Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Inlet<br>Invert<br>Offset | Outlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Offset | Total<br>Drop | Average<br>Slope | Pipe<br>Shape | Pipe<br>Diameter<br>or Height | Pipe<br>Width | Manning's<br>Roughness | Peak<br>Flow | Time of<br>Peak<br>Flow<br>Occurrence | Max<br>Flow<br>Velocity | Travel<br>Time | Design<br>Flow<br>Capacity | Max Flow /<br>Design Flow<br>Ratio | Max<br>Flow Depth /<br>Total Depth<br>Ratio | Total<br>Time<br>Surcharged | Max<br>Flow<br>Depth | Reported<br>Condition |
|-----|-------------------------------|---------------|----------------------|---------------------|--------|------------------------------|---------------------------|-------------------------------|----------------------------|---------------|------------------|---------------|-------------------------------|---------------|------------------------|--------------|---------------------------------------|-------------------------|----------------|----------------------------|------------------------------------|---------------------------------------------|-----------------------------|----------------------|-----------------------|
|     | Yes/No                        |               |                      |                     | (ft)   | (ft)                         | (ft)                      | (ft)                          | (ft)                       | (ft)          | (%)              |               | (inches)                      | (inches)      |                        | (cfs)        | (days hh:mm)                          | (ft/sec)                | (min)          | (cfs)                      |                                    |                                             | (min)                       | (ft)                 |                       |
| 55  |                               | Link-204      | CB-F08-21            | CB-F08-20           | 41.49  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2100           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.23         | 0 12:05                               | 3.29                    | 0.21           | 3.91                       | 0.57                               | 0.82                                        | 0.00                        | 0.82                 | Calculated            |
| 56  |                               | Link-205      | CB-F08-20            | CB-F08-19           | 38.41  | 914.50                       | 0.00                      | 914.00                        | 7.00                       | 0.50          | 1.3000           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.42         | 0 12:05                               | 5.03                    | 0.13           | 4.06                       | 0.84                               | 0.82                                        | 0.00                        | 0.82                 | Calculated            |
| 57  |                               | Link-206      | CB-F08-19            | MH-F08-03           | 61.98  | 911.00                       | 4.00                      | 910.00                        | 6.15                       | 1.00          | 1.6100           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.26         | 0 12:05                               | 6.85                    | 0.15           | 13.34                      | 0.62                               | 0.65                                        | 0.00                        | 0.97                 | Calculated            |
| 58  |                               | Link-207      | CB-F08-18            | CB-F08-19           | 40.46  | 914.50                       | 0.00                      | 914.00                        | 7.00                       | 0.50          | 1.2400           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 3.62         | 0 12:05                               | 5.09                    | 0.13           | 7.18                       | 0.50                               | 0.56                                        | 0.00                        | 0.70                 | Calculated            |
| 59  |                               | Link-208      | CB-F08-09            | CB-F08-10           | 40.46  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.23         | 0 12:04                               | 2.63                    | 0.26           | 3.96                       | 0.31                               | 0.62                                        | 0.00                        | 0.61                 | Calculated            |
| 60  |                               | Link-209      | CB-F08-10            | CB-F08-11           | 39.75  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.41         | 0 12:05                               | 3.38                    | 0.20           | 4.00                       | 0.60                               | 0.91                                        | 0.00                        | 0.91                 | Calculated            |
| 61  |                               | Link-210      | CB-F08-11            | CB-F08-12           | 39.75  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.59         | 0 12:05                               | 5.29                    | 0.13           | 4.00                       | 0.90                               | 0.84                                        | 0.00                        | 0.84                 | Calculated            |
| 62  |                               | Link-211      | CB-F08-15            | CB-F08-14           | 40.35  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.61                    | 0.26           | 3.97                       | 0.30                               | 0.57                                        | 0.00                        | 0.57                 | Calculated            |
| 63  |                               | Link-212      | CB-F08-14            | CB-F08-13           | 40.11  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.44         | 0 12:05                               | 3.61                    | 0.19           | 3.98                       | 0.61                               | 0.80                                        | 0.00                        | 0.80                 | Calculated            |
| 64  |                               | Link-213      | CB-F08-13            | CB-F08-12           | 43.98  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.1400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.11         | 0 12:05                               | 4.80                    | 0.15           | 3.80                       | 0.82                               | 0.77                                        | 0.00                        | 0.77                 | Calculated            |
| 65  |                               | Link-214      | CB-F08-12            | MH-F08-02           | 61.83  | 911.00                       | -3.00                     | 910.00                        | 5.59                       | 1.00          | 1.6200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 7.89         | 0 12:05                               | 11.51                   | 0.09           | 26.72                      | 0.30                               | 0.41                                        | 0.00                        | 0.62                 | Calculated            |
| 66  |                               | Link-215      | CB-F07-23            | CB-F07-24           | 40.43  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.20         | 0 12:05                               | 2.60                    | 0.26           | 3.96                       | 0.30                               | 0.79                                        | 0.00                        | 0.78                 | Calculated            |
| 67  |                               | Link-216      | CB-F07-24            | CB-F07-25           | 40.03  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.19                    | 0.21           | 3.98                       | 0.60                               | 1.00                                        | 1.00                        | 1.00                 | SURCHARGED            |
| 68  |                               | Link-217      | CB-F07-25            | CB-F08-05           | 44.84  | 914.50                       | 0.00                      | 914.00                        | 5.50                       | 0.50          | 1.1200           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.69         | 0 12:05                               | 4.95                    | 0.15           | 3.76                       | 0.98                               | 0.90                                        | 0.00                        | 0.90                 | Calculated            |
| 69  |                               | Link-218      | CB-F08-05            | MH-F08-01           | 61.33  | 911.00                       | 2.50                      | 910.00                        | 5.04                       | 1.00          | 1.6300           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.50         | 0 12:05                               | 6.90                    | 0.15           | 13.41                      | 0.63                               | 0.66                                        | 0.00                        | 0.98                 | Calculated            |
| 70  |                               | Link-219      | CB-F08-08            | CB-F08-07           | 40.83  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2200           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.22         | 0 12:05                               | 2.64                    | 0.26           | 3.94                       | 0.31                               | 0.67                                        | 0.00                        | 0.66                 | Calculated            |
| 71  |                               | Link-220      | CB-F08-07            | CB-F08-06           | 38.43  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.3000           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.42         | 0 12:05                               | 3.35                    | 0.19           | 4.06                       | 0.60                               | 0.94                                        | 0.00                        | 0.94                 | Calculated            |
| 72  |                               | Link-221      | CB-F08-06            | CB-F08-05           | 40.48  | 914.50                       | 0.00                      | 914.00                        | 5.50                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.61         | 0 12:05                               | 4.95                    | 0.14           | 3.96                       | 0.91                               | 0.88                                        | 0.00                        | 0.87                 | Calculated            |
| 73  |                               | Link-222      | CB-F07-16            | CB-F07-17           | 40.24  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.19         | 0 12:05                               | 2.61                    | 0.26           | 3.97                       | 0.30                               | 0.68                                        | 0.00                        | 0.67                 | Calculated            |
| 74  |                               | Link-223      | CB-F07-17            | CB-F07-18           | 39.63  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.29                    | 0.20           | 4.00                       | 0.60                               | 0.95                                        | 0.00                        | 0.95                 | Calculated            |
| 75  |                               | Link-224      | CB-F07-18            | CB-F07-19           | 44.44  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.1300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.58         | 0 12:05                               | 5.01                    | 0.15           | 3.78                       | 0.95                               | 0.86                                        | 0.00                        | 0.86                 | Calculated            |
| 76  |                               | Link-225      | CB-F07-22            | CB-F07-21           | 39.93  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.20         | 0 12:05                               | 2.62                    | 0.25           | 3.99                       | 0.30                               | 0.64                                        | 0.00                        | 0.63                 | Calculated            |
| 77  |                               | Link-226      | CB-F07-21            | CB-F07-20           | 39.64  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.34                    | 0.20           | 4.00                       | 0.60                               | 0.93                                        | 0.00                        | 0.92                 | Calculated            |
| 78  |                               | Link-227      | CB-F07-20            | CB-F07-19           | 40.24  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.58         | 0 12:05                               | 5.07                    | 0.13           | 3.97                       | 0.90                               | 0.86                                        | 0.00                        | 0.86                 | Calculated            |
| 79  |                               | Link-228      | CB-F07-19            | MH-F07-03           | 63.62  | 911.00                       | -3.00                     | 910.00                        | 4.49                       | 1.00          | 1.5700           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.49         | 0 12:05                               | 11.60                   | 0.09           | 26.34                      | 0.32                               | 0.43                                        | 0.00                        | 0.65                 | Calculated            |
| 80  |                               | Link-229      | CB-F07-09            | CB-F07-10           | 40.44  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.03         | 0 12:05                               | 2.49                    | 0.27           | 3.96                       | 0.26                               | 0.53                                        | 0.00                        | 0.53                 | Calculated            |
| 81  |                               | Link-230      | CB-F07-10            | CB-F07-11           | 39.63  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.23         | 0 12:05                               | 3.28                    | 0.20           | 4.00                       | 0.56                               | 0.84                                        | 0.00                        | 0.83                 | Calculated            |
| 82  |                               | Link-231      | CB-F07-11            | CB-F07-12           | 40.04  | 914.50                       | 0.00                      | 914.00                        | 5.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.42         | 0 12:05                               | 4.94                    | 0.14           | 3.98                       | 0.86                               | 0.84                                        | 0.00                        | 0.84                 | Calculated            |
| 83  |                               | Link-232      | CB-F07-15            | CB-F07-14           | 40.44  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.60                    | 0.26           | 3.96                       | 0.30                               | 0.59                                        | 0.00                        | 0.58                 | Calculated            |
| 84  |                               | Link-233      | CB-F07-14            | CB-F07-13           | 40.04  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.43         | 0 12:05                               | 3.43                    | 0.19           | 3.98                       | 0.61                               | 0.86                                        | 0.00                        | 0.85                 | Calculated            |
| 85  |                               | Link-234      | CB-F07-13            | CB-F07-12           | 40.04  | 914.50                       | 0.00                      | 914.00                        | 5.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0120                 | 3.61         | 0 12:05                               | 5.26                    | 0.13           | 4.31                       | 0.84                               | 0.83                                        | 0.00                        | 0.82                 | Calculated            |
| 86  |                               | Link-235      | CB-F07-12            | MH-F07-02           | 66.47  | 911.00                       | 2.00                      | 910.00                        | 3.94                       | 1.00          | 1.5000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.25         | 0 12:05                               | 6.71                    | 0.17           | 12.88                      | 0.64                               | 0.66                                        | 0.00                        | 0.98                 | Calculated            |
| 87  |                               | Link-236      | CB-F06-25            | CB-F06-26           | 39.94  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:04                               | 2.61                    | 0.26           | 3.99                       | 0.30                               | 0.61                                        | 0.00                        | 0.60                 | Calculated            |
| 88  |                               | Link-237      | CB-F06-26            | CB-F07-04           | 40.24  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.38         | 0 12:05                               | 3.38                    | 0.20           | 3.97                       | 0.60                               | 0.91                                        | 0.00                        | 0.90                 | Calculated            |
| 89  |                               | Link-238      | CB-F07-04            | CB-F07-05           | 39.64  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.60         | 0 12:06                               | 5.37                    | 0.12           | 4.00                       | 0.90                               | 0.84                                        | 0.00                        | 0.84                 | Calculated            |
| 90  |                               | Link-239      | CB-F07-05            | MH-F07-01           | 61.83  | 911.00                       | -3.00                     | 910.00                        | 3.25                       | 1.00          | 1.6200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 7.96         | 0 12:05                               | 11.53                   | 0.09           | 26.72                      | 0.30                               | 0.45                                        | 0.00                        | 0.63                 | Calculated            |
| 91  |                               | Link-240      | CB-F07-08            | CB-F07-07           | 27.95  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.7900           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 0.86         | 0 12:05                               | 2.41                    | 0.19           | 4.77                       | 0.18                               | 0.47                                        | 0.00                        | 0.47                 | Calculated            |
| 92  |                               | Link-241      | CB-F07-07            | CB-F07-06           | 44.12  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.1300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.01         | 0 12:05                               | 3.16                    | 0.23           | 3.79                       | 0.53                               | 0.76                                        | 0.00                        | 0.76                 | Calculated            |
| 93  |                               | Link-242      | CB-F07-06            | CB-F07-05           | 40.24  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.21         | 0 12:05                               | 5.00                    | 0.13           | 3.97                       | 0.81                               | 0.77                                        | 0.00                        | 0.77                 | Calculated            |
| 94  |                               | Link-243      | CB-F06-18            | CB-F06-19           | 40.05  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.61                    | 0.26           | 3.98                       | 0.30                               | 0.57                                        | 0.00                        | 0.57                 | Calculated            |
| 95  |                               | Link-244      | CB-F06-19            | CB-F06-20           | 40.05  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.44         | 0 12:05                               | 3.77                    | 0.18           | 3.98                       | 0.61                               | 0.77                                        | 0.00                        | 0.77                 | Calculated            |
| 96  |                               | Link-245      | CB-F06-20            | CB-F06-21           | 44.05  | 914.00                       | 0.00                      | 913.50                        | 0.00                       | 0.50          | 1.1400           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 3.65         | 0 12:05                               | 4.74                    | 0.15           | 6.88                       | 0.53                               | 0.61                                        | 0.00                        | 0.76                 | Calculated            |
| 97  |                               | Link-246      | CB-F06-21            | CB-F06-22           | 40.45  | 913.50                       | 0.00                      | 914.00                        | 0.00                       | -0.50         | -1.2400          | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 3.62         | 0 12:05                               | 4.42                    | 0.15           | 11.68                      | 0.31                               | 0.48                                        | 0.00                        | 0.72                 | Calculated            |
| 98  |                               | Link-247      | CB-F06-24            | CB-F06-23           | 40.45  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.65                    | 0.25           | 3.96                       | 0.31                               | 0.56                                        | 0.00                        | 0.56                 | Calculated            |
| 99  |                               | Link-248      | CB-F06-23            | CB-F06-22           | 39.65  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.41         | 0 12:05                               | 4.00                    | 0.17           | 4.00                       | 0.60                               | 0.72                                        | 0.00                        | 0.72                 | Calculated            |
| 100 |                               | Link-249      | CB-F06-21            | MH-F06-03           | 63.11  | 911.00                       | -2.50                     | 910.00                        | 2.70                       | 1.00          | 1.5800           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.61         | 0 12:05                               | 10.98                   | 0.10           | 24.74                      | 0.35                               | 0.56                                        | 0.00                        | 0.79                 | Calculated            |
| 101 |                               | Link-250      | CB-F05-04            | CB-F05-05           | 39.52  | 917.00                       | 0.00                      | 916.50                        | 0.00                       | 0.50          | 1.2700           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 0.68         | 0 12:05                               | 2.04                    | 0.32           | 4.01                       | 0.17                               | 0.44                                        | 0.00                        | 0.44                 | Calculated            |
| 102 |                               | Link-251      | CB-F05-05            | CB-F05-06           | 40.05  | 916.50                       | 0.00                      | 916.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.           |                        |              |                                       |                         |                |                            |                                    |                                             |                             |                      |                       |

10-year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | From (Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Inlet<br>Invert<br>Offset | Outlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Offset | Total<br>Drop | Average<br>Slope | Pipe<br>Shape | Pipe<br>Diameter<br>or Height | Pipe<br>Width | Manning's<br>Roughness | Peak<br>Flow | Time of<br>Peak<br>Flow<br>Occurrence | Max<br>Flow<br>Velocity | Travel<br>Time | Design<br>Flow<br>Capacity | Max Flow /<br>Design Flow<br>Ratio | Max<br>Flow Depth /<br>Total Depth<br>Ratio | Total<br>Time<br>Surcharged | Max<br>Flow<br>Depth | Reported<br>Condition |
|-----|-------------------------------|---------------|----------------------|---------------------|--------|------------------------------|---------------------------|-------------------------------|----------------------------|---------------|------------------|---------------|-------------------------------|---------------|------------------------|--------------|---------------------------------------|-------------------------|----------------|----------------------------|------------------------------------|---------------------------------------------|-----------------------------|----------------------|-----------------------|
|     | Yes/No                        |               |                      |                     | (ft)   | (ft)                         | (ft)                      | (ft)                          | (ft)                       | (ft)          | (%)              |               | (inches)                      | (inches)      |                        | (cfs)        | (days hh:mm)                          | (ft/sec)                | (min)          | (cfs)                      |                                    |                                             | (min)                       | (ft)                 |                       |
| 109 |                               | Link-258      | CB-F05-12            | CB-F05-13           | 32.57  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.5400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.38         | 0 12:05                               | 3.48                    | 0.16           | 4.41                       | 0.54                               | 0.84                                        | 0.00                        | 0.83                 | Calculated            |
| 110 |                               | Link-259      | CB-F05-13            | CB-F05-14           | 40.05  | 915.50                       | 0.00                      | 915.00                        | 1.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.40         | 0 12:05                               | 4.94                    | 0.14           | 3.98                       | 0.85                               | 0.83                                        | 0.00                        | 0.83                 | Calculated            |
| 111 |                               | Link-260      | CB-F05-17            | CB-F05-16           | 40.05  | 916.50                       | 0.00                      | 916.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.20         | 0 12:05                               | 2.60                    | 0.26           | 3.98                       | 0.30                               | 0.66                                        | 0.00                        | 0.65                 | Calculated            |
| 112 |                               | Link-261      | CB-F05-16            | CB-F05-15           | 40.05  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.42         | 0 12:05                               | 3.35                    | 0.20           | 3.98                       | 0.61                               | 0.94                                        | 0.00                        | 0.94                 | Calculated            |
| 113 |                               | Link-262      | CB-F05-15            | CB-F05-14           | 39.52  | 915.50                       | 0.00                      | 915.00                        | 1.00                       | 0.50          | 1.2700           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.61         | 0 12:05                               | 4.98                    | 0.13           | 4.01                       | 0.90                               | 0.87                                        | 0.00                        | 0.87                 | Calculated            |
| 114 |                               | Link-263      | CB-F05-14            | MH-F05-02           | 61.14  | 914.00                       | 0.00                      | 912.25                        | 1.50                       | 1.75          | 2.8600           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 8.20         | 0 12:05                               | 8.37                    | 0.12           | 38.27                      | 0.21                               | 0.35                                        | 0.00                        | 0.70                 | Calculated            |
| 115 |                               | Link-264      | CB-F05-21            | MH-F05-03           | 60.92  | 911.00                       | -3.00                     | 910.00                        | -0.05                      | 1.00          | 1.6400           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.43         | 0 12:05                               | 6.25                    | 0.16           | 26.75                      | 0.32                               | 0.71                                        | 0.00                        | 1.07                 | Calculated            |
| 116 |                               | Link-265      | CB-F05-18            | CB-F05-19           | 40.58  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.61                    | 0.26           | 3.95                       | 0.31                               | 0.58                                        | 0.00                        | 0.58                 | Calculated            |
| 117 |                               | Link-266      | CB-F05-19            | CB-F05-20           | 39.52  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2700           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.40         | 0 12:05                               | 3.38                    | 0.19           | 4.01                       | 0.60                               | 0.86                                        | 0.00                        | 0.86                 | Calculated            |
| 118 |                               | Link-267      | CB-F05-20            | CB-F05-21           | 40.05  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.60         | 0 12:05                               | 5.40                    | 0.12           | 3.98                       | 0.90                               | 0.80                                        | 0.00                        | 0.80                 | Calculated            |
| 119 |                               | Link-268      | CB-F06-04            | CB-F05-24           | 28.84  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.7300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 0.78         | 0 12:05                               | 2.45                    | 0.20           | 4.69                       | 0.17                               | 0.43                                        | 0.00                        | 0.43                 | Calculated            |
| 120 |                               | Link-269      | CB-F05-24            | CB-F05-23           | 38.45  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.3000           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.81         | 0 12:05                               | 3.06                    | 0.21           | 4.06                       | 0.45                               | 0.72                                        | 0.00                        | 0.72                 | Calculated            |
| 121 |                               | Link-270      | CB-F05-23            | CB-F05-22           | 32.57  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.5400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.96         | 0 12:05                               | 3.98                    | 0.14           | 4.41                       | 0.67                               | 0.90                                        | 0.00                        | 0.90                 | Calculated            |
| 122 |                               | Link-271      | CB-F05-22            | CB-F05-21           | 28.31  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.7700           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.81         | 0 12:05                               | 5.78                    | 0.08           | 4.73                       | 0.80                               | 0.79                                        | 0.00                        | 0.79                 | Calculated            |
| 123 |                               | Link-272      | CB-F06-07            | MH-F06-01           | 70.45  | 911.00                       | 0.50                      | 910.00                        | 1.10                       | 1.00          | 1.4200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.58         | 0 12:05                               | 6.45                    | 0.18           | 12.51                      | 0.69                               | 0.91                                        | 0.00                        | 1.31                 | Calculated            |
| 124 |                               | Link-273      | CB-F06-05            | CB-F06-06           | 40.05  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.73                    | 0.24           | 3.98                       | 0.30                               | 0.55                                        | 0.00                        | 0.55                 | Calculated            |
| 125 |                               | Link-274      | CB-F06-06            | CB-F06-07           | 40.05  | 914.50                       | 0.00                      | 914.00                        | 3.50                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.41         | 0 12:05                               | 4.69                    | 0.14           | 3.98                       | 0.61                               | 0.62                                        | 0.00                        | 0.62                 | Calculated            |
| 126 |                               | Link-275      | CB-F06-11            | CB-F06-10           | 43.26  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.1600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.34         | 0 12:05                               | 2.69                    | 0.27           | 3.83                       | 0.35                               | 0.61                                        | 0.00                        | 0.60                 | Calculated            |
| 127 |                               | Link-276      | CB-F06-10            | CB-F06-09           | 40.58  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.56         | 0 12:05                               | 4.01                    | 0.17           | 3.95                       | 0.65                               | 0.76                                        | 0.00                        | 0.76                 | Calculated            |
| 128 |                               | Link-277      | CB-F06-09            | CB-F06-08           | 39.52  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2700           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 3.79         | 0 12:05                               | 3.89                    | 0.17           | 11.82                      | 0.32                               | 0.54                                        | 0.00                        | 0.81                 | Calculated            |
| 129 |                               | Link-278      | CB-F06-08            | CB-F06-07           | 40.05  | 914.50                       | 0.00                      | 914.00                        | 3.50                       | 0.50          | 1.2500           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 4.99         | 0 12:05                               | 5.45                    | 0.12           | 11.74                      | 0.43                               | 0.51                                        | 0.00                        | 0.77                 | Calculated            |
| 130 |                               | Link-279      | CB-F06-14            | MH-F06-02           | 65.23  | 911.00                       | 0.50                      | 910.00                        | 2.15                       | 1.00          | 1.5300           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 7.24         | 0 12:05                               | 6.52                    | 0.17           | 13.01                      | 0.56                               | 0.76                                        | 0.00                        | 1.05                 | Calculated            |
| 131 |                               | Link-280      | CB-F06-12            | CB-F06-13           | 40.05  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.23         | 0 12:05                               | 2.73                    | 0.24           | 3.98                       | 0.31                               | 0.56                                        | 0.00                        | 0.56                 | Calculated            |
| 132 |                               | Link-281      | CB-F06-13            | CB-F06-14           | 40.59  | 914.50                       | 0.00                      | 914.00                        | 3.50                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.46         | 0 12:05                               | 4.69                    | 0.14           | 3.95                       | 0.62                               | 0.63                                        | 0.00                        | 0.63                 | Calculated            |
| 133 |                               | Link-282      | CB-F06-17            | CB-F06-16           | 40.05  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.20         | 0 12:05                               | 2.61                    | 0.26           | 3.98                       | 0.30                               | 0.63                                        | 0.00                        | 0.63                 | Calculated            |
| 134 |                               | Link-283      | CB-F06-16            | CB-F06-15           | 40.05  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.35                    | 0.20           | 3.98                       | 0.60                               | 0.92                                        | 0.00                        | 0.92                 | Calculated            |
| 135 |                               | Link-284      | CB-F06-15            | CB-F06-14           | 38.98  | 914.50                       | 0.00                      | 914.00                        | 3.50                       | 0.50          | 1.2800           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.58         | 0 12:05                               | 5.00                    | 0.13           | 4.04                       | 0.89                               | 0.87                                        | 0.00                        | 0.87                 | Calculated            |
| 136 |                               | Link-286      | CB-E08-20            | CB-E08-19           | 41.10  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2200           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.20         | 0 12:05                               | 2.61                    | 0.26           | 3.93                       | 0.30                               | 0.66                                        | 0.00                        | 0.66                 | Calculated            |
| 137 |                               | Link-287      | CB-E08-19            | CB-E08-18           | 39.49  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2700           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.32                    | 0.20           | 4.01                       | 0.60                               | 0.94                                        | 0.00                        | 0.94                 | Calculated            |
| 138 |                               | Link-288      | CB-E08-15            | CB-E08-16           | 40.20  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.07         | 0 12:05                               | 2.70                    | 0.25           | 3.97                       | 0.27                               | 0.50                                        | 0.00                        | 0.50                 | Calculated            |
| 139 |                               | Link-289      | CB-E08-16            | CB-E08-17           | 39.88  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.11         | 0 12:05                               | 4.57                    | 0.15           | 3.99                       | 0.53                               | 0.57                                        | 0.00                        | 0.57                 | Calculated            |
| 140 |                               | Link-290      | CB-E08-18            | CB-E08-17           | 40.34  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.61         | 0 12:05                               | 4.95                    | 0.14           | 3.97                       | 0.91                               | 0.87                                        | 0.00                        | 0.87                 | Calculated            |
| 141 |                               | Link-291      | CB-E08-10            | CB-E08-11           | 40.52  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.07         | 0 12:05                               | 2.70                    | 0.25           | 3.96                       | 0.27                               | 0.50                                        | 0.00                        | 0.50                 | Calculated            |
| 142 |                               | Link-292      | CB-E08-11            | CB-E08-12           | 40.10  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.11         | 0 12:05                               | 4.56                    | 0.15           | 3.98                       | 0.53                               | 0.57                                        | 0.00                        | 0.57                 | Calculated            |
| 143 |                               | Link-293      | CB-E08-13            | CB-E08-12           | 44.01  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.1400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.22         | 0 12:05                               | 4.49                    | 0.16           | 3.80                       | 0.59                               | 0.60                                        | 0.00                        | 0.60                 | Calculated            |
| 144 |                               | Link-294      | CB-E08-14            | CB-E08-13           | 39.74  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.05         | 0 12:05                               | 2.58                    | 0.26           | 4.00                       | 0.26                               | 0.51                                        | 0.00                        | 0.51                 | Calculated            |
| 145 |                               | Link-295      | CB-E08-05            | CB-E08-06           | 40.21  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.73                    | 0.25           | 3.97                       | 0.30                               | 0.55                                        | 0.00                        | 0.55                 | Calculated            |
| 146 |                               | Link-296      | CB-E08-06            | CB-E08-07           | 40.35  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.41         | 0 12:05                               | 4.68                    | 0.14           | 3.97                       | 0.61                               | 0.62                                        | 0.00                        | 0.62                 | Calculated            |
| 147 |                               | Link-299      | CB-E08-09            | CB-E08-08           | 39.77  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.07         | 0 12:05                               | 2.71                    | 0.24           | 3.99                       | 0.27                               | 0.50                                        | 0.00                        | 0.50                 | Calculated            |
| 148 |                               | Link-300      | CB-E08-08            | CB-E08-07           | 39.19  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2800           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.11         | 0 12:05                               | 4.59                    | 0.14           | 4.02                       | 0.52                               | 0.57                                        | 0.00                        | 0.57                 | Calculated            |
| 149 |                               | Link-301      | CB-E07-23            | CB-E07-24           | 39.78  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.23         | 0 12:05                               | 2.75                    | 0.24           | 3.99                       | 0.31                               | 0.56                                        | 0.00                        | 0.56                 | Calculated            |
| 150 |                               | Link-302      | CB-E07-24            | CB-E07-25           | 39.93  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.44         | 0 12:05                               | 4.71                    | 0.14           | 3.99                       | 0.61                               | 0.63                                        | 0.00                        | 0.63                 | Calculated            |
| 151 |                               | Link-303      | CB-E07-27            | CB-E07-26           | 40.20  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.34         | 0 12:05                               | 2.83                    | 0.24           | 3.97                       | 0.34                               | 0.58                                        | 0.00                        | 0.58                 | Calculated            |
| 152 |                               | Link-304      | CB-E07-26            | CB-E07-25           | 40.04  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.54         | 0 12:05                               | 4.74                    | 0.14           | 3.98                       | 0.64                               | 0.65                                        | 0.00                        | 0.64                 | Calculated            |
| 153 |                               | Link-305      | CB-E07-18            | CB-E07-19           | 40.21  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.73                    | 0.25           | 3.97                       | 0.30                               | 0.55                                        | 0.00                        | 0.55                 | Calculated            |
| 154 |                               | Link-306      | CB-E07-19            | CB-E07-20           | 39.94  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.41         | 0 12:05                               | 4.70                    | 0.14           | 3.99                       | 0.61                               | 0.62                                        | 0.00                        | 0.62                 | Calculated            |
| 155 |                               | Link-307      | CB-E07-22            | CB-E07-21           | 39.77  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.62                    | 0.25           | 3.99                       | 0.30                               | 0.57                                        | 0.00                        | 0.57                 | Calculated            |
| 156 |                               | Link-308      | CB-E07-21            | CB-E07-20           | 44.36  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          |                  |               |                               |               |                        |              |                                       |                         |                |                            |                                    |                                             |                             |                      |                       |

10-year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | From (Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Inlet<br>Invert<br>Offset | Outlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Offset | Total<br>Drop | Average<br>Slope | Pipe<br>Shape | Pipe<br>Diameter<br>or Height | Pipe<br>Width | Manning's<br>Roughness | Peak<br>Flow | Time of<br>Peak<br>Flow<br>Occurrence | Max<br>Flow<br>Velocity | Travel<br>Time | Design<br>Flow<br>Capacity | Max Flow /<br>Design Flow<br>Ratio | Max<br>Flow Depth /<br>Total Depth<br>Ratio | Total<br>Time<br>Surcharged | Max<br>Flow<br>Depth | Reported<br>Condition |
|-----|-------------------------------|---------------|----------------------|---------------------|--------|------------------------------|---------------------------|-------------------------------|----------------------------|---------------|------------------|---------------|-------------------------------|---------------|------------------------|--------------|---------------------------------------|-------------------------|----------------|----------------------------|------------------------------------|---------------------------------------------|-----------------------------|----------------------|-----------------------|
|     | Yes/No                        |               |                      |                     | (ft)   | (ft)                         | (ft)                      | (ft)                          | (ft)                       | (ft)          | (%)              |               | (inches)                      | (inches)      |                        | (cfs)        | (days hh:mm)                          | (ft/sec)                | (min)          | (cfs)                      |                                    |                                             | (min)                       | (ft)                 |                       |
| 163 |                               | Link-315      | CB-E07-12            | CB-E07-11           | 40.63  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.94                    | 0.23           | 3.95                       | 0.31                               | 0.52                                        | 0.00                        | 0.52                 | Calculated            |
| 164 |                               | Link-316      | CB-E07-11            | CB-E07-10           | 26.62  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.8800           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.24         | 0 12:05                               | 5.17                    | 0.09           | 4.88                       | 0.46                               | 0.54                                        | 0.00                        | 0.54                 | Calculated            |
| 165 |                               | Link-317      | CB-E07-09            | CB-E07-10           | 32.60  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.5300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.59         | 0 12:05                               | 5.33                    | 0.10           | 4.41                       | 0.81                               | 0.80                                        | 0.00                        | 0.80                 | Calculated            |
| 166 |                               | Link-318      | CB-E06-24            | CB-E06-25           | 39.77  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.20         | 0 12:05                               | 2.61                    | 0.25           | 3.99                       | 0.30                               | 0.65                                        | 0.00                        | 0.65                 | Calculated            |
| 167 |                               | Link-319      | CB-E06-25            | CB-E06-26           | 40.20  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.33                    | 0.20           | 3.97                       | 0.60                               | 0.94                                        | 0.00                        | 0.93                 | Calculated            |
| 168 |                               | Link-320      | CB-E06-26            | CB-E06-27           | 40.39  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.58         | 0 12:05                               | 4.93                    | 0.14           | 3.96                       | 0.90                               | 0.87                                        | 0.00                        | 0.87                 | Calculated            |
| 169 |                               | Link-321      | CB-E07-06            | CB-E06-27           | 39.58  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 4.04                    | 0.16           | 4.00                       | 0.30                               | 0.41                                        | 0.00                        | 0.41                 | Calculated            |
| 170 |                               | Link-322      | CB-E06-19            | CB-E06-20           | 40.20  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.22         | 0 12:05                               | 2.65                    | 0.25           | 3.97                       | 0.31                               | 0.65                                        | 0.00                        | 0.65                 | Calculated            |
| 171 |                               | Link-323      | CB-E06-20            | CB-E06-21           | 39.92  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.33                    | 0.20           | 3.99                       | 0.60                               | 0.93                                        | 0.00                        | 0.93                 | Calculated            |
| 172 |                               | Link-324      | CB-E06-21            | CB-E06-22           | 40.25  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.58         | 0 12:05                               | 4.94                    | 0.14           | 3.97                       | 0.90                               | 0.87                                        | 0.00                        | 0.87                 | Calculated            |
| 173 |                               | Link-325      | CB-E06-23            | CB-E06-22           | 43.03  | 914.50                       | 0.00                      | 914.00                        | 3.00                       | 0.50          | 1.1600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 3.94                    | 0.18           | 3.84                       | 0.31                               | 0.41                                        | 0.00                        | 0.41                 | Calculated            |
| 174 |                               | Link-326      | CB-E06-15            | CB-E06-16           | 39.77  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.39         | 0 12:05                               | 3.15                    | 0.21           | 3.99                       | 0.60                               | 0.98                                        | 0.00                        | 0.98                 | Calculated            |
| 175 |                               | Link-327      | CB-E06-14            | CB-E06-15           | 39.77  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.19         | 0 12:05                               | 2.61                    | 0.25           | 3.99                       | 0.30                               | 0.74                                        | 0.00                        | 0.73                 | Calculated            |
| 176 |                               | Link-328      | CB-E06-16            | CB-E06-17           | 40.40  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.60         | 0 12:05                               | 4.61                    | 0.15           | 3.96                       | 0.91                               | 0.97                                        | 0.00                        | 0.97                 | Calculated            |
| 177 |                               | Link-329      | CB-E06-17            | CB-E06-18           | 40.00  | 914.50                       | 0.00                      | 914.00                        | 1.50                       | 0.50          | 1.2500           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 4.80         | 0 12:05                               | 5.42                    | 0.12           | 7.22                       | 0.66                               | 0.68                                        | 0.00                        | 0.85                 | Calculated            |
| 178 |                               | Link-330      | CB-E06-09            | CB-E06-10           | 40.63  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.62                    | 0.26           | 3.95                       | 0.31                               | 0.58                                        | 0.00                        | 0.58                 | Calculated            |
| 179 |                               | Link-331      | CB-E06-10            | CB-E06-11           | 39.99  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.41         | 0 12:05                               | 3.49                    | 0.19           | 3.98                       | 0.60                               | 0.83                                        | 0.00                        | 0.83                 | Calculated            |
| 180 |                               | Link-332      | CB-E06-12            | CB-E06-13           | 40.20  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 4.33         | 0 12:05                               | 5.92                    | 0.11           | 7.20                       | 0.60                               | 0.58                                        | 0.00                        | 0.72                 | Calculated            |
| 181 |                               | Link-333      | CB-E06-11            | CB-E06-12           | 43.89  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.1400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.01         | 0 12:05                               | 4.07                    | 0.18           | 3.80                       | 0.79                               | 0.89                                        | 0.00                        | 0.89                 | Calculated            |
| 182 |                               | Link-334      | CB-E05-23            | CB-E05-24           | 40.78  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.14         | 0 12:05                               | 2.64                    | 0.26           | 3.95                       | 0.29                               | 0.54                                        | 0.00                        | 0.54                 | Calculated            |
| 183 |                               | Link-335      | CB-E06-08            | CB-E06-07           | 40.20  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.23         | 0 12:05                               | 2.63                    | 0.25           | 3.97                       | 0.31                               | 0.60                                        | 0.00                        | 0.60                 | Calculated            |
| 184 |                               | Link-336      | CB-E06-07            | CB-E06-06           | 39.77  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.42         | 0 12:05                               | 3.39                    | 0.20           | 3.99                       | 0.61                               | 0.89                                        | 0.00                        | 0.89                 | Calculated            |
| 185 |                               | Link-337      | CB-E06-06            | CB-E06-05           | 31.99  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.5600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.49         | 0 12:05                               | 4.63                    | 0.12           | 4.45                       | 0.78                               | 0.92                                        | 0.00                        | 0.92                 | Calculated            |
| 186 |                               | Link-338      | CB-E06-05            | CB-E05-24           | 27.52  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.8200           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 4.39         | 0 12:05                               | 5.62                    | 0.08           | 8.71                       | 0.50                               | 0.61                                        | 0.00                        | 0.76                 | Calculated            |
| 187 |                               | Link-339      | CB-E05-17            | CB-E05-18           | 40.27  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.71                    | 0.25           | 3.97                       | 0.30                               | 0.55                                        | 0.00                        | 0.55                 | Calculated            |
| 188 |                               | Link-340      | CB-E05-19            | CB-E05-18           | 39.34  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2700           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 4.31         | 0 12:05                               | 5.34                    | 0.12           | 7.28                       | 0.59                               | 0.63                                        | 0.00                        | 0.78                 | Calculated            |
| 189 |                               | Link-341      | CB-E05-20            | CB-E05-19           | 40.63  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 3.08         | 0 12:05                               | 4.15                    | 0.16           | 3.95                       | 0.78                               | 0.90                                        | 0.00                        | 0.90                 | Calculated            |
| 190 |                               | Link-342      | CB-E05-21            | CB-E05-20           | 39.14  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2800           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.88         | 0 12:05                               | 2.99                    | 0.22           | 4.03                       | 0.47                               | 0.77                                        | 0.00                        | 0.77                 | Calculated            |
| 191 |                               | Link-343      | CB-E05-22            | CB-E05-21           | 28.39  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.7600           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 0.86         | 0 12:05                               | 2.52                    | 0.19           | 4.73                       | 0.18                               | 0.45                                        | 0.00                        | 0.45                 | Calculated            |
| 192 |                               | Link-344      | CB-E05-12            | CB-E05-13           | 28.10  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.7800           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 5.24         | 0 12:05                               | 5.37                    | 0.09           | 14.01                      | 0.37                               | 0.54                                        | 0.00                        | 0.81                 | Calculated            |
| 193 |                               | Link-345      | CB-E05-14            | CB-E05-13           | 40.20  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 3.62         | 0 12:05                               | 4.49                    | 0.15           | 7.20                       | 0.50                               | 0.62                                        | 0.00                        | 0.78                 | Calculated            |
| 194 |                               | Link-346      | CB-E05-15            | CB-E05-14           | 40.21  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.41         | 0 12:05                               | 3.75                    | 0.18           | 3.97                       | 0.61                               | 0.76                                        | 0.00                        | 0.76                 | Calculated            |
| 195 |                               | Link-347      | CB-E05-16            | CB-E05-15           | 40.00  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2500           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 2.63                    | 0.25           | 3.98                       | 0.30                               | 0.57                                        | 0.00                        | 0.57                 | Calculated            |
| 196 |                               | Link-348      | CB-E05-08            | CB-E05-07           | 40.20  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 1.2400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.21         | 0 12:05                               | 3.08                    | 0.22           | 3.97                       | 0.30                               | 0.50                                        | 0.00                        | 0.50                 | Calculated            |
| 197 |                               | Link-349      | CB-E05-09            | CB-E05-10           | 53.17  | 916.00                       | 0.00                      | 915.50                        | 0.00                       | 0.50          | 0.9400           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 1.49         | 0 12:05                               | 2.62                    | 0.34           | 3.45                       | 0.43                               | 0.70                                        | 0.00                        | 0.70                 | Calculated            |
| 198 |                               | Link-350      | CB-E05-10            | CB-E05-11           | 40.74  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 2.86         | 0 12:05                               | 3.89                    | 0.17           | 3.95                       | 0.72                               | 0.89                                        | 0.00                        | 0.88                 | Calculated            |
| 199 |                               | Link-351      | CB-E05-25            | CB-E05-05           | 39.77  | 914.50                       | 0.00                      | 914.00                        | 0.00                       | 0.50          | 1.2600           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 4.90         | 0 12:05                               | 5.78                    | 0.11           | 11.78                      | 0.42                               | 0.48                                        | 0.00                        | 0.72                 | Calculated            |
| 200 |                               | Link-352      | CB-E05-06            | CB-E05-25           | 40.91  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.2200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 3.64         | 0 12:05                               | 3.85                    | 0.18           | 11.61                      | 0.31                               | 0.53                                        | 0.00                        | 0.79                 | Calculated            |
| 201 |                               | Link-353      | CB-E05-07            | CB-E05-06           | 39.09  | 915.50                       | 0.00                      | 915.00                        | 0.00                       | 0.50          | 1.2800           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 2.44         | 0 12:05                               | 3.30                    | 0.20           | 11.88                      | 0.21                               | 0.44                                        | 0.00                        | 0.65                 | Calculated            |
| 202 | Yes                           | Link-365      | MH-E09-04            | NULL-545            | 144.82 | 900.33                       | 0.00                      | 900.20                        | 0.00                       | 0.13          | 0.0900           | Rectangular   | 84.000                        | 216.00        | 0.0120                 | 650.40       | 0 12:16                               | 6.19                    | 0.39           | 865.70                     | 0.75                               | 0.83                                        | 0.00                        | 5.82                 | Calculated            |
| 203 |                               | Link-366      | CB-E09-07            | MH-E09-04           | 142.59 | 901.50                       | 0.00                      | 900.77                        | 0.44                       | 0.73          | 0.5100           | CIRCULAR      | 36.000                        | 36.00         | 0.0120                 | 10.74        | 0 12:10                               | 1.60                    | 1.49           | 51.70                      | 0.21                               | 1.00                                        | 41.00                       | 3.00                 | SURCHARGED            |
| 204 |                               | Link-369      | Jun-380              | Jun-379             | 113.18 | 917.25                       | 0.00                      | 917.00                        | 0.00                       | 0.25          | 0.2200           | CIRCULAR      | 36.000                        | 36.00         | 0.0130                 | 30.33        | 0 12:17                               | 5.33                    | 0.35           | 31.35                      | 0.97                               | 0.77                                        | 0.00                        | 2.30                 | Calculated            |
| 205 |                               | Link-378      | CB-F01-02            | MH-F01-01           | 40.79  | 909.00                       | 0.00                      | 908.50                        | 3.94                       | 0.50          | 1.2300           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 7.86         | 0 12:07                               | 5.91                    | 0.12           | 25.05                      | 0.31                               | 0.63                                        | 0.00                        | 1.26                 | Calculated            |
| 206 |                               | Link-394      | Jun-405              | Jun-406             | 85.89  | 917.90                       | 0.00                      | 917.66                        | -0.02                      | 0.24          | 0.2800           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 5.43         | 0 12:05                               | 2.17                    | 0.66           | 11.45                      | 0.47                               | 1.00                                        | 2.00                        | 2.00                 | SURCHARGED            |
| 207 |                               | Link-411      | CB-G10-04            | CB-G09-02           | 815.12 | 904.50                       | 0.00                      | 903.93                        | 1.01                       | 0.57          | 0.0700           | CIRCULAR      | 72.000                        | 72.00         | 0.0130                 | 102.75       | 0 12:10                               | 5.39                    | 2.52           | 111.99                     | 0.92                               | 0.84                                        | 0.00                        | 5.06                 | Calculated            |
| 208 | Yes                           | Link-418      | MH-E02-01            | MH-D02-03           | 235.58 | 903.63                       | 0.00                      | 903.39                        | 0.00                       | 0.24          | 0.1000           | Rectangular   | 84.000                        | 216.00        | 0.0120                 | 502.57       | 0 12:16                               | 5.78                    | 0.68           | 922.24                     | 0.54                               | 0.69                                        | 0.00                        | 4.82                 | Calculated            |
| 209 |                               | Link-419      | MH-G04-01            | MH-G03-02           | 388.33 | 909.70                       | 0.00                      | 909.30                        | 1.00                       | 0.40          | 0.1000           | CIRCULAR      | 36.000                        | 36.00         | 0.0130                 | 15.52        | 0 12:06                               | 3.66                    | 1.77           | 21.41                      | 0.72                               | 0.59                                        | 0.00                        | 1.73                 | Calculated            |
| 210 |                               | Link-420      | MH-G03-02            | MH-G03-01           | 386.98 | 908.30                       | 0.00                      |                               |                            |               |                  |               |                               |               |                        |              |                                       |                         |                |                            |                                    |                                             |                             |                      |                       |



10-year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | From (Inlet)<br>Node | To (Outlet)<br>Node  | Length | Inlet<br>Invert<br>Elevation | Inlet<br>Invert<br>Offset | Outlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Offset | Total<br>Drop | Average<br>Slope | Pipe<br>Shape | Pipe<br>Diameter<br>or Height | Pipe<br>Width | Manning's<br>Roughness | Peak<br>Flow | Time of<br>Peak<br>Flow<br>Occurrence | Max<br>Flow<br>Velocity | Travel<br>Time | Design<br>Flow<br>Capacity | Max Flow /<br>Design Flow<br>Ratio | Max<br>Flow Depth /<br>Total Depth<br>Ratio | Total<br>Time<br>Surcharged | Max<br>Flow<br>Depth | Reported<br>Condition |
|-----|-------------------------------|---------------|----------------------|----------------------|--------|------------------------------|---------------------------|-------------------------------|----------------------------|---------------|------------------|---------------|-------------------------------|---------------|------------------------|--------------|---------------------------------------|-------------------------|----------------|----------------------------|------------------------------------|---------------------------------------------|-----------------------------|----------------------|-----------------------|
|     | Yes/No                        |               |                      |                      | (ft)   | (ft)                         | (ft)                      | (ft)                          | (ft)                       | (ft)          | (%)              |               | (inches)                      | (inches)      |                        | (cfs)        | (days hh:mm)                          | (ft/sec)                | (min)          | (cfs)                      |                                    |                                             | (min)                       | (ft)                 |                       |
| 217 |                               | Link-432      | CB-E05-11            | CB-E05-12            | 43.55  | 915.00                       | 0.00                      | 914.50                        | 0.00                       | 0.50          | 1.1500           | CIRCULAR      | 15.000                        | 15.00         | 0.0130                 | 4.09         | 0 12:05                               | 4.40                    | 0.16           | 6.92                       | 0.59                               | 0.71                                        | 0.00                        | 0.88                 | Calculated            |
| 218 | Yes                           | Link-433      | MH-F02-02            | MH-F02-01            | 348.95 | 905.43                       | 0.00                      | 905.08                        | 0.00                       | 0.35          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 126.71       | 0 12:10                               | 4.36                    | 1.33           | 219.18                     | 0.58                               | 0.74                                        | 0.00                        | 5.19                 | Calculated            |
| 219 |                               | Link-439      | CB-F09-06            | MH-F09-02            | 38.26  | 903.00                       | 0.00                      | 902.29                        | 0.00                       | 0.71          | 1.8600           | CIRCULAR      | 48.000                        | 48.00         | 0.0130                 | 28.24        | 0 12:10                               | 2.37                    | 0.27           | 195.68                     | 0.14                               | 1.00                                        | 27.00                       | 4.00                 | SURCHARGED            |
| 220 |                               | Link-440      | HW-D03-01            | CB-D03-02            | 74.00  | 915.00                       | 0.00                      | 911.50                        | 1.00                       | 3.50          | 4.7300           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 3.63         | 0 12:16                               | 8.73                    | 0.14           | 22.84                      | 0.16                               | 0.53                                        | 0.00                        | 0.49                 | Calculated            |
| 221 |                               | Link-441      | HW-D07-01            | CB-D07-02            | 74.46  | 916.20                       | 0.20                      | 913.50                        | 0.50                       | 2.70          | 3.6300           | CIRCULAR      | 12.000                        | 12.00         | 0.0130                 | 0.50         | 0 12:12                               | 4.66                    | 0.27           | 6.78                       | 0.07                               | 0.27                                        | 0.00                        | 0.27                 | Calculated            |
| 222 |                               | Link-442      | MH-J07-01            | MH-J08.01            | 395.99 | 908.07                       | 0.00                      | 907.28                        | 0.00                       | 0.79          | 0.2000           | CIRCULAR      | 84.000                        | 84.00         | 0.0130                 | 228.77       | 0 12:17                               | 6.11                    | 1.08           | 285.34                     | 0.80                               | 0.95                                        | 0.00                        | 6.60                 | Calculated            |
| 223 |                               | Link-443      | MH-J08.01            | MH-J08-02            | 327.82 | 907.28                       | 0.00                      | 906.63                        | 0.00                       | 0.65          | 0.2000           | CIRCULAR      | 84.000                        | 84.00         | 0.0130                 | 249.89       | 0 12:15                               | 7.21                    | 0.76           | 284.46                     | 0.88                               | 0.89                                        | 0.00                        | 6.14                 | Calculated            |
| 224 |                               | Link-444      | MH-J08-02            | MH-09-01             | 454.72 | 906.63                       | 0.00                      | 905.70                        | 0.00                       | 0.93          | 0.2000           | Rectangular   | 84.000                        | 96.00         | 0.0130                 | 263.18       | 0 12:16                               | 5.97                    | 1.27           | 438.88                     | 0.60                               | 0.85                                        | 0.00                        | 5.91                 | Calculated            |
| 225 |                               | Link-445      | MH-H09-01            | MH-G09-01            | 371.00 | 904.10                       | 0.00                      | 903.36                        | 0.00                       | 0.74          | 0.2000           | Rectangular   | 84.000                        | 96.00         | 0.0120                 | 289.69       | 0 12:18                               | 6.46                    | 0.96           | 469.53                     | 0.62                               | 0.88                                        | 0.00                        | 6.07                 | Calculated            |
| 226 | Yes                           | Link-446      | MH-G09-01            | CB-G09-02            | 211.28 | 903.36                       | 0.00                      | 902.92                        | 0.00                       | 0.44          | 0.2100           | Rectangular   | 84.000                        | 180.00        | 0.0130                 | 418.59       | 0 12:18                               | 4.75                    | 0.74           | 978.11                     | 0.43                               | 0.87                                        | 0.00                        | 6.08                 | Calculated            |
| 227 |                               | Link-447      | CB-E09-02            | MH-E09-05            | 136.06 | 910.00                       | 0.00                      | 909.00                        | 8.55                       | 1.00          | 0.7300           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 4.58         | 0 12:10                               | 4.78                    | 0.47           | 9.01                       | 0.51                               | 0.53                                        | 0.00                        | 0.80                 | Calculated            |
| 228 |                               | Link-450      | CB-J07-04            | CB-J07-03            | 73.19  | 909.50                       | 0.00                      | 909.00                        | 0.00                       | 0.50          | 0.6800           | Rectangular   | 48.000                        | 72.00         | 0.0150                 | 174.34       | 0 12:13                               | 7.26                    | 0.17           | 221.91                     | 0.79                               | 1.00                                        | 34.00                       | 4.00                 | SURCHARGED            |
| 229 |                               | Link-451      | CB-J07-03            | CB-J07-02            | 75.38  | 909.00                       | 0.00                      | 908.50                        | 0.00                       | 0.50          | 0.6600           | Rectangular   | 48.000                        | 72.00         | 0.0150                 | 184.67       | 0 12:27                               | 7.69                    | 0.16           | 218.67                     | 0.84                               | 1.00                                        | 35.00                       | 4.00                 | SURCHARGED            |
| 230 |                               | Link-452      | CB-J07-02            | MH-J07-01            | 37.63  | 908.50                       | 0.00                      | 908.07                        | 0.00                       | 0.43          | 1.1400           | Rectangular   | 48.000                        | 72.00         | 0.0150                 | 209.55       | 0 12:24                               | 8.73                    | 0.07           | 287.01                     | 0.73                               | 1.00                                        | 36.00                       | 4.00                 | SURCHARGED            |
| 231 |                               | Link-453      | HW-D05-01            | CB-D05-02            | 42.24  | 916.52                       | 0.00                      | 913.00                        | 0.50                       | 3.52          | 8.3300           | CIRCULAR      | 12.000                        | 12.00         | 0.0150                 | 0.83         | 0 12:21                               | 5.12                    | 0.14           | 8.91                       | 0.09                               | 0.67                                        | 0.00                        | 0.67                 | Calculated            |
| 232 |                               | Link-454      | HW-D06-03            | CB-D06-04            | 71.03  | 916.00                       | 0.00                      | 912.22                        | 0.50                       | 3.78          | 5.3200           | CIRCULAR      | 12.000                        | 12.00         | 0.0150                 | 1.63         | 0 12:13                               | 5.73                    | 0.21           | 7.12                       | 0.23                               | 0.57                                        | 0.00                        | 0.55                 | Calculated            |
| 233 |                               | Link-455      | CB-D03-02            | Infiltration_Basin_1 | 107.00 | 910.50                       | 0.00                      | 909.00                        | 10.50                      | 1.50          | 1.4000           | CIRCULAR      | 24.000                        | 24.00         | 0.0150                 | 34.46        | 0 00:02                               | 11.03                   | 0.16           | 23.21                      | 1.48                               | 0.98                                        | 0.00                        | 1.69                 | > CAPACITY            |
| 234 |                               | Link-456      | CB-D05-02            | Infiltration_Basin_1 | 115.00 | 912.50                       | 0.00                      | 910.00                        | 11.50                      | 2.50          | 2.1700           | CIRCULAR      | 12.000                        | 12.00         | 0.0150                 | 6.33         | 0 12:13                               | 8.05                    | 0.24           | 4.55                       | 1.39                               | 1.00                                        | 19.00                       | 1.00                 | SURCHARGED            |
| 235 |                               | Link-457      | CB-D06-04            | Infiltration_Basin_1 | 96.00  | 911.72                       | 0.00                      | 910.00                        | 11.50                      | 1.72          | 1.7900           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 10.48        | 0 12:11                               | 6.96                    | 0.23           | 12.19                      | 0.86                               | 0.79                                        | 0.00                        | 1.18                 | Calculated            |
| 236 |                               | Link-467      | CB-D07-02            | Infiltration_Basin_1 | 74.00  | 913.00                       | 0.00                      | 911.67                        | 13.17                      | 1.33          | 1.8000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 6.58         | 0 12:07                               | 6.92                    | 0.18           | 14.08                      | 0.47                               | 0.53                                        | 0.00                        | 0.78                 | Calculated            |
| 237 |                               | Link-471      | CB-D08-05            | Infiltration_Basin_1 | 84.00  | 911.50                       | 0.00                      | 911.00                        | 12.50                      | 0.50          | 0.6000           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 4.91         | 0 12:07                               | 4.33                    | 0.32           | 8.10                       | 0.61                               | 0.61                                        | 0.00                        | 0.89                 | Calculated            |
| 238 |                               | Link-472      | CB-G04-03            | CB-G04-02            | 106.27 | 913.00                       | 0.00                      | 912.50                        | 0.00                       | 0.50          | 0.4700           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 4.15         | 0 12:09                               | 2.35                    | 0.75           | 6.24                       | 0.66                               | 1.00                                        | 12.00                       | 1.50                 | SURCHARGED            |
| 239 |                               | Link-473      | CB-G04-02            | CB-F04-04            | 126.59 | 912.50                       | 0.00                      | 912.00                        | 0.00                       | 0.50          | 0.3900           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 9.23         | 0 12:08                               | 6.20                    | 0.34           | 5.72                       | 1.61                               | 0.79                                        | 0.00                        | 1.18                 | > CAPACITY            |
| 240 |                               | Link-474      | CB-F04-04            | MH-F04-01            | 65.69  | 912.00                       | 0.00                      | 909.50                        | 2.97                       | 2.50          | 3.8100           | CIRCULAR      | 24.000                        | 24.00         | 0.0150                 | 13.30        | 0 12:07                               | 8.42                    | 0.13           | 38.25                      | 0.35                               | 0.71                                        | 0.00                        | 1.43                 | Calculated            |
| 241 |                               | Link-475      | Jun-491              | CB-E04-01            | 195.27 | 915.00                       | 0.00                      | 906.00                        | 1.33                       | 9.00          | 4.6100           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 3.72         | 0 12:07                               | 4.90                    | 0.66           | 19.54                      | 0.19                               | 0.65                                        | 0.00                        | 0.97                 | Calculated            |
| 242 |                               | Link-484      | HW-F01-03            | CB-F01-02            | 74.26  | 912.50                       | 0.00                      | 912.00                        | 3.00                       | 0.50          | 0.6700           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 4.61         | 0 12:07                               | 4.14                    | 0.30           | 7.47                       | 0.62                               | 0.60                                        | 0.00                        | 0.88                 | Calculated            |
| 243 |                               | Link-486      | CB--E02-03           | CB-E02-02            | 79.28  | 911.50                       | -4.30                     | 911.20                        | 0.00                       | 0.30          | 0.3800           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 19.71        | 0 00:07                               | 11.71                   | 0.11           | 25.30                      | 0.78                               | 0.91                                        | 0.00                        | 1.32                 | Calculated            |
| 244 |                               | Link-487      | CB-E02-02            | MH-E02-01            | 31.21  | 911.20                       | 0.00                      | 907.50                        | 3.87                       | 3.70          | 11.8600          | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 19.71        | 0 00:07                               | 13.96                   | 0.04           | 31.35                      | 0.63                               | 0.75                                        | 0.00                        | 1.10                 | Calculated            |
| 245 |                               | Link-499      | HW-D04-01            | CB-DO4-02            | 68.61  | 916.50                       | 0.00                      | 913.00                        | 0.50                       | 3.50          | 5.1000           | CIRCULAR      | 12.000                        | 12.00         | 0.0150                 | 2.34         | 0 12:11                               | 7.54                    | 0.15           | 6.97                       | 0.34                               | 0.42                                        | 0.00                        | 0.41                 | Calculated            |
| 246 |                               | Link-500      | CB-DO4-02            | Infiltration_Basin_1 | 100.00 | 912.50                       | 0.00                      | 910.50                        | 12.00                      | 2.00          | 2.0000           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 5.27         | 0 12:07                               | 6.44                    | 0.26           | 12.87                      | 0.41                               | 0.47                                        | 0.00                        | 0.70                 | Calculated            |
| 247 |                               | Link-505      | CB-G04-03            | CB-G04-02            | 106.28 | 916.80                       | 3.80                      | 915.50                        | 3.00                       | 1.30          | 1.2200           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 0.00         | 0 00:00                               | 0.00                    |                | 10.07                      | 0.00                               | 0.00                                        | 0.00                        | 0.00                 | Calculated            |
| 248 |                               | Link-517      | HW-J09-04            | Jun-384              | 172.93 | 921.80                       | -0.05                     | 921.30                        | 0.00                       | 0.50          | 0.2900           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 5.08         | 0 12:21                               | 4.50                    | 0.64           | 5.13                       | 0.99                               | 0.63                                        | 0.00                        | 0.94                 | Calculated            |
| 249 |                               | Link-520      | HW-J09-05            | HW-J09-04            | 120.87 | 922.51                       | 0.00                      | 921.85                        | 0.00                       | 0.66          | 0.5500           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 2.96         | 0 12:14                               | 2.55                    | 0.79           | 6.73                       | 0.44                               | 0.68                                        | 0.00                        | 1.01                 | Calculated            |
| 250 |                               | Link-527      | HW-E10-01            | HW-E10-02            | 74.05  | 918.50                       | 0.00                      | 918.40                        | 0.00                       | 0.10          | 0.1400           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 1.52         | 0 12:11                               | 2.06                    | 0.60           | 3.35                       | 0.45                               | 0.44                                        | 0.00                        | 0.65                 | Calculated            |
| 251 |                               | Link-530      | CB-D09-04            | CB-D09-03            | 103.39 | 912.00                       | 0.00                      | 911.00                        | 7.00                       | 1.00          | 0.9700           | CIRCULAR      | 18.000                        | 18.00         | 0.0150                 | 3.10         | 0 12:09                               | 4.34                    | 0.40           | 8.95                       | 0.35                               | 0.42                                        | 0.00                        | 0.63                 | Calculated            |
| 252 | Yes                           | Link-531      | NULL-545             | HW-D09-01            | 129.53 | 900.20                       | 0.00                      | 900.00                        | 0.00                       | 0.20          | 0.1500           | Rectangular   | 84.000                        | 216.00        | 0.0120                 | 659.44       | 0 12:16                               | 7.32                    | 0.29           | 1135.37                    | 0.58                               | 0.72                                        | 0.00                        | 5.00                 | Calculated            |
| 253 |                               | Link-532      | CB-D09-03            | NULL-545             | 87.87  | 904.00                       | 0.00                      | 903.00                        | 2.80                       | 1.00          | 1.1400           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 8.29         | 0 12:12                               | 5.57                    | 0.26           | 11.21                      | 0.74                               | 1.00                                        | 20.00                       | 1.50                 | SURCHARGED            |
| 254 |                               | Link-534      | CB-G10-08            | CB-G10-07            | 86.27  | 907.50                       | 0.00                      | 907.00                        | 0.00                       | 0.50          | 0.5800           | CIRCULAR      | 54.000                        | 54.00         | 0.0130                 | 81.58        | 0 12:10                               | 5.38                    | 0.27           | 149.71                     | 0.54                               | 0.91                                        | 0.00                        | 4.08                 | Calculated            |
| 255 |                               | Link-535      | CB-G10-07            | CB-G10-06            | 82.50  | 907.00                       | 0.00                      | 906.50                        | 0.00                       | 0.50          | 0.6100           | CIRCULAR      | 54.000                        | 54.00         | 0.0130                 | 87.98        | 0 12:10                               | 6.11                    | 0.23           | 153.09                     | 0.57                               | 0.87                                        | 0.00                        | 3.90                 | Calculated            |
| 256 |                               | Link-536      | CB-G10-06            | CB-G10-04            | 78.68  | 906.50                       | 0.00                      | 906.00                        | 1.50                       | 0.50          | 0.6400           | CIRCULAR      | 54.000                        | 54.00         | 0.0130                 | 90.50        | 0 12:10                               | 7.81                    | 0.17           | 156.76                     | 0.58                               | 0.80                                        | 0.00                        | 3.59                 | Calculated            |
| 257 |                               | Link-537      | CB-G10-05            | CB-G10-03            | 109.04 | 912.00                       | 0.00                      | 911.50                        | 0.50                       | 0.50          | 0.4600           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 5.30         | 0 12:05                               | 4.15                    | 0.44           | 7.11                       | 0.74                               | 0.70                                        | 0.00                        | 1.05                 | Calculated            |
| 258 |                               | Link-538      | CB-G10-03            | CB-G10-02            | 85.18  | 911.00                       | 0.00                      | 910.50                        | 0.00                       | 0.50          | 0.5900           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 9.42         | 0 12:05                               | 3.56                    | 0.40           | 17.33                      | 0.54                               | 0.79                                        | 0.00                        | 1.56                 | Calculated            |
| 259 |                               | Link-539      | CB-G10-02            | CB-G10-01            | 74.38  | 910.50                       | 0.00                      | 910.00                        | 0.50                       | 0.50          | 0.6700           | CIRCULAR      | 24.000                        | 24.00         | 0.0130                 | 14.00        | 0 12:05                               | 5.61                    | 0.22           | 18.55                      | 0.75                               | 0.74                                        | 0.00                        | 1.47                 | Calculated            |
| 260 |                               | Link-540      | CB-G10-01            | CB-G10-04            | 82.08  | 909.50                       | 0.00                      | 909.00                        | 4.50                       | 0.50          | 0.6100           | CIRCULAR      | 30.000                        | 30.00         | 0.0130                 | 16.33        | 0 12:05                               | 5.72                    | 0.24           | 32.01                      | 0.51                               | 0.56                                        | 0.00                        | 1.40                 | Calculated            |
| 261 | Yes                           | Link-541      | NULL-545             | CB-D08-05            | 452.91 | 900.20                       | 0.00                      | 916.00                        | 4.50                       | -15.80        | -3.4900          | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 0.00         | 0 00:00                               | 0.00                    |                | 19.62                      | 0.00                               | 0.50                                        | 0.00                        | 0.75                 | Calculated            |
| 262 |                               | Link-543      | HW-D08-04            | CB-D08-05            | 68.24  | 916.00                       | 1.50                      | 911.50                        | 0.00                       | 4.50          | 6.5900           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 0.00         | 0 00:00                               | 0.00                    |                | 26.97                      | 0.00                               | 0.33                                        | 0.00                        | 0.48                 | Calculated            |
| 263 |                               | Link-544      | HW-D06-01            | HW-D06-02            | 137.15 | 917.02                       | 0.00                      | 916.17                        | 0.00                       | 0.85          | 0.6200           | CIRCULAR      | 18.000                        | 18.00         | 0.0130                 | 0.54         | 0 12:11                               | 1.54                    | 1.48           | 8.27                       | 0.07                               | 0.25                                        | 0.00                        | 0.38                 | Calculated            |

10-year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | From (Inlet)<br>Node | To (Outlet)<br>Node  | Length | Inlet<br>Invert<br>Elevation | Inlet<br>Invert<br>Offset | Outlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Offset | Total<br>Drop | Average<br>Slope | Pipe<br>Shape | Pipe<br>Diameter<br>or Height | Pipe<br>Width | Manning's<br>Roughness | Peak<br>Flow | Time of<br>Peak<br>Flow<br>Occurrence | Max<br>Flow<br>Velocity | Travel<br>Time | Design<br>Flow<br>Capacity | Max Flow /<br>Design Flow<br>Ratio | Max<br>Flow Depth /<br>Total Depth<br>Ratio | Total<br>Time<br>Surcharged | Max<br>Flow<br>Depth | Reported<br>Condition |
|-----|-------------------------------|---------------|----------------------|----------------------|--------|------------------------------|---------------------------|-------------------------------|----------------------------|---------------|------------------|---------------|-------------------------------|---------------|------------------------|--------------|---------------------------------------|-------------------------|----------------|----------------------------|------------------------------------|---------------------------------------------|-----------------------------|----------------------|-----------------------|
|     | Yes/No                        |               |                      |                      | (ft)   | (ft)                         | (ft)                      | (ft)                          | (ft)                       | (ft)          | (%)              |               | (inches)                      | (inches)      |                        | (cfs)        | (days hh:mm)                          | (ft/sec)                | (min)          | (cfs)                      |                                    |                                             | (min)                       | (ft)                 |                       |
| 271 | Yes                           | Pipe-101      | CB-E06-02            | CB-E06-03            | 199.83 | 908.07                       | 0.00                      | 907.67                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 36.000                        | 36.00         | 0.0120                 | 9.06         | 0 12:06                               | 1.90                    | 1.75           | 32.33                      | 0.28                               | 0.67                                        | 0.00                        | 1.94                 | Calculated            |
| 272 | Yes                           | Pipe-101A     | CB-E06-03            | CB-E06-04            | 198.94 | 907.67                       | 0.00                      | 907.27                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 42.000                        | 42.00         | 0.0120                 | 19.24        | 0 12:06                               | 2.99                    | 1.11           | 48.87                      | 0.39                               | 0.65                                        | 0.00                        | 2.19                 | Calculated            |
| 273 | Yes                           | Pipe-102      | CB-E06-04            | CB-E07-01            | 199.78 | 907.27                       | 0.00                      | 906.87                        | 1.00                       | 0.40          | 0.2000           | CIRCULAR      | 42.000                        | 42.00         | 0.0130                 | 29.49        | 0 12:06                               | 5.13                    | 0.65           | 45.02                      | 0.66                               | 0.62                                        | 0.00                        | 2.05                 | Calculated            |
| 274 | Yes                           | Pipe-102A     | CB-E07-01            | CB-E07-02            | 161.47 | 905.87                       | 0.00                      | 905.35                        | 0.00                       | 0.52          | 0.3200           | CIRCULAR      | 54.000                        | 54.00         | 0.0130                 | 39.44        | 0 12:06                               | 3.63                    | 0.74           | 111.60                     | 0.35                               | 0.69                                        | 0.00                        | 3.00                 | Calculated            |
| 275 | Yes                           | Pipe-102B     | CB-E07-02            | CB-E07-03            | 200.11 | 905.35                       | 0.00                      | 904.95                        | 0.60                       | 0.40          | 0.2000           | CIRCULAR      | 54.000                        | 54.00         | 0.0130                 | 48.59        | 0 12:06                               | 4.57                    | 0.73           | 87.92                      | 0.55                               | 0.73                                        | 0.00                        | 3.17                 | Calculated            |
| 276 | Yes                           | Pipe-103      | CB-E07-03            | CB-E07-04            | 200.48 | 904.35                       | 0.00                      | 903.95                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 57.96        | 0 12:07                               | 3.66                    | 0.91           | 126.03                     | 0.46                               | 0.79                                        | 0.00                        | 3.86                 | Calculated            |
| 277 | Yes                           | PIPE-104      | CB-E07-04            | CB-E07-05            | 199.13 | 903.95                       | 0.00                      | 903.55                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 67.83        | 0 12:07                               | 4.11                    | 0.81           | 126.45                     | 0.54                               | 0.81                                        | 0.00                        | 3.96                 | Calculated            |
| 278 | Yes                           | Pipe-105      | CB-E07-05            | CB-E08-01            | 200.64 | 903.55                       | 0.00                      | 903.15                        | 0.50                       | 0.40          | 0.2000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 77.34        | 0 12:07                               | 4.77                    | 0.70           | 125.98                     | 0.61                               | 0.81                                        | 0.00                        | 3.96                 | Calculated            |
| 279 | Yes                           | Pipe-106      | CB-E08-01            | CB-E08-02            | 199.09 | 902.65                       | 0.00                      | 902.25                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 66.000                        | 66.00         | 0.0120                 | 86.41        | 0 12:07                               | 4.16                    | 0.80           | 163.06                     | 0.53                               | 0.82                                        | 0.00                        | 4.44                 | Calculated            |
| 280 | Yes                           | Pipe-107      | CB-E08-02            | CB-E08-03            | 200.41 | 902.25                       | 0.00                      | 901.85                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 66.000                        | 66.00         | 0.0120                 | 95.21        | 0 12:08                               | 4.60                    | 0.73           | 162.53                     | 0.59                               | 0.81                                        | 0.00                        | 4.43                 | Calculated            |
| 281 | Yes                           | Pipe-109      | CB-E08-04            | CB-E09-01            | 200.00 | 901.13                       | 0.00                      | 900.73                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 118.92       | 0 12:08                               | 5.51                    | 0.60           | 205.18                     | 0.58                               | 0.71                                        | 0.00                        | 4.27                 | Calculated            |
| 282 | Yes                           | Pipe-110      | CB-E09-01            | MH-E09-05            | 140.00 | 900.73                       | 0.00                      | 900.45                        | 0.00                       | 0.28          | 0.2000           | CIRCULAR      | 84.000                        | 84.00         | 0.0130                 | 121.08       | 0 12:08                               | 5.50                    | 0.42           | 285.69                     | 0.42                               | 0.56                                        | 0.00                        | 3.89                 | Calculated            |
| 283 | Yes                           | Pipe-130      | MH-F06-02            | MH-F06-03            | 275.38 | 907.85                       | 0.00                      | 907.30                        | 0.00                       | 0.55          | 0.2000           | CIRCULAR      | 48.000                        | 48.00         | 0.0120                 | 37.52        | 0 12:07                               | 3.51                    | 1.31           | 69.54                      | 0.54                               | 0.91                                        | 0.00                        | 3.59                 | Calculated            |
| 284 | Yes                           | Pipe-130A     | MH-F06-03            | MH-F07-01            | 275.60 | 907.30                       | 0.00                      | 906.75                        | 0.00                       | 0.55          | 0.2000           | CIRCULAR      | 54.000                        | 54.00         | 0.0120                 | 50.72        | 0 12:07                               | 3.81                    | 1.21           | 95.17                      | 0.53                               | 0.87                                        | 0.00                        | 3.86                 | Calculated            |
| 285 | Yes                           | Pipe-132      | MH-F07-02            | MH-F07-03            | 274.04 | 906.06                       | 0.00                      | 905.51                        | 0.00                       | 0.55          | 0.2000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 76.26        | 0 12:07                               | 4.31                    | 1.06           | 126.40                     | 0.60                               | 0.87                                        | 0.00                        | 4.32                 | Calculated            |
| 286 | Yes                           | PIPE-132A     | MH-F07-03            | MH-F08-01            | 275.99 | 905.51                       | 0.00                      | 904.96                        | 0.00                       | 0.55          | 0.2000           | CIRCULAR      | 66.000                        | 66.00         | 0.0120                 | 88.80        | 0 12:07                               | 4.44                    | 1.04           | 162.40                     | 0.55                               | 0.81                                        | 0.00                        | 4.48                 | Calculated            |
| 287 | Yes                           | Pipe-133      | MH-F08-01            | MH-F08-02            | 274.88 | 904.96                       | 0.00                      | 904.41                        | 0.00                       | 0.55          | 0.2000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 100.94       | 0 12:07                               | 4.55                    | 1.01           | 205.23                     | 0.49                               | 0.78                                        | 0.00                        | 4.65                 | Calculated            |
| 288 | Yes                           | PIPE-133A     | MH-F08-02            | MH-F08-03            | 274.91 | 904.41                       | 0.00                      | 903.85                        | 0.00                       | 0.56          | 0.2000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 111.54       | 0 12:07                               | 5.00                    | 0.92           | 207.07                     | 0.54                               | 0.83                                        | 0.00                        | 4.90                 | Calculated            |
| 289 | Yes                           | Pipe-134      | MH-F08-03            | MH-F08-04            | 278.24 | 903.85                       | 0.00                      | 903.29                        | 0.00                       | 0.56          | 0.2000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 121.00       | 0 12:07                               | 4.83                    | 0.96           | 310.48                     | 0.39                               | 0.76                                        | 0.00                        | 5.28                 | Calculated            |
| 290 | Yes                           | Pipe-135      | MH-F08-04            | MH-F09-01            | 410.74 | 903.29                       | 0.00                      | 902.47                        | 0.00                       | 0.82          | 0.2000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 129.68       | 0 12:07                               | 4.98                    | 1.37           | 309.22                     | 0.42                               | 0.83                                        | 0.00                        | 5.82                 | Calculated            |
| 291 | Yes                           | Pipe-136      | MH-F09-01            | MH-F09-02            | 90.00  | 902.47                       | 0.00                      | 902.29                        | 0.00                       | 0.18          | 0.2000           | CIRCULAR      | 84.000                        | 84.00         | 0.0130                 | 123.90       | 0 12:08                               | 4.79                    | 0.31           | 285.69                     | 0.43                               | 0.88                                        | 0.00                        | 6.18                 | Calculated            |
| 292 |                               | Pipe-160      | CB-G06-01            | CB-G06-02            | 274.74 | 907.87                       | 0.00                      | 907.60                        | 0.00                       | 0.27          | 0.1000           | CIRCULAR      | 66.000                        | 66.00         | 0.0120                 | 54.75        | 0 12:10                               | 3.52                    | 1.30           | 114.04                     | 0.48                               | 0.65                                        | 0.00                        | 3.56                 | Calculated            |
| 293 |                               | Pipe-161      | CB-G06-03            | CB-G07-01            | 275.02 | 907.32                       | 0.00                      | 907.05                        | 0.00                       | 0.27          | 0.1000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 63.25        | 0 12:11                               | 3.75                    | 1.22           | 143.76                     | 0.44                               | 0.62                                        | 0.00                        | 3.72                 | Calculated            |
| 294 |                               | Pipe-162      | CB-G07-01            | CB-G07-02            | 274.74 | 907.05                       | 0.00                      | 906.21                        | 1.00                       | 0.84          | 0.3100           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 92.07        | 0 12:10                               | 6.23                    | 0.73           | 253.69                     | 0.36                               | 0.67                                        | 0.00                        | 4.00                 | Calculated            |
| 295 |                               | Pipe-163      | CB-G07-03            | CB-G08-01            | 274.46 | 904.93                       | 0.00                      | 904.66                        | 0.00                       | 0.27          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 94.29        | 0 12:13                               | 3.60                    | 1.27           | 217.07                     | 0.43                               | 0.78                                        | 0.00                        | 5.43                 | Calculated            |
| 296 |                               | Pipe-164      | CB-G08-02            | CB-G08-03            | 274.74 | 904.38                       | 0.00                      | 904.11                        | 0.00                       | 0.27          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 101.02       | 0 12:15                               | 3.47                    | 1.32           | 216.96                     | 0.47                               | 0.80                                        | 0.00                        | 5.61                 | Calculated            |
| 297 |                               | Pipe-165      | CB-G08-03            | CB-G08-04            | 275.30 | 904.11                       | 0.00                      | 903.84                        | 0.00                       | 0.27          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 123.10       | 0 12:14                               | 5.81                    | 0.79           | 216.73                     | 0.57                               | 0.81                                        | 0.00                        | 5.62                 | Calculated            |
| 298 |                               | Pipe-166      | CB-G08-04            | MH-G09-01            | 485.00 | 903.84                       | 0.00                      | 903.36                        | 0.00                       | 0.48          | 0.1000           | Rectangular   | 84.000                        | 180.00        | 0.0120                 | 126.65       | 0 12:15                               | 1.44                    | 5.61           | 730.47                     | 0.17                               | 0.84                                        | 0.00                        | 5.83                 | Calculated            |
| 299 | Yes                           | Pipe-168      | CB-G09-02            | MH-F09-02            | 325.00 | 902.92                       | 0.00                      | 902.29                        | 0.00                       | 0.63          | 0.1900           | Rectangular   | 84.000                        | 180.00        | 0.0120                 | 499.70       | 0 12:17                               | 5.44                    | 1.00           | 1022.30                    | 0.49                               | 0.88                                        | 0.00                        | 6.16                 | Calculated            |
| 300 | Yes                           | Pipe-169      | MH-F09-02            | MH-F09-03            | 334.00 | 902.29                       | 0.00                      | 901.62                        | 0.00                       | 0.67          | 0.2000           | Rectangular   | 84.000                        | 192.00        | 0.0120                 | 613.05       | 0 12:15                               | 6.23                    | 0.89           | 1124.24                    | 0.55                               | 0.88                                        | 0.00                        | 6.15                 | Calculated            |
| 301 | Yes                           | Pipe-170      | MH-F09-05            | MH-E09-03            | 369.00 | 901.62                       | 0.00                      | 900.88                        | 0.00                       | 0.74          | 0.2000           | Rectangular   | 84.000                        | 216.00        | 0.0120                 | 623.00       | 0 12:16                               | 5.60                    | 1.10           | 1293.93                    | 0.48                               | 0.88                                        | 0.00                        | 6.16                 | Calculated            |
| 302 | Yes                           | Pipe-171      | MH-E09-03            | MH-E09-04            | 275.00 | 900.88                       | 0.00                      | 900.33                        | 0.00                       | 0.55          | 0.2000           | Rectangular   | 84.000                        | 216.00        | 0.0120                 | 641.82       | 0 12:16                               | 5.74                    | 0.80           | 1292.18                    | 0.50                               | 0.89                                        | 0.00                        | 6.19                 | Calculated            |
| 303 | Yes                           | Pipe-200      | CB-E05-04            | CB-E05-03            | 199.70 | 908.19                       | 0.00                      | 907.79                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 42.000                        | 42.00         | 0.0130                 | 10.56        | 0 12:05                               | 1.79                    | 1.86           | 45.03                      | 0.23                               | 0.77                                        | 0.00                        | 2.59                 | Calculated            |
| 304 | Yes                           | Pipe-201A     | CB-E05-03            | CB-E05-02            | 199.38 | 907.79                       | 0.00                      | 907.39                        | 0.00                       | 0.40          | 0.2000           | CIRCULAR      | 42.000                        | 42.00         | 0.0130                 | 20.93        | 0 12:06                               | 2.64                    | 1.26           | 45.06                      | 0.46                               | 0.86                                        | 0.00                        | 2.90                 | Calculated            |
| 305 | Yes                           | Pipe-202      | CB-E05-02            | CB-E05-01            | 361.63 | 907.39                       | 0.00                      | 906.67                        | 0.00                       | 0.72          | 0.2000           | CIRCULAR      | 48.000                        | 48.00         | 0.0120                 | 37.48        | 0 12:06                               | 3.64                    | 1.66           | 69.44                      | 0.54                               | 0.83                                        | 0.00                        | 3.25                 | Calculated            |
| 306 | Yes                           | Pipe-202A     | CB-E04-03            | CB-E04-02            | 200.61 | 906.27                       | 0.00                      | 905.87                        | 1.00                       | 0.40          | 0.2000           | CIRCULAR      | 48.000                        | 48.00         | 0.0120                 | 49.93        | 0 12:07                               | 4.98                    | 0.67           | 69.49                      | 0.72                               | 0.88                                        | 0.00                        | 3.48                 | Calculated            |
| 307 | Yes                           | Pipe-203      | CB-E04-02            | CB-E04-01            | 198.94 | 904.87                       | 0.00                      | 904.67                        | 0.00                       | 0.20          | 0.1000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 61.15        | 0 12:08                               | 3.32                    | 1.00           | 89.46                      | 0.68                               | 0.89                                        | 0.00                        | 4.44                 | Calculated            |
| 308 | Yes                           | Pipe-204      | CB-E04-01            | MH-E03-02            | 485.59 | 904.67                       | 0.00                      | 904.19                        | 0.00                       | 0.48          | 0.1000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 70.91        | 0 12:09                               | 3.86                    | 2.10           | 88.71                      | 0.80                               | 0.88                                        | 0.00                        | 4.41                 | Calculated            |
| 309 | Yes                           | Pipe-205      | MH-E03-02            | MH-E03-01            | 497.49 | 904.19                       | 0.00                      | 903.69                        | 0.00                       | 0.50          | 0.1000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 96.14        | 0 12:08                               | 4.41                    | 1.88           | 145.45                     | 0.66                               | 0.73                                        | 0.00                        | 4.38                 | Calculated            |
| 310 | Yes                           | Pipe-206      | MH-E03-01            | MH-E02-03            | 329.72 | 903.69                       | 0.00                      | 903.36                        | 0.00                       | 0.33          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 117.38       | 0 12:10                               | 4.89                    | 1.12           | 218.94                     | 0.54                               | 0.60                                        | 0.00                        | 4.20                 | Calculated            |
| 311 | Yes                           | Pipe-207      | MH-E02-03            | Infiltration_Basin_1 | 367.00 | 903.36                       | 0.00                      | 903.00                        | 4.50                       | 0.36          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 132.00       | 0 12:10                               | 6.85                    | 0.89           | 216.75                     | 0.61                               | 0.50                                        | 0.00                        | 3.50                 | Calculated            |
| 312 | Yes                           | Pipe-230      | CB-F04-03            |                      | 319.00 | 908.94                       | 0.00                      | 908.30                        | 0.50                       | 0.64          | 0.2000           | CIRCULAR      | 54.000                        | 54.00         | 0.0120                 | 48.85        | 0 12:09                               | 4.18                    | 1.27           | 95.42                      | 0.51                               | 0.84                                        | 0.00                        | 3.76                 | Calculated            |
| 313 | Yes                           | Pipe-231      | MH-F04-02            |                      | 273.76 | 907.80                       | 0.00                      | 907.53                        | 1.00                       | 0.27          | 0.1000           | CIRCULAR      | 60.000                        | 60.00         | 0.0120                 | 78.37        | 0 12:10                               | 4.83                    | 0.94           | 88.61                      | 0.88                               | 0.86                                        | 0.00                        | 4.30                 | Calculated            |
| 314 | Yes                           | Pipe-232      | MH-F04-01            |                      | 391.79 | 906.53                       | 0.00                      | 906.14                        | 0.00                       | 0.39          | 0.1000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 96.70        | 0 12:10                               | 3.71                    | 1.76           | 144.75                     | 0.67                               | 0.87                                        | 0.00                        | 5.18                 | Calculated            |
| 315 | Yes                           | Pipe-233      | MH-F03-02            | MH-F03-01            | 362.89 | 906.14                       | 0.00                      | 905.78                        | 0.00                       | 0.36          | 0.1000           | CIRCULAR      | 72.000                        | 72.00         | 0.0120                 | 107.54       | 0 12:10                               | 4.18                    | 1.45           | 144.51                     | 0.74                               | 0.86                                        | 0.00                        | 5.14                 | Calculated            |
| 316 | Yes                           | Pipe-234      | MH-F03-01            | MH-F02-02            | 350.84 | 905.78                       | 0.00                      | 905.43                        | 0.00                       | 0.35          | 0.1000           | CIRCULAR      | 84.000                        | 84.00         | 0.0120                 | 117.42       | 0 12:10                               | 3.97                    | 1.47           | 218.59                     | 0.54                               | 0.73                                        | 0.00                        | 5.11                 | Calculated            |
| 317 | Yes                           | Pipe-236      | MH-F02-01            | MH-F01-01            | 517.91 | 905.08                       | 0.00                      |                               |                            |               |                  |               |                               |               |                        |              |                                       |                         |                |                            |                                    |                                             |                             |                      |                       |

25-Year Storm Event Analysis

| SN | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|----|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
|    | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 1  |                               | CB-D03-02     | 12942164.05  | 279268.13    | 910.50              | 915.70                           | 5.20                          | 910.50                        | 0.00                      | 917.70                 | 2.00               | 0.00           | 0.00                  | 52.19          | 0.00                      | 916.01                                  | 5.51                                | 0.00                                      | 1.69                             | 910.86                                  | 0.36                                | 0 00:02                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 2  |                               | CB-D05-02     | 12943712.79  | 279269.22    | 912.50              | 916.37                           | 3.87                          | 912.50                        | 0.00                      | 918.37                 | 2.00               | 0.00           | 0.00                  | 15.37          | 0.00                      | 917.12                                  | 4.62                                | 0.00                                      | 1.25                             | 913.14                                  | 0.64                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 3  |                               | CB-D06-04     | 12945063.49  | 279265.29    | 911.72              | 914.00                           | 2.28                          | 911.72                        | 0.00                      | 916.00                 | 2.00               | 0.00           | 0.00                  | 14.00          | 0.00                      | 914.24                                  | 2.52                                | 0.00                                      | 1.76                             | 912.07                                  | 0.35                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 4  |                               | CB-D07-02     | 12946012.48  | 279264.14    | 913.00              | 915.50                           | 2.50                          | 913.00                        | 0.00                      | 917.50                 | 2.00               | 0.00           | 0.00                  | 8.63           | 0.00                      | 914.06                                  | 1.06                                | 0.00                                      | 3.44                             | 913.22                                  | 0.22                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 5  |                               | CB-D08-05     | 12946965.45  | 279269.40    | 911.50              | 916.00                           | 4.50                          | 911.50                        | 0.00                      | 918.00                 | 2.00               | 0.00           | 0.00                  | 6.31           | 0.00                      | 912.71                                  | 1.21                                | 0.00                                      | 5.29                             | 911.73                                  | 0.23                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 6  |                               | CB-D09-03     | 12947511.02  | 279268.64    | 904.00              | 915.75                           | 11.75                         | 904.00                        | 0.00                      | 917.75                 | 2.00               | 0.00           | 0.00                  | 11.13          | 0.00                      | 907.97                                  | 3.97                                | 0.00                                      | 9.78                             | 904.50                                  | 0.50                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 7  |                               | CB-D09-04     | 12947590.08  | 279335.27    | 912.00              | 916.00                           | 4.00                          | 912.00                        | 0.00                      | 918.00                 | 2.00               | 0.00           | 0.00                  | 3.98           | 0.00                      | 912.77                                  | 0.77                                | 0.00                                      | 6.48                             | 912.19                                  | 0.19                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 8  |                               | CB-D04-02     | 12943022.53  | 279268.74    | 912.50              | 916.10                           | 3.60                          | 912.50                        | 0.00                      | 918.10                 | 2.00               | 0.00           | 0.00                  | 6.84           | 0.00                      | 913.38                                  | 0.88                                | 0.00                                      | 4.72                             | 912.70                                  | 0.20                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 9  |                               | CB-E02-02     | 12940787.01  | 279487.92    | 911.20              | 916.00                           | 4.80                          | 911.20                        | 0.00                      | 918.00                 | 2.00               | 0.00           | 0.00                  | 19.71          | 0.00                      | 912.59                                  | 1.39                                | 0.00                                      | 5.41                             | 911.53                                  | 0.33                                | 0 00:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 10 |                               | CB--E02-03    | 12940736.62  | 279426.72    | 915.80              | 917.80                           | 2.00                          | 915.80                        | 0.00                      | 917.80                 | 0.00               | 0.00           | 0.00                  | 70.66          | 0.00                      | 917.15                                  | 1.35                                | 0.00                                      | 0.65                             | 916.10                                  | 0.30                                | 0 00:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 11 | Yes                           | CB-E04-01     | 12942884.63  | 279527.68    | 904.67              | 915.75                           | 11.08                         | 904.67                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 97.30          | 8.47                      | 914.23                                  | 9.56                                | 0.00                                      | 1.52                             | 905.64                                  | 0.97                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 12 | Yes                           | CB-E04-02     | 12943083.57  | 279527.68    | 904.87              | 915.75                           | 10.88                         | 904.87                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 84.13          | 8.69                      | 914.91                                  | 10.04                               | 0.00                                      | 0.84                             | 905.84                                  | 0.97                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 13 | Yes                           | CB-E04-03     | 12943284.18  | 279528.99    | 906.27              | 915.75                           | 9.48                          | 906.27                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 68.35          | 0.00                      | 913.36                                  | 7.09                                | 0.00                                      | 2.39                             | 907.03                                  | 0.76                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 14 |                               | CB-E04-04     | 12943379.94  | 279812.17    | 907.20              | 913.50                           | 6.30                          | 907.20                        | 0.00                      | 913.50                 | 0.00               | 0.00           | 45.60                 | 8.34           | 8.34                      | 913.50                                  | 6.30                                | 0.00                                      | 0.00                             | 907.60                                  | 0.40                                | 0 12:05                                                 | 0 12:05                                                   | 0.00                                      | 0.00                                  |
| 15 | Yes                           | CB-E05-01     | 12943484.68  | 279529.95    | 906.67              | 915.75                           | 9.08                          | 906.67                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 62.46          | 0.00                      | 915.04                                  | 8.37                                | 0.00                                      | 0.71                             | 907.43                                  | 0.76                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 16 | Yes                           | CB-E05-02     | 12943846.38  | 279529.00    | 907.39              | 915.75                           | 8.36                          | 907.39                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 50.83          | 0.00                      | 914.95                                  | 7.56                                | 0.00                                      | 0.80                             | 908.04                                  | 0.65                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 17 | Yes                           | CB-E05-03     | 12944045.88  | 279528.79    | 907.79              | 915.75                           | 7.96                          | 907.79                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 28.09          | 0.00                      | 914.97                                  | 7.18                                | 0.00                                      | 0.78                             | 908.36                                  | 0.57                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 18 | Yes                           | CB-E05-04     | 12944245.53  | 279529.51    | 908.19              | 915.75                           | 7.56                          | 908.19                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 13.83          | 0.00                      | 915.11                                  | 6.92                                | 0.00                                      | 0.64                             | 908.65                                  | 0.46                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 19 |                               | CB-E05-05     | 12943495.77  | 279649.03    | 914.00              | 920.35                           | 6.35                          | 914.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 6.76           | 0.77                      | 914.68                                  | 0.68                                | 0.00                                      | 5.67                             | 914.14                                  | 0.14                                | 0 12:03                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 20 |                               | CB-E05-06     | 12943576.43  | 279648.25    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 4.47           | 1.48                      | 915.86                                  | 0.86                                | 0.00                                      | 4.49                             | 915.16                                  | 0.16                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 21 |                               | CB-E05-07     | 12943615.38  | 279649.06    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 40.20                 | 2.99           | 1.51                      | 916.15                                  | 0.65                                | 0.00                                      | 4.20                             | 915.62                                  | 0.12                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 22 |                               | CB-E05-08     | 12943655.72  | 279649.46    | 916.00              | 920.35                           | 4.35                          | 916.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 40.20                 | 1.48           | 1.48                      | 916.50                                  | 0.50                                | 0.00                                      | 3.85                             | 916.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 23 |                               | CB-E05-09     | 12943695.92  | 279649.46    | 916.00              | 920.35                           | 4.35                          | 916.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 40.20                 | 1.82           | 1.82                      | 917.00                                  | 1.00                                | 0.00                                      | 3.35                             | 916.12                                  | 0.12                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 24 |                               | CB-E05-10     | 12943749.09  | 279649.03    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 3.49           | 1.70                      | 916.81                                  | 1.31                                | 0.00                                      | 3.54                             | 915.67                                  | 0.17                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 25 |                               | CB-E05-11     | 12943789.83  | 279649.03    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 49.20                 | 5.00           | 1.51                      | 916.08                                  | 1.08                                | 0.00                                      | 4.27                             | 915.18                                  | 0.18                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 26 |                               | CB-E05-12     | 12943833.38  | 279649.46    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 6.41           | 1.42                      | 915.48                                  | 0.98                                | 0.00                                      | 4.87                             | 914.68                                  | 0.18                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 27 |                               | CB-E05-13     | 12943861.48  | 279649.46    | 914.00              | 920.45                           | 6.45                          | 914.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 59.40                 | 12.09          | 1.26                      | 914.83                                  | 0.83                                | 0.00                                      | 5.62                             | 914.17                                  | 0.17                                | 0 12:02                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 28 |                               | CB-E05-14     | 12943901.68  | 279649.03    | 914.50              | 920.45                           | 5.95                          | 914.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 56.40                 | 4.43           | 1.48                      | 915.41                                  | 0.91                                | 0.00                                      | 5.04                             | 914.67                                  | 0.17                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 29 |                               | CB-E05-15     | 12943941.89  | 279648.59    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 2.96           | 1.48                      | 915.89                                  | 0.89                                | 0.00                                      | 4.46                             | 915.15                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 30 |                               | CB-E05-16     | 12943981.89  | 279649.12    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 1.48           | 1.48                      | 916.01                                  | 0.51                                | 0.00                                      | 4.34                             | 915.60                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 31 |                               | CB-E05-17     | 12944021.79  | 279649.42    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 1.48           | 1.48                      | 915.01                                  | 0.51                                | 0.00                                      | 5.34                             | 914.60                                  | 0.10                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 32 |                               | CB-E05-18     | 12944062.06  | 279649.46    | 914.00              | 920.35                           | 6.35                          | 914.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 61.20                 | 8.25           | 1.51                      | 914.93                                  | 0.93                                | 0.00                                      | 5.42                             | 914.16                                  | 0.16                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 33 |                               | CB-E05-19     | 12944101.40  | 279649.03    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 55.20                 | 5.27           | 1.51                      | 915.55                                  | 1.05                                | 0.00                                      | 4.80                             | 914.68                                  | 0.18                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 34 |                               | CB-E05-20     | 12944142.03  | 279649.03    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 3.76           | 1.48                      | 916.33                                  | 1.33                                | 0.00                                      | 4.02                             | 915.18                                  | 0.18                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 35 |                               | CB-E05-21     | 12944181.76  | 279649.42    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 2.30           | 1.26                      | 916.62                                  | 1.12                                | 0.00                                      | 3.73                             | 915.63                                  | 0.13                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 36 |                               | CB-E05-22     | 12944209.47  | 279649.46    | 916.00              | 920.35                           | 4.35                          | 916.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 40.20                 | 1.05           | 1.05                      | 916.65                                  | 0.65                                | 0.00                                      | 3.70                             | 916.08                                  | 0.08                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 37 |                               | CB-E05-23     | 12944241.46  | 279649.46    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 1.39           | 1.39                      | 915.00                                  | 0.50                                | 0.00                                      | 5.35                             | 914.59                                  | 0.09                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 38 |                               | CB-E05-24     | 12944282.24  | 279649.21    | 914.00              | 920.35                           | 6.35                          | 914.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 61.20                 | 8.05           | 1.26                      | 914.93                                  | 0.93                                | 0.00                                      | 5.42                             | 914.16                                  | 0.16                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 39 |                               | CB-E05-25     | 12943535.54  | 279649.46    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 5.99           | 1.54                      | 915.46                                  | 0.96                                | 0.00                                      | 4.89                             | 914.68                                  | 0.18                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 40 | Yes                           | CB-E06-01     | 12944447.08  | 279529.77    | 909.47              | 915.75                           | 6.28                          | 909.47                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 0.63           | 0.00                      | 910.76                                  | 1.29                                | 0.00                                      | 4.99                             | 909.52                                  | 0.05                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 41 | Yes                           | CB-E06-02     | 12944646.25  | 279529.08    | 908.07              | 915.75                           | 7.68                          | 908.07                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 11.85          | 0.00                      | 910.71                                  | 2.64                                | 0.00                                      | 5.04                             | 908.42                                  | 0.35                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 42 | Yes                           | CB-E06-03     | 12944846.09  | 279529.08    | 907.67              | 915.75                           | 8.08                          | 907.67                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 23.80          | 0.00                      | 910.64                                  | 2.97                                | 0.00                                      | 5.11                             | 908.12                                  | 0.45                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 43 | Yes                           | CB-E06-04     | 12945046.60  | 279528.66    | 907.27              | 915.75                           | 8.48                          | 907.27                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 36.10          | 0.00                      | 910.48                                  | 3.21                                | 0.00                                      | 5.27                             | 907.83                                  | 0.56                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 44 |                               | CB-E06-05     | 12944309.76  | 279649.03    | 914.50              | 920.45                           | 5.95                          | 914.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 56.40                 | 5.42           | 1.11                      | 915.51                                  | 1.01                                | 0.00                                      | 4.94                             | 914.67                                  | 0.17                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 45 |                               | CB-E06-06     | 12944341.75  | 279649.46    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 |                    |                |                       |                |                           |                                         |                                     |                                           |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |

25-Year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|-----|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
|     | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 57  |                               | CB-E06-18     | 12944825.90  | 279649.46    | 912.50              | 920.35                           | 7.85                          | 912.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 61.20                 | 7.41           | 1.48                      | 913.35                                  | 0.85                                | 0.00                                      | 7.00                             | 912.67                                  | 0.17                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 58  |                               | CB-E06-19     | 12944865.67  | 279649.03    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 1.51           | 1.51                      | 916.66                                  | 1.16                                | 0.00                                      | 3.69                             | 915.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 59  |                               | CB-E06-20     | 12944905.87  | 279649.46    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 2.96           | 1.45                      | 916.56                                  | 1.56                                | 0.00                                      | 3.79                             | 915.16                                  | 0.16                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 60  |                               | CB-E06-21     | 12944945.79  | 279649.11    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 4.45           | 1.48                      | 916.06                                  | 1.56                                | 0.00                                      | 4.29                             | 914.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 61  |                               | CB-E06-22     | 12944986.04  | 279649.12    | 911.00              | 920.35                           | 9.35                          | 911.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 64.20                 | 7.56           | 1.64                      | 912.20                                  | 1.20                                | 0.00                                      | 8.15                             | 911.22                                  | 0.22                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 62  |                               | CB-E06-23     | 12945029.07  | 279649.46    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 1.48           | 1.48                      | 915.00                                  | 0.50                                | 0.00                                      | 5.35                             | 914.60                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 63  |                               | CB-E06-24     | 12945069.71  | 279649.46    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 1.48           | 1.48                      | 916.66                                  | 1.16                                | 0.00                                      | 3.69                             | 915.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 64  |                               | CB-E06-25     | 12945109.48  | 279649.03    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 2.97           | 1.48                      | 916.56                                  | 1.56                                | 0.00                                      | 3.79                             | 915.17                                  | 0.17                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 65  |                               | CB-E06-26     | 12945149.68  | 279649.46    | 914.50              | 920.45                           | 5.95                          | 914.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 59.40                 | 4.45           | 1.48                      | 916.06                                  | 1.56                                | 0.00                                      | 4.39                             | 914.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 66  |                               | CB-E06-27     | 12945190.07  | 279649.12    | 911.00              | 920.45                           | 9.45                          | 911.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 65.40                 | 7.41           | 1.48                      | 912.20                                  | 1.20                                | 0.00                                      | 8.25                             | 911.22                                  | 0.22                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 67  | Yes                           | CB-E07-01     | 12945246.38  | 279529.51    | 905.87              | 915.75                           | 9.88                          | 905.87                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 47.95          | 0.00                      | 910.08                                  | 4.21                                | 0.00                                      | 5.67                             | 906.45                                  | 0.58                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 68  | Yes                           | CB-E07-02     | 12945407.85  | 279529.13    | 905.35              | 918.21                           | 12.86                         | 905.35                        | 0.00                      | 918.21                 | 0.00               | 0.00           | 80.52                 | 58.44          | 4.77                      | 909.88                                  | 4.53                                | 0.00                                      | 8.33                             | 906.06                                  | 0.71                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 69  | Yes                           | CB-E07-03     | 12945607.96  | 279529.45    | 904.35              | 915.75                           | 11.40                         | 904.35                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 69.37          | 0.00                      | 909.52                                  | 5.17                                | 0.00                                      | 6.23                             | 905.12                                  | 0.77                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 70  | Yes                           | CB-E07-04     | 12945808.44  | 279529.52    | 903.95              | 915.75                           | 11.80                         | 903.95                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 81.18          | 0.00                      | 909.21                                  | 5.26                                | 0.00                                      | 6.54                             | 904.77                                  | 0.82                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 71  | Yes                           | CB-E07-05     | 12946007.57  | 279529.04    | 903.55              | 915.75                           | 12.20                         | 903.55                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 93.32          | 0.00                      | 908.78                                  | 5.23                                | 0.00                                      | 6.97                             | 904.42                                  | 0.87                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 72  |                               | CB-E07-06     | 12945229.65  | 279649.03    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 1.48           | 1.48                      | 914.99                                  | 0.49                                | 0.00                                      | 5.36                             | 914.60                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 73  |                               | CB-E07-07     | 12945269.42  | 279649.03    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 1.51           | 1.51                      | 916.49                                  | 0.99                                | 0.00                                      | 3.86                             | 915.61                                  | 0.11                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 74  |                               | CB-E07-08     | 12945309.94  | 279648.93    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 2.98           | 1.48                      | 916.40                                  | 1.40                                | 0.00                                      | 3.95                             | 915.16                                  | 0.16                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 75  |                               | CB-E07-09     | 12945349.83  | 279649.14    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 4.39           | 1.42                      | 915.90                                  | 1.40                                | 0.00                                      | 4.45                             | 914.69                                  | 0.19                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 76  |                               | CB-E07-10     | 12945382.43  | 279649.12    | 911.00              | 920.35                           | 9.35                          | 911.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 64.20                 | 8.17           | 1.05                      | 912.30                                  | 1.30                                | 0.00                                      | 8.05                             | 911.23                                  | 0.23                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 77  |                               | CB-E07-11     | 12945409.05  | 279649.03    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 2.74           | 1.26                      | 915.20                                  | 0.70                                | 0.00                                      | 5.15                             | 914.63                                  | 0.13                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 78  |                               | CB-E07-12     | 12945449.68  | 279649.46    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 1.48           | 1.48                      | 915.49                                  | 0.49                                | 0.00                                      | 4.86                             | 915.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 79  |                               | CB-E07-13     | 12945489.74  | 279648.88    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 1.48           | 1.48                      | 915.49                                  | 0.49                                | 0.00                                      | 4.86                             | 915.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 80  |                               | CB-E07-14     | 12945529.66  | 279649.03    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 2.96           | 1.48                      | 915.30                                  | 0.80                                | 0.00                                      | 5.05                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 81  |                               | CB-E07-15     | 12945569.84  | 279649.03    | 911.00              | 920.45                           | 9.45                          | 911.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 65.40                 | 7.41           | 1.51                      | 912.18                                  | 1.18                                | 0.00                                      | 8.27                             | 911.22                                  | 0.22                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 82  |                               | CB-E07-16     | 12945610.04  | 279649.35    | 914.50              | 920.45                           | 5.95                          | 914.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 59.40                 | 2.96           | 1.48                      | 915.30                                  | 0.80                                | 0.00                                      | 5.15                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 83  |                               | CB-E07-17     | 12945649.62  | 279648.88    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 1.48           | 1.48                      | 915.49                                  | 0.49                                | 0.00                                      | 4.86                             | 915.09                                  | 0.09                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 84  |                               | CB-E07-18     | 12945689.60  | 279649.03    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 1.48           | 1.48                      | 915.49                                  | 0.49                                | 0.00                                      | 4.86                             | 915.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 85  |                               | CB-E07-19     | 12945729.80  | 279649.89    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 2.96           | 1.48                      | 915.30                                  | 0.80                                | 0.00                                      | 5.05                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 86  |                               | CB-E07-20     | 12945769.74  | 279649.55    | 911.00              | 920.35                           | 9.35                          | 911.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 64.20                 | 7.52           | 1.48                      | 912.35                                  | 1.35                                | 0.00                                      | 8.00                             | 911.24                                  | 0.24                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 87  |                               | CB-E07-21     | 12945814.10  | 279649.46    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 3.11           | 1.64                      | 915.37                                  | 0.87                                | 0.00                                      | 4.98                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 88  |                               | CB-E07-22     | 12945853.87  | 279649.46    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 1.48           | 1.48                      | 915.50                                  | 0.50                                | 0.00                                      | 4.85                             | 915.09                                  | 0.09                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 89  |                               | CB-E07-23     | 12945894.07  | 279649.89    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 1.51           | 1.51                      | 915.50                                  | 0.50                                | 0.00                                      | 4.95                             | 915.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 90  |                               | CB-E07-24     | 12945933.84  | 279649.03    | 914.50              | 920.45                           | 5.95                          | 914.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 59.40                 | 2.99           | 1.48                      | 915.31                                  | 0.81                                | 0.00                                      | 5.14                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 91  |                               | CB-E07-25     | 12945973.77  | 279649.55    | 911.00              | 920.35                           | 9.35                          | 914.00                        | 3.00                      | 920.35                 | 0.00               | 0.00           | 64.20                 | 7.59           | 1.51                      | 914.00                                  | 3.00                                | 0.00                                      | 6.35                             | 911.22                                  | 0.22                                | 0 00:00                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 92  |                               | CB-E07-26     | 12946013.81  | 279649.46    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 3.11           | 1.48                      | 915.34                                  | 0.84                                | 0.00                                      | 5.01                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 93  |                               | CB-E07-27     | 12946054.01  | 279649.46    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 1.64           | 1.64                      | 915.53                                  | 0.53                                | 0.00                                      | 4.82                             | 915.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 94  | Yes                           | CB-E08-01     | 12946208.21  | 279529.33    | 902.65              | 915.75                           | 13.10                         | 902.65                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 105.06         | 0.00                      | 908.21                                  | 5.56                                | 0.00                                      | 7.54                             | 903.57                                  | 0.92                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 95  | Yes                           | CB-E08-02     | 12946407.02  | 279529.68    | 902.25              | 915.75                           | 13.50                         | 902.25                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 116.62         | 0.00                      | 907.74                                  | 5.49                                | 0.00                                      | 8.01                             | 903.20                                  | 0.95                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 96  | Yes                           | CB-E08-03     | 12946608.00  | 279528.62    | 901.85              | 915.75                           | 13.90                         | 901.85                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 129.67         | 0.00                      | 907.17                                  | 5.32                                | 0.00                                      | 8.58                             | 902.79                                  | 0.94                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 97  | Yes                           | CB-E08-04     | 12946969.51  | 279528.77    | 901.13              | 915.75                           | 14.62                         | 901.13                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 147.72         | 0.00                      | 906.28                                  | 5.15                                | 0.00                                      | 9.47                             | 902.17                                  | 1.04                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 98  |                               | CB-E08-05     | 12946097.67  | 279649.46    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 1.48           | 1.48                      | 915.49                                  | 0.49                                | 0.00                                      | 4.86                             | 915.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 99  |                               | CB-E08-06     | 12946137.88  | 279649.46    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 58.20                 | 2.96           | 1.48                      | 915.30                                  | 0.80                                | 0.00                                      | 5.05                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 100 |                               | CB-E08-07     | 12946178.23  | 279649.12    | 911.00              | 920.45                           | 9.45                          | 911.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 65.40                 | 7.10           | 1.48                      | 912.13                                  | 1.13                                | 0.00                                      | 8.32                             | 911.21                                  | 0.21                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 101 |                               | CB-E08-08     | 12946217.42  | 279649.03    | 914.50              | 920.45                           | 5.95                          | 914.50                        |                           |                        |                    |                |                       |                |                           |                                         |                                     |                                           |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |



25-Year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|-----|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
|     | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 113 |                               | CB-E08-20     | 12946702.62  | 279648.43    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 1.48           | 1.48                      | 916.67                                  | 1.17                                | 0.00                                      | 3.68                             | 915.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 114 |                               | CB-E08-21     | 12946742.01  | 279648.67    | 915.50              | 920.35                           | 4.85                          | 915.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 46.20                 | 1.48           | 1.48                      | 916.46                                  | 0.96                                | 0.00                                      | 3.89                             | 915.60                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 115 |                               | CB-E08-22     | 12946781.89  | 279649.16    | 915.00              | 920.35                           | 5.35                          | 915.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 52.20                 | 2.73           | 1.26                      | 916.37                                  | 1.37                                | 0.00                                      | 3.98                             | 915.14                                  | 0.14                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 116 |                               | CB-E08-23     | 12946814.47  | 279648.67    | 914.50              | 920.35                           | 5.85                          | 914.50                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 55.20                 | 4.12           | 1.42                      | 915.98                                  | 1.48                                | 0.00                                      | 4.37                             | 914.67                                  | 0.17                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 117 |                               | CB-E08-24     | 12946854.35  | 279649.16    | 914.00              | 920.35                           | 6.35                          | 914.00                        | 0.00                      | 920.35                 | 0.00               | 0.00           | 61.20                 | 5.45           | 1.33                      | 915.66                                  | 1.66                                | 0.00                                      | 4.69                             | 914.21                                  | 0.21                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 118 |                               | CB-E08-25     | 12946893.74  | 279648.43    | 913.50              | 920.40                           | 6.90                          | 913.50                        | 0.00                      | 920.40                 | 0.00               | 0.00           | 67.80                 | 6.92           | 1.48                      | 915.06                                  | 1.56                                | 0.00                                      | 5.34                             | 913.73                                  | 0.23                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 119 |                               | CB-E08-26     | 12946934.11  | 279648.92    | 911.00              | 920.14                           | 9.14                          | 911.00                        | 0.00                      | 920.14                 | 0.00               | 0.00           | 49.68                 | 9.23           | 1.48                      | 912.65                                  | 1.65                                | 0.00                                      | 7.49                             | 911.26                                  | 0.26                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 120 |                               | CB-E08-27     | 12946973.98  | 279649.40    | 915.50              | 919.91                           | 4.41                          | 915.50                        | 0.00                      | 919.91                 | 0.00               | 0.00           | 40.92                 | 0.83           | 0.83                      | 915.85                                  | 0.35                                | 0.00                                      | 4.06                             | 915.57                                  | 0.07                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 121 | Yes                           | CB-E09-01     | 12947170.16  | 279528.75    | 900.73              | 915.75                           | 15.02                         | 900.73                        | 0.00                      | 915.75                 | 0.00               | 0.00           | 0.00                  | 150.35         | 0.00                      | 905.44                                  | 4.71                                | 0.00                                      | 10.31                            | 901.89                                  | 1.16                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 122 |                               | CB-E09-02     | 12947365.35  | 279506.86    | 910.00              | 919.09                           | 9.09                          | 910.00                        | 0.00                      | 919.09                 | 0.00               | 0.00           | 91.08                 | 5.85           | 5.85                      | 910.99                                  | 0.99                                | 0.00                                      | 8.10                             | 910.21                                  | 0.21                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 123 |                               | CB-E09-05     | 12947129.71  | 279784.92    | 908.45              | 913.50                           | 5.05                          | 908.45                        | 0.00                      | 913.50                 | 0.00               | 0.00           | 36.60                 | 9.70           | 9.70                      | 910.32                                  | 1.87                                | 0.00                                      | 3.18                             | 908.74                                  | 0.29                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 124 |                               | CB-E09-06     | 12947130.08  | 279924.83    | 908.00              | 913.50                           | 5.50                          | 908.00                        | 0.00                      | 913.50                 | 0.00               | 0.00           | 42.00                 | 12.64          | 3.03                      | 909.97                                  | 1.97                                | 0.00                                      | 3.53                             | 908.35                                  | 0.35                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 125 |                               | CB-E09-07     | 12947557.23  | 279445.22    | 901.50              | 919.05                           | 17.55                         | 901.50                        | 0.00                      | 919.05                 | 0.00               | 0.00           | 174.60                | 13.67          | 13.67                     | 907.48                                  | 5.98                                | 0.00                                      | 11.57                            | 902.53                                  | 1.03                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 126 |                               | CB-F01-02     | 12940644.52  | 280424.72    | 909.00              | 918.50                           | 9.50                          | 909.00                        | 0.00                      | 918.50                 | 0.00               | 0.00           | 12.00                 | 10.12          | 0.00                      | 911.31                                  | 2.31                                | 0.00                                      | 7.19                             | 909.29                                  | 0.29                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 127 | Yes                           | CB-F04-03     | 12943244.95  | 280433.45    | 908.94              | 916.50                           | 7.56                          | 908.94                        | 0.00                      | 916.50                 | 0.00               | 0.00           | 36.72                 | 66.69          | 25.88                     | 914.71                                  | 5.77                                | 0.00                                      | 1.79                             | 909.78                                  | 0.84                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 128 |                               | CB-F04-04     | 12942665.25  | 280496.07    | 912.00              | 915.51                           | 3.51                          | 912.00                        | 0.00                      | 917.51                 | 2.00               | 0.00           | 18.12                 | 16.28          | 0.00                      | 913.70                                  | 1.70                                | 0.00                                      | 1.81                             | 912.25                                  | 0.25                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 129 |                               | CB-F05-04     | 12943495.75  | 280333.77    | 917.00              | 920.21                           | 3.21                          | 917.00                        | 0.00                      | 920.21                 | 0.00               | 0.00           | 26.52                 | 0.83           | 0.83                      | 918.09                                  | 1.09                                | 0.00                                      | 2.12                             | 917.08                                  | 0.08                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 130 |                               | CB-F05-05     | 12943535.27  | 280334.30    | 916.50              | 920.38                           | 3.88                          | 916.50                        | 0.00                      | 920.38                 | 0.00               | 0.00           | 34.56                 | 2.36           | 1.51                      | 918.06                                  | 1.56                                | 0.00                                      | 2.32                             | 916.64                                  | 0.14                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 131 |                               | CB-F05-06     | 12943575.32  | 280334.30    | 916.00              | 920.45                           | 4.45                          | 916.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 41.40                 | 3.86           | 1.51                      | 917.75                                  | 1.75                                | 0.00                                      | 2.70                             | 916.19                                  | 0.19                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 132 |                               | CB-F05-07     | 12943615.37  | 280334.30    | 915.25              | 920.20                           | 4.95                          | 915.25                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 44.40                 | 5.34           | 1.48                      | 916.88                                  | 1.63                                | 0.00                                      | 3.32                             | 915.45                                  | 0.20                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 133 |                               | CB-F05-08     | 12943655.42  | 280334.30    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 9.50           | 1.51                      | 916.29                                  | 1.79                                | 0.00                                      | 3.91                             | 914.77                                  | 0.27                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 134 |                               | CB-F05-09     | 12943699.21  | 280334.30    | 915.50              | 920.20                           | 4.70                          | 915.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 44.40                 | 2.67           | 1.02                      | 916.72                                  | 1.22                                | 0.00                                      | 3.48                             | 915.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 135 |                               | CB-F05-10     | 12943749.40  | 280334.84    | 916.00              | 920.20                           | 4.20                          | 916.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 38.40                 | 1.67           | 1.67                      | 916.87                                  | 0.87                                | 0.00                                      | 3.33                             | 916.11                                  | 0.11                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 136 |                               | CB-F05-11     | 12943789.99  | 280334.30    | 916.50              | 920.42                           | 3.92                          | 916.50                        | 0.00                      | 920.42                 | 0.00               | 0.00           | 35.04                 | 1.51           | 1.51                      | 917.43                                  | 0.93                                | 0.00                                      | 2.99                             | 916.61                                  | 0.11                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 137 |                               | CB-F05-12     | 12943829.51  | 280334.84    | 916.00              | 920.45                           | 4.45                          | 916.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 41.40                 | 2.92           | 1.42                      | 917.35                                  | 1.35                                | 0.00                                      | 3.10                             | 916.15                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 138 |                               | CB-F05-13     | 12943862.08  | 280334.30    | 915.50              | 920.45                           | 4.95                          | 915.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 47.40                 | 4.17           | 1.26                      | 916.92                                  | 1.42                                | 0.00                                      | 3.53                             | 915.69                                  | 0.19                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 139 |                               | CB-F05-14     | 12943902.13  | 280334.30    | 914.00              | 920.45                           | 6.45                          | 914.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 10.13          | 1.48                      | 915.34                                  | 1.34                                | 0.00                                      | 5.11                             | 914.18                                  | 0.18                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 140 |                               | CB-F05-15     | 12943941.65  | 280334.30    | 915.50              | 920.45                           | 4.95                          | 915.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 47.40                 | 4.48           | 1.48                      | 917.07                                  | 1.57                                | 0.00                                      | 3.38                             | 915.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 141 |                               | CB-F05-16     | 12943981.70  | 280334.30    | 916.00              | 920.45                           | 4.45                          | 916.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 41.40                 | 3.00           | 1.51                      | 917.58                                  | 1.58                                | 0.00                                      | 2.87                             | 916.17                                  | 0.17                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 142 |                               | CB-F05-17     | 12944021.75  | 280334.30    | 916.50              | 920.25                           | 3.75                          | 916.50                        | 0.00                      | 920.25                 | 0.00               | 0.00           | 33.00                 | 1.48           | 1.48                      | 917.67                                  | 1.17                                | 0.00                                      | 2.58                             | 916.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 143 |                               | CB-F05-18     | 12944061.27  | 280334.30    | 915.50              | 920.20                           | 4.70                          | 915.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 44.40                 | 1.48           | 1.48                      | 918.32                                  | 2.82                                | 0.00                                      | 1.88                             | 915.62                                  | 0.12                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 144 |                               | CB-F05-19     | 12944101.85  | 280334.30    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 2.97           | 1.48                      | 918.14                                  | 3.14                                | 0.00                                      | 2.06                             | 915.17                                  | 0.17                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 145 |                               | CB-F05-20     | 12944141.37  | 280333.77    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.45           | 1.48                      | 917.56                                  | 3.06                                | 0.00                                      | 2.64                             | 914.71                                  | 0.21                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 146 |                               | CB-F05-21     | 12944181.42  | 280334.30    | 914.00              | 920.20                           | 6.20                          | 914.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 62.40                 | 10.39          | 1.26                      | 916.47                                  | 2.47                                | 0.00                                      | 3.73                             | 914.16                                  | 0.16                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 147 |                               | CB-F05-22     | 12944209.72  | 280334.84    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.70           | 1.05                      | 917.33                                  | 2.83                                | 0.00                                      | 2.87                             | 914.70                                  | 0.20                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 148 |                               | CB-F05-23     | 12944242.29  | 280334.30    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 3.64           | 1.42                      | 918.04                                  | 3.04                                | 0.00                                      | 2.16                             | 915.19                                  | 0.19                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 149 |                               | CB-F05-24     | 12944280.74  | 280333.77    | 915.50              | 920.20                           | 4.70                          | 915.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 44.40                 | 2.22           | 1.26                      | 918.41                                  | 2.91                                | 0.00                                      | 1.79                             | 915.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 150 |                               | CB-F05-25     | 12943675.17  | 280525.47    | 910.86              | 917.31                           | 6.45                          | 910.86                        | 0.00                      | 917.31                 | 0.00               | 0.00           | 47.40                 | 13.72          | 2.75                      | 915.46                                  | 4.60                                | 0.00                                      | 1.85                             | 911.38                                  | 0.52                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 151 |                               | CB-F05-26     | 12944088.54  | 280480.84    | 911.45              | 919.51                           | 8.06                          | 911.45                        | 0.00                      | 919.51                 | 0.00               | 0.00           | 72.72                 | 6.83           | 4.50                      | 919.51                                  | 8.06                                | 0.00                                      | 0.00                             | 911.74                                  | 0.29                                | 0 12:04                                                 | 0 12:04                                                   | 0.00                                      | 0.00                                  |
| 152 |                               | CB-F06-04     | 12944309.58  | 280334.30    | 916.00              | 920.45                           | 4.45                          | 916.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 41.40                 | 0.96           | 0.96                      | 918.49                                  | 2.49                                | 0.00                                      | 1.96                             | 916.09                                  | 0.09                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 153 |                               | CB-F06-05     | 12944341.62  | 280334.30    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 1.48           | 1.48                      | 915.82                                  | 0.82                                | 0.00                                      | 4.63                             | 915.10                                  | 0.10                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 154 |                               | CB-F06-06     | 12944381.67  | 280334.30    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 2.96           | 1.48                      | 916.38                                  | 1.88                                | 0.00                                      | 3.82                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 155 |                               | CB-F06-07     | 12944421.72  | 280333.77    | 910.50              | 920.20                           | 9.70                          | 910.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 10.52          | 1.48                      | 915.35                                  | 4.85                                | 0.00                                      | 4.85                             | 911.29                                  | 0.79                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 156 |                               | CB-F06-08     | 12944461.77  | 280333.77    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 6.11           | 1.48                      | 915.60                                  | 1.10                                | 0.00                                      | 4.60                             | 914.69                                  | 0.19                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 157 |                               | CB-F06-09     | 12944501.29  | 280334.30    | 915.00</            |                                  |                               |                               |                           |                        |                    |                |                       |                |                           |                                         |                                     |                                           |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |



25-Year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|-----|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
|     | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 169 |                               | CB-F06-21     | 12944989.54  | 280334.08    | 913.50              | 920.20                           | 6.70                          | 913.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 62.40                 | 10.41          | 1.61                      | 914.55                                  | 1.05                                | 0.00                                      | 5.65                             | 913.67                                  | 0.17                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 170 |                               | CB-F06-22     | 12945029.98  | 280334.08    | 914.00              | 920.20                           | 6.20                          | 914.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.42           | 1.48                      | 914.85                                  | 0.85                                | 0.00                                      | 5.35                             | 914.16                                  | 0.16                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 171 |                               | CB-F06-23     | 12945069.63  | 280334.08    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 2.96           | 1.48                      | 915.37                                  | 0.87                                | 0.00                                      | 4.83                             | 914.65                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 172 |                               | CB-F06-24     | 12945110.08  | 280334.08    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 1.48           | 1.48                      | 915.50                                  | 0.50                                | 0.00                                      | 4.70                             | 915.10                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 173 |                               | CB-F06-25     | 12945149.72  | 280334.04    | 915.50              | 920.45                           | 4.95                          | 915.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 47.40                 | 1.48           | 1.48                      | 916.59                                  | 1.09                                | 0.00                                      | 3.86                             | 915.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 174 |                               | CB-F06-26     | 12945189.66  | 280333.74    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 2.97           | 1.48                      | 916.50                                  | 1.50                                | 0.00                                      | 3.95                             | 915.16                                  | 0.16                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 175 |                               | CB-F06-27     | 12944337.64  | 280480.41    | 911.00              | 919.51                           | 8.51                          | 911.00                        | 0.00                      | 919.51                 | 0.00               | 0.00           | 84.12                 | 4.46           | 4.46                      | 915.72                                  | 4.72                                | 0.00                                      | 3.79                             | 911.32                                  | 0.32                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 176 |                               | CB-F07-04     | 12945229.91  | 280333.74    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.45           | 1.48                      | 915.99                                  | 1.49                                | 0.00                                      | 4.21                             | 914.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 177 |                               | CB-F07-05     | 12945269.55  | 280334.04    | 914.00              | 920.20                           | 6.20                          | 914.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 62.40                 | 9.84           | 1.48                      | 914.81                                  | 0.81                                | 0.00                                      | 5.39                             | 914.15                                  | 0.15                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 178 |                               | CB-F07-06     | 12945309.79  | 280334.04    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 3.91           | 1.48                      | 915.72                                  | 1.22                                | 0.00                                      | 4.48                             | 914.68                                  | 0.18                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 179 |                               | CB-F07-07     | 12945353.91  | 280334.07    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 2.44           | 1.42                      | 916.08                                  | 1.08                                | 0.00                                      | 4.12                             | 915.14                                  | 0.14                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 180 |                               | CB-F07-08     | 12945381.86  | 280333.74    | 915.50              | 920.20                           | 4.70                          | 915.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 44.40                 | 1.05           | 1.05                      | 916.12                                  | 0.62                                | 0.00                                      | 4.08                             | 915.58                                  | 0.08                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 181 |                               | CB-F07-09     | 12945409.53  | 280333.75    | 915.50              | 920.24                           | 4.74                          | 915.50                        | 0.00                      | 920.24                 | 0.00               | 0.00           | 44.88                 | 1.26           | 1.26                      | 916.40                                  | 0.90                                | 0.00                                      | 3.84                             | 915.60                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 182 |                               | CB-F07-10     | 12945449.97  | 280334.15    | 915.00              | 920.30                           | 5.30                          | 915.00                        | 0.00                      | 920.30                 | 0.00               | 0.00           | 51.60                 | 2.73           | 1.48                      | 916.36                                  | 1.36                                | 0.00                                      | 3.94                             | 915.15                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 183 |                               | CB-F07-11     | 12945489.60  | 280334.15    | 914.50              | 920.45                           | 5.95                          | 914.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 59.40                 | 4.21           | 1.48                      | 915.94                                  | 1.44                                | 0.00                                      | 4.51                             | 914.69                                  | 0.19                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 184 |                               | CB-F07-12     | 12945529.64  | 280334.15    | 909.00              | 920.45                           | 11.45                         | 909.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 65.40                 | 10.19          | 1.51                      | 913.10                                  | 4.10                                | 0.00                                      | 7.35                             | 911.05                                  | 2.05                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 185 |                               | CB-F07-13     | 12945569.67  | 280334.15    | 914.50              | 920.45                           | 5.95                          | 914.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 59.40                 | 4.48           | 1.48                      | 915.98                                  | 1.48                                | 0.00                                      | 4.47                             | 914.69                                  | 0.19                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 186 |                               | CB-F07-14     | 12945609.71  | 280333.75    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 3.00           | 1.51                      | 916.50                                  | 1.50                                | 0.00                                      | 3.95                             | 915.16                                  | 0.16                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 187 |                               | CB-F07-15     | 12945650.14  | 280333.75    | 915.50              | 920.45                           | 4.95                          | 915.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 47.40                 | 1.48           | 1.48                      | 916.59                                  | 1.09                                | 0.00                                      | 3.86                             | 915.61                                  | 0.11                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 188 |                               | CB-F07-16     | 12945689.54  | 280334.16    | 915.50              | 920.40                           | 4.90                          | 915.50                        | 0.00                      | 920.40                 | 0.00               | 0.00           | 46.80                 | 1.48           | 1.48                      | 916.71                                  | 1.21                                | 0.00                                      | 3.69                             | 915.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 189 |                               | CB-F07-17     | 12945729.78  | 280333.86    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 2.97           | 1.48                      | 916.61                                  | 1.61                                | 0.00                                      | 3.59                             | 915.17                                  | 0.17                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 190 |                               | CB-F07-18     | 12945769.41  | 280333.86    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.45           | 1.48                      | 916.11                                  | 1.61                                | 0.00                                      | 4.09                             | 914.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 191 |                               | CB-F07-19     | 12945813.85  | 280333.56    | 914.00              | 920.20                           | 6.20                          | 914.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 62.40                 | 10.53          | 1.64                      | 914.82                                  | 0.82                                | 0.00                                      | 5.38                             | 914.15                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 192 |                               | CB-F07-20     | 12945854.08  | 280334.16    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.45           | 1.48                      | 916.05                                  | 1.55                                | 0.00                                      | 4.15                             | 914.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 193 |                               | CB-F07-21     | 12945893.72  | 280333.86    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 2.97           | 1.48                      | 916.55                                  | 1.55                                | 0.00                                      | 3.90                             | 915.16                                  | 0.16                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 194 |                               | CB-F07-22     | 12945933.65  | 280333.86    | 915.50              | 920.45                           | 4.95                          | 915.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 47.40                 | 1.48           | 1.48                      | 916.64                                  | 1.14                                | 0.00                                      | 3.81                             | 915.61                                  | 0.11                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 195 |                               | CB-F07-23     | 12945973.31  | 280333.80    | 915.50              | 920.28                           | 4.78                          | 915.50                        | 0.00                      | 920.28                 | 0.00               | 0.00           | 45.36                 | 1.48           | 1.48                      | 916.83                                  | 1.33                                | 0.00                                      | 3.45                             | 915.62                                  | 0.12                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 196 |                               | CB-F07-24     | 12946013.74  | 280333.40    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 2.97           | 1.48                      | 916.73                                  | 1.73                                | 0.00                                      | 3.47                             | 915.17                                  | 0.17                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 197 |                               | CB-F07-25     | 12946053.77  | 280333.40    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.60           | 1.64                      | 916.23                                  | 1.73                                | 0.00                                      | 3.97                             | 914.71                                  | 0.21                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 198 |                               | CB-F07-26     | 12945262.94  | 280479.55    | 913.50              | 918.88                           | 5.38                          | 913.50                        | 0.00                      | 918.88                 | 0.00               | 0.00           | 46.56                 | 4.90           | 4.90                      | 914.35                                  | 0.85                                | 0.00                                      | 4.53                             | 913.68                                  | 0.18                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 199 |                               | CB-F08-05     | 12946098.60  | 280334.20    | 908.50              | 920.20                           | 11.70                         | 908.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 62.40                 | 10.56          | 1.48                      | 912.34                                  | 3.84                                | 0.00                                      | 7.86                             | 910.97                                  | 2.47                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 200 |                               | CB-F08-06     | 12946139.03  | 280333.80    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.48           | 1.48                      | 916.08                                  | 1.58                                | 0.00                                      | 4.12                             | 914.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 201 |                               | CB-F08-07     | 12946177.46  | 280333.80    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 3.00           | 1.48                      | 916.58                                  | 1.58                                | 0.00                                      | 3.87                             | 915.17                                  | 0.17                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 202 |                               | CB-F08-08     | 12946218.29  | 280333.80    | 915.50              | 920.45                           | 4.95                          | 915.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 47.40                 | 1.51           | 1.51                      | 916.68                                  | 1.18                                | 0.00                                      | 3.77                             | 915.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 203 |                               | CB-F08-09     | 12946257.72  | 280333.66    | 915.50              | 920.20                           | 4.70                          | 915.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 44.40                 | 1.51           | 1.51                      | 916.65                                  | 1.15                                | 0.00                                      | 3.55                             | 915.61                                  | 0.11                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 204 |                               | CB-F08-10     | 12946298.18  | 280333.66    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 2.99           | 1.48                      | 916.55                                  | 1.55                                | 0.00                                      | 3.65                             | 915.16                                  | 0.16                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 205 |                               | CB-F08-11     | 12946337.93  | 280333.66    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 4.48           | 1.48                      | 916.04                                  | 1.54                                | 0.00                                      | 4.16                             | 914.70                                  | 0.20                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 206 |                               | CB-F08-12     | 12946377.69  | 280333.66    | 914.00              | 920.20                           | 6.20                          | 914.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 62.40                 | 9.76           | 1.48                      | 914.78                                  | 0.78                                | 0.00                                      | 5.42                             | 914.15                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 207 |                               | CB-F08-13     | 12946421.66  | 280333.66    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 56.40                 | 3.81           | 0.83                      | 915.75                                  | 1.25                                | 0.00                                      | 4.45                             | 914.68                                  | 0.18                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 208 |                               | CB-F08-14     | 12946461.77  | 280334.01    | 915.00              | 920.45                           | 5.45                          | 915.00                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 53.40                 | 2.98           | 1.51                      | 916.26                                  | 1.26                                | 0.00                                      | 4.19                             | 915.16                                  | 0.16                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 209 |                               | CB-F08-15     | 12946502.12  | 280333.63    | 915.50              | 920.45                           | 4.95                          | 915.50                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 47.40                 | 1.48           | 1.48                      | 916.34                                  | 0.84                                | 0.00                                      | 4.11                             | 915.60                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 210 |                               | CB-F08-16     | 12946541.63  | 280333.63    | 915.50              | 920.20                           | 4.70                          | 915.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 44.40                 | 1.48           | 1.48                      | 916.00                                  | 0.50                                | 0.00                                      | 4.20                             | 915.60                                  | 0.10                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 211 |                               | CB-F08-17     | 12946581.41  | 280333.63    | 915.00              | 920.20                           | 5.20                          | 915.00                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 50.40                 | 2.96           | 1.48                      | 915.88                                  | 0.88                                | 0.00                                      | 4.32                             | 915.15                                  | 0.15                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 212 |                               | CB-F08-18     | 12946621.53  | 280333.63    | 914.50              | 920.20                           | 5.70                          | 914.50                        | 0.00                      | 920.20                 | 0.00               | 0.00           | 53.40                 | 4.42           | 1.48                      | 915.39                                  | 0.89                                | 0.00                                      | 4.81                             | 914.67                                  | 0.17                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 213 |                               | CB-F08-19     | 12946662.00  | 280333.63    | 907.00              | 920.20                           |                               |                               |                           |                        |                    |                |                       |                |                           |                                         |                                     |                                           |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |

25-Year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|-----|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
|     | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 225 |                               | CB-G04-02     | 12942669.76  | 280622.58    | 912.50              | 915.56                           | 3.06                          | 912.50                        | 0.00                      | 917.56                 | 2.00               | 0.00           | 0.00                  | 12.02          | 0.00                      | 916.01                                  | 3.51                                | 0.00                                      | 1.55                             | 912.98                                  | 0.48                                | 0 12:11                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 226 |                               | CB-G04-03     | 12942775.94  | 280618.06    | 913.00              | 916.80                           | 3.80                          | 913.00                        | 0.00                      | 918.80                 | 2.00               | 0.00           | 0.00                  | 5.36           | 0.00                      | 916.48                                  | 3.48                                | 0.00                                      | 2.32                             | 913.37                                  | 0.37                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 227 |                               | CB-G04-11     | 12943393.60  | 280832.48    | 911.93              | 917.00                           | 5.07                          | 911.93                        | 0.00                      | 917.00                 | 0.00               | 0.00           | 36.84                 | 4.32           | 4.32                      | 917.00                                  | 5.07                                | 0.00                                      | 0.00                             | 912.26                                  | 0.33                                | 0 12:06                                                 | 0 12:06                                                   | 0.00                                      | 0.00                                  |
| 228 |                               | CB-G05-01     | 12943675.35  | 280774.95    | 911.36              | 917.31                           | 5.95                          | 911.36                        | 0.00                      | 917.31                 | 0.00               | 0.00           | 41.40                 | 11.67          | 7.34                      | 917.31                                  | 5.95                                | 0.00                                      | 0.00                             | 911.81                                  | 0.45                                | 0 12:06                                                 | 0 12:06                                                   | 0.00                                      | 0.00                                  |
| 229 |                               | CB-G05-02     | 12943906.14  | 280928.86    | 909.47              | 918.00                           | 8.53                          | 909.47                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 48.36                 | 24.99          | 24.99                     | 913.28                                  | 3.81                                | 0.00                                      | 4.72                             | 910.13                                  | 0.66                                | 0 12:15                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 230 |                               | CB-G05-03     | 12944180.59  | 280929.42    | 908.42              | 918.00                           | 9.58                          | 908.42                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 54.96                 | 31.22          | 7.99                      | 913.23                                  | 4.81                                | 0.00                                      | 4.77                             | 909.19                                  | 0.77                                | 0 12:15                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 231 |                               | CB-G06-01     | 12944455.61  | 280928.86    | 907.87              | 918.00                           | 10.13                         | 907.87                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 55.56                 | 69.70          | 41.21                     | 913.08                                  | 5.21                                | 0.00                                      | 4.92                             | 908.90                                  | 1.03                                | 0 12:15                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 232 |                               | CB-G06-02     | 12944730.35  | 280929.14    | 907.60              | 918.00                           | 10.40                         | 907.60                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 52.80                 | 74.45          | 7.52                      | 912.89                                  | 5.29                                | 0.00                                      | 5.11                             | 908.64                                  | 1.04                                | 0 12:15                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 233 |                               | CB-G06-03     | 12945005.37  | 280929.14    | 907.32              | 918.00                           | 10.68                         | 907.32                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 56.16                 | 78.16          | 7.59                      | 912.78                                  | 5.46                                | 0.00                                      | 5.22                             | 908.38                                  | 1.06                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 234 |                               | CB-G07-01     | 12945280.39  | 280929.14    | 907.05              | 918.00                           | 10.95                         | 907.05                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 59.40                 | 113.99         | 40.97                     | 912.63                                  | 5.58                                | 0.00                                      | 5.37                             | 908.04                                  | 0.99                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 235 |                               | CB-G07-02     | 12945555.13  | 280929.42    | 905.21              | 918.00                           | 12.79                         | 905.21                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 69.48                 | 115.72         | 7.63                      | 913.03                                  | 7.82                                | 0.00                                      | 4.97                             | 906.56                                  | 1.35                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 236 |                               | CB-G07-03     | 12945830.43  | 280928.86    | 904.93              | 918.00                           | 13.07                         | 904.93                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 72.84                 | 116.98         | 7.45                      | 913.06                                  | 8.13                                | 0.00                                      | 4.94                             | 906.32                                  | 1.39                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 237 |                               | CB-G08-01     | 12946104.88  | 280928.86    | 904.66              | 918.00                           | 13.34                         | 904.66                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 76.08                 | 121.29         | 7.63                      | 912.44                                  | 7.78                                | 0.00                                      | 5.56                             | 906.07                                  | 1.41                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 238 |                               | CB-G08-02     | 12946380.74  | 280928.86    | 904.38              | 916.57                           | 12.19                         | 904.38                        | 0.00                      | 916.57                 | 0.00               | 0.00           | 62.28                 | 127.55         | 7.54                      | 912.15                                  | 7.77                                | 0.00                                      | 4.42                             | 905.81                                  | 1.43                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 239 |                               | CB-G08-03     | 12946655.48  | 280929.14    | 904.11              | 915.77                           | 11.66                         | 904.11                        | 0.00                      | 915.77                 | 0.00               | 0.00           | 55.92                 | 155.26         | 35.53                     | 911.90                                  | 7.79                                | 0.00                                      | 3.87                             | 905.54                                  | 1.43                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 240 |                               | CB-G08-04     | 12946930.78  | 280929.39    | 903.84              | 920.45                           | 16.61                         | 903.84                        | 0.00                      | 920.45                 | 0.00               | 0.00           | 115.32                | 160.82         | 9.41                      | 911.45                                  | 7.61                                | 0.00                                      | 9.00                             | 904.90                                  | 1.06                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 241 | Yes                           | CB-G09-02     | 12947420.21  | 280722.42    | 902.92              | 918.94                           | 16.02                         | 902.92                        | 0.00                      | 918.94                 | 0.00               | 0.00           | 108.12                | 595.64         | 11.64                     | 910.88                                  | 7.96                                | 0.00                                      | 8.06                             | 904.28                                  | 1.36                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 242 |                               | CB-G10-01     | 12948251.36  | 280618.40    | 909.50              | 918.28                           | 8.78                          | 909.50                        | 0.00                      | 920.28                 | 2.00               | 0.00           | 0.00                  | 20.79          | 0.00                      | 911.80                                  | 2.30                                | 0.00                                      | 8.48                             | 909.87                                  | 0.37                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 243 |                               | CB-G10-02     | 12948324.51  | 280604.96    | 910.50              | 919.00                           | 8.50                          | 910.50                        | 0.00                      | 921.00                 | 2.00               | 0.00           | 0.00                  | 17.87          | 5.56                      | 912.67                                  | 2.17                                | 0.00                                      | 8.33                             | 910.86                                  | 0.36                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 244 |                               | CB-G10-03     | 12948408.05  | 280588.33    | 911.00              | 919.45                           | 8.45                          | 911.00                        | 0.00                      | 921.00                 | 1.55               | 0.00           | 0.00                  | 12.08          | 3.42                      | 913.14                                  | 2.14                                | 0.00                                      | 8.32                             | 911.31                                  | 0.31                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 245 |                               | CB-G10-04     | 12948234.99  | 280698.83    | 904.50              | 921.86                           | 17.36                         | 904.50                        | 0.00                      | 921.86                 | 0.00               | 0.00           | 124.32                | 136.77         | 7.22                      | 911.63                                  | 7.13                                | 0.00                                      | 10.23                            | 905.91                                  | 1.41                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 246 |                               | CB-G10-05     | 12948430.58  | 280695.02    | 912.00              | 917.78                           | 5.78                          | 912.00                        | 0.00                      | 917.78                 | 0.00               | 0.00           | 51.36                 | 6.71           | 6.71                      | 913.81                                  | 1.81                                | 0.00                                      | 3.97                             | 912.25                                  | 0.25                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 247 |                               | CB-G10-06     | 12948251.57  | 280775.74    | 906.50              | 919.76                           | 13.26                         | 906.50                        | 0.00                      | 921.76                 | 2.00               | 0.00           | 0.00                  | 114.88         | 0.00                      | 912.50                                  | 6.00                                | 0.00                                      | 9.26                             | 907.41                                  | 0.91                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 248 |                               | CB-G10-07     | 12948331.52  | 280796.08    | 907.00              | 920.15                           | 13.15                         | 907.00                        | 0.00                      | 922.15                 | 2.00               | 0.00           | 0.00                  | 111.99         | 0.00                      | 913.34                                  | 6.34                                | 0.00                                      | 8.81                             | 907.93                                  | 0.93                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 249 |                               | CB-G10-08     | 12948417.58  | 280802.09    | 907.50              | 919.16                           | 11.66                         | 907.50                        | 0.00                      | 921.00                 | 1.84               | 0.00           | 0.00                  | 103.99         | 99.51                     | 914.11                                  | 6.61                                | 0.00                                      | 7.05                             | 908.42                                  | 0.92                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 250 |                               | CB-J02-01     | 12941091.73  | 281957.74    | 906.60              | 918.33                           | 11.73                         | 906.60                        | 0.00                      | 918.33                 | 0.00               | 0.00           | 0.00                  | 373.51         | 29.72                     | 916.05                                  | 9.45                                | 0.00                                      | 2.78                             | 908.27                                  | 1.67                                | 0 12:16                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 251 |                               | CB-J02-03     | 12941091.73  | 282031.58    | 906.80              | 916.00                           | 9.20                          | 906.80                        | 0.00                      | 918.00                 | 2.00               | 0.00           | 45.00                 | 289.72         | 4.31                      | 917.01                                  | 10.21                               | 1.01                                      | 0.00                             | 908.42                                  | 1.62                                | 0 12:17                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 252 |                               | CB-J02-04     | 12941089.40  | 282107.71    | 907.00              | 918.33                           | 11.33                         | 907.00                        | 0.00                      | 918.33                 | 0.00               | 0.00           | 0.00                  | 296.69         | 71.32                     | 917.95                                  | 10.95                               | 0.00                                      | 0.88                             | 908.61                                  | 1.61                                | 0 12:17                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 253 |                               | CB-J07-02     | 12945878.83  | 281957.31    | 908.50              | 916.25                           | 7.75                          | 908.50                        | 0.00                      | 919.25                 | 3.00               | 0.00           | 0.00                  | 220.67         | 43.19                     | 917.42                                  | 8.92                                | 0.00                                      | 2.33                             | 910.18                                  | 1.68                                | 0 12:18                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 254 |                               | CB-J07-03     | 12945880.29  | 282032.68    | 909.00              | 916.00                           | 7.00                          | 909.00                        | 0.00                      | 918.00                 | 2.00               | 0.00           | 0.00                  | 198.78         | 6.39                      | 918.33                                  | 9.33                                | 0.33                                      | 0.00                             | 910.57                                  | 1.57                                | 0 12:22                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 255 |                               | CB-J07-04     | 12945878.10  | 282105.84    | 909.50              | 915.00                           | 5.50                          | 909.50                        | 0.00                      | 918.00                 | 3.00               | 0.00           | 0.00                  | 226.06         | 23.67                     | 919.29                                  | 9.79                                | 0.79                                      | 0.00                             | 911.06                                  | 1.56                                | 0 12:17                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 256 |                               | CB-J08-01     | 12946782.62  | 282110.91    | 920.00              | 923.00                           | 3.00                          | 920.00                        | 0.00                      | 923.00                 | 0.00               | 0.00           | 0.00                  | 31.58          | 18.92                     | 921.04                                  | 1.04                                | 0.00                                      | 2.46                             | 920.23                                  | 0.23                                | 0 12:11                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 257 | HW-D02-01                     | 12941301.37   | 279153.19    | 903.00       | 918.00              | 15.00                            | 903.00                        | 0.00                          | 918.00                    | 0.00                   | 0.00               | 0.00           | 701.99                | 42.92          | 907.32                    | 4.32                                    | 0.00                                | 10.68                                     | 904.27                           | 1.27                                    | 0 12:15                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 258 | HW-D03-01                     | 12942164.75   | 279344.15    | 915.00       | 917.00              | 2.00                             | 915.00                        | 0.00                          | 917.00                    | 0.00                   | 0.00               | 0.00           | 5.83                  | 0.00           | 915.54                    | 0.54                                    | 0.00                                | 1.46                                      | 915.14                           | 0.14                                    | 0 12:15                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 259 | HW-D04-01                     | 12943013.83   | 279336.80    | 916.50       | 916.50              | 0.00                             | 916.50                        | 0.00                          | 918.50                    | 2.00                   | 0.00               | 0.00           | 3.48                  | 0.00           | 917.02                    | 0.52                                    | 0.00                                | 1.48                                      | 916.62                           | 0.12                                    | 0 12:11                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 260 | HW-D05-01                     | 12943716.72   | 279336.98    | 916.52       | 919.52              | 3.00                             | 916.52                        | 0.00                          | 919.52                    | 0.00                   | 0.00               | 12.00          | 1.66                  | 0.00           | 917.13                    | 0.61                                    | 0.00                                | 2.39                                      | 916.60                           | 0.08                                    | 0 12:15                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 261 | HW-D06-01                     | 12944408.88   | 279339.92    | 917.02       | 917.02              | 0.00                             | 917.02                        | 0.00                          | 919.02                    | 2.00                   | 0.00               | 0.00           | 0.92                  | 0.00           | 917.33                    | 0.31                                    | 0.00                                | 1.69                                      | 917.10                           | 0.08                                    | 0 12:10                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 262 | HW-D06-02                     | 12944405.51   | 279263.96    | 916.17       | 916.17              | 0.00                             | 916.17                        | 0.00                          | 918.17                    | 2.00                   | 0.00               | 0.00           | 8.78                  | 0.00           | 916.75                    | 0.58                                    | 0.00                                | 1.42                                      | 916.30                           | 0.13                                    | 0 12:10                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 263 | HW-D06-03                     | 12945060.91   | 279339.53    | 916.00       | 918.00              | 2.00                             | 916.00                        | 0.00                          | 918.00                    | 0.00                   | 0.00               | 0.00           | 2.62                  | 0.00           | 916.38                    | 0.38                                    | 0.00                                | 1.62                                      | 916.10                           | 0.10                                    | 0 12:12                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 264 | HW-D07-01                     | 12946014.14   | 279338.58    | 916.00       | 916.00              | 0.00                             | 916.00                        | 0.00                          | 918.00                    | 2.00                   | 0.00               | 0.00           | 0.92                  | 0.00           | 916.43                    | 0.43                                    | 0.00                                | 1.57                                      | 916.21                           | 0.21                                    | 0 12:10                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 265 | HW-D08-04                     | 12946964.20   | 279337.05    | 914.50       | 914.50              | 0.00                             | 914.50                        | 0.00                          | 916.50                    | 2.00                   | 0.00               | 0.00           | 2.47                  | 0.00           | 915.75                    | 1.25                                    | 0.00                                | 1.75                                      | 915.28                           | 0.78                                    | 1 00:00                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 266 | HW-D09-01                     | 12947419.43   | 279141.43    | 900.00       | 918.00              | 18.00                            | 900.00                        | 0.00                          | 918.00                    | 0.00                   | 0.00               | 24.00          | 833.88                | 0.00           | 904.90                    | 4.90                                    | 0.00                                | 13.10                                     | 901.90                           | 1.90                                    | 0 12:13                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 267 | HW-E10-01                     | 12948254.01   | 279816.46    | 918.50       | 918.50              | 0.00                             | 918.50                        | 0.00                          | 920.50                    | 2.00                   | 0.00               | 0.00           | 2.27                  | 0.00           | 919.33                    | 0.83                                    | 0.00                                | 1.17                                      | 918.70                           | 0.20                                    | 0 12:11                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 268 | HW-E10-02                     | 12948328.06   | 279815.50    | 918.40       | 918.40              | 0.00                             | 918.40                        | 0.00                          | 920.40                    | 2.00                   | 0.00               | 0.00           | 13.12                 | 10.35          | 919.11                    | 0.71                                    | 0.00                                | 1.29                                      | 918.60                           | 0.20                                    | 0 12:13                             | 0 00:00                                                 | 0.00                                                      | 0.00                                      |                                       |
| 269 | HW-F01-03                     | 12940570.27   | 280424.16    | 912.50       |                     |                                  |                               |                               |                           |                        |                    |                |                       |                |                           |                                         |                                     |                                           |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |

25-Year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|-----|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
|     | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 281 |                               | Jun-184       | 12943160.94  | 282111.35    | 917.61              | 920.61                           | 3.00                          | 917.61                        | 0.00                      | 920.61                 | 0.00               | 0.00           | 0.00                  | 98.53          | 59.47                     | 920.43                                  | 2.82                                | 0.00                                      | 0.68                             | 918.42                                  | 0.81                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 282 |                               | Jun-366       | 12947457.52  | 282133.72    | 923.61              | 923.50                           | -0.11                         | 923.61                        | 0.00                      | 926.50                 | 3.00               | 0.00           | 0.00                  | 12.98          | 12.98                     | 924.26                                  | 0.65                                | 0.00                                      | 2.85                             | 923.75                                  | 0.14                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 283 |                               | Jun-378       | 12940492.76  | 281956.54    | 917.00              | 920.00                           | 3.00                          | 917.00                        | 0.00                      | 920.00                 | 0.00               | 0.00           | 0.00                  | 5.62           | 5.62                      | 918.43                                  | 1.43                                | 0.00                                      | 2.97                             | 917.90                                  | 0.90                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 284 |                               | Jun-379       | 12942681.22  | 281923.37    | 917.00              | 920.00                           | 3.00                          | 917.00                        | 0.00                      | 920.00                 | 0.00               | 0.00           | 0.00                  | 74.54          | 44.85                     | 919.32                                  | 2.32                                | 0.00                                      | 1.18                             | 917.67                                  | 0.67                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 285 |                               | Jun-380       | 12942794.40  | 281923.37    | 917.25              | 920.25                           | 3.00                          | 917.25                        | 0.00                      | 920.25                 | 0.00               | 0.00           | 0.00                  | 38.45          | 0.00                      | 920.18                                  | 2.93                                | 0.00                                      | 0.57                             | 918.07                                  | 0.82                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 286 |                               | Jun-381       | 12943811.16  | 281953.61    | 920.00              | 923.00                           | 3.00                          | 920.00                        | 0.00                      | 923.00                 | 0.00               | 0.00           | 0.00                  | 43.95          | 43.95                     | 921.04                                  | 1.04                                | 0.00                                      | 2.46                             | 920.24                                  | 0.24                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 287 |                               | Jun-383       | 12946599.28  | 281954.79    | 918.50              | 920.50                           | 2.00                          | 918.50                        | 0.00                      | 920.50                 | 0.00               | 0.00           | 0.00                  | 14.30          | 6.05                      | 919.58                                  | 1.08                                | 0.00                                      | 0.92                             | 918.86                                  | 0.36                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 288 |                               | Jun-384       | 12947417.49  | 281953.19    | 921.30              | 926.66                           | 5.36                          | 921.30                        | 0.00                      | 926.66                 | 0.00               | 0.00           | 40.32                 | 9.67           | 5.94                      | 922.06                                  | 0.76                                | 0.00                                      | 4.60                             | 921.53                                  | 0.23                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 289 |                               | Jun-387       | 12940642.24  | 280019.56    | 917.70              | 919.70                           | 2.00                          | 917.70                        | 0.00                      | 919.70                 | 0.00               | 0.00           | 0.00                  | 8.36           | 8.36                      | 918.27                                  | 0.57                                | 0.00                                      | 1.43                             | 917.83                                  | 0.13                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 290 |                               | Jun-393       | 12945740.15  | 279340.38    | 917.00              | 919.00                           | 2.00                          | 917.00                        | 0.00                      | 919.00                 | 0.00               | 0.00           | 0.00                  | 0.59           | 0.59                      | 917.16                                  | 0.16                                | 0.00                                      | 1.84                             | 917.03                                  | 0.03                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 291 |                               | Jun-395       | 12945671.75  | 279339.46    | 917.25              | 919.25                           | 2.00                          | 917.25                        | 0.00                      | 919.25                 | 0.00               | 0.00           | 0.00                  | 1.89           | 1.89                      | 917.63                                  | 0.38                                | 0.00                                      | 1.62                             | 917.32                                  | 0.07                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 292 |                               | Jun-397       | 12944637.81  | 279338.96    | 917.29              | 919.29                           | 2.00                          | 917.29                        | 0.00                      | 919.29                 | 0.00               | 0.00           | 0.00                  | 0.92           | 0.92                      | 917.50                                  | 0.21                                | 0.00                                      | 1.79                             | 917.33                                  | 0.04                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 293 |                               | Jun-398       | 12944058.70  | 279337.74    | 917.50              | 919.50                           | 2.00                          | 917.50                        | 0.00                      | 919.50                 | 0.00               | 0.00           | 0.00                  | 0.76           | 0.76                      | 917.70                                  | 0.20                                | 0.00                                      | 1.80                             | 917.54                                  | 0.04                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 294 |                               | Jun-401       | 12941225.02  | 279338.46    | 917.92              | 919.92                           | 2.00                          | 917.92                        | 0.00                      | 919.92                 | 0.00               | 0.00           | 0.00                  | 4.88           | 4.88                      | 918.30                                  | 0.38                                | 0.00                                      | 1.62                             | 918.00                                  | 0.08                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 295 |                               | Jun-403       | 12942615.88  | 279346.57    | 916.00              | 918.00                           | 2.00                          | 916.00                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 0.00                  | 3.93           | 1.27                      | 916.51                                  | 0.51                                | 0.00                                      | 1.49                             | 916.11                                  | 0.11                                | 0 12:09                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 296 |                               | Jun-405       | 12942929.14  | 282037.78    | 917.90              | 919.90                           | 2.00                          | 917.90                        | 0.00                      | 919.90                 | 0.00               | 0.00           | 0.00                  | 15.88          | 0.00                      | 919.90                                  | 2.00                                | 0.00                                      | 0.00                             | 918.34                                  | 0.44                                | 0 12:07                                                 | 0 12:11                                                   | 2.92                                      | 15.00                                 |
| 297 |                               | Jun-406       | 12942929.14  | 281954.37    | 917.68              | 920.68                           | 3.00                          | 917.68                        | 0.00                      | 920.68                 | 0.00               | 0.00           | 0.00                  | 57.49          | 39.04                     | 920.19                                  | 2.51                                | 0.00                                      | 0.99                             | 918.22                                  | 0.54                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 298 |                               | Jun-407       | 12940544.90  | 282030.26    | 918.25              | 920.25                           | 2.00                          | 918.25                        | 0.00                      | 918.25                 | -2.00              | 0.00           | 27.00                 | 5.28           | 5.28                      | 918.48                                  | 0.23                                | 0.00                                      | 1.77                             | 918.30                                  | 0.05                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 299 |                               | Jun-408       | 12942584.17  | 282036.67    | 918.50              | 920.50                           | 2.00                          | 918.50                        | 0.00                      | 920.50                 | 0.00               | 0.00           | 0.00                  | 4.11           | 4.11                      | 919.00                                  | 0.50                                | 0.00                                      | 1.50                             | 918.66                                  | 0.16                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 300 |                               | Jun-409       | 12941886.55  | 282031.87    | 918.00              | 920.00                           | 2.00                          | 918.00                        | 0.00                      | 920.00                 | 0.00               | 0.00           | 0.00                  | 6.55           | 5.14                      | 918.29                                  | 0.29                                | 0.00                                      | 1.96                             | 918.08                                  | 0.08                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 301 |                               | Jun-411       | 12943643.45  | 282037.10    | 921.00              | 923.00                           | 2.00                          | 921.00                        | 0.00                      | 923.00                 | 0.00               | 0.00           | 0.00                  | 8.51           | 8.51                      | 921.43                                  | 0.43                                | 0.00                                      | 1.57                             | 921.08                                  | 0.08                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 302 |                               | Jun-412       | 12943872.65  | 282028.57    | 919.20              | 921.20                           | 2.00                          | 919.20                        | 0.00                      | 921.20                 | 0.00               | 0.00           | 0.00                  | 3.94           | 3.94                      | 919.53                                  | 0.33                                | 0.00                                      | 1.67                             | 919.26                                  | 0.06                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 303 |                               | Jun-413       | 12944486.50  | 282033.37    | 917.94              | 919.94                           | 2.00                          | 917.94                        | 0.00                      | 919.94                 | 0.00               | 0.00           | 0.00                  | 8.57           | 5.17                      | 918.46                                  | 0.52                                | 0.00                                      | 1.48                             | 918.05                                  | 0.11                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 304 |                               | Jun-414       | 12945232.23  | 282030.97    | 916.70              | 918.70                           | 2.00                          | 916.70                        | 0.00                      | 918.70                 | 0.00               | 0.00           | 0.00                  | 33.30          | 5.36                      | 918.40                                  | 1.70                                | 0.00                                      | 0.30                             | 916.98                                  | 0.28                                | 0 12:21                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 305 |                               | Jun-416       | 12946601.29  | 282031.65    | 919.31              | 921.31                           | 2.00                          | 919.31                        | 0.00                      | 921.31                 | 0.00               | 0.00           | 0.00                  | 10.52          | 5.91                      | 919.81                                  | 0.50                                | 0.00                                      | 1.50                             | 919.43                                  | 0.12                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 306 |                               | Jun-417       | 12947433.50  | 282031.65    | 924.61              | 926.61                           | 2.00                          | 924.61                        | 0.00                      | 926.61                 | 0.00               | 0.00           | 0.00                  | 5.17           | 5.17                      | 924.89                                  | 0.28                                | 0.00                                      | 1.72                             | 924.66                                  | 0.05                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 307 |                               | Jun-437       | 12941869.06  | 281950.52    | 916.11              | 919.11                           | 3.00                          | 916.11                        | 0.00                      | 919.11                 | 0.00               | 0.00           | 0.00                  | 91.15          | 29.00                     | 918.80                                  | 2.69                                | 0.00                                      | 0.81                             | 917.03                                  | 0.92                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 308 |                               | Jun-459       | 12946794.20  | 280380.52    | 900.00              | 906.00                           | 6.00                          | 900.00                        | 0.00                      | 906.00                 | 0.00               | 0.00           | 0.00                  | 0.00           | 0.00                      | 900.00                                  | 0.00                                | 0.00                                      | 6.00                             | 900.00                                  | 0.00                                | 0 00:00                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 309 |                               | Jun-469       | 12943722.19  | 283693.67    | 921.16              | 923.16                           | 2.00                          | 921.16                        | 0.00                      | 923.16                 | 0.00               | 0.00           | 0.00                  | 7.39           | 7.39                      | 921.65                                  | 0.49                                | 0.00                                      | 1.51                             | 921.25                                  | 0.09                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 310 |                               | Jun-470       | 12943702.61  | 282224.55    | 918.31              | 920.31                           | 2.00                          | 918.31                        | 0.00                      | 920.31                 | 0.00               | 0.00           | 0.00                  | 56.50          | 0.00                      | 920.31                                  | 2.00                                | 0.00                                      | 0.00                             | 918.78                                  | 0.47                                | 0 12:05                                                 | 0 12:13                                                   | 11.46                                     | 18.00                                 |
| 311 |                               | Jun-471       | 12943699.93  | 282938.60    | 919.70              | 921.70                           | 2.00                          | 919.70                        | 0.00                      | 921.70                 | 0.00               | 0.00           | 0.00                  | 12.33          | 5.97                      | 920.40                                  | 0.70                                | 0.00                                      | 1.30                             | 919.84                                  | 0.14                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 312 |                               | Jun-472       | 12943812.55  | 283673.86    | 921.17              | 923.17                           | 2.00                          | 921.17                        | 0.00                      | 923.17                 | 0.00               | 0.00           | 0.00                  | 6.80           | 6.80                      | 921.63                                  | 0.46                                | 0.00                                      | 1.54                             | 921.26                                  | 0.09                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 313 |                               | Jun-473       | 12943786.69  | 282221.28    | 918.34              | 920.34                           | 2.00                          | 918.34                        | 0.00                      | 920.34                 | 0.00               | 0.00           | 0.00                  | 12.93          | 0.00                      | 920.27                                  | 1.93                                | 0.00                                      | 0.07                             | 918.65                                  | 0.31                                | 0 12:15                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 314 |                               | Jun-474       | 12943793.15  | 282932.48    | 919.70              | 925.70                           | 6.00                          | 919.70                        | 0.00                      | 925.70                 | 0.00               | 0.00           | 48.00                 | 14.00          | 8.16                      | 920.37                                  | 0.67                                | 0.00                                      | 5.33                             | 919.84                                  | 0.14                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 315 |                               | Jun-475       | 12946198.47  | 279340.66    | 917.00              | 919.00                           | 2.00                          | 917.00                        | 0.00                      | 919.00                 | 0.00               | 0.00           | 0.00                  | 0.39           | 0.39                      | 917.11                                  | 0.11                                | 0.00                                      | 1.89                             | 917.02                                  | 0.02                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 316 |                               | Jun-476       | 12945907.11  | 279264.77    | 916.50              | 918.50                           | 2.00                          | 916.50                        | 0.00                      | 918.50                 | 0.00               | 0.00           | 0.00                  | 3.49           | 3.49                      | 916.75                                  | 0.25                                | 0.00                                      | 1.75                             | 916.55                                  | 0.05                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 317 |                               | Jun-478       | 12944554.33  | 279339.77    | 917.50              | 919.50                           | 2.00                          | 917.50                        | 0.00                      | 919.50                 | 0.00               | 0.00           | 0.00                  | 0.33           | 0.33                      | 917.62                                  | 0.12                                | 0.00                                      | 1.88                             | 917.52                                  | 0.02                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 318 |                               | Jun-479       | 12944124.67  | 279339.06    | 917.92              | 919.92                           | 2.00                          | 917.92                        | 0.00                      | 919.92                 | 0.00               | 0.00           | 0.00                  | 0.65           | 0.65                      | 918.09                                  | 0.17                                | 0.00                                      | 1.83                             | 917.95                                  | 0.03                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 319 |                               | Jun-481       | 12944295.36  | 279264.61    | 917.47              | 919.74                           | 2.27                          | 917.47                        | 0.00                      | 919.47                 | -0.27              | 0.00           | 2.88                  | 8.21           | 8.21                      | 917.82                                  | 0.35                                | 0.00                                      | 1.92                             | 917.55                                  | 0.08                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 320 |                               | Jun-491       | 12942809.82  | 279657.69    | 915.00              | 915.00                           | 0.00                          | 915.00                        | 0.00                      | 917.00                 | 2.00               | 0.00           | 0.00                  | 4.71           | 0.00                      | 915.50                                  | 0.50                                | 0.00                                      | 1.60                             | 915.11                                  | 0.11                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 321 |                               | Jun-493       | 12942813.88  | 279349.44    | 917.25              | 917.25                           | 0.00                          | 917.25                        | 0.00                      | 919.25                 | 2.00               | 0.00           | 0.00                  | 2.69           | 0.45                      | 917.63                                  | 0.38                                | 0.00                                      | 1.62                             | 917.32                                  | 0.07                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 322 |                               | Jun-494       | 12943482.90  | 279338.92    | 917.44              | 919.44                           | 2.00                          | 917.44                        | 0.00                      | 919.44                 | 0.00               | 0.00           | 0.00                  | 1.04           | 1.04                      | 917.69                                  | 0.25                                | 0.00                                      | 1.75                             | 917.49                                  | 0.05                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 323 |                               | Jun-495       | 12943577.91  | 279339.83    | 917.00              | 919.00                           | 2.00                          | 917.00                        | 0.00                      | 919.00                 | 0.00               | 0.00           | 0.00                  | 0.31           | 0.31                      | 917.14                                  | 0.14                                | 0.00                                      | 1.86                             | 917.02                                  | 0.02                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 324 |                               | Jun-496       | 12946297.40  | 279340.68    | 917.00              | 919.00                           | 2.00                          | 917.00                        | 0.00                      | 919.00                 | 0.00               | 0.00           | 0.00                  | 1.53           | 1.53                      | 917.26                                  | 0.26                                | 0.00                                      | 1.74                             | 917.05                                  | 0.05                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 325 |                               | Jun-497       | 12947422.76  | 279340.61    | 917.72              | 917.72                           | 0.00                          | 917.72                        | 0.00                      | 919.72                 | 2.00               | 0.00           | 0.00                  | 2.15           | 2.15                      | 918.02                                  | 0.30                                | 0.00                                      |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |

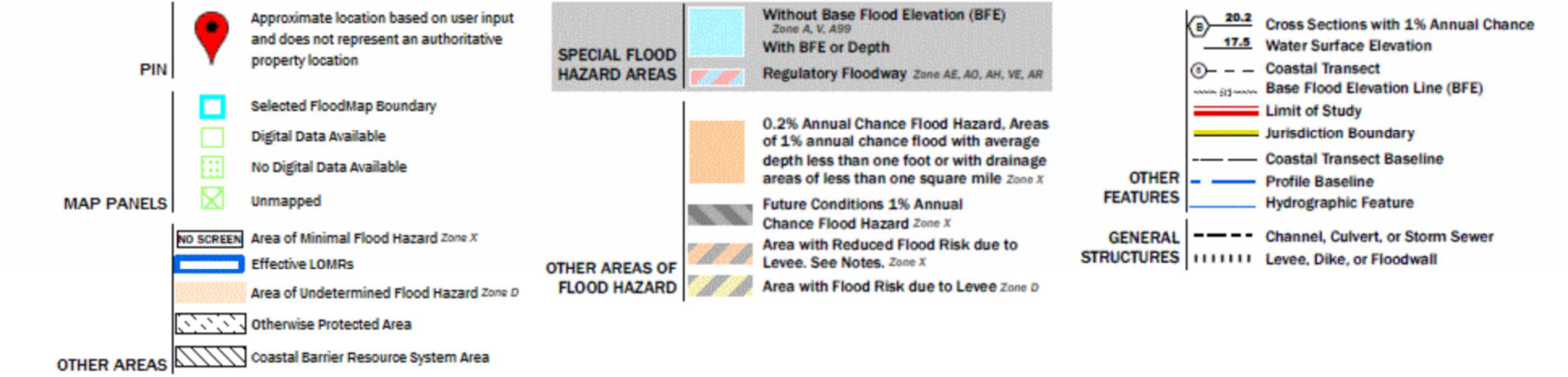
| 25-Year Storm Event Analysis |                               |               |              |              |                     |                                  |                               |                               |                           |                        |                    |                |                       |                |                           |                                         |                                     |                                           |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |
|------------------------------|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
| SN                           | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|                              | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 337                          |                               | Jun-512       | 12942704.18  | 281258.37    | 920.35              | 922.35                           | 2.00                          | 920.35                        | 0.00                      | 922.35                 | 0.00               | 0.00           | 0.00                  | 7.39           | 7.39                      | 920.95                                  | 0.60                                | 0.00                                      | 1.40                             | 920.48                                  | 0.13                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 338                          |                               | Jun-513       | 12942772.66  | 281260.78    | 920.35              | 922.35                           | 2.00                          | 920.35                        | 0.00                      | 922.35                 | 0.00               | 0.00           | 0.00                  | 4.97           | 4.97                      | 920.91                                  | 0.56                                | 0.00                                      | 1.44                             | 920.48                                  | 0.13                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 339                          |                               | Jun-514       | 12942774.87  | 279997.62    | 918.50              | 918.50                           | 0.00                          | 918.50                        | 0.00                      | 920.50                 | 2.00               | 0.00           | 0.00                  | 6.46           | 6.46                      | 918.90                                  | 0.40                                | 0.00                                      | 1.60                             | 918.59                                  | 0.09                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 340                          |                               | Jun-515       | 12942701.17  | 279996.02    | 918.50              | 918.50                           | 0.00                          | 918.50                        | 0.00                      | 920.50                 | 2.00               | 0.00           | 0.00                  | 8.11           | 8.11                      | 918.89                                  | 0.39                                | 0.00                                      | 1.61                             | 918.57                                  | 0.07                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 341                          |                               | Jun-516       | 12942805.71  | 279569.32    | 917.90              | 917.90                           | 0.00                          | 917.90                        | 0.00                      | 919.90                 | 2.00               | 0.00           | 0.00                  | 2.27           | 2.27                      | 918.30                                  | 0.40                                | 0.00                                      | 1.60                             | 917.97                                  | 0.07                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 342                          |                               | Jun-526       | 12948329.34  | 281608.62    | 924.75              | 924.75                           | 0.00                          | 924.75                        | 0.00                      | 926.75                 | 2.00               | 0.00           | 0.00                  | 5.59           | 5.59                      | 925.28                                  | 0.53                                | 0.00                                      | 1.47                             | 924.87                                  | 0.12                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 343                          |                               | Jun-528       | 12948311.63  | 281421.40    | 925.73              | 925.73                           | 0.00                          | 925.73                        | 0.00                      | 927.73                 | 2.00               | 0.00           | 0.00                  | 17.89          | 17.89                     | 926.16                                  | 0.43                                | 0.00                                      | 1.57                             | 925.82                                  | 0.09                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 344                          |                               | Jun-529       | 12948245.91  | 281382.04    | 924.30              | 924.30                           | 0.00                          | 924.30                        | 0.00                      | 926.30                 | 2.00               | 0.00           | 0.00                  | 4.42           | 4.42                      | 924.76                                  | 0.46                                | 0.00                                      | 1.54                             | 924.40                                  | 0.10                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 345                          |                               | Jun-530       | 12948396.47  | 280135.25    | 920.35              | 920.35                           | 0.00                          | 920.35                        | 0.00                      | 922.35                 | 2.00               | 0.00           | 0.00                  | 9.44           | 9.44                      | 920.91                                  | 0.56                                | 0.00                                      | 1.44                             | 920.48                                  | 0.13                                | 0 12:09                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 346                          |                               | Jun-531       | 12947473.09  | 279186.96    | 915.00              | 915.00                           | 0.00                          | 915.00                        | 0.00                      | 917.00                 | 2.00               | 0.00           | 0.00                  | 28.18          | 23.61                     | 915.95                                  | 0.95                                | 0.00                                      | 1.05                             | 915.21                                  | 0.21                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 347                          |                               | Jun-532       | 12948326.53  | 280057.10    | 921.00              | 921.00                           | 0.00                          | 921.00                        | 0.00                      | 923.00                 | 2.00               | 0.00           | 0.00                  | 1.98           | 1.98                      | 921.11                                  | 0.11                                | 0.00                                      | 1.89                             | 921.02                                  | 0.02                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 348                          |                               | Jun-534       | 12948226.13  | 281498.53    | 924.30              | 924.30                           | 0.00                          | 924.30                        | 0.00                      | 926.30                 | 2.00               | 0.00           | 0.00                  | 6.25           | 6.25                      | 924.90                                  | 0.60                                | 0.00                                      | 1.40                             | 924.42                                  | 0.12                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 349                          |                               | Jun-538       | 12948137.72  | 279484.19    | 918.50              | 918.50                           | 0.00                          | 918.50                        | 0.00                      | 920.50                 | 2.00               | 0.00           | 0.00                  | 3.99           | 3.99                      | 919.05                                  | 0.55                                | 0.00                                      | 1.45                             | 918.63                                  | 0.13                                | 0 12:09                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 350                          |                               | Jun-542       | 12948254.01  | 280193.82    | 920.00              | 920.00                           | 0.00                          | 920.00                        | 0.00                      | 922.00                 | 2.00               | 0.00           | 0.00                  | 5.84           | 5.84                      | 920.54                                  | 0.54                                | 0.00                                      | 1.46                             | 920.12                                  | 0.12                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 351                          |                               | Jun-544       | 12946656.46  | 279272.12    | 917.00              | 917.00                           | 0.00                          | 917.00                        | 0.00                      | 919.00                 | 2.00               | 0.00           | 0.00                  | 6.94           | 6.94                      | 917.55                                  | 0.55                                | 0.00                                      | 1.45                             | 917.11                                  | 0.11                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 352                          |                               | MH-09-01      | 12947055.78  | 281926.13    | 905.70              | 923.95                           | 18.25                         | 905.70                        | 0.00                      | 923.95                 | 0.00               | 0.00           | 135.00                | 287.07         | 0.00                      | 914.09                                  | 8.39                                | 0.00                                      | 9.86                             | 907.10                                  | 1.40                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 353                          |                               | MH-09-02      | 12947415.56  | 281669.35    | 904.84              | 922.95                           | 18.11                         | 904.84                        | 0.00                      | 922.95                 | 0.00               | 0.00           | 133.32                | 288.57         | 0.00                      | 913.49                                  | 8.65                                | 0.00                                      | 9.46                             | 906.18                                  | 1.34                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 354                          | Yes                           | MH-D02-03     | 12941002.31  | 279373.55    | 903.39              | 918.40                           | 15.01                         | 903.39                        | 0.00                      | 918.40                 | 0.00               | 0.00           | 96.12                 | 665.45         | 10.51                     | 908.79                                  | 5.40                                | 0.00                                      | 9.61                             | 904.66                                  | 1.27                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 355                          | Yes                           | MH-E01-01     | 12940680.13  | 279924.75    | 904.06              | 918.86                           | 14.80                         | 904.06                        | 0.00                      | 918.86                 | 0.00               | 0.00           | 93.60                 | 646.06         | 7.22                      | 910.41                                  | 6.35                                | 0.00                                      | 8.45                             | 905.38                                  | 1.32                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 356                          | Yes                           | MH-E02-01     | 12940809.27  | 279509.79    | 903.63              | 918.58                           | 14.95                         | 903.63                        | 0.00                      | 918.85                 | 0.27               | 0.00           | 95.40                 | 662.13         | 10.09                     | 909.69                                  | 6.06                                | 0.00                                      | 8.89                             | 904.99                                  | 1.36                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 357                          | Yes                           | MH-E02-03     | 12941571.83  | 279529.34    | 903.36              | 918.00                           | 14.64                         | 903.36                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 91.68                 | 174.05         | 19.41                     | 908.08                                  | 4.72                                | 0.00                                      | 9.92                             | 904.46                                  | 1.10                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 358                          | Yes                           | MH-E03-01     | 12941901.55  | 279528.92    | 903.69              | 918.00                           | 14.31                         | 903.69                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 87.72                 | 158.66         | 29.09                     | 908.80                                  | 5.11                                | 0.00                                      | 9.20                             | 904.77                                  | 1.08                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 359                          | Yes                           | MH-E03-02     | 12942399.04  | 279529.16    | 904.19              | 918.00                           | 13.81                         | 904.19                        | 0.00                      | 918.00                 | 0.00               | 0.00           | 93.72                 | 135.45         | 40.68                     | 909.54                                  | 5.35                                | 0.00                                      | 8.46                             | 905.22                                  | 1.03                                | 0 12:06                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 360                          | Yes                           | MH-E09-03     | 12947427.96  | 279692.75    | 900.88              | 916.00                           | 15.12                         | 900.88                        | 0.00                      | 916.00                 | 0.00               | 0.00           | 97.44                 | 790.69         | 31.08                     | 908.26                                  | 7.38                                | 0.00                                      | 7.74                             | 902.51                                  | 1.63                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 361                          | Yes                           | MH-E09-04     | 12947426.99  | 279415.68    | 900.33              | 918.83                           | 18.50                         | 900.33                        | 0.00                      | 918.83                 | 0.00               | 0.00           | 138.00                | 812.42         | 0.00                      | 907.40                                  | 7.07                                | 0.00                                      | 11.43                            | 902.29                                  | 1.96                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 362                          | Yes                           | MH-E09-05     | 12947260.16  | 279420.56    | 900.45              | 917.38                           | 16.93                         | 900.45                        | 0.00                      | 917.38                 | 0.00               | 0.00           | 82.56                 | 155.73         | 0.00                      | 904.63                                  | 4.18                                | 0.00                                      | 12.75                            | 901.71                                  | 1.26                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 363                          | Yes                           | MH-F01-01     | 12940679.94  | 280424.65    | 904.56              | 918.73                           | 14.17                         | 904.56                        | 0.00                      | 918.73                 | 0.00               | 0.00           | 86.04                 | 651.73         | 24.14                     | 911.15                                  | 6.59                                | 0.00                                      | 7.58                             | 905.91                                  | 1.35                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 364                          | Yes                           | MH-F02-01     | 12941197.85  | 280424.05    | 905.08              | 915.50                           | 10.42                         | 905.08                        | 0.00                      | 915.50                 | 0.00               | 0.00           | 41.04                 | 170.98         | 15.29                     | 911.58                                  | 6.50                                | 0.00                                      | 3.92                             | 906.49                                  | 1.41                                | 0 12:12                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 365                          | Yes                           | MH-F02-02     | 12941546.79  | 280426.53    | 905.43              | 916.00                           | 10.57                         | 905.43                        | 0.00                      | 916.00                 | 0.00               | 0.00           | 42.84                 | 164.19         | 19.80                     | 911.95                                  | 6.52                                | 0.00                                      | 4.05                             | 906.79                                  | 1.36                                | 0 12:11                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 366                          | Yes                           | MH-F03-01     | 12941897.63  | 280427.44    | 905.78              | 917.00                           | 11.22                         | 905.78                        | 0.00                      | 917.00                 | 0.00               | 0.00           | 50.64                 | 152.08         | 20.06                     | 912.26                                  | 6.48                                | 0.00                                      | 4.74                             | 907.10                                  | 1.32                                | 0 12:11                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 367                          | Yes                           | MH-F03-02     | 12942260.51  | 280429.44    | 906.14              | 917.50                           | 11.36                         | 906.14                        | 0.00                      | 917.50                 | 0.00               | 0.00           | 64.32                 | 136.25         | 21.36                     | 912.87                                  | 6.73                                | 0.00                                      | 4.63                             | 907.44                                  | 1.30                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 368                          | Yes                           | MH-F04-01     | 12942652.38  | 280431.66    | 906.53              | 918.50                           | 11.97                         | 906.53                        | 0.00                      | 918.50                 | 0.00               | 0.00           | 71.64                 | 119.21         | 10.98                     | 913.38                                  | 6.85                                | 0.00                                      | 5.12                             | 907.77                                  | 1.24                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 369                          | Yes                           | MH-F04-02     | 12942926.14  | 280432.40    | 907.80              | 917.00                           | 9.20                          | 907.80                        | 0.00                      | 917.00                 | 0.00               | 0.00           | 50.40                 | 103.03         | 36.92                     | 914.14                                  | 6.34                                | 0.00                                      | 2.86                             | 908.91                                  | 1.11                                | 0 12:09                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 370                          | Yes                           | MH-F05-01     | 12943630.64  | 280395.51    | 910.22              | 918.90                           | 8.68                          | 910.22                        | 0.00                      | 918.90                 | 0.00               | 0.00           | 40.80                 | 42.66          | 4.34                      | 915.09                                  | 4.87                                | 0.00                                      | 3.81                             | 910.90                                  | 0.68                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 371                          | Yes                           | MH-F05-02     | 12943897.20  | 280395.24    | 910.75              | 917.52                           | 6.77                          | 910.75                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 39.24                 | 17.86          | 7.74                      | 915.17                                  | 4.42                                | 0.00                                      | 2.35                             | 911.24                                  | 0.49                                | 0 12:07                                                 | 0 12:07                                                   | 0.00                                      | 0.00                                  |
| 372                          | Yes                           | MH-F05-03     | 12944187.42  | 280394.92    | 910.05              | 917.52                           | 7.47                          | 910.05                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 53.64                 | 17.69          | 3.19                      | 916.20                                  | 6.15                                | 0.00                                      | 1.32                             | 910.54                                  | 0.49                                | 0 12:04                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 373                          | Yes                           | MH-F06-01     | 12944455.94  | 280395.34    | 908.90              | 917.52                           | 8.62                          | 908.90                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 61.44                 | 34.56          | 3.19                      | 914.40                                  | 5.50                                | 0.00                                      | 3.12                             | 909.57                                  | 0.67                                | 0 12:05                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 374                          | Yes                           | MH-F06-02     | 12944729.81  | 280395.17    | 907.85              | 917.52                           | 9.67                          | 907.85                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 68.04                 | 51.42          | 8.06                      | 913.92                                  | 6.07                                | 0.00                                      | 3.60                             | 908.61                                  | 0.76                                | 0 12:07                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 375                          | Yes                           | MH-F06-03     | 12945005.59  | 280395.12    | 907.30              | 917.52                           | 10.22                         | 907.30                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 68.64                 | 69.62          | 8.16                      | 913.47                                  | 6.17                                | 0.00                                      | 4.05                             | 908.14                                  | 0.84                                | 0 12:08                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 376                          | Yes                           | MH-F07-01     | 12945280.79  | 280394.84    | 906.75              | 917.52                           | 10.77                         | 906.75                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 42.24                 | 87.18          | 3.24                      | 913.03                                  | 6.28                                | 0.00                                      | 4.49                             | 907.64                                  | 0.89                                | 0 12:09                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 377                          | Yes                           | MH-F07-02     | 12945555.52  | 280395.37    | 906.06              | 917.52                           | 11.46                         | 906.06                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 72.24                 | 100.70         | 8.15                      | 912.33                                  | 6.27                                | 0.00                                      | 5.19                             | 907.04                                  | 0.98                                | 0 12:09                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 378                          | Yes                           | MH-F07-03     | 12945829.55  | 280395.22    | 905.51              | 917.52                           | 12.01                         | 905.51                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 72.24                 | 117.90         | 7.91                      | 911.75                                  | 6.24                                | 0.00                                      | 5.77                             | 906.55                                  | 1.04                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 379                          | Yes                           | MH-F08-01     | 12946106.07  | 280396.49    | 904.96              | 917.52                           | 12.56                         | 904.96                        | 0.00                      | 917.52                 | 0.00               | 0.00           | 72.24                 | 131.85         | 8.14                      | 911.26                                  | 6.30                                | 0.00                                      | 6.26                             | 906.06                                  | 1.10                                | 0 12:10                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 380                          | Yes                           | MH-F08-02     | 12946380.42  | 280395.43    | 904.41              | 91                               |                               |                               |                           |                        |                    |                |                       |                |                           |                                         |                                     |                                           |                                  |                                         |                                     |                                                         |                                                           |                                           |                                       |

25-Year Storm Event Analysis

| SN  | Phase 1<br>Deep<br>Stormwater | Element<br>ID | X Coordinate | Y Coordinate | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe Cover | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Maximum<br>HGL<br>Elevation<br>Attained | Maximum<br>HGL<br>Depth<br>Attained | Maximum<br>Surcharge<br>Depth<br>Attained | Minimum<br>Freeboard<br>Attained | Average<br>HGL<br>Elevation<br>Attained | Average<br>HGL<br>Depth<br>Attained | Time of<br>Maximum<br>HGL<br>Occurrence<br>(days hh:mm) | Time of<br>Peak<br>Flooding<br>Occurrence<br>(days hh:mm) | Total<br>Flooded<br>Volume<br>(ac-inches) | Total<br>Time<br>Flooded<br>(minutes) |
|-----|-------------------------------|---------------|--------------|--------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|-----------------------|----------------|---------------------------|-----------------------------------------|-------------------------------------|-------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------------|
|     | Yes/No                        |               |              |              | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (inches)              | (cfs)          | (cfs)                     | (ft)                                    | (ft)                                | (ft)                                      | (ft)                             | (ft)                                    | (ft)                                | (days hh:mm)                                            | (days hh:mm)                                              | (ac-inches)                               | (minutes)                             |
| 393 |                               | MH-H01-01     | 12940680.20  | 281136.45    | 905.27              | 921.39                           | 16.12                         | 905.27                        | 0.00                      | 921.39                 | 0.00               | 0.00           | 109.44                | 395.73         | 26.53                     | 911.80                                  | 6.53                                | 0.00                                      | 9.59                             | 906.50                                  | 1.23                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 394 |                               | MH-H01-02     | 12940680.41  | 281636.13    | 905.77              | 921.39                           | 15.62                         | 905.77                        | 0.00                      | 921.39                 | 0.00               | 0.00           | 103.44                | 384.98         | 24.31                     | 912.85                                  | 7.08                                | 0.00                                      | 8.54                             | 907.26                                  | 1.49                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 395 |                               | MH-H09-01     | 12947415.10  | 281300.99    | 904.10              | 922.26                           | 18.16                         | 904.10                        | 0.00                      | 922.26                 | 0.00               | 0.00           | 133.92                | 322.23         | 64.72                     | 912.89                                  | 8.79                                | 0.00                                      | 9.37                             | 905.51                                  | 1.41                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 396 |                               | MH-J01-01     | 12940680.78  | 281921.19    | 906.06              | 918.97                           | 12.91                         | 906.06                        | 0.00                      | 918.97                 | 0.00               | 0.00           | 70.92                 | 377.86         | 10.20                     | 913.65                                  | 7.59                                | 0.00                                      | 5.32                             | 907.61                                  | 1.55                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 397 |                               | MH-J02-01     | 12941091.73  | 281919.98    | 906.47              | 917.95                           | 11.48                         | 906.47                        | 0.00                      | 917.95                 | 0.00               | 0.00           | 53.76                 | 375.00         | 0.00                      | 914.57                                  | 8.10                                | 0.00                                      | 3.38                             | 908.05                                  | 1.58                                | 0 12:15                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 398 |                               | MH-J07-01     | 12945877.28  | 281919.71    | 908.07              | 920.47                           | 12.40                         | 908.07                        | 0.00                      | 920.47                 | 0.00               | 0.00           | 64.80                 | 245.42         | 40.60                     | 916.22                                  | 8.15                                | 0.00                                      | 4.25                             | 909.90                                  | 1.83                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 399 |                               | MH-J08.01     | 12946273.26  | 281921.01    | 907.28              | 920.26                           | 12.98                         | 907.28                        | 0.00                      | 920.26                 | 0.00               | 0.00           | 71.76                 | 271.42         | 34.61                     | 915.83                                  | 8.55                                | 0.00                                      | 4.43                             | 909.08                                  | 1.80                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 400 |                               | MH-J08-02     | 12946601.09  | 281921.65    | 906.63              | 919.67                           | 13.04                         | 906.63                        | 0.00                      | 919.67                 | 0.00               | 0.00           | 72.48                 | 292.05         | 22.95                     | 914.76                                  | 8.13                                | 0.00                                      | 4.91                             | 907.96                                  | 1.33                                | 0 12:13                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 401 |                               | NULL-545      | 12947420.52  | 279268.90    | 900.20              | 906.20                           | 6.00                          | 900.20                        | 0.00                      | 906.20                 | 0.00               | 0.00           | 0.00                  | 819.82         | 3.80                      | 906.40                                  | 6.20                                | 0.00                                      | 0.80                             | 902.11                                  | 1.91                                | 0 12:14                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 402 |                               | OCS           | 12943731.51  | 278479.06    | 887.76              | 903.00                           | 15.24                         | 887.76                        | 0.00                      | 903.00                 | 0.00               | 0.00           | 0.00                  | 197.24         | 0.00                      | 894.06                                  | 6.30                                | 0.00                                      | 8.94                             | 891.32                                  | 3.56                                | 0 13:46                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |
| 403 |                               | ST-1          | 12943719.24  | 278330.32    | 885.69              | 899.00                           | 13.31                         | 885.69                        | 0.00                      | 899.00                 | 0.00               | 0.00           | 0.00                  | 197.78         | 0.00                      | 889.89                                  | 4.20                                | 0.00                                      | 11.30                            | 887.98                                  | 2.29                                | 0 13:46                                                 | 0 00:00                                                   | 0.00                                      | 0.00                                  |

## **Appendix D. FEMA – Firmette Map**



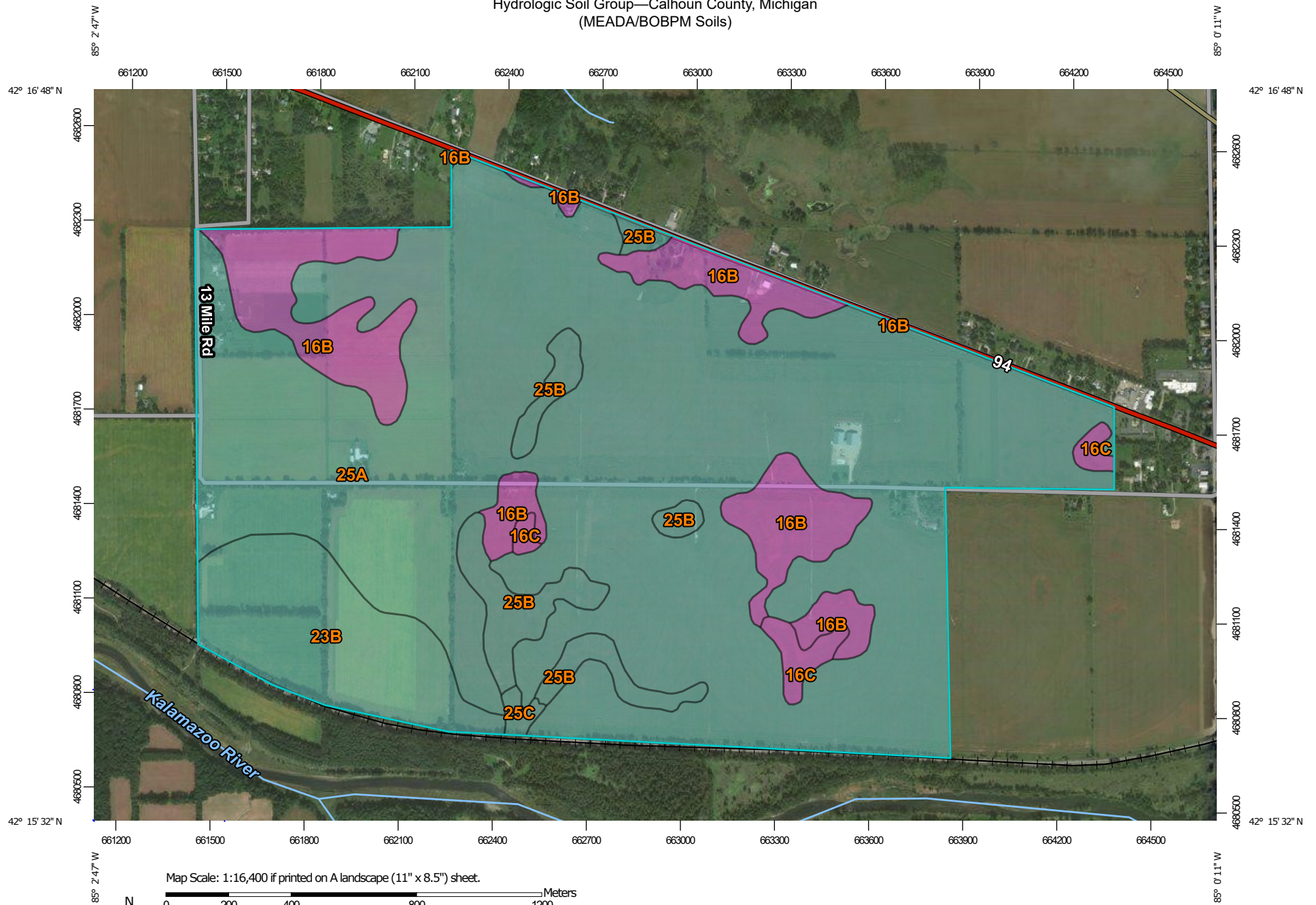




## **Appendix E. Web Soil Survey Report**



# Hydrologic Soil Group—Calhoun County, Michigan (MEADA/BOBPM Soils)



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

4/13/2023  
Page 1 of 4

# Hydrologic Soil Group—Calhoun County, Michigan (MEADA/BOBPM Soils)

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons

 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Lines

 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Points

 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available

### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Calhoun County, Michigan

Survey Area Data: Version 20, Aug 25, 2022

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

Date(s) aerial images were photographed: Jul 1, 2011—Mar 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

| Map unit symbol                    | Map unit name                              | Rating | Acres in AOI | Percent of AOI |
|------------------------------------|--------------------------------------------|--------|--------------|----------------|
| 16B                                | Oshtemo sandy loam, 0 to 6 percent slopes  | A      | 114.2        | 11.8%          |
| 16C                                | Oshtemo sandy loam, 6 to 12 percent slopes | A      | 12.8         | 1.3%           |
| 23B                                | Hixton loam, 0 to 6 percent slopes         | C      | 83.3         | 8.6%           |
| 25A                                | Kalamazoo loam, 0 to 2 percent slopes      | C      | 710.5        | 73.3%          |
| 25B                                | Kalamazoo loam, 2 to 6 percent slopes      | C      | 45.7         | 4.7%           |
| 25C                                | Kalamazoo loam, 6 to 12 percent slopes     | C      | 3.2          | 0.3%           |
| <b>Totals for Area of Interest</b> |                                            |        | <b>969.8</b> | <b>100.0%</b>  |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher



## **Appendix F. Culvert Calculations**

Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 10  
    *Junctions* ..... 6  
    *Outfalls* ..... 2  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin ID             | Area   | Peak Rate | Weighted | Total    | Total  | Total   | Peak    | Time of         |
|----------------------------|--------|-----------|----------|----------|--------|---------|---------|-----------------|
|                            |        | Factor    | Curve    | Rainfall | Runoff | Runoff  | Runoff  | Concentration   |
|                            | (ac)   |           | Number   | (in)     | (in)   | (ac-in) | (cfs)   | (days hh:mm:ss) |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00    | 5.60     | 4.57   | 3478.20 | 2785.54 | 0 00:33:17      |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00    | 5.60     | 2.85   | 22.27   | 14.99   | 0 00:45:00      |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00    | 5.60     | 2.85   | 50.55   | 34.04   | 0 00:45:00      |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00    | 5.60     | 2.94   | 111.58  | 75.32   | 0 00:45:00      |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00    | 5.60     | 2.85   | 280.77  | 309.01  | 0 00:20:00      |

Node Summary

| SN | Element ID           | Element Type | Invert Elevation | Ground/Rim (Max) Elevation | Initial Water Elevation | Surcharge Elevation | Ponded Area | Peak Inflow | Max HGL Elevation Attained | Max Surcharge Depth Attained | Min Freeboard Attained | Time of Peak Flooding Occurrence | Total Flooded Volume | Total Time Flooded |
|----|----------------------|--------------|------------------|----------------------------|-------------------------|---------------------|-------------|-------------|----------------------------|------------------------------|------------------------|----------------------------------|----------------------|--------------------|
|    |                      |              | (ft)             | (ft)                       | (ft)                    | (ft)                | (ft²)       | (cfs)       | (ft)                       | (ft)                         | (ft)                   | (days hh:mm)                     | (ac-in)              | (min)              |
| 1  | 12'_DIA_MANHOLE      | Junction     | 886.40           | 895.75                     | 886.40                  | 895.75              | 0.00        | 454.50      | 895.75                     | 0.00                         | 0.00                   | 0 12:26                          | 147.86               | 177.00             |
| 2  | Ditch_Start_East     | Junction     | 899.00           | 902.00                     | 899.00                  | 902.00              | 0.00        | 14.99       | 899.34                     | 0.00                         | 4.66                   | 0 00:00                          | 0.00                 | 0.00               |
| 3  | Ditch_Start_West     | Junction     | 899.00           | 902.00                     | 899.00                  | 902.00              | 0.00        | 34.04       | 899.55                     | 0.00                         | 4.45                   | 0 00:00                          | 0.00                 | 0.00               |
| 4  | HW_36_East           | Junction     | 892.00           | 895.00                     | 892.00                  | 895.00              | 0.00        | 37.47       | 895.89                     | 0.00                         | 1.11                   | 0 00:00                          | 0.00                 | 0.00               |
| 5  | HW_36_West           | Junction     | 892.00           | 895.00                     | 892.00                  | 899.00              | 0.00        | 41.67       | 896.28                     | 0.00                         | 0.72                   | 0 00:00                          | 0.00                 | 0.00               |
| 6  | IB_1_OCS             | Junction     | 891.00           | 900.80                     | 891.00                  | 900.80              | 0.00        | 701.35      | 900.80                     | 0.00                         | 0.00                   | 0 12:44                          | 395.64               | 153.00             |
| 7  | Analysis_Point_1     | Outfall      | 884.00           |                            |                         |                     |             | 366.52      | 889.16                     |                              |                        |                                  |                      |                    |
| 8  | Analysis_Point_2     | Outfall      | 890.65           |                            |                         |                     |             | 278.75      | 895.22                     |                              |                        |                                  |                      |                    |
| 9  | Culvert_2_Inlet      | Storage Node | 892.00           | 900.00                     | 892.00                  |                     | 8168.00     | 305.37      | 899.48                     |                              |                        |                                  | 0.00                 | 0.00               |
| 10 | Infiltration_Basin_1 | Storage Node | 898.50           | 905.50                     | 900.80                  |                     | 1690091.00  | 3024.00     | 904.36                     |                              |                        |                                  | 0.00                 | 0.00               |

STARTING WATER ELEV. AT OCS RIM ELEV. TO APPROXIMATE A 1YR TO 2YR STORM LEVEL IN BASIN #1



Link Summary

| SN Element ID      | Element Type | From (Inlet) Node    | To (Outlet) Node | Length | Inlet Invert Elevation | Outlet Invert Elevation | Average Slope | Diameter or Height | Manning's Roughness | Peak Flow | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Reported Condition |
|--------------------|--------------|----------------------|------------------|--------|------------------------|-------------------------|---------------|--------------------|---------------------|-----------|----------------------|------------------------------|--------------------|-----------------|------------------------------------|-----------------------|--------------------|
|                    |              |                      |                  | (ft)   | (ft)                   | (ft)                    | (%)           | (in)               |                     | (cfs)     | (cfs)                |                              | (ft/sec)           | (ft)            |                                    | (min)                 |                    |
| 1 36_East          | Pipe         | HW_36_East           | 12'_DIA_MANHOLE  | 53.00  | 892.00                 | 889.46                  | 4.7900        | 36.000             | 0.0150              | 24.42     | 126.55               | 0.19                         | 6.32               | 3.00            | 1.00                               | 198.00                | SURCHARGED         |
| 2 36_West          | Pipe         | HW_36_West           | 12'_DIA_MANHOLE  | 53.00  | 892.00                 | 889.46                  | 4.7900        | 36.000             | 0.0150              | 33.55     | 126.55               | 0.27                         | 8.39               | 3.00            | 1.00                               | 199.00                | SURCHARGED         |
| 3 Culvert_1_CMP_72 | Pipe         | 12'_DIA_MANHOLE      | Analysis_Point_1 | 117.00 | 886.40                 | 884.00                  | 2.0500        | 72.000             | 0.0260              | 366.52    | 303.28               | 1.21                         | 13.38              | 5.58            | 0.93                               | 0.00                  | > CAPACITY         |
| 4 Culvert_1_RCP_72 | Pipe         | IB_1_OCS             | 12'_DIA_MANHOLE  | 201.00 | 891.00                 | 886.40                  | 2.2900        | 72.000             | 0.0130              | 406.04    | 640.68               | 0.63                         | 14.36              | 6.00            | 1.00                               | 219.00                | SURCHARGED         |
| 5 Culvert_2        | Pipe         | Culvert_2_Inlet      | Analysis_Point_2 | 111.00 | 892.25                 | 890.65                  | 1.4400        | 72.000             | 0.0260              | 278.75    | 254.23               | 1.10                         | 10.57              | 5.28            | 0.88                               | 0.00                  | > CAPACITY         |
| 6 Ditch_East       | Channel      | Ditch_Start_East     | HW_36_East       | 300.00 | 899.00                 | 892.00                  | 2.3300        | 60.000             | 0.0320              | 14.97     | 2363.82              | 0.01                         | 1.65               | 2.11            | 0.42                               | 0.00                  |                    |
| 7 Ditch_West       | Channel      | Ditch_Start_West     | HW_36_West       | 300.00 | 899.00                 | 892.00                  | 2.3300        | 60.000             | 0.0320              | 34.00     | 2363.82              | 0.01                         | 2.35               | 2.41            | 0.48                               | 0.00                  |                    |
| 8 OCS_Weir         | Orifice      | Infiltration_Basin_1 | IB_1_OCS         |        | 898.50                 | 891.00                  |               | 120.000            |                     | 701.35    |                      |                              |                    |                 |                                    |                       |                    |
| 9 IB_1_Spillway    | Weir         | Infiltration_Basin_1 | Culvert_2_Inlet  |        | 898.50                 | 892.00                  |               |                    |                     | 258.64    |                      |                              |                    |                 |                                    |                       |                    |

100YR PEAK FLOW OVER EMERGENCY SPILLWAY WITH STARTING WATER ELEV. AT OCS RIM ELEV. OF 900.80'

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 761.76    |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 91        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

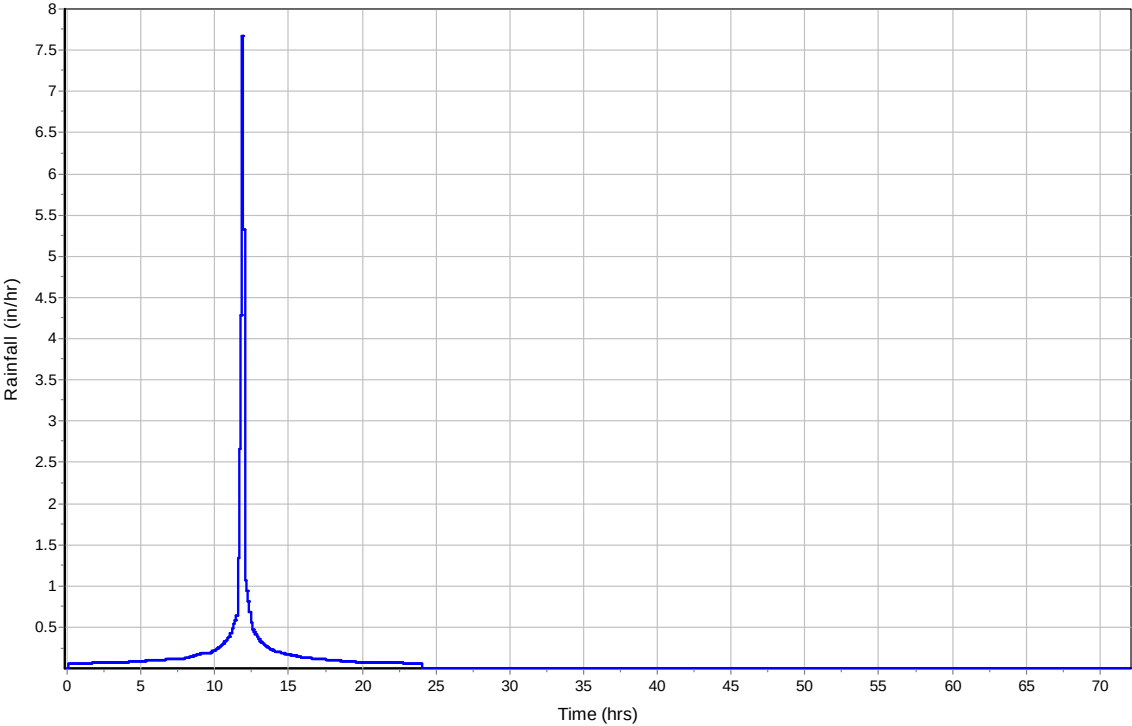
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

### Subbasin Runoff Results

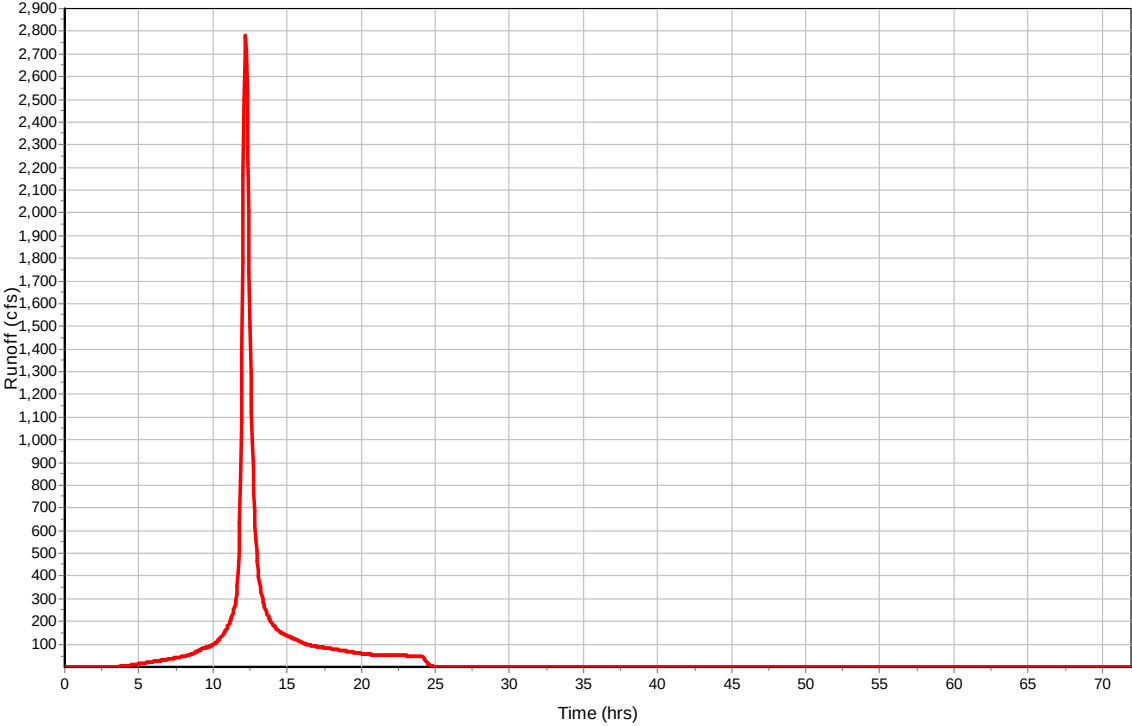
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 5.6        |
| Total Runoff (in) .....                     | 4.57       |
| Peak Runoff (cfs) .....                     | 2785.54    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr100yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

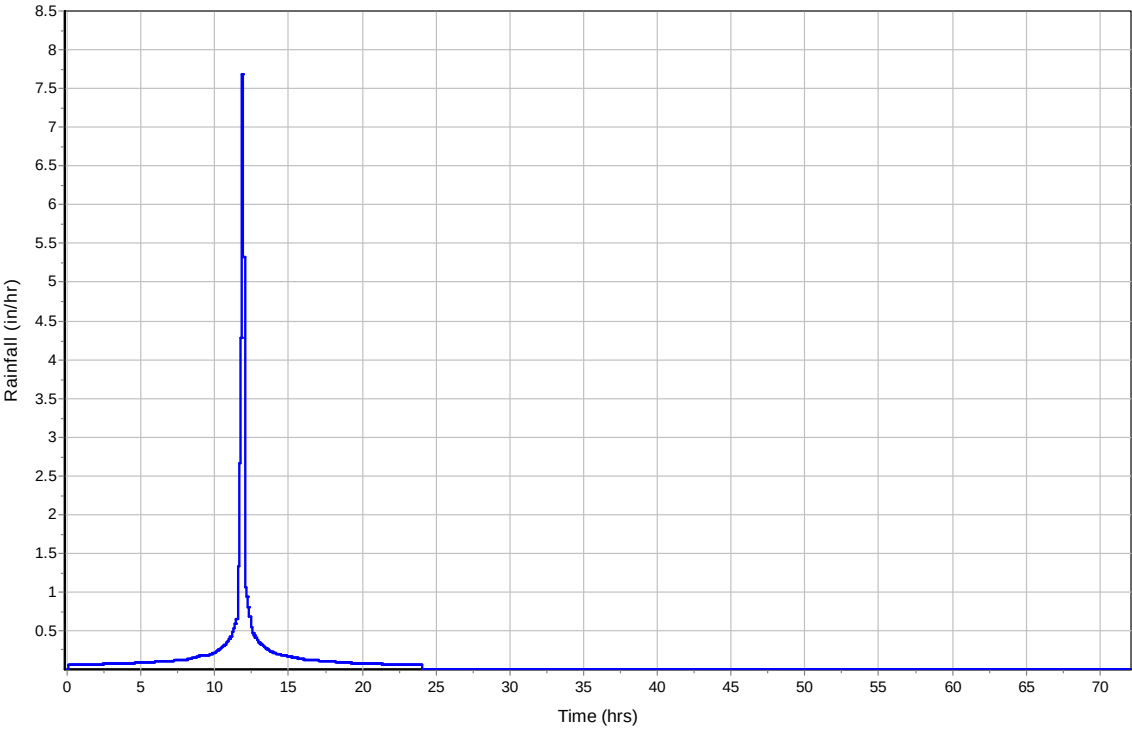
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

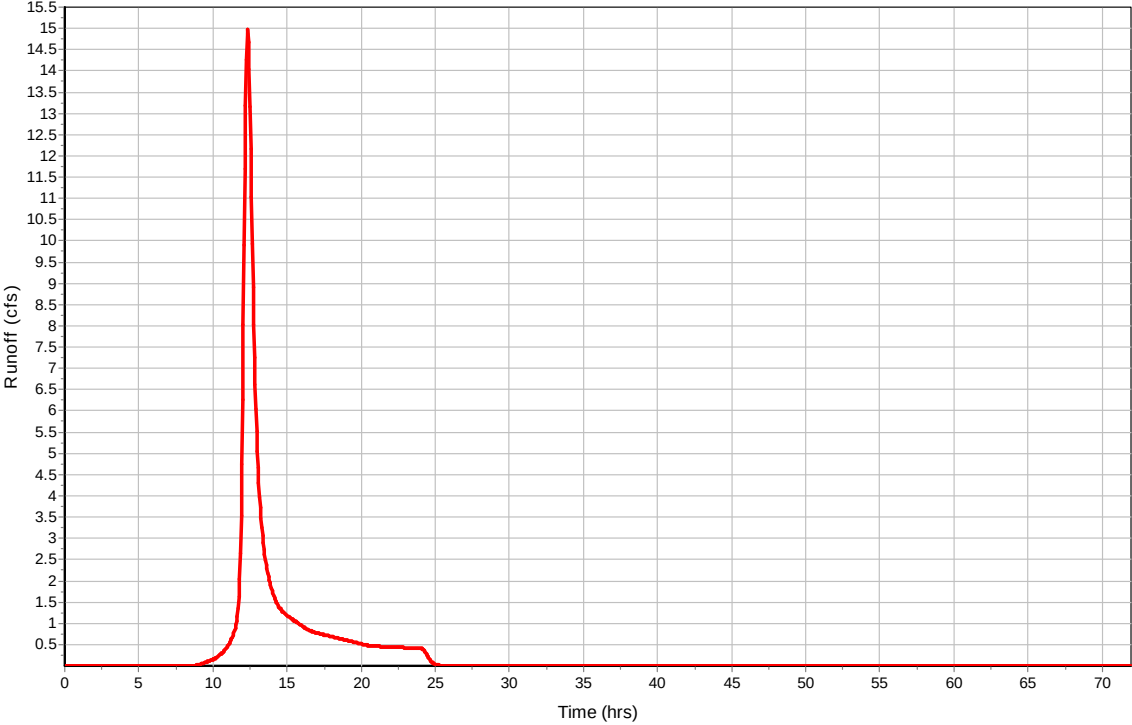
Total Rainfall (in) ..... 5.6  
Total Runoff (in) ..... 2.85  
Peak Runoff (cfs) ..... 14.99  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 17.73     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 74        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

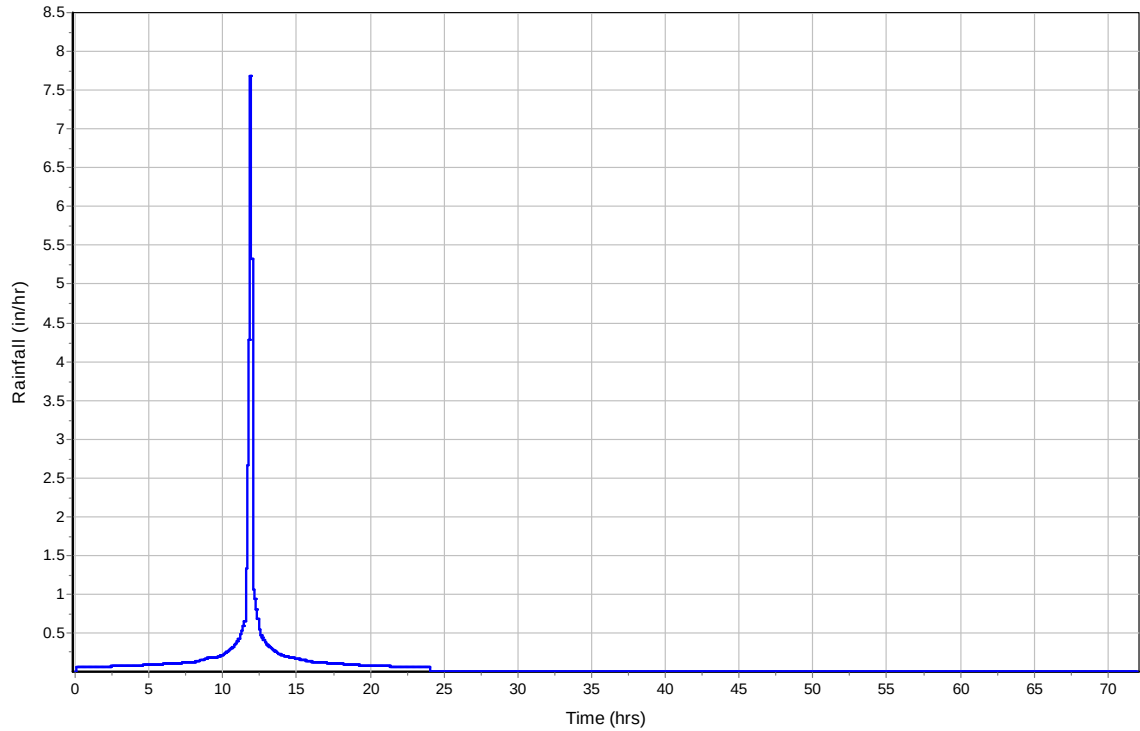
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

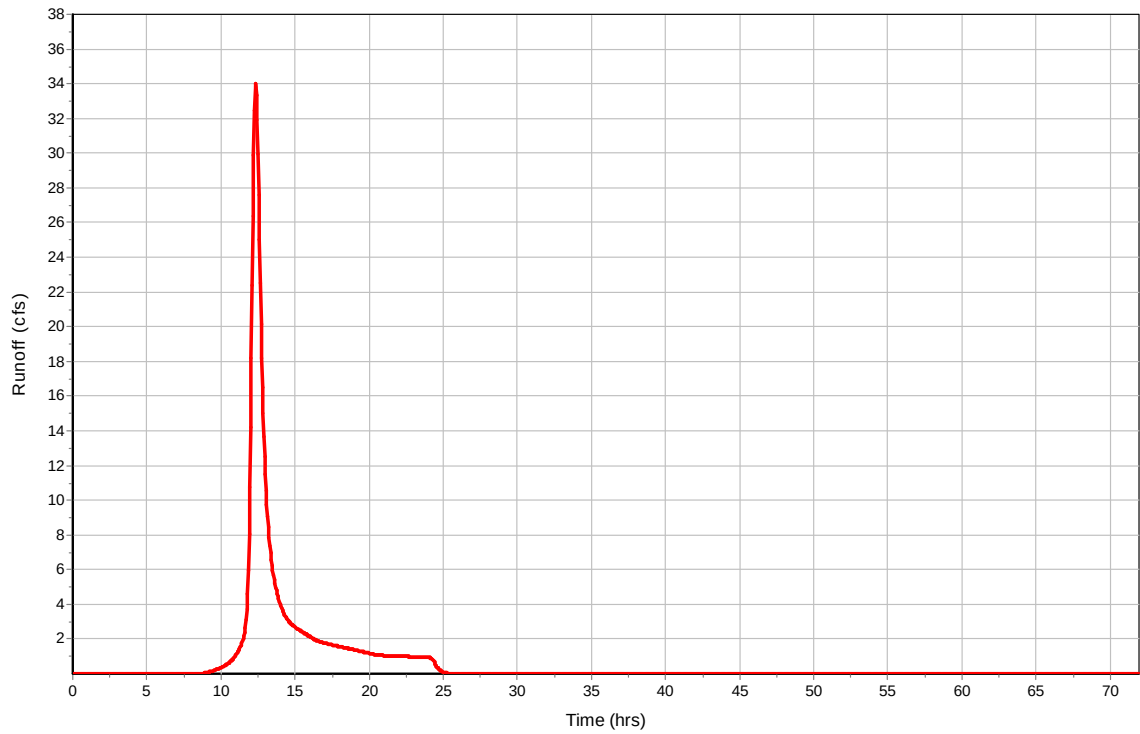
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.85       |
| Peak Runoff (cfs)                     | 34.04      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph





Subbasin : Drainage\_Area\_2b

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 37.9      |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 75        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

Time of Concentration

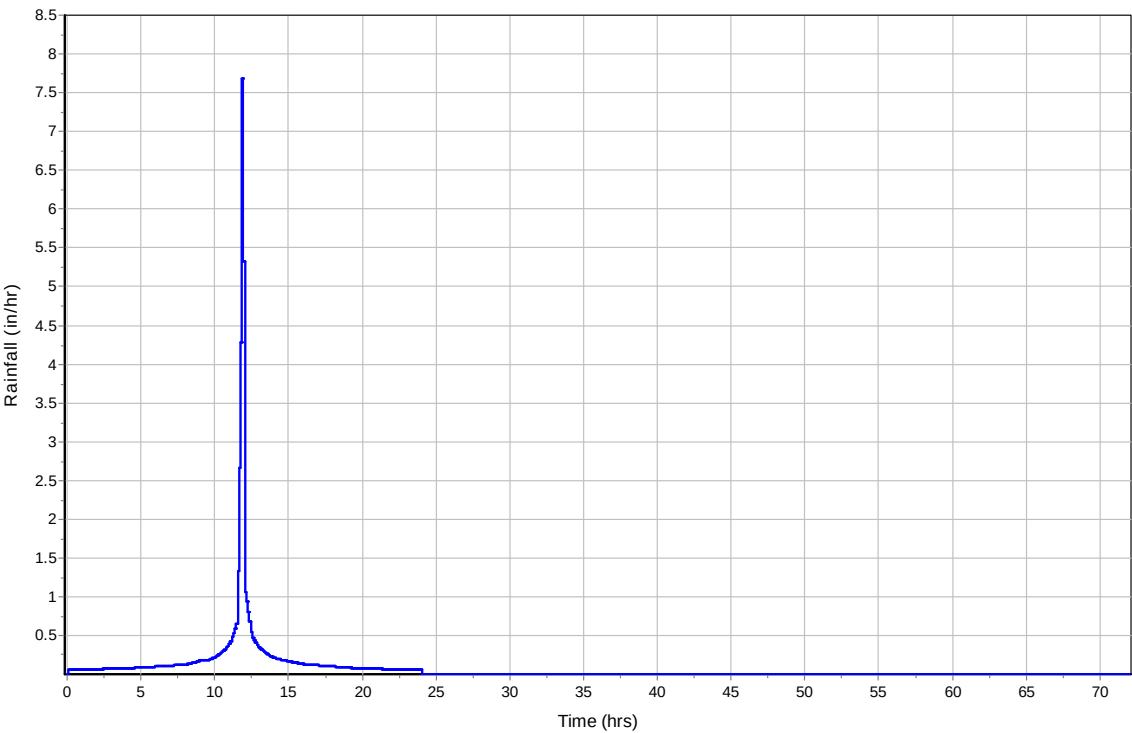
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

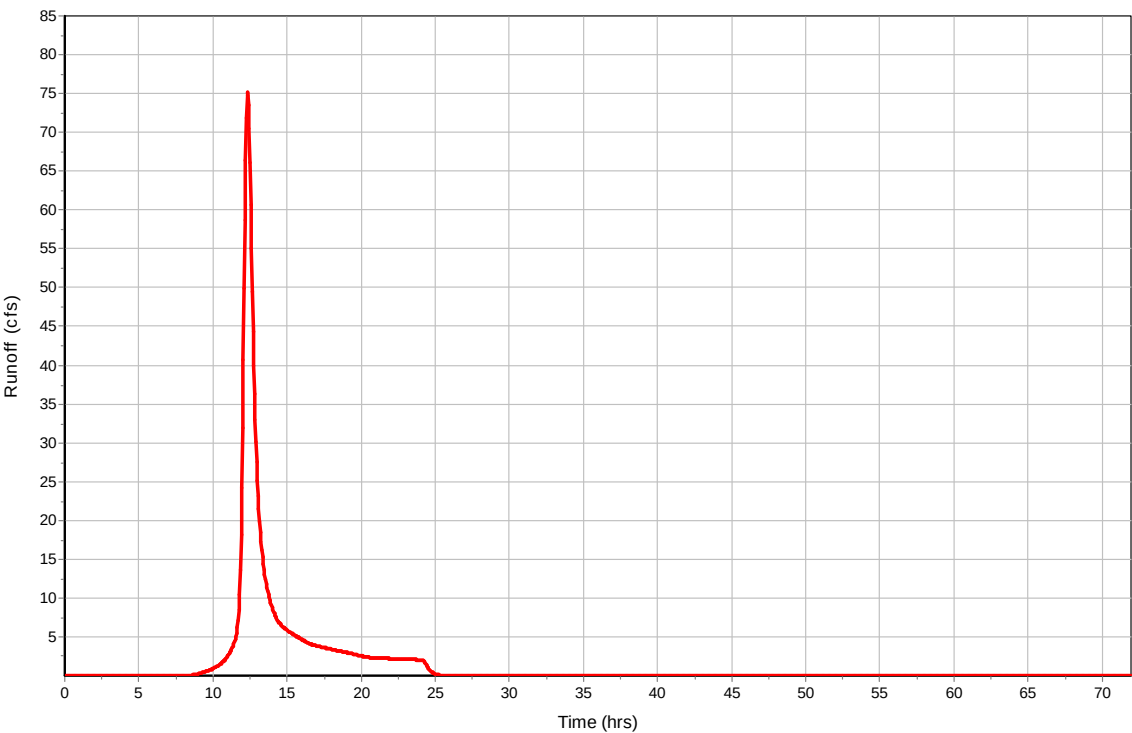
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.94       |
| Peak Runoff (cfs)                     | 75.32      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_2b

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 98.48     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 74        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

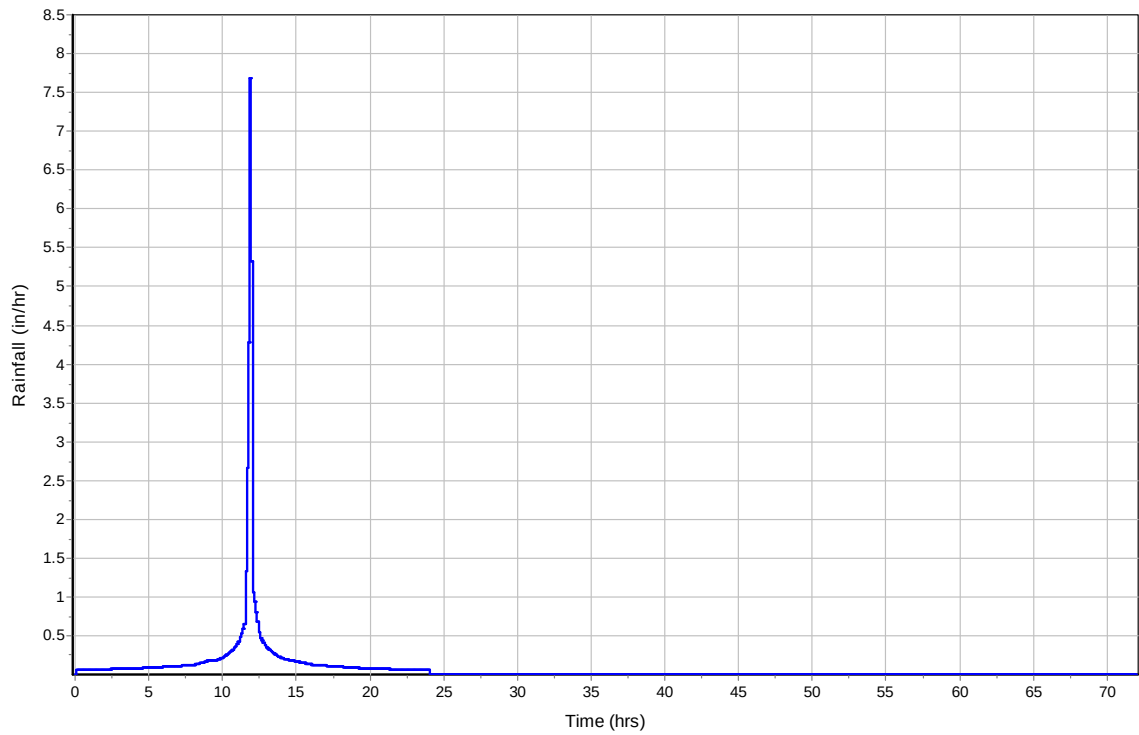
Time of Concentration

User-Defined TOC override (minutes): 20.00

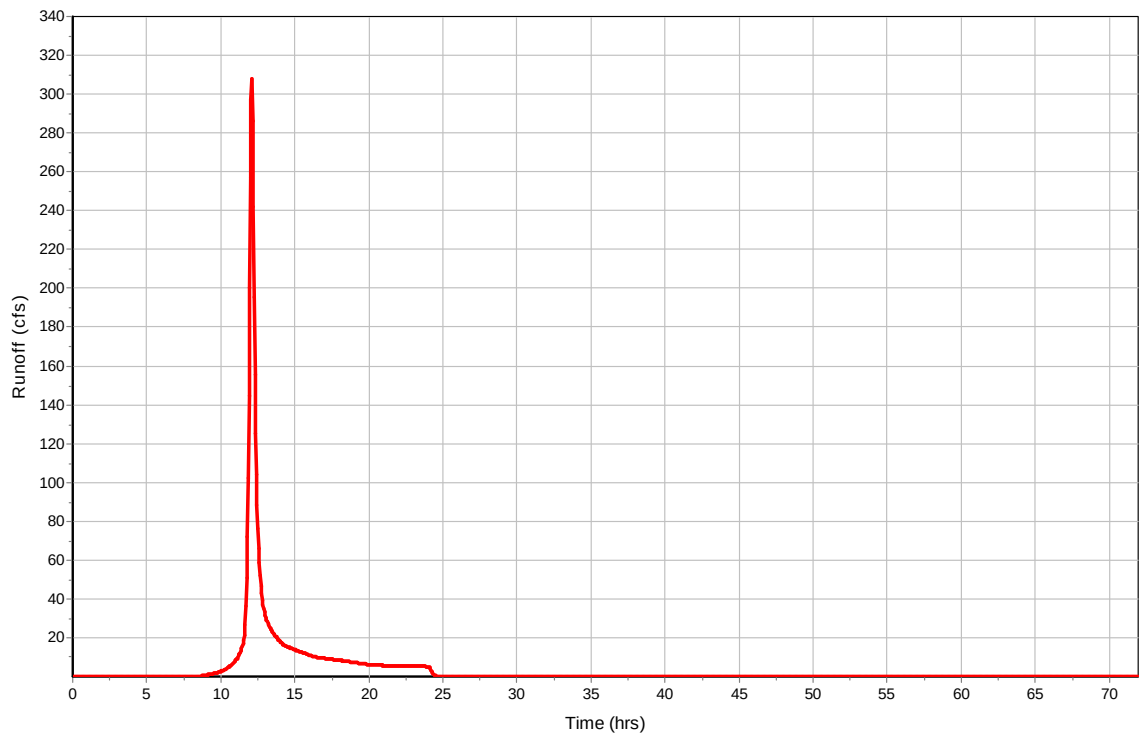
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.85       |
| Peak Runoff (cfs)                     | 309.01     |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

| SN | Element<br>ID    | Invert<br>Elevation<br><br>(ft) | Ground/Rim<br>(Max)<br>Elevation<br>(ft) | Ground/Rim<br>(Max)<br>Offset<br>(ft) | Initial<br>Water<br>Elevation<br>(ft) | Initial<br>Water<br>Depth<br>(ft) | Surcharge<br>Elevation<br>(ft) | Surcharge<br>Depth<br>(ft) | Ponded<br>Area<br>(ft²) | Minimum<br>Pipe<br>Cover<br>(in) |
|----|------------------|---------------------------------|------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------|--------------------------------|----------------------------|-------------------------|----------------------------------|
| 1  | 12" DIA MANHOLE  | 886.40                          | 895.75                                   | 9.35                                  | 886.40                                | 0.00                              | 895.75                         | 0.00                       | 0.00                    | 0.00                             |
| 2  | Ditch_Start_East | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 3  | Ditch_Start_West | 899.00                          | 902.00                                   | 3.00                                  | 899.00                                | 0.00                              | 902.00                         | 0.00                       | 0.00                    | 0.00                             |
| 4  | HW_36_East       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 895.00                         | 0.00                       | 0.00                    | 0.00                             |
| 5  | HW_36_West       | 892.00                          | 895.00                                   | 3.00                                  | 892.00                                | 0.00                              | 899.00                         | 4.00                       | 0.00                    | 0.00                             |
| 6  | IB_1_OCS         | 891.00                          | 900.80                                   | 9.80                                  | 891.00                                | 0.00                              | 900.80                         | 0.00                       | 0.00                    | 0.00                             |

Junction Results

| SN Element<br>ID   | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|--------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|                    | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1 12' DIA MANHOLE  | 454.50         | 0.00                      | 895.75                           | 9.35                         | 0.00                                  | 0.00                         | 887.79                               | 1.39                             | 0 12:16                          | 0 12:26                                   | 147.86                     | 177.00                |
| 2 Ditch_Start_East | 14.99          | 14.99                     | 899.34                           | 0.34                         | 0.00                                  | 4.66                         | 899.02                               | 0.02                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3 Ditch_Start_West | 34.04          | 34.04                     | 899.55                           | 0.55                         | 0.00                                  | 4.45                         | 899.03                               | 0.03                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4 HW_36_East       | 37.47          | 0.00                      | 895.89                           | 3.89                         | 0.00                                  | 1.11                         | 892.22                               | 0.22                             | 0 12:17                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5 HW_36_West       | 41.67          | 0.00                      | 896.28                           | 4.28                         | 0.00                                  | 0.72                         | 892.23                               | 0.23                             | 0 12:26                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6 IB_1_OCS         | 701.35         | 0.00                      | 900.80                           | 9.80                         | 0.00                                  | 0.00                         | 892.02                               | 1.02                             | 0 12:16                          | 0 12:44                                   | 395.64                     | 153.00                |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

Channel Results

| SN | Element ID | Peak Flow | Time of Peak Flow Occurrence | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Travel Time | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Froude Number | Reported Condition |
|----|------------|-----------|------------------------------|----------------------|------------------------------|--------------------|-------------|-----------------|------------------------------------|-----------------------|---------------|--------------------|
|    |            | (cfs)     | (days hh:mm)                 | (cfs)                |                              | (ft/sec)           | (min)       | (ft)            |                                    | (min)                 |               |                    |
| 1  | Ditch_East | 14.97     | 0 12:24                      | 2363.82              | 0.01                         | 1.65               | 3.03        | 2.11            | 0.42                               | 0.00                  |               |                    |
| 2  | Ditch_West | 34.00     | 0 12:24                      | 2363.82              | 0.01                         | 2.35               | 2.13        | 2.41            | 0.48                               | 0.00                  |               |                    |



Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|---------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |               |                       |
| 1 36_East          | 24.42        | 0 12:15                            | 126.55                  | 0.19                               | 6.32                  | 0.14           | 3.00               | 1.00                                        | 198.00                   |               | SURCHARGED            |
| 2 36_West          | 33.55        | 0 12:27                            | 126.55                  | 0.27                               | 8.39                  | 0.11           | 3.00               | 1.00                                        | 199.00                   |               | SURCHARGED            |
| 3 Culvert_1_CMP_72 | 366.52       | 0 14:48                            | 303.28                  | 1.21                               | 13.38                 | 0.15           | 5.58               | 0.93                                        | 0.00                     |               | > CAPACITY            |
| 4 Culvert_1_RCP_72 | 406.04       | 0 12:24                            | 640.68                  | 0.63                               | 14.36                 | 0.23           | 6.00               | 1.00                                        | 219.00                   |               | SURCHARGED            |
| 5 Culvert_2        | 278.75       | 0 12:50                            | 254.23                  | 1.10                               | 10.57                 | 0.18           | 5.28               | 0.88                                        | 0.00                     |               | > CAPACITY            |

Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

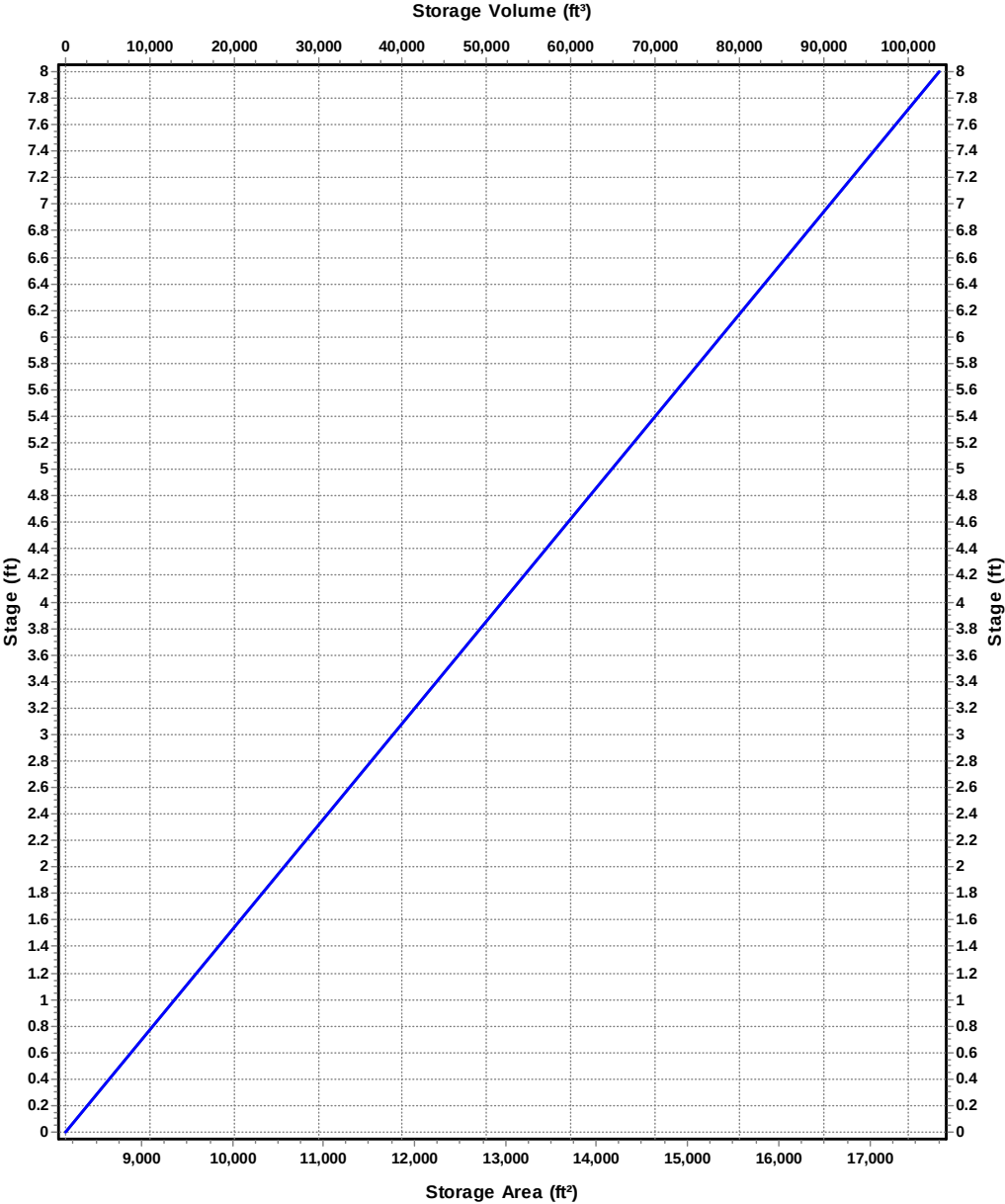
|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage | Storage |
|-------|---------|---------|
| (ft)  | Area    | Volume  |
|       | (ft²)   | (ft³)   |
| 0     | 8168    | 0       |
| 8     | 17763   | 103724  |

Storage Area Volume Curves



**Storage Node : Culvert\_2\_Inlet (continued)**

**Output Summary Results**

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 305.37  |
| Peak Lateral Inflow (cfs) .....               | 75.24   |
| Peak Outflow (cfs) .....                      | 278.75  |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 899.48  |
| Max HGL Depth Attained (ft) .....             | 7.48    |
| Average HGL Elevation Attained (ft) .....     | 892.4   |
| Average HGL Depth Attained (ft) .....         | 0.4     |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:50 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

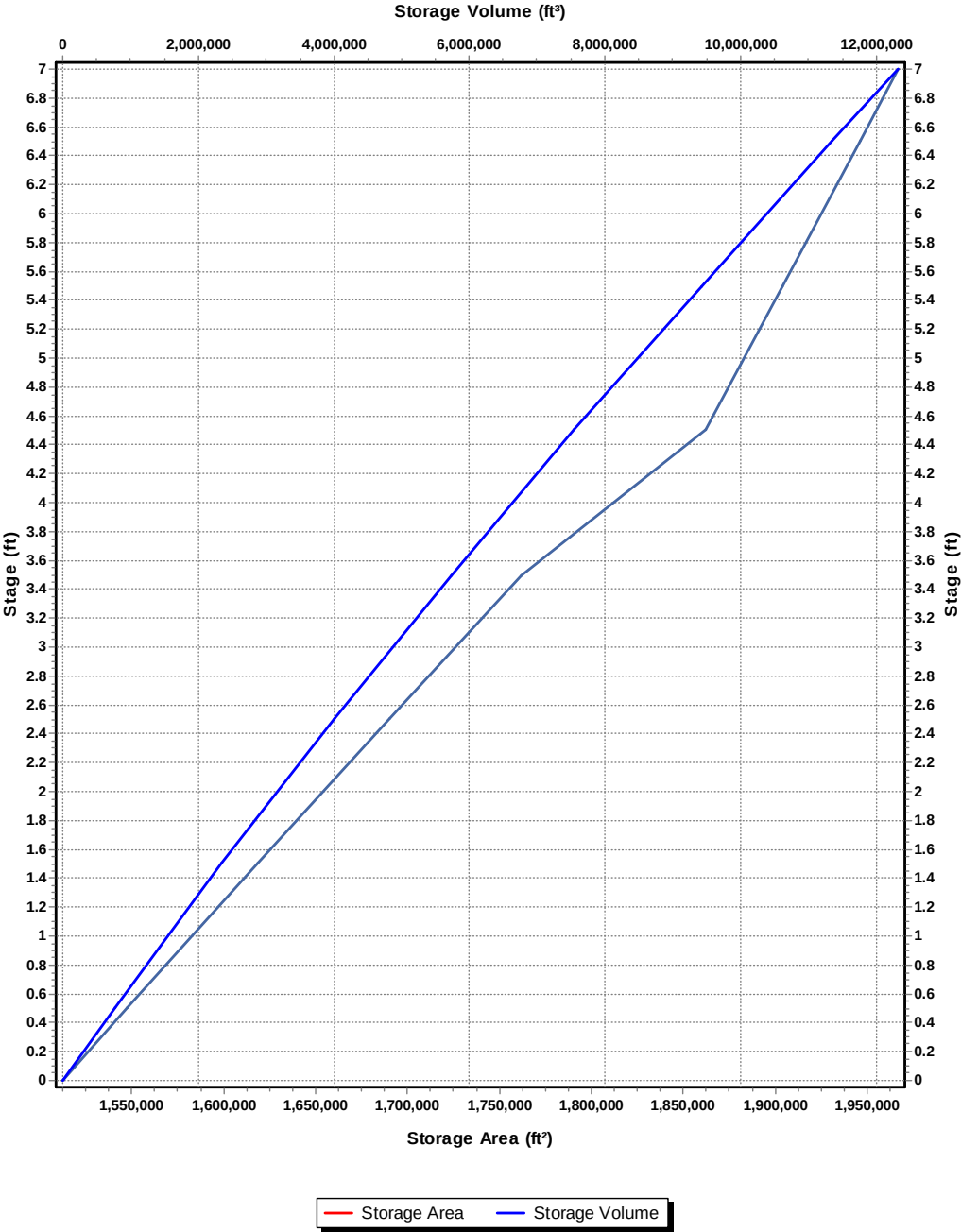
|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 900.80     |
| Initial Water Depth (ft)     | 2.30       |
| Ponded Area (ft²)            | 1690091.00 |
| Evaporation Loss             | 0.00       |

Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |

Storage Area Volume Curves





## Storage Node : Infiltration\_Basin\_1 (continued)

### Outflow Weirs

| SN Element<br>ID | Weir<br>Type | Flap<br>Gate | Crest<br>Elevation<br>(ft) | Crest<br>Offset<br>(ft) | Length<br>(ft) | Weir Total<br>Height<br>(ft) | Discharge<br>Coefficient |
|------------------|--------------|--------------|----------------------------|-------------------------|----------------|------------------------------|--------------------------|
| 1 IB_1_Spillway  | Trapezoidal  | No           | 904.00                     | 5.50                    | 350.00         | 1.50                         | 3.40                     |

### Outflow Orifices

| SN Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|------------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1 OCS_Weir       | Bottom          | CIRCULAR         | No           | 120.00                                  |                                          |                                         | 900.80                                 | 0.61                   |

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 3024    |
| Peak Lateral Inflow (cfs) .....               | 3024    |
| Peak Outflow (cfs) .....                      | 960     |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 904.36  |
| Max HGL Depth Attained (ft) .....             | 5.86    |
| Average HGL Elevation Attained (ft) .....     | 901.22  |
| Average HGL Depth Attained (ft) .....         | 2.72    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:44 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

# HY-8 Culvert Analysis Report

## Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: MDOT Culvert 1 (CMP)

| Headwater Elevation (ft) | Discharge Names | Total Discharge (cfs) | Culvert 1 Discharge (cfs) | Roadway Discharge (cfs) | Iterations  |
|--------------------------|-----------------|-----------------------|---------------------------|-------------------------|-------------|
| 888.11                   | 2 year          | 23.32                 | 23.32                     | 0.00                    | 1           |
| 889.73                   | 5 year          | 81.40                 | 81.40                     | 0.00                    | 1           |
| 890.30                   | 10 year         | 105.81                | 105.81                    | 0.00                    | 1           |
| 892.44                   | 25 year         | 206.38                | 206.38                    | 0.00                    | 1           |
| 899.51                   | 100 year        | 435.49                | 435.49                    | 0.00                    | 1           |
| 901.00                   | Overtopping     | 466.79                | 466.79                    | 0.00                    | Overtopping |

## Culvert Data: Culvert 1

Table 1 - Culvert Summary Table: Culvert 1

| Discharge Name | Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|----------------|-----------------------|-------------------------|--------------------------|--------------------------|---------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 2 year         | 23.32 cfs             | 23.32 cfs               | 888.11                   | 1.71                     | 1.128                     | 1-JS1t    | 1.08              | 1.27                | 3.50              | 3.50                 | 1.36                   | 0.00                      |
| 5 year         | 81.40 cfs             | 81.40 cfs               | 889.73                   | 3.33                     | 1.440                     | 1-JS1t    | 2.03              | 2.42                | 3.50              | 3.50                 | 4.75                   | 0.00                      |
| 10 year        | 105.81 cfs            | 105.81 cfs              | 890.30                   | 3.90                     | 1.674                     | 1-S2n     | 2.34              | 2.77                | 2.36              | 3.50                 | 10.24                  | 0.00                      |
| 25 year        | 206.38 cfs            | 206.38 cfs              | 892.44                   | 6.04                     | 3.711                     | 5-S2n     | 3.44              | 3.93                | 3.47              | 3.50                 | 12.18                  | 0.00                      |
| 100 year       | 435.49 cfs            | 435.49 cfs              | 899.51                   | 13.11                    | 13.092                    | 7-M2c     | 6.00              | 5.48                | 5.48              | 3.50                 | 16.08                  | 0.00                      |

## Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 886.40 ft,

Outlet Elevation (invert): 884.00 ft

Culvert Length: 117.02 ft,

Culvert Slope: 0.0205

### Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 886.40 ft

Outlet Station: 117.00 ft

Outlet Elevation: 884.00 ft

Number of Barrels: 1

### Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 6.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

### Tailwater Data for Crossing: MDOT Culvert 1 (CMP)

Table 2 - Downstream Channel Rating Curve (Crossing: MDOT Culvert 1 (CMP))

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) |
|------------|-------------------------|------------|
| 23.32      | 887.50                  | 3.50       |
| 81.40      | 887.50                  | 3.50       |
| 105.81     | 887.50                  | 3.50       |
| 206.38     | 887.50                  | 3.50       |
| 435.49     | 887.50                  | 3.50       |

### Tailwater Channel Data - MDOT Culvert 1 (CMP)

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 887.50 ft

### Roadway Data for Crossing: MDOT Culvert 1 (CMP)

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

#### Irregular Roadway Cross-Section

| Coord No. | Station (ft) | Elevation (ft) |
|-----------|--------------|----------------|
| 0         | 0.00         | 902.00         |
| 1         | 100.00       | 901.00         |
| 2         | 650.00       | 901.00         |
| 3         | 750.00       | 902.00         |

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

### Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 3 - Summary of Culvert Flows at Crossing: MDOT Culvert 2 (CMP)

| Headwater Elevation (ft) | Discharge Names | Total Discharge (cfs) | Culvert 2 Discharge (cfs) | Roadway Discharge (cfs) | Iterations  |
|--------------------------|-----------------|-----------------------|---------------------------|-------------------------|-------------|
| 895.03                   | 2 year          | 15.50                 | 15.50                     | 0.00                    | 1           |
| 895.12                   | 5 year          | 29.60                 | 29.60                     | 0.00                    | 1           |
| 895.16                   | 10 year         | 33.72                 | 33.72                     | 0.00                    | 1           |
| 895.31                   | 25 year         | 47.61                 | 47.61                     | 0.00                    | 1           |
| 895.81                   | 100 year        | 75.24                 | 75.24                     | 0.00                    | 1           |
| 901.65                   | 200 year        | 333.88                | 333.88                    | 0.00                    | 1           |
| 904.00                   | Overtopping     | 391.59                | 391.59                    | 0.00                    | Overtopping |

### Culvert Data: Culvert 2

Table 2 - Culvert Summary Table: Culvert 2

| Discharge Names | Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------|-----------------------|-------------------------|--------------------------|--------------------------|---------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 2 year          | 15.50 cfs             | 15.50 cfs               | 895.03                   | 1.39                     | 2.783                     | 1-S1t     | 0.96              | 1.03                | 4.35              | 4.35                 | 0.71                   | 0.00                      |

|                     |                |                |            |      |           |               |      |          |          |      |           |      |
|---------------------|----------------|----------------|------------|------|-----------|---------------|------|----------|----------|------|-----------|------|
| <b>5<br/>year</b>   | 29.60<br>cfs   | 29.60<br>cfs   | 895.1<br>2 | 1.94 | 2.87<br>0 | 1-<br>S1<br>t | 1.32 | 1.4<br>3 | 4.3<br>5 | 4.35 | 1.35      | 0.00 |
| <b>10<br/>year</b>  | 33.72<br>cfs   | 33.72<br>cfs   | 895.1<br>6 | 2.08 | 2.90<br>6 | 1-<br>S1<br>t | 1.42 | 1.5<br>3 | 4.3<br>5 | 4.35 | 1.54      | 0.00 |
| <b>25<br/>year</b>  | 47.61<br>cfs   | 47.61<br>cfs   | 895.3<br>1 | 2.49 | 3.06<br>3 | 1-<br>S1<br>t | 1.69 | 1.8<br>3 | 4.3<br>5 | 4.35 | 2.17      | 0.00 |
| <b>100<br/>year</b> | 75.24<br>cfs   | 75.24<br>cfs   | 895.8<br>1 | 3.20 | 3.56<br>0 | 1-<br>S1<br>t | 2.14 | 2.3<br>2 | 4.3<br>5 | 4.35 | 3.43      | 0.00 |
| <b>200<br/>year</b> | 333.8<br>8 cfs | 333.8<br>8 cfs | 901.6<br>5 | 9.40 | 9.33<br>2 | 7-<br>M<br>2c | 6.00 | 4.9<br>7 | 4.9<br>7 | 4.35 | 13.3<br>4 | 0.00 |

### Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 892.25 ft,

Outlet Elevation (invert): 890.65 ft

Culvert Length: 111.01 ft,

Culvert Slope: 0.0144

### Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 892.25 ft

Outlet Station: 111.00 ft

Outlet Elevation: 890.65 ft

Number of Barrels: 1

### Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 6.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall ( $K_e=0.5$ )

Inlet Depression: None

### Tailwater Data for Crossing: MDOT Culvert 2 (CMP)

Table 4 - Downstream Channel Rating Curve (Crossing: MDOT Culvert 2 (CMP))

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) |
|------------|-------------------------|------------|
| 15.50      | 895.00                  | 4.35       |
| 29.60      | 895.00                  | 4.35       |
| 33.72      | 895.00                  | 4.35       |
| 47.61      | 895.00                  | 4.35       |
| 75.24      | 895.00                  | 4.35       |
| 333.88     | 895.00                  | 4.35       |

### Tailwater Channel Data - MDOT Culvert 2 (CMP)

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 895.00 ft

### Roadway Data for Crossing: MDOT Culvert 2 (CMP)

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

#### Irregular Roadway Cross-Section

| Coord No. | Station (ft) | Elevation (ft) |
|-----------|--------------|----------------|
| 0         | 0.00         | 906.00         |
| 1         | 200.00       | 904.00         |
| 2         | 1800.00      | 904.00         |
| 3         | 2000.00      | 906.00         |

Roadway Surface: Paved

Roadway Top Width: 30.00 ft



## **Appendix G. Plunge Pool Calculations**

## Plunge Pool Design HEC-14

### Culvert 1

|                 |        |       |                               |
|-----------------|--------|-------|-------------------------------|
| Q               | 435.49 | cfs   | Design flow for the culvert   |
| D               | 6      | ft    | Culvert diameter or span      |
| y <sub>o</sub>  | 4.92   | ft    | Outlet depth                  |
| A               | 24.81  | sq ft | Wetted culvert area           |
| V <sub>o</sub>  | 17.55  | ft/s  | Outlet velocity               |
| y <sub>e</sub>  | 3.52   | ft    | Equivalent brink outlet depth |
| Fr              | 1.39   | --    | Froude number                 |
| h <sub>s</sub>  | 3.5    | ft    | Plunge pool depth             |
| Co              | 1.4    | --    | Coefficient                   |
| D <sub>50</sub> | 1.36   | ft    | Median stone size             |
| D <sub>50</sub> | 16.3   | in    | Median stone size             |
| W <sub>o</sub>  | 6      | ft    | Riprap width at outlet        |
| L <sub>s</sub>  | 35     | ft    | Pool length                   |
| L <sub>a</sub>  | 17.5   | ft    | Apron Length                  |
| L <sub>b</sub>  | 52.5   | ft    | Basin length                  |
| W <sub>b</sub>  | 41     | ft    | Width at end of apron         |

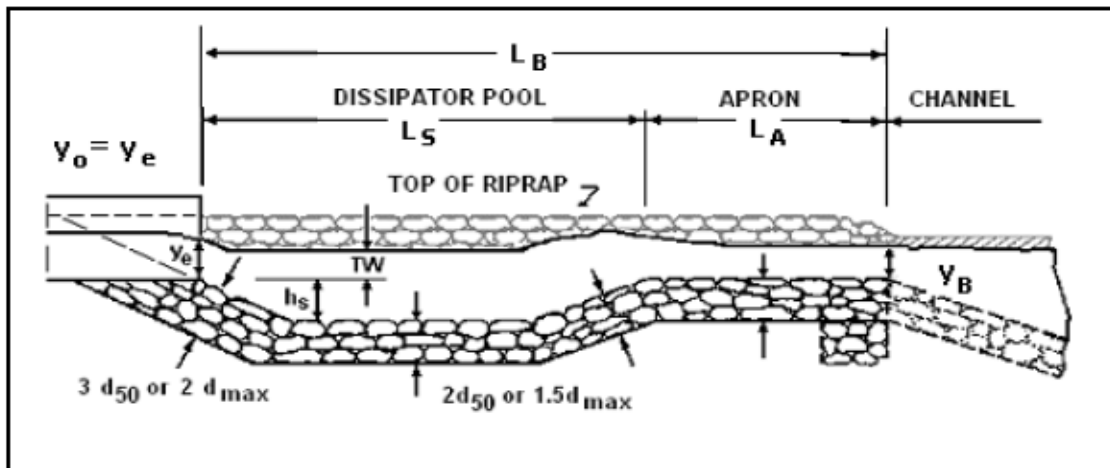


Figure 10.1. Profile of Riprap Basin



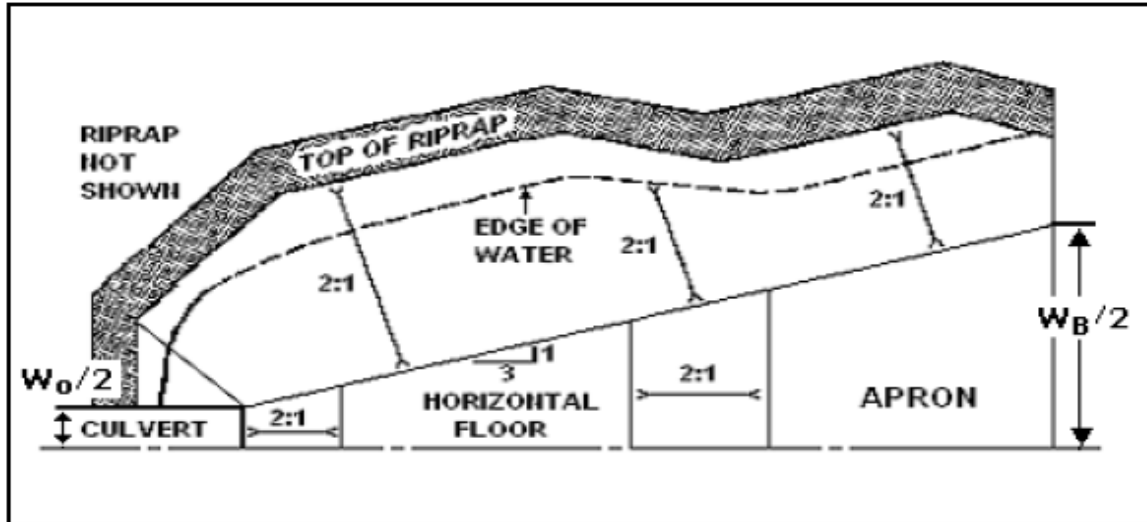


Figure 10.2. Half Plan of Riprap Basin

$$\frac{h_s}{y_e} = 0.86 \left( \frac{D_{50}}{y_e} \right)^{-0.55} \left( \frac{V_o}{\sqrt{g y_e}} \right) - C_o \quad (10.1)$$

where,

- $h_s$  = dissipator pool depth, m (ft)
- $y_e$  = equivalent brink (outlet) depth, m (ft)
- $D_{50}$  = median rock size by weight, m (ft)
- $C_o$  = tailwater parameter

The tailwater parameter,  $C_o$ , is defined as:

$$\begin{aligned} C_o &= 1.4 & TW/y_e < 0.75 \\ C_o &= 4.0(TW/y_e) - 1.6 & 0.75 < TW/y_e < 1.0 \\ C_o &= 2.4 & 1.0 < TW/y_e \end{aligned} \quad (10.2)$$

Table 5.1. Minimum and Maximum Allowable Particle Size in Inches.

| Nominal Riprap Class<br>by Median Particle<br>Diameter |       | $d_{15}$ |      | $d_{50}$ |      | $d_{85}$ |      | $d_{100}$ |
|--------------------------------------------------------|-------|----------|------|----------|------|----------|------|-----------|
| Class                                                  | Size  | Min      | Max  | Min      | Max  | Min      | Max  | Max       |
| I                                                      | 6 in  | 3.7      | 5.2  | 5.7      | 6.9  | 7.8      | 9.2  | 12.0      |
| II                                                     | 9 in  | 5.5      | 7.8  | 8.5      | 10.5 | 11.5     | 14.0 | 18.0      |
| III                                                    | 12 in | 7.3      | 10.5 | 11.5     | 14.0 | 15.5     | 18.5 | 24.0      |
| IV                                                     | 15 in | 9.2      | 13.0 | 14.5     | 17.5 | 19.5     | 23.0 | 30.0      |
| V                                                      | 18 in | 11.0     | 15.5 | 17.0     | 20.5 | 23.5     | 27.5 | 36.0      |
| VI                                                     | 21 in | 13.0     | 18.5 | 20.0     | 24.0 | 27.5     | 32.5 | 42.0      |
| VII                                                    | 24 in | 14.5     | 21.0 | 23.0     | 27.5 | 31.0     | 37.0 | 48.0      |
| VIII                                                   | 30 in | 18.5     | 26.0 | 28.5     | 34.5 | 39.0     | 46.0 | 60.0      |
| IX                                                     | 36 in | 22.0     | 31.5 | 34.0     | 41.5 | 47.0     | 55.5 | 72.0      |
| X                                                      | 42 in | 25.5     | 36.5 | 40.0     | 48.5 | 54.5     | 64.5 | 84.0      |

Note: Particle size  $d$  corresponds to the intermediate ("B") axis of the particle.

## Outlet Depth Calculation - Circular Culverts - HEC-14

### Culvert 1

|                 |        |     |                                       |
|-----------------|--------|-----|---------------------------------------|
| Q               | 435.49 | cfs | Design flow for the culvert           |
| D               | 6      | ft  | Culvert diameter or span              |
| $K_u Q/D^{2.5}$ | 4.94   | --  | Used in Figure 3.4                    |
| Tw              | 0      | ft  | Tailwater depth in downstream channel |
| Tw/D            | 0.00   | --  | Used in Figure 3.4                    |
| $y_o/D$         | 0.82   | --  | Obtained from Figure 3.4              |
| $y_o$           | 4.92   | ft  | Outlet depth                          |

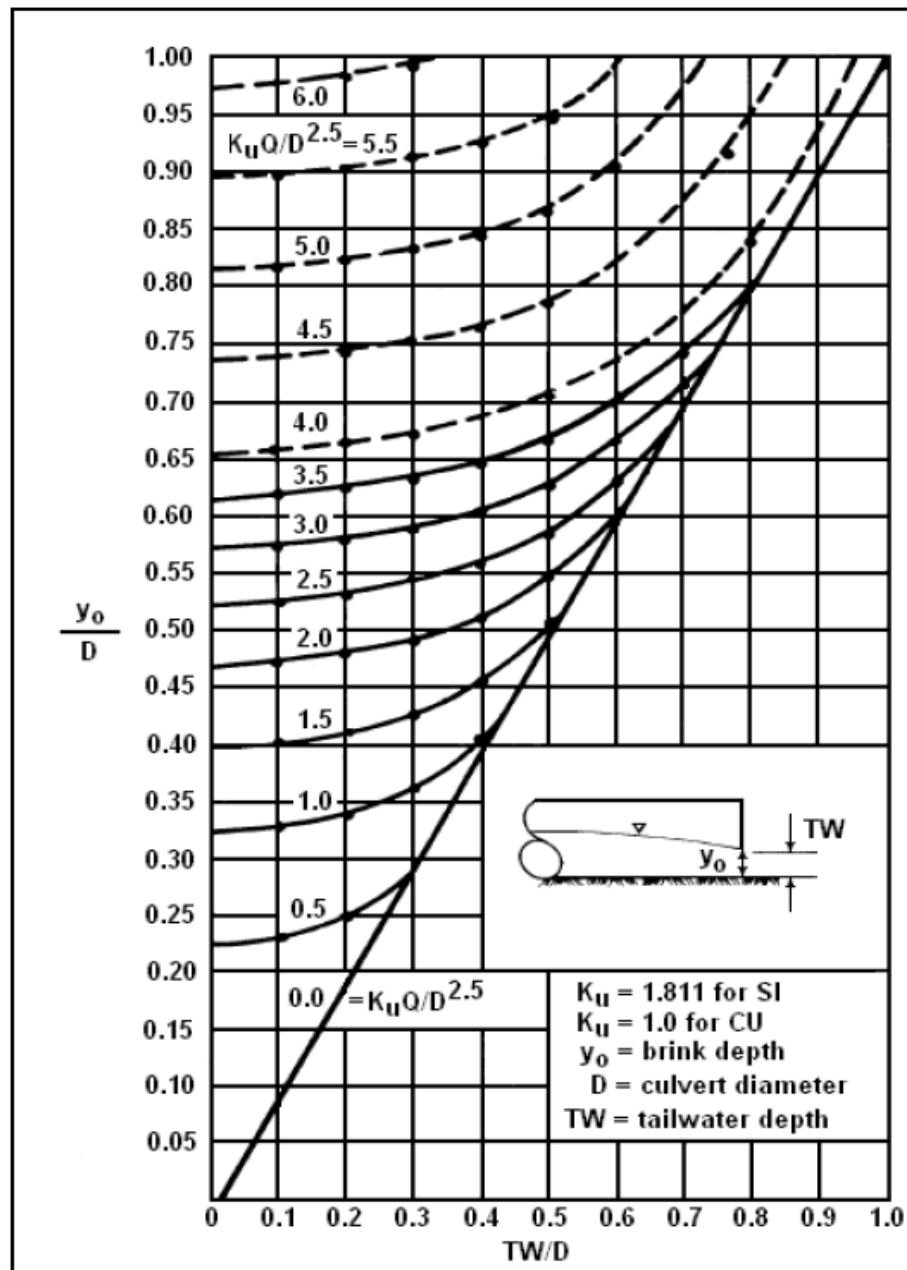


Figure 3.4. Dimensionless Rating Curves for the Outlets of Circular Culverts on Horizontal and Mild Slopes (Simons, 1970)

## Plunge Pool Design HEC-14

### Culvert 2

|                 |        |       |                               |
|-----------------|--------|-------|-------------------------------|
| Q               | 333.88 | cfs   | Design flow for the culvert   |
| D               | 6      | ft    | Culvert diameter or span      |
| y <sub>o</sub>  | 3.84   | ft    | Outlet depth                  |
| A               | 19.11  | sq ft | Wetted culvert area           |
| V <sub>o</sub>  | 17.47  | ft/s  | Outlet velocity               |
| y <sub>e</sub>  | 3.09   | ft    | Equivalent brink outlet depth |
| Fr              | 1.57   | --    | Froude number                 |
| h <sub>s</sub>  | 3      | ft    | Plunge pool depth             |
| Co              | 1.4    | --    | Coefficient                   |
| D <sub>50</sub> | 1.35   | ft    | Median stone size             |
| D <sub>50</sub> | 16.3   | in    | Median stone size             |
| W <sub>o</sub>  | 6      | ft    | Riprap width at outlet        |
| L <sub>s</sub>  | 30     | ft    | Pool length                   |
| L <sub>a</sub>  | 15     | ft    | Apron Length                  |
| L <sub>b</sub>  | 45     | ft    | Basin length                  |
| W <sub>b</sub>  | 36     | ft    | Width at end of apron         |

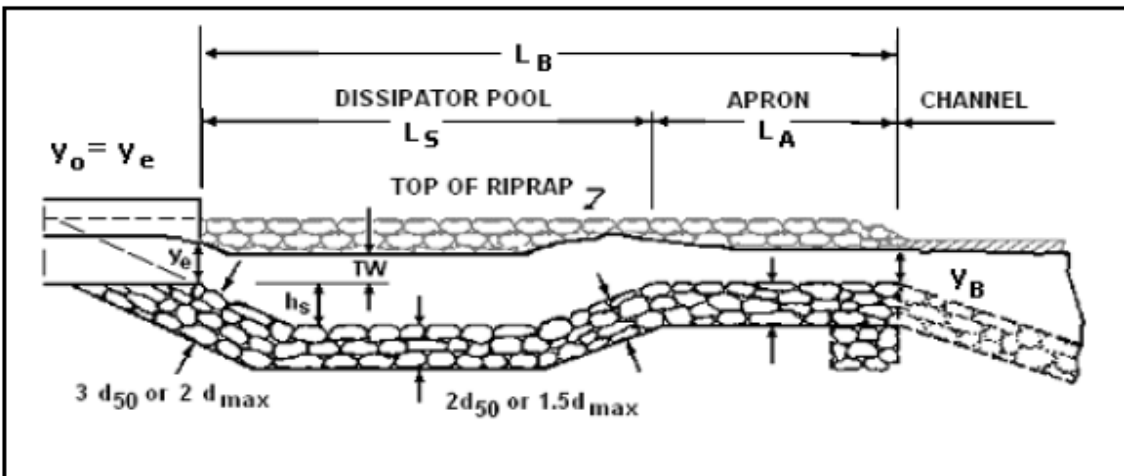


Figure 10.1. Profile of Riprap Basin

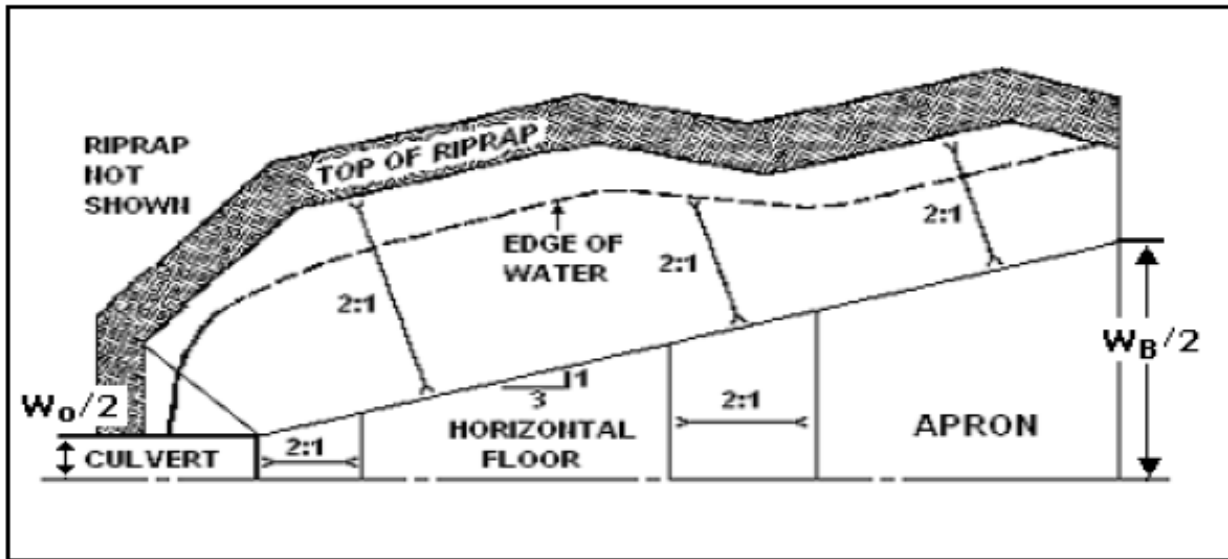


Figure 10.2. Half Plan of Riprap Basin

$$\frac{h_s}{y_e} = 0.86 \left( \frac{D_{50}}{y_e} \right)^{-0.55} \left( \frac{V_o}{\sqrt{gy_e}} \right) - C_o \quad (10.1)$$

where,

- $h_s$  = dissipator pool depth, m (ft)
- $y_e$  = equivalent brink (outlet) depth, m (ft)
- $D_{50}$  = median rock size by weight, m (ft)
- $C_o$  = tailwater parameter

The tailwater parameter,  $C_o$ , is defined as:

$$\begin{aligned} C_o &= 1.4 & TW/y_e < 0.75 \\ C_o &= 4.0(TW/y_e) - 1.6 & 0.75 < TW/y_e < 1.0 \\ C_o &= 2.4 & 1.0 < TW/y_e \end{aligned} \quad (10.2)$$

Table 5.1. Minimum and Maximum Allowable Particle Size in Inches.

| Nominal Riprap Class<br>by Median Particle<br>Diameter |       | $d_{15}$ |      | $d_{50}$ |      | $d_{85}$ |      | $d_{100}$ |
|--------------------------------------------------------|-------|----------|------|----------|------|----------|------|-----------|
| Class                                                  | Size  | Min      | Max  | Min      | Max  | Min      | Max  | Max       |
| I                                                      | 6 in  | 3.7      | 5.2  | 5.7      | 6.9  | 7.8      | 9.2  | 12.0      |
| II                                                     | 9 in  | 5.5      | 7.8  | 8.5      | 10.5 | 11.5     | 14.0 | 18.0      |
| III                                                    | 12 in | 7.3      | 10.5 | 11.5     | 14.0 | 15.5     | 18.5 | 24.0      |
| IV                                                     | 15 in | 9.2      | 13.0 | 14.5     | 17.5 | 19.5     | 23.0 | 30.0      |
| V                                                      | 18 in | 11.0     | 15.5 | 17.0     | 20.5 | 23.5     | 27.5 | 36.0      |
| VI                                                     | 21 in | 13.0     | 18.5 | 20.0     | 24.0 | 27.5     | 32.5 | 42.0      |
| VII                                                    | 24 in | 14.5     | 21.0 | 23.0     | 27.5 | 31.0     | 37.0 | 48.0      |
| VIII                                                   | 30 in | 18.5     | 26.0 | 28.5     | 34.5 | 39.0     | 46.0 | 60.0      |
| IX                                                     | 36 in | 22.0     | 31.5 | 34.0     | 41.5 | 47.0     | 55.5 | 72.0      |
| X                                                      | 42 in | 25.5     | 36.5 | 40.0     | 48.5 | 54.5     | 64.5 | 84.0      |

Note: Particle size  $d$  corresponds to the intermediate ("B") axis of the particle.

## Outlet Depth Calculation - Circular Culverts - HEC-14

### Culvert 2

|                 |        |     |                                       |
|-----------------|--------|-----|---------------------------------------|
| Q               | 333.88 | cfs | Design flow for the culvert           |
| D               | 6      | ft  | Culvert diameter or span              |
| $K_u Q/D^{2.5}$ | 3.79   | --  | Used in Figure 3.4                    |
| Tw              | 0      | ft  | Tailwater depth in downstream channel |
| Tw/D            | 0.00   | --  | Used in Figure 3.4                    |
| $y_o/D$         | 0.64   | --  | Obtained from Figure 3.4              |
| $y_o$           | 3.84   | ft  | Outlet depth                          |

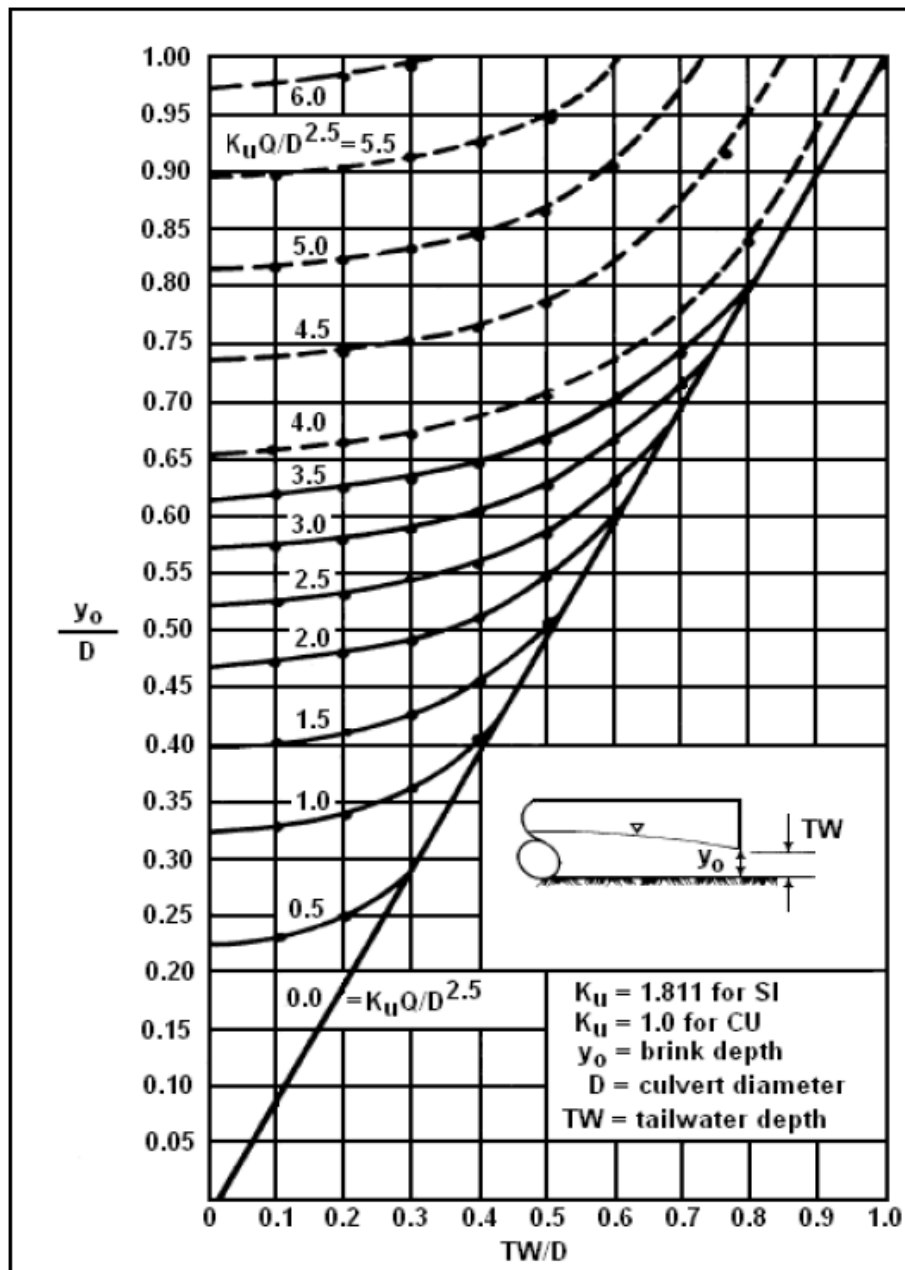


Figure 3.4. Dimensionless Rating Curves for the Outlets of Circular Culverts on Horizontal and Mild Slopes (Simons, 1970)

## Appendix H. Emergency Overflow Spillway Calculation

Project Description

File Name ..... Single Pipe\_02-12-2024.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .... YES

Analysis Options

Start Analysis On ..... 00:00:00      0:00:00  
End Analysis On ..... 00:00:00      0:00:00  
Start Reporting On ..... 00:00:00      0:00:00  
Antecedent Dry Days ..... 0      days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00      days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00      days hh:mm:ss  
Reporting Time Step ..... 0 00:03:00      days hh:mm:ss  
Routing Time Step ..... 30      seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins..... 5  
Nodes..... 11  
    *Junctions* ..... 6  
    *Outfalls* ..... 3  
    *Flow Diversions* ..... 0  
    *Inlets* ..... 0  
    *Storage Nodes* ..... 2  
Links..... 9  
    *Channels* ..... 2  
    *Pipes* ..... 5  
    *Pumps* ..... 0  
    *Orifices* ..... 1  
    *Weirs* ..... 1  
    *Outlets* ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State    | County  | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|----------|---------|-----------------------|-------------------------|-----------------------|
| 1  | 1yr24hr      | Time Series | 1-inch         | Cumulative    | inches     | Michigan | Calhoun | 1.00                  | 1.00                    | SCS Type II 24-hr     |
| 2  | 24hr100yr    | Time Series | 24hr100yr      | Cumulative    | inches     | Michigan | Calhoun | 100.00                | 5.60                    | SCS Type II 24-hr     |
| 3  | 24hr10yr     | Time Series | 24hr10yr       | Cumulative    | inches     | Michigan | Calhoun | 10.00                 | 3.60                    | SCS Type II 24-hr     |
| 4  | 24hr25yr     | Time Series | 24hr25yr       | Cumulative    | inches     | Michigan | Calhoun | 25.00                 | 4.30                    | SCS Type II 24-hr     |
| 5  | 24hr2yr      | Time Series | 24hy2yr        | Cumulative    | inches     | Michigan | Calhoun | 2.00                  | 2.57                    | SCS Type II 24-hr     |
| 6  | 24hr50yr     | Time Series | 24hr50yr       | Cumulative    | inches     | Michigan | Calhoun | 50.00                 | 4.91                    | SCS Type II 24-hr     |
| 7  | 24hr-5yr     | Time Series | 24hr-5yr       | Cumulative    | inches     | Michigan | Calhoun | 5.00                  | 3.38                    | SCS Type II 24-hr     |

Subbasin Summary

| SN Subbasin ID             | Area   | Peak Rate | Weighted Curve | Total Rainfall | Total Runoff | Total Runoff Volume | Peak Runoff | Time of Concentration |
|----------------------------|--------|-----------|----------------|----------------|--------------|---------------------|-------------|-----------------------|
|                            | (ac)   | Factor    | Number         | (in)           | (in)         | (ac-in)             | (cfs)       | (days hh:mm:ss)       |
| 1 Drainage_Area_1          | 761.76 | 484.00    | 91.00          | 5.60           | 4.57         | 3478.20             | 2785.54     | 0 00:33:17            |
| 2 Drainage_Area_1b_East    | 7.81   | 484.00    | 74.00          | 5.60           | 2.85         | 22.27               | 14.99       | 0 00:45:00            |
| 3 Drainage_Area_1b_West    | 17.73  | 484.00    | 74.00          | 5.60           | 2.85         | 50.55               | 34.04       | 0 00:45:00            |
| 4 Drainage_Area_2b         | 37.90  | 484.00    | 75.00          | 5.60           | 2.94         | 111.58              | 75.32       | 0 00:45:00            |
| 5 Sub_Infiltration_Basin_1 | 98.48  | 484.00    | 74.00          | 5.60           | 2.85         | 280.77              | 309.01      | 0 00:20:00            |



Node Summary

| SN | Element ID           | Element Type | Invert Elevation | Ground/Rim (Max) Elevation | Initial Water Elevation | Surcharge Elevation | Ponded Area | Peak Inflow | Max HGL Elevation Attained | Max Surcharge Depth Attained | Min Freeboard Attained | Time of Peak Flooding Occurrence | Total Flooded Volume | Total Time Flooded |
|----|----------------------|--------------|------------------|----------------------------|-------------------------|---------------------|-------------|-------------|----------------------------|------------------------------|------------------------|----------------------------------|----------------------|--------------------|
|    |                      |              | (ft)             | (ft)                       | (ft)                    | (ft)                | (ft²)       | (cfs)       | (ft)                       | (ft)                         | (ft)                   | (days hh:mm)                     | (ac-in)              | (min)              |
| 1  | 12'_DIA_MANHOLE      | Junction     | 886.40           | 895.75                     | 886.40                  | 895.75              | 0.00        | 454.51      | 895.75                     | 0.00                         | 0.00                   | 0 12:26                          | 181.32               | 233.00             |
| 2  | Ditch_Start_East     | Junction     | 899.00           | 902.00                     | 899.00                  | 902.00              | 0.00        | 14.99       | 899.34                     | 0.00                         | 4.66                   | 0 00:00                          | 0.00                 | 0.00               |
| 3  | Ditch_Start_West     | Junction     | 899.00           | 902.00                     | 899.00                  | 902.00              | 0.00        | 34.04       | 899.55                     | 0.00                         | 4.45                   | 0 00:00                          | 0.00                 | 0.00               |
| 4  | HW_36_East           | Junction     | 892.00           | 895.00                     | 892.00                  | 895.00              | 0.00        | 125.38      | 895.89                     | 0.00                         | 1.11                   | 0 00:00                          | 0.00                 | 0.00               |
| 5  | HW_36_West           | Junction     | 892.00           | 895.00                     | 892.00                  | 899.00              | 0.00        | 41.35       | 896.28                     | 0.00                         | 0.72                   | 0 00:00                          | 0.00                 | 0.00               |
| 6  | IB_1_OCS             | Junction     | 891.00           | 900.80                     | 891.00                  | 900.80              | 0.00        | 720.03      | 900.80                     | 0.00                         | 0.00                   | 0 12:42                          | 486.90               | 202.00             |
| 7  | Analysis_Point_1     | Outfall      | 884.00           |                            |                         |                     |             | 406.27      | 889.35                     |                              |                        |                                  |                      |                    |
| 8  | Analysis_Point_2     | Outfall      | 890.65           |                            |                         |                     |             | 72.88       | 892.85                     |                              |                        |                                  |                      |                    |
| 9  | Out-17               | Outfall      | 900.00           |                            |                         |                     |             | 329.30      | 900.00                     |                              |                        |                                  |                      |                    |
| 10 | Culvert_2_Inlet      | Storage Node | 892.00           | 900.00                     | 892.00                  |                     | 8168.00     | 75.24       | 894.84                     |                              |                        |                                  | 0.00                 | 0.00               |
| 11 | Infiltration_Basin_1 | Storage Node | 898.50           | 905.50                     | 904.00                  |                     | 1904021.00  | 3024.00     | 904.42                     |                              |                        |                                  | 0.00                 | 0.00               |

Link Summary

| SN Element<br>ID   | Element<br>Type | From<br>(Inlet)<br>Node | To (Outlet)<br>Node | Length | Inlet<br>Invert<br>Elevation | Outlet<br>Invert<br>Elevation | Average<br>Slope | Diameter or<br>Height | Manning's<br>Roughness | Peak<br>Flow | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time Reported<br>Surcharged | Reported<br>Condition |
|--------------------|-----------------|-------------------------|---------------------|--------|------------------------------|-------------------------------|------------------|-----------------------|------------------------|--------------|-------------------------|------------------------------------|-----------------------|--------------------|---------------------------------------------|-----------------------------------|-----------------------|
|                    |                 |                         |                     | (ft)   | (ft)                         | (ft)                          | (%)              | (in)                  |                        | (cfs)        | (cfs)                   |                                    | (ft/sec)              | (ft)               |                                             | (min)                             |                       |
| 1 36_East          | Pipe            | HW_36_East              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 125.38       | 126.55                  | 0.99                               | 31.28                 | 3.00               | 1.00                                        | 270.00                            | SURCHARGED            |
| 2 36_West          | Pipe            | HW_36_West              | 12'_DIA_MANHOLE     | 53.00  | 892.00                       | 889.46                        | 4.7900           | 36.000                | 0.0150                 | 105.84       | 126.55                  | 0.84                               | 14.97                 | 3.00               | 1.00                                        | 272.00                            | SURCHARGED            |
| 3 Culvert_1_CMP_72 | Pipe            | 12'_DIA_MANHOLE         | Analysis_Point_1    | 117.00 | 886.40                       | 884.00                        | 2.0500           | 72.000                | 0.0260                 | 406.27       | 303.28                  | 1.34                               | 14.79                 | 5.58               | 0.93                                        | 0.00                              | > CAPACITY            |
| 4 Culvert_1_RCP_72 | Pipe            | IB_1_OCS                | 12'_DIA_MANHOLE     | 201.00 | 891.00                       | 886.40                        | 2.2900           | 72.000                | 0.0130                 | 426.91       | 640.68                  | 0.67                               | 15.10                 | 6.00               | 1.00                                        | 304.00                            | SURCHARGED            |
| 5 Culvert_2        | Pipe            | Culvert_2_Inlet         | Analysis_Point_2    | 111.00 | 892.25                       | 890.65                        | 1.4400           | 72.000                | 0.0260                 | 72.88        | 254.23                  | 0.29                               | 6.92                  | 2.39               | 0.40                                        | 0.00                              | Calculated            |
| 6 Ditch_East       | Channel         | Ditch_Start_East        | HW_36_East          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 14.97        | 2363.82                 | 0.01                               | 1.56                  | 2.10               | 0.42                                        | 0.00                              |                       |
| 7 Ditch_West       | Channel         | Ditch_Start_West        | HW_36_West          | 300.00 | 899.00                       | 892.00                        | 2.3300           | 60.000                | 0.0320                 | 34.00        | 2363.82                 | 0.01                               | 2.25                  | 2.41               | 0.53                                        | 0.00                              |                       |
| 8 OCS_Weir         | Orifice         | Infiltration_Basin_1    | IB_1_OCS            |        | 898.50                       | 891.00                        |                  | 120.000               |                        | 720.03       |                         |                                    |                       |                    |                                             |                                   |                       |
| 9 IB_1_Spillway    | Weir            | Infiltration_Basin_1    | Out-17              |        | 898.50                       | 900.00                        |                  |                       |                        | 329.30       |                         |                                    |                       |                    |                                             |                                   |                       |

Subbasin Hydrology

Subbasin : Drainage\_Area\_1

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 761.76    |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 91        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| Urban industrial, 72% imp    | 761.76  | C     | 91     |
| Composite Area & Weighted CN | 761.76  |       | 91     |

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$

Where :

- Tc = Time of Concentration (hr)
- n = Manning's roughness
- Lf = Flow Length (ft)
- P = 2 yr, 24 hr Rainfall (inches)
- Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

- V = 16.1345 \* (Sf^0.5) (unpaved surface)
- V = 20.3282 \* (Sf^0.5) (paved surface)
- V = 15.0 \* (Sf^0.5) (grassed waterway surface)
- V = 10.0 \* (Sf^0.5) (nearly bare & untilled surface)
- V = 9.0 \* (Sf^0.5) (cultivated straight rows surface)
- V = 7.0 \* (Sf^0.5) (short grass pasture surface)
- V = 5.0 \* (Sf^0.5) (woodland surface)
- V = 2.5 \* (Sf^0.5) (forest w/heavy litter surface)
- Tc = (Lf / V) / (3600 sec/hr)

Where:

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3})) * (S_f^{0.5}) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

- Tc = Time of Concentration (hr)
- Lf = Flow Length (ft)
- R = Hydraulic Radius (ft)
- Aq = Flow Area (ft²)
- Wp = Wetted Perimeter (ft)
- V = Velocity (ft/sec)
- Sf = Slope (ft/ft)
- n = Manning's roughness

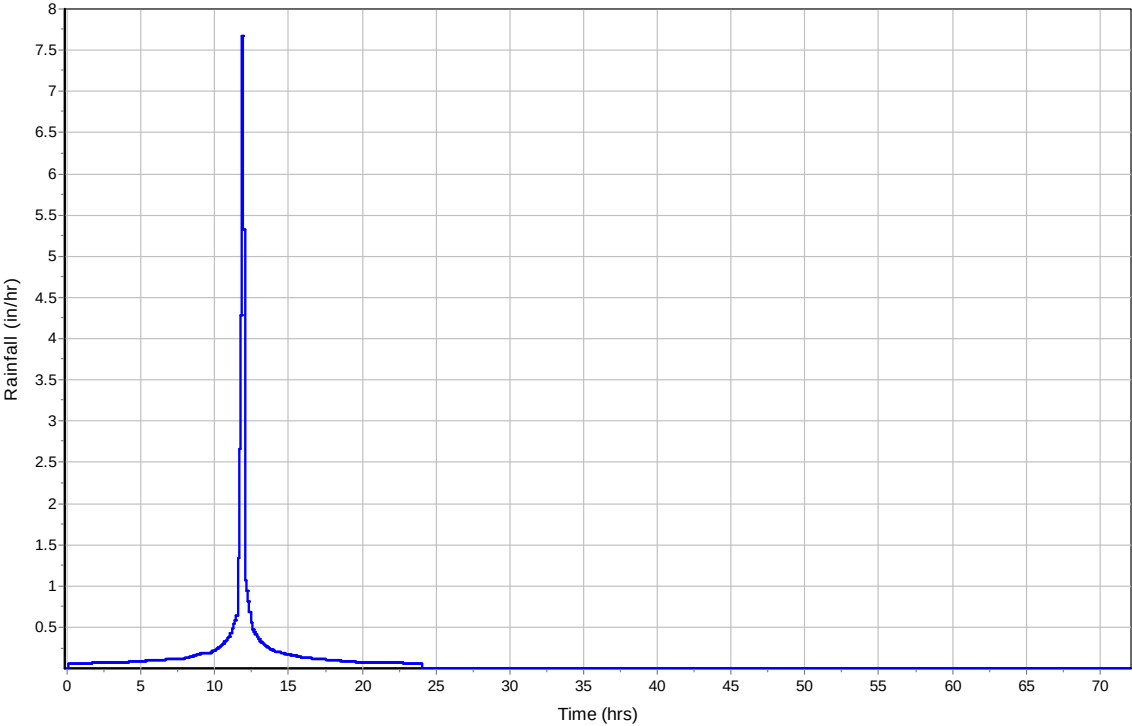
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
|----------------------------------------|--------------|--------------|--------------|
| Sheet Flow Computations                |              |              |              |
| Manning's Roughness :                  | 0.15         | 0.011        | 0            |
| Flow Length (ft) :                     | 150          | 150          | 0            |
| Slope (%) :                            | 0.5          | 0.5          | 0            |
| 2 yr, 24 hr Rainfall (in) :            | 2.53         | 2.53         | 0            |
| Velocity (ft/sec) :                    | 0.09         | 0.76         | 0            |
| Computed Flow Time (min) :             | 26.54        | 3.28         | 0            |
|                                        |              |              |              |
|                                        | Subarea<br>A | Subarea<br>B | Subarea<br>C |
| Shallow Concentrated Flow Computations |              |              |              |
| Flow Length (ft) :                     | 300          | 0            | 0            |
| Slope (%) :                            | 0.5          | 0            | 0            |
| Surface Type :                         | Paved        | Unpaved      | Unpaved      |
| Velocity (ft/sec) :                    | 1.44         | 0            | 0            |
| Computed Flow Time (min) :             | 3.47         | 0            | 0            |
| Total TOC (min) .....                  | 33.29        |              |              |

### Subbasin Runoff Results

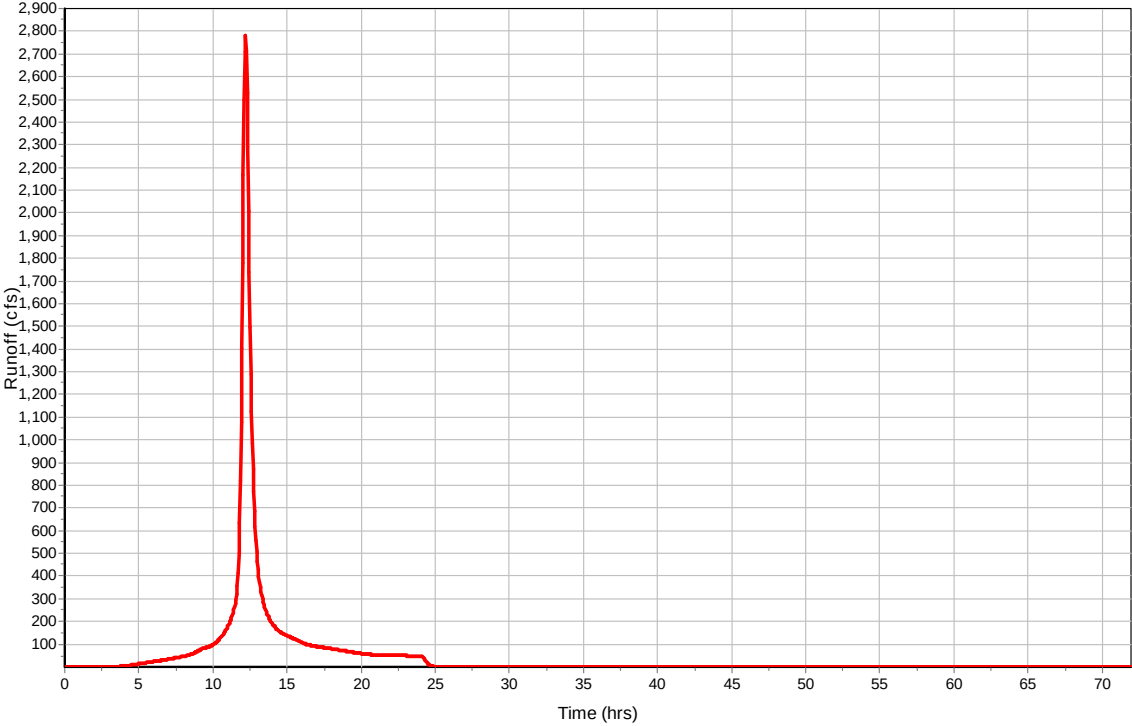
|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 5.6        |
| Total Runoff (in) .....                     | 4.57       |
| Peak Runoff (cfs) .....                     | 2785.54    |
| Weighted Curve Number .....                 | 91         |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:33:17 |

Subbasin : Drainage\_Area\_1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_East

Input Data

Area (ac) ..... 7.81  
Peak Rate Factor ..... 484  
Weighted Curve Number ..... 74  
Rain Gage ID ..... 24hr100yr

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 7.81    | C     | 74     |
| Composite Area & Weighted CN | 7.81    |       | 74     |

Time of Concentration

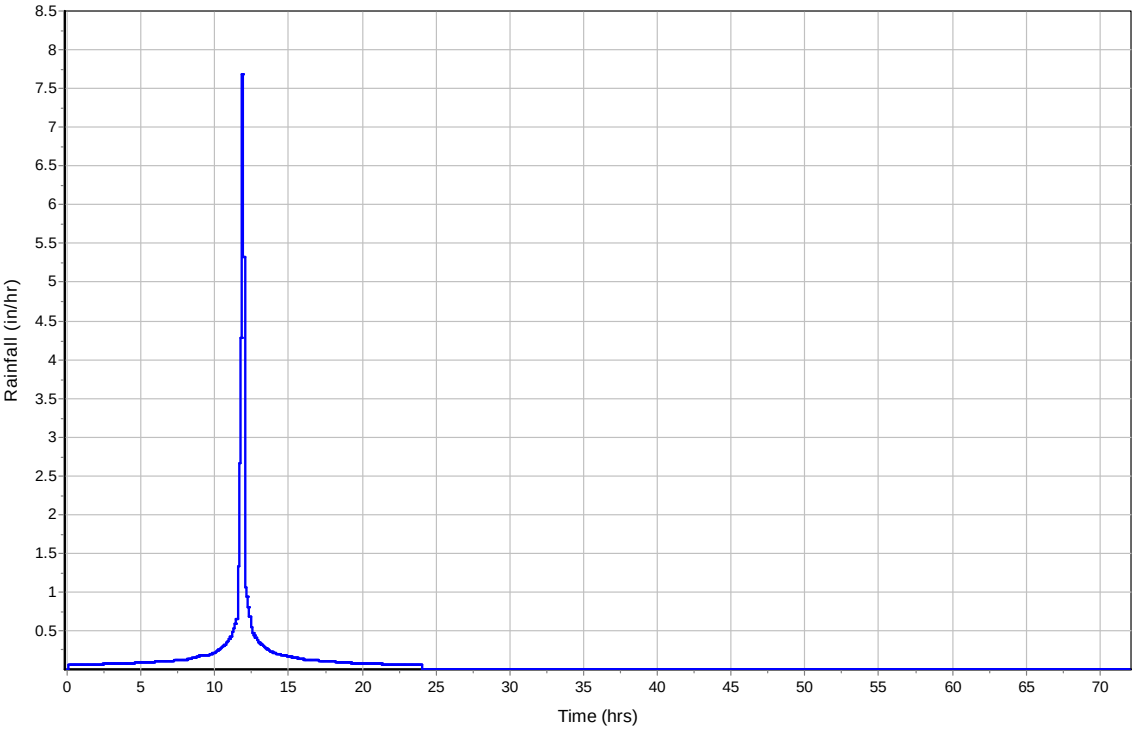
User-Defined TOC override (minutes): 45

Subbasin Runoff Results

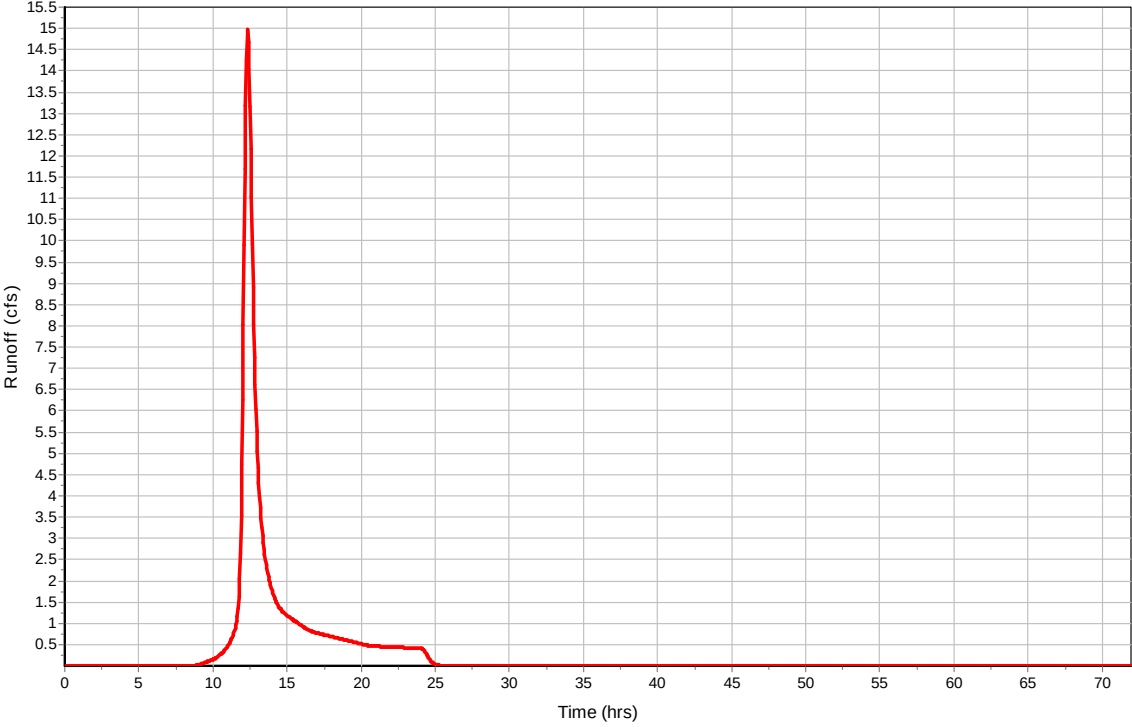
Total Rainfall (in) ..... 5.6  
Total Runoff (in) ..... 2.85  
Peak Runoff (cfs) ..... 14.99  
Weighted Curve Number ..... 74  
Time of Concentration (days hh:mm:ss) ..... 0 00:45:00

Subbasin : Drainage\_Area\_1b\_East

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_1b\_West

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 17.73     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 74        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 17.73   | C     | 74     |
| Composite Area & Weighted CN | 17.73   |       | 74     |

Time of Concentration

User-Defined TOC override (minutes): 45.00

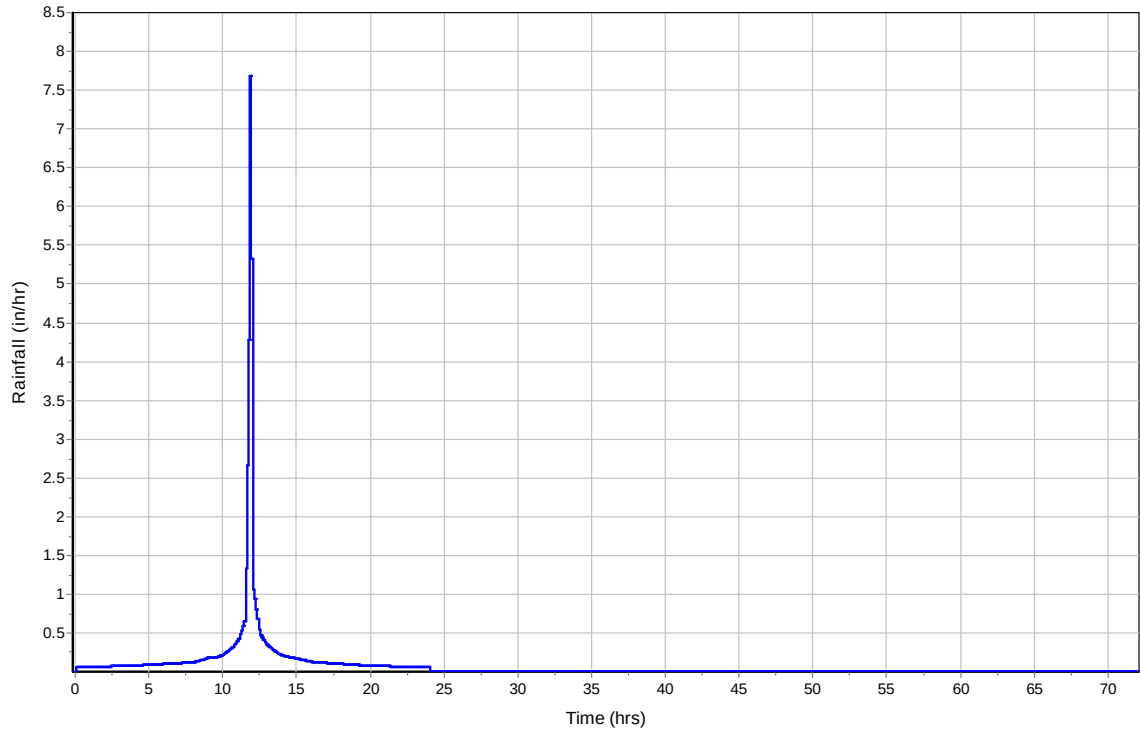
Subbasin Runoff Results

|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.85       |
| Peak Runoff (cfs)                     | 34.04      |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

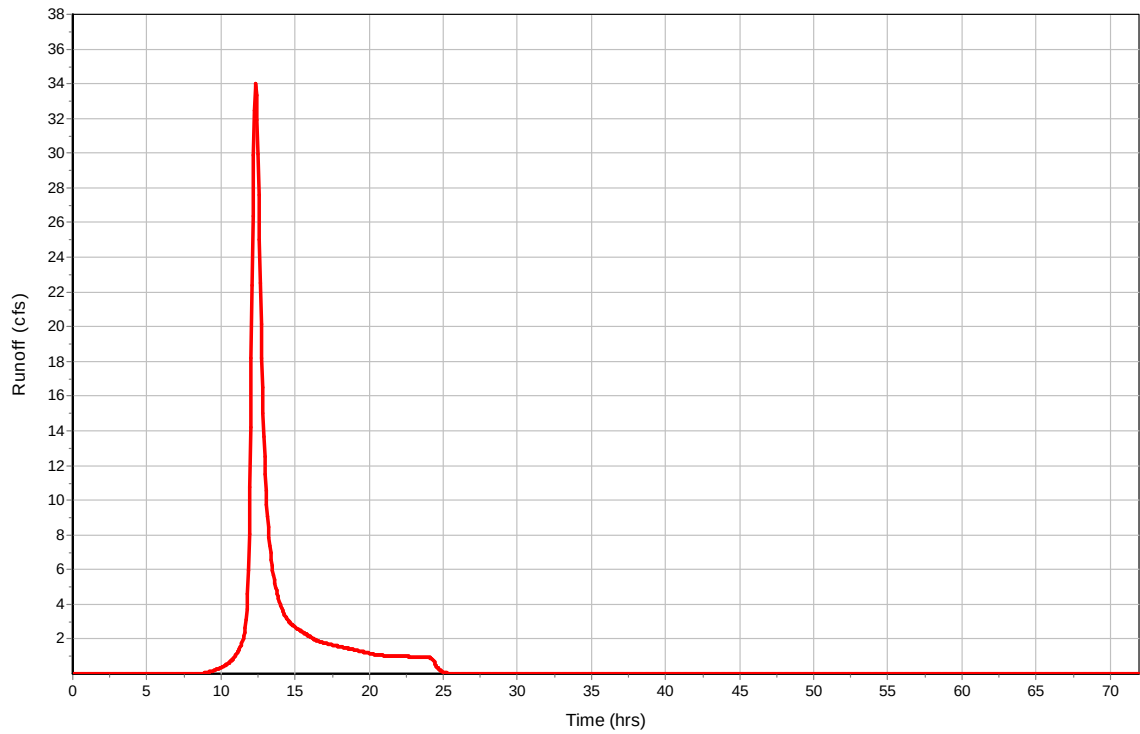


Subbasin : Drainage\_Area\_1b\_West

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Drainage\_Area\_2b

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 37.9      |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 75        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| -                            | 12.47   | -     | 75     |
| Composite Area & Weighted CN | 12.47   |       | 75     |

Time of Concentration

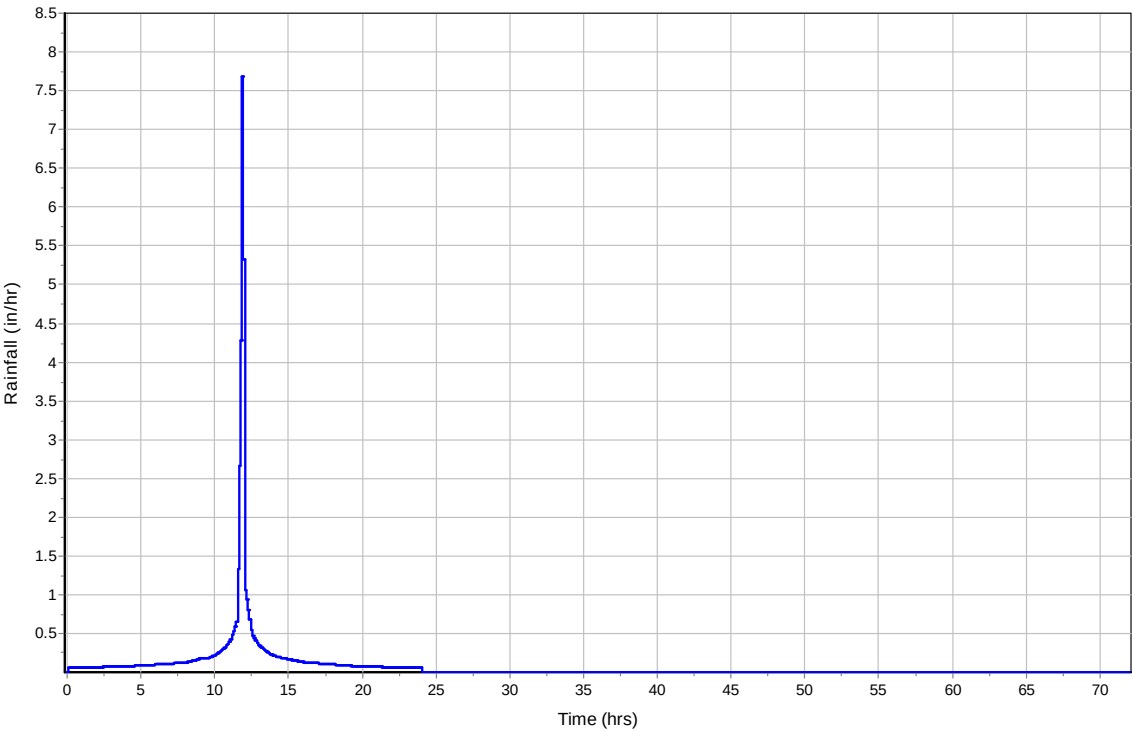
User-Defined TOC override (minutes): 45.00

Subbasin Runoff Results

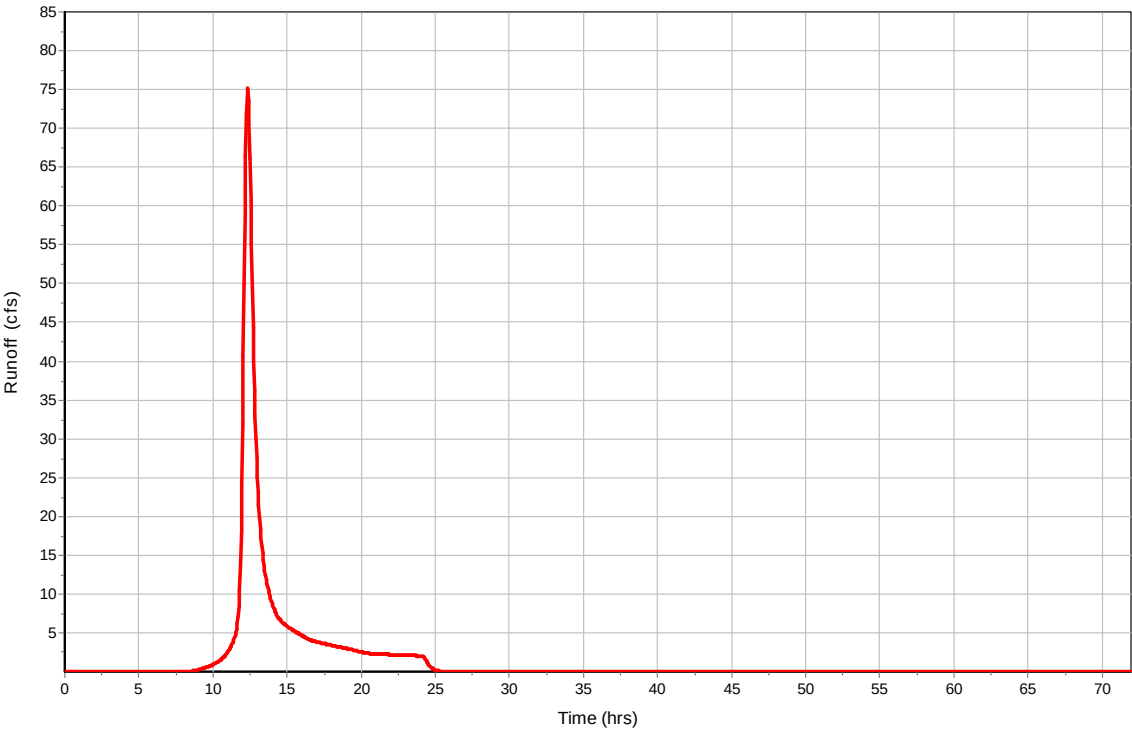
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.94       |
| Peak Runoff (cfs)                     | 75.32      |
| Weighted Curve Number                 | 75         |
| Time of Concentration (days hh:mm:ss) | 0 00:45:00 |

Subbasin : Drainage\_Area\_2b

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub\_Infiltration\_Basin\_1

Input Data

|                       |           |
|-----------------------|-----------|
| Area (ac)             | 98.48     |
| Peak Rate Factor      | 484       |
| Weighted Curve Number | 74        |
| Rain Gage ID          | 24hr100yr |

Composite Curve Number

|                              |         |       |        |
|------------------------------|---------|-------|--------|
| 32                           | Area    | Soil  | Curve  |
| Soil/Surface Description     | (acres) | Group | Number |
| > 75% grass cover, Good      | 98.48   | C     | 74     |
| Composite Area & Weighted CN | 98.48   |       | 74     |

Time of Concentration

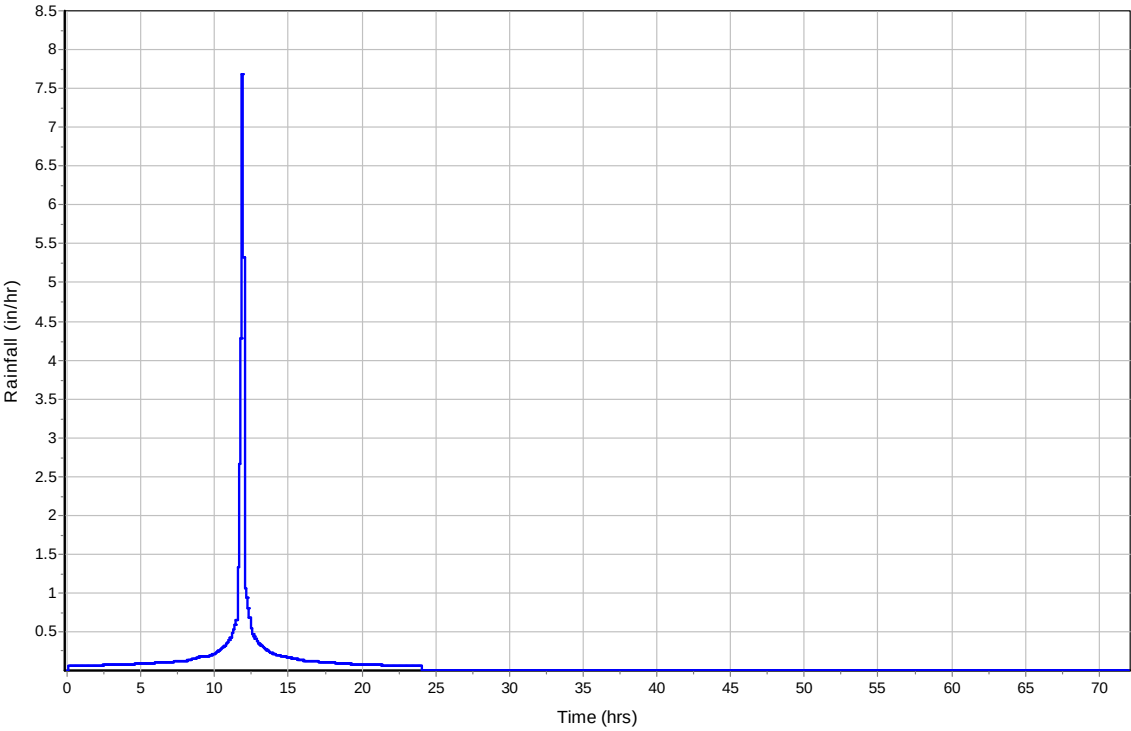
User-Defined TOC override (minutes): 20.00

Subbasin Runoff Results

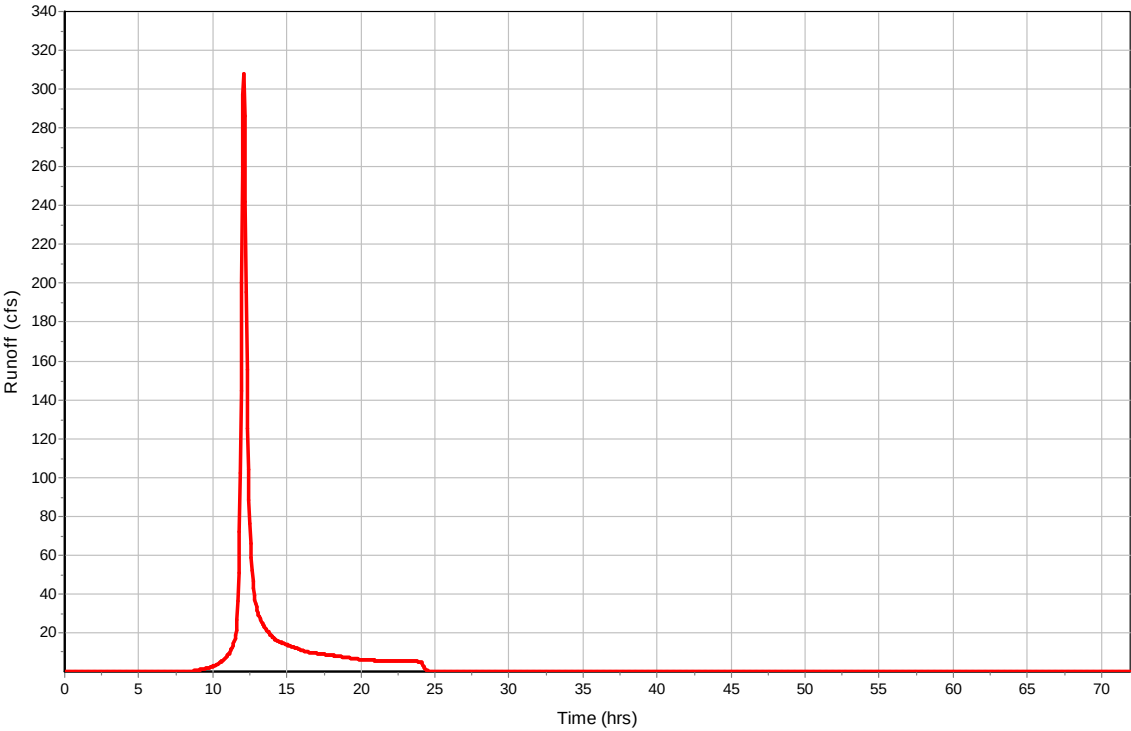
|                                       |            |
|---------------------------------------|------------|
| Total Rainfall (in)                   | 5.6        |
| Total Runoff (in)                     | 2.85       |
| Peak Runoff (cfs)                     | 309.01     |
| Weighted Curve Number                 | 74         |
| Time of Concentration (days hh:mm:ss) | 0 00:20:00 |

Subbasin : Sub\_Infiltration\_Basin\_1

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

| SN | Element<br>ID    | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Ground/Rim<br>(Max)<br>Offset | Initial<br>Water<br>Elevation | Initial<br>Water<br>Depth | Surcharge<br>Elevation | Surcharge<br>Depth | Ponded<br>Area | Minimum<br>Pipe<br>Cover |
|----|------------------|---------------------|----------------------------------|-------------------------------|-------------------------------|---------------------------|------------------------|--------------------|----------------|--------------------------|
|    |                  | (ft)                | (ft)                             | (ft)                          | (ft)                          | (ft)                      | (ft)                   | (ft)               | (ft²)          | (in)                     |
| 1  | 12" DIA MANHOLE  | 886.40              | 895.75                           | 9.35                          | 886.40                        | 0.00                      | 895.75                 | 0.00               | 0.00           | 0.00                     |
| 2  | Ditch_Start_East | 899.00              | 902.00                           | 3.00                          | 899.00                        | 0.00                      | 902.00                 | 0.00               | 0.00           | 0.00                     |
| 3  | Ditch_Start_West | 899.00              | 902.00                           | 3.00                          | 899.00                        | 0.00                      | 902.00                 | 0.00               | 0.00           | 0.00                     |
| 4  | HW_36_East       | 892.00              | 895.00                           | 3.00                          | 892.00                        | 0.00                      | 895.00                 | 0.00               | 0.00           | 0.00                     |
| 5  | HW_36_West       | 892.00              | 895.00                           | 3.00                          | 892.00                        | 0.00                      | 899.00                 | 4.00               | 0.00           | 0.00                     |
| 6  | IB_1_OCS         | 891.00              | 900.80                           | 9.80                          | 891.00                        | 0.00                      | 900.80                 | 0.00               | 0.00           | 0.00                     |

Junction Results

| SN Element<br>ID   | Peak<br>Inflow | Peak<br>Lateral<br>Inflow | Max HGL<br>Elevation<br>Attained | Max HGL<br>Depth<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Average HGL<br>Elevation<br>Attained | Average HGL<br>Depth<br>Attained | Time of<br>Max HGL<br>Occurrence | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|--------------------|----------------|---------------------------|----------------------------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------------------------------|----------------------------------|-------------------------------------------|----------------------------|-----------------------|
|                    | (cfs)          | (cfs)                     | (ft)                             | (ft)                         | (ft)                                  | (ft)                         | (ft)                                 | (ft)                             | (days hh:mm)                     | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1 12" DIA MANHOLE  | 454.51         | 0.00                      | 895.75                           | 9.35                         | 0.00                                  | 0.00                         | 888.30                               | 1.90                             | 0 00:05                          | 0 12:26                                   | 181.32                     | 233.00                |
| 2 Ditch_Start_East | 14.99          | 14.99                     | 899.34                           | 0.34                         | 0.00                                  | 4.66                         | 899.02                               | 0.02                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 3 Ditch_Start_West | 34.04          | 34.04                     | 899.55                           | 0.55                         | 0.00                                  | 4.45                         | 899.03                               | 0.03                             | 0 12:24                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 4 HW_36_East       | 125.38         | 0.00                      | 895.89                           | 3.89                         | 0.00                                  | 1.11                         | 892.30                               | 0.30                             | 0 12:16                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 5 HW_36_West       | 41.35          | 0.00                      | 896.28                           | 4.28                         | 0.00                                  | 0.72                         | 892.31                               | 0.31                             | 0 12:26                          | 0 00:00                                   | 0.00                       | 0.00                  |
| 6 IB_1_OCS         | 720.03         | 0.00                      | 900.80                           | 9.80                         | 0.00                                  | 0.00                         | 892.38                               | 1.38                             | 0 00:00                          | 0 12:42                                   | 486.90                     | 202.00                |

Channel Input

| SN | Element ID | Length | Inlet Invert Elevation | Inlet Invert Offset | Outlet Invert Elevation | Outlet Invert Offset | Total Drop | Average Slope | Shape       | Height | Width  | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------|--------|------------------------|---------------------|-------------------------|----------------------|------------|---------------|-------------|--------|--------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |            | (ft)   | (ft)                   | (ft)                | (ft)                    | (ft)                 | (ft)       | (%)           |             | (ft)   | (ft)   |                     |                 |                  |                   | (cfs)        |           |
| 1  | Ditch_East | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | Ditch_West | 300.00 | 899.00                 | 0.00                | 892.00                  | 0.00                 | 7.00       | 2.3300        | Trapezoidal | 5.000  | 52.000 | 0.0320              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |



Channel Results

| SN | Element ID | Peak Flow | Time of Peak Flow Occurrence | Design Flow Capacity | Peak Flow/ Design Flow Ratio | Peak Flow Velocity | Travel Time | Peak Flow Depth | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged | Froude Number | Reported Condition |
|----|------------|-----------|------------------------------|----------------------|------------------------------|--------------------|-------------|-----------------|------------------------------------|-----------------------|---------------|--------------------|
|    |            | (cfs)     | (days hh:mm)                 | (cfs)                |                              | (ft/sec)           | (min)       | (ft)            |                                    | (min)                 |               |                    |
| 1  | Ditch_East | 14.97     | 0 12:24                      | 2363.82              | 0.01                         | 1.56               | 3.21        | 2.10            | 0.42                               | 0.00                  |               |                    |
| 2  | Ditch_West | 34.00     | 0 12:24                      | 2363.82              | 0.01                         | 2.25               | 2.22        | 2.41            | 0.53                               | 0.00                  |               |                    |

Pipe Input

| SN | Element ID       | Length | Inlet Invert | Inlet Invert Offset | Outlet Invert | Outlet Invert Offset | Total Drop | Average Slope | Pipe Shape | Pipe Diameter or Height | Pipe Width | Manning's Roughness | Entrance Losses | Exit/Bend Losses | Additional Losses | Initial Flow | Flap Gate |
|----|------------------|--------|--------------|---------------------|---------------|----------------------|------------|---------------|------------|-------------------------|------------|---------------------|-----------------|------------------|-------------------|--------------|-----------|
|    |                  | (ft)   | (ft)         | (ft)                | (ft)          | (ft)                 | (ft)       | (%)           |            | (in)                    | (in)       |                     |                 |                  |                   | (cfs)        |           |
| 1  | 36_East          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 2  | 36_West          | 53.00  | 892.00       | 0.00                | 889.46        | 3.06                 | 2.54       | 4.7900        | CIRCULAR   | 36.000                  | 36.000     | 0.0150              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 3  | Culvert_1_CMP_72 | 117.00 | 886.40       | 0.00                | 884.00        | 0.00                 | 2.40       | 2.0500        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 4  | Culvert_1_RCP_72 | 201.00 | 891.00       | 0.00                | 886.40        | 0.00                 | 4.60       | 2.2900        | CIRCULAR   | 72.000                  | 72.000     | 0.0130              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |
| 5  | Culvert_2        | 111.00 | 892.25       | 0.25                | 890.65        | 0.00                 | 1.60       | 1.4400        | CIRCULAR   | 72.000                  | 72.000     | 0.0260              | 0.5000          | 0.5000           | 0.0000            | 0.00         | No        |

No. of  
Barrels

|   |
|---|
| 1 |
| 1 |
| 1 |
| 1 |
| 1 |

Pipe Results

| SN Element<br>ID   | Peak<br>Flow | Time of<br>Peak Flow<br>Occurrence | Design Flow<br>Capacity | Peak Flow/<br>Design Flow<br>Ratio | Peak Flow<br>Velocity | Travel<br>Time | Peak Flow<br>Depth | Peak Flow<br>Depth/<br>Total Depth<br>Ratio | Total Time<br>Surcharged | Froude Number | Reported<br>Condition |
|--------------------|--------------|------------------------------------|-------------------------|------------------------------------|-----------------------|----------------|--------------------|---------------------------------------------|--------------------------|---------------|-----------------------|
|                    | (cfs)        | (days hh:mm)                       | (cfs)                   |                                    | (ft/sec)              | (min)          | (ft)               |                                             | (min)                    |               |                       |
| 1 36_East          | 125.38       | 0 00:00                            | 126.55                  | 0.99                               | 31.28                 | 0.03           | 3.00               | 1.00                                        | 270.00                   |               | SURCHARGED            |
| 2 36_West          | 105.84       | 0 00:00                            | 126.55                  | 0.84                               | 14.97                 | 0.06           | 3.00               | 1.00                                        | 272.00                   |               | SURCHARGED            |
| 3 Culvert_1_CMP_72 | 406.27       | 0 00:00                            | 303.28                  | 1.34                               | 14.79                 | 0.13           | 5.58               | 0.93                                        | 0.00                     |               | > CAPACITY            |
| 4 Culvert_1_RCP_72 | 426.91       | 0 00:02                            | 640.68                  | 0.67                               | 15.10                 | 0.22           | 6.00               | 1.00                                        | 304.00                   |               | SURCHARGED            |
| 5 Culvert_2        | 72.88        | 0 12:27                            | 254.23                  | 0.29                               | 6.92                  | 0.27           | 2.39               | 0.40                                        | 0.00                     |               | Calculated            |

Storage Nodes

Storage Node : Culvert\_2\_Inlet

Input Data

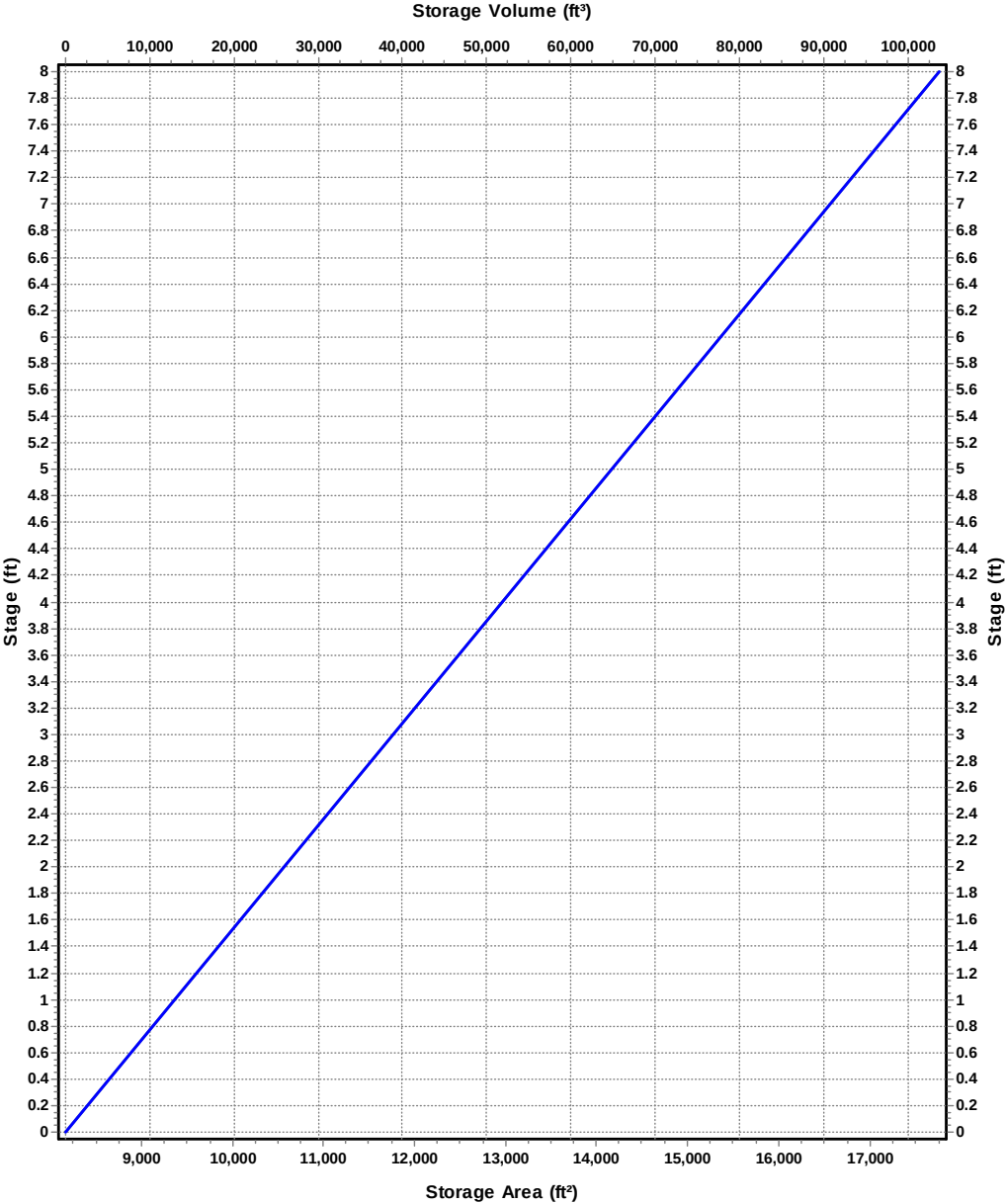
|                                    |         |
|------------------------------------|---------|
| Invert Elevation (ft) .....        | 892.00  |
| Max (Rim) Elevation (ft) .....     | 900.00  |
| Max (Rim) Offset (ft) .....        | 8.00    |
| Initial Water Elevation (ft) ..... | 892.00  |
| Initial Water Depth (ft) .....     | 0.00    |
| Ponded Area (ft²) .....            | 8168.00 |
| Evaporation Loss .....             | 0.00    |

Storage Area Volume Curves

Storage Curve : Offsite\_2

| Stage | Storage | Storage |
|-------|---------|---------|
| (ft)  | Area    | Volume  |
|       | (ft²)   | (ft³)   |
| 0     | 8168    | 0       |
| 8     | 17763   | 103724  |

Storage Area Volume Curves



## Storage Node : Culvert\_2\_Inlet (continued)

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 75.24   |
| Peak Lateral Inflow (cfs) .....               | 75.24   |
| Peak Outflow (cfs) .....                      | 72.88   |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 894.84  |
| Max HGL Depth Attained (ft) .....             | 2.84    |
| Average HGL Elevation Attained (ft) .....     | 892.36  |
| Average HGL Depth Attained (ft) .....         | 0.36    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:27 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

Storage Node : Infiltration\_Basin\_1

Input Data

|                              |            |
|------------------------------|------------|
| Invert Elevation (ft)        | 898.50     |
| Max (Rim) Elevation (ft)     | 905.50     |
| Max (Rim) Offset (ft)        | 7.00       |
| Initial Water Elevation (ft) | 904.00     |
| Initial Water Depth (ft)     | 5.50       |
| Ponded Area (ft²)            | 1904021.00 |
| Evaporation Loss             | 0.00       |

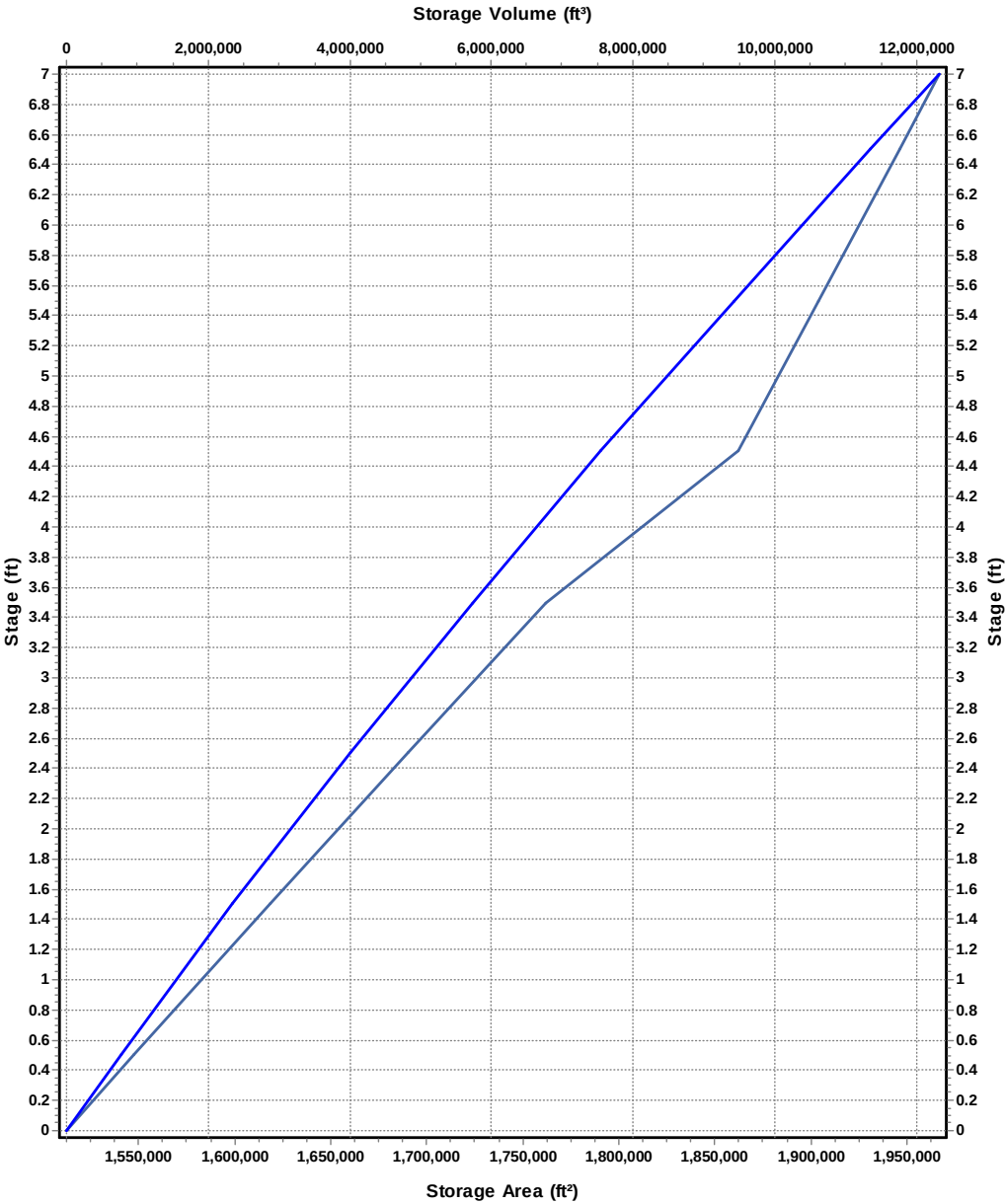
Storage Area Volume Curves

Storage Curve : SME Pond

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 1512370      | 0              |
| 0.5   | 1547431      | 764950.25      |
| 1.5   | 1618709      | 2348020.25     |
| 2.5   | 1690091      | 4002420.25     |
| 3.5   | 1761575      | 5728253.25     |
| 4.5   | 1862035      | 7540058.25     |
| 5.5   | 1904021      | 9423086.25     |
| 6.5   | 1946087      | 11348140.25    |
| 7     | 1966758      | 12326351.5     |



Storage Area Volume Curves



## Storage Node : Infiltration\_Basin\_1 (continued)

### Outflow Weirs

| SN | Element<br>ID | Weir<br>Type | Flap<br>Gate | Crest<br>Elevation<br>(ft) | Crest<br>Offset<br>(ft) | Length<br>(ft) | Weir Total<br>Height<br>(ft) | Discharge<br>Coefficient |
|----|---------------|--------------|--------------|----------------------------|-------------------------|----------------|------------------------------|--------------------------|
| 1  | IB_1_Spillway | Trapezoidal  | No           | 904.00                     | 5.50                    | 350.00         | 1.50                         | 3.40                     |

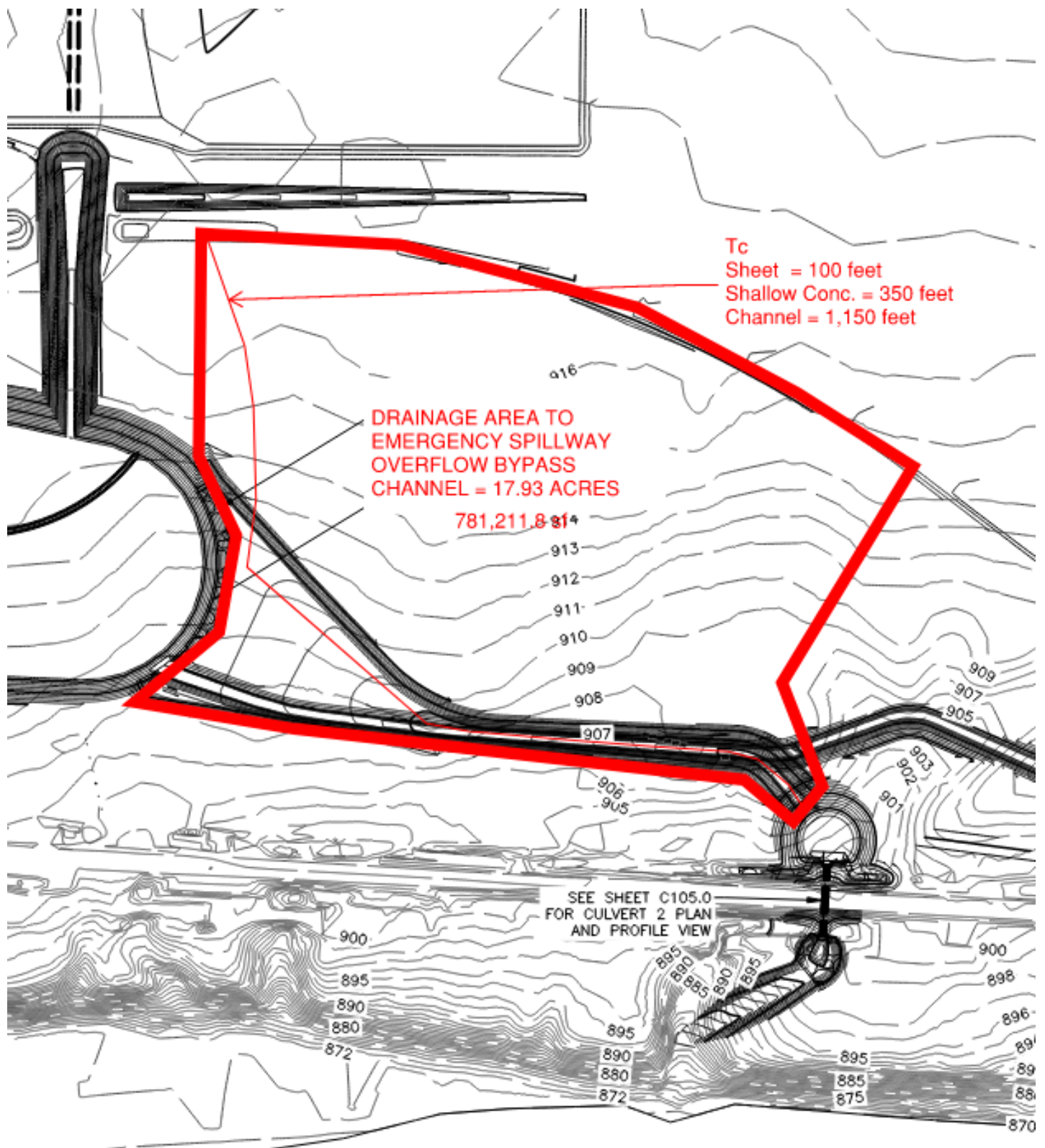
### Outflow Orifices

| SN | Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|----|---------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1  | OCS_Weir      | Bottom          | CIRCULAR         | No           | 120.00                                  |                                          |                                         | 900.80                                 | 0.61                   |

### Output Summary Results

|                                               |         |
|-----------------------------------------------|---------|
| Peak Inflow (cfs) .....                       | 3024    |
| Peak Lateral Inflow (cfs) .....               | 3024    |
| Peak Outflow (cfs) .....                      | 1049.34 |
| Peak Exfiltration Flow Rate (cfm) .....       | 0       |
| Max HGL Elevation Attained (ft) .....         | 904.42  |
| Max HGL Depth Attained (ft) .....             | 5.92    |
| Average HGL Elevation Attained (ft) .....     | 901.38  |
| Average HGL Depth Attained (ft) .....         | 2.88    |
| Time of Max HGL Occurrence (days hh:mm) ..... | 0 12:42 |
| Total Exfiltration Volume (1000-ft³) .....    | 0       |
| Total Flooded Volume (ac-in) .....            | 0       |
| Total Time Flooded (min) .....                | 0       |
| Total Retention Time (sec) .....              | 0       |

## Bypass Channel Erosion Calculation



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

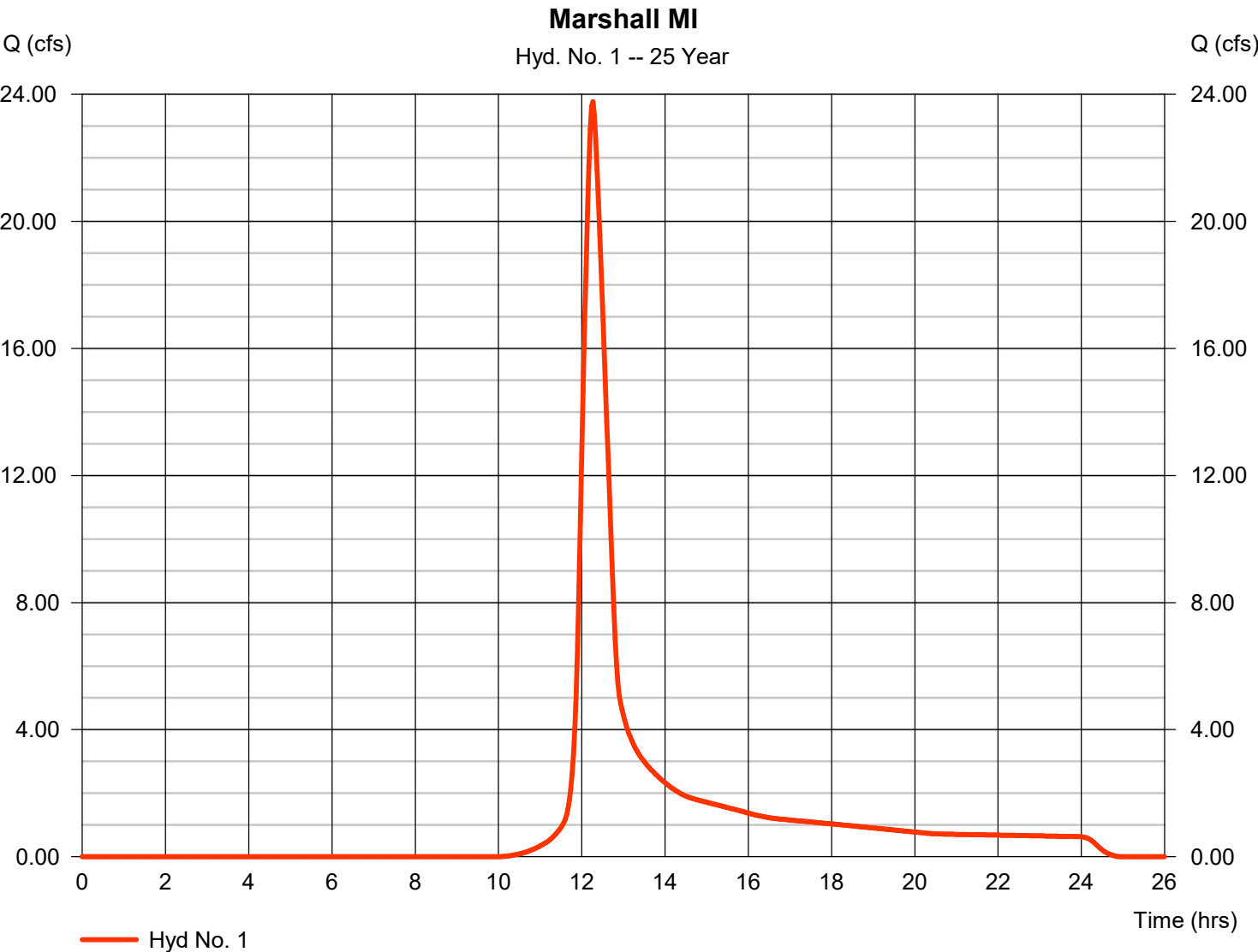
| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft)     | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|----------|--------------------------|-----------------|---------------------|--------------------|------------------------|---------------|------------------------|-------------------------|------------------------|
| 1        | SCS Runoff               | 23.78           | 2                   | 736                | 110,935                | -----         | -----                  | -----                   | Marshall MI            |
| New.gpw  |                          |                 |                     |                    | Return Period: 25 Year |               |                        | Tuesday, 10 / 24 / 2023 |                        |

# Hydrograph Report

## Hyd. No. 1

Marshall MI

|                 |   |            |                    |   |              |
|-----------------|---|------------|--------------------|---|--------------|
| Hydrograph type | = | SCS Runoff | Peak discharge     | = | 23.78 cfs    |
| Storm frequency | = | 25 yrs     | Time to peak       | = | 12.27 hrs    |
| Time interval   | = | 2 min      | Hyd. volume        | = | 110,935 cuft |
| Drainage area   | = | 17.930 ac  | Curve number       | = | 73           |
| Basin Slope     | = | 0.0 %      | Hydraulic length   | = | 0 ft         |
| Tc method       | = | TR55       | Time of conc. (Tc) | = | 33.90 min    |
| Total precip.   | = | 4.27 in    | Distribution       | = | Type II      |
| Storm duration  | = | 24 hrs     | Shape factor       | = | 484          |



# TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

## Hyd. No. 1

Marshall MI

| <u>Description</u>                 | <u>A</u>       | <u>B</u> | <u>C</u>    | <u>Totals</u>    |
|------------------------------------|----------------|----------|-------------|------------------|
| <b>Sheet Flow</b>                  |                |          |             |                  |
| Manning's n-value                  | = 0.240        | 0.011    | 0.011       |                  |
| Flow length (ft)                   | = 100.0        | 0.0      | 0.0         |                  |
| Two-year 24-hr precip. (in)        | = 2.53         | 0.00     | 0.00        |                  |
| Land slope (%)                     | = 0.50         | 0.00     | 0.00        |                  |
| <b>Travel Time (min)</b>           | <b>= 27.94</b> | <b>+</b> | <b>0.00</b> | <b>+</b>         |
|                                    |                |          | <b>0.00</b> | <b>= 27.94</b>   |
| <b>Shallow Concentrated Flow</b>   |                |          |             |                  |
| Flow length (ft)                   | = 350.00       | 0.00     | 0.00        |                  |
| Watercourse slope (%)              | = 1.10         | 0.00     | 0.00        |                  |
| Surface description                | = Unpaved      | Paved    | Paved       |                  |
| Average velocity (ft/s)            | =1.69          | 0.00     | 0.00        |                  |
| <b>Travel Time (min)</b>           | <b>= 3.45</b>  | <b>+</b> | <b>0.00</b> | <b>+</b>         |
|                                    |                |          | <b>0.00</b> | <b>= 3.45</b>    |
| <b>Channel Flow</b>                |                |          |             |                  |
| X sectional flow area (sqft)       | = 45.60        | 0.00     | 0.00        |                  |
| Wetted perimeter (ft)              | = 55.50        | 0.00     | 0.00        |                  |
| Channel slope (%)                  | = 0.80         | 0.00     | 0.00        |                  |
| Manning's n-value                  | = 0.015        | 0.015    | 0.015       |                  |
| Velocity (ft/s)                    | =7.79          | 0.00     | 0.00        |                  |
| Flow length (ft)                   | (0)1150.0      | 0.0      | 0.0         |                  |
| <b>Travel Time (min)</b>           | <b>= 2.46</b>  | <b>+</b> | <b>0.00</b> | <b>+</b>         |
|                                    |                |          | <b>0.00</b> | <b>= 2.46</b>    |
| <b>Total Travel Time, Tc .....</b> |                |          |             | <b>33.90 min</b> |

## Worksheet for Channel - Undetained 100

|                       |                      |
|-----------------------|----------------------|
| Project Description   |                      |
| Friction Method       | Manning              |
|                       | Formula              |
| Solve For             | Normal Depth         |
| Input Data            |                      |
| Roughness Coefficient | 0.030                |
| Channel Slope         | 0.008 ft/ft          |
| Left Side Slope       | 3.000 H:V            |
| Right Side Slope      | 3.000 H:V            |
| Bottom Width          | 10.00 ft             |
| Discharge             | 333.88 cfs           |
| Results               |                      |
| Normal Depth          | 33.0 in              |
| Flow Area             | 50.3 ft <sup>2</sup> |
| Wetted Perimeter      | 27.4 ft              |
| Hydraulic Radius      | 22.0 in              |
| Top Width             | 26.52 ft             |
| Critical Depth        | 30.3 in              |
| Critical Slope        | 0.011 ft/ft          |
| Velocity              | 6.64 ft/s            |
| Velocity Head         | 0.68 ft              |
| Specific Energy       | 3.44 ft              |
| Froude Number         | 0.850                |
| Flow Type             | Subcritical          |
| GVF Input Data        |                      |
| Downstream Depth      | 0.0 in               |
| Length                | 0.0 ft               |
| Number Of Steps       | 0                    |
| GVF Output Data       |                      |
| Upstream Depth        | 0.0 in               |
| Profile Description   | N/A                  |
| Profile Headloss      | 0.00 ft              |
| Downstream Velocity   | Infinity ft/s        |
| Upstream Velocity     | Infinity ft/s        |
| Normal Depth          | 33.0 in              |
| Critical Depth        | 30.3 in              |
| Channel Slope         | 0.008 ft/ft          |
| Critical Slope        | 0.011 ft/ft          |

## Worksheet for Channel - 25-year

|                       |                     |
|-----------------------|---------------------|
| Project Description   |                     |
| Friction Method       | Manning             |
| Solve For             | Formula             |
|                       | Normal Depth        |
| Input Data            |                     |
| Roughness Coefficient | 0.030               |
| Channel Slope         | 0.008 ft/ft         |
| Left Side Slope       | 3.000 H:V           |
| Right Side Slope      | 3.000 H:V           |
| Bottom Width          | 10.00 ft            |
| Discharge             | 23.78 cfs           |
| Results               |                     |
| Normal Depth          | 7.9 in              |
| Flow Area             | 7.9 ft <sup>2</sup> |
| Wetted Perimeter      | 14.2 ft             |
| Hydraulic Radius      | 6.7 in              |
| Top Width             | 13.96 ft            |
| Critical Depth        | 6.4 in              |
| Critical Slope        | 0.017 ft/ft         |
| Velocity              | 3.01 ft/s           |
| Velocity Head         | 0.14 ft             |
| Specific Energy       | 0.80 ft             |
| Froude Number         | 0.704               |
| Flow Type             | Subcritical         |
| GVF Input Data        |                     |
| Downstream Depth      | 0.0 in              |
| Length                | 0.0 ft              |
| Number Of Steps       | 0                   |
| GVF Output Data       |                     |
| Upstream Depth        | 0.0 in              |
| Profile Description   | N/A                 |
| Profile Headloss      | 0.00 ft             |
| Downstream Velocity   | Infinity ft/s       |
| Upstream Velocity     | Infinity ft/s       |
| Normal Depth          | 7.9 in              |
| Critical Depth        | 6.4 in              |
| Channel Slope         | 0.008 ft/ft         |
| Critical Slope        | 0.017 ft/ft         |





## **Appendix I. Underdrain Dewatering Calculation**

## Underdrain Dewatering Calculation

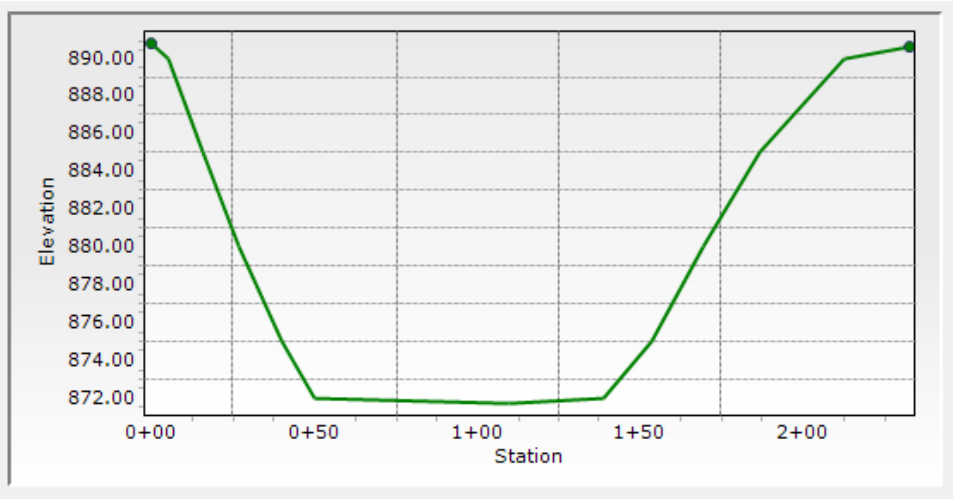
| Input Data                                                                                     |            |         |
|------------------------------------------------------------------------------------------------|------------|---------|
| Job Name                                                                                       |            |         |
| Engineer                                                                                       | M. Reineke |         |
| Date                                                                                           | 9-7-2023   |         |
| Surface area at high water stage, [Atop]                                                       | 1654400    | ft²     |
| Surface area at low water stage, [Abot]                                                        | 1512370    | ft²     |
| Permeability of filter sand, [k]                                                               | 16         | ft/day  |
| Driving head at high water stage, [Htop]                                                       | 5.05       | ft      |
| Driving head at low water stage, [Hbot]                                                        | 3.05       | ft      |
| Drawdown time, [t]                                                                             | 2          | days    |
| Average flow path length, [Xo]                                                                 | .5         | ft      |
| Exposed underdrain width, [Lo]                                                                 | 5          | ft      |
| Slope of underdrain face, [S]                                                                  | 999        | ?H : 1V |
| Factor of safety for analysis, [FS]                                                            | 1          |         |
| Percent drawdown for analysis, [P]                                                             | 95         | %       |
| Background seepage rate, [Q]                                                                   | 0          | gpm     |
| Note: For efficient and economical underdrain sizing, design for P <= 95%<br>(See help screen) |            |         |

| Input Data                                                                               |              |              |
|------------------------------------------------------------------------------------------|--------------|--------------|
| Total length of side/bottom drain filter required                                        | 2326.173     | ft           |
| Total length of side/bottom drain filter required to recover treatment volume only       | 2326.173     | ft           |
| Total length of side/bottom drain filter required to accomodate background seepage       | 0            | ft           |
| Percent drawdown simulated                                                               | 95           | %            |
| Maximum flow rate through filter                                                         | 4.19756      | gpm / lin ft |
| Average flow rate through filter                                                         | 2.09878      | gpm / lin ft |
| Volume of water between Atop and Abot                                                    | 2.369061E+07 | gallons      |
| Recovery (or treatment) volume                                                           | 2.250608E+07 | gallons      |
| Recovery (or treatment) volume                                                           | 69.06409     | acre-ft      |
| Note: Drain pipe diameter should be checked to ensure that peak flow can be accomodated. |              |              |



## **Appendix J. Outfall Section at Wetland W-4**

Cross Sections from Outfall to Kalamazoo River



Section 1+00