Stormwater Management

VILLAGE OF BAYSIDE
STORMWATER PLAN CHECKLIST

NAMEOFPROJECT: Bayside Middle School
ADDRESS:_____

	Sec. 107-52. Stormwater management plan contents.		
x	***(a)***		***Stormwater Plan requirements.***
X	***1***		The stormwater management plan required under this article shall contain any information the village may need to evaluate the environmental characteristics of the area affected by land development activity, the potential impacts of the proposed development upon the quality and quantity of stormwater discharges, the potential impacts upon water resources and drainage utilities, and the effectiveness and acceptability of proposed stormwater management measures in meeting the performance standards set forth in this section.
X	***2***		The plan shall include computations of peak flow rates and discharge volumes at each point of discharge into and out of the site concerned under existing and planned development and redevelopment conditions. The data shall include times of concentration to key junctions in flow paths and to points of discharge into and out of the site.
X	***3***		The plan shall consist of narrative descriptions and explanations; maps, charts, and graphs; tables; photographs; supporting calculations; and references to recognized engineering text and manuals as may be necessary to provide a clear and concise description of the plan. The sources of maps and data presented in the plan shall be identified.
X	***4***		For phased developments, the site development stormwater management plan shall consider the cumulative effect of all phases.
X	***5***		Unless specified otherwise by this section, stormwater management plans shall contain, at a minimum, the following information:
X		a.	Name, address, and telephone number for the following or their designees: landowner; developer; project engineer for practice design and certification; person responsible for installation of stormwater management practices; person responsible for maintenance of stormwater management practices prior to the transfer, if any, of maintenance responsibility to another party.
X		b.	A proper legal description of the property proposed to be developed referenced to the U.S. Public Land Survey system or to block and lot numbers with a recorded land subdivision plat.
X		c.	Description of pre-development site conditions and supporting documentation.
X		d.	Description of post-development site conditions and supporting documentation.
X		e.	Description of post-development anticipated impacts and supporting documentation.
X		f.	Description of proposed stormwater management facilities and measures and supporting documentation.
Y/N	***(b)***		***Pre-development site conditions.*** The plan shall include a map and description of the existing conditions of the site concerned including:
Y	***1***		A map of the site at a scale of one inch equals 100 feet or larger showing the property boundaries referenced to the U. S. Public Land Survey system or to a lot and block of a recorded subdivision plat; the topography of the site including contours shown at an interval of two feet or less, together with such spot elevations as may be necessary; the contours and spot elevations shall be referenced to the National Geodetic Vertical Datum of 1929, or to village datum with prior written approval from the village;

Y	***2***		The hydrologic and hydraulic characteristics of the site including drainage flow paths and directions of flow onto, through, and out of the site; related drainage basin boundaries, including off-site tributary areas; times of concentration;
N/A	***3***		The location of areas where stormwater may collect or percolate into the ground;
Y	***4***		Locations where runoff enters the site from adjacent tributary areas together with the size of those areas expressed in acres;
Y	***5***		Locations where runoff leaves the site and the contributing watersheds to each of these locations expressed in acres;
Y	***6***		Groundwater elevations referred to the National Geodetic Vertical Datum of 1929 or to village datum with prior written approval from the village;
Y	***7***		Soils by hydrologic group;
Y	***8***		Cover type and condition;
Y	***9***		Location and extent of impervious surfaces, including type and condition of the surfaces;
Y	***10***		Locations and outlines of all buildings or other structures;
	11		Location of all receiving bodies of surface water on or within 100 feet of the site into which stormwater flows;
N/A	***12***		Locations and size of wetlands on or within 100 feet of the site;
N/A	***13***		Location and extent of the 100-year recurrence interval flood hazard area associated with any perennial stream or watercourse on or within 100 feet of the site;
N/A	***14***		Information regarding current water quality objectives and current water quality conditions in any perennial watercourses located on or within 100 feet to the site;
Y	***15***		Locations, sizes, and elevations of all existing storm sewers, channels, ditches, detention or retention ponds, or other engineered drainage facilities on or within 100 feet of the site; the elevations being referred to the National Geodetic Datum of 1929 or to village datum with prior written approval from the village.
Y/N	***(c)***		***Proposed post-development site conditions.*** The plan shall describe the alterations proposed as to the site and the resulting proposed post-development conditions. The description shall include:
Y	***1***		Explanation of the provisions to preserve and use natural topography and land cover features to minimize changes in peak flow runoff rates and volumes to surface waters;
Y	***2***		Proposed changes in the planimetry of the site, and in the topography of the site by contours having the same contour interval and referred to the same datum as used to present the topography of the existing site conditions;
Y	***3***		The location and outline of all proposed buildings or other structures;
Y	***4***		Changes in the location, extent and type of impervious surfaces;
Y	***5***		The location and extent of areas where vegetation is to be disturbed or planted;
Y	***6***		Impacts on existing natural storage or infiltration areas;
Y	***7***		Changes in the drainage flow paths into, through, and out of the site, and related changes in drainage basin boundaries;
Y	***8***		The location, elevations, and sizes of all proposed minor and major stormwater management facilities; the former including all storm sewers and inlets, and the latter including curbed roadways, roadway ditches, culverts, storage facilities, and interconnected flow paths; all elevations being referred to the National Geodetic Vertical Datum of 1929 or to village datum with prior written approval from the village;
N/A	***9***		Any changes to lakes, streams, watercourses, or wetlands on or within 100 feet of the site concerned; and
Y	***10***		The location and widths of required public rights-of-way or easements needed to accommodate the recommended stormwater management facilities.

*The storm water management approach seeks to meet MMSD CH 13 Volumetric requirements, not the Village of Bayside 0.15 cfs and 0.5 cfs unit release requirements

Y/N	(d)		**Anticipated impacts.** The plan shall contain a description of the following anticipated impacts of stormwater runoff from the proposed development, redevelopment, or land development as managed by the facilities and measures recommended in the plan:
Y	1		Computed 100-year, 24-hour, SCS type II peak runoff rate at each location where runoff enters and leaves the site, expressed in cubic feet per second;
Y	2		Computed two-year, 24-hour, SCS type II peak runoff rate at each location where runoff enters and leaves the site, expressed in cubic feet per second;
N	3		Computed peak runoff rate corresponding to 0.15 cfs/acre at each location where runoff leaves the site, expressed in cubic feet per second;
N	4		Computed peak runoff rate corresponding to 0.5 cfs/acre at each location where runoff leaves the site, expressed in cubic feet per second;
N/A	5		Computed runoff volume for the 1.5-inch, four-hour rainfall;
Y	6		All major assumptions used in developing input parameters shall be clearly stated. The computations shall be made for each discharge point in to and out of the site, and the geographic areas used in making the calculations shall be clearly cross-referenced to the required map, including off-site tributary watershed areas;
Y	7		Changes in the locations and conveyance capacities of stormwater discharge points from and to the site concerned;
Y	8		Adequacy of receiving storm sewer, engineered stormwater management facility or watercourse to convey or store the anticipated peak rate of stormwater discharge from the site concerned, giving due consideration to existing and off-site flows;
N/A	9		Changes in the location and extent of the 100-year recurrence interval flood hazard area of any perennial watercourse location within, through, or within 100 feet of, the site concerned;
Y	10		Results of investigations of soils and groundwater required for the placement and design of stormwater management measures; and
N/A	11		Changes in groundwater elevations referred to National Geodetic Vertical Datum of 1929 or to village datum with prior written approval from the village.
Y/N	**(e)**		***Proposed stormwater management facilities and measures.***
Y	1		The plan shall include a definitive description of the proposed stormwater management facilities and measures for the control of the quantity and quality of the anticipated stormwater runoff from the proposed development, redevelopment, or land division.
Y	2		All site investigations, plans, designs, computations, and drawings shall be certified as prepared in accordance with accepted current engineering practice and in accordance with technical standards identified, developed or disseminated by the state department of natural resources under Wis. Admin. Code ch. NR 151, subch. V, and "Standard Specifications for Sewer and Water Construction in Wisconsin."
	3		The description of the proposed management facilities shall include:
Y		a.	For detention and retention facilities: locations, areas, depths, volumes, inlet and outlet configurations, and elevation of the bottoms, and of key inlet and outlet control structures; all elevations being referred to National Geodetic Vertical Datum of 1929 or to village datum with prior written approval from the village;

*Detail drawings, construction schedule, and maintenance plan will be included with final SWMP submittal

Y		b.	For conveyance facilities: locations of inlets and manholes and associated rim and invert elevations, and pipe sizes, slope and materials; locations, elevations, and cross-sections of ditches, swales and channels; and culvert sizes, inlet and outlet configurations and elevations; all elevations being referred to National Geodetic Vertical Datum of 1929 or to village datum with prior written approval from the village;
Y		c.	Design computations and all applicable assumptions for the stormwater conveyance (open channel, closed pipe, etc.) system;
N		d.	Detailed drawings including cross-sections and profiles of all permanent stormwater conveyance and treatment practices;
N/A		e.	Design computations and all applicable assumptions for stormwater quality practices (sedimentation type, filtration type, infiltration type) as needed to show that practices are appropriately sized to accommodate runoff from the 1.5-inch rainfall;
Y		f.	For practice designs that depart from those specified in the technical standards identified, developed or disseminated by the state department of natural resources under Wis. Admin. Code ch. NR 151, subch. V, the results of continuous simulation modeling, conducted according to the guidelines established in that manual, shall be presented in such a way as to show the reduction in average annual total suspended solids loading from the developed site;
Y		g.	Erosion control plan in accordance with the technical standards identified, developed or disseminated by the state department of natural resources under Wis. Admin. Code ch. NR 151, subch. V;
N/A		h.	Measures to abate any potential pollution of surface waters and groundwaters;
N		i.	A schedule for the construction of the recommended stormwater management facilities and estimates of attendant capital and operation and maintenance costs;
N		j.	A maintenance plan developed for the life of each stormwater management practice including the required maintenance activities and maintenance activity schedule;
Y		k.	A landscaping plan in accordance with technical standards identified, developed or disseminated by the state department of natural resources under Wis. Admin. Code ch. NR 151, subch. V; and
Y		l.	Other information as needed by the village to determine compliance of the proposed stormwater management measures with the provisions of this section.
Y/N	***(f)***		***Exceptions.*** The village may prescribe alternative submittal requirements for applicants seeking an exemption to on-site stormwater management performance standards under this section.

*Maintenance Agreement will be included with final SWMP submittal

	Sec. 107-53. Maintenance.		
	(a)		***Maintenance agreement required.*** The maintenance agreement required for stormwater management practices under this section shall be an agreement between the village and the permittee to provide for maintenance of stormwater practices beyond the duration period of this permit. The agreement or recordable document shall be recorded with the Milwaukee County Register of Deeds or the Ozaukee County Register of Deeds so that it is binding upon all subsequent owners of land served by the stormwater management practices.
Y/N	***(b)***		***Agreement provisions.*** The maintenance agreement shall contain the following information and provisions:
		1	Identification of the stormwater facilities and designation of the drainage area served by the facilities;
		2	A schedule for regular maintenance of each aspect of the stormwater management system consistent with the stormwater management plan;

		3	Identification of the landowner, organization or municipality responsible for long-term maintenance of the stormwater management practices;
		4	The landowner, organization, or municipality shall maintain stormwater management practices in accordance with the schedule included in the agreement;
		5	The village is authorized to access the property to conduct inspections of stormwater practices as necessary to ascertain that the practices are being maintained and operated in accordance with the agreement;
		6	The village shall maintain public records of the results of the site inspections, shall inform the landowner responsible for maintenance of the inspection results, and shall specifically indicate any corrective actions required to bring the stormwater management practice into proper working condition;
		7	If the village notifies the party designated under the maintenance agreement of maintenance problems that require correction, the specific corrective actions shall be taken within a reasonable time frame determined by the village; and
		8	The village is authorized to perform the corrective actions identified in the inspection report if the landowner does not make the required corrections in the specified time period. The village shall enter the amount due on the tax rolls and collect the money as a special charge against the property pursuant to Wis. Stats. § 66.0627, as amended from time to time.

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PRELIMINARY STORM WATER MANAGEMENT PLAN
BAYSIDE MIDDLE SCHOOL

Prepared For:

Fox Point-Bayside School District

7300 North Lombardy Road

Fox Point, WI 53217

Prepared By:

Kapur & Associates, Inc.

7711 North Port Washington Road

Milwaukee, WI 53217

JANUARY 2023

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1.0 Project Contacts

Owner: Fox Point-Bayside School District

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Engineer: Kapur & Associates, Inc.
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2.0 Project Location and Description

The middle school is located at 601 E Ellsworth Lane, Bayside, WI 53217. The parcel is located in part of the W 1/2 of the SW 1/4 of Section 4, Township 8 North, Range 22 East, in the Village of Bayside, Milwaukee County, Wisconsin.
Refer to the Plat of Survey of the Plan Set in Appendix F for the exact legal description and figure SWMP-1 in Appendix E for an aerial photo of the existing subject site and SWMP limits.

The parcel area of the middle school site is approximately 14.74 acres (642,220 sq. ft.). The existing site is a developed site consisting of a school building, parking lots, athletic fields, sidewalks, and landscaped areas. The proposed project would disturb approximately 12.43 acres (541,453 sq. ft.).

The proposed project includes the demolition of the existing school building and parking lots and the construction of a new school, parking lots, sidewalks, landscaped areas, bioretention basins, and a bus lane along King Road.

3.0 Soil Information

Geotechnical exploration of the site was conducted by Giles Engineering Associates, Inc on September 26th, 2022. The purpose of the exploration was to provide information and geotechnical engineering recommendations about subsurface soil conditions, groundwater conditions, site preparation and earthwork, excavation considerations, pavement design and construction, frost conditions, and stormwater considerations.

A total of seventeen (17) standard penetration test (SPT) borings were drilled at the site. Nine (9) borings were drilled in the proposed building area, four (4) borings in proposed pavement areas, and four (4) borings in the proposed bioretention basins. The complete geotechnical report is provided in Appendix A of this report. The USDA soil types located on this site are shown on the Hydrologic Soil Group (HSG) Map in Appendix A. As shown on the HSG Map, most of the soils on site can be classified as Kewaunee silt loams. These soils are characterized as hydrologic soil classification group “C”. Therefore, a soil type of C was assumed for all storm water analyzes provided in this report.

4.0 Hydrology

Hydrologic conditions were modeled using HydroCAD, which is based on TR-55 methodology. Three storm events were analyzed based on the 2-year, 10-year, and 100-year recurrence intervals with rainfall amounts of 2.62, 3.73, and 6.20 inches per 24 hours, respectively. Rainfall amounts for the selected 24-hour storm events were based on the rainfall values contained in NOAA Atlas 14 for Bayside, Wisconsin. Per Village of Bayside Stormwater Ordinance, an SCS Type II rainfall distribution was used in the HydroCAD modeling.

Existing and proposed watershed locations and characteristics are provided in Figures SWMP-2 through SWMP-5 in Appendix E. The SWMP limits include all locations of land disturbance and any offsite drainage to the proposed stormwater devices. The SWMP limits were then divided into sub-watersheds based on the areas of captured and uncaptured runoff. Weighted Runoff Curve Numbers (CN) for all existing and proposed watersheds were computed dependent upon the area, soil type, and ground cover. The time of concentration (T_c) for each watershed was determined by selecting the longest runoff flow path (with regards to time, not necessarily distance) within the watershed basin to the point of interest. The T_c values were calculated based on a combination of sheet flow, shallow concentrated flow, and pipe flow with a 6-minute minimum Tc set as the default.

5.0 Storm Water Performance Standards

The post-construction storm water management plan shall comply with Village of Bayside Code of Ordinance, Chapter 13 of the Milwaukee Metropolitan Sewerage District (MMSD) Rules on Surface Water and Storm Water Runoff Management, and Wisconsin Department of Natural Resources (WDNR) Chapter NR 151.

Peak Discharge Control:
Per Chapter 13 MMSD Rules on Surface Water and Storm Water Runoff Section 13.302(3)(a), if development or redevelopment will add one-half acre or more of impervious surface, then runoff management techniques shall limit the outflows from redevelopments. The volumetric design procedure shall be used to satisfy MMSD storm water performance standards.

- The 2-year and 100-year post-development runoff volume shall not exceed pre-development runoff volume during the critical time period. The site falls within the MMSD Lake Michigan direct sewer shed which has a critical time period of 1.5 hours from 11.75 to 13.25 hours.

Hydrologic models of the existing and proposed conditions were modeled with HydroCAD. Refer to Appendices B and C for the HydroCAD input and output

Water Quality/TSS Removal:
Per Village of Bayside Code of Ordinances, Chapter 107 Article III- Stormwater Management, Section 107-50(d), for redevelopment, by design, reduce to the maximum extent practicable, the total suspended solids load by 40 percent, based on the average annual rainfall, as compared to no runoff management controls.

Infiltration:
Per Village of Bayside Code of Ordinance Chapter 107 Article III- Storm Water Management, Section 107-50(f), BMPs shall be designed, installed, and maintained to infiltrate runoff to the maximum extent practicable. Per section 107-50(h)(1), “Areas where the infiltration rate of the soil is less than 0.6 inches/hour measured at the site,” are exempt from infiltration requirements. Based on the borings conducted by Giles Engineering Associates, Inc., the soils on the site contain clays and have low infiltration rates. Therefore, this project is exempt from the Village of Bayside infiltration standards.

6.0 Pre-Development Site Conditions

The area enclosed by the SWMP limits totals 12.43 acres (541,453 sq. ft.). The pre-developed conditions within the SWMP limits consist of the existing school, parking lots, athletic fields, and a dry pond that will be demolished and replaced by the proposed improvements. The norther portion of the site contains a track and soccer field that will remain undisturbed. Refer to Figures SWMP-2 and SWMP-4 in Appendix E for additional information. Figure SWMP-2 shows the pre-developed site conditions and Figure SWMP-4 provides information on the pre-developed drainage conditions for the storm water management area.

Refer to Table 1 for a summary of the pre-developed site conditions for the project area. Refer to Appendix B for the pre-developed HydroCAD report.

Table 1 – Pre-Developed Watershed Data Summary

Project Name: Bayside Middle School	**Parcel Size:** 14.74 acres	**Project Type:** Institutional Development
Number of Runoff Discharge Points: 2	**Watershed (Ultimate Discharge):** Lake Michigan Direct	
Project Watershed Area (including off-site runoff traveling through project area): 12.43 acres		
Public Land Survey Location: Part of the W 1/2 of the SW 1/4 of Section 4, Township 8 North, Range 22 East, in the Village of Bayside, Milwaukee County, Wisconsin.		

Summary Data Elements	E1 – North to King Rd	E2 – West to King Rd	E3 – South to King Rd.	E4 - Northeast Parking Lot to Ellsworth Storm Water Basin	E5 – Existing Dry Pond to King Rd.	E6 – Offsite Area
Watershed Area *(see SWMP-2 in Appendix E)*	1.75 acres	4.56 acres	2.01 acres	1.38 acres	1.81 acres	0.92 acres
Land Uses (Acres of Each)	0.90 Pavement 0.06 Sidewalks 0.79 Grass	2.01 Roofs 0.06 Pavement 0.07 Sidewalks 2.42 Grass	0.01 Pavement 0.24 Sidewalks 1.76 Grass	0.88 Pavement 0.15 Sidewalks 0.35 Grass	1.04 Pavement 0.03 Sidewalks 0.74 Grass	0.04 Sidewalks 0.88 Grass
Weighted Runoff Curve Numbers	87	85	77	92	88	75
Time of Concentration (Tc) *(see SWMP-4 in Appendix E)*	6.0 minutes	15.6 minutes	12.9 minutes	6.0 minutes	6.0 minutes	6.0 minutes
2-year/24-hour Peak Flow *(See Appendix B)*	4.24 cfs	7.31 cfs	2.17 cfs	4.13 cfs	4.60 cfs	1.13 cfs
10-year/24-hour Peak Flow *(See Appendix B)*	7.05 cfs	12.70 cfs	4.42 cfs	6.36 cfs	7.53 cfs	2.36 cfs
100-year/24-hour Peak Flow *(see Appendix B)*	13.40 cfs	25.18 cfs	10.07 cfs	11.28 cfs	14.09 cfs	5.46 cfs

7.0 Post-Development Site Conditions

As previously discussed, the area enclosed by the SWMP limits 12.43 acres (541,453 sq. ft.). The post-developed site includes the construction of a new school building, parking lots, a bus lane, sidewalks, a baseball field, two bioretention basins, and grass restoration with various landscaping. Refer to Figures SWMP-3, and SWMP-5 in Appendix E for additional information. The proposed site development will result in an increase in impervious area of approximately 0.29 acres (12,571 sq. ft.). The site was graded to match existing drainage, as much as possible, to maintain downstream facilities. Refer to Table 2 for a summary of the post-development conditions of the watershed for the project area. Refer to Appendix C for the post-development HydroCAD report.

Table 2 – Post-Developed Watershed Data Summary

Project Name: Bayside Middle School	**Parcel Size:** 14.74 acres	**Project Type:** Institutional Development
Number of Runoff Discharge Points: 2	**Watershed (Ultimate Discharge):** Lake Michigan Direct	
Project Watershed Area (including off-site runoff traveling through project area): 12.43 acres		
Public Land Survey Location: Part of the W 1/2 of the SW 1/4 of Section 4, Township 8 North, Range 22 East, in the Village of Bayside, Milwaukee County, Wisconsin.		

Summary Data Elements	P1 – Proposed Building to King Rd.	P2 – Proposed to Bio-1	P3 – Proposed to Bio-2	P4 – Proposed to Ellsworth Park Storm Water Basin	P5 - Proposed to Bio-Swale-1	P6 - Proposed to Permeable Pavers-2 (Center)	P7 – Proposed to Permeable Pavers-3 (South)	P8- Uncaptured	P9- Offsite Area
Watershed Area *(see SWMP-5 in Appendix E)*	1.96 acres	3.49 acres	2.34 acres	0.94 acres	0.47 acres	0.56 acres	0.38 acres	1.37 acres	0.92 acres
Land Uses (Acres of Each)	1.96 Roofs	0.21 Pavement 0.76 Sidewalks 2.52 Grass	0.59 Pavement 0.31 Sidewalks 1.44 Grass	0.28 Pavement 0.66 Grass	0.21 Pavement 0.13 Permeable Pavers 0.01 Sidewalks 0.12 Grass	0.27 Pavement 0.19 Permeable Pavers 0.03 Sidewalks 0.07 Grass	0.15 Pavement 0.13 Permeable Pavers 0.01 Sidewalk 0.09 Grass	0.23 Pavement 0.26 Sidewalks 0.88 Grass	0.04 Sidewalks 0.88 Grass
Weighted Runoff Curve Numbers	98	81	83	81	92	95	92	83	75
Time of Concentration (Tc) *(see SWMP-5 in Appendix E)*	6.0 minutes	14.2 minutes	6.0 minutes	6.0 minutes	6.0 minutes	6.0 minutes	6.0 minutes	8.7 minutes	6.0 minutes
2-year/24-hour Peak Flow *(See Appendix C)*	7.02 cfs	4.68 cfs	4.67 cfs	1.68 cfs	1.41 cfs	1.86 cfs	1.15 cfs	2.50 cfs	1.13 cfs
10-year/24-hour Peak Flow *(See Appendix C)*	10.09 cfs	8.74 cfs	8.22 cfs	3.06 cfs	2.18 cfs	2.75 cfs	1.77 cfs	4.46 cfs	2.36 cfs
100-year/24-hour Peak Flow *(see Appendix C)*	16.86 cfs	18.53 cfs	16.62 cfs	6.40 cfs	3.86 cfs	4.71 cfs	3.14 cfs	9.05 cfs	5.46 cfs

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8.0 Post-Development Summary

To best manage storm water runoff from the post-developed site, two bioretention basins will be used to to improve water quality and volumetric discharge. The bioretention basins will treat storm water runoff from site and discharge it at a controlled rate to meet the quantity, and quality requirements set by the WDNR, MMSD and Village of Bayside Code of Ordinances.

Bio-Retention Basin-1 (North) (BIO-1)

The bio-retention basin-1 (North) has been designed to accommodate the entire flow from proposed Watershed area P2 as shown in the SWMP figures. Tables 3 and 4 illustrate the design parameters and performance of the bio-retention basin-1 (North).

Table 3 – Bio-Retention Basin-1 (North) (BIO-1) Summary	Design Data
Site Assessment Data: (Refer to Appendix E for Proposed Drainage Figures)	
Contributing Drainage Area to Basin	3.49 acres
% of Each Land Use Contributing to Drainage Area	72% Pervious, 28% Impervious
Floodplain, Shoreland, or Wetlands?	No
Basin Design Data: (Refer to the Civil Engineering Plan Set in Appendix F for additional Information)	
Top of Berm Elevation	667.00’
Overflow Weir Elevation	666.50’
Top of Engineered Soil Elevation	663.00’
Bottom of Engineered Soil Elevation	661.50’
Surface Area of Engineered Soil	4,447 Sq. Ft.

Table 4 – Bio-Retention Basin-1 (North) - Inflow, Outflow, & Storage Data (BIO-1)

(See Hydrographs & Modeling Output in Appendix C and the Detail Drawings in the Civil Engineering Plan Set in Appendix F)

Design Storm	Peak Inflow Rate (cfs)	Peak Outflow Rate (cfs)	Max. Water Elevation (ft)	Storage Volume at Max. Elev. (cu ft)	Time to Drain Fully Saturated Device (hrs)	Outflow Control Structures
2-yr/24-hour	4.68	0.97	663.41	4,444	12.95	#1
10-yr/24-hour	8.74	1.18	664.41	9,807	13.10	#1
100-yr/24-hour	18.53	14.11	665.35	15,887	13.80	#1
The controlling elements are summarized below (Refer to Appendix H and the detail drawings in the Civil Engineering Plan Set in Appendix F)						
#1 = 6” Orifice at 661.00						
#2 = 72” Standpipe at 665.00						
#3 = Overflow Weir at 666.50						

Bio-Retention Basin-2 (South) (BIO-2)

The bio-retention basin-2 (South) has been designed to accommodate the entire flow from proposed Watershed area P3, P5, P6, and P7 as shown in the SWMP figures. Tables 5 and 6 illustrate the design parameters and performance of the bio-retention basin-2 (South).

Table 5 – Bio-Retention Basin-2 (South) (BIO-2) Summary	**Design Data**
Site Assessment Data: (Refer to Appendix E for Proposed Drainage Figures)	
Contributing Drainage Area to Basin	3.75 acres
% of Each Land Use Contributing to Drainage Area	46% Pervious, 54% Impervious
Floodplain, Shoreland, or Wetlands?	No
Basin Design Data: (Refer to the Civil Engineering Plan Set in Appendix F for additional Information)	
Top of Berm Elevation	669.00’
Top of Engineered Soil Elevation	664.00’
Bottom of Engineered Soil Elevation	662.50’
Surface Area of Engineered Soil	2,107Sq. Ft.

Table 6 – Bio-Retention Basin-2 (South) - Inflow, Outflow, & Storage Data (BIO-2)

(See Hydrographs & Modeling Output in Appendix C and the Detail Drawings in the Civil Engineering Plan Set in Appendix F)

Design Storm	**Peak Inflow Rate (cfs)**	**Peak Outflow Rate (cfs)**	**Max. Water Elevation (ft)**	**Storage Volume at Max. Elev. (cu ft)**	**Time to Drain Fully Saturated Device (hrs)**	**Outflow Control Structures**
2-yr/24-hour	6.76	1.68	665.39	5,086	13.70	#1
10-yr/24-hour	11.31	5.26	666.19	8,173	14.25	#1, #2
100-yr/24-hour	20.82	13.58	666.91	11,564	14.75	#1, #2

The controlling elements are summarized below (Refer to Appendix H and the detail drawings in the Civil Engineering Plan Set in Appendix F)

#1 = 6” Orifice at 662.00

#2 = 48” Standpipe at 666.00

Permeable Pavers 1 (PP1)

The permeable pavers 1 been designed to accommodate the entire flow from proposed watershed area P5 as shown in the SWMP figures. Tables 7 and 8 illustrate the design parameters and performance of the permeable pavers.

Table 7 – Permeable Pavers 1 (PP1) Summary	Design Data
Site Assessment Data: (Refer to Appendix F for Proposed Drainage Figures)	
Contributing Drainage Area to Basin	0.47 acres
% of Each Land Use Contributing to Drainage Area	26% Pervious, 74% Impervious
Floodplain, Shoreland, or Wetlands?	No
Paver Design Data: (Refer to the Civil Engineering Plan Set in Appendix G for additional Information)	
Top of Curb Elevation	670.57’
Top of Pavement	669.93’
Top of Aggregate Bedding	669.68’
Top of Aggregate Base	669.26’
Bottom of Aggregate Base	668.26’
Surface Area of Permeable Pavers	5,595 Sq. Ft.

Table 8 – Permeable Pavers - Inflow, Outflow, & Storage Data (PP1)

(See Hydrographs & Modeling Output in Appendix C and the

Detail Drawings in the Civil Engineering Plan Set in Appendix F)

Design Storm	Peak Inflow Rate (cfs)	Peak Outflow Rate (cfs)	Max. Water Elevation (ft)	Storage Volume at Max. Elev. (cu ft)	Time to Drain Ponding Area (hrs)	Outflow Control Structures
2-yr/24-hour	1.41	0.90	668.78	818	9.4	#1
10-yr/24-hour	2.18	1.24	668.97	1,195	12.3	#1
100-yr/24-hour	3.86	1.78	669.55	2,218	12.65	#1

The controlling elements are summarized below (Refer to the detail drawings in the Civil Engineering Plan Set in Appendix G)

#1 = 4’’ Draintile at 668.26

Permeable Pavers 2 (PP2)

The permeable pavers 2 been designed to accommodate the entire flow from proposed watershed area P6 as shown in the SWMP figures. Tables 9 and 10 illustrate the design parameters and performance of the permeable pavers.

Table 9 – Permeable Pavers 2 (PP2) Summary	Design Data
Site Assessment Data: (Refer to Appendix F for Proposed Drainage Figures)	
Contributing Drainage Area to Basin	0.56 acres
% of Each Land Use Contributing to Drainage Area	13% Pervious, 87% Impervious
Floodplain, Shoreland, or Wetlands?	No
Paver Design Data: (Refer to the Civil Engineering Plan Set in for additional Information)	
Top of Curb Elevation	670.87’
Top of Pavement	669.72’
Top of Aggregate Bedding	669.47’
Top of Aggregate Base	669.05’
Bottom of Aggregate Base	668.05’
Surface Area of Permeable Pavers	8,265 Sq. Ft.

Table 10 – Permeable Pavers - Inflow, Outflow, & Storage Data (PP2)

(See Hydrographs & Modeling Output in Appendix C and the

Detail Drawings in the Civil Engineering Plan Set in Appendix F)

Design Storm	Peak Inflow Rate (cfs)	Peak Outflow Rate (cfs)	Max. Water Elevation (ft)	Storage Volume at Max. Elev. (cu ft)	Time to Drain Ponding Area (hrs)	Outflow Control Structures
2-yr/24-hour	1.86	0.80	668.62	1,423	12.15	#1
10-yr/24-hour	2.75	1.04	668.89	2,085	12.65	#1
100-yr/24-hour	4.71	1.42	669.49	3,672	13.15	#1

The controlling elements are summarized below (Refer to the detail drawings in the Civil Engineering Plan Set in Appendix G)

#1 = 4’’ Draintile at 668.05

Permeable Pavers 3 (PP3)

The permeable pavers 3 been designed to accommodate the entire flow from proposed watershed area P7 as shown in the SWMP figures. Tables 11 and 12 illustrate the design parameters and performance of the permeable pavers.

Table 11 – Permeable Pavers 3 (PP3) Summary	Design Data
Site Assessment Data: (Refer to Appendix F for Proposed Drainage Figures)	
Contributing Drainage Area to Basin	0.38 acres
% of Each Land Use Contributing to Drainage Area	24% Pervious, 76% Impervious
Floodplain, Shoreland, or Wetlands?	No
Paver Design Data: (Refer to the Civil Engineering Plan Set in Appendix G for additional Information)	
Top of Curb Elevation	670.06’
Top of Pavement	669.78’
Top of Aggregate Bedding	669.53’
Top of Aggregate Base	669.11’
Bottom of Aggregate Base	668.11’
Surface Area of Permeable Pavers	5,437 Sq. Ft.

Table 12 – Permeable Pavers - Inflow, Outflow, & Storage Data (PP3)

(See Hydrographs & Modeling Output in Appendix C and the

Detail Drawings in the Civil Engineering Plan Set in Appendix F)

Design Storm	Peak Inflow Rate (cfs)	Peak Outflow Rate (cfs)	Max. Water Elevation (ft)	Storage Volume at Max. Elev. (cu ft)	Time to Drain Ponding Area (hrs)	Outflow Control Structures
2-yr/24-hour	1.15	0.72	668.53	677	7.7	#1
10-yr/24-hour	1.77	1.09	668.69	952	12.1	#1
100-yr/24-hour	3.14	1.58	669.16	1,728	12.5	#1

The controlling elements are summarized below (Refer to the detail drawings in the Civil Engineering Plan Set in Appendix G)

#1 = 4’’ Draintile at 668.11

Total Storm Water Flows/Peak Discharge

Tables 13-18 summarize the proposed outflow of the post-developed site versus pre-developed conditions.

Table 13 – Total Storm Water Flow Leaving Site to King Rd. Storm Sewer
(See Hydrographs in Appendices B & C)

Design Storm	Pre-Developed Peak Discharge Rate	Post-Development Peak Discharge Rate
2-yr/24-hour	13.73 cfs	**11.39 cfs**
10-yr/24-hour	23.33 cfs	**16.87 cfs**
100-yr/24-hour	57.77 cfs	**39.97cfs**

Table 14 – Total Storm Water Flow Leaving Site to Ellsworth Park Storm Water Basin
(See Hydrographs in Appendices B & C)

Design Storm	Pre-Developed Peak Discharge Rate	Post-Development Peak Discharge Rate
2-yr/24-hour	5.22 cfs	**2.81 cfs**
10-yr/24-hour	8.68 cfs	**5.39 cfs**
100-yr/24-hour	16.73 cfs	**11.86 cfs**

Table 15 – Total Storm Water Flow Leaving Site
(See Hydrographs in Appendices B & C)

Design Storm	Pre-Developed Peak Discharge Rate	Post-Development Peak Discharge Rate
2-yr/24-hour	18.47 cfs	**14.20 cfs**
10-yr/24-hour	31.21 cfs	**22.30 cfs**
100-yr/24-hour	72.50 cfs	**52.77 cfs**

As detailed in Tables 13-15, the post-development peak discharge rates for the 2-, 10- and 100-year storm events are less than the existing peak discharge rates of the 2-, 10- and 100-year storm events at each discharge point. **Therefore, this site will not increase peak discharge to the King Rd. storm sewer Ellsworth Park storm water basin and will not increase peak discharge from the site.**

Table 16 – Total Storm Water Volume Leaving Site to King Rd. Storm Sewer (Runoff Volume Over Critical Time Period 11.75 to 13.25 hrs (See MMSD Volumetric Analysis Calculations in Appendix G)		
Design Storm	**Pre-Development Runoff Volume**	**Post-Development Runoff Volume**
2-yr/24-hour	25,654 cu. ft.	**24,148 cu. ft.**
100-yr/24-hour	87,176 cu. ft.	**78,192 cu. ft.**

Table 17 – Total Storm Water Volume Leaving Site to Ellsworth Park Storm Water Basin (Runoff Volume Over Critical Time Period 11.75 to 13.25 hrs (See MMSD Volumetric Analysis Calculations in Appendix G)		
Design Storm	**Pre-Development Runoff Volume**	**Post-Development Runoff Volume**
2-yr/24-hour	6,022 cu. ft.	**3,233 cu. ft.**
100-yr/24-hour	19,118 cu. ft.	**13,603 cu. ft.**

Table 18 – Total Storm Water Volume Leaving Site (Runoff Volume Over Critical Time Period 11.75 to 13.25 hrs (See MMSD Volumetric Analysis Calculations in Appendix G)		
Design Storm	**Pre-Development Runoff Volume**	**Post-Development Runoff Volume**
2-yr/24-hour	31,676 cu. ft.	**27,380 cu. ft.**
100-yr/24-hour	106,295 cu. ft.	**91,795 cu. ft.**

As detailed in Tables 16-88, the post-development storm water volume leaving the site as a whole and leaving the site to the King Rd storm sewer and the Ellsworth Park storm water basin, during the critical time period is less than the pre-development volume. **Therefore, this site meets the volumetric requirement of MMSD Chapter 13.**

Total Suspended Solids/Water Quality Requirements

Table 19 – WinSLAMM Model Output Results (See Model Output Attachment in Appendix D)	
Required TSS Reduction	**Modeled TSS Reduction**
40%	61.67%

Based on the WinSLAMM analysis, the post-developed site reduces TSS by 61.67% exceeding the required reduction of 40% TSS removal. **Therefore, the site meets the water quality requirements of the Village of Bayside Code of Ordinances and the DNR requirements of Chapter 151.21 through NR 151.128.**

Appendix A

Giles Engineering Associates Inc. Geotechnical Exploration

Web Soil Survey Report

Depth to Water Table

Geotechnical Engineering Exploration and Analysis

Proposed Bayside Middle School Replacement
601 East Ellsworth Lane
Bayside, Wisconsin

Prepared for:

Fox Point - Bayside School District
Fox Point, Wisconsin

October 4, 2022
Giles Project No. 1G-2208024

GILES
ENGINEERING ASSOCIATES, INC.

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

- Dallas, TX
- Los Angeles, CA
- Manassas, VA
- Milwaukee, WI

October 4, 2022

Fox Point - Bayside School District
7300 N. Lombardy Road
Fox Point, WI 53217

Attention: Ms. Kathleen Wiesner
Business Manager

Subject: Geotechnical Engineering Exploration and Analysis
Proposed Bayside Middle School Replacement
601 E. Ellsworth Lane
Bayside, Wisconsin
Giles Project No. 1G-2208024

Dear Ms. Wiesner:

As requested, Giles Engineering Associates, Inc. conducted a *Geotechnical Engineering Exploration and Analysis* for the proposed project. The accompanying report describes the services that were performed, and it provides geotechnical-related findings, conclusions, and recommendations that were derived from those services.

We sincerely appreciate the opportunity to provide geotechnical services for the proposed project. Please contact the undersigned if there are questions about the report or if we may be of further service.

Very truly yours,

GILES ENGINEERING ASSOCIATES, INC.

Grace C. Hill
Staff Professional

Anthony C. Giles, P.E.
Vice President

Distribution: Eppstein Uhen Architects, Inc.
Attn: Mr. Tory Schulz, RA (pdf via email: torys@eua.com)

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PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT
601 EAST ELLSWORTH LANE
BAYSIDE, WISCONSIN
GILES PROJECT NO. 1G-2208024

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Appendix B - Field Procedures
Appendix C - Laboratory Testing and Classification
Appendix D - General Information and Important Information about This Geotechnical Report

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT
601 EAST ELLSWORTH LANE
BAYSIDE, WISCONSIN
GILES PROJECT NO. 1G-2208024

1.0 SCOPE OF SERVICES

This report provides the results of the *Geotechnical Engineering Exploration and Analysis* that Giles Engineering Associates, Inc. ("Giles") conducted for the proposed project. The *Geotechnical Engineering Exploration and Analysis* included a geotechnical subsurface exploration program, geotechnical laboratory services, and geotechnical engineering. The scope of each service area was narrow and limited as directed by our client and based on our understanding and assumptions about the proposed project. Services are briefly described later. Environmental consulting was beyond Giles' authorized scope for this project.

Geotechnical-related recommendations are provided in this report for design and construction of the foundations, at-grade floors, and elevator pits for the proposed school building. Recommendations are also provided for new parking areas and drives. Furthermore, preliminary infiltration information is provided regarding proposed stormwater management areas. Site preparation recommendations are also given but are only preliminary because the means and methods of site preparation will depend on factors that were unknown when this report was prepared. These factors include, but are not limited to, the weather before and during construction, the subsurface conditions that are exposed during construction, and the final details of the proposed project.

2.0 SITE DESCRIPTION

The subject site is along the south side of E. Ellsworth Lane, immediately east of N. King Road, in Bayside, Wisconsin. The subject site is shown on the *Test Boring Location Plan*, enclosed as Figure 1 in Appendix A. When the test borings (described later) were performed, the site was occupied by the Bayside Middle School development, which generally included a school building, athletic fields, asphalt-concrete parking areas and drives, and grass-covered areas. The site was relatively flat and level. Topographic contour lines on the *Site Layout Plan*, prepared by Kapur, show that ground grades at the site vary between ±El. 665 and ±El. 675.

3.0 PROJECT DESCRIPTION

Proposed School Building

The existing school building will be demolished, and a new school building (122,000 square feet) will be constructed at the location shown on the *Test Boring Location Plan*. Specific details of the proposed building were not provided to us; therefore, this report assumes that it will be a two-story masonry structure that will not have a basement but will have elevator pits, which are assumed to be a maximum of about 4 feet deep. It is expected that bearing walls and columns

will support the building. The maximum foundation load from bearing walls is assumed to be 7,000 pounds per lineal foot, and the maximum foundation load per column is assumed to be 300,000 pounds. It is understood that the first floor of the school building is planned to be a ground-bearing concrete slab; the maximum floor load is assumed to be 100 pounds per square foot (psf).

The *Site Layout Plan*, referenced above, shows that the first floor of the proposed school building will be at EL. 673. According to the topographic contour lines on the *Site Layout Plan*, ground grades in the proposed building area vary between ±El. 669 and ±El. 674. Therefore, up to several feet of fill, with relatively minor cutting, is expected in the proposed building area.

Proposed Parking Areas and Drives

As shown on the *Test Boring Location Plan*, new parking areas and drives will be east of the proposed school building and along the eastern property boundary. It is assumed that the parking areas and drives will be paved with asphalt-concrete, but Portland cement concrete pavement will be in areas of higher traffic stress. Because Giles was not provided with traffic information, the pavement recommendations provided later are based on assumed traffic conditions. Also, because proposed pavement grades were not provided, this report assumes that pavement surface grades will be within 1½ feet of the current ground grades.

Proposed Stormwater Management Basins

Details of the proposed stormwater management basins were not provided, except that the basins are planned to be constructed at the northwest and southeast corners of the proposed construction area, as shown on the *Test Boring Location Plan*. This report assumes that the basins are planned to be several feet deep, measured from the existing ground grades.

4.0 GEOTECHNICAL SUBSURFACE EXPLORATION PROGRAM

To explore subsurface conditions, seventeen geotechnical test borings were conducted at the site using a mechanical drill-rig. Test Borings 1 through 8 were in the proposed school building area and were advanced to ±31 feet below-ground. Test Borings 9 through 12 were in proposed pavement areas and were ±16 feet deep. Test Borings 13 through 16 were in the proposed stormwater basin areas and were ±21 feet deep. Test Boring 17 was in the existing athletic field located near the intersection of E. Ellsworth Lane and N. King Road and was advanced to ±31 feet. The test boring locations were positioned at the site based on measurements from existing site features and by estimating right angles. Approximate locations of the test borings are shown on the *Test Boring Location Plan*.

Samples were collected from each test boring, at certain depths, using the Standard Penetration Test (SPT), conducted with the drill rig. A brief description of the SPT is given in Appendix B along with descriptions of other field procedures. Immediately after sampling, select portions of the SPT samples were placed in containers that were labeled at the site for identification. A Standard

Penetration Resistance value (N-value) was determined from each SPT. N-values are reported on the *Test Boring Logs* (in Appendix A), which are records of the test borings.

The boreholes were backfilled upon completion; however, backfill material will likely settle or heave, creating a hazard that can injure people and animals. Borehole areas should, therefore, be carefully and routinely monitored by the property owner or by others; settlement and heave of backfill materials should be repaired immediately. Giles will not monitor or repair boreholes.

5.0 GEOTECHNICAL LABORATORY SERVICES

Samples that were retained from the test borings were transported to Giles' geotechnical laboratory where the samples were classified using the descriptive terms and particle-size criteria shown on the *General Notes* in Appendix D and by using the Unified Soil Classification System (ASTM D 2488) as a general guide. Classifications are shown on the *Test Boring Logs* along with horizontal lines that show estimated depths of material change. Field-related information pertaining to the test borings is also shown on the *Test Boring Logs*. For simplicity and abbreviation, terms and symbols are used on the *Test Boring Logs;* the terms and symbols are defined on the *General Notes*.

Soil samples retained from Test Borings 13 through 16 (conducted in the proposed stormwater basin areas) were visually classified using the USDA textural classification system in general accordance with the guidelines provided in the *Field Book for Describing and Sampling Soils* (USDA, Sept. 2012). USDA classifications are shown on the Wisconsin DSPS *Soil and Site Evaluation – Storm* logs, included in Appendix A. Supplemental information regarding soil classifications, including the USDA and USCS soil classification systems, is included in the *Soil Classification Notes* enclosure in Appendix D.

Unconfined compression (without measured strain), calibrated penetrometer resistance, and moisture content tests were performed on select soil samples to evaluate their engineering properties. Test results are on the *Test Boring Logs*. Because testing was conducted on SPT samples, which are categorized as disturbed samples, results of the strength-related tests are approximate. Laboratory procedures are briefly described in Appendix C.

6.0 MATERIAL CONDITIONS

Because material sampling at the test borings was discontinuous, it was necessary to estimate conditions between sample intervals. Estimated conditions at the test borings are briefly discussed in this section and are described in more detail on the *Test Boring Logs*. The conclusions and recommendations in this report are based only on the estimated conditions shown on the *Test Boring Logs*.

6.1. Surface Materials

Topsoil that was between ±4 and ±12 inches thick was at the surface of Test Borings 1, 3, 4, 5, 6, 7, 8, 13, 14, 15, and 17. The topsoil generally consisted of lean clay and sandy clay and included an estimated little amount of organic matter. About 1 inch of gravel was at the surface of Test Boring 2. Asphalt-concrete pavement that was about 4 to 5 inches thick was at the surface of Test Borings 9, 10, 11, 12, and 16. Base material that was between ±7 and ±16 inches thick was below the asphalt pavement.

6.2. Fill Material

At Test Borings 1 through 7, 10, 12, 13, 15, 16, and 17 fill material was beneath the surface materials and was encountered to depths between ±2 and ±6½ feet below-ground. The fill material mostly consisted of sandy clay and lean clay. However, gravel fill was encountered at Test Boring 15 and sandy silt fill was encountered at Test Boring 16. Based on laboratory testing, cohesive fill material (sandy clay and lean clay) exhibited highly variable strength characteristics with comparative consistencies of medium stiff to hard. Because of the variable strength characteristics, existing fill does not appear to be engineered material.

6.3. Native Soil

Native soil that generally consisted of lean clay was below the materials discussed above and was encountered to the termination depth at each test boring. At the test borings, native lean clay typically became gray at depths between ±6½ and ±11 feet below-ground, but gray lean clay was encountered at about 4 feet at Test Boring 15; gray coloration is an indication of soil pore saturation. Based on laboratory testing, native lean clay typically exhibited comparative consistencies of very stiff and hard, but lower-strength (stiff) native lean clay was encountered at Test Boring 15, where gray lean clay was encountered at ±4 feet. At the test borings, gray lean clay was typically wet.

7.0 GROUNDWATER CONDITIONS

Based on the (gray) colors and moisture conditions of the soil samples that were retained from the test borings, it is estimated that the water table was typically ±6½ to ±11 feet below-ground at the test boring locations when the test borings were conducted, except that the water table was about 4 feet below-ground at Test Boring 15. Based on the topographic contour lines on the *Site Layout Plan*, it is estimated that the water table was between ±El. 661 and ±El. 667. Furthermore, the site might be subject to perched groundwater, where groundwater perches above the water table. Groundwater conditions at the site will likely fluctuate.

Because the water table was estimated from test borings, it could be shallower or deeper than described above. If a precise determination of the water table is needed, groundwater observation wells are recommended to be installed at the site, and the observation wells are recommended to be monitored over a sufficiently long timeframe. Giles can install and monitor observation wells.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1. Seismic Design Considerations

A soil Site Class C is recommended for seismic design. Site Class is based on the average properties of subsurface materials to 100 feet below-ground. Because 100-foot test borings were not requested or authorized for the project, it was necessary to estimate the Site Class based on the test borings, presumed area geology, and the International Building Code.

8.2. Building Foundation Recommendations

Based on the proposed first-floor elevation, discussed in Section 3.0, a spread-footing foundation is recommended for the proposed school building. However, existing fill is unsuitable for direct or indirect support of foundations. Each footing must bear on suitable native soil, or on new engineered fill or lean-concrete backfill (both discussed below) placed on suitable native soil. The foundations are recommended to be designed using a 4,500 pound per square foot (psf) maximum, net, allowable soil bearing capacity. For geotechnical considerations and regardless of the calculated foundation-bearing stress, strip footings are recommended to be at least 16 inches wide and isolated footings are recommended to be at least 24 inches wide and long. From a geotechnical perspective, foundation walls could be constructed of reinforced cast-in-place concrete or concrete masonry units (CMU). It is recommended that a structural engineer provide specific foundation details, including footing dimensions, reinforcing, etc.

A minimum 48-inch foundation-embedment depth is required by the building code. It is, therefore, recommended that footings for perimeter walls and other exterior elements of the building bear at least 48 inches below the finished ground-grade at the perimeter of the building. Because the building will be heated, interior footings can bear above the 48-inch embedment depth.

The following table provides estimated depths and elevations of native soil that was suitable for foundation support (based on the recommended 4,500 psf bearing capacity) at Test Borings 1 through 8, which were conducted in the proposed building area. Suitable soil might be at variable and deeper depths away from the test borings, especially due to existing fill, the existing development, perched groundwater, and lower-strength native soil.

TABLE 1
ESTIMATED DEPTH/ELEVATION OF SUITABLE NATIVE SOIL

Test Boring Number	Estimated Depth of Suitable Native Soil	Estimated Elevation of Suitable Native Soil
1	±6½ feet	±El. 666.5
2	±2 feet	±El. 672.7
3	±5 feet	±El. 668.9
4	±6½ feet	±El. 663.3
5	±6½ feet	±El. 666.7
6	±6½ feet	±El. 665.5
7	±6½ feet	±El. 663.3
8	±1½ feet	±El. 671.0

- For direct foundation support and for placement of engineered fill or lean-concrete backfill; based on a 4,500 psf maximum, net, allowable soil bearing capacity.
- Depths are referenced to the site grades when the test borings were performed.
- Elevations are referenced to the elevations on the *Test Boring Logs*.

Based on the proposed first-floor elevation and the depths/elevations of suitable native soil shown in Table 1, extensive over-excavation below the planned foundation bearing grades is expected to be necessary to develop proper foundation support. Therefore, testing and approval of foundation-support soil by a geotechnical engineer during construction is critical. Without testing and approval of foundation-support soil by a geotechnical engineer, the proposed building could be improperly supported.

A frictional coefficient of 0.32 is recommended to determine lateral resistance at the base of foundations. The recommended frictional coefficient is only for concrete cast directly on suitable native soil, or on new engineered fill or lean-concrete backfill used to replace unsuitable materials. Lateral resistance due to friction should be determined based on dead load only. Also, the ultimate lateral resistance determined from the frictional coefficient is recommended to be factored to determine an allowable value. Passive resistance is recommended to be neglected to at least the recommended 48-inch foundation-embedment depth due to seasonal changes and due to the amount of lateral movement necessary to develop full passive pressure.

Foundation excavations are recommended to be dug with a smooth-edge excavator bucket to develop a relatively undisturbed bearing grade. A toothed bucket will likely disturb foundation-bearing soil more than a smooth-edge bucket thereby making soil at the excavation base more susceptible to saturation and instability, especially during adverse weather. It is critical that contractors protect foundation-support soil and foundation construction materials (concrete and reinforcing). Furthermore, engineered fill is recommended to be placed and compacted in benched excavations along foundation walls immediately after the foundation walls can properly support lateral pressures from backfill, compaction, and compaction equipment. Earth-formed footing construction techniques are expected to be feasible.

Foundation Support Soil Recommendations

Existing fill is unsuitable for direct or indirect support of foundations. Each footing must be directly supported by suitable native soil, or by new engineered fill or lean-concrete backfill (both discussed below) placed on suitable native soil. Based on the recommended 4,500 psf maximum, net, allowable soil bearing capacity, the in-situ unconfined compressive strength of cohesive native soil, such as lean clay, within foundation influence zones is recommended to be at least 2¼ tons per square foot (tsf). Granular native soil, if any, within foundation influence zones is recommended to have a corrected N-value (determined from SPTs and correlated from other in-situ tests) of at least 14, based on the recommended bearing capacity. It is further recommended that the strength characteristics of soil within all foundation influence zones (determined by a geotechnical engineer during construction) meet or exceed the recommended values unless Giles approves other values. Foundations are recommended to be constructed immediately after suitable soil support is confirmed since weather can cause soil to become unstable.

Full-time evaluation of foundation-support soil by a geotechnical engineer during foundation excavation and foundation construction is recommended. The purpose of the evaluation is (1) to confirm that the foundations will be properly supported by suitable native soil, (2) to determine where over-excavation is needed, and (3) to confirm that the subsurface conditions are similar to those shown on the *Test Boring Logs*. If a firm other than Giles performs the recommended support-soil evaluation, Giles must be notified if the composition or strength characteristics of foundation-support soil differ from the subsurface conditions shown on the *Test Boring Logs*; revision of this report might be necessary. Without evaluation and approval of foundation-support soil by a geotechnical engineer the proposed building could be improperly supported, which could lead to excessive settlement and other structural problems. OSHA requirements must be strictly followed when evaluating foundation-support soil. Excavations that do not meet OSHA safety guidelines must not be entered.

Depending on the excavation depth and groundwater conditions, unsuitable materials beneath foundation areas could be replaced with engineered fill consisting of properly compacted dense-graded crushed stone that meets the gradation requirements of *dense-graded base* (1¼-inch) in Section 305 of the Wisconsin Department of Transportation Standard Specifications (current edition). Granular material with other gradation characteristics could possibly be used but should be approved by a geotechnical engineer before the material is placed. If engineered fill is used as backfill lateral over-excavation of unsuitable materials will also be required, in addition to the required vertical over-excavation. The overall width of lateral over-excavation will depend on the depth of vertical over-excavation. For estimating purposes, the minimum lateral over-excavation could be approximated by extending an imaginary line outward and downward at a ratio of 1(horizontal):2(vertical) from the bottom edges of a footing pad, but the actual lateral extents of over-excavation are recommended to be approved by a geotechnical engineer during construction.

Lean Portland cement concrete (minimum 28-day compressive strength of 500 psi) could also be used to replace unsuitable materials beneath foundation areas and is Giles' preferred backfill material for this project, considering the groundwater conditions and expected over-excavation depths. Where it is used, footing construction must not begin until the lean-concrete backfill has gained sufficient strength. Also, over-excavations that are filled with lean concrete must be at least as wide (on all sides) as the footing pad that will be supported by the concrete, and excavation sidewalls are recommended to be plumb and parallel. To help control caving and to protect the support materials, lean-concrete backfill is recommended to be placed immediately after excavation. This trench-and-pour method requires close communication and scheduling between the general contractor, foundation contractor, geotechnical engineer, and concrete supply company. With a trench-and-pour method it is critical that a geotechnical engineer observe excavations as they are made.

As an option to replacing unsuitable materials beneath foundation areas, strip footings can possibly be stepped or thickened to extend through unsuitable materials and isolated footings can possibly be uniformly thickened. It is recommended that a structural engineer provide specific details of stepped and thickened footings.

Estimated Foundation Settlement

The post-construction total and differential settlements of a spread-footing foundation designed and constructed based on this report are estimated to be less than about 1.0 inch and ½ inch, respectively. Estimated settlements assume that foundation-support materials will be thoroughly evaluated and approved by a geotechnical engineer during foundation excavation and foundation construction.

8.3. At-Grade Floor Slab Recommendations

With proper subgrade preparation, existing soil (including existing fill) is expected to be suitable to support an at-grade floor slab for the proposed school building; new engineered fill that is placed on properly prepared existing soil is also expected to be suitable. However, especially due to existing fill and the existing development, subgrade improvement will likely be necessary to develop proper slab support, as discussed in Section 8.7 of this report. Consequently, the entire floor area is recommended to be thoroughly evaluated and approved by a geotechnical engineer immediately before fill placement and before floor construction.

From a geotechnical perspective and based on a maximum 100 psf floor load, a minimum 4-inch-thick floor slab is recommended for the proposed building; this thickness assumes that the 28-day compressive strength of concrete will be at least 3,500 pounds per square inch (psi). Assuming proper site preparation, the floor slab may be designed using a *Modulus of Subgrade Reaction* (K_{v1}) value of 100 pounds per square inch per inch (psi/in). It is recommended that a structural engineer specify the floor slab thickness, reinforcing, joint details, and other parameters.

A minimum 4-inch-thick base course is recommended to be below the floor slab to serve as a capillary break and for support considerations. It is recommended that the base course consist of free-draining aggregate that has been tested and approved by a geotechnical engineer. Depending on aggregate gradation, geotextile might need to be below the base course to serve as a separator. The need for geotextile should be determined during construction with the assistance of a geotechnical engineer.

A minimum 10-mil vapor retarder is recommended to be directly above or below the base course throughout the entire floor area. The position (above or below the base course) of the vapor retarder should be specified by the project structural engineer. Vapor retarder sheets are recommended to be overlapped at least 6 inches, and the overlaps are recommended to be continuously taped. Also, vapor retarder must extend to all foundation walls. Vapor retarder is recommended to be in accordance with ASTM E 1745, entitled *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs*, and other relevant documents. If the base course includes sharp aggregate, protecting the retarder with geotextile or by other means is recommended.

Due to the frost-susceptible site soil and groundwater conditions, certain areas of the floor slab (such as near exterior doors and entrance/exit vestibules) might be susceptible to freeze-thaw related movement. Installation of insulation or other protective measures against freeze-thaw movement should be considered for these areas. Pavement and ground grades are recommended to be sloped away from the building and sidewalks to reduce water infiltration and potential freeze-thaw problems.

Estimated Floor Slab Settlement

The post-construction total and differential settlements of an isolated floor slab constructed in accordance with this report are estimated to be less than about ½ inch and ⅜ inch, respectively, over about 20 feet. Estimated settlements assume that floor slab support materials will be thoroughly tested and approved by a geotechnical engineer

8.4. Elevator Pit Recommendations

It is assumed that the building will have elevator pits. This report assumes that elevator pits will be a maximum of 4 feet deep and that the floor of each pit will be at or ±El. 669. Based on that pit-floor elevation, the elevator pits are recommended to be watertight. It is recommended that watertight construction include water stops at all control joints, construction joints, and at all other junctures where water could enter the elevator pits. Furthermore, the elevator pits are recommended to be surrounded by a waterproof membrane. Alternative waterproofing materials (such as a concrete admixture) could also be used to waterproof the elevator pits. Waterproofing materials are to be specified by the structural engineer and are recommended to be installed in accordance with the manufacturer's recommendations.

The elevator pits are recommended to be designed based on fully submerged conditions. Therefore, elevator-pit walls are recommended to be designed to resist lateral earth pressure and hydraulic lateral pressure, and pit floors are recommended to be designed to resist hydrostatic uplift. Hydrostatic uplift must, however, be determined by a structural engineer based on final details of the elevator pits. The structural engineer should also determine if anchors or additional concrete are needed to resist uplift of the elevator pits.

It is assumed that elevator-pit walls will be cast near existing soil, and that engineered fill between the walls and surrounding soil will consist of properly compacted well-graded aggregate. Based on the test borings, and for submerged conditions, elevator-pit walls are recommended to be designed for an equivalent “at-rest” fluid pressure of 100 psf/ft. Horizontal pressures caused by surface and subsurface surcharge loads (such as floor loads) must be added to the "at-rest" fluid pressure. Giles could provide supplemental recommendations regarding surface and subsurface surcharge loads on a case-by-case basis but would require specific structural information. Elevator-pit walls that are not designed to resist actual pressures could move laterally and possibly fail.

8.5. Pavement Recommendations

Because traffic-related information was not provided to us, recommendations are included herein for light-duty and moderate-duty pavement using assumed traffic conditions. The light-duty pavement section is for passenger-vehicle parking areas and is based on an assumed traffic condition of five 18-kip Equivalent Single Axle Loads (ESALs) per day. The moderate-duty pavement section is for drives that will be subject to buses and other heavy vehicles and is based on an assumed traffic condition consisting of fifteen 18-kip ESALs per day. The recommended pavement sections assume no increase in traffic volume and no changes in vehicle type or traffic pattern. Also, it is assumed that the ESALs noted above will be in one direction for each lane.

It is important that the project owner, developer, civil engineer, and other design professionals involved with the project confirm that the ESALs noted above are appropriate for the expected traffic conditions, vehicle types, and axle loadings. If requested, Giles can provide supplemental pavement recommendations based on other traffic conditions, vehicle types, and axle loads. The recommended pavement sections could underperform or fail prematurely if the design ESALs are exceeded.

Based on the test borings and with proper subgrade preparation, it is expected that pavement support materials will include lean clay and likely other cohesive soil. Therefore, the recommended pavement sections were developed based on a lean clay subgrade with an assumed field CBR value of 4 and a *Modulus of Subgrade Reaction* (K_{V1}) value of 100 psi/in. Engineered fill that is placed in proposed pavement areas is recommended to have a field CBR value and a *Modulus of Subgrade Reaction* (K_{V1}) value at least equal to these design values. Fill is recommended to be placed and compacted per this report.

The following table shows the recommended thicknesses for hot-mix asphalt (HMA) pavement with an aggregate base-course. State specifications are also included in the table. The recommended pavement sections are based on the traffic conditions described above.

TABLE 2
RECOMMENDED HMA PAVEMENT SECTION

Materials	Light Duty	Moderate Duty	Wisconsin DOT Standard Specifications
Hot-Mix Asphalt Surface Course	1.5 inches	1.5 inches	Section 460
Hot Mix Asphalt Binder Course	1.5 inches	2.5 inches	Section 460
Dense-Graded Aggregate Base Course	7.0 inches	8.0 inches	Section 305, 1¼-inch Crushed Stone

Portland cement concrete pavement is recommended in higher-stress areas, such as the lot entrance and exit aprons, at refuse enclosures, and in areas where trucks will turn or will be parked. Based on the assumed ESALs, discussed above, concrete pavement is recommended to be at least 6 inches thick and is recommended to be underlain by a minimum 4-inch-thick aggregate base course. It is recommended that concrete pavement have load-transfer reinforcement, where appropriate. Control-joint spacing should be determined in accordance with the current ACI code. Expansion joints should be provided where pavement abuts fixed objects, such as the building and light poles. The 28-day compressive strength of concrete is recommended to be at least 4,000 psi, and the concrete should be properly air-entrained for durability. It is recommended and assumed that a civil engineer will provide specific recommendations for concrete pavement, including reinforcing details and control-joint spacing. Materials and construction procedures for concrete pavement and the aggregate base are recommended to be in accordance with Wisconsin DOT specifications.

General Pavement Considerations

The pavement recommendations assume that the pavement subgrade will be prepared according to this report, the base course will be properly drained, and a geotechnical engineer will observe and test pavement construction. Pavement was designed based on AASHTO design parameters for a twenty-year design period, but the actual service life will likely be much less, considering the cohesive soil. Local codes may require specific testing to determine soil support characteristics, and a minimum pavement section might be required. Pavement will be subject to frost heave.

8.6. Preliminary Stormwater Infiltration Screening

Stormwater management basins are planned to be constructed in the areas of Test Borings 13 through 16 (test boring locations are shown on the *Test Boring Location Plan*). This report assumes that the basins are planned to be several feet deep, measured from the existing ground

grades. Because of the low permeability soil that was encountered, Giles considers the proposed basin areas to be exempt from stormwater infiltration requirements per section NR 151.124(4)(c) of the Wisconsin Administrative Code and WDNR 1002 guidelines.

8.7. Generalized Site Preparation Recommendations

This section provides recommendations for preparation of floor slab, pavement, and engineered fill areas. The means and methods of site preparation will greatly depend on the weather conditions before and during construction, the subsurface conditions that are exposed during earthwork operations, and the finalized details of the proposed development. Therefore, only generalized site preparation recommendations are given.

In addition to being generalized, the following site preparation recommendations are abbreviated; the *Guide Specifications* in Appendix D gives further recommendations. The *Guide Specifications* should be read along with this section. Also, the *Guide Specifications* are recommended to be used as an aid to develop the project specifications.

Removal and Stripping

All components of the existing building are recommended to be removed from the proposed building area and to at least three feet beyond the proposed building area. Disposal of rubble and debris is recommended to be in accordance with local, state, and federal regulations for the material type. Outside the proposed building area, it might be feasible for existing foundations to remain provided the foundations are stable, are cut-off at least three feet below the planned subgrade, and hollow cores are grouted solid. Remaining floor slabs that are outside the proposed building area could also stay in-place provided the slabs are at least three feet below the planned finished grade, are perforated (broken) on a maximum two-foot grid, are “seated” into the subgrade for stability, and are covered with a minimum 12-inch-thick layer of well-graded free-draining granular material for drainage. It is important to note that building remnants that remain in-place might cause excavation difficulties for new utilities, landscape plantings, and future construction. Construction remnants that stay in-place might be susceptible to frost heave. Excavations created during removal of construction components must be backfilled with engineered fill, which might need to be benched into the surrounding soil, as noted in Item No. 3 of the *Guide Specifications* enclosed in Appendix D.

Pavement, surface vegetation, trees and bushes (including root-balls), topsoil, and other unsuitable materials are recommended to be removed from the proposed building area, proposed pavement areas, and other proposed structural areas. Stripping should extend at least several feet beyond proposed development areas, where feasible. Existing pavement should remain in place as long and possible to protect the underlying soil, which is extremely sensitive to moisture and disturbance.

Proof-Rolling and Fill Placement

After the recommended removal and stripping, and once the proposed development areas are cut (lowered) as needed, the subgrade within each proposed development area is recommended to be proof-rolled with a fully-loaded tandem-axle dump truck to help locate unstable soil based on subgrade deflection caused by the wheel loads of the proof-roll equipment. All proposed development areas are recommended to be proof-rolled. And, where feasible, proof-rolling should extend at least several feet beyond the proposed development areas. However, for safety, proof-roll equipment must be kept a sufficient distance from excavations. Because of the existing fill and existing development, it is critical that a geotechnical engineer observe proof-roll operations and evaluate subgrade stability based on those observations. Areas that cannot be proof-rolled are recommended to be evaluated and approved by a geotechnical engineer using appropriate means and methods.

Unsuitable material will likely be identified during proof-rolling/testing, especially considering the existing fill and existing development. Subgrade improvement might be necessary. Areas requiring improvement should be defined during construction with the assistance of a geotechnical engineer. Also, specific improvement methods should be determined during construction on an area-by-area basis depending on the site conditions and the results of proof-rolling/testing. Where subgrade improvement is needed, it might be necessary to construct “test strips” to determine cost-effective methods of developing a suitable subgrade. A geotechnical engineer should provide specific recommendations regarding subgrade improvement at the time of construction based on the site conditions.

The proposed development areas are recommended to be raised, where necessary, to the planned finished grade with engineered fill immediately after the subgrade within each area is confirmed to be stable and suitable to support the proposed site improvements. Engineered fill is recommended to be placed in relatively thin layers (lifts) that are uniform in elevation. Each layer of engineered fill is recommended to be compacted to at least 95 percent of the fill material’s maximum dry density determined from the Standard Proctor compaction test (ASTM D698). As an exception, the in-place dry density of engineered fill within one foot of a pavement subgrade is recommended to be compacted to at least 100 percent of the fill’s maximum dry density. The water content of fill material is recommended to be uniform and within a narrow range of the optimum moisture content, also determined from the Standard Proctor compaction test. Item Nos. 4 and 5 of the *Guide Specifications* give more information pertaining to selection and compaction of engineered fill.

Engineered fill that does not meet the density and water content requirements is recommended to be replaced or scarified to a sufficient depth (likely 6 to 12 inches, or more), moisture-conditioned, and compacted to the required density. A subsequent lift of fill should only be placed after a geotechnical engineer confirms that the previous lift was properly placed and compacted. Subgrade soil will likely need to be recompacted immediately before construction since equipment traffic and adverse weather may reduce soil stability.

Use of Site Soil as Engineered Fill

Site soil that does not contain over-sized materials, adverse organic content, or other deleterious materials possibly could be used as engineered fill. However, due to the variability of the existing fill, it might not be possible to monitor the in-place compaction and moisture content of non-native soil, used as fill, with a nuclear gauge or sand cone since the maximum dry density and optimum moisture content of the soil would also be variable. Instead, a method specification might need to be developed for placement and compaction of non-native soil used as engineered fill. In general, a method specification should be based on the actual compaction equipment used and should specify a maximum lift thickness, the minimum quantity and orientation of passes with the compaction equipment, and the minimum overlap of passes.

Also, site soil will likely need to be moisture conditioned (uniformly moistened or dried) before it is used as engineered fill. If construction is during adverse weather (discussed below), drying site soil will likely not be feasible. In this case, fill material will likely need to be imported to the site. Additional recommendations regarding fill selection, placement, and compaction are given in the *Guide Specifications*.

8.8. Generalized Construction Considerations

Adverse Weather

Site soil is extremely sensitive to moisture and will become unstable when exposed to adverse weather, such as rain, snow, and freezing temperatures. Therefore, it might be necessary to remove or stabilize the upper 6 to 12 inches (or more) of soil due to adverse weather, which commonly occurs during late fall, winter, and early spring. At least some over-excavation or stabilization of unstable soil should be expected if construction is during or after adverse weather. Because site preparation is weather dependent, bids for site preparation and other earthwork activities should consider the time of year that construction will be conducted.

To protect soil from adverse weather, the site surface is recommended to be smoothly graded and contoured during construction to divert surface water away from construction areas. Contoured subgrades are recommended to be rolled with a smooth-drum compactor before precipitation to “seal” the surface. Furthermore, construction traffic should be restricted to certain aggregate-covered areas to control traffic-related soil disturbance. Foundation, floor slab, and pavement construction should begin immediately after suitable support is confirmed since adverse weather can cause soil to become unstable.

Dewatering

Filtered sump pumps, drawing water from sump pits excavated in the bottom of construction trenches, are expected to be adequate to remove water that collects in shallow excavations. Excavated sump pits should be lined with geotextile and filled with open-graded, free-draining

aggregate. It is recommended that a geotechnical engineer monitor and approve dewatering since improper dewatering could cause support-related problems at the site and at nearby properties.

Excavation Stability

Excavations are recommended to be made in accordance with current OSHA excavation and trench safety standards and other applicable requirements. Excavation walls are recommended to be sloped, benched, or braced to develop and maintain a safe work environment. Temporary shoring must be designed according to applicable regulatory requirements. Contractors are responsible for excavation safety.

Existing Utilities

All existing utilities are recommended to be identified and located and any planned to be maintained should be relocated outside the proposed building area. Utilities that are not reused should be capped-off and removed in accordance with local codes and ordinances. Excavations for the removal of utilities are recommended to be backfilled with engineered fill placed under engineering-controlled conditions. Grading operations must be done carefully so that existing utilities are not damaged or disturbed. Utility locations, elevations, and types should be checked relative to the planned construction to identify any concerns.

8.9. Recommended Construction Materials Testing Services

This report was prepared assuming that a geotechnical engineer will perform Construction Materials Testing ("CMT") services during construction of the proposed development. Supplemental geotechnical recommendations might be needed based on the results of CMT services and specific details of the project not known at this time.

9.0 BASIS OF REPORT

This report is strictly based on the project description given in Section 3.0. Giles must be notified if the project description or our assumptions are not accurate so that this report can be amended, if needed. This report assumes that the facility will be designed and constructed according to the codes that govern construction at the site.

The conclusions and recommendations in this report are only based on the estimated subsurface conditions shown on the *Test Boring Logs*. Giles must be notified if the subsurface conditions that are encountered during construction of the proposed development differ from those shown on the *Test Boring Logs*; revision of this report might be necessary. General comments and limitations of this report are given in the appendix.

The conclusions and recommendations in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.

APPENDIX A

FIGURES AND TEST BORING LOGS

The Test Boring Location Plan contained herein was prepared based upon information supplied by *Giles'* client, or others, along with *Giles'* field measurements and observations. The diagram is presented for conceptual purposes only and is intended to assist the reader in report interpretation.

The Test Boring Logs and related information enclosed herein depict the subsurface (soil and water) conditions encountered at the specific boring locations on the date that the exploration was performed. Subsurface conditions may differ between boring locations and within areas of the site that were not explored with test borings. The subsurface conditions may also change at the boring locations over the passage of time.

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NOTES:

1.) TEST BORING LOCATIONS ARE APPROXIMATE.

2.) BASE MAP DEVELOPED FROM THE "SITE LAYOUT PLAN" (SHEET C102), UNDATED, PREPARED BY KAPUR, INC.

FIGURE 1
TEST BORING LOCATION PLAN
PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT
601 E. ELLSWORTH LANE
BAYSIDE, WISCONSIN

DESIGNED	DRAWN	SCALE	DATE	REVISED
GCH	Jdid	approx. 1"=80'	09-29-22	--
PROJECT NO.: 1G-2208024			CAD No. 1g2208024-blp	

LEGEND:

- 1–8, 17 — BUILDING GEOTECHNICAL TEST BORING
- 9–12 — PAVEMENT GEOTECHNICAL TEST BORING
- 13–16 — STORMWATER GEOTECHNICAL TEST BORING

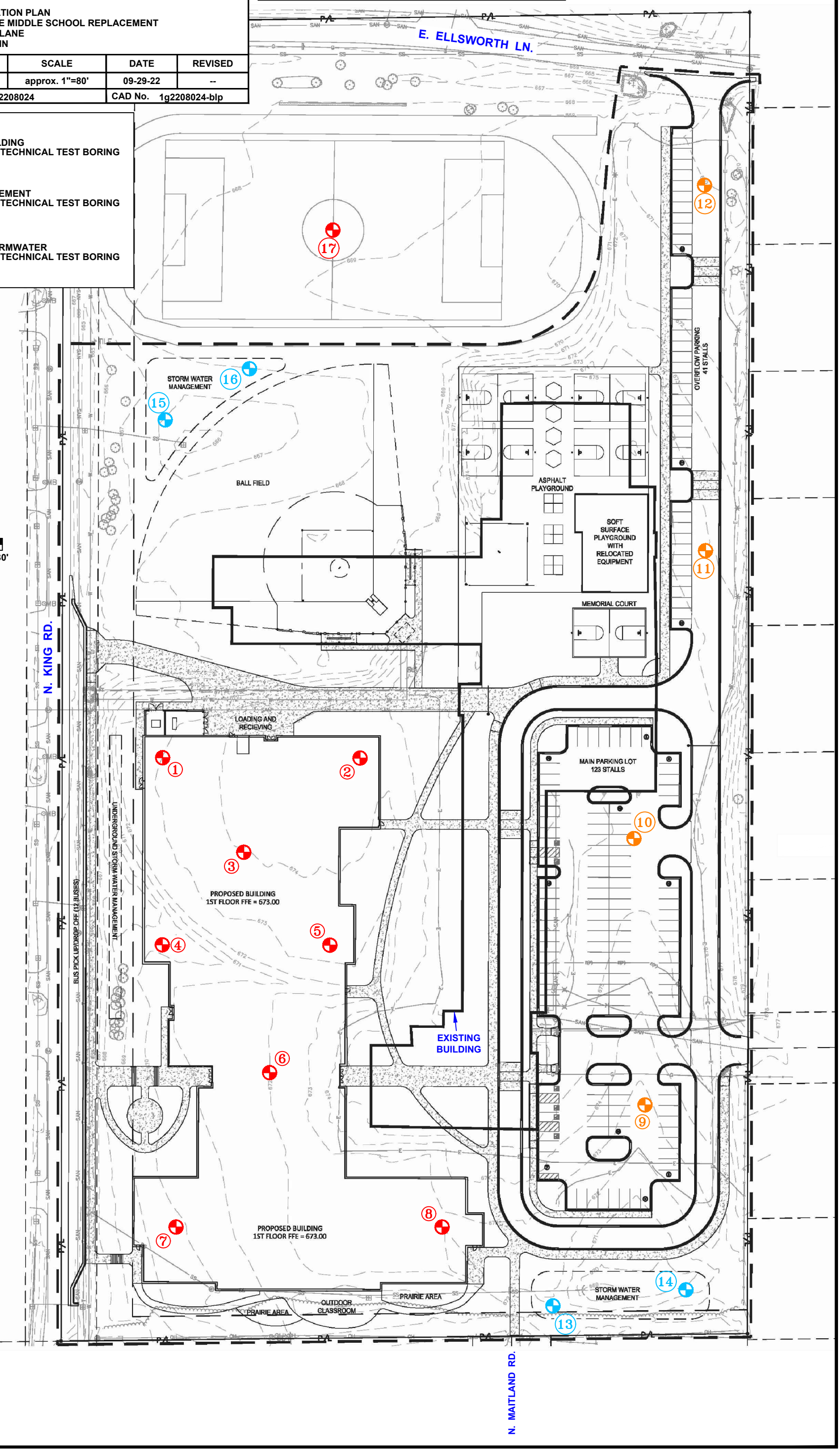
N

W E

S

0 40' 80'

APPROXIMATE SCALE



BORING NO. & LOCATION: 1	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 673 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: JAMES BLAIR	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±4" Topsoil: Dark Brown lean Clay, trace Gravel with Organic Matter-Moist			1-SS	6		2.0		16		
Fill: Red-Brown lean Clay-Moist		670	2-SS	11		3.8		16		
Fill: Brown lean Clay, little Sand and Gravel-Moist										
Fill: Dark Brown Sandy Clay-Moist	5		3-SS	11	2.5	2.8		21		
Gray lean Clay, little Sand-Moist		665	4-SS	11	2.4	2.3		27		
	10		5-SS	18	5.4	4.0		17		
		660								
	15		6-SS	22		2.5		17		
		655								
	20		7-SS	15	3.0	2.8		18		
		650								
	25		8-SS	16	4.5	3.0		18		
		645								
	30		9-SS	17	3.1	2.0		19		
Boring Terminated at about 31 feet (EL. 642')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

BORING NO. & LOCATION: 2	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 674.7 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: JAMES BLAIR	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±1" Gravel										
Fill: Brown Sandy Clay, trace Gravel-Moist			1-SS	11	6.4	4.5+		15		
Brown lean Clay, little Sand, trace Gravel-Moist			2-SS	16	7.6	4.5+		15		
	5	670	3-SS	19	6.8	4.5+		17		
			4-SS	19	3.7	3.8		19		
	10	665	5-SS	13	3.5	3.5		20		
Gray lean Clay, little Sand-Moist	15	660	6-SS	14	2.7	3.0		19		
	20	655	7-SS	14	3.5	3.3		19		
	25	650	8-SS	16	3.9	3.3		18		
	30	645	9-SS	18	3.1	3.3		17		
Boring Terminated at about 31 feet (EL. 643.7')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 3	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 673.9 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: DAVIS LUCKETT	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±6" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist			1-SS	20						
Fill: Clayey Sand, Gravel-Moist			2-SS	17		2.3		26		
Fill: Sandy Clay, trace Gravel-Moist		670								
Brown lean Clay, trace Sand and Gravel-Moist	5		3-SS	9		4.5+		19		
			4-SS	19	7.6	4.5+		18		
		665								
	10		5-SS	25	7.4	4.5+		18		
Gray lean Clay, little Sand, trace Gravel-Wet		660								
	15		6-SS	12	3.5	3.3		19		
		655								
	20		7-SS	14	2.7	2.8		20		
		650								
	25		8-SS	15	3.5	3.3		19		
		645								
	30		9-SS	21	3.3	3.0		19		
Boring Terminated at about 31 feet (EL. 642.9')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

BORING NO. & LOCATION: 4	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 669.8 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: DAVIS LUCKETT	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±3" Topsoil: Dark Brown Sandy Clay, little Organic Matter			1-SS	8		3.0		20		
Fill: Dark Gray and Brown Sandy Clay, trace Gravel-Moist			2-SS	11		3.5		29		
	5	665	3-SS	11		2.3		34		
Brown lean Clay, little Sand-Moist			4-SS	23	5.2	4.5+		19		
Gray lean Clay, little Sand-Moist to Wet at ±11 feet	10	660	5-SS	16	5.8	4.5+		18		
	15	655	6-SS	12						
	20	650	7-SS	14	3.3	3.0		20		
	25	645	8-SS	14	3.1	3.5		19		
	30	640	9-SS	22	5.8	4.5+		17		
Boring Terminated at about 31 feet (EL. 638.8')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

BORING NO. & LOCATION: 5	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 673.2 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±6" Topsoil:										
Fill: Red-Brown Sandy Clay, trace Gravel-Moist			1-SS	8	5.0	4.5+		17		
		670	2-SS	5		2.0		27		
	5		3-SS	7	1.7	2.0		27		
Brown lean Clay, little Sand, trace Gravel-Moist		665	4-SS	16	5.4	4.5+		20		
	10		5-SS	13	3.7	3.3		19		
Gray lean Clay, little Sand-Wet		660								
	15		6-SS	12	2.9	2.5		19		
		655								
	20		7-SS	9		2.0		18		
		650								
	25		8-SS	15	3.3	3.0		19		
		645								
	30		9-SS	21	4.1	4.3		18		
Boring Terminated at about 31 feet (EL. 642.2')										

	Water Observation Data	Remarks:
▽	Water Encountered During Drilling:	
▼	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
▼	Water Level After Drilling:	
	Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 6	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 672 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±6" Topsoil:										
Fill: Red-Brown Sandy Clay-Moist		670	1-SS	4	2.6	4.5+		18		
			2-SS	7		3.0		25		
Fill: Red-Brown Sandy Clay, little Gravel-Wet	5		3-SS	10		0.8		16		
Brown lean Clay, trace Sand and Gravel-Moist		665	4-SS	16		4.5+		17		
	10		5-SS	15		4.5+		18		
Gray lean Clay, little Sand-Wet		660								
	15		6-SS	15	4.0	3.5		18		
		655								
	20		7-SS	10	2.9	2.3		21		
		650								
	25		8-SS	13	3.9	3.5		19		
		645								
	30		9-SS	13		4.0		18		
Boring Terminated at about 31 feet (EL. 641')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

BORING NO. & LOCATION: 7	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 669.8 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±12" Topsoil: Red-Brown Sandy Clay, little Organic Matter-Moist			1-SS	6		2.5		22		
Fill: Dark Brown lean Clay-Moist			2-SS	6		1.0		31		
Fill: Gray Silty Clay, trace Gravel-Moist	5	665	3-SS	9		1.8		25		
Red-Brown and Gray mottled lean Clay, little Sand-Moist			4-SS	10	5.6	4.5+		16		
Gray lean Clay, little Sand-Moist to Wet at ±11 feet	10	660	5-SS	14	5.6	4.5+		16		
	15	655	6-SS	15	3.5	3.5		19		
	20	650	7-SS	14	4.1	4.3		18		
	25	645	8-SS	14	3.3	3.8		19		
	30	640	9-SS	15	3.1	3.5		18		
Boring Terminated at about 31 feet (EL. 638.8')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 8	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 672.5 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±6" Topsoil: Red-Brown Sandy Clay, little Organic Matter			1-SS	5	2.9	3.3		22		
Red-Brown lean Clay, little Sand-Moist		670	2-SS	8	4.5	4.5+		19		
	5		3-SS	11	8.5	4.5+		18		
Brown lean Clay, trace Gravel-Moist		665	4-SS	14		4.0		20		
	10		5-SS	16	3.1	3.3		20		
Gray lean Clay, little Sand-Wet		660								
	15		6-SS	10	3.1	3.0		21		
		655								
	20		7-SS	12	2.1	2.5		22		
		650								
	25		8-SS	13	3.5	3.5		19		
		645								
	30		9-SS	16		3.5		20		
Boring Terminated at about 31 feet (EL. 641.5')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 9	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 672.7 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: DAVIS LUCKETT	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±5" Asphalt Concrete			1-SS	7		1.0		21		
±7" Base Course										
Red-Brown lean Clay, trace to little Sand-Moist		670	2-SS	35	9.1	4.5+		18		
	5		3-SS	16	7.4	4.5+		17		
Brown lean Clay-Moist		665	4-SS	21	5.0	4.5+		19		
	10		5-SS	18	5.8	4.5+		20		
Gray lean Clay, little Sand-Wet		660								
	15		6-SS	15	3.3	3.0		20		
Boring Terminated at about 16 feet (EL. 656.7')										

	Water Observation Data	Remarks:
▽	Water Encountered During Drilling:	
▼	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
▼	Water Level After Drilling:	
	Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 10	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 675.5 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: DAVIS LUCKETT	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±5" Asphalt Concrete		675	1-SS	9						
±7" Base Course										
Fill: Dark Brown lean Clay, trace Sand-Moist			2-SS	19		4.3		19		
Red-Brown lean Clay, trace Sand-Moist										
	5	670	3-SS	17	3.5	3.5		20		
Brown lean Clay, little Sand-Moist			4-SS	23	4.5	4.5		20		
Gray lean Clay, little Sand-Moist to Wet at ±11 feet	10	665	5-SS	18	4.1	4.0		17		
	15	660	6-SS	20	4.3	3.8		19		
Boring Terminated at about 16 feet (EL. 659.5')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 11	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 675.2 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: DAVIS LUCKETT	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±5" Asphalt Concrete										
±7" Base Course										
Red-Brown lean Clay, little Sand-Moist			1-SS	21						
			2-SS	14	6.2	4.5+		18		
	5	670	3-SS	20	6.2	4.5+		17		
Brown lean Clay, trace Sand-Moist			4-SS	17	4.3	4.3		19		
	10	665	5-SS	20	5.4	4.5+		20		
Gray lean Clay, little Sand-Wet										
	15	660	6-SS	20				20		
Boring Terminated at about 16 feet (EL. 659.2')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 12	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 670.1 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: DAVIS LUCKETT	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±5" Asphalt Concrete			1-SS	9						
±12" Base Course										
Fill: Brown lean Clay-Moist			2-SS	11		2.5		20		
Fill: Gray lean Clay, little Sand-Moist										
	5	665	3-SS	11		1.5		31		
Gray lean Clay, little Sand-Moist			4-SS	17	4.1	4.5		17		
	10	660	5-SS	12	3.5	3.8		17		
Gray lean Clay with Silty Sand lenses-Wet	▽ 15	655	6-SS	14		4.0		18		
Boring Terminated at about 16 feet (EL. 654.1')										

Water Observation Data	Remarks:
▽ Water Encountered During Drilling: 15 ft.	
▼ Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
▼ Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 13	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 671.8 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±6" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist			1-SS	7		2.8		18		
Fill: Dark Brown Sandy Clay-Moist		670	2-SS	4		1.0		28		
Brown lean Clay, little Sand, trace Gravel-Moist	5		3-SS	10	3.1	2.8		20		
		665	4-SS	22		4.5+		17		
	10		5-SS	17	5.6	4.5+		18		
Gray lean Clay, little Sand-Wet		660								
	15		6-SS	27	2.9	3.3		22		
		655								
	20		7-SS	10	2.5	3.0		19		
Boring Terminated at about 21 feet (EL. 650.8')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 14	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 669 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±8" Topsoil: Dark Brown Sandy Clay, trace to little Organic Matter-Moist			1-SS	7	4.7	4.5+		23		
Brown lean Clay, little Sand, trace Gravel-Moist			2-SS	7						
		665								
	5		3-SS	10		2.5		19		
			4-SS	15		4.0		19		
		660								
	10		5-SS	14	4.1	4.0		17		
Gray lean Clay, little Sand, trace Gravel-Wet										
		655								
	15		6-SS	12	2.5	2.5		20		
		650								
	20		7-SS	13	3.3	3.3		12		
Boring Terminated at about 21 feet (EL. 648')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 15	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 667 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: JAMES BLAIR	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±4" Topsoil:			1-SS	8						
Fill: Gravel		665								
Fill: Brown lean Clay with Sand and Gravel, little Organic Matter-Moist			2-SS	11		1.5				
Gray lean Clay, little Sand-Moist	5		3-SS	8		1.5				
		660								
			4-SS	13		2.5				
	10		5-SS	17		2.3				
		655								
	15		6-SS	13	3.4	2.8				
		650								
	20		7-SS	11		2.5				
Boring Terminated at about 21 feet (EL. 646')										

	Water Observation Data	Remarks:
▽	Water Encountered During Drilling:	
▼	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
▼	Water Level After Drilling:	
	Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 16	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 668 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: JAMES BLAIR	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±4" Asphalt Concrete			1-SS	7		2.8		20		
±16" Base Course										
Fill: Dark Brown and Gray Sandy Silt, trace Gravel-Moist		665	2-SS	11		1.5		16		(a)
	5		3-SS	6		2.0		15		
Gray lean Clay, little Sand-Moist to Wet at ±11 feet		660	4-SS	11		2.3		19		
	10		5-SS	12	4.0	4.3		17		
		655								
	15		6-SS	16	4.1	2.8		18		
		650								
	20		7-SS	16	3.7	2.8		20		
Boring Terminated at about 21 feet (EL. 647')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	(a) Poor Sample Recovery
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 17	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 668.7 feet	PROPOSED BAYSIDE MIDDLE SCHOOL REPLACEMENT	
COMPLETION DATE: 09/26/22	601 EAST ELLSWORTH LANE BAYSIDE, WISCONSIN	
FIELD REP: JAMES BLAIR	PROJECT NO: 1G-2208024	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±4" Topsoil Fill:: Dark Brown Sandy Clay with Organic Matter-Moist			1-SS	7		1.5		21		
Fill: Brown Sandy Clay, trace Gravel-Moist			2-SS	11		2.0		23		
		665								
Brown lean Clay, trace Sand-Moist	5		3-SS	8	3.5	2.3		20		
			4-SS	15	2.5	3.3		18		
		660								
Gray lean Clay, little Sand-Moist to Wet at ±11 feet	10		5-SS	14	4.1	4.3		17		
		655								
	15		6-SS	18	6.0	4.0		18		
		650								
	20		7-SS	15	2.6	3.5		19		
		645								
	25		8-SS	16		3.0		18		
		640								
	30		9-SS	14	2.6	2.3		19		
Boring Terminated at about 31 feet (EL. 637.7')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2208024.GPJ GILES.GDT 10/3/22

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

Attachment 2:

SOIL AND SITE EVALUATION – STORM

In accordance with SPS 382.365, 385, Wis. Adm. Code, and WDNR Standard 1002

1002-CPS-23
Division of Industry Services
P. O. Box 2658
Madison, Wisconsin 53701
Scott Walker, Governor
Laura Gutierrez, Secretary

Attach a complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent of slope, scale or dimensions, north arrow, and BM referenced to nearest road

Please print all information

Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1)(m)]

County: Milwaukee

Parcel I.D.:

Reviewed by:

Date:

Property Owner:

Property Location: 601 E Ellsworth Ln
Govt. Lot: W ½ SW ¼ S4 T8N R22E

Property Owner' Mail Address:

Lot #:

Block #:

Subd. Name or CSM #:

City: Bayside, WI | State | Zip Code | Phone Number

[ ] City [X] Village [ ] Town

Nearest Road: North King Road

Drainage area: sq. ft. acres

Test site suitable for (check all that apply) [ ] Site not suitable:

[ ] Bioretention [ ] Subsurface Dispersal System:

[ ] Reuse: [ ] Irrigation: [ ] Other:

Hydraulic Application Test Method

[x] Morphological Evaluation
[ ] Double Ring Infiltrometer
[ ] Other: (specify)

Soil Moisture
Date of soil borings:
USDA-NRCS WETS Value:
[ ] Dry = 1;
[ ] Normal = 2;
[ ] Wet = 3

13 #OBS. [ ] Pit [x] Boring Ground surface elevation 671.8 ft. Elevation of limiting factor _____ ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate inches/Hr
FILL	0-6	10YR 3/2	--	SCL	1, VF, SBK	M, FI	A – S	>5%	70%	--
FILL	6-48	10YR 3/3	--	SCL	1, VF, SBK	M, FI	A – S	10%	55%	--
C	48-132	5YR 4/3	--	SICL	MA	M, FI	C – W	>5%	85%	0.04
C	132-252	10YR 4/1	--	SICL	MA	M, FI	--	>5%	85%	0.04

Comments: Water encountered at about ±132 inches below ground surface

14 #OBS. [ ] Pit [x] Boring Ground surface elevation 699.0 ft. Elevation of limiting factor _____ ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate inches/Hr
A	0-8	10YR 3/2	--	SCL	1, VF, SBK	M, FI	A – S	>5%	70%	0.11
C	8-132	10YR 3/3	--	SICL	MA	M, FI	C – W	>5%	85%	0.04
C	132-252	10YR 4/1	--	SICL	MA	M, FI	--	>5%	85%	0.04

Comments: Water encountered at about ±132 inches below ground surface

Name (Please Print): Benjamin M. Stark, P.E.

Signature:

Credential Number: Soil Tester: SP-111600001; P.E. No.: 48164-6

Address: N8 W22350 Johnson Drive, Waukesha, WI

Date Evaluation Conducted: September 26, 2022

Telephone Number: 262-544-0118

15 #OBS. [ ] Pit [x] Boring Ground surface elevation 667.0 ft. Elevation of limiting factor _____ ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate inches/Hr
FILL	0-4	10YR 3/2	--	SCL	1, VF, SBK	M, FI	A – S	10%	70%	--
FILL	4-24	10 YR 3/3	--	GR	--	--	C – S	100%	0%	--
FILL	24-48	5YR 4/3	--	SC	MA	M, FI	C – S	10%	70%	0.04
C	48-252	10YR 4/1	--	SICL	MA	M, FI	--	>5%	85%	0.04

Comments:

16 #OBS. [ ] Pit [x] Boring Ground surface elevation 668.0 ft. Elevation of limiting factor _____ ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate inches/Hr
PVMT	0-20	--	--	--	--	--	A – S	--	--	--
FILL	20-78	10YR 4/4	--	SC	MA	M, FI	A – W	>5%	55%	--
C	78-252	10YR 4/1	--	SICL	MA	M, FI	--	>5%	85%	0.04

Comments: Water encountered at about ±132 inches below ground surface

APPENDIX B

FIELD PROCEDURES

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D

420 entitled “Standard Guide for Sampling Rock and Rock” and/or other relevant specifications. Soil samples were preserved and transported to *Giles'* laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled “Standard Practice for Preserving and Transporting Soil Samples.” Brief descriptions of the sampling, testing and field procedures commonly performed by *Giles* are provided herein.

GENERAL FIELD PROCEDURES

Test Boring Elevations

The ground surface elevations reported on the Test Boring Logs are referenced to the assumed benchmark shown on the Boring Location Plan (Figure 1). Unless otherwise noted, the elevations were determined with a conventional hand-level and are accurate to within about 1 foot.

Test Boring Locations

The test borings were located on-site based on the existing site features and/or apparent property lines. Dimensions illustrating the approximate boring locations are reported on the Boring Location Plan (Figure 1).

Water Level Measurement

The water levels reported on the Test Boring Logs represent the depth of "free" water encountered during drilling and/or after the drilling tools were removed from the borehole. Water levels measured within a granular (sand and gravel) soil profile are typically indicative of the water table elevation. It is usually not possible to accurately identify the water table elevation with cohesive (clayey) soils, since the rate of seepage is slow. The water table elevation within cohesive soils must therefore be determined over a period of time with groundwater observation wells.

It must be recognized that the water table may fluctuate seasonally and during periods of heavy precipitation. Depending on the subsurface conditions, water may also become perched above the water table, especially during wet periods.

Borehole Backfilling Procedures

Each borehole was backfilled upon completion of the field operations. If potential contamination was encountered, and/or if required by state or local regulations, boreholes were backfilled with an "impervious" material (such as bentonite slurry). Borings that penetrated pavements, sidewalks, etc. were "capped" with Portland Cement concrete, asphaltic concrete, or a similar surface material. It must, however, be recognized that the backfill material may settle, and the surface cap may subside, over a period of time. Further backfilling and/or re-surfacing by *Giles'* client or the property owner may be required.

FIELD SAMPLING AND TESTING PROCEDURES

Auger Sampling (AU)

Soil samples are removed from the auger flights as an auger is withdrawn above the ground surface. Such samples are used to determine general soil types and identify approximate soil stratifications. Auger samples are highly disturbed and are therefore not typically used for geotechnical strength testing.

Split-Barrel Sampling (SS) – (ASTM D-1586)

A split-barrel sampler with a 2-inch outside diameter is driven into the subsoil with a 140-pound hammer free-falling a vertical distance of 30 inches. The summation of hammer-blows required to drive the sampler the final 12-inches of an 18-inch sample interval is defined as the "Standard Penetration Resistance" or N-value is an index of the relative density of granular soils and the comparative consistency of cohesive soils. A soil sample is collected from each SPT interval.

Shelby Tube Sampling (ST) – (ASTM D-1587)

A relatively undisturbed soil sample is collected by hydraulically advancing a thin-walled Shelby Tube sampler into a soil mass. Shelby Tubes have a sharp cutting edge and are commonly 2 to 5 inches in diameter.

Bulk Sample (BS)

A relatively large volume of soils is collected with a shovel or other manually-operated tool. The sample is typically transported to *Giles'* materials laboratory in a sealed bag or bucket.

Dynamic Cone Penetration Test (DC) – (ASTM STP 399)

This test is conducted by driving a 1.5-inch-diameter cone into the subsoil using a 15-pound steel ring (hammer), free-falling a vertical distance of 20 inches. The number of hammer-blows required to drive the cone 1¾ inches is an indication of the soil strength and density, and is defined as "N". The Dynamic Cone Penetration test is commonly conducted in hand auger borings, test pits and within excavated trenches.

- Continued -

Ring-Lined Barrel Sampling – (ASTM D 3550)

In this procedure, a ring-lined barrel sampler is used to collect soil samples for classification and laboratory testing. This method provides samples that fit directly into laboratory test instruments without additional handling/disturbance.

Sampling and Testing Procedures

The field testing and sampling operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the field testing (i.e. N-values) are reported on the Test Boring Logs. Explanations of the terms and symbols shown on the logs are provided on the appendix enclosure entitled “General Notes”.

APPENDIX C

LABORATORY TESTING AND CLASSIFICATION

The laboratory testing was conducted under the supervision of a geotechnical engineer in accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Brief descriptions of laboratory tests commonly performed by *Giles* are provided herein.

LABORATORY TESTING AND CLASSIFICATION

Photoionization Detector (PID)

In this procedure, soil samples are "scanned" in *Giles'* analytical laboratory using a Photoionization Detector (PID). The instrument is equipped with an 11.7 eV lamp calibrated to a Benzene Standard and is capable of detecting a minute concentration of **certain** Volatile Organic Compound (VOC) vapors, such as those commonly associated with petroleum products and some solvents. Results of the PID analysis are expressed in HNu (manufacturer's) units rather than actual concentration.

Moisture Content (w) (ASTM D 2216)

Moisture content is defined as the ratio of the weight of water contained within a soil sample to the weight of the dry solids within the sample. Moisture content is expressed as a percentage.

Unconfined Compressive Strength (qu) (ASTM D 2166)

An axial load is applied at a uniform rate to a cylindrical soil sample. The unconfined compressive strength is the maximum stress obtained or the stress when 15% axial strain is reached, whichever occurs first.

Calibrated Penetrometer Resistance (qp)

The small, cylindrical tip of a hand-held penetrometer is pressed into a soil sample to a prescribed depth to measure the soils capacity to resist penetration. This test is used to evaluate unconfined compressive strength.

Vane-Shear Strength (qs)

The blades of a vane are inserted into the flat surface of a soil sample and the vane is rotated until failure occurs. The maximum shear resistance measured immediately prior to failure is taken as the vane-shear strength.

Loss-on-Ignition (ASTM D 2974; Method C)

The Loss-on-Ignition (L.O.I.) test is used to determine the organic content of a soil sample. The procedure is conducted by heating a dry soil sample to 440°C in order to burn-off or "ash" organic matter present within the sample. The L.O.I. value is the ratio of the weight loss due to ignition compared to the initial weight of the dry sample. L.O.I. is expressed as a percentage.

Particle Size Distribution (ASTB D 421, D 422, and D 1140)

This test is performed to determine the distribution of specific particle sizes (diameters) within a soil sample. The distribution of coarse-grained soil particles (sand and gravel) is determined from a “sieve analysis,” which is conducted by passing the sample through a series of nested sieves. The distribution of fine-grained soil particles (silt and clay) is determined from a “hydrometer analysis” which is based on the sedimentation of particles suspended in water.

Consolidation Test (ASTM D 2435)

In this procedure, a series of cumulative vertical loads are applied to a small, laterally confined soil sample. During each load increment, vertical compression (consolidation) of the sample is measured over a period of time. Results of this test are used to estimate settlement and time rate of settlement.

Classification of Samples

Each soil sample was visually-manually classified, based on texture and plasticity, in general accordance with the Unified Soil Classification System (ASTM D-2488-75). The classifications are reported on the Test Boring Logs.

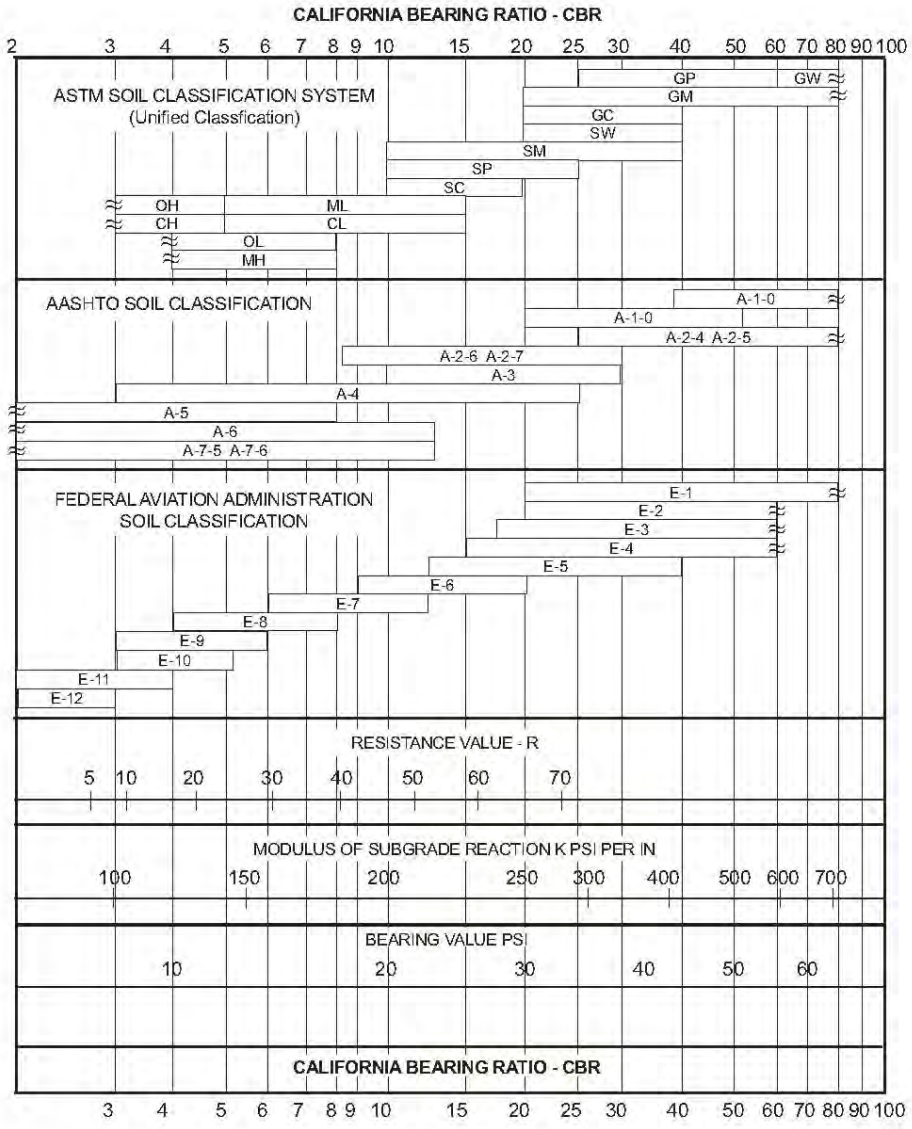
Laboratory Testing

The laboratory testing operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the laboratory tests are provided on the Test Boring Logs or other appendix enclosures. Explanation of the terms and symbols used on the logs is provided on the appendix enclosure entitled “General Notes.”

California Bearing Ratio (CBR) Test ASTM D-1833

The CBR test is used for evaluation of a soil subgrade for pavement design. The test consists of measuring the force required for a 3-square-inch cylindrical piston to penetrate 0.1 or 0.2 inch into a compacted soil sample. The result is expressed as a percent of force required to penetrate a standard compacted crushed stone.

Unless a CBR test has been specifically requested by the client, the CBR is estimated from published charts, based on soil classification and strength characteristics. A typical correlation chart is below.



APPENDIX D

GENERAL INFORMATION

AND
IMPORTANT INFORMATION ABOUT
YOUR GEOTECHNICAL REPORT

GENERAL COMMENTS

The soil samples obtained during the subsurface exploration will be retained for a period of thirty days. If no instructions are received, they will be disposed of at that time.

This report has been prepared exclusively for the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. Copies of this report may be provided to contractor(s), with contract documents, to disclose information relative to this project. The report, however, has not been prepared to serve as the plans and specifications for actual construction without the appropriate interpretation by the project architect, structural engineer, and/or civil engineer. Reproduction and distribution of this report must be authorized by the client and *Giles*.

This report has been based on assumed conditions/characteristics of the proposed development where specific information was not available. It is recommended that the architect, civil engineer and structural engineer along with any other design professionals involved in this project carefully review these assumptions to ensure they are consistent with the actual planned development. When discrepancies exist, they should be brought to our attention to ensure they do not affect the conclusions and recommendations provided herein. The project plans and specifications may also be submitted to *Giles* for review to ensure that the geotechnical related conclusions and recommendations provided herein have been correctly interpreted.

The analysis of this site was based on a subsoil profile interpolated from a limited subsurface exploration. If the actual conditions encountered during construction vary from those indicated by the borings, *Giles* must be contacted immediately to determine if the conditions alter the recommendations contained herein.

The conclusions and recommendations presented in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.

GUIDE SPECIFICATIONS FOR SUBGRADE AND GRADE PREPARATION FOR FILL, FOUNDATION, FLOOR SLAB AND PAVEMENT SUPPORT; AND SELECTION, PLACEMENT AND COMPACTION OF FILL SOILS USING STANDARD PROCTOR PROCEDURES

1. Construction monitoring and testing of subgrades and grades for fill, foundation, floor slab and pavement; and fill selection, placement and compaction shall be performed by an experienced soils engineer and/or his representatives.

2. All compaction fill, subgrades and grades shall be (a) underlain by suitable bearing material; (b) free of all organic, frozen, or other deleterious material, and (c) observed, tested and approved by qualified engineering personnel representing an experienced soils engineer. Preparation of subgrades after stripping vegetation, organic or other unsuitable materials shall consist of (a) proof-rolling to detect soil, wet yielding soils or other unstable materials that must be undercut, (b) scarifying top 6 to 8 inches, (c) moisture conditioning the soils as required, and (d) recompaction to same minimum in-situ density required for similar materials indicated under Item 5. Note: compaction requirements for pavement subgrade are higher than other areas. Weather and construction equipment may damage compacted fill surface and reworking and retesting may be necessary to assure proper performance.

3. In overexcavation and fill areas, the compacted fill must extend (a) a minimum 1 foot lateral distance beyond the exterior edge of the foundation at bearing grade or pavement subgrade and down to compacted fill subgrade on a maximum 0.5(H):1(V) slope, (b) 1 foot above footing grade outside the building, and (c) to floor subgrade inside the building. Fill shall be placed and compacted on a 5(H):1(V) slope or must be stepped or benched as required to flatten if not specifically approved by qualified personnel under the direction of an experienced soil engineer.

4. The compacted fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated", and shall be low-expansive with a maximum Liquid Limit (ASTM D-423) and Plasticity Index (ASTM D-424) of 30 and 15, respectively, unless specifically tested and found to have low expansive properties and approved by an experienced soils engineer. The top 12 inches of compacted fill should have a maximum 3-inch-particle diameter and all underlying compacted fill a maximum 6-inch-diameter unless specifically approved by an experienced soils engineer. All fill materials must be tested and approved under the direction of an experienced soils engineer prior to placement. If the fill is to provide non-frost susceptible characteristics, it must be classified as a clean GW, GP, SW or SP per the Unified Soil Classification System (ASTM D-2487).

5. For structural fill depths less than 20 feet, the density of the structural compacted fill and scarified subgrade and grades shall not be less than 95 percent of the maximum dry density as determined by Standard Proctor (ASTM-698) with the exception of the top 12 inches of pavement subgrade which shall have a minimum in-situ density of 100 percent of maximum dry density, or 5 percent higher than underlying fill materials. Where the structural fill depth is greater than 20 feet, the portions below 20 feet should have a minimum in-place density of 100 percent of its maximum dry density of 5 percent greater than the top 20 feet. The moisture content of cohesive soil shall not vary by more than -1 to +3 percent and granular soil ±3 percent of the optimum when placed and compacted or recompacted, unless specifically recommended/approved by the soils engineer monitoring the placement and compaction. Cohesive soils with moderate to high expansion potentials (PI>15) should, however, be placed, compacted and maintained prior to construction at a moisture content 3±1 percent above optimum moisture content to limit further heave. The fill shall be placed in layers with a maximum loose thickness of 8 inches for foundations and 10 inches for floor slabs and pavement, unless specifically approved by the soils engineer taking into consideration the type of materials and compaction equipment being used. The compaction equipment should consist of suitable mechanical equipment specifically designed for soil compaction. Bulldozers or similar tracked vehicles are typically not suitable for compaction.

6. Excavation, filling, subgrade and grade preparation shall be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs and seepage water encountered shall be pumped or drained to provide a suitable working platform. Springs or water seepage encountered during grading/foundation construction must be called to the soil engineer's attention immediately for possible construction procedure revision or inclusion of an underdrain system.

7. Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below-grade walls (i.e. basement walls and retaining walls) must be properly tested and approved by an experienced soils engineer with consideration for the lateral pressure used in the wall design.

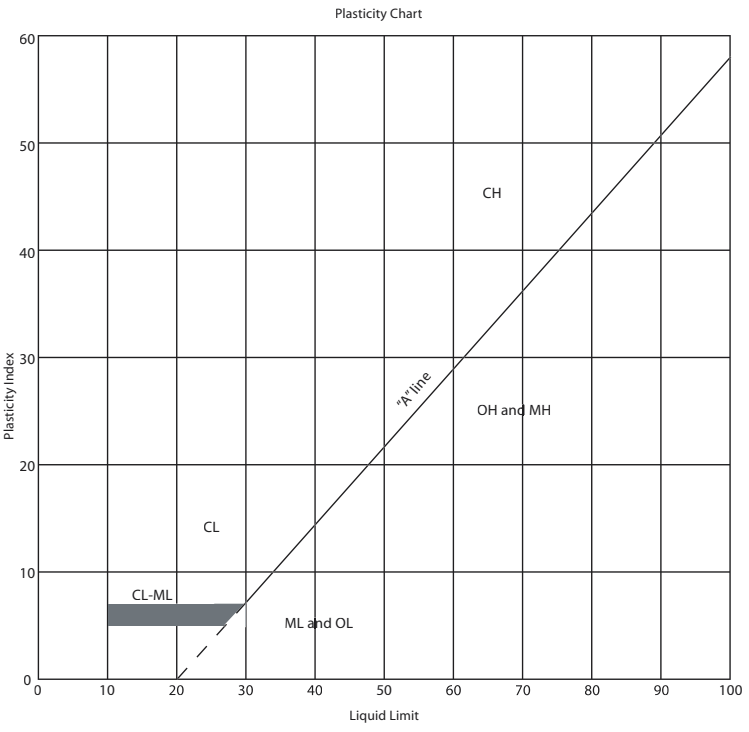
8. Whenever, in the opinion of the soils engineer or the Owner's Representatives, an unstable condition is being created either by cutting or filling, the work shall not proceed into that area until an appropriate geotechnical exploration and analysis has been performed and the grading plan revised, if found necessary.

CHARACTERISTICS AND RATINGS OF UNIFIED SOIL SYSTEM CLASSES FOR SOIL CONSTRUCTION *									
Class	**Compaction Characteristics**	**Max. Dry Density Standard Proctor (pcf)**	**Compressibility and Expansion**	**Drainage and Permeability**	**Value as an Embankment Material**	**Value as Subgrade When Not Subject to Frost**	**Value as Base Course**	**Value as Temporary Pavement**	
								With Dust Palliative	**With Bituminous Treatment**
GW	Good: tractor, rubber-tired, steel wheel or vibratory roller	125-135	Almost none	Good drainage, pervious	Very stable	Excellent	Good	Fair to poor	Excellent
GP	Good: tractor, rubber-tired, steel wheel or vibratory roller	115-125	Almost none	Good drainage, pervious	Reasonably stable	Excellent to good	Poor to fair	Poor	
GM	Good: rubber-tired or light sheepsfoot roller	120-135	Slight	Poor drainage, semipervious	Reasonably stable	Excellent to good	Fair to poor	Poor	Poor to fair
GC	Good to fair: rubber-tired or sheepsfoot roller	115-130	Slight	Poor drainage, impervious	Reasonably stable	Good	Good to fair **	Excellent	Excellent
SW	Good: tractor, rubber-tired or vibratory roller	110-130	Almost none	Good drainage, pervious	Very stable	Good	Fair to poor	Fair to poor	Good
SP	Good: tractor, rubber-tired or vibratory roller	100-120	Almost none	Good drainage, pervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SM	Good: rubber-tired or sheepsfoot roller	110-125	Slight	Poor drainage, impervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SC	Good to fair: rubber-tired or sheepsfoot roller	105-125	Slight to medium	Poor drainage, impervious	Reasonably stable	Good to fair	Fair to poor	Excellent	Excellent
ML	Good to poor: rubber-tired or sheepsfoot roller	95-120	Slight to medium	Poor drainage, impervious	Poor stability, high density required	Fair to poor	Not suitable	Poor	Poor
CL	Good to fair: sheepsfoot or rubber-tired roller	95-120	Medium	No drainage, impervious	Good stability	Fair to poor	Not suitable	Poor	Poor
OL	Fair to poor: sheepsfoot or rubber-tired roller	80-100	Medium to high	Poor drainage, impervious	Unstable, should not be used	Poor	Not suitable	Not suitable	Not suitable
MH	Fair to poor: sheepsfoot or rubber-tired roller	70-95	High	Poor drainage, impervious	Poor stability, should not be used	Poor	Not suitable	Very poor	Not suitable
CH	Fair to poor: sheepsfoot roller	80-105	Very high	No drainage, impervious	Fair stability, may soften on expansion	Poor to very poor	Not suitable	Very poor	Not suitable
OH	Fair to poor: sheepsfoot roller	65-100	High	No drainage, impervious	Unstable, should not be used	Very poor	Not suitable	Not suitable	Not suitable
Pt	Not suitable		Very high	Fair to poor drainage	Should not be used	Not suitable	Not suitable	Not suitable	Not suitable

* "The Unified Classification: Appendix A - Characteristics of Soil, Groups Pertaining to Roads and Airfields, and Appendix B - Characteristics of Soil Groups Pertaining to Embankments and Foundations," Technical Memorandum 357, U.S. Waterways Ixperiment Station, Vicksburg, 1953.

** Not suitable if subject to frost.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria	
Coarse-grained soils (more than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent: GW, GP, SW, SP. More than 12 percent: GM, GC, SM, SC. 5 to 12 percent: *Borderline* cases requiring dual symbols[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels, gravel-sand mixtrues, little or no fines		Not meeting all gradation requirements for GW
		Gravels with fines (appreciable amount of fines)	GM[a] d	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GM[a] u			
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM[a] d	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SM[a] u			
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt	Peat and other highly organic soils		

[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits, suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u is used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group sympols. For example GW-GC, well-graded gravel-sand mixture with clay binder.

GENERAL NOTES

SAMPLE IDENTIFICATION

All samples are visually classified in general accordance with the Unified Soil Classification System (ASTM D-2487-75 or D-2488-75)

DESCRIPTIVE TERM (% BY DRY WEIGHT)

Trace:	1-10%
Little:	11-20%
Some:	21-35%
And/Adjective	36-50%

PARTICLE SIZE (DIAMETER)

Boulders:	8 inch and larger
Cobbles:	3 inch to 8 inch
Gravel:	coarse - ¾ to 3 inch
	fine – No. 4 (4.76 mm) to ¾ inch
Sand:	coarse – No. 4 (4.76 mm) to No. 10 (2.0 mm)
	medium – No. 10 (2.0 mm) to No. 40 (0.42 mm)
	fine – No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt:	No. 200 (0.074 mm) and smaller (non-plastic)
Clay:	No 200 (0.074 mm) and smaller (plastic)

SOIL PROPERTY SYMBOLS

Dd:	Dry Density (pcf)
LL:	Liquid Limit, percent
PL:	Plastic Limit, percent
PI:	Plasticity Index (LL-PL)
LOI:	Loss on Ignition, percent
Gs:	Specific Gravity
K:	Coefficient of Permeability
w:	Moisture content, percent
qp:	Calibrated Penetrometer Resistance, tsf
qs:	Vane-Shear Strength, tsf
qu:	Unconfined Compressive Strength, tsf
qc:	Static Cone Penetrometer Resistance (correlated to Unconfined Compressive Strength, tsf)
PID:	Results of vapor analysis conducted on representative samples utilizing a Photoionization Detector calibrated to a benzene standard. Results expressed in HNU-Units. (BDL=Below Detection Limit)

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon
ST:	Shelby Tube – 3 inch O.D. (except where noted)
CS:	3 inch O.D. California Ring Sampler
DC:	Dynamic Cone Penetrometer per ASTM Special Technical Publication No. 399
AU:	Auger Sample
DB:	Diamond Bit
CB:	Carbide Bit
WS:	Wash Sample
RB:	Rock-Roller Bit
BS:	Bulk Sample
Note:	Depth intervals for sampling shown on Record of Subsurface Exploration are not indicative of sample recovery, but position where sampling initiated

N: Penetration Resistance per 12 inch interval, or fraction thereof, for a standard 2 inch O.D. (1⅜ inch I.D.) split spoon sampler driven with a 140 pound weight free-falling 30 inches. Performed in general accordance with Standard Penetration Test Specifications (ASTM D-1586). N in blows per foot equals sum of N-Values where plus sign (+) is shown.

Nc: Penetration Resistance per 1¾ inches of Dynamic Cone Penetrometer. Approximately equivalent to Standard Penetration Test N-Value in blows per foot.

Nr: Penetration Resistance per 12 inch interval, or fraction thereof, for California Ring Sampler driven with a 140 pound weight free-falling 30 inches per ASTM D-3550. Not equivalent to Standard Penetration Test N-Value.

SOIL STRENGTH CHARACTERISTICS

COHESIVE (CLAYEY) SOILS

COMPARATIVE CONSISTENCY	BLOWS PER FOOT (N)	UNCONFINED COMPRESSIVE STRENGTH (TSF)
Very Soft	0 - 2	0 - 0.25
Soft	3 - 4	0.25 - 0.50
Medium Stiff	5 – 8	0.50 - 1.00
Stiff	9 – 15	1.00 - 2.00
Very Stiff	16 – 30	2.00 - 4.00
Hard	31+	4.00+

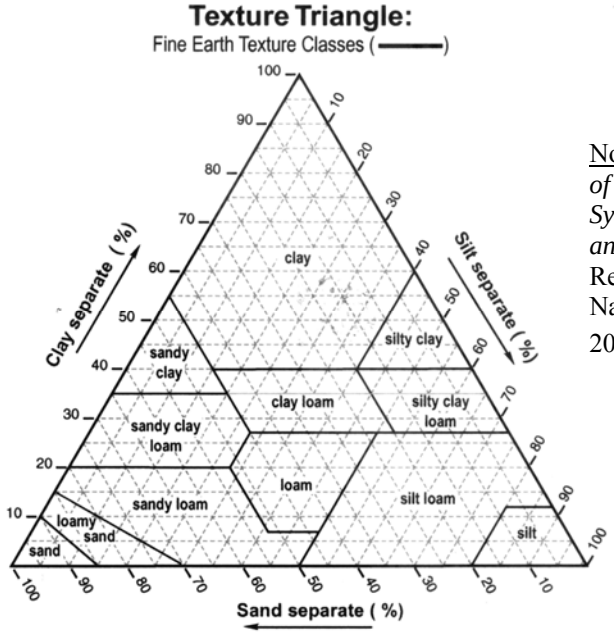
NON-COHESIVE (GRANULAR) SOILS

RELATIVE DENSITY	BLOWS PER FOOT (N)
Very Loose	0 - 4
Loose	5 - 10
Firm	11 - 30
Dense	31 - 50
Very Dense	51+

DEGREE OF PLASTICITY	PI
None to Slight	0 - 4
Slight	5 - 10
Medium	11 - 30
High to Very High	31+

DEGREE OF EXPANSIVE POTENTIAL	PI
Low	0 - 15
Medium	15 - 25
High	25+

SOIL CLASSIFICATION NOTES



Note: *Texture Triangle* and *Comparison of Particle Size Classes in Different Systems* from *Field Book for Describing and Sampling Soil*, USDA Natural Resources Conservation Service National Soil Survey Center (September 2002).

Comparison of Particle Size Classes in Different Systems

	FINE EARTH									ROCK FRAGMENTS					
										channers			flagst.	stones	boulders
USDA [1]	Clay [2]		Silt		Sand					Gravel			Cobbles	Stones	Boulders
	fine	co.	fine	co.	v.fi.	fi.	med.	co.	v. co.	fine	medium	coarse			
millimeters:	0.0002	.002 mm		.02	.05	.1	.25	.5	1	2 mm	5	20	76	250	600 mm
U.S. Standard Sieve No. *(opening)*:					300 [3]	140	60	35	18	10	4	*(3/4")*	*(3")*	*(10")*	*(25")*

International [4]	Clay	Silt	Sand		Gravel	Stones
			fine	coarse		
millimeters:	.002 mm	.02	.20		2 mm	20 mm
U.S. Standard Sieve No. *(opening)*:					10	*(3/4")*

Unified [5]	Silt or Clay	Sand			Gravel		Cobbles	Boulders
		fine	medium	co.	fine	coarse		
millimeters:	.074	.42	2 mm	4.8	19	76	300 mm	
U.S. Standard Sieve No. *(opening)*:	200	40	10	4	*(3/4")*	*(3")*		

AASHTO [6,7]	Clay	Silt	Sand		Gravel or Stones			Broken Rock (angular), or Boulders (rounded)
			fine	coarse	fine	med.	co.	
millimeters:	.005 mm	.074	.42	2 mm	9.5	25	75 mm	
U.S. Standard Sieve No.:		200	40	10	*(3/8")*	*(1")*	*(3")*	

phi #:	12	10	9	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-12
Modified Wentworth [8]	clay			silt				sand					pebbles						Cobbles	boulders			
millimeters:	.002	.004	.008	.016	.031	.062	.125	.25	.5	1	2 mm	8	16	32	64	256	4092 mm						
U.S. Standard Sieve No.:						230	120	60	35	18	10	5											

1. Soil Survey Staff. 1995. Soil survey Laboratory information manual. USDA, Natural Resources Conservation Service, Soil Survey Investigations Report No. 45, Version 1.0, National Soil Survey Center, Lincoln, NE. 305 p.
2. Soil Survey Staff. 1995. Soil Survey Lab information manual. USDA-NRCS, Soil Survey Investigation Report #45, version 1.0, National Soil Survey Center, Lincoln, NE. Note: Mineralogy studies may subdivide clay into three size ranges; fine (<0.08µm), medium (0.08-0.2µm), and coarse (0.2-2µm); Jackson, 1969.
3. The Soil Survey Lab (Lincoln, NE) uses a no. 300 sieve (0.047 mm opening) for the USDA-sand/silt measurement. A no. 270 sieve (0.053 mm opening) is more readily available and widely used.
4. International Soil Science Society. 1951. *In*: Soil Survey Manual. Soil Survey Staff, USDA-Soil Conservation Service, Agricultural Handbook No. 18, U.S. Gov. Print. Office, Washington, D.C. 214 p.
5. ASTM. 1993. Standard classification of soils for engineering purposes (Unified Soil Classification System). ASTM designation D2487-92. *In*: Soil and rock; dimension stone; geosynthetics. Annual book of ASTM standards-Vol. 04.08.
6. AASHTO. 1986a. Recommended practice for the classification of soils and soil-aggregate mixtures for highway construction purposes. AASHTO designation M145-82. *In*: Standard specifications for transportation materials and methods of sampling and testing; Part 1: Specifications (14th ed.). American Association of State Highway and Transportation Officials, Washington, D.C.
7. AASHTO. 1986b. Standard definitions of terms relating to subgrade, soil-aggregate, and fill materials. AASHTO designation M146-70 (1980). *In*: sampling and testing; Part 1: Specifications (14th ed.). American Association of State Highway and Transportation Officials, Washington, D.C.
8. Ingram, R.L. 1982. Modified Wentworth scale. *In*: Grain-size scales. AGI Date Sheet 29.1. *In*: Dutro, J.T., Dietrich, R.V., and Foose, R.M. 1989. AGI data sheets for geology in the field, laboratory, and office, 3rd edition. American Geological Institute, Washington, D.C.

GILES ENGINEERING ASSOCIATES, INC.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific imes

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependen

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mol

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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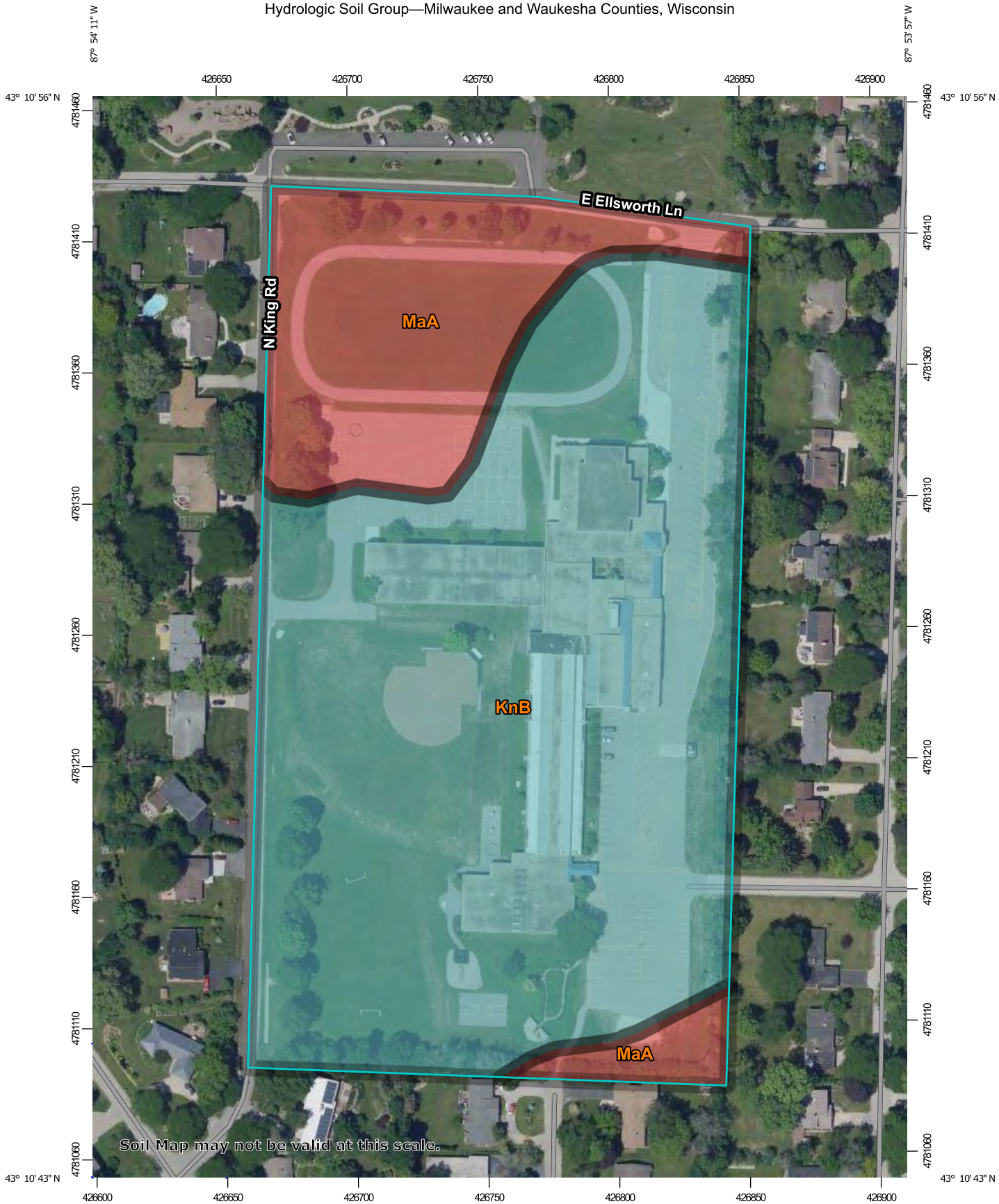
Geotechnical, Environmental & Construction Materials Consultants

GILES

ENGINEERING ASSOCIATES, INC.

www.gilesengr.com



Map Scale: 1:2,010 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Milwaukee and Waukesha Counties, Wisconsin
Survey Area Data: Version 17, Sep 10, 2021

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

Date(s) aerial images were photographed: May 20, 2020—Jul 1, 2020

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
KnB	Kewaunee silt loam, 2 to 6 percent slopes	C	11.8	77.3%
MaA	Manawa silt loam, 0 to 3 percent slopes	D	3.5	22.7%
Totals for Area of Interest			**15.2**	**100.0%**

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.

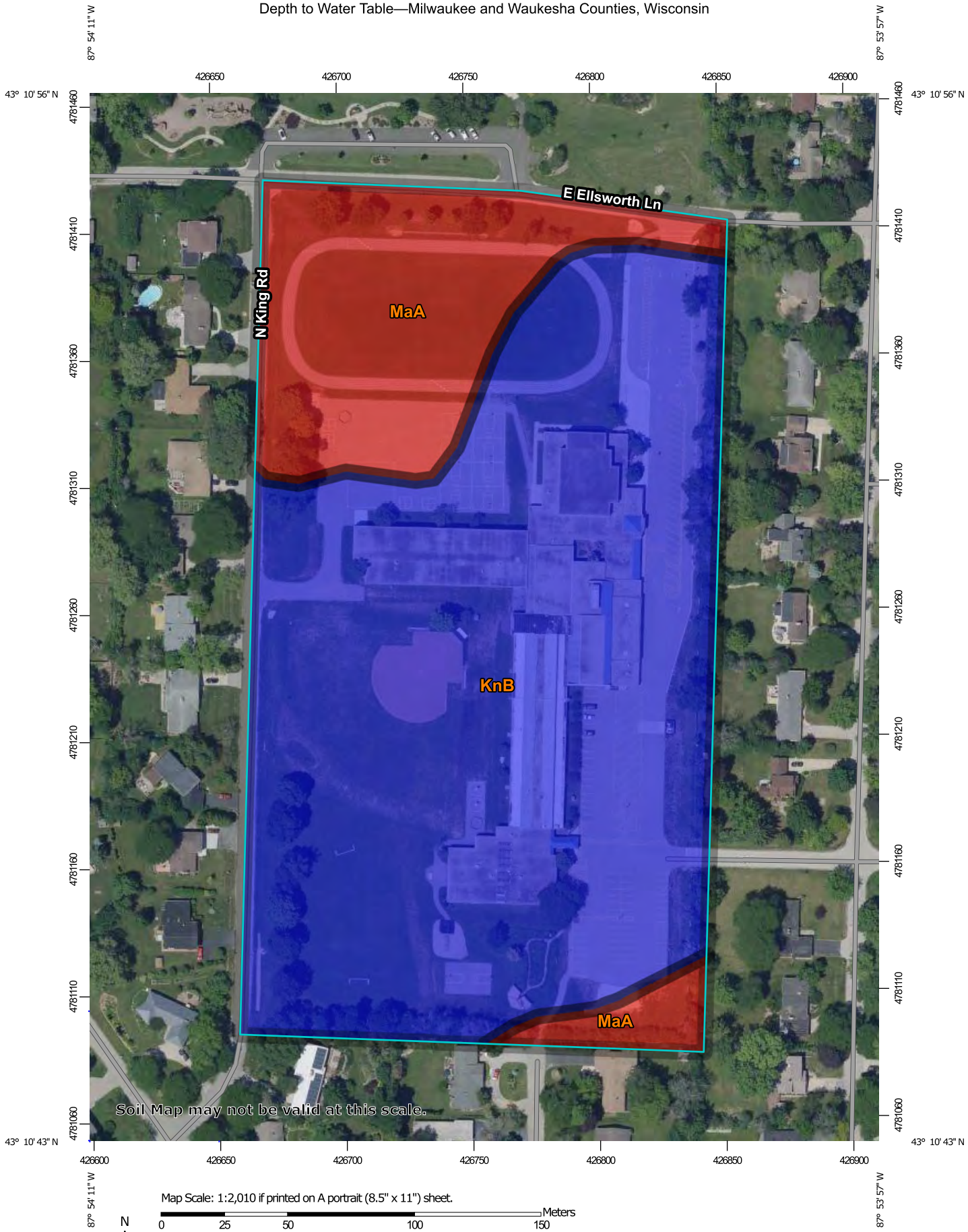
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Map Scale: 1:2,010 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Lines

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Points

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- 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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Milwaukee and Waukesha Counties, Wisconsin
Survey Area Data: Version 17, Sep 10, 2021

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

Date(s) aerial images were photographed: May 20, 2020—Jul 1, 2020

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.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
KnB	Kewaunee silt loam, 2 to 6 percent slopes	>200	11.8	77.3%
MaA	Manawa silt loam, 0 to 3 percent slopes	15	3.5	22.7%
Totals for Area of Interest			**15.2**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

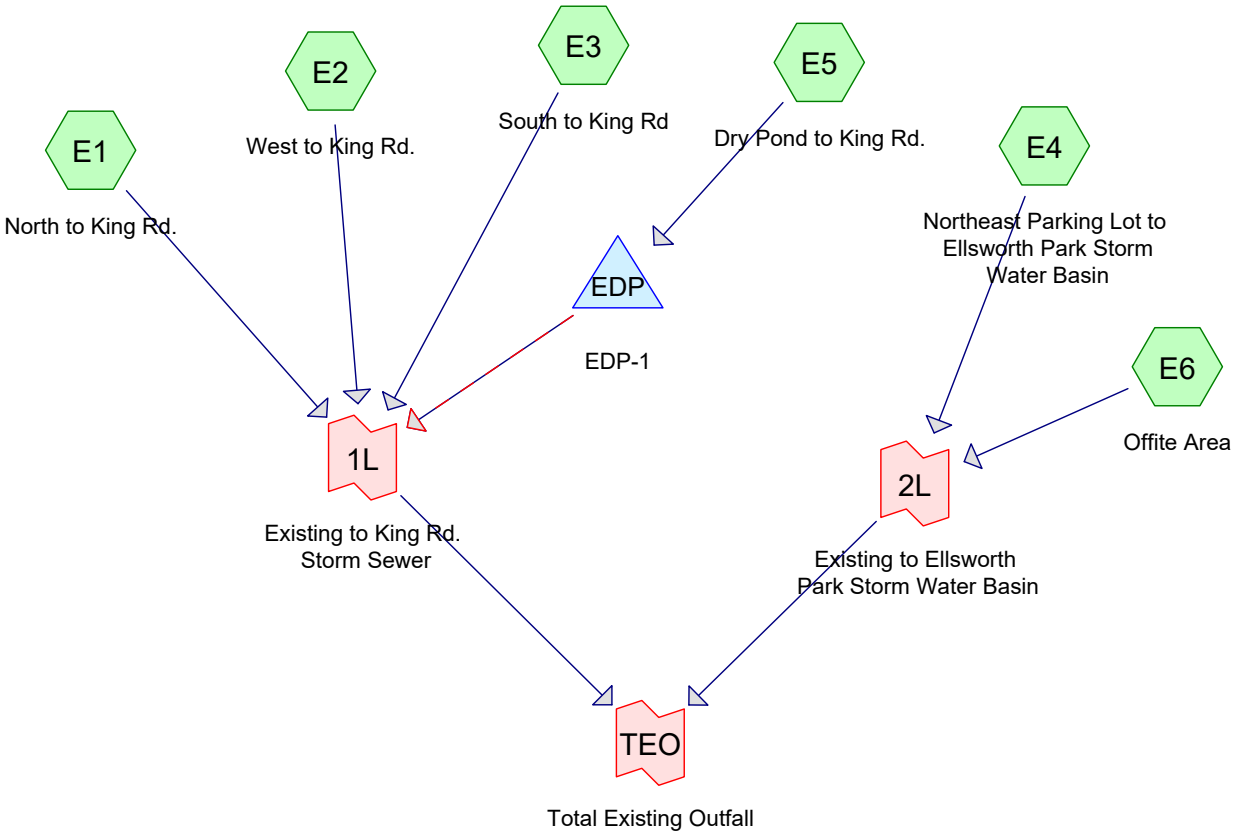
Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Appendix B

HydroCAD Analysis – Pre-Development Conditions



Lake Michigan Direct
Watershed Critical Time
1.5 Hr (11.75 to 13.25)

Existing 2-year (37,276 - 5,600) = 31,676

Existing 100-year (141,347 - 35,052) = 106,295

Subcat Reach Pond Link

Routing Diagram for 220126_Existing HydroCAD
Prepared by Kapur& Associates, Inc., Printed 1/13/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type II 24-hr		Default	24.00	1	2.62	2
2	10-Year	Type II 24-hr		Default	24.00	1	3.73	2
3	100-Year	Type II 24-hr		Default	24.00	1	6.20	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
302,740	74	>75% Grass cover, Good, HSG C (E1, E2, E3, E4, E5, E6)
125,648	98	Paved parking, HSG C (E1, E2, E3, E4, E5)
87,648	98	Roofs, HSG C (E2)
25,417	98	Sidewalks, HSG C (E1, E2, E3, E4, E5, E6)
541,453	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
541,453	HSG C	E1, E2, E3, E4, E5, E6
0	HSG D	
0	Other	
541,453		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	302,740	0	0	302,740	>75% Grass cover, Good	
0	0	125,648	0	0	125,648	Paved parking	
0	0	87,648	0	0	87,648	Roofs	
0	0	25,417	0	0	25,417	Sidewalks	
0	**0**	**541,453**	**0**	**0**	**541,453**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	EDP	668.50	667.70	100.0	0.0080	0.010	8.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: North to King Rd. Runoff Area=76,291 sf 54.52% Impervious Runoff Depth=1.41"
Tc=6.0 min CN=87 Runoff=4.24 cfs 8,978 cf

Subcatchment E2: West to King Rd. Runoff Area=198,651 sf 46.83% Impervious Runoff Depth=1.27"
Flow Length=547' Tc=15.6 min CN=85 Runoff=7.31 cfs 21,103 cf

Subcatchment E3: South to King Rd Runoff Area=87,421 sf 12.29% Impervious Runoff Depth=0.82"
Flow Length=408' Tc=12.9 min CN=77 Runoff=2.17 cfs 5,949 cf

Subcatchment E4: Northeast Parking Lot Runoff Area=59,851 sf 74.75% Impervious Runoff Depth=1.80"
Tc=6.0 min CN=92 Runoff=4.13 cfs 9,000 cf

Subcatchment E5: Dry Pond to King Rd. Runoff Area=78,967 sf 59.20% Impervious Runoff Depth=1.48"
Tc=6.0 min CN=88 Runoff=4.60 cfs 9,770 cf

Subcatchment E6: Offite Area Runoff Area=40,272 sf 4.59% Impervious Runoff Depth=0.72"
Tc=6.0 min CN=75 Runoff=1.13 cfs 2,422 cf

Pond EDP: EDP-1 Peak Elev=670.27' Storage=1,864 cf Inflow=4.60 cfs 9,770 cf
ound Culvert n=0.010 L=100.0' S=0.0080 '/' Primary=1.78 cfs 9,770 cf Secondary=0.00 cfs 0 cf Outflow=1.78 cfs 9,770 cf

Link 1L: Existing to King Rd. Storm Sewer Inflow=13.73 cfs 45,800 cf
Primary=13.73 cfs 45,800 cf

Link 2L: Existing to Ellsworth Park Storm Water Basin Inflow=5.22 cfs 11,423 cf
Primary=5.22 cfs 11,423 cf

Link TEO: Total Existing Outfall Inflow=18.47 cfs 57,222 cf
Primary=18.47 cfs 57,222 cf

Total Runoff Area = 541,453 sf Runoff Volume = 57,222 cf Average Runoff Depth = 1.27"
55.91% Pervious = 302,740 sf 44.09% Impervious = 238,713 sf

Summary for Subcatchment E1: North to King Rd.

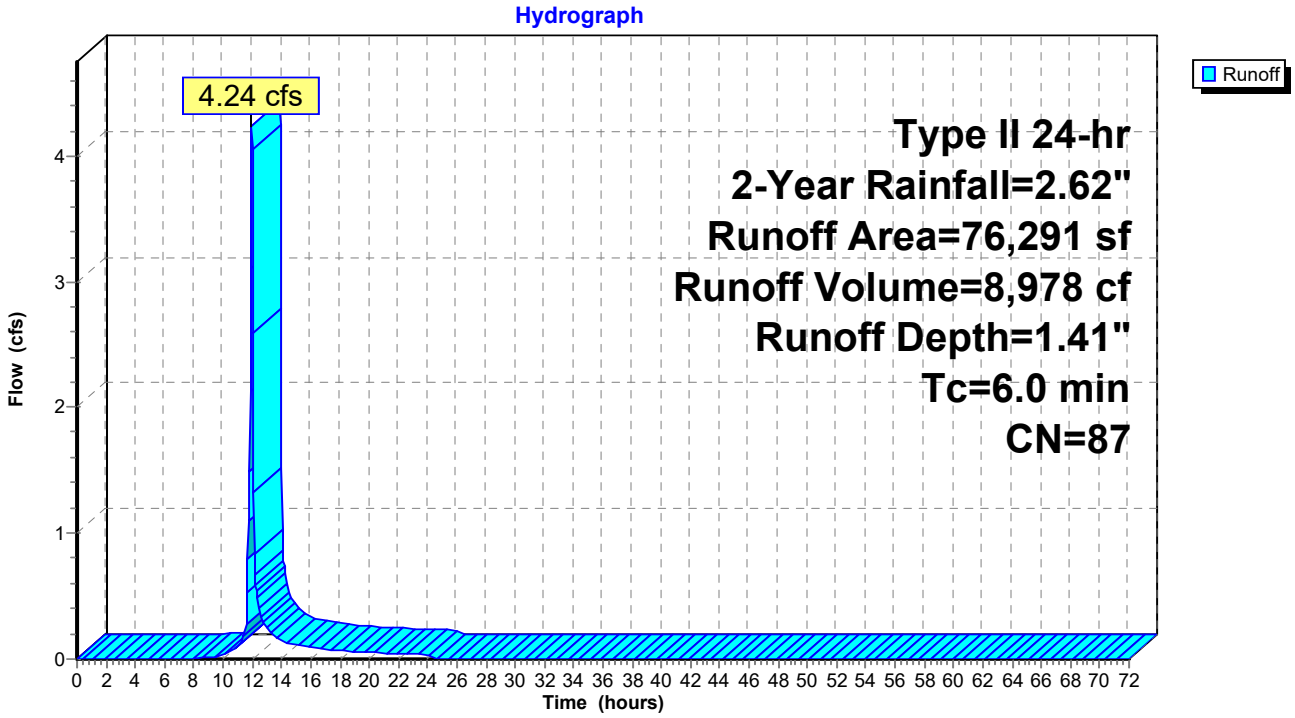
Runoff = 4.24 cfs @ 11.97 hrs, Volume= 8,978 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	39,074	98	Paved parking, HSG C
*	2,522	98	Sidewalks, HSG C
	34,695	74	>75% Grass cover, Good, HSG C
	76,291	87	Weighted Average
	34,695		45.48% Pervious Area
	41,596		54.52% Impervious Area

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

Subcatchment E1: North to King Rd.



Summary for Subcatchment E2: West to King Rd.

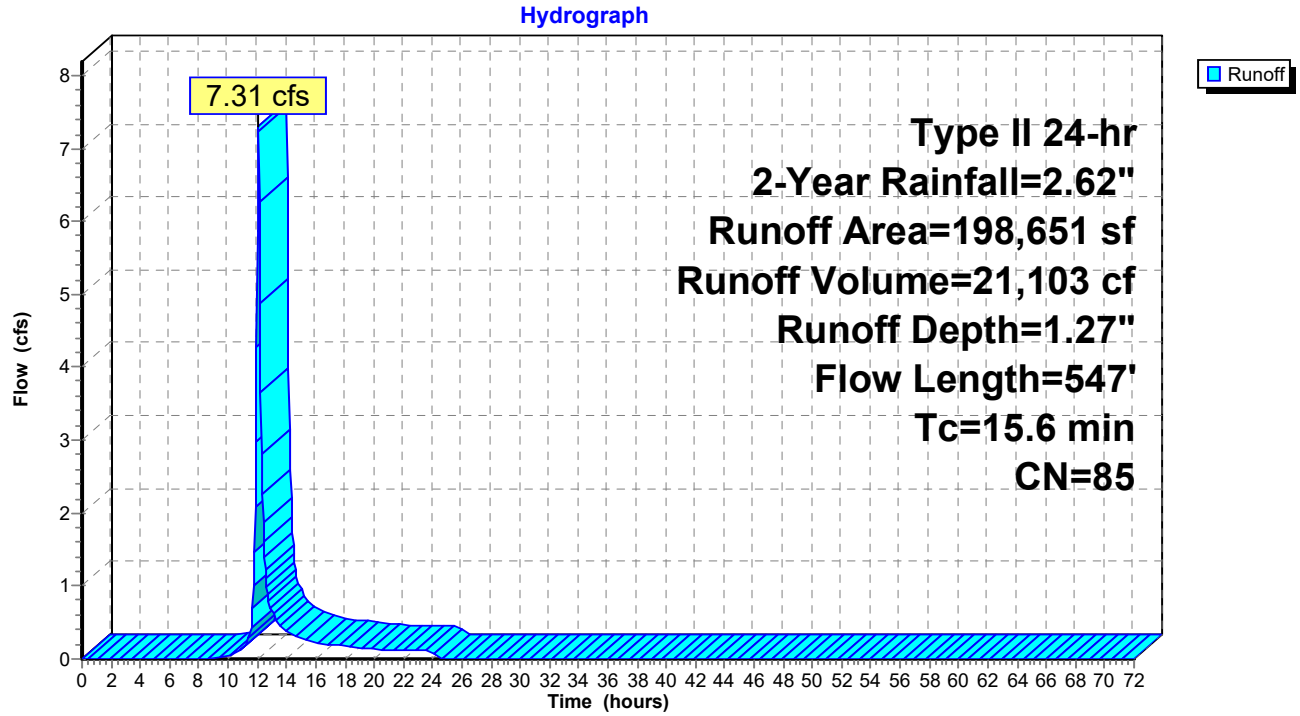
Runoff = 7.31 cfs @ 12.08 hrs, Volume= 21,103 cf, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
*	87,648	98	Roofs, HSG C
	2,439	98	Paved parking, HSG C
*	2,946	98	Sidewalks, HSG C
	105,618	74	>75% Grass cover, Good, HSG C
	198,651	85	Weighted Average
	105,618		53.17% Pervious Area
	93,033		46.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0159	0.14		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
3.5	397	0.0156	1.87		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Grassed Waterway Kv= 15.0 fps
0.2	50	0.0956	4.64		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Grassed Waterway Kv= 15.0 fps
15.6	547	Total			

Subcatchment E2: West to King Rd.



Summary for Subcatchment E3: South to King Rd

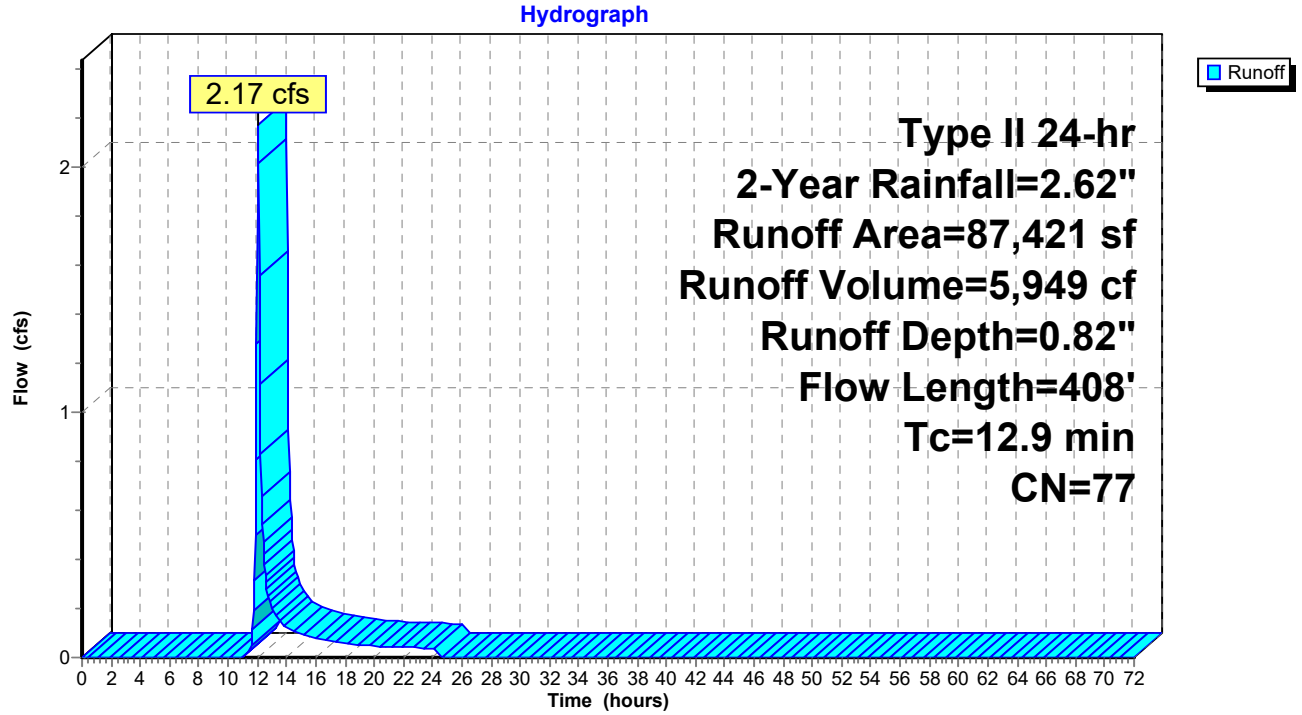
Runoff = 2.17 cfs @ 12.06 hrs, Volume= 5,949 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	363	98	Paved parking, HSG C
*	10,385	98	Sidewalks, HSG C
	76,673	74	>75% Grass cover, Good, HSG C
	87,421	77	Weighted Average
	76,673		87.71% Pervious Area
	10,748		12.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0345	0.19		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
1.4	109	0.0333	1.28		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1994	3.13		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Short Grass Pasture Kv= 7.0 fps
2.7	183	0.0056	1.12		**Shallow Concentrated Flow, Shallow Concentrated Flow-3** Grassed Waterway Kv= 15.0 fps
12.9	408	Total			

Subcatchment E3: South to King Rd



Summary for Subcatchment E4: Northeast Parking Lot to Ellsworth Park Storm Water Basin

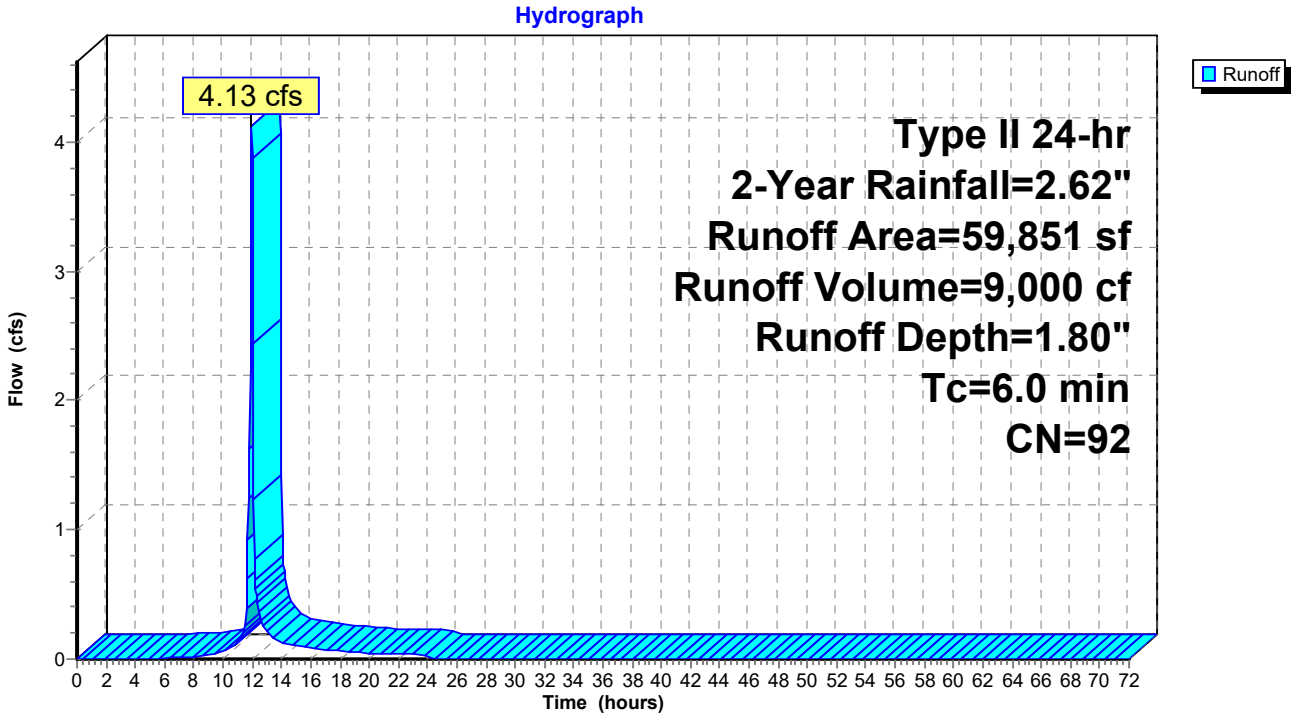
Runoff = 4.13 cfs @ 11.97 hrs, Volume= 9,000 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	38,236	98	Paved parking, HSG C
*	6,502	98	Sidewalks, HSG C
	15,113	74	>75% Grass cover, Good, HSG C
	59,851	92	Weighted Average
	15,113		25.25% Pervious Area
	44,738		74.75% Impervious Area

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

Subcatchment E4: Northeast Parking Lot to Ellsworth Park Storm Water Basin



Summary for Subcatchment E5: Dry Pond to King Rd.

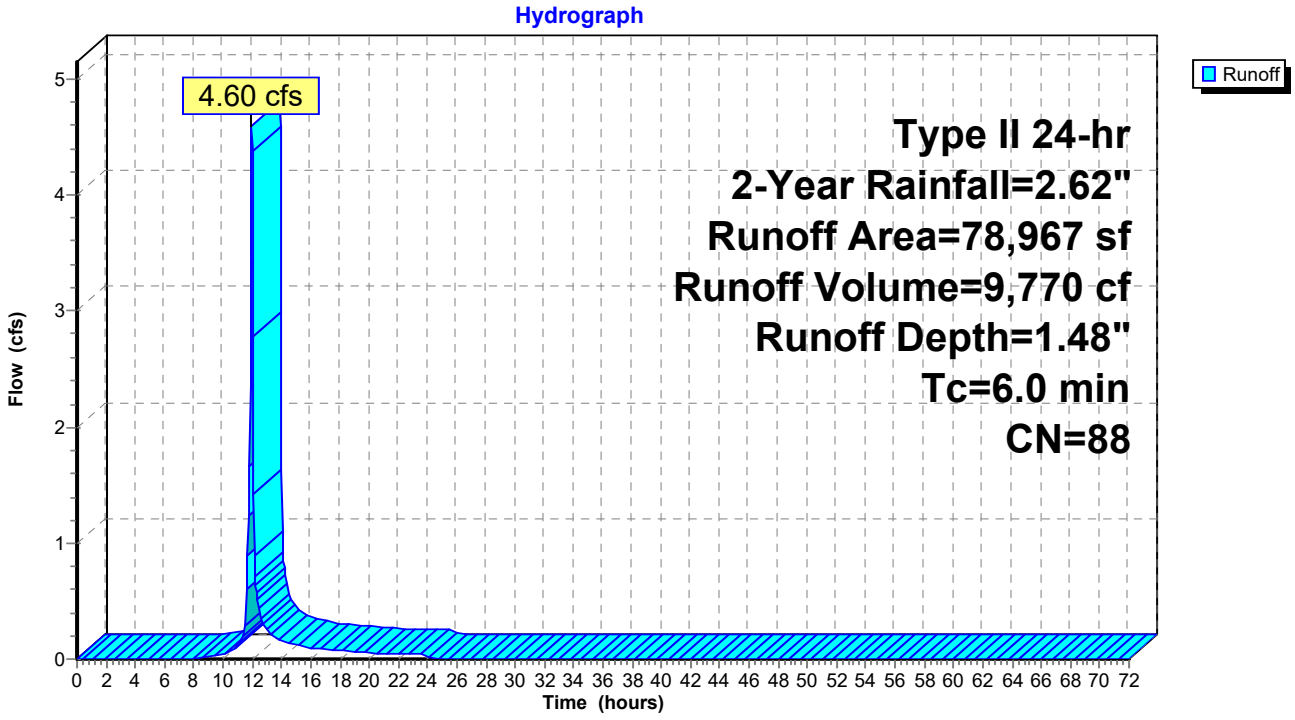
Runoff = 4.60 cfs @ 11.97 hrs, Volume= 9,770 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	45,536	98	Paved parking, HSG C
*	1,212	98	Sidewalks, HSG C
	32,219	74	>75% Grass cover, Good, HSG C
	78,967	88	Weighted Average
	32,219		40.80% Pervious Area
	46,748		59.20% Impervious Area

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

Subcatchment E5: Dry Pond to King Rd.



Summary for Subcatchment E6: Offite Area

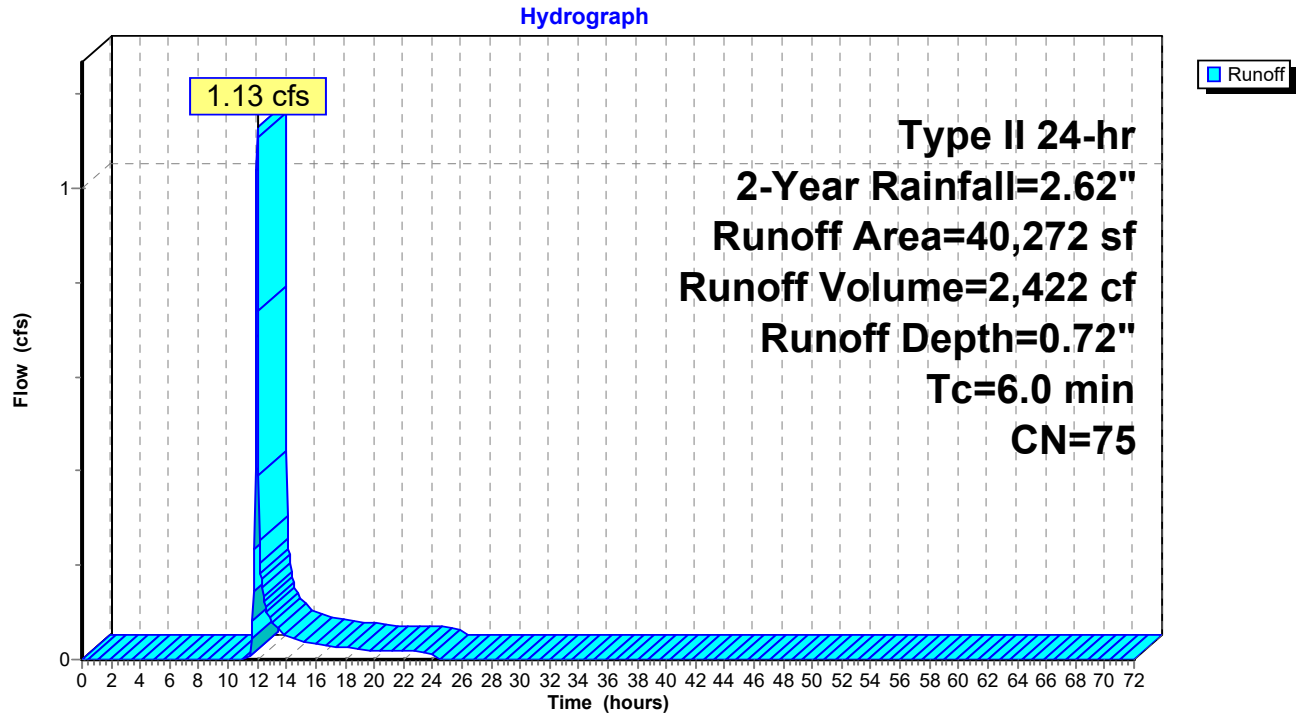
Runoff = 1.13 cfs @ 11.98 hrs, Volume= 2,422 cf, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
*	1,850	98	Sidewalks, HSG C
	38,422	74	>75% Grass cover, Good, HSG C
	40,272	75	Weighted Average
	38,422		95.41% Pervious Area
	1,850		4.59% Impervious Area

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

Subcatchment E6: Offite Area



Summary for Pond EDP: EDP-1

Inflow Area = 78,967 sf, 59.20% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 4.60 cfs @ 11.97 hrs, Volume= 9,770 cf
Outflow = 1.78 cfs @ 12.09 hrs, Volume= 9,770 cf, Atten= 61%, Lag= 7.3 min
Primary = 1.78 cfs @ 12.09 hrs, Volume= 9,770 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 670.27' @ 12.09 hrs Surf.Area= 3,392 sf Storage= 1,864 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.3 min (825.7 - 820.4)

Volume	Invert	Avail.Storage	Storage Description
#1	668.50'	5,633 cf	**Open Storage (Prismatic)**Listed below (Recalc)

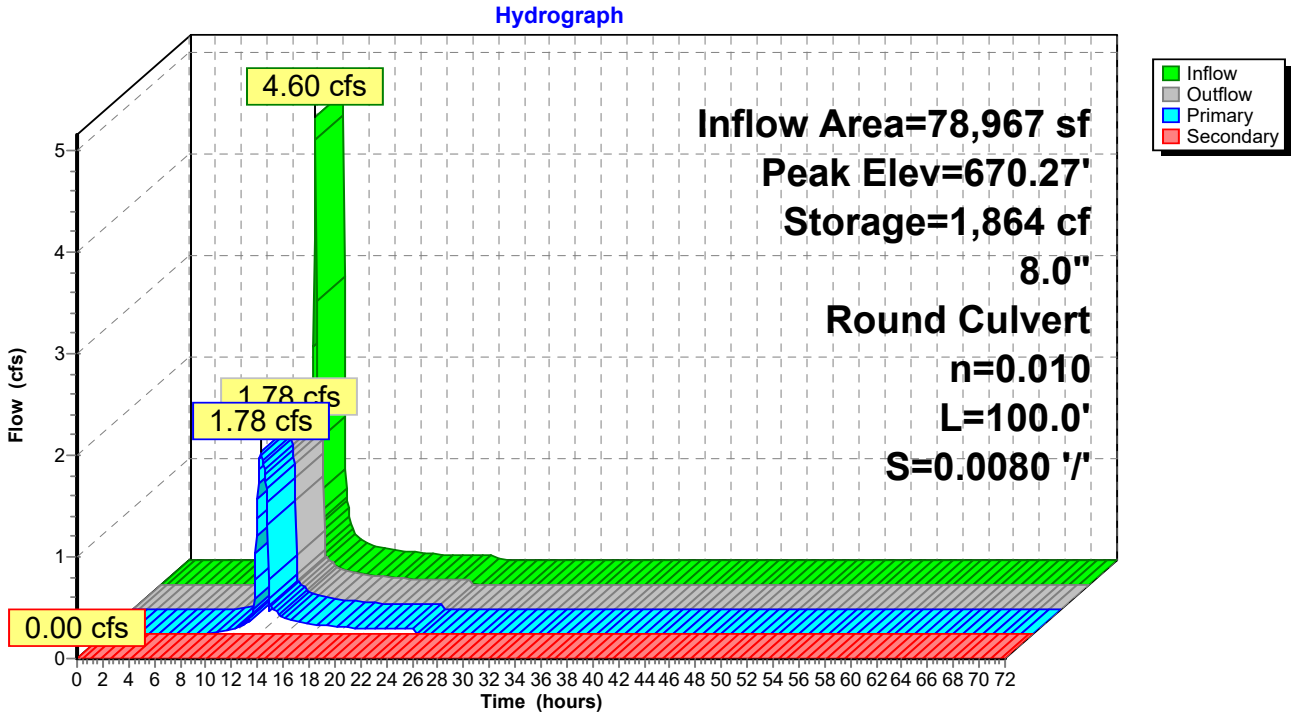
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.50	2	0	0
669.00	96	25	25
670.00	2,111	1,104	1,128
671.00	6,898	4,505	5,633

Device	Routing	Invert	Outlet Devices
#0	Secondary	671.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.50'	**8.0" Round 8" Culvert** L= 100.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 668.50' / 667.70' S= 0.0080 '/' Cc= 0.900 n= 0.010, Flow Area= 0.35 sf

Primary OutFlow Max=1.78 cfs @ 12.09 hrs HW=670.26' (Free Discharge)
1=8" Culvert (Barrel Controls 1.78 cfs @ 5.10 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=668.50' (Free Discharge)

Pond EDP: EDP-1

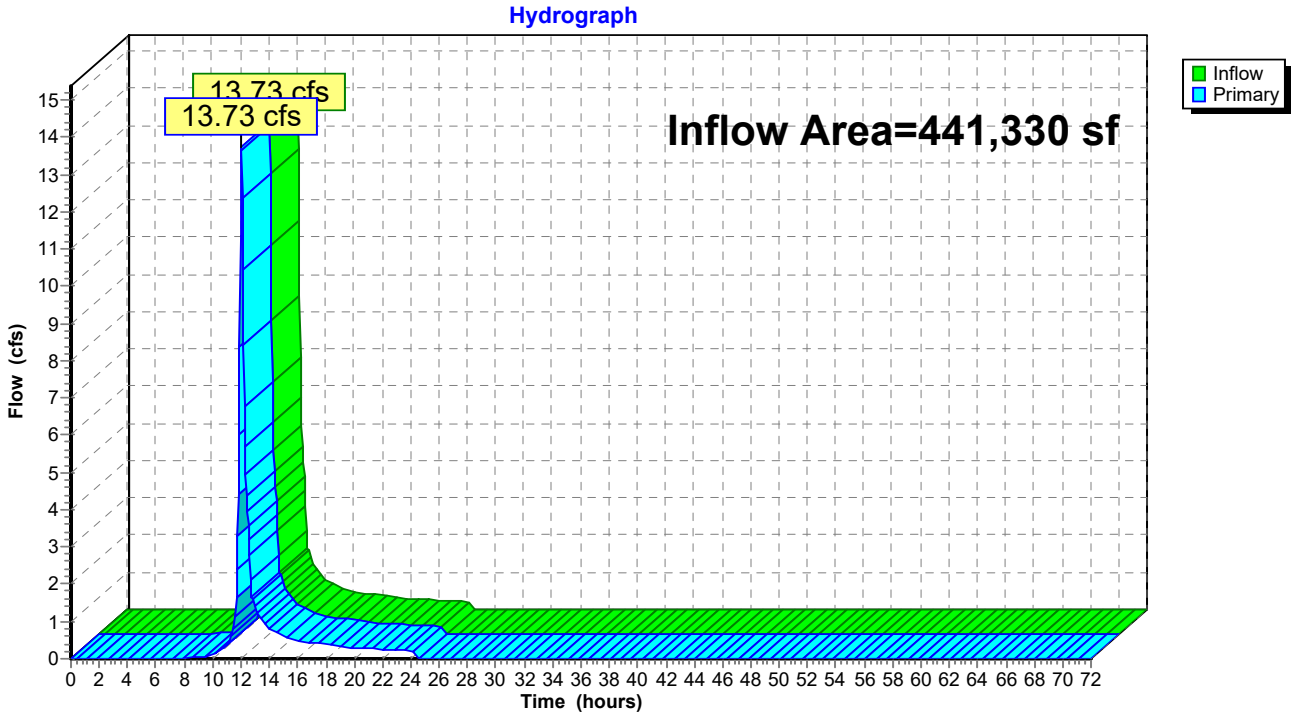


Summary for Link 1L: Existing to King Rd. Storm Sewer

Inflow Area = 441,330 sf, 43.53% Impervious, Inflow Depth = 1.25" for 2-Year event
Inflow = 13.73 cfs @ 12.03 hrs, Volume= 45,800 cf
Primary = 13.73 cfs @ 12.03 hrs, Volume= 45,800 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 1L: Existing to King Rd. Storm Sewer

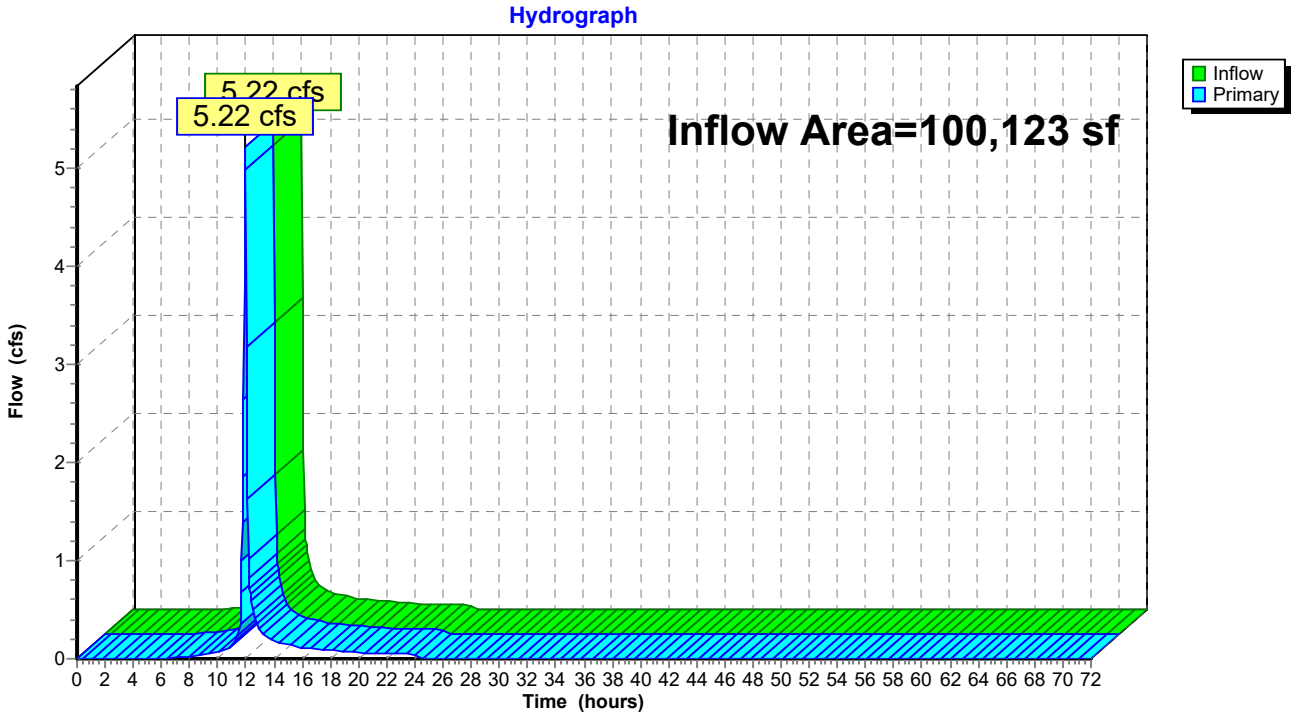


Summary for Link 2L: Existing to Ellsworth Park Storm Water Basin

Inflow Area = 100,123 sf, 46.53% Impervious, Inflow Depth = 1.37" for 2-Year event
Inflow = 5.22 cfs @ 11.97 hrs, Volume= 11,423 cf
Primary = 5.22 cfs @ 11.97 hrs, Volume= 11,423 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 2L: Existing to Ellsworth Park Storm Water Basin

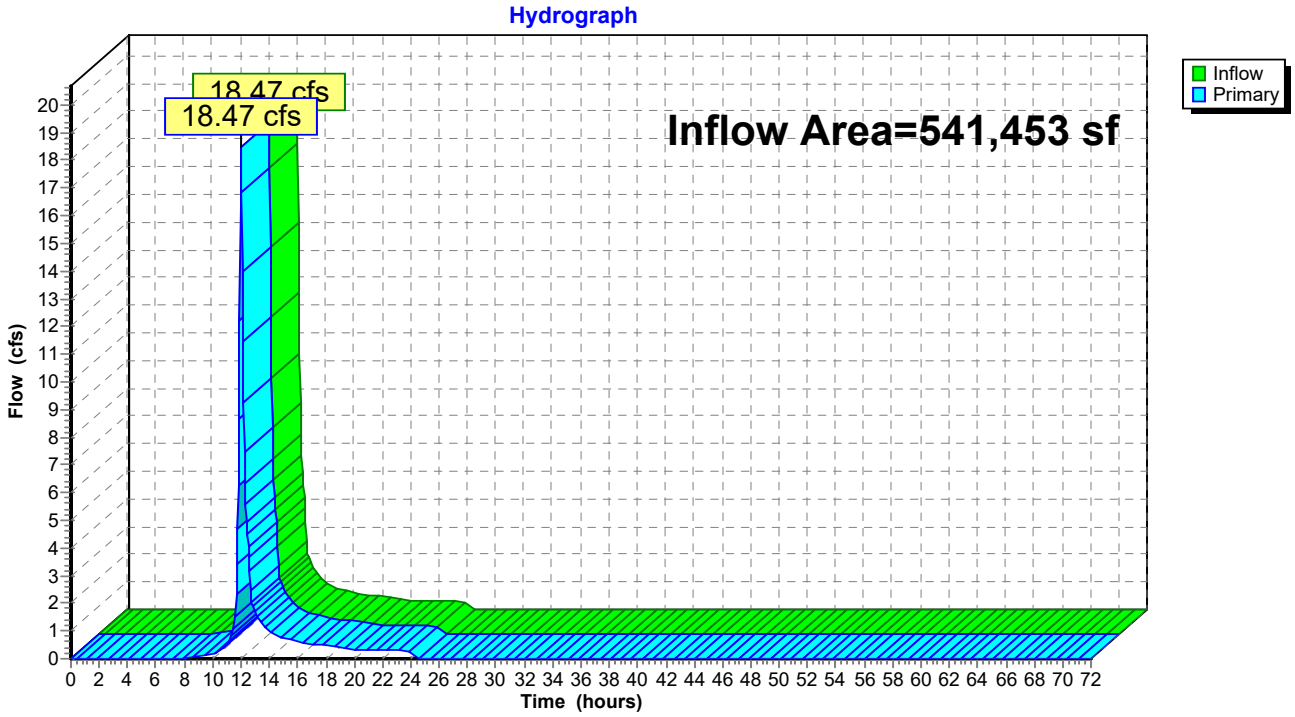


Summary for Link TEO: Total Existing Outfall

Inflow Area = 541,453 sf, 44.09% Impervious, Inflow Depth = 1.27" for 2-Year event
Inflow = 18.47 cfs @ 12.00 hrs, Volume= 57,222 cf
Primary = 18.47 cfs @ 12.00 hrs, Volume= 57,222 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link TEO: Total Existing Outfall



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: North to King Rd. Runoff Area=76,291 sf 54.52% Impervious Runoff Depth=2.39"
Tc=6.0 min CN=87 Runoff=7.05 cfs 15,196 cf

Subcatchment E2: West to King Rd. Runoff Area=198,651 sf 46.83% Impervious Runoff Depth=2.22"
Flow Length=547' Tc=15.6 min CN=85 Runoff=12.70 cfs 36,718 cf

Subcatchment E3: South to King Rd Runoff Area=87,421 sf 12.29% Impervious Runoff Depth=1.60"
Flow Length=408' Tc=12.9 min CN=77 Runoff=4.42 cfs 11,682 cf

Subcatchment E4: Northeast Parking Lot Runoff Area=59,851 sf 74.75% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=92 Runoff=6.36 cfs 14,251 cf

Subcatchment E5: Dry Pond to King Rd. Runoff Area=78,967 sf 59.20% Impervious Runoff Depth=2.48"
Tc=6.0 min CN=88 Runoff=7.53 cfs 16,316 cf

Subcatchment E6: Offite Area Runoff Area=40,272 sf 4.59% Impervious Runoff Depth=1.47"
Tc=6.0 min CN=75 Runoff=2.36 cfs 4,923 cf

Pond EDP: EDP-1 Peak Elev=670.77' Storage=4,196 cf Inflow=7.53 cfs 16,316 cf
nd Culvert n=0.010 L=100.0' S=0.0080 '/' Primary=2.01 cfs 16,316 cf Secondary=0.00 cfs 0 cf Outflow=2.01 cfs 16,316 cf

Link 1L: Existing to King Rd. Storm Sewer Inflow=23.33 cfs 79,911 cf
Primary=23.33 cfs 79,911 cf

Link 2L: Existing to Ellsworth Park Storm Water Basin Inflow=8.68 cfs 19,175 cf
Primary=8.68 cfs 19,175 cf

Link TEO: Total Existing Outfall Inflow=31.21 cfs 99,086 cf
Primary=31.21 cfs 99,086 cf

Total Runoff Area = 541,453 sf Runoff Volume = 99,086 cf Average Runoff Depth = 2.20"
55.91% Pervious = 302,740 sf 44.09% Impervious = 238,713 sf

Summary for Subcatchment E1: North to King Rd.

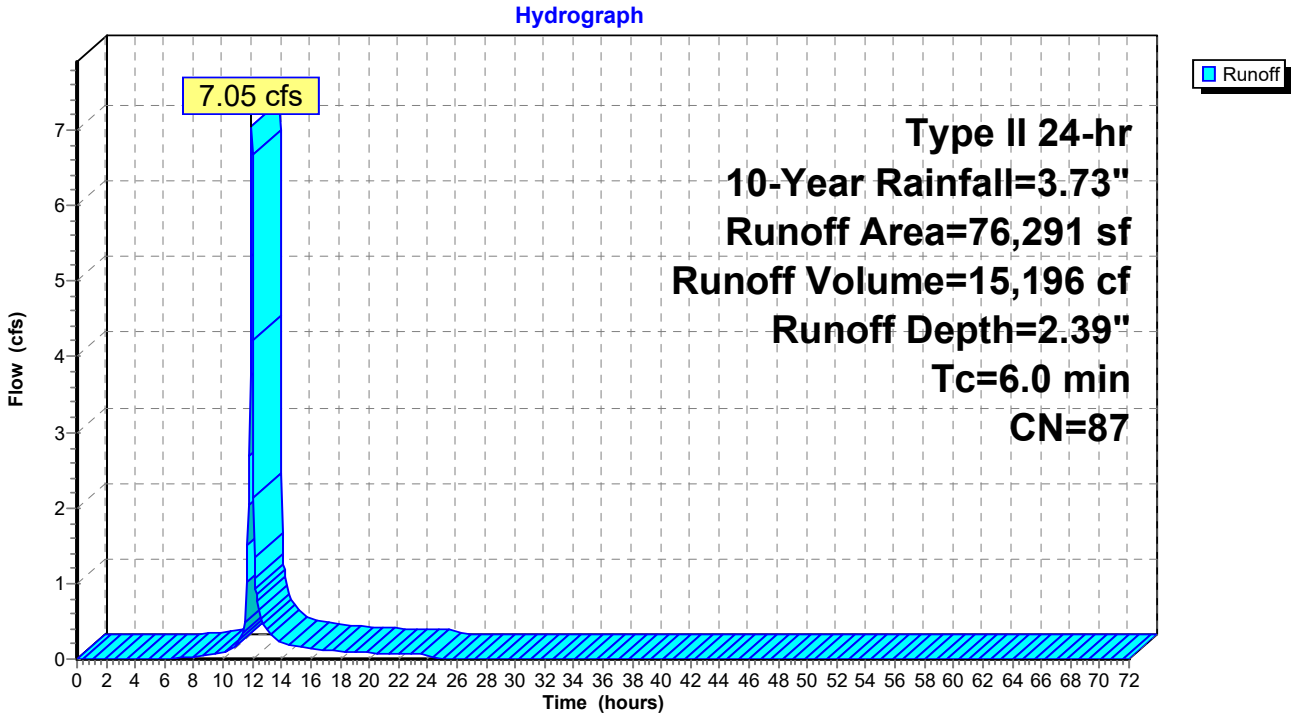
Runoff = 7.05 cfs @ 11.97 hrs, Volume= 15,196 cf, Depth= 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	39,074	98	Paved parking, HSG C
*	2,522	98	Sidewalks, HSG C
	34,695	74	>75% Grass cover, Good, HSG C
	76,291	87	Weighted Average
	34,695		45.48% Pervious Area
	41,596		54.52% Impervious Area

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

Subcatchment E1: North to King Rd.



Summary for Subcatchment E2: West to King Rd.

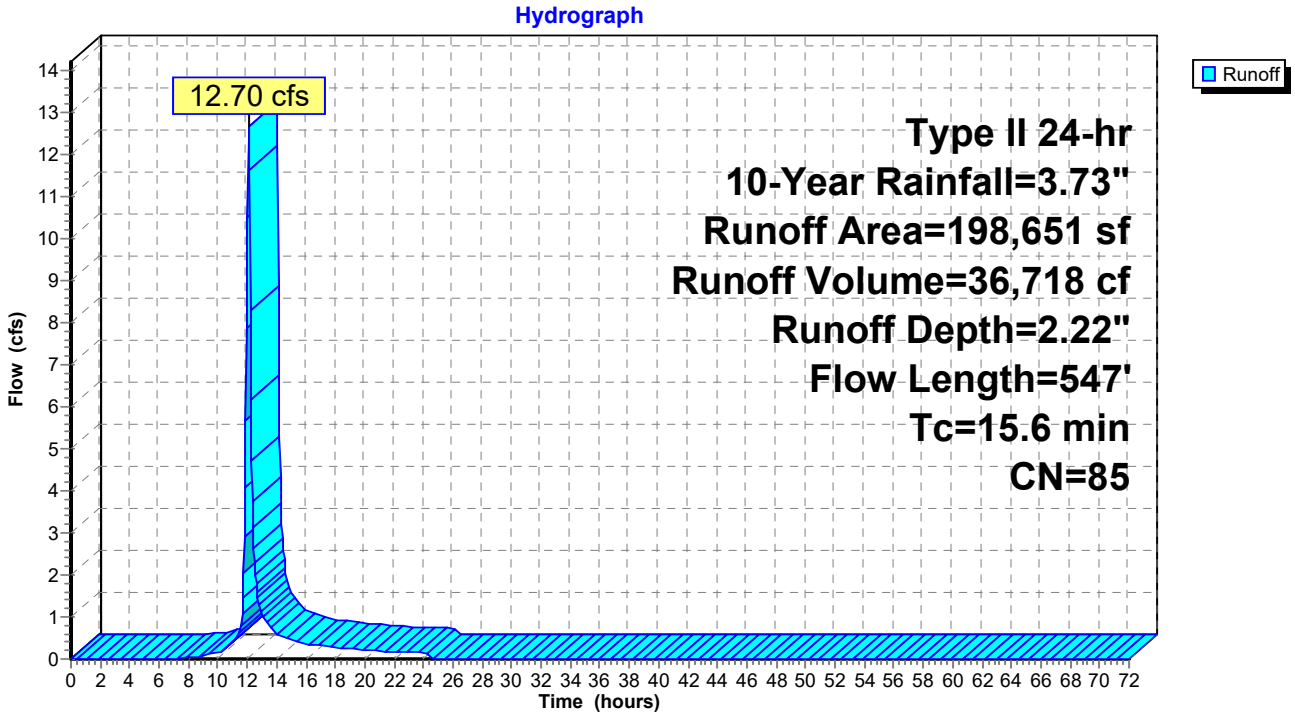
Runoff = 12.70 cfs @ 12.08 hrs, Volume= 36,718 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
*	87,648	98	Roofs, HSG C
	2,439	98	Paved parking, HSG C
*	2,946	98	Sidewalks, HSG C
	105,618	74	>75% Grass cover, Good, HSG C
	198,651	85	Weighted Average
	105,618		53.17% Pervious Area
	93,033		46.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0159	0.14		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
3.5	397	0.0156	1.87		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Grassed Waterway Kv= 15.0 fps
0.2	50	0.0956	4.64		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Grassed Waterway Kv= 15.0 fps
15.6	547	Total			

Subcatchment E2: West to King Rd.



Summary for Subcatchment E3: South to King Rd

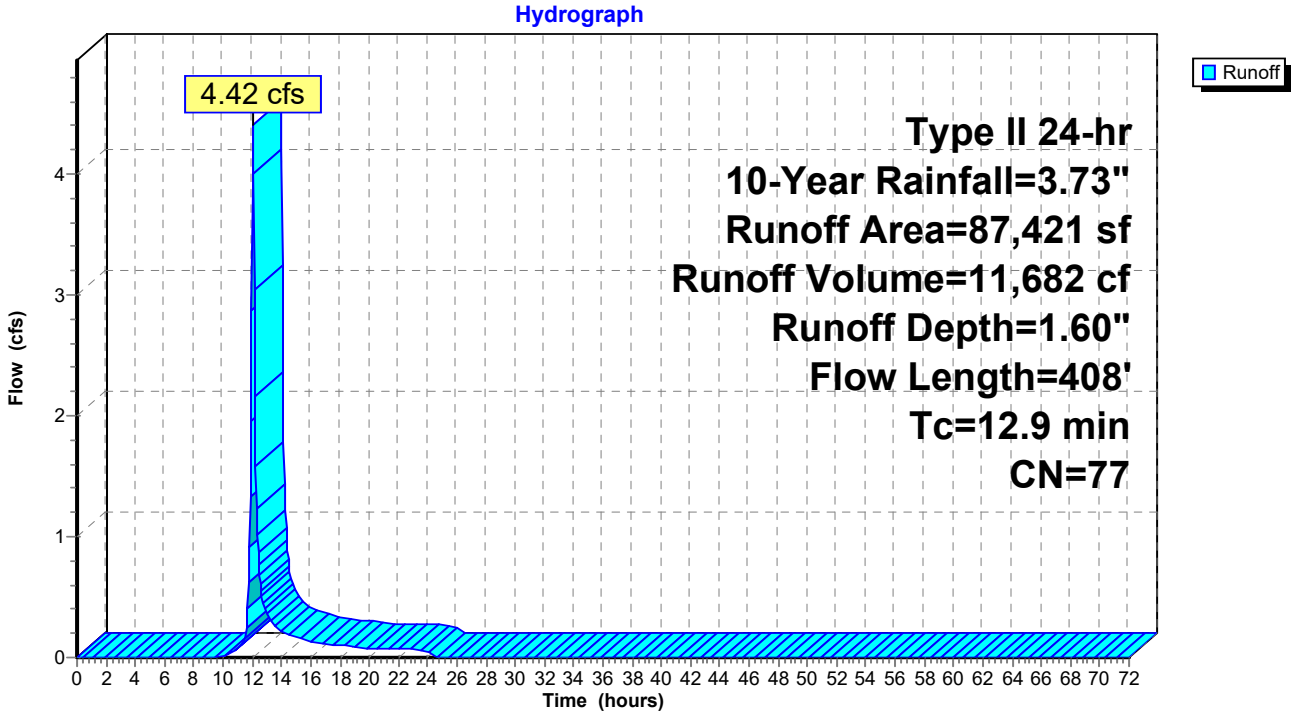
Runoff = 4.42 cfs @ 12.05 hrs, Volume= 11,682 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	363	98	Paved parking, HSG C
*	10,385	98	Sidewalks, HSG C
	76,673	74	>75% Grass cover, Good, HSG C
	87,421	77	Weighted Average
	76,673		87.71% Pervious Area
	10,748		12.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0345	0.19		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
1.4	109	0.0333	1.28		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1994	3.13		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Short Grass Pasture Kv= 7.0 fps
2.7	183	0.0056	1.12		**Shallow Concentrated Flow, Shallow Concentrated Flow-3** Grassed Waterway Kv= 15.0 fps
12.9	408	Total			

Subcatchment E3: South to King Rd



Summary for Subcatchment E4: Northeast Parking Lot to Ellsworth Park Storm Water Basin

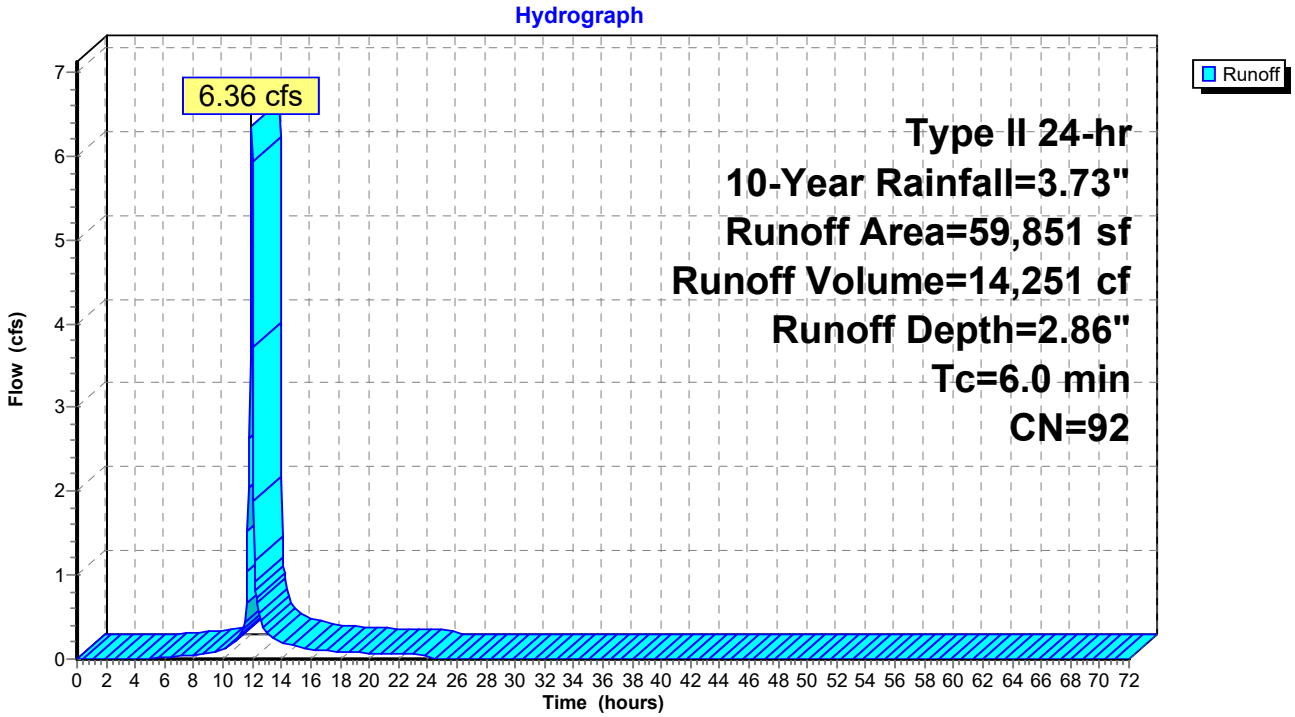
Runoff = 6.36 cfs @ 11.96 hrs, Volume= 14,251 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	38,236	98	Paved parking, HSG C
*	6,502	98	Sidewalks, HSG C
	15,113	74	>75% Grass cover, Good, HSG C
	59,851	92	Weighted Average
	15,113		25.25% Pervious Area
	44,738		74.75% Impervious Area

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

Subcatchment E4: Northeast Parking Lot to Ellsworth Park Storm Water Basin



Summary for Subcatchment E5: Dry Pond to King Rd.

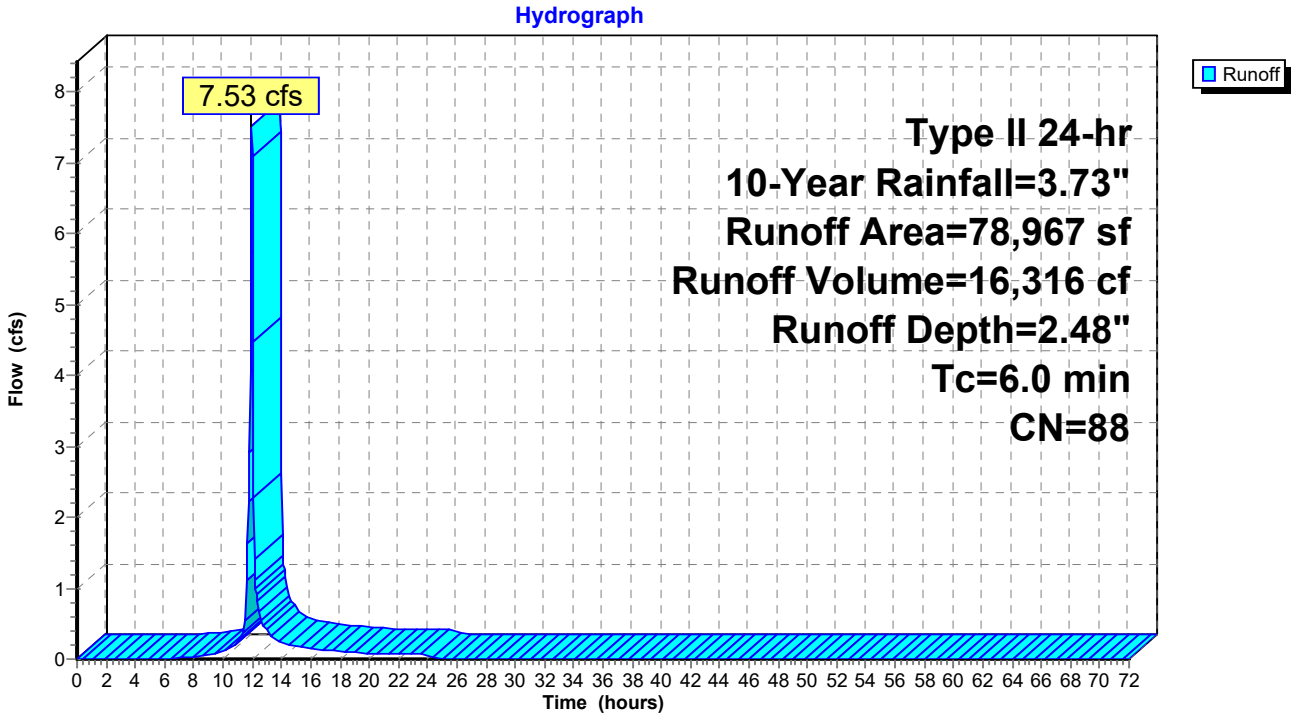
Runoff = 7.53 cfs @ 11.97 hrs, Volume= 16,316 cf, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	45,536	98	Paved parking, HSG C
*	1,212	98	Sidewalks, HSG C
	32,219	74	>75% Grass cover, Good, HSG C
	78,967	88	Weighted Average
	32,219		40.80% Pervious Area
	46,748		59.20% Impervious Area

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

Subcatchment E5: Dry Pond to King Rd.



Summary for Subcatchment E6: Offite Area

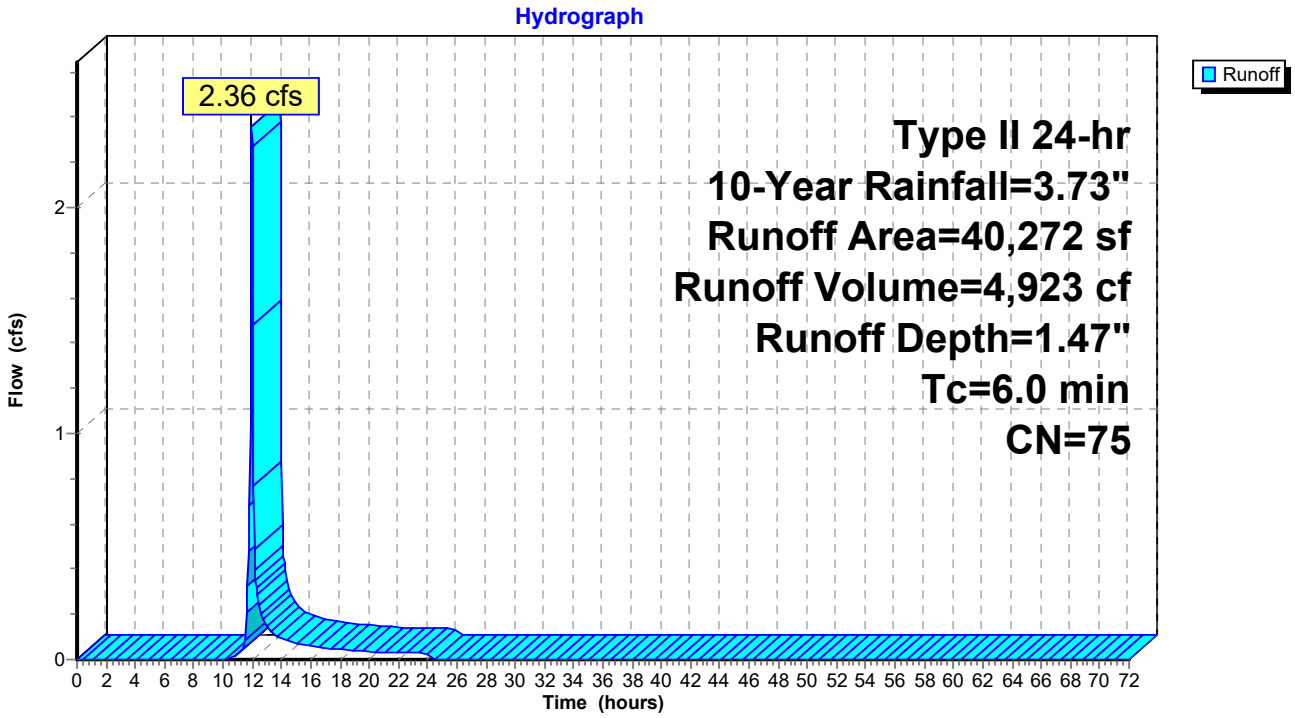
Runoff = 2.36 cfs @ 11.98 hrs, Volume= 4,923 cf, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
*	1,850	98	Sidewalks, HSG C
	38,422	74	>75% Grass cover, Good, HSG C
	40,272	75	Weighted Average
	38,422		95.41% Pervious Area
	1,850		4.59% Impervious Area

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

Subcatchment E6: Offite Area



Summary for Pond EDP: EDP-1

Inflow Area = 78,967 sf, 59.20% Impervious, Inflow Depth = 2.48" for 10-Year event
Inflow = 7.53 cfs @ 11.97 hrs, Volume= 16,316 cf
Outflow = 2.01 cfs @ 12.12 hrs, Volume= 16,316 cf, Atten= 73%, Lag= 9.2 min
Primary = 2.01 cfs @ 12.12 hrs, Volume= 16,316 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 670.77' @ 12.12 hrs Surf.Area= 5,816 sf Storage= 4,196 cf

Plug-Flow detention time= 11.5 min calculated for 16,304 cf (100% of inflow)
Center-of-Mass det. time= 11.5 min (817.3 - 805.8)

Volume	Invert	Avail.Storage	Storage Description
#1	668.50'	5,633 cf	**Open Storage (Prismatic)**Listed below (Recalc)

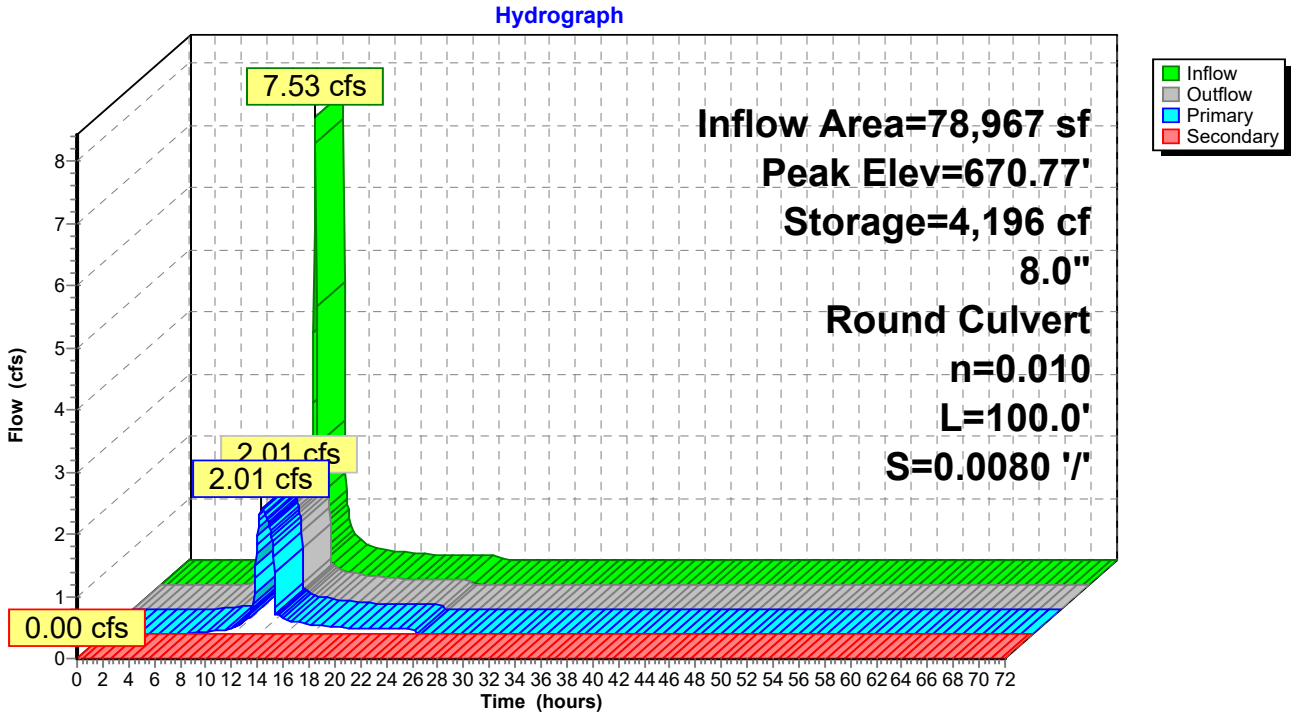
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.50	2	0	0
669.00	96	25	25
670.00	2,111	1,104	1,128
671.00	6,898	4,505	5,633

Device	Routing	Invert	Outlet Devices
#0	Secondary	671.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.50'	**8.0" Round 8" Culvert** L= 100.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 668.50' / 667.70' S= 0.0080 '/' Cc= 0.900 n= 0.010, Flow Area= 0.35 sf

Primary OutFlow Max=2.00 cfs @ 12.12 hrs HW=670.77' (Free Discharge)
↑**1=8" Culvert** (Barrel Controls 2.00 cfs @ 5.74 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=668.50' (Free Discharge)

Pond EDP: EDP-1

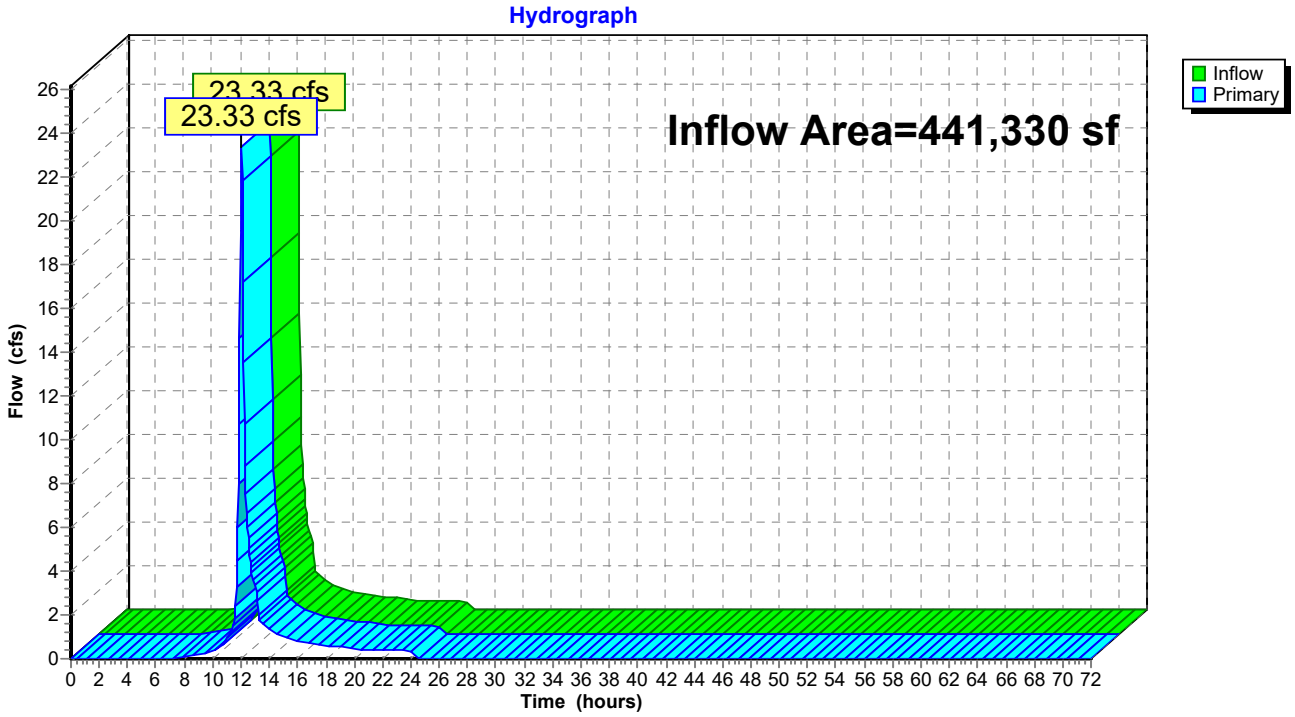


Summary for Link 1L: Existing to King Rd. Storm Sewer

Inflow Area = 441,330 sf, 43.53% Impervious, Inflow Depth = 2.17" for 10-Year event
Inflow = 23.33 cfs @ 12.03 hrs, Volume= 79,911 cf
Primary = 23.33 cfs @ 12.03 hrs, Volume= 79,911 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 1L: Existing to King Rd. Storm Sewer

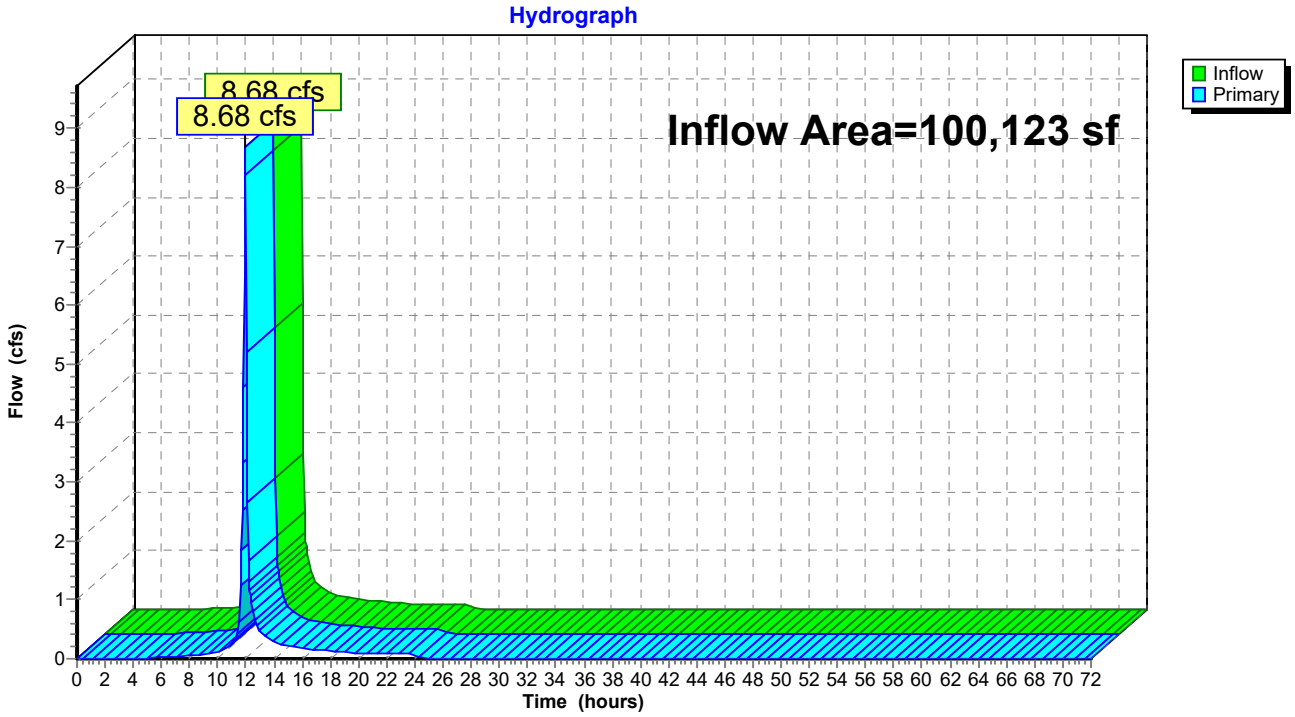


Summary for Link 2L: Existing to Ellsworth Park Storm Water Basin

Inflow Area = 100,123 sf, 46.53% Impervious, Inflow Depth = 2.30" for 10-Year event
Inflow = 8.68 cfs @ 11.97 hrs, Volume= 19,175 cf
Primary = 8.68 cfs @ 11.97 hrs, Volume= 19,175 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 2L: Existing to Ellsworth Park Storm Water Basin

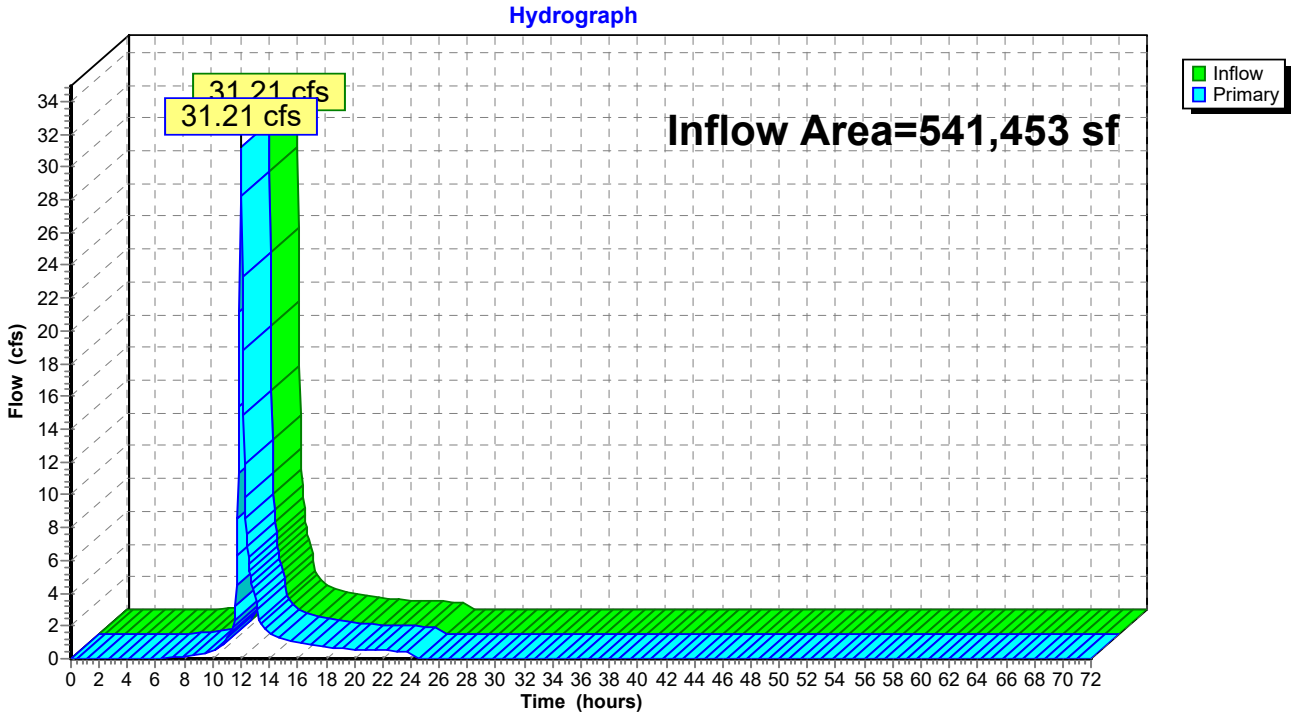


Summary for Link TEO: Total Existing Outfall

Inflow Area = 541,453 sf, 44.09% Impervious, Inflow Depth = 2.20" for 10-Year event
Inflow = 31.21 cfs @ 12.00 hrs, Volume= 99,086 cf
Primary = 31.21 cfs @ 12.00 hrs, Volume= 99,086 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link TEO: Total Existing Outfall



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: North to King Rd. Runoff Area=76,291 sf 54.52% Impervious Runoff Depth=4.71"
Tc=6.0 min CN=87 Runoff=13.40 cfs 29,937 cf

Subcatchment E2: West to King Rd. Runoff Area=198,651 sf 46.83% Impervious Runoff Depth=4.49"
Flow Length=547' Tc=15.6 min CN=85 Runoff=25.18 cfs 74,353 cf

Subcatchment E3: South to King Rd Runoff Area=87,421 sf 12.29% Impervious Runoff Depth=3.65"
Flow Length=408' Tc=12.9 min CN=77 Runoff=10.07 cfs 26,622 cf

Subcatchment E4: Northeast Parking Lot Runoff Area=59,851 sf 74.75% Impervious Runoff Depth=5.27"
Tc=6.0 min CN=92 Runoff=11.28 cfs 26,265 cf

Subcatchment E5: Dry Pond to King Rd. Runoff Area=78,967 sf 59.20% Impervious Runoff Depth=4.82"
Tc=6.0 min CN=88 Runoff=14.09 cfs 31,710 cf

Subcatchment E6: Offite Area Runoff Area=40,272 sf 4.59% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=75 Runoff=5.46 cfs 11,589 cf

Pond EDP: EDP-1 Peak Elev=671.00' Storage=5,633 cf Inflow=14.09 cfs 31,710 cf
vert n=0.010 L=100.0' S=0.0080 '/' Primary=2.10 cfs 26,987 cf Secondary=12.02 cfs 4,723 cf Outflow=14.11 cfs 31,710 cf

Link 1L: Existing to King Rd. Storm Sewer Inflow=57.77 cfs 162,621 cf
Primary=57.77 cfs 162,621 cf

Link 2L: Existing to Ellsworth Park Storm Water Basin Inflow=16.73 cfs 37,854 cf
Primary=16.73 cfs 37,854 cf

Link TEO: Total Existing Outfall Inflow=72.50 cfs 200,476 cf
Primary=72.50 cfs 200,476 cf

Total Runoff Area = 541,453 sf Runoff Volume = 200,476 cf Average Runoff Depth = 4.44"
55.91% Pervious = 302,740 sf 44.09% Impervious = 238,713 sf

Summary for Subcatchment E1: North to King Rd.

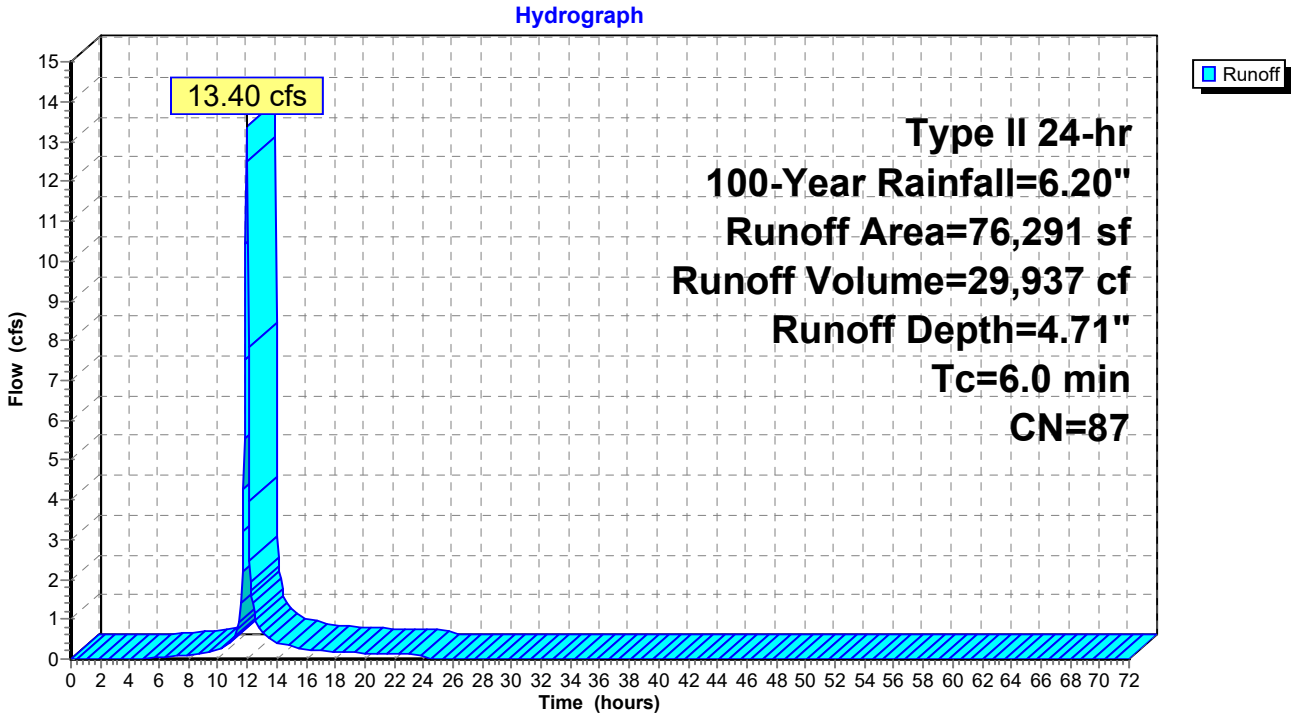
Runoff = 13.40 cfs @ 11.96 hrs, Volume= 29,937 cf, Depth= 4.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	39,074	98	Paved parking, HSG C
*	2,522	98	Sidewalks, HSG C
	34,695	74	>75% Grass cover, Good, HSG C
	76,291	87	Weighted Average
	34,695		45.48% Pervious Area
	41,596		54.52% Impervious Area

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

Subcatchment E1: North to King Rd.



Summary for Subcatchment E2: West to King Rd.

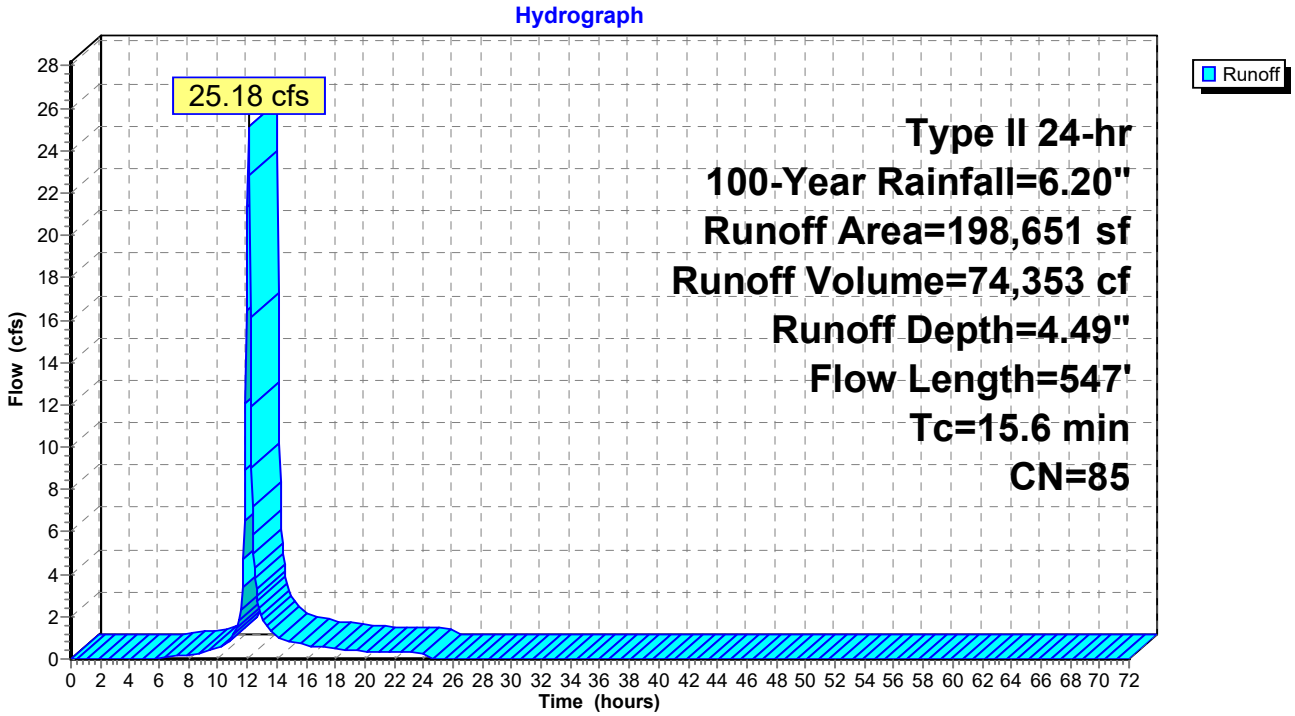
Runoff = 25.18 cfs @ 12.07 hrs, Volume= 74,353 cf, Depth= 4.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
*	87,648	98	Roofs, HSG C
	2,439	98	Paved parking, HSG C
*	2,946	98	Sidewalks, HSG C
	105,618	74	>75% Grass cover, Good, HSG C
	198,651	85	Weighted Average
	105,618		53.17% Pervious Area
	93,033		46.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0159	0.14		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
3.5	397	0.0156	1.87		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Grassed Waterway Kv= 15.0 fps
0.2	50	0.0956	4.64		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Grassed Waterway Kv= 15.0 fps
15.6	547	Total			

Subcatchment E2: West to King Rd.



Summary for Subcatchment E3: South to King Rd

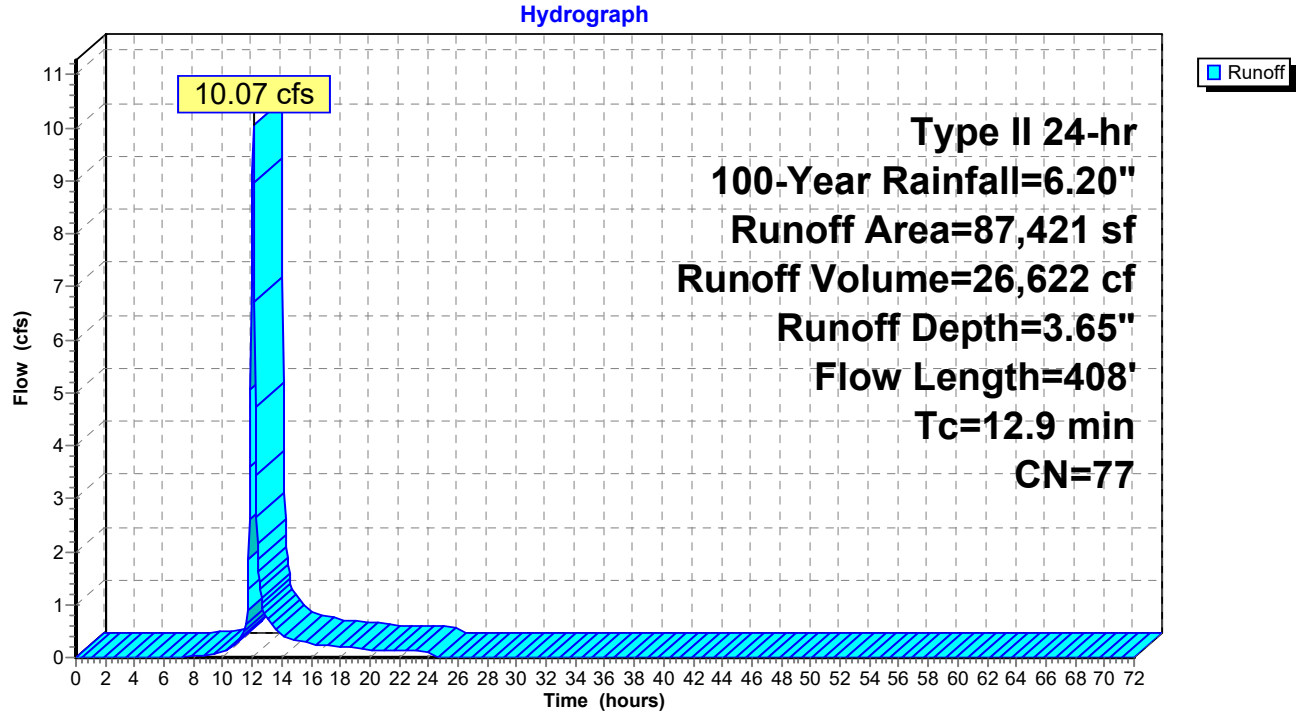
Runoff = 10.07 cfs @ 12.05 hrs, Volume= 26,622 cf, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	363	98	Paved parking, HSG C
*	10,385	98	Sidewalks, HSG C
	76,673	74	>75% Grass cover, Good, HSG C
	87,421	77	Weighted Average
	76,673		87.71% Pervious Area
	10,748		12.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0345	0.19		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
1.4	109	0.0333	1.28		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1994	3.13		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Short Grass Pasture Kv= 7.0 fps
2.7	183	0.0056	1.12		**Shallow Concentrated Flow, Shallow Concentrated Flow-3** Grassed Waterway Kv= 15.0 fps
12.9	408	Total			

Subcatchment E3: South to King Rd



Summary for Subcatchment E4: Northeast Parking Lot to Ellsworth Park Storm Water Basin

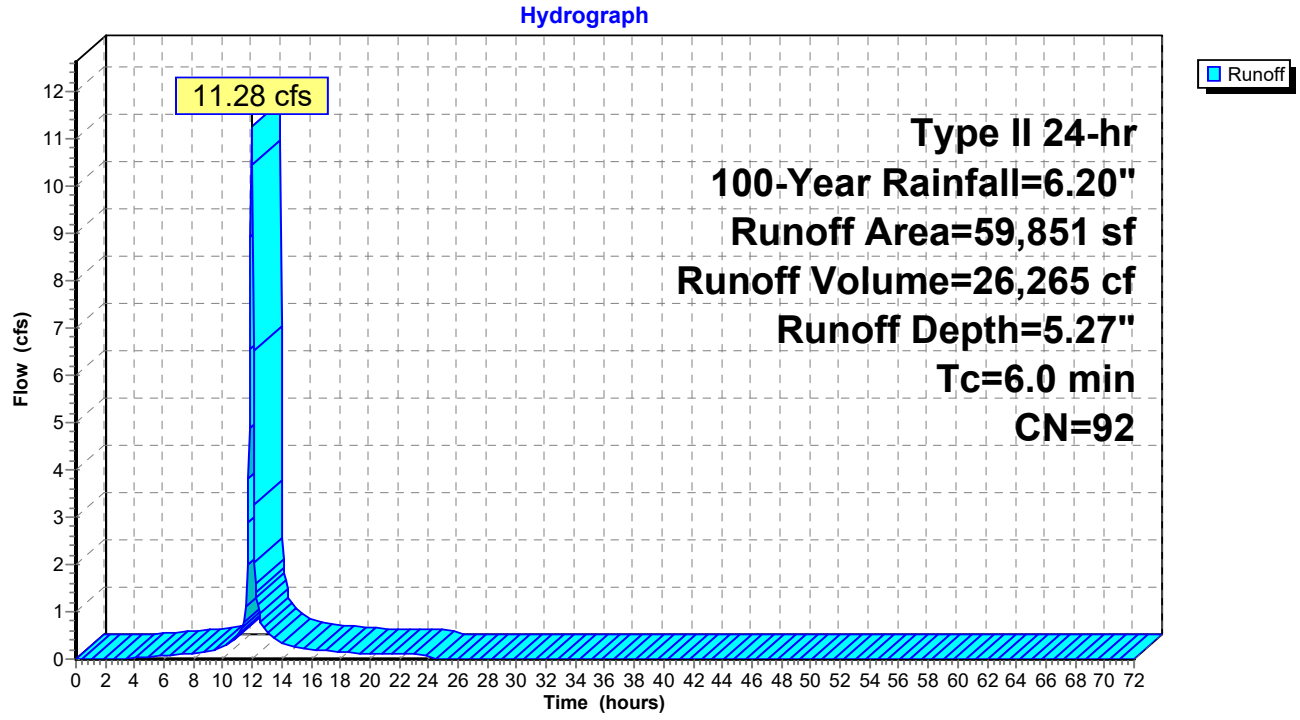
Runoff = 11.28 cfs @ 11.96 hrs, Volume= 26,265 cf, Depth= 5.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	38,236	98	Paved parking, HSG C
*	6,502	98	Sidewalks, HSG C
	15,113	74	>75% Grass cover, Good, HSG C
	59,851	92	Weighted Average
	15,113		25.25% Pervious Area
	44,738		74.75% Impervious Area

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

Subcatchment E4: Northeast Parking Lot to Ellsworth Park Storm Water Basin



Summary for Subcatchment E5: Dry Pond to King Rd.

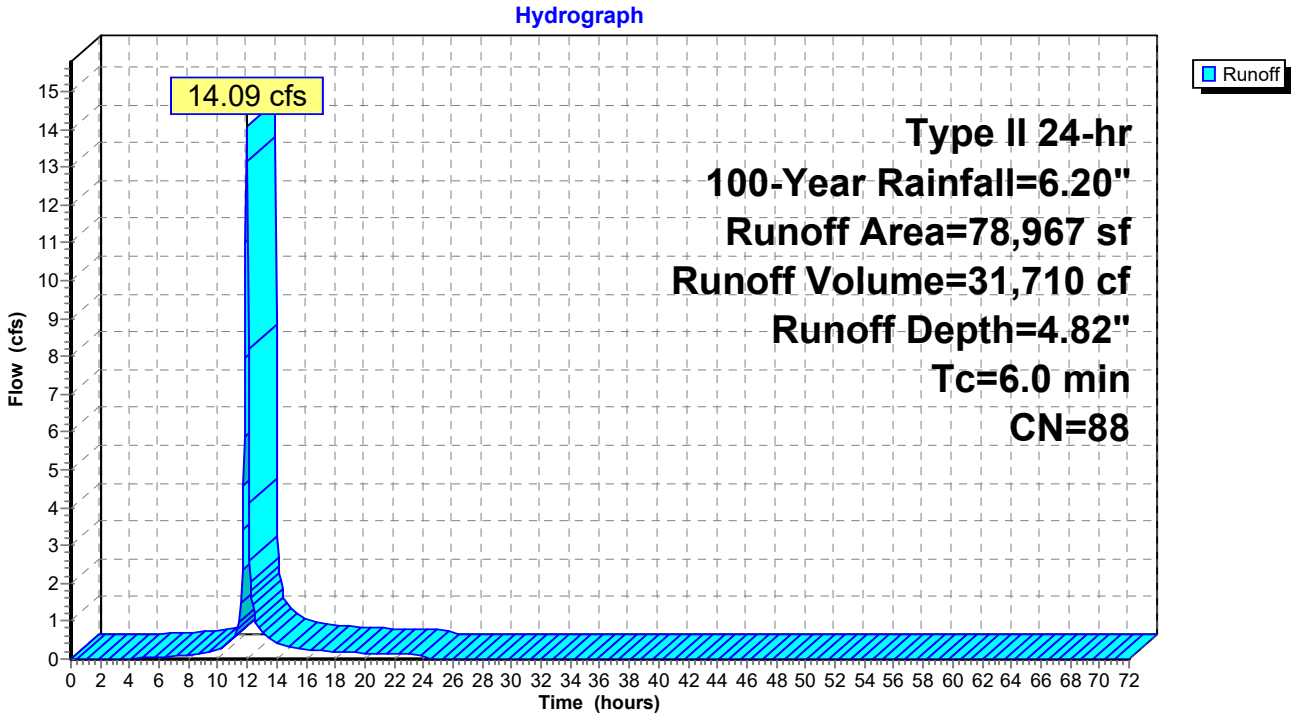
Runoff = 14.09 cfs @ 11.96 hrs, Volume= 31,710 cf, Depth= 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	45,536	98	Paved parking, HSG C
*	1,212	98	Sidewalks, HSG C
	32,219	74	>75% Grass cover, Good, HSG C
	78,967	88	Weighted Average
	32,219		40.80% Pervious Area
	46,748		59.20% Impervious Area

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

Subcatchment E5: Dry Pond to King Rd.



Summary for Subcatchment E6: Offite Area

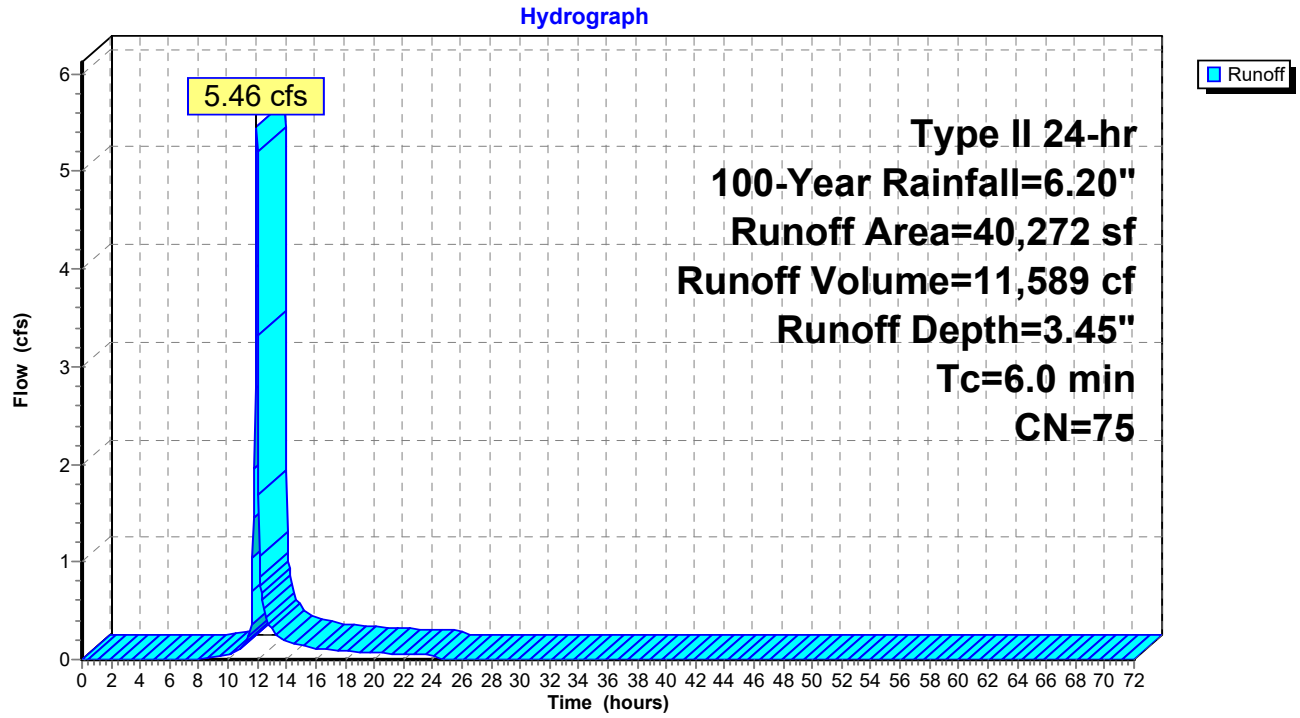
Runoff = 5.46 cfs @ 11.97 hrs, Volume= 11,589 cf, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
*	1,850	98	Sidewalks, HSG C
	38,422	74	>75% Grass cover, Good, HSG C
	40,272	75	Weighted Average
	38,422		95.41% Pervious Area
	1,850		4.59% Impervious Area

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

Subcatchment E6: Offite Area



Summary for Pond EDP: EDP-1

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 78,967 sf, 59.20% Impervious, Inflow Depth = 4.82" for 100-Year event
Inflow = 14.09 cfs @ 11.96 hrs, Volume= 31,710 cf
Outflow = 14.11 cfs @ 12.01 hrs, Volume= 31,710 cf, Atten= 0%, Lag= 3.0 min
Primary = 2.10 cfs @ 11.95 hrs, Volume= 26,987 cf
Secondary = 12.02 cfs @ 12.01 hrs, Volume= 4,723 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 671.00' @ 11.95 hrs Surf.Area= 6,898 sf Storage= 5,633 cf

Plug-Flow detention time= 13.3 min calculated for 31,688 cf (100% of inflow)
Center-of-Mass det. time= 13.2 min (800.4 - 787.1)

Volume	Invert	Avail.Storage	Storage Description
#1	668.50'	5,633 cf	**Open Storage (Prismatic)**Listed below (Recalc)

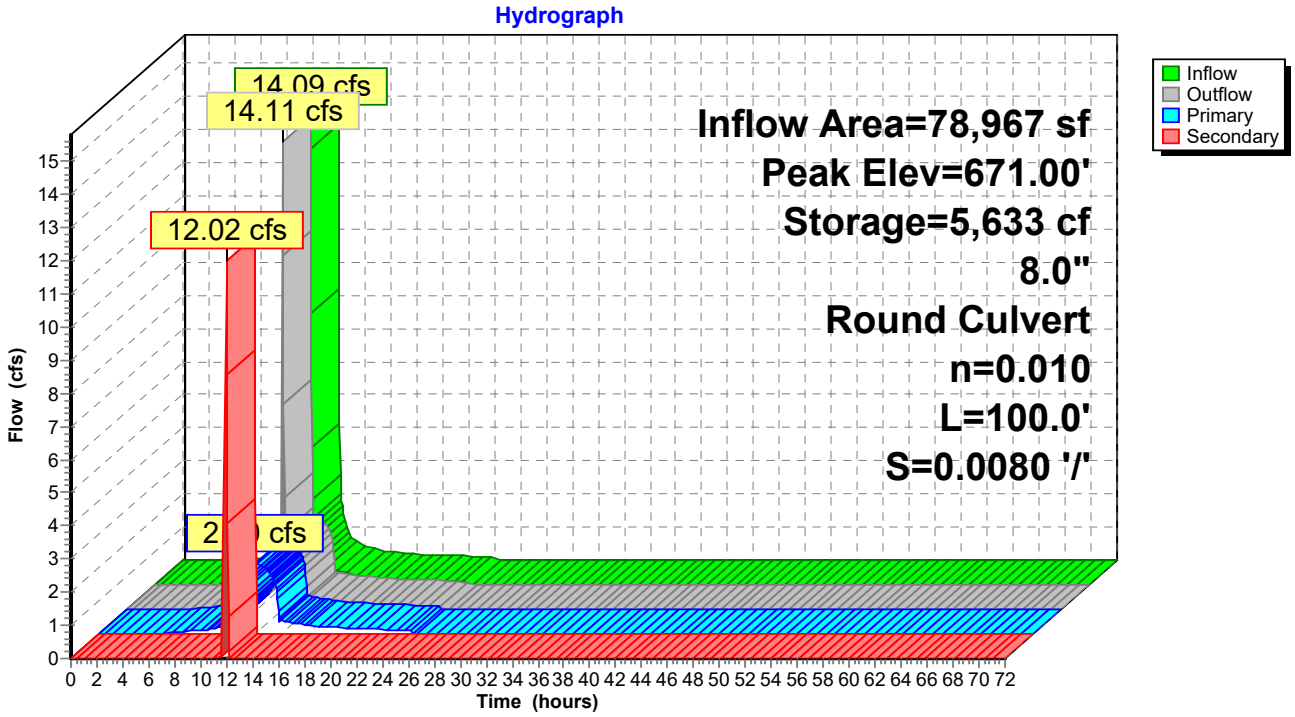
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.50	2	0	0
669.00	96	25	25
670.00	2,111	1,104	1,128
671.00	6,898	4,505	5,633

Device	Routing	Invert	Outlet Devices
#0	Secondary	671.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.50'	**8.0" Round 8" Culvert** L= 100.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 668.50' / 667.70' S= 0.0080 '/' Cc= 0.900 n= 0.010, Flow Area= 0.35 sf

Primary OutFlow Max=2.10 cfs @ 11.95 hrs HW=671.00' (Free Discharge)
↑—**1=8" Culvert** (Barrel Controls 2.10 cfs @ 6.01 fps)

Secondary OutFlow Max=0.00 cfs @ 12.01 hrs HW=671.00' (Free Discharge)

Pond EDP: EDP-1

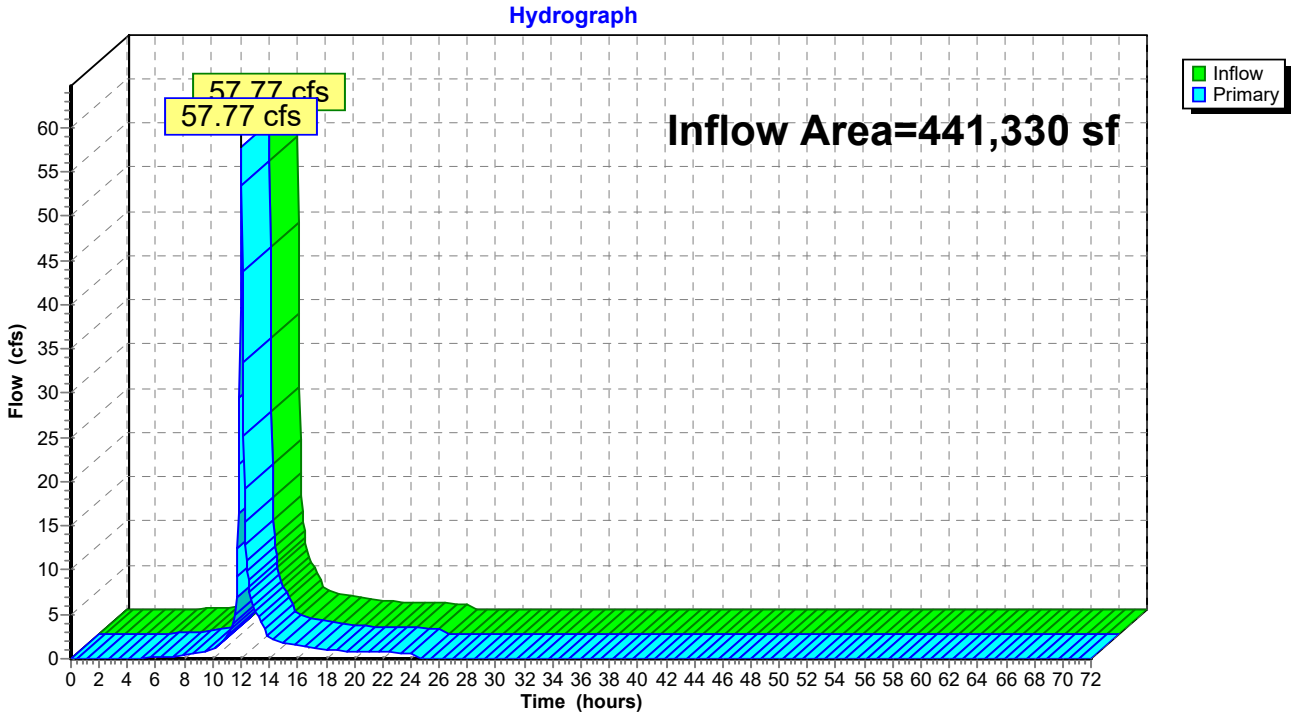


Summary for Link 1L: Existing to King Rd. Storm Sewer

Inflow Area = 441,330 sf, 43.53% Impervious, Inflow Depth = 4.42" for 100-Year event
Inflow = 57.77 cfs @ 12.02 hrs, Volume= 162,621 cf
Primary = 57.77 cfs @ 12.02 hrs, Volume= 162,621 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 1L: Existing to King Rd. Storm Sewer

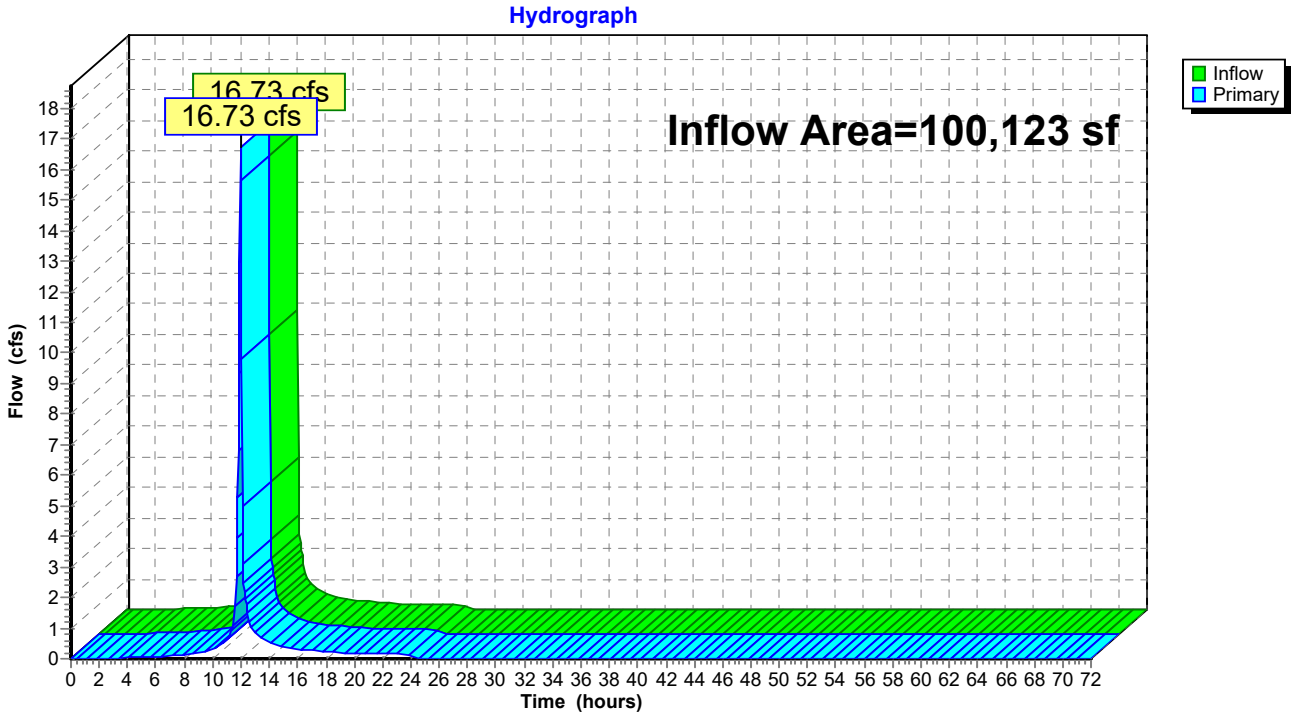


Summary for Link 2L: Existing to Ellsworth Park Storm Water Basin

Inflow Area = 100,123 sf, 46.53% Impervious, Inflow Depth = 4.54" for 100-Year event
Inflow = 16.73 cfs @ 11.97 hrs, Volume= 37,854 cf
Primary = 16.73 cfs @ 11.97 hrs, Volume= 37,854 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 2L: Existing to Ellsworth Park Storm Water Basin

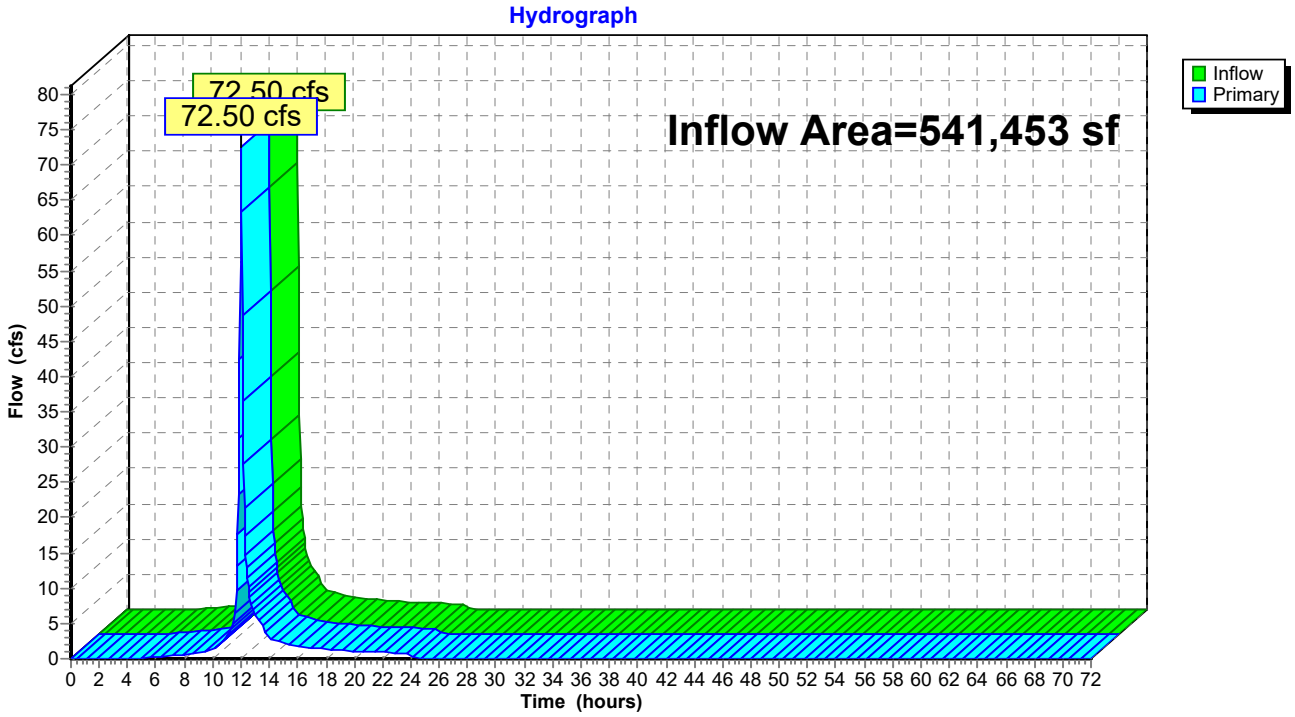


Summary for Link TEO: Total Existing Outfall

Inflow Area = 541,453 sf, 44.09% Impervious, Inflow Depth = 4.44" for 100-Year event
Inflow = 72.50 cfs @ 12.01 hrs, Volume= 200,476 cf
Primary = 72.50 cfs @ 12.01 hrs, Volume= 200,476 cf, Atten= 0%, Lag= 0.0 min

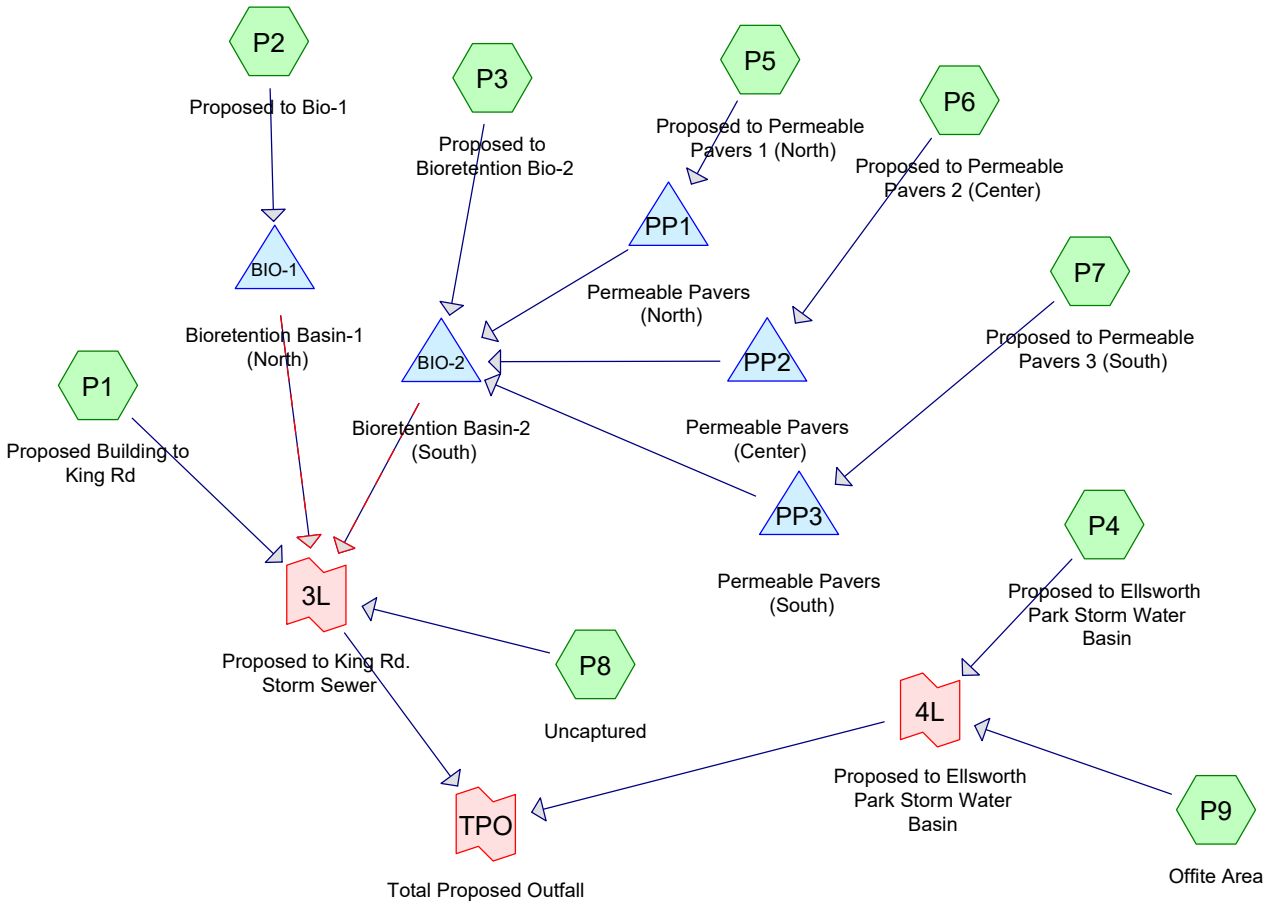
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link TEO: Total Existing Outfall



Appendix C

HydroCAD Analysis – Post-Development Conditions



Lake Michigan Direct Watershed Critical Time 1.5 Hr (11.75 to 13.25)

Proposed 2-year (34,354 - 6,974) = 27,380

Proposed 100-year (125,370 - 33,475) = 91,795

Subcat Reach Pond Link

Routing Diagram for 220126_Proposed HydroCAD
Prepared by Kapur& Associates, Inc., Printed 1/13/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type II 24-hr		Default	24.00	1	2.62	2
2	10-Year	Type II 24-hr		Default	24.00	1	3.73	2
3	100-Year	Type II 24-hr		Default	24.00	1	6.20	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
290,169	74	>75% Grass cover, Good, HSG C (P2, P3, P4, P5, P6, P7, P8, P9)
84,605	98	Paved parking, HSG C (P2, P3, P4, P5, P6, P7, P8)
19,297	98	Pervious Pavers, HSG C (P5, P6, P7)
85,438	98	Roofs, HSG C (P1)
61,944	98	Sidewalks, HSG C (P2, P3, P5, P6, P7, P8, P9)
541,453	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
541,453	HSG C	P1, P2, P3, P4, P5, P6, P7, P8, P9
0	HSG D	
0	Other	
541,453		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	290,169	0	0	290,169	>75% Grass cover, Good	
0	0	84,605	0	0	84,605	Paved parking	
0	0	19,297	0	0	19,297	Pervious Pavers	
0	0	85,438	0	0	85,438	Roofs	
0	0	61,944	0	0	61,944	Sidewalks	
0	**0**	**541,453**	**0**	**0**	**541,453**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	BIO-1	661.00	660.50	50.0	0.0100	0.013	18.0	0.0	0.0
2	BIO-2	662.00	659.00	300.0	0.0100	0.013	18.0	0.0	0.0
3	PP1	668.26	667.26	100.0	0.0100	0.012	12.0	0.0	0.0
4	PP2	668.05	667.97	8.0	0.0100	0.012	12.0	0.0	0.0
5	PP3	668.11	668.03	8.0	0.0100	0.012	24.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Proposed Building to Runoff Area=85,438 sf 100.00% Impervious Runoff Depth=2.39"
Tc=6.0 min CN=98 Runoff=7.02 cfs 17,017 cf

Subcatchment P2: Proposed to Bio-1 Runoff Area=152,166 sf 27.69% Impervious Runoff Depth=1.03"
Flow Length=212' Tc=14.2 min CN=81 Runoff=4.68 cfs 13,046 cf

Subcatchment P3: Proposed to Runoff Area=101,769 sf 38.44% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=83 Runoff=4.67 cfs 9,730 cf

Subcatchment P4: Proposed to Ellsworth Runoff Area=40,804 sf 29.98% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=81 Runoff=1.68 cfs 3,498 cf

Subcatchment P5: Proposed to Permeable Runoff Area=20,463 sf 74.70% Impervious Runoff Depth=1.80"
Tc=6.0 min CN=92 Runoff=1.41 cfs 3,077 cf

Subcatchment P6: Proposed to Permeable Runoff Area=24,281 sf 88.23% Impervious Runoff Depth=2.08"
Tc=6.0 min CN=95 Runoff=1.86 cfs 4,208 cf

Subcatchment P7: Proposed to Permeable Runoff Area=16,684 sf 75.67% Impervious Runoff Depth=1.80"
Tc=6.0 min CN=92 Runoff=1.15 cfs 2,509 cf

Subcatchment P8: Uncaptured Runoff Area=59,576 sf 35.55% Impervious Runoff Depth=1.15"
Flow Length=352' Tc=8.7 min CN=83 Runoff=2.50 cfs 5,696 cf

Subcatchment P9: Offite Area Runoff Area=40,272 sf 4.59% Impervious Runoff Depth=0.72"
Tc=6.0 min CN=75 Runoff=1.13 cfs 2,422 cf

Pond BIO-1: Bioretention Basin-1 (North) Peak Elev=663.41' Storage=4,444 cf Inflow=4.68 cfs 13,046 cf
Primary=0.97 cfs 13,046 cf Secondary=0.00 cfs 0 cf Outflow=0.97 cfs 13,046 cf

Pond BIO-2: Bioretention Basin-2 (South) Peak Elev=665.39' Storage=5,086 cf Inflow=6.76 cfs 19,523 cf
Outflow=1.68 cfs 19,523 cf

Pond PP1: Permeable Pavers (North) Peak Elev=668.75' Storage=818 cf Inflow=1.41 cfs 3,077 cf
Outflow=0.90 cfs 3,077 cf

Pond PP2: Permeable Pavers (Center) Peak Elev=668.62' Storage=1,423 cf Inflow=1.86 cfs 4,208 cf
Outflow=0.80 cfs 4,208 cf

Pond PP3: Permeable Pavers (South) Peak Elev=668.53' Storage=677 cf Inflow=1.15 cfs 2,509 cf
Outflow=0.72 cfs 2,509 cf

Link 3L: Proposed to King Rd. Storm Sewer Inflow=11.39 cfs 55,282 cf
Primary=11.39 cfs 55,282 cf

Link 4L: Proposed to Ellsworth Park Storm Water Basin Inflow=2.81 cfs 5,920 cf
Primary=2.81 cfs 5,920 cf

Link TPO: Total Proposed Outfall

Inflow=14.20 cfs 61,203 cf
Primary=14.20 cfs 61,203 cf

Total Runoff Area = 541,453 sf Runoff Volume = 61,203 cf Average Runoff Depth = 1.36"
53.59% Pervious = 290,169 sf 46.41% Impervious = 251,284 sf

Summary for Subcatchment P1: Proposed Building to King Rd

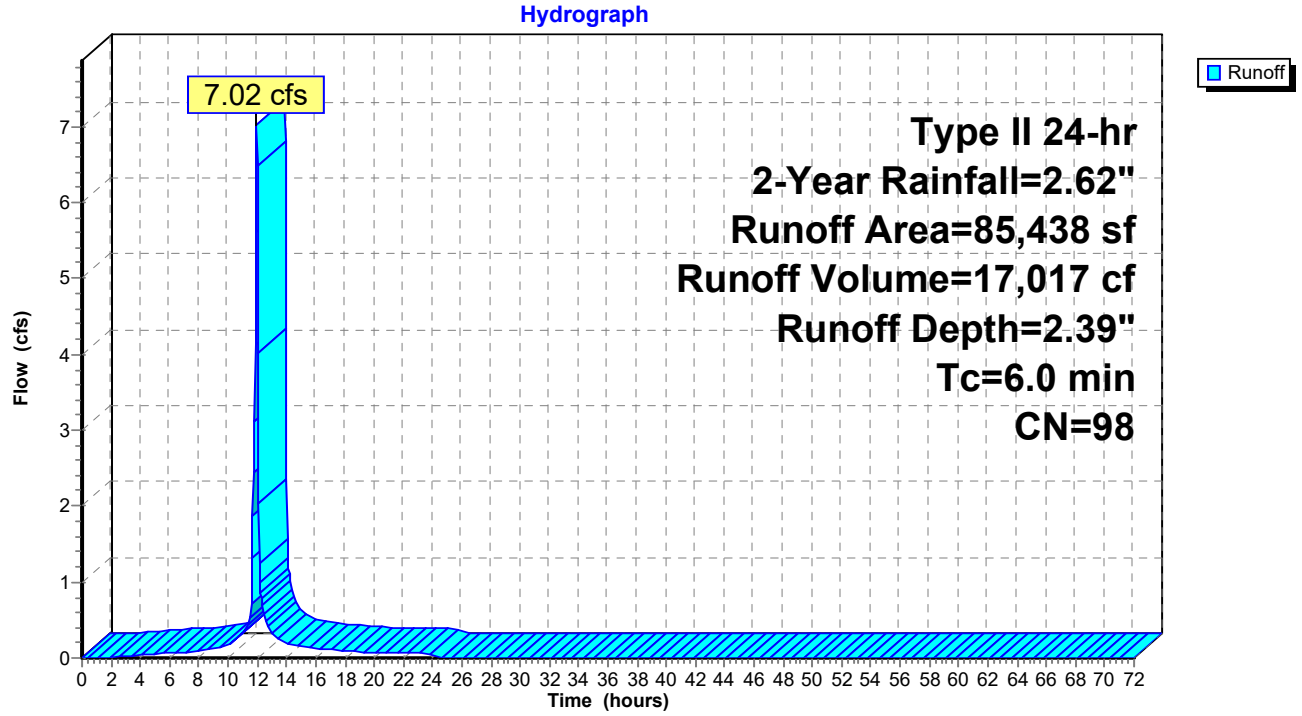
Runoff = 7.02 cfs @ 11.96 hrs, Volume= 17,017 cf, Depth= 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

Area (sf)	CN	Description
85,438	98	Roofs, HSG C
85,438		100.00% Impervious Area

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

Subcatchment P1: Proposed Building to King Rd



Summary for Subcatchment P2: Proposed to Bio-1

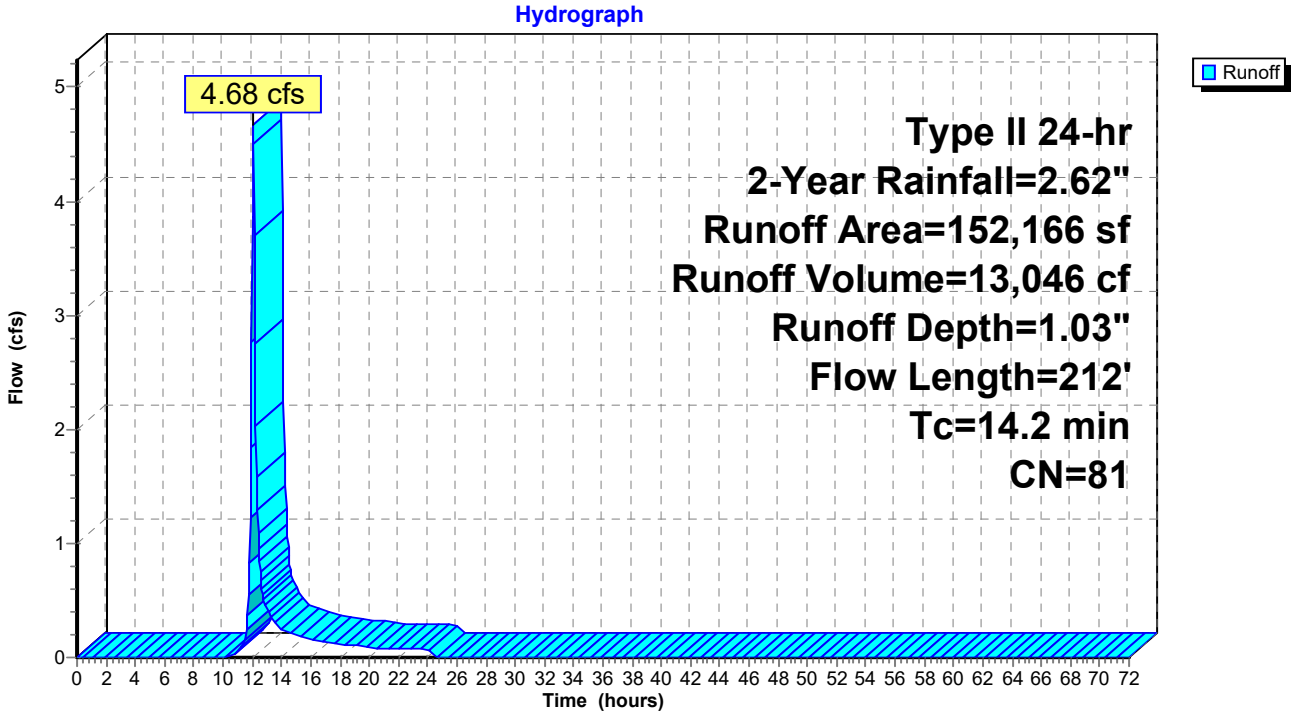
Runoff = 4.68 cfs @ 12.07 hrs, Volume= 13,046 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	9,071	98	Paved parking, HSG C
*	33,060	98	Sidewalks, HSG C
	110,035	74	>75% Grass cover, Good, HSG C
	152,166	81	Weighted Average
	110,035		72.31% Pervious Area
	42,131		27.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0120	0.13		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
0.3	34	0.0900	2.10		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Short Grass Pasture Kv= 7.0 fps
0.6	78	0.0200	2.12		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Grassed Waterway Kv= 15.0 fps
14.2	212	Total			

Subcatchment P2: Proposed to Bio-1



Summary for Subcatchment P3: Proposed to Bioretention Bio-2

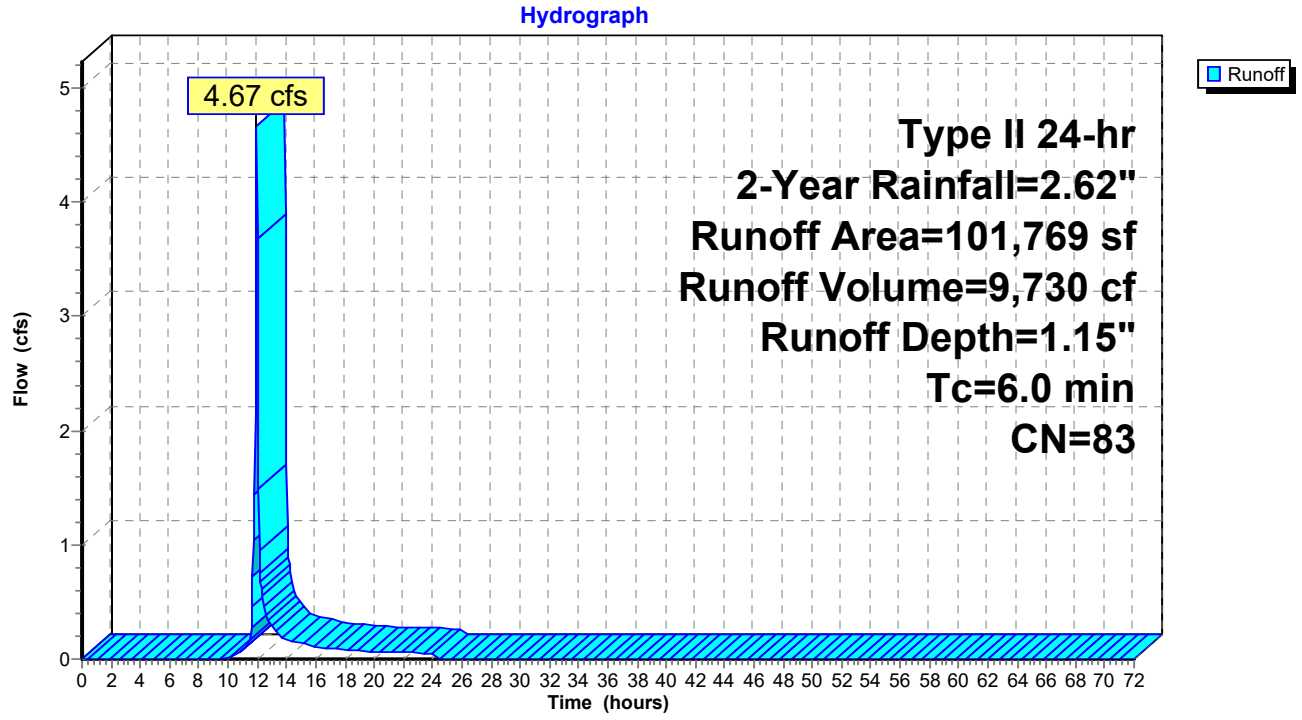
Runoff = 4.67 cfs @ 11.98 hrs, Volume= 9,730 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	25,743	98	Paved parking, HSG C
*	13,375	98	Sidewalks, HSG C
	62,651	74	>75% Grass cover, Good, HSG C
	101,769	83	Weighted Average
	62,651		61.56% Pervious Area
	39,118		38.44% Impervious Area

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

Subcatchment P3: Proposed to Bioretention Bio-2



Summary for Subcatchment P4: Proposed to Ellsworth Park Storm Water Basin

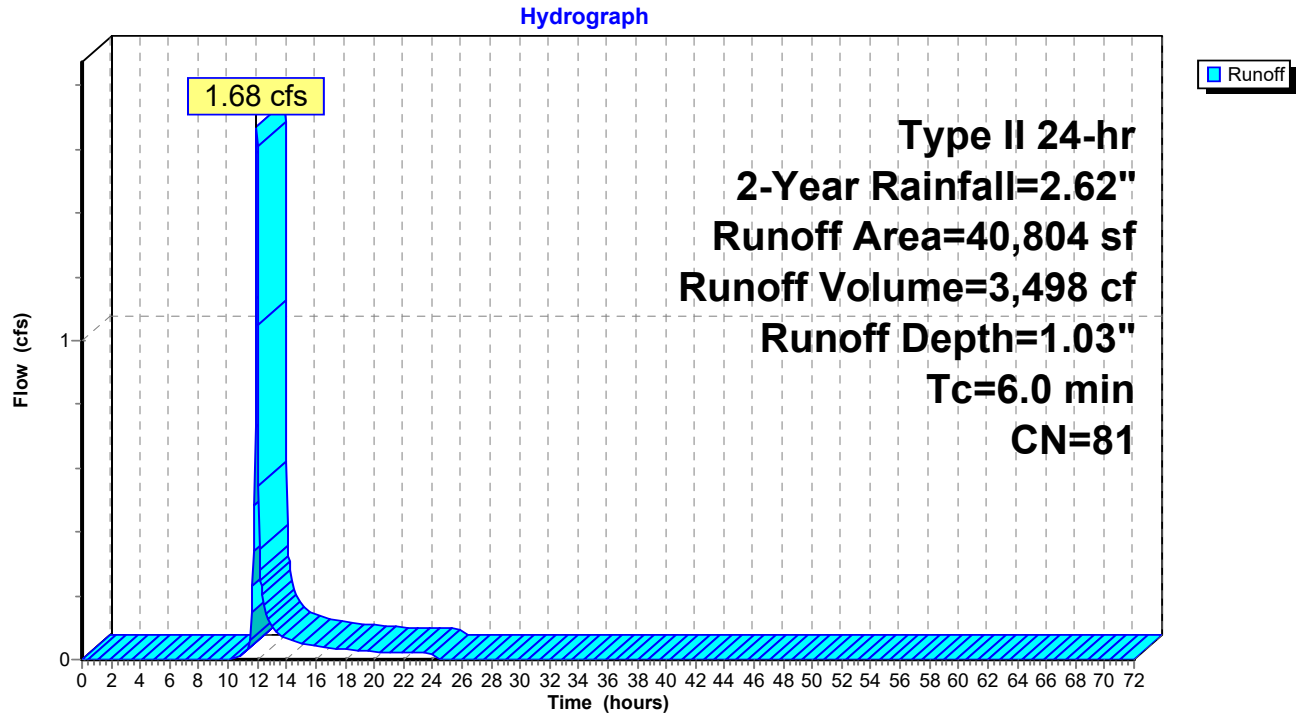
Runoff = 1.68 cfs @ 11.98 hrs, Volume= 3,498 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

Area (sf)	CN	Description
12,234	98	Paved parking, HSG C
28,570	74	>75% Grass cover, Good, HSG C
40,804	81	Weighted Average
28,570		70.02% Pervious Area
12,234		29.98% Impervious Area

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

Subcatchment P4: Proposed to Ellsworth Park Storm Water Basin



Summary for Subcatchment P5: Proposed to Permeable Pavers 1 (North)

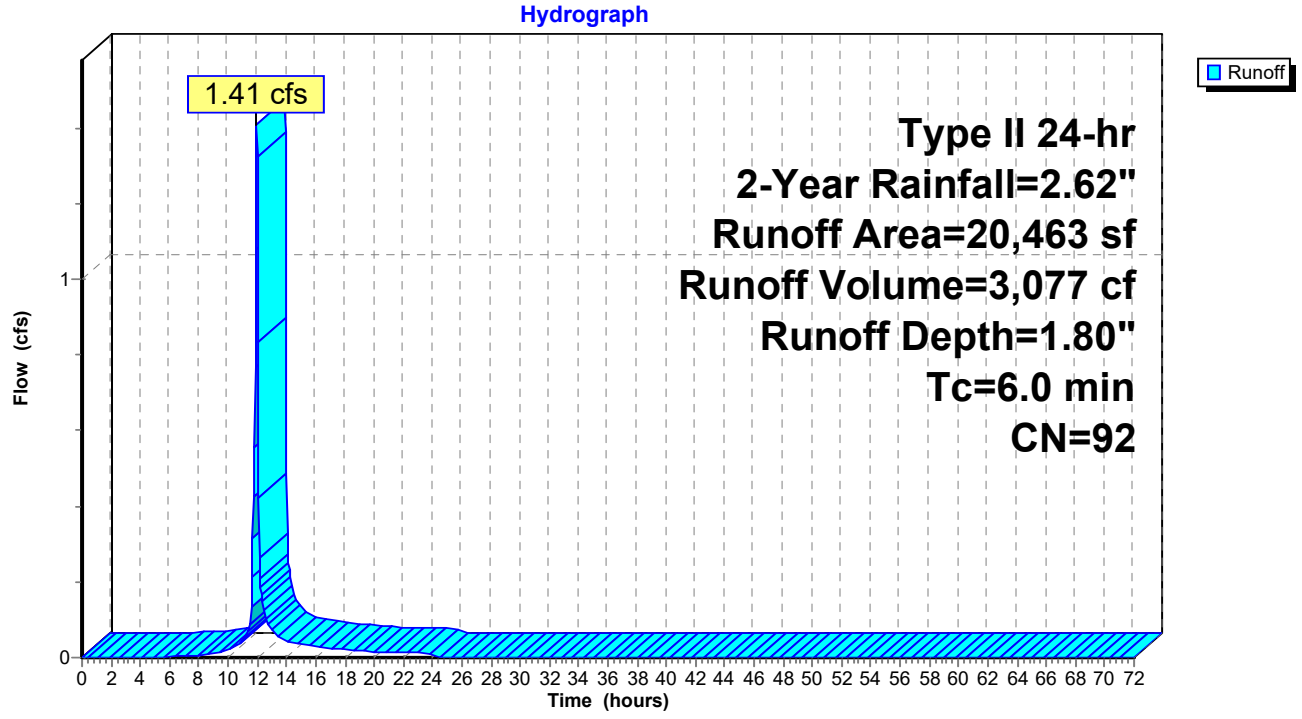
Runoff = 1.41 cfs @ 11.97 hrs, Volume= 3,077 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	9,020	98	Paved parking, HSG C
*	5,595	98	Pervious Pavers, HSG C
*	671	98	Sidewalks, HSG C
	5,177	74	>75% Grass cover, Good, HSG C
	20,463	92	Weighted Average
	5,177		25.30% Pervious Area
	15,286		74.70% Impervious Area

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

Subcatchment P5: Proposed to Permeable Pavers 1 (North)



Summary for Subcatchment P6: Proposed to Permeable Pavers 2 (Center)

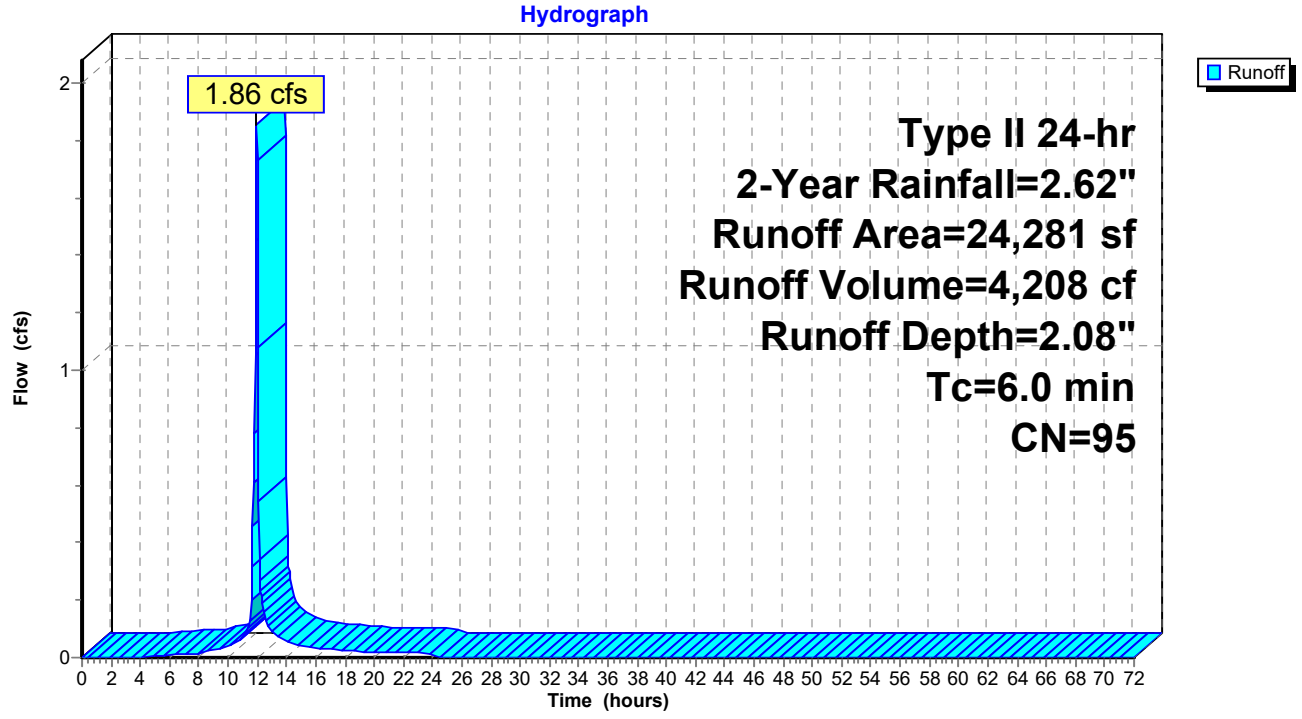
Runoff = 1.86 cfs @ 11.96 hrs, Volume= 4,208 cf, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	12,052	98	Paved parking, HSG C
*	8,265	98	Pervious Pavers, HSG C
*	1,107	98	Sidewalks, HSG C
	2,857	74	>75% Grass cover, Good, HSG C
	24,281	95	Weighted Average
	2,857		11.77% Pervious Area
	21,424		88.23% Impervious Area

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

Subcatchment P6: Proposed to Permeable Pavers 2 (Center)



Summary for Subcatchment P7: Proposed to Permeable Pavers 3 (South)

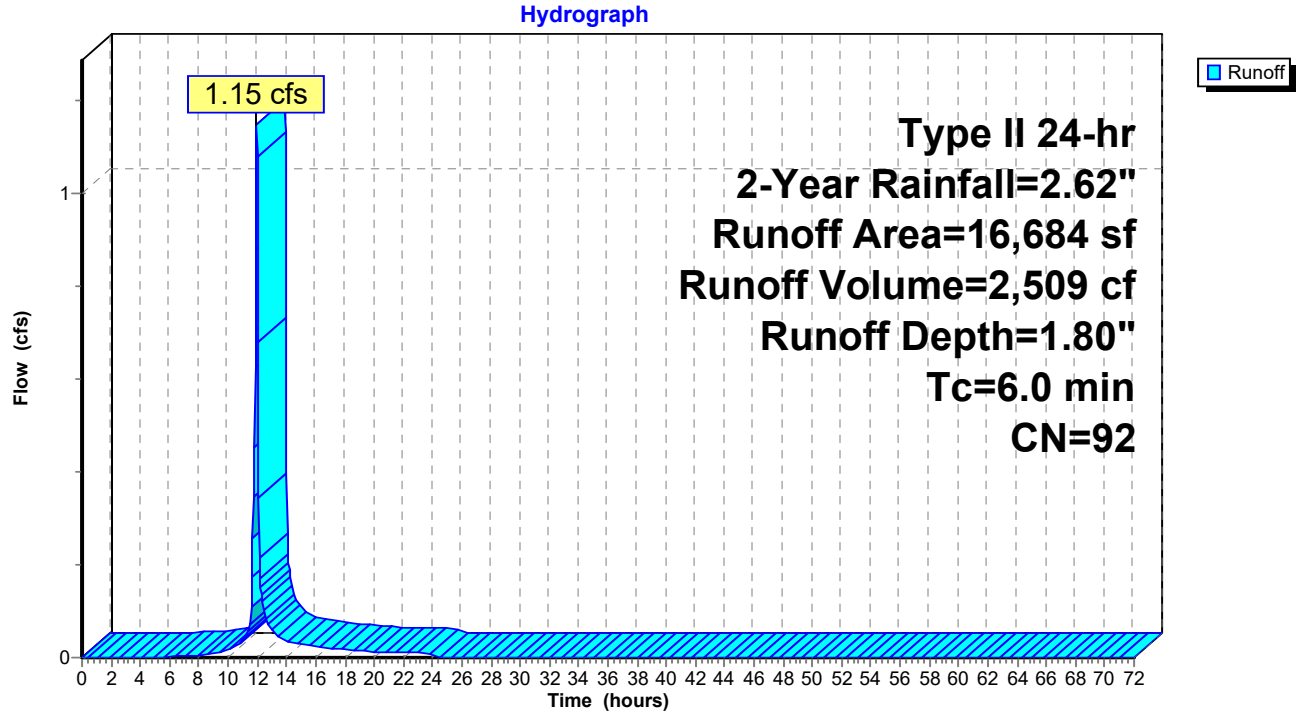
Runoff = 1.15 cfs @ 11.97 hrs, Volume= 2,509 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	6,584	98	Paved parking, HSG C
*	5,437	98	Pervious Pavers, HSG C
*	603	98	Sidewalks, HSG C
	4,060	74	>75% Grass cover, Good, HSG C
	16,684	92	Weighted Average
	4,060		24.33% Pervious Area
	12,624		75.67% Impervious Area

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

Subcatchment P7: Proposed to Permeable Pavers 3 (South)



Summary for Subcatchment P8: Uncaptured

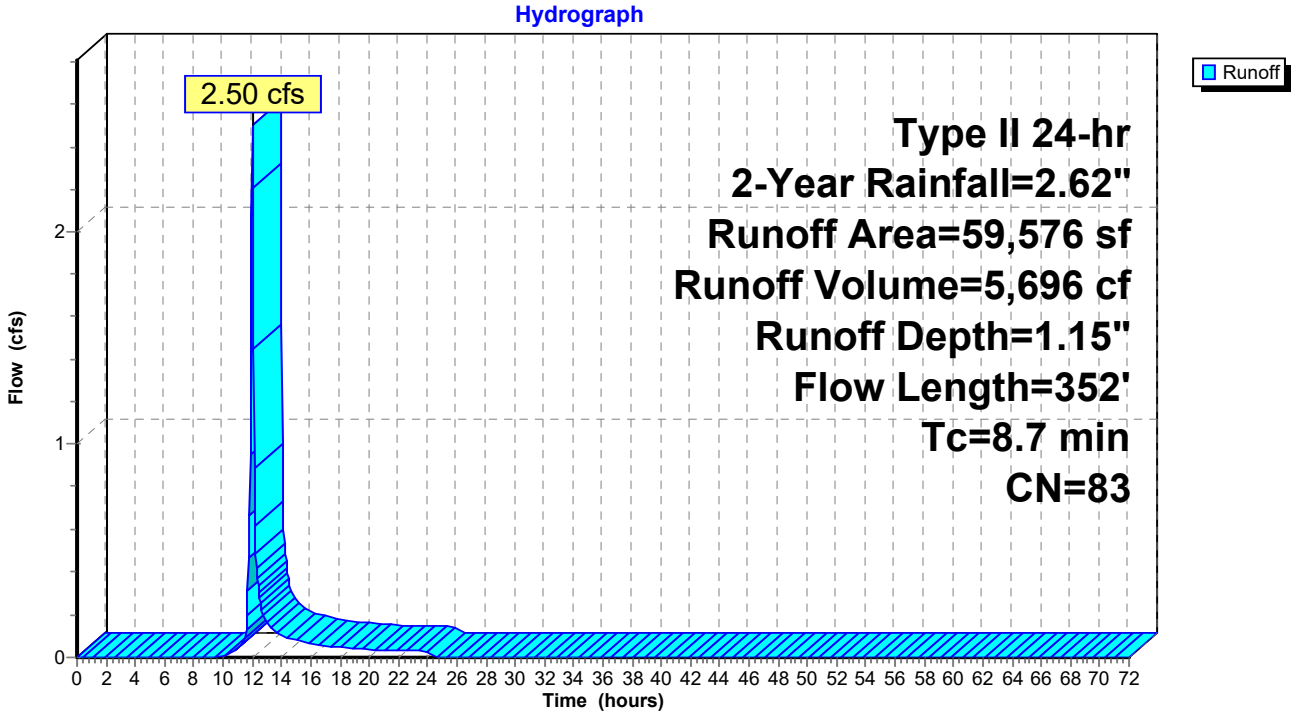
Runoff = 2.50 cfs @ 12.00 hrs, Volume= 5,696 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
	9,901	98	Paved parking, HSG C
*	11,278	98	Sidewalks, HSG C
	38,397	74	>75% Grass cover, Good, HSG C
	59,576	83	Weighted Average
	38,397		64.45% Pervious Area
	21,179		35.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	39	0.0187	0.12		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
3.5	313	0.0100	1.50		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Grassed Waterway Kv= 15.0 fps
8.7	352	Total			

Subcatchment P8: Uncaptured



Summary for Subcatchment P9: Offite Area

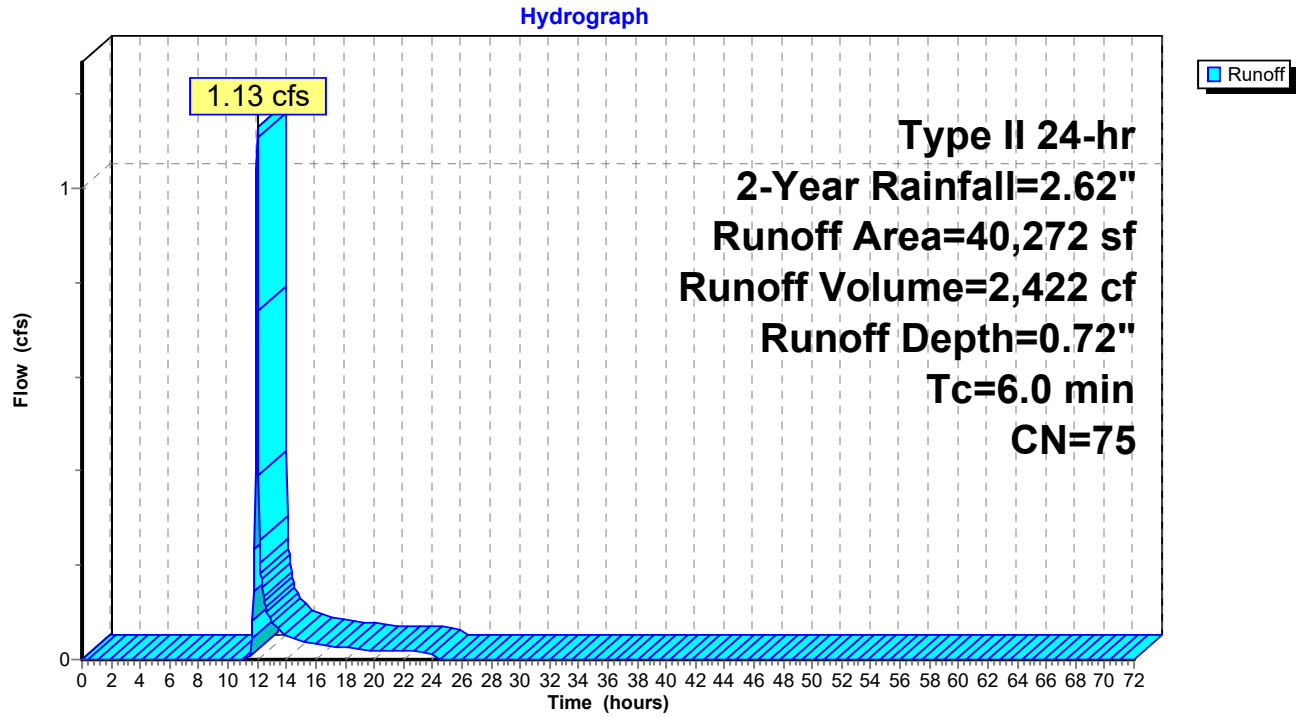
Runoff = 1.13 cfs @ 11.98 hrs, Volume= 2,422 cf, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.62"

	Area (sf)	CN	Description
*	1,850	98	Sidewalks, HSG C
	38,422	74	>75% Grass cover, Good, HSG C
	40,272	75	Weighted Average
	38,422		95.41% Pervious Area
	1,850		4.59% Impervious Area

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

Subcatchment P9: Offite Area



Summary for Pond BIO-1: Bioretention Basin-1 (North)

Inflow Area = 152,166 sf, 27.69% Impervious, Inflow Depth = 1.03" for 2-Year event
Inflow = 4.68 cfs @ 12.07 hrs, Volume= 13,046 cf
Outflow = 0.97 cfs @ 12.44 hrs, Volume= 13,046 cf, Atten= 79%, Lag= 22.4 min
Primary = 0.97 cfs @ 12.44 hrs, Volume= 13,046 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 663.41' @ 12.44 hrs Surf.Area= 13,739 sf Storage= 4,444 cf

Plug-Flow detention time= 52.9 min calculated for 13,037 cf (100% of inflow)
Center-of-Mass det. time= 53.2 min (907.5 - 854.3)

Volume	Invert	Avail.Storage	Storage Description
#1	661.00'	734 cf	**Stone Storage (Prismatic)**Listed below (Recalc) 2,224 cf Overall x 33.0% Voids
#2	661.50'	1,801 cf	**Engineered Soil (Prismatic)**Listed below (Recalc) 6,671 cf Overall x 27.0% Voids
#3	663.00'	26,143 cf	**Open Storage (Prismatic)**Listed below (Recalc)
		28,678 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
661.00	4,447	0	0
661.50	4,447	2,224	2,224

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
661.50	4,447	0	0
663.00	4,447	6,671	6,671

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
663.00	4,447	0	0
664.00	5,417	4,932	4,932
665.00	6,643	6,030	10,962
666.00	7,526	7,085	18,047
667.00	8,667	8,097	26,143

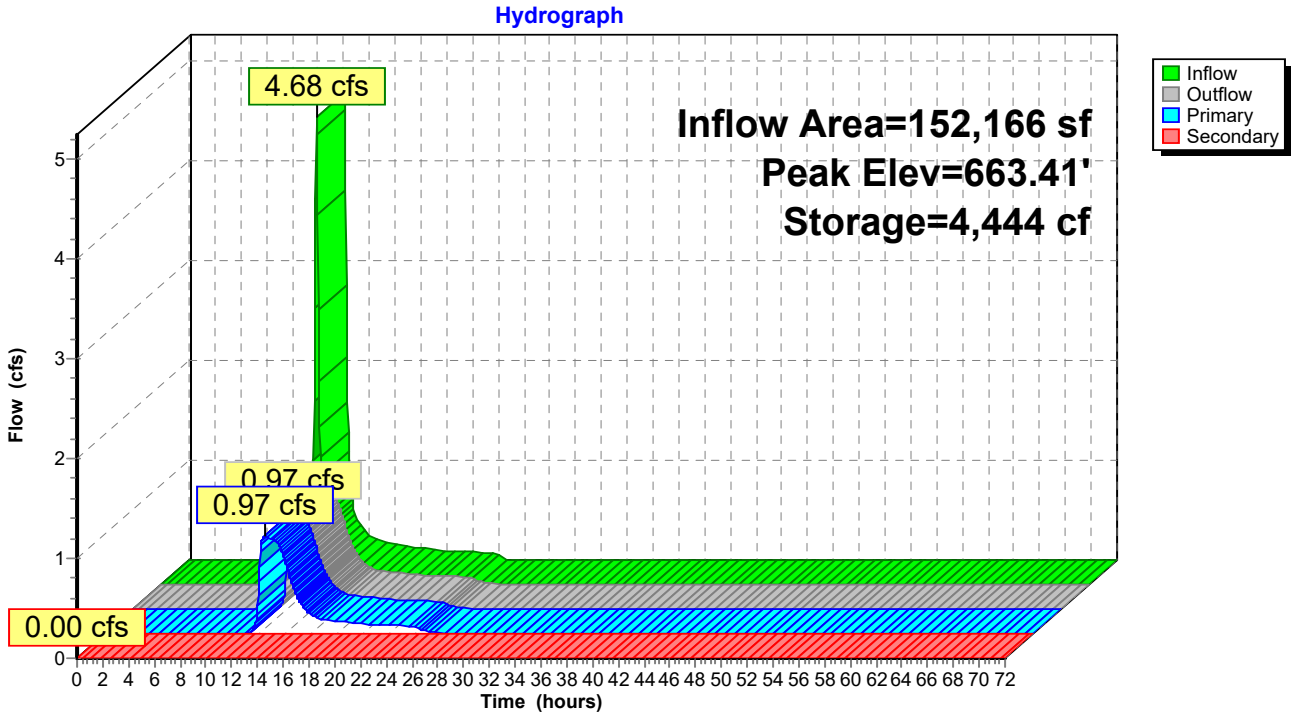
Device	Routing	Invert	Outlet Devices
#1	Primary	661.00'	**18.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 661.00' / 660.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	661.00'	**5.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	665.00'	**72.0" Horiz. 72" Standpipe** C= 0.600 Limited to weir flow at low heads
#4	Secondary	666.50'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65

2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.97 cfs @ 12.44 hrs HW=663.41' (Free Discharge)
└**1=Culvert** (Passes 0.97 cfs of 10.84 cfs potential flow)
└**2=6" Orifice** (Orifice Controls 0.97 cfs @ 7.15 fps)
└**3=72" Standpipe** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=661.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BIO-1: Bioretention Basin-1 (North)



Summary for Pond BIO-2: Bioretention Basin-2 (South)

Inflow Area = 163,197 sf, 54.20% Impervious, Inflow Depth = 1.44" for 2-Year event
Inflow = 6.76 cfs @ 11.99 hrs, Volume= 19,523 cf
Outflow = 1.68 cfs @ 12.37 hrs, Volume= 19,523 cf, Atten= 75%, Lag= 23.1 min
Primary = 1.68 cfs @ 12.37 hrs, Volume= 19,523 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 665.39' @ 12.37 hrs Surf.Area= 7,694 sf Storage= 5,086 cf

Plug-Flow detention time= 29.1 min calculated for 19,510 cf (100% of inflow)
Center-of-Mass det. time= 29.1 min (878.4 - 849.3)

Volume	Invert	Avail.Storage	Storage Description
#1	662.00'	348 cf	**Stone Storage (Prismatic)**Listed below (Recalc) 1,054 cf Overall x 33.0% Voids
#2	662.50'	853 cf	**Engineered Soil (Prismatic)**Listed below (Recalc) 3,161 cf Overall x 27.0% Voids
#3	664.00'	23,494 cf	**Open Storage (Prismatic)**Listed below (Recalc)
		24,695 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.00	2,107	0	0
662.50	2,107	1,054	1,054

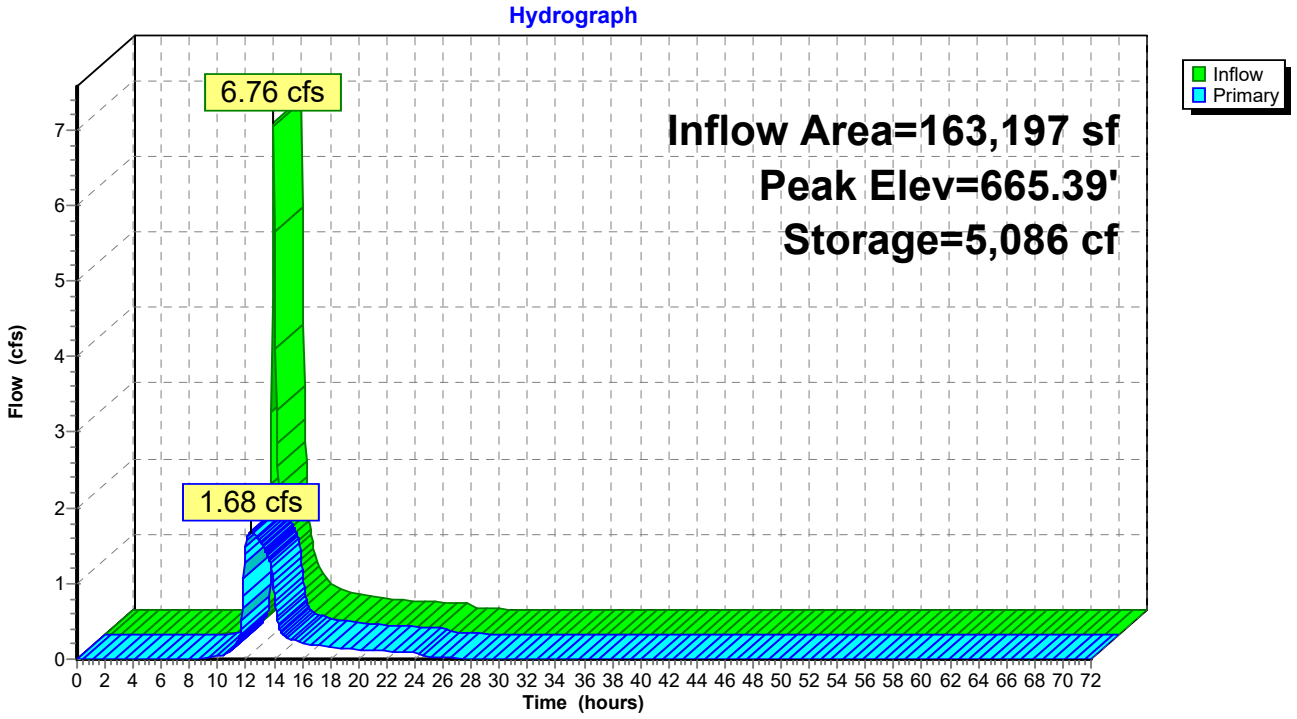
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.50	2,107	0	0
664.00	2,107	3,161	3,161

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
664.00	2,107	0	0
665.00	3,076	2,592	2,592
666.00	4,101	3,589	6,180
667.00	5,183	4,642	10,822
668.00	6,322	5,753	16,575
669.00	7,517	6,920	23,494

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	**18.0" Round Culvert** L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 662.00' / 659.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	662.00'	**6.0" Vert. 6" Drain Tile** C= 0.600 Limited to weir flow at low heads
#3	Device 1	666.00'	**48.0" Horiz. 48" Standpipe** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.68 cfs @ 12.37 hrs HW=665.39' (Free Discharge)
└**1=Culvert** (Passes 1.68 cfs of 11.87 cfs potential flow)
└**2=6" Drain Tile** (Orifice Controls 1.68 cfs @ 8.54 fps)
└**3=48" Standpipe** (Controls 0.00 cfs)

Pond BIO-2: Bioretention Basin-2 (South)



Summary for Pond PP1: Permeable Pavers (North)

Inflow Area = 20,463 sf, 74.70% Impervious, Inflow Depth = 1.80" for 2-Year event
Inflow = 1.41 cfs @ 11.97 hrs, Volume= 3,077 cf
Outflow = 0.90 cfs @ 12.05 hrs, Volume= 3,077 cf, Atten= 36%, Lag= 4.9 min
Primary = 0.90 cfs @ 12.05 hrs, Volume= 3,077 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 668.75' @ 12.05 hrs Surf.Area= 5,595 sf Storage= 818 cf

Plug-Flow detention time= 53.1 min calculated for 3,075 cf (100% of inflow)
Center-of-Mass det. time= 54.0 min (856.1 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	668.26'	1,679 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 5,595 cf Overall x 30.0% Voids
#2	669.26'	775 cf	**Bedding (Prismatic)** Listed below (Recalc) 2,350 cf Overall x 33.0% Voids
#3	669.68'	350 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 1,399 cf Overall x 25.0% Voids
#4	669.93'	1,466 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		4,270 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.26	5,595	0	0
669.26	5,595	5,595	5,595

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.26	5,595	0	0
669.68	5,595	2,350	2,350

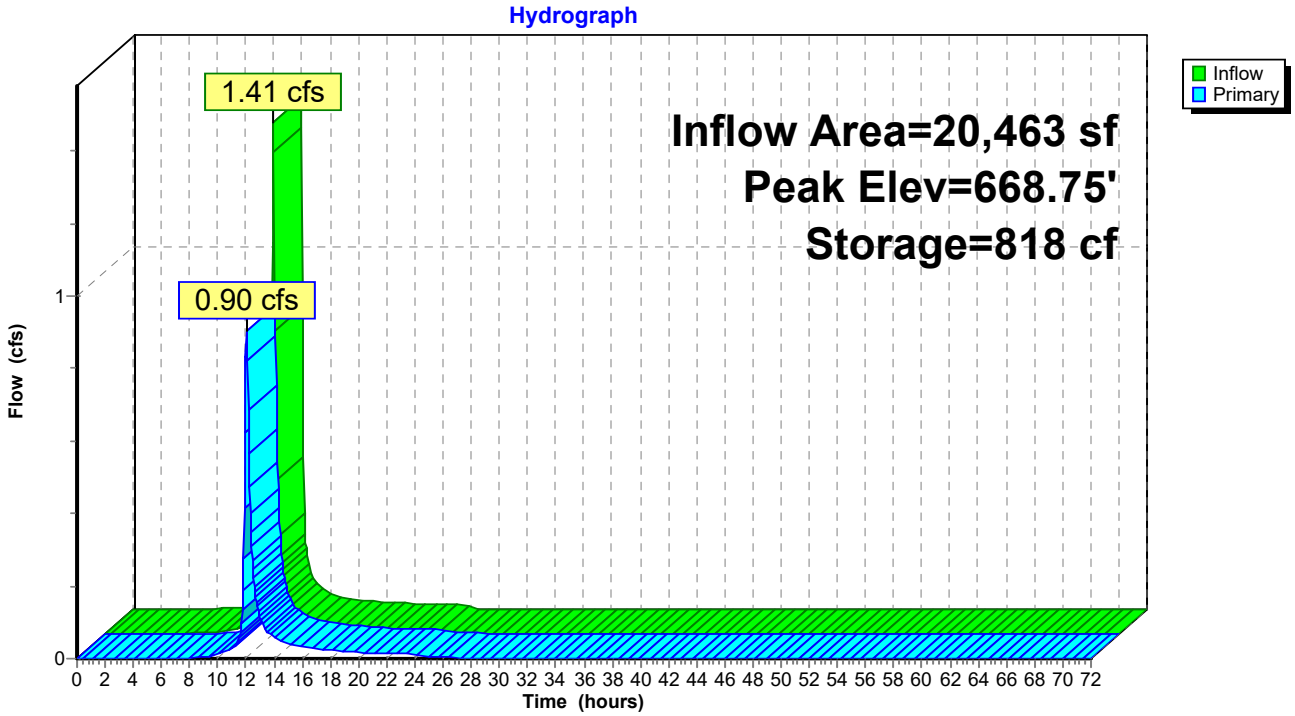
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.68	5,595	0	0
669.93	5,595	1,399	1,399

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.93	1,560	0	0
670.87	1,560	1,466	1,466

Device	Routing	Invert	Outlet Devices
#0	Primary	670.87'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.26'	**12.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 668.26' / 667.26' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	668.26'	**4.0" Vert. 4" Drain Tile X 4.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.90 cfs @ 12.05 hrs HW=668.75' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.90 cfs @ 2.38 fps)
└**2=4" Drain Tile** (Passes 0.90 cfs of 0.95 cfs potential flow)

Pond PP1: Permeable Pavers (North)



Summary for Pond PP2: Permeable Pavers (Center)

Inflow Area = 24,281 sf, 88.23% Impervious, Inflow Depth = 2.08" for 2-Year event
Inflow = 1.86 cfs @ 11.96 hrs, Volume= 4,208 cf
Outflow = 0.80 cfs @ 12.08 hrs, Volume= 4,208 cf, Atten= 57%, Lag= 6.7 min
Primary = 0.80 cfs @ 12.08 hrs, Volume= 4,208 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 668.62' @ 12.08 hrs Surf.Area= 8,265 sf Storage= 1,423 cf

Plug-Flow detention time= 79.6 min calculated for 4,208 cf (100% of inflow)
Center-of-Mass det. time= 79.3 min (863.4 - 784.1)

Volume	Invert	Avail.Storage	Storage Description
#1	668.05'	2,480 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 8,265 cf Overall x 30.0% Voids
#2	669.05'	1,146 cf	**Bedding (Prismatic)** Listed below (Recalc) 3,471 cf Overall x 33.0% Voids
#3	669.47'	517 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 2,066 cf Overall x 25.0% Voids
#4	669.72'	2,253 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		6,394 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.05	8,265	0	0
669.05	8,265	8,265	8,265

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.05	8,265	0	0
669.47	8,265	3,471	3,471

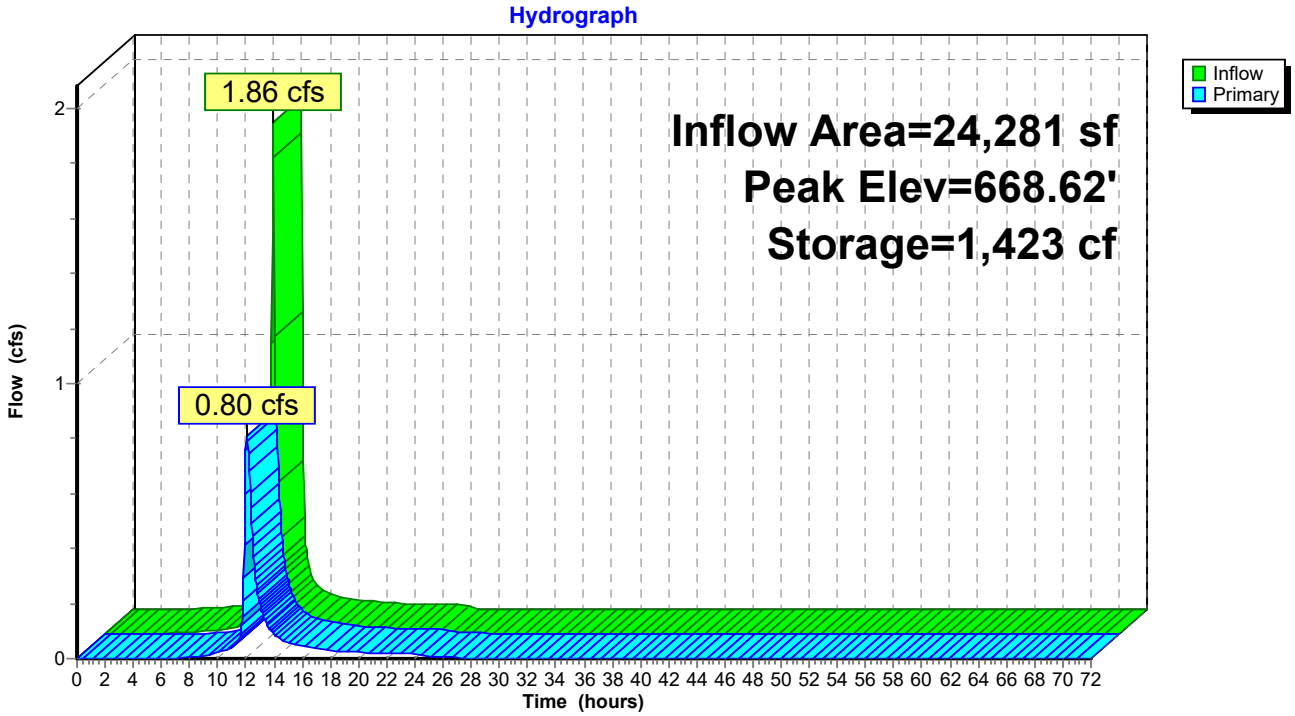
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.47	8,265	0	0
669.72	8,265	2,066	2,066

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.72	1,959	0	0
670.87	1,959	2,253	2,253

Device	Routing	Invert	Outlet Devices
#0	Primary	670.87'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.05'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 668.05' / 667.97' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	668.05'	**4.0" Vert. 4" Drain Tile X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.80 cfs @ 12.08 hrs HW=668.62' (Free Discharge)
└**1=Culvert** (Passes 0.80 cfs of 0.92 cfs potential flow)
└**2=4" Drain Tile** (Orifice Controls 0.80 cfs @ 3.06 fps)

Pond PP2: Permeable Pavers (Center)



Summary for Pond PP3: Permeable Pavers (South)

Inflow Area = 16,684 sf, 75.67% Impervious, Inflow Depth = 1.80" for 2-Year event
Inflow = 1.15 cfs @ 11.97 hrs, Volume= 2,509 cf
Outflow = 0.72 cfs @ 12.05 hrs, Volume= 2,509 cf, Atten= 37%, Lag= 5.0 min
Primary = 0.72 cfs @ 12.05 hrs, Volume= 2,509 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 668.53' @ 12.05 hrs Surf.Area= 5,437 sf Storage= 677 cf

Plug-Flow detention time= 52.4 min calculated for 2,507 cf (100% of inflow)
Center-of-Mass det. time= 53.2 min (855.3 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	668.11'	1,631 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 5,437 cf Overall x 30.0% Voids
#2	669.11'	754 cf	**Bedding (Prismatic)** Listed below (Recalc) 2,284 cf Overall x 33.0% Voids
#3	669.53'	340 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 1,359 cf Overall x 25.0% Voids
#4	669.78'	377 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		3,101 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.11	5,437	0	0
669.11	5,437	5,437	5,437

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.11	5,437	0	0
669.53	5,437	2,284	2,284

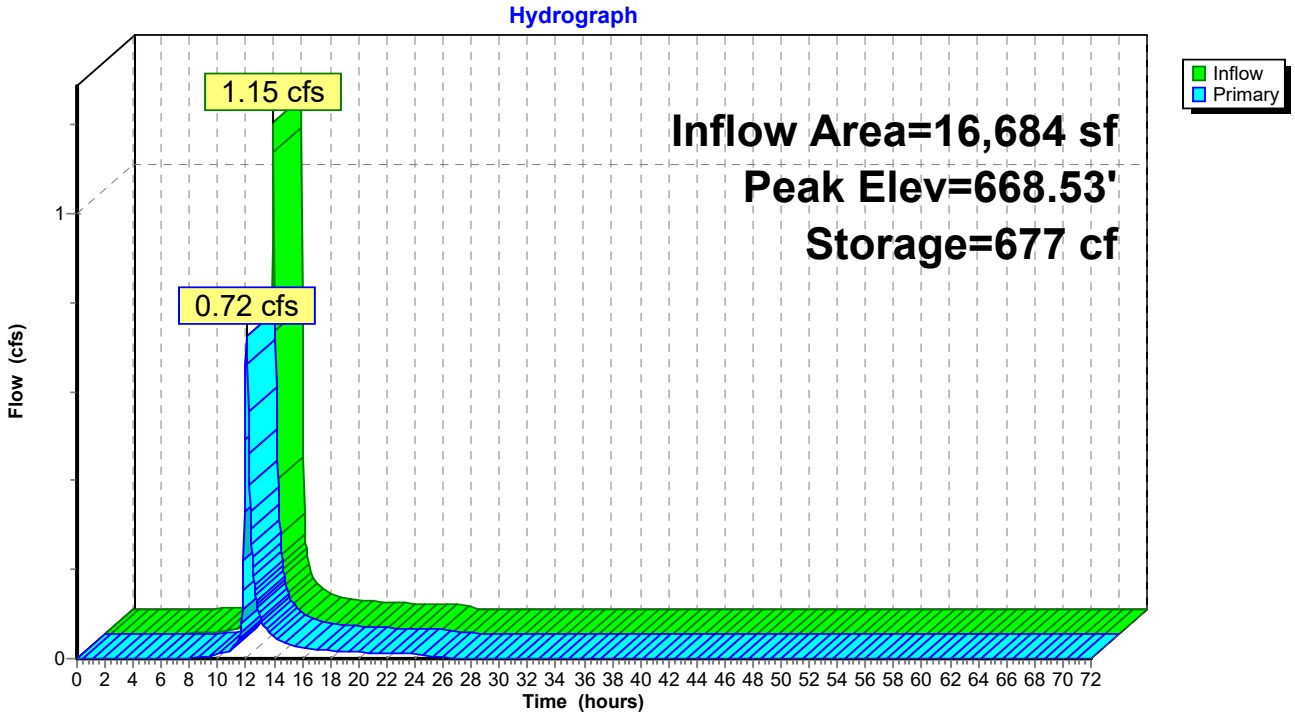
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.53	5,437	0	0
669.78	5,437	1,359	1,359

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.78	1,345	0	0
670.06	1,345	377	377

Device	Routing	Invert	Outlet Devices
#0	Primary	670.06'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.11'	**24.0" Round 12" Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 668.11' / 668.03' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	668.11'	**4.0" Vert. 4" Drain Tile X 4.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.72 cfs @ 12.05 hrs HW=668.53' (Free Discharge)
└**1=12" Culvert** (Barrel Controls 0.72 cfs @ 2.32 fps)
└**2=4" Drain Tile** (Passes 0.72 cfs of 0.84 cfs potential flow)

Pond PP3: Permeable Pavers (South)

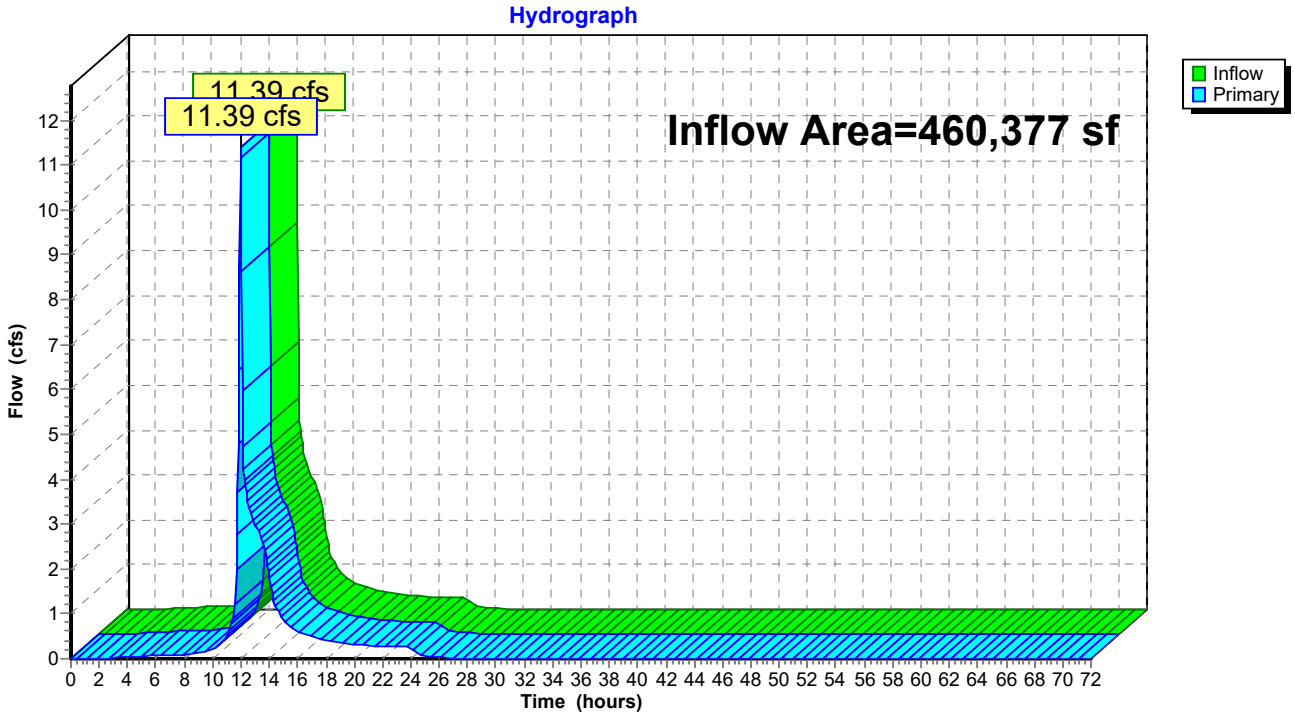


Summary for Link 3L: Proposed to King Rd. Storm Sewer

Inflow Area = 460,377 sf, 51.52% Impervious, Inflow Depth = 1.44" for 2-Year event
Inflow = 11.39 cfs @ 11.98 hrs, Volume= 55,282 cf
Primary = 11.39 cfs @ 11.98 hrs, Volume= 55,282 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 3L: Proposed to King Rd. Storm Sewer

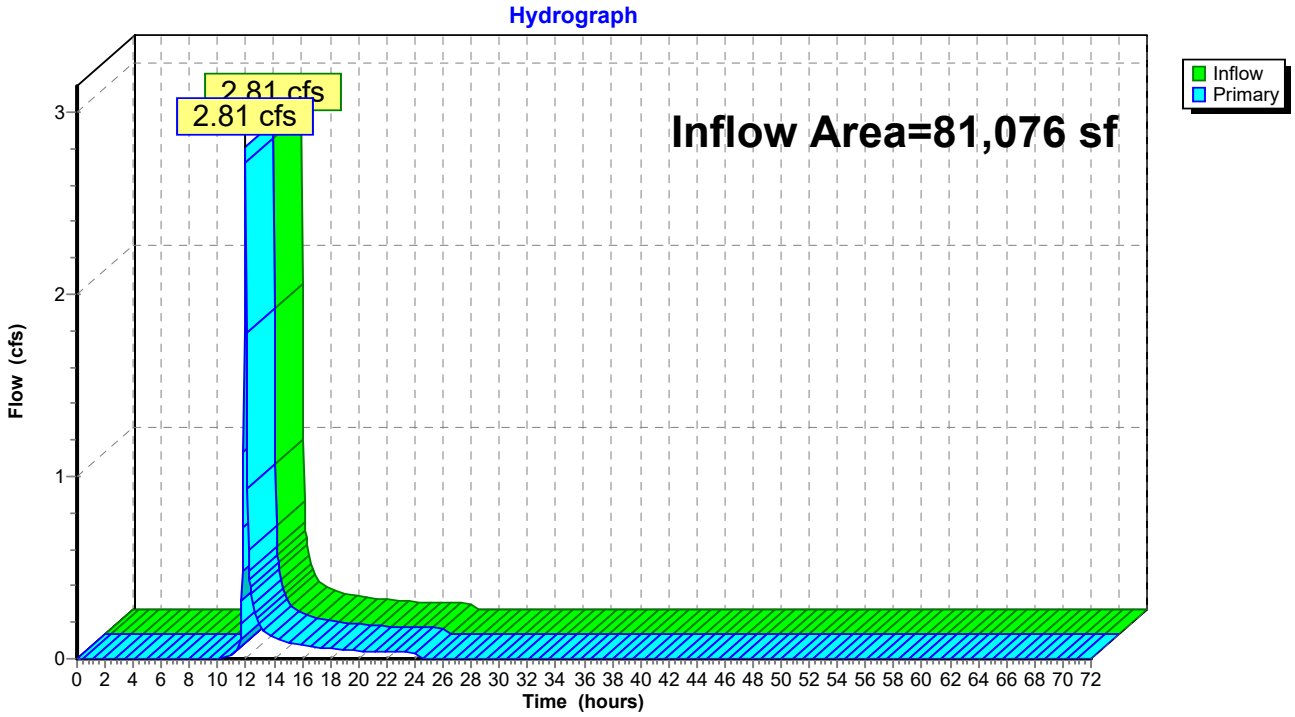


Summary for Link 4L: Proposed to Ellsworth Park Storm Water Basin

Inflow Area = 81,076 sf, 17.37% Impervious, Inflow Depth = 0.88" for 2-Year event
Inflow = 2.81 cfs @ 11.98 hrs, Volume= 5,920 cf
Primary = 2.81 cfs @ 11.98 hrs, Volume= 5,920 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 4L: Proposed to Ellsworth Park Storm Water Basin

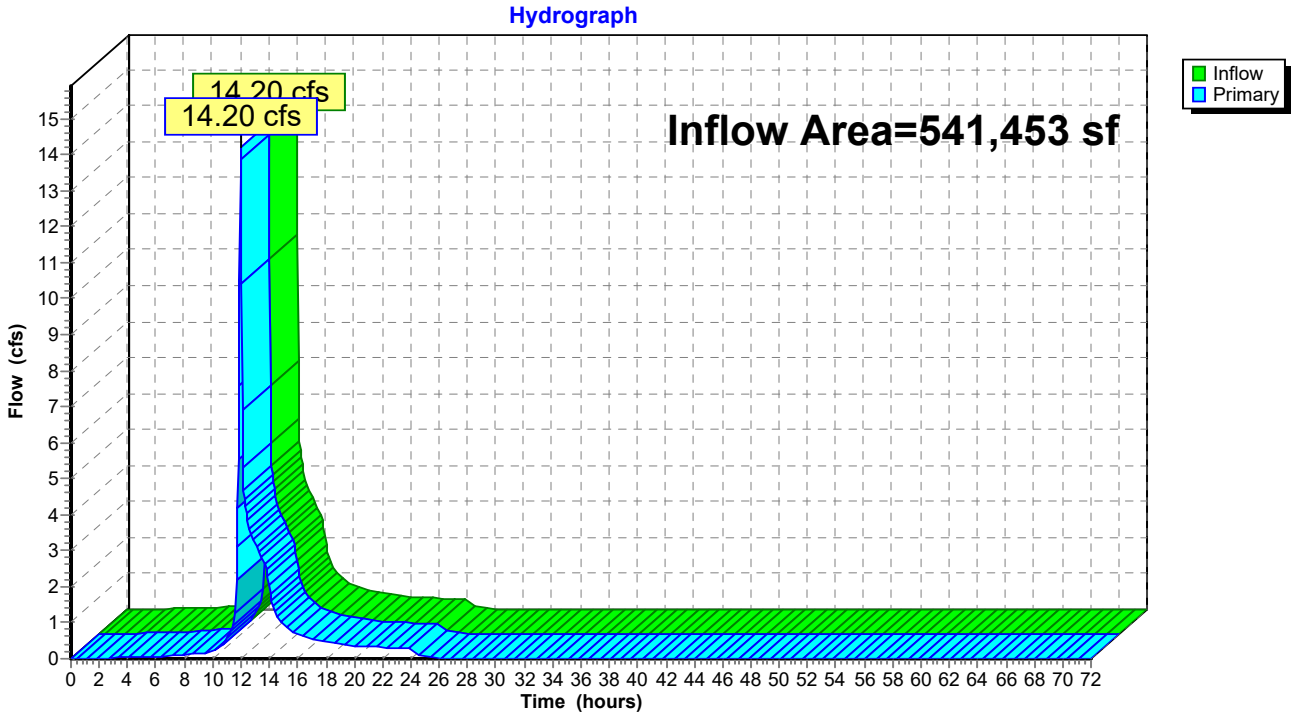


Summary for Link TPO: Total Proposed Outfall

Inflow Area = 541,453 sf, 46.41% Impervious, Inflow Depth = 1.36" for 2-Year event
Inflow = 14.20 cfs @ 11.98 hrs, Volume= 61,203 cf
Primary = 14.20 cfs @ 11.98 hrs, Volume= 61,203 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link TPO: Total Proposed Outfall



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Proposed Building to Runoff Area=85,438 sf 100.00% Impervious Runoff Depth=3.50"
Tc=6.0 min CN=98 Runoff=10.09 cfs 24,890 cf

Subcatchment P2: Proposed to Bio-1 Runoff Area=152,166 sf 27.69% Impervious Runoff Depth=1.90"
Flow Length=212' Tc=14.2 min CN=81 Runoff=8.74 cfs 24,050 cf

Subcatchment P3: Proposed to Runoff Area=101,769 sf 38.44% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=83 Runoff=8.22 cfs 17,416 cf

Subcatchment P4: Proposed to Ellsworth Runoff Area=40,804 sf 29.98% Impervious Runoff Depth=1.90"
Tc=6.0 min CN=81 Runoff=3.06 cfs 6,449 cf

Subcatchment P5: Proposed to Permeable Runoff Area=20,463 sf 74.70% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=92 Runoff=2.18 cfs 4,873 cf

Subcatchment P6: Proposed to Permeable Runoff Area=24,281 sf 88.23% Impervious Runoff Depth=3.17"
Tc=6.0 min CN=95 Runoff=2.75 cfs 6,404 cf

Subcatchment P7: Proposed to Permeable Runoff Area=16,684 sf 75.67% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=92 Runoff=1.77 cfs 3,973 cf

Subcatchment P8: Uncaptured Runoff Area=59,576 sf 35.55% Impervious Runoff Depth=2.05"
Flow Length=352' Tc=8.7 min CN=83 Runoff=4.46 cfs 10,195 cf

Subcatchment P9: Offite Area Runoff Area=40,272 sf 4.59% Impervious Runoff Depth=1.47"
Tc=6.0 min CN=75 Runoff=2.36 cfs 4,923 cf

Pond BIO-1: Bioretention Basin-1 (North) Peak Elev=664.41' Storage=9,807 cf Inflow=8.74 cfs 24,050 cf
Primary=1.18 cfs 24,050 cf Secondary=0.00 cfs 0 cf Outflow=1.18 cfs 24,050 cf

Pond BIO-2: Bioretention Basin-2 (South) Peak Elev=666.19' Storage=8,173 cf Inflow=11.31 cfs 32,666 cf
Outflow=5.26 cfs 32,666 cf

Pond PP1: Permeable Pavers (North) Peak Elev=668.97' Storage=1,195 cf Inflow=2.18 cfs 4,873 cf
Outflow=1.24 cfs 4,873 cf

Pond PP2: Permeable Pavers (Center) Peak Elev=668.89' Storage=2,085 cf Inflow=2.75 cfs 6,404 cf
Outflow=1.04 cfs 6,404 cf

Pond PP3: Permeable Pavers (South) Peak Elev=668.69' Storage=952 cf Inflow=1.77 cfs 3,973 cf
Outflow=1.09 cfs 3,973 cf

Link 3L: Proposed to King Rd. Storm Sewer Inflow=16.87 cfs 91,800 cf
Primary=16.87 cfs 91,800 cf

Link 4L: Proposed to Ellsworth Park Storm Water Basin Inflow=5.39 cfs 11,372 cf
Primary=5.39 cfs 11,372 cf

Link TPO: Total Proposed Outfall Inflow=22.30 cfs 103,172 cf
Primary=22.30 cfs 103,172 cf

Total Runoff Area = 541,453 sf Runoff Volume = 103,172 cf Average Runoff Depth = 2.29"
53.59% Pervious = 290,169 sf 46.41% Impervious = 251,284 sf

Summary for Subcatchment P1: Proposed Building to King Rd

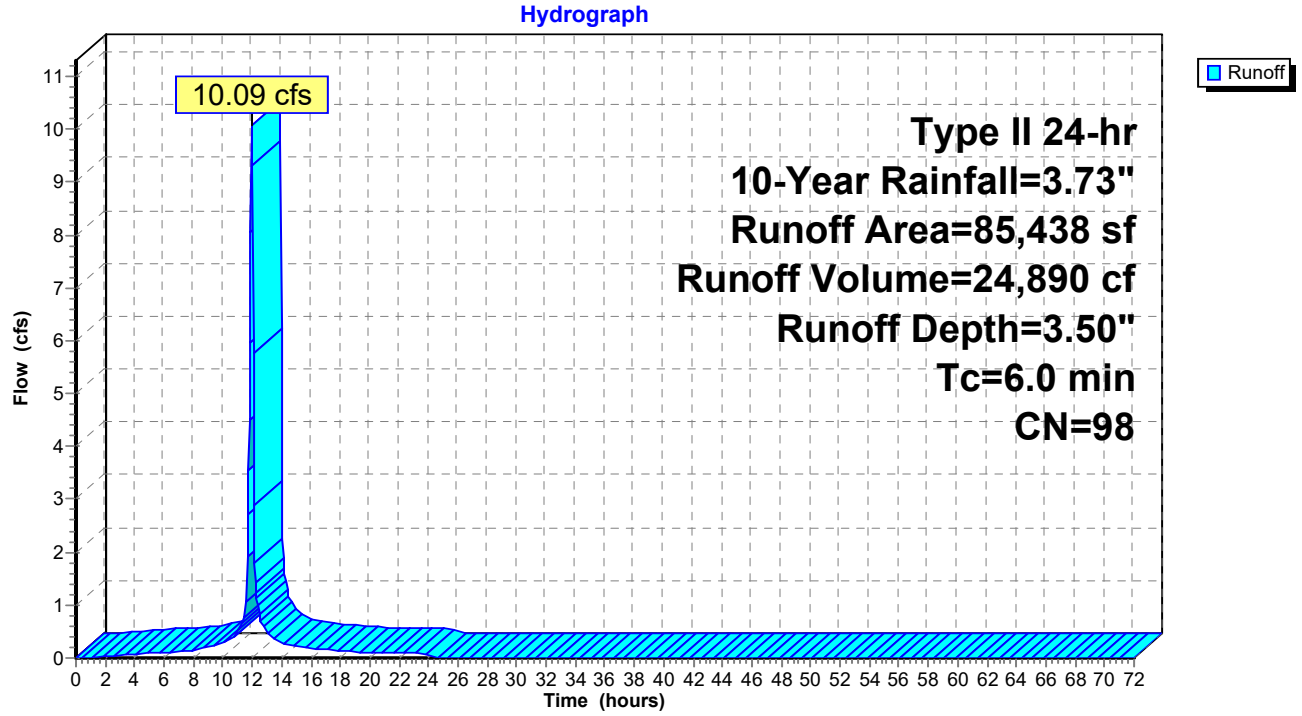
Runoff = 10.09 cfs @ 11.96 hrs, Volume= 24,890 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

Area (sf)	CN	Description
85,438	98	Roofs, HSG C
85,438		100.00% Impervious Area

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

Subcatchment P1: Proposed Building to King Rd



Summary for Subcatchment P2: Proposed to Bio-1

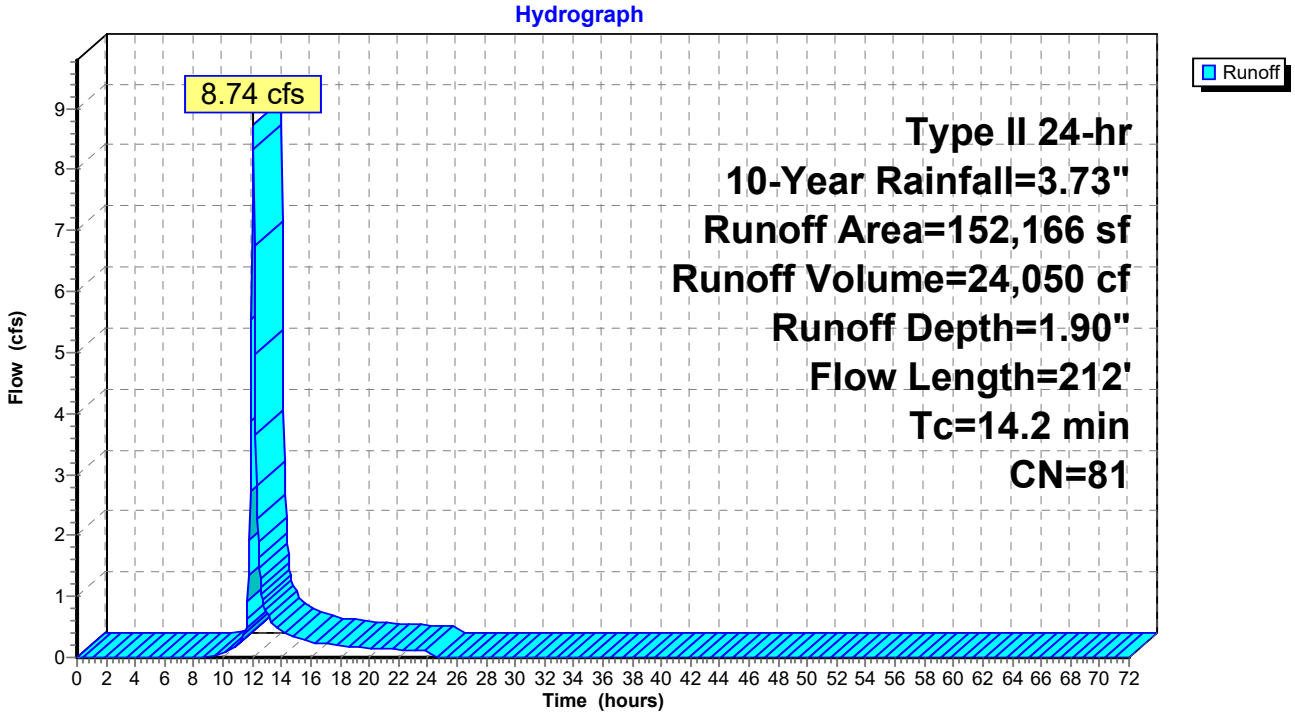
Runoff = 8.74 cfs @ 12.06 hrs, Volume= 24,050 cf, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	9,071	98	Paved parking, HSG C
*	33,060	98	Sidewalks, HSG C
	110,035	74	>75% Grass cover, Good, HSG C
	152,166	81	Weighted Average
	110,035		72.31% Pervious Area
	42,131		27.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0120	0.13		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
0.3	34	0.0900	2.10		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Short Grass Pasture Kv= 7.0 fps
0.6	78	0.0200	2.12		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Grassed Waterway Kv= 15.0 fps
14.2	212	Total			

Subcatchment P2: Proposed to Bio-1



Summary for Subcatchment P3: Proposed to Bioretention Bio-2

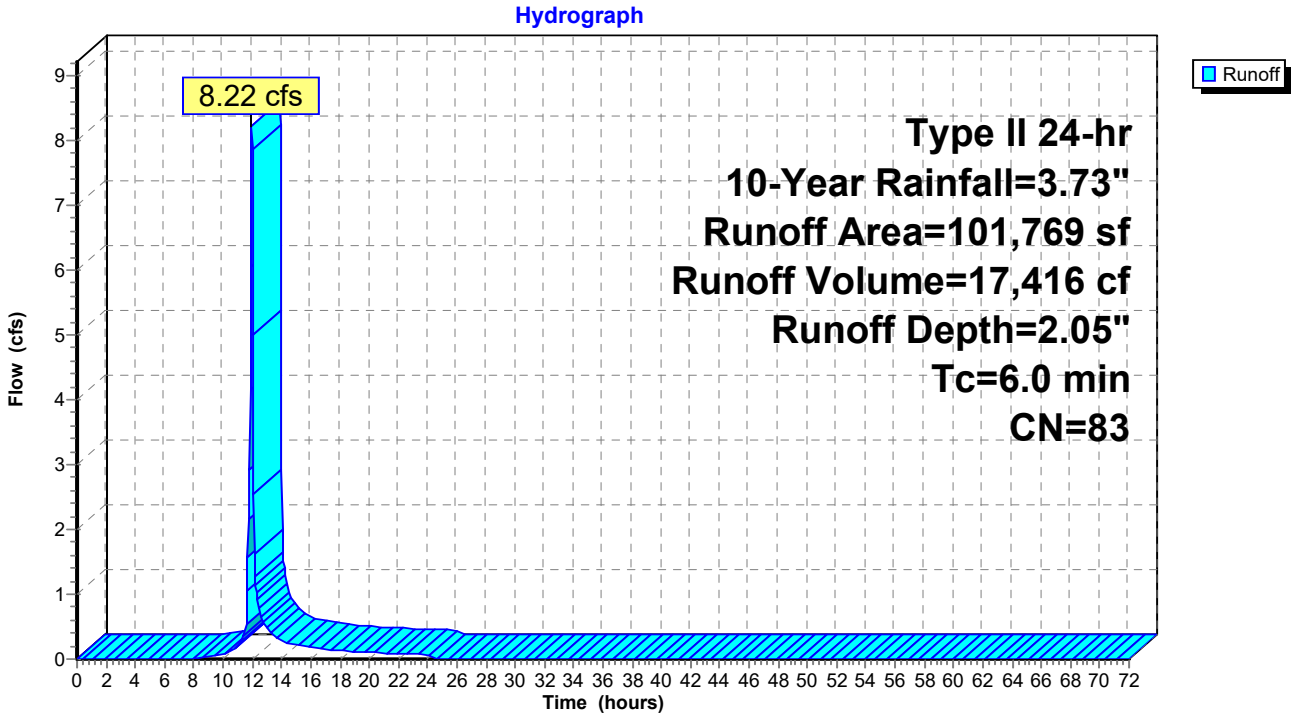
Runoff = 8.22 cfs @ 11.97 hrs, Volume= 17,416 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	25,743	98	Paved parking, HSG C
*	13,375	98	Sidewalks, HSG C
	62,651	74	>75% Grass cover, Good, HSG C
	101,769	83	Weighted Average
	62,651		61.56% Pervious Area
	39,118		38.44% Impervious Area

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

Subcatchment P3: Proposed to Bioretention Bio-2



Summary for Subcatchment P4: Proposed to Ellsworth Park Storm Water Basin

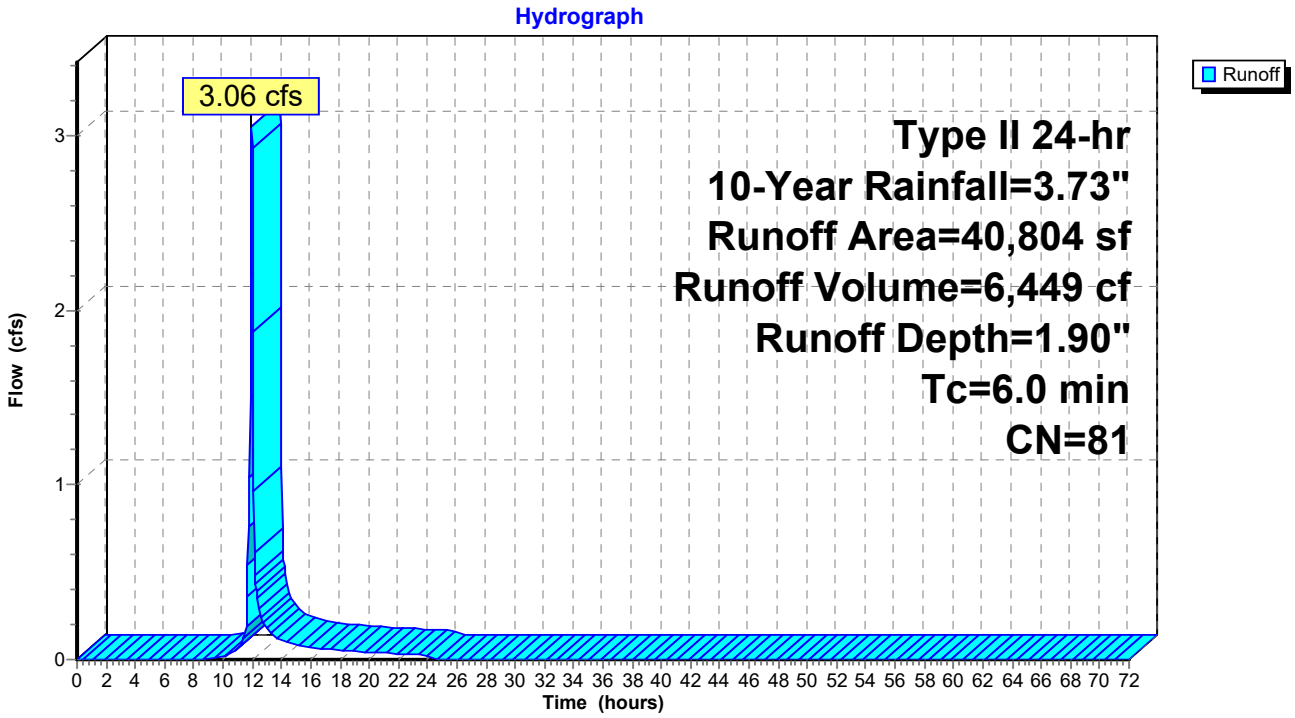
Runoff = 3.06 cfs @ 11.97 hrs, Volume= 6,449 cf, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

Area (sf)	CN	Description
12,234	98	Paved parking, HSG C
28,570	74	>75% Grass cover, Good, HSG C
40,804	81	Weighted Average
28,570		70.02% Pervious Area
12,234		29.98% Impervious Area

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

Subcatchment P4: Proposed to Ellsworth Park Storm Water Basin



Summary for Subcatchment P5: Proposed to Permeable Pavers 1 (North)

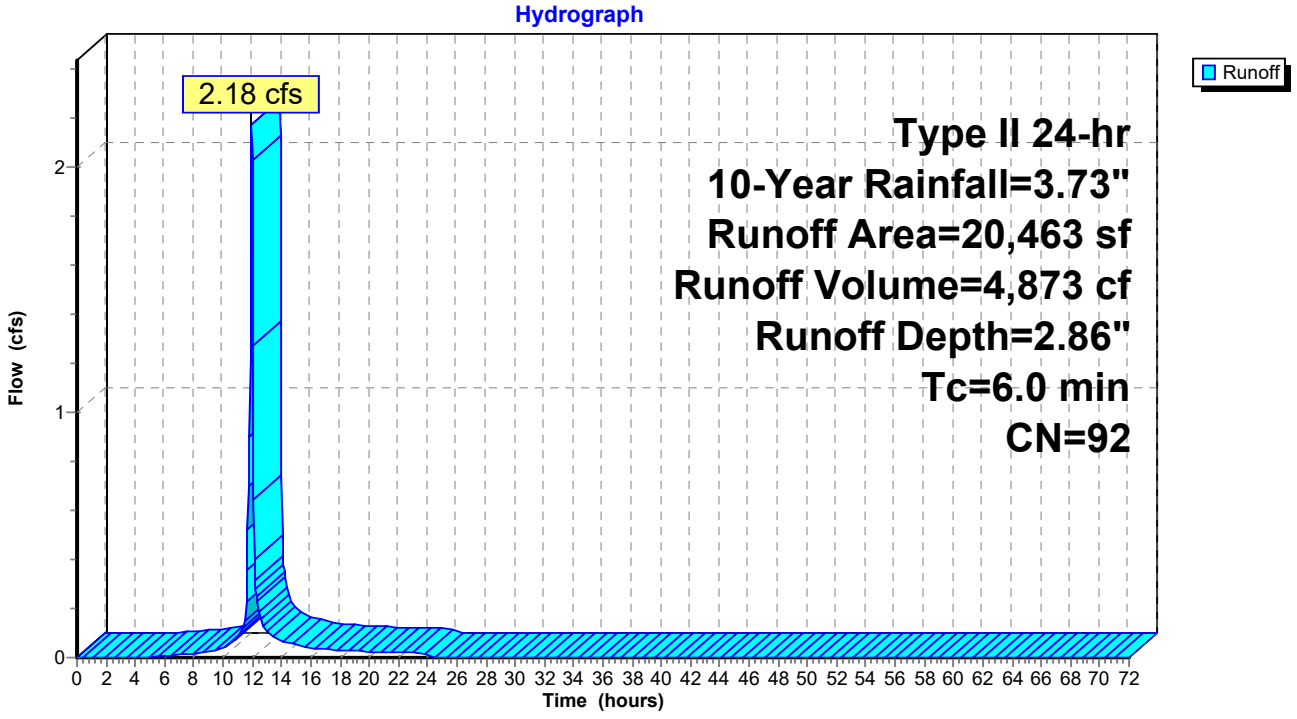
Runoff = 2.18 cfs @ 11.96 hrs, Volume= 4,873 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	9,020	98	Paved parking, HSG C
*	5,595	98	Pervious Pavers, HSG C
*	671	98	Sidewalks, HSG C
	5,177	74	>75% Grass cover, Good, HSG C
	20,463	92	Weighted Average
	5,177		25.30% Pervious Area
	15,286		74.70% Impervious Area

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

Subcatchment P5: Proposed to Permeable Pavers 1 (North)



Summary for Subcatchment P6: Proposed to Permeable Pavers 2 (Center)

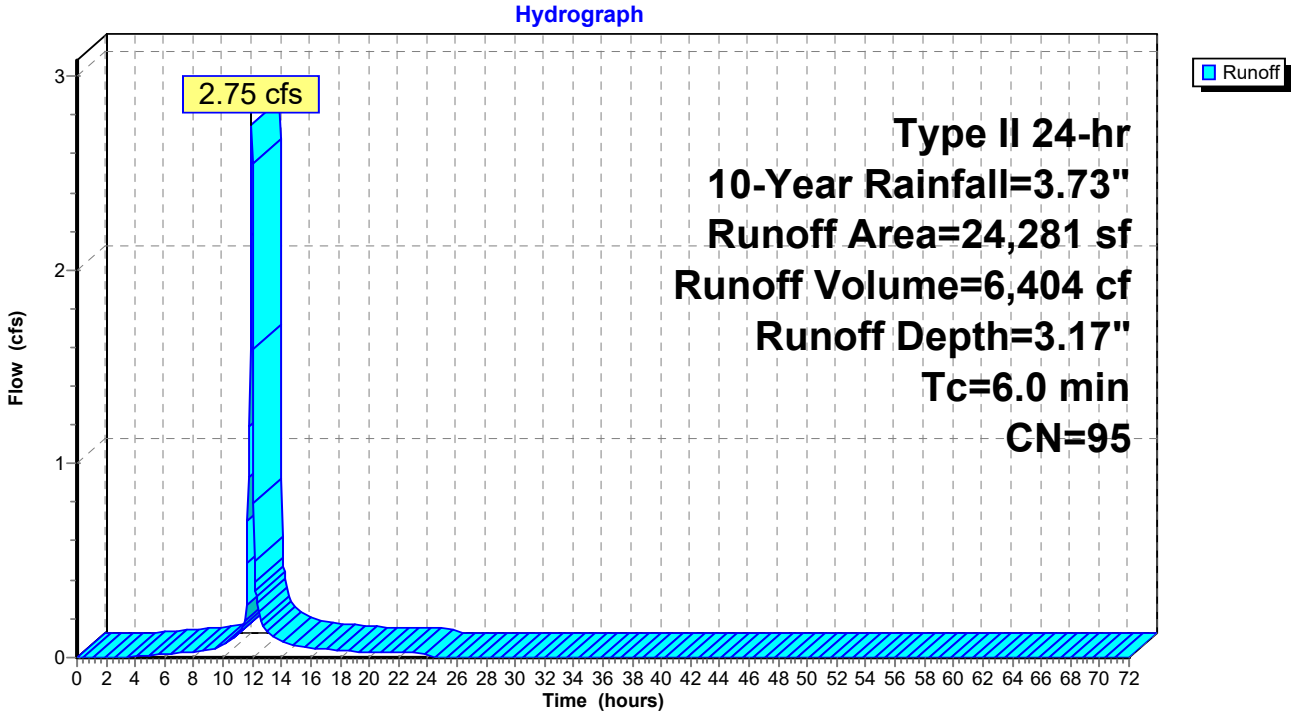
Runoff = 2.75 cfs @ 11.96 hrs, Volume= 6,404 cf, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	12,052	98	Paved parking, HSG C
*	8,265	98	Pervious Pavers, HSG C
*	1,107	98	Sidewalks, HSG C
	2,857	74	>75% Grass cover, Good, HSG C
	24,281	95	Weighted Average
	2,857		11.77% Pervious Area
	21,424		88.23% Impervious Area

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

Subcatchment P6: Proposed to Permeable Pavers 2 (Center)



Summary for Subcatchment P7: Proposed to Permeable Pavers 3 (South)

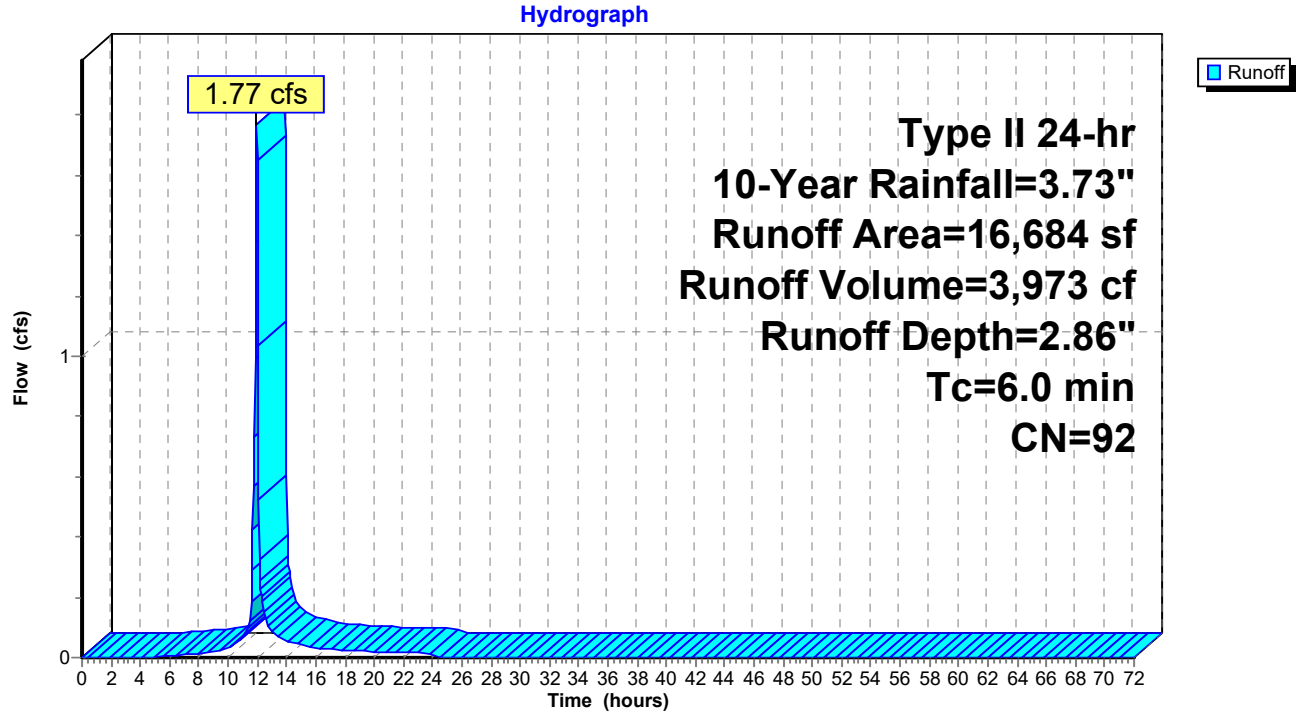
Runoff = 1.77 cfs @ 11.96 hrs, Volume= 3,973 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	6,584	98	Paved parking, HSG C
*	5,437	98	Pervious Pavers, HSG C
*	603	98	Sidewalks, HSG C
	4,060	74	>75% Grass cover, Good, HSG C
	16,684	92	Weighted Average
	4,060		24.33% Pervious Area
	12,624		75.67% Impervious Area

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

Subcatchment P7: Proposed to Permeable Pavers 3 (South)



Summary for Subcatchment P8: Uncaptured

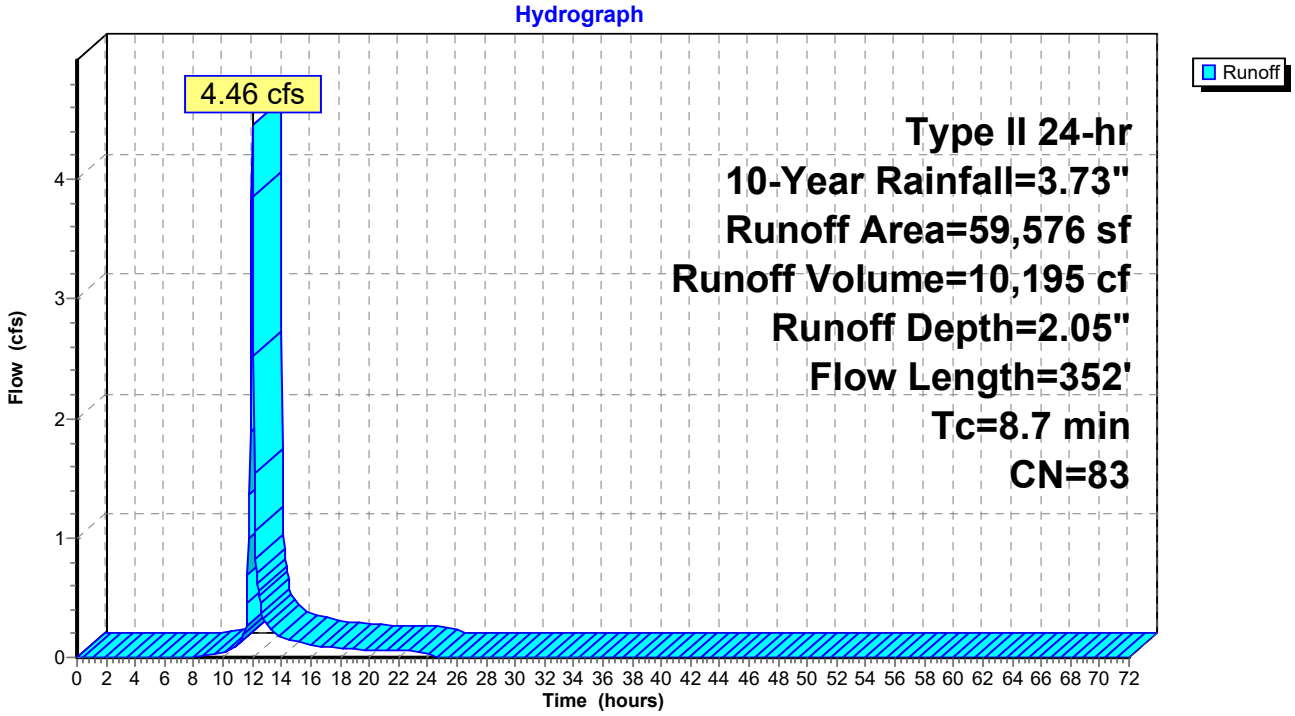
Runoff = 4.46 cfs @ 12.00 hrs, Volume= 10,195 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
	9,901	98	Paved parking, HSG C
*	11,278	98	Sidewalks, HSG C
	38,397	74	>75% Grass cover, Good, HSG C
	59,576	83	Weighted Average
	38,397		64.45% Pervious Area
	21,179		35.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	39	0.0187	0.12		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
3.5	313	0.0100	1.50		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Grassed Waterway Kv= 15.0 fps
8.7	352	Total			

Subcatchment P8: Uncaptured



Summary for Subcatchment P9: Offite Area

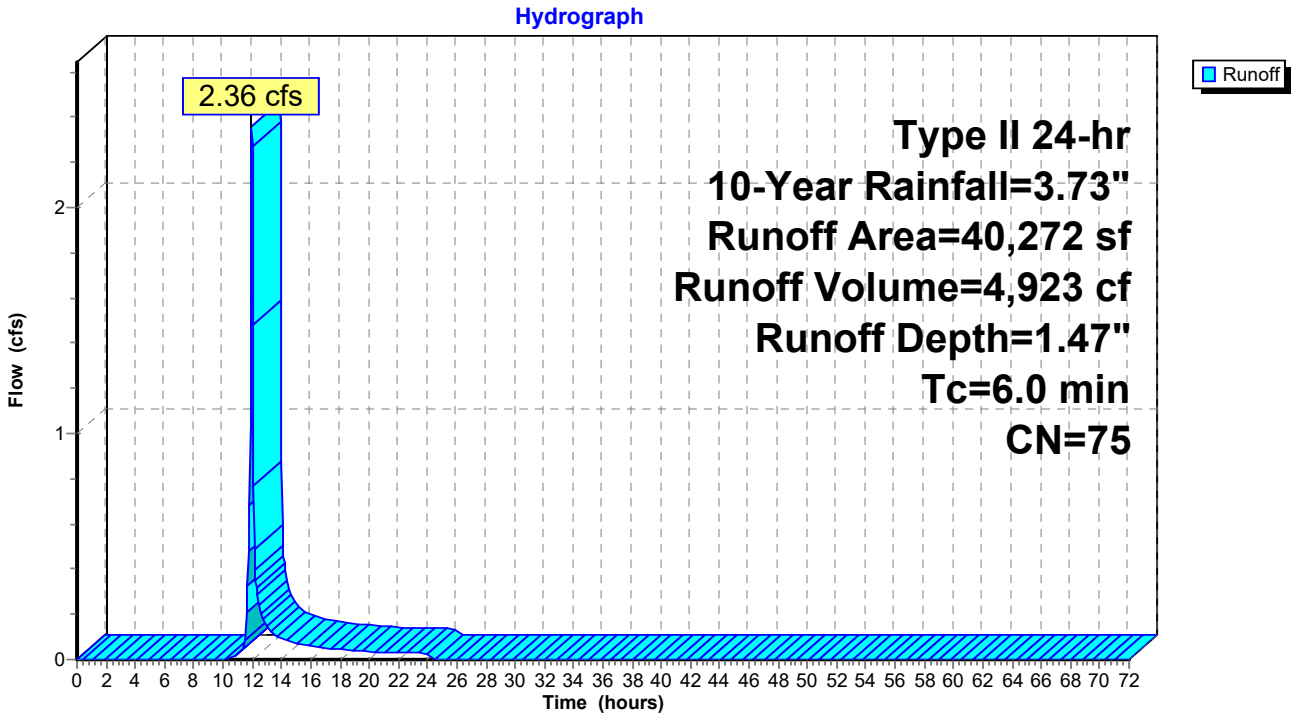
Runoff = 2.36 cfs @ 11.98 hrs, Volume= 4,923 cf, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.73"

	Area (sf)	CN	Description
*	1,850	98	Sidewalks, HSG C
	38,422	74	>75% Grass cover, Good, HSG C
	40,272	75	Weighted Average
	38,422		95.41% Pervious Area
	1,850		4.59% Impervious Area

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

Subcatchment P9: Offite Area



Summary for Pond BIO-1: Bioretention Basin-1 (North)

Inflow Area = 152,166 sf, 27.69% Impervious, Inflow Depth = 1.90" for 10-Year event
Inflow = 8.74 cfs @ 12.06 hrs, Volume= 24,050 cf
Outflow = 1.18 cfs @ 12.59 hrs, Volume= 24,050 cf, Atten= 87%, Lag= 31.8 min
Primary = 1.18 cfs @ 12.59 hrs, Volume= 24,050 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 664.41' @ 12.59 hrs Surf.Area= 14,817 sf Storage= 9,807 cf

Plug-Flow detention time= 83.5 min calculated for 24,050 cf (100% of inflow)
Center-of-Mass det. time= 82.7 min (919.3 - 836.5)

Volume	Invert	Avail.Storage	Storage Description
#1	661.00'	734 cf	**Stone Storage (Prismatic)**Listed below (Recalc) 2,224 cf Overall x 33.0% Voids
#2	661.50'	1,801 cf	**Engineered Soil (Prismatic)**Listed below (Recalc) 6,671 cf Overall x 27.0% Voids
#3	663.00'	26,143 cf	**Open Storage (Prismatic)**Listed below (Recalc)
		28,678 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
661.00	4,447	0	0
661.50	4,447	2,224	2,224

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
661.50	4,447	0	0
663.00	4,447	6,671	6,671

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
663.00	4,447	0	0
664.00	5,417	4,932	4,932
665.00	6,643	6,030	10,962
666.00	7,526	7,085	18,047
667.00	8,667	8,097	26,143

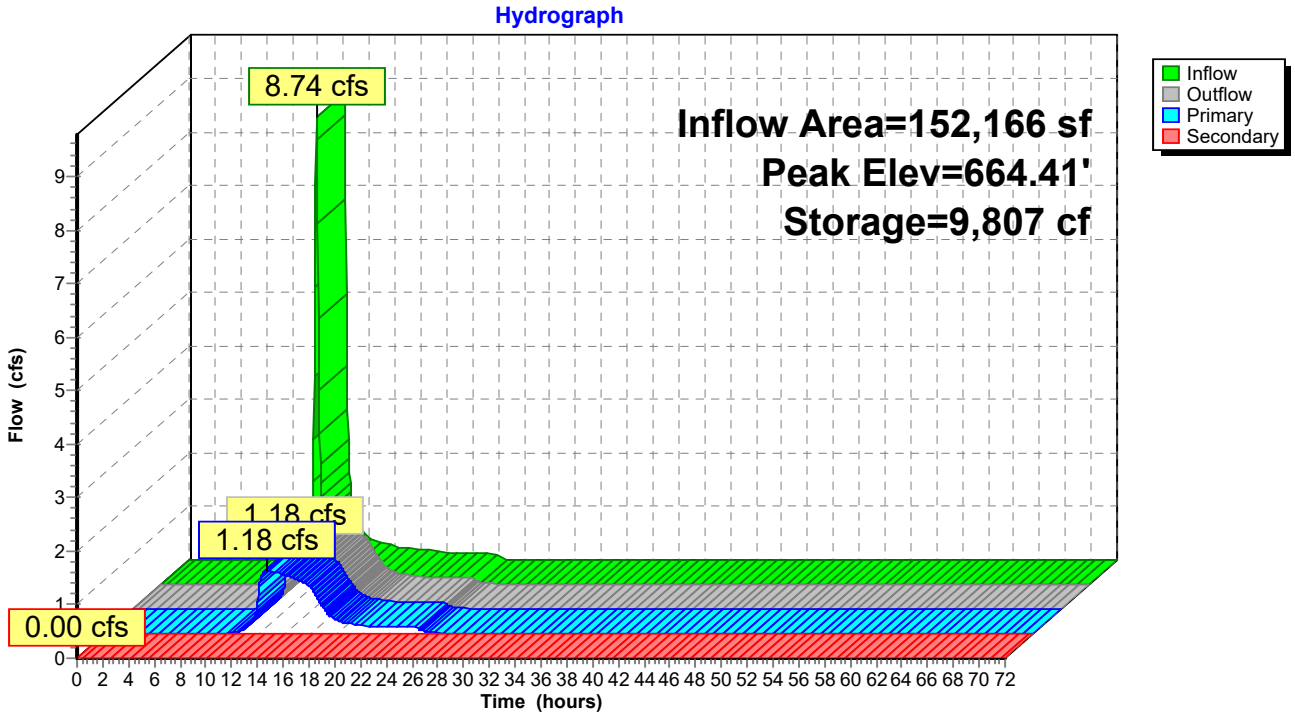
Device	Routing	Invert	Outlet Devices
#1	Primary	661.00'	**18.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 661.00' / 660.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	661.00'	**5.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	665.00'	**72.0" Horiz. 72" Standpipe** C= 0.600 Limited to weir flow at low heads
#4	Secondary	666.50'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65

2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.18 cfs @ 12.59 hrs HW=664.41' (Free Discharge)
└**1=Culvert** (Passes 1.18 cfs of 13.88 cfs potential flow)
└**2=6" Orifice** (Orifice Controls 1.18 cfs @ 8.62 fps)
└**3=72" Standpipe** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=661.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BIO-1: Bioretention Basin-1 (North)



Summary for Pond BIO-2: Bioretention Basin-2 (South)

Inflow Area = 163,197 sf, 54.20% Impervious, Inflow Depth = 2.40" for 10-Year event
Inflow = 11.31 cfs @ 11.98 hrs, Volume= 32,666 cf
Outflow = 5.26 cfs @ 12.13 hrs, Volume= 32,666 cf, Atten= 53%, Lag= 9.3 min
Primary = 5.26 cfs @ 12.13 hrs, Volume= 32,666 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 666.19' @ 12.13 hrs Surf.Area= 8,519 sf Storage= 8,173 cf

Plug-Flow detention time= 33.4 min calculated for 32,643 cf (100% of inflow)
Center-of-Mass det. time= 33.4 min (862.5 - 829.1)

Volume	Invert	Avail.Storage	Storage Description
#1	662.00'	348 cf	**Stone Storage (Prismatic)**Listed below (Recalc) 1,054 cf Overall x 33.0% Voids
#2	662.50'	853 cf	**Engineered Soil (Prismatic)**Listed below (Recalc) 3,161 cf Overall x 27.0% Voids
#3	664.00'	23,494 cf	**Open Storage (Prismatic)**Listed below (Recalc)
		24,695 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.00	2,107	0	0
662.50	2,107	1,054	1,054

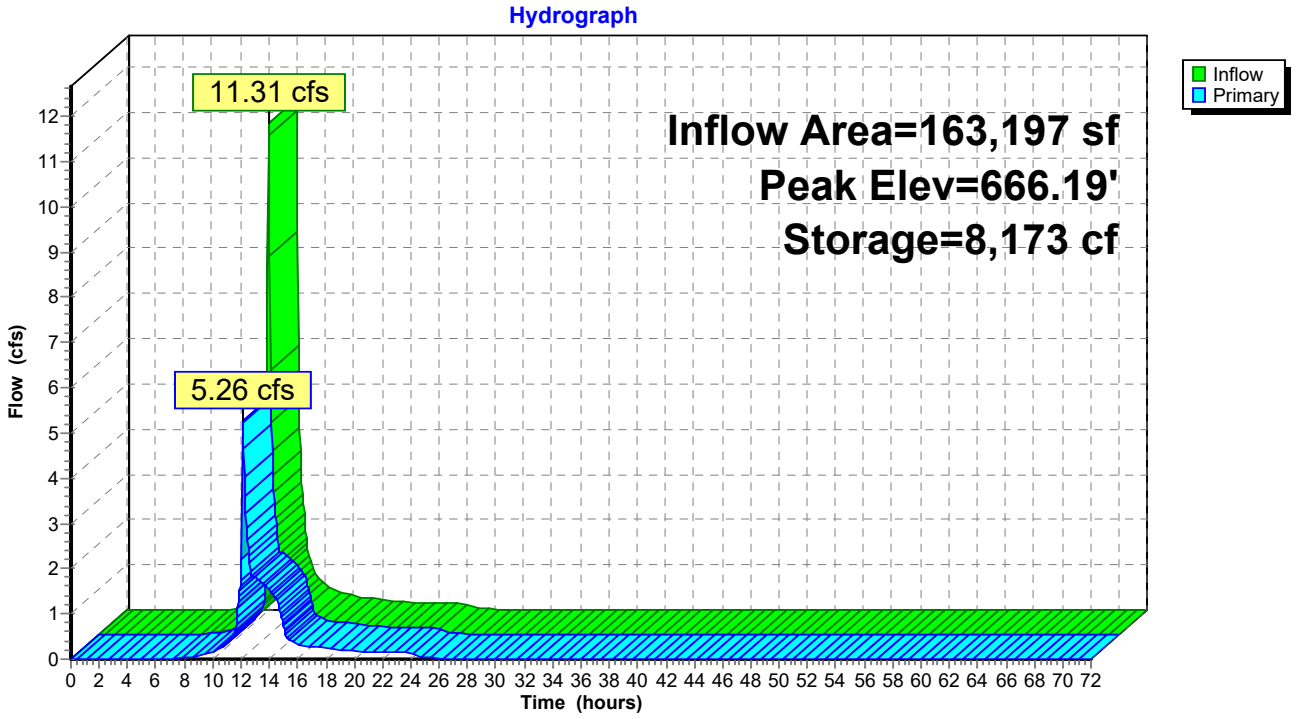
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.50	2,107	0	0
664.00	2,107	3,161	3,161

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
664.00	2,107	0	0
665.00	3,076	2,592	2,592
666.00	4,101	3,589	6,180
667.00	5,183	4,642	10,822
668.00	6,322	5,753	16,575
669.00	7,517	6,920	23,494

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	**18.0" Round Culvert** L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 662.00' / 659.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	662.00'	**6.0" Vert. 6" Drain Tile** C= 0.600 Limited to weir flow at low heads
#3	Device 1	666.00'	**48.0" Horiz. 48" Standpipe** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.15 cfs @ 12.13 hrs HW=666.19' (Free Discharge)
└**1=Culvert** (Passes 5.15 cfs of 12.79 cfs potential flow)
└**2=6" Drain Tile** (Orifice Controls 1.88 cfs @ 9.55 fps)
└**3=48" Standpipe** (Weir Controls 3.28 cfs @ 1.41 fps)

Pond BIO-2: Bioretention Basin-2 (South)



Summary for Pond PP1: Permeable Pavers (North)

Inflow Area = 20,463 sf, 74.70% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 2.18 cfs @ 11.96 hrs, Volume= 4,873 cf
Outflow = 1.24 cfs @ 12.06 hrs, Volume= 4,873 cf, Atten= 43%, Lag= 5.5 min
Primary = 1.24 cfs @ 12.06 hrs, Volume= 4,873 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 668.97' @ 12.06 hrs Surf.Area= 5,595 sf Storage= 1,195 cf

Plug-Flow detention time= 43.4 min calculated for 4,869 cf (100% of inflow)
Center-of-Mass det. time= 44.3 min (833.4 - 789.2)

Volume	Invert	Avail.Storage	Storage Description
#1	668.26'	1,679 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 5,595 cf Overall x 30.0% Voids
#2	669.26'	775 cf	**Bedding (Prismatic)** Listed below (Recalc) 2,350 cf Overall x 33.0% Voids
#3	669.68'	350 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 1,399 cf Overall x 25.0% Voids
#4	669.93'	1,466 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		4,270 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.26	5,595	0	0
669.26	5,595	5,595	5,595

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.26	5,595	0	0
669.68	5,595	2,350	2,350

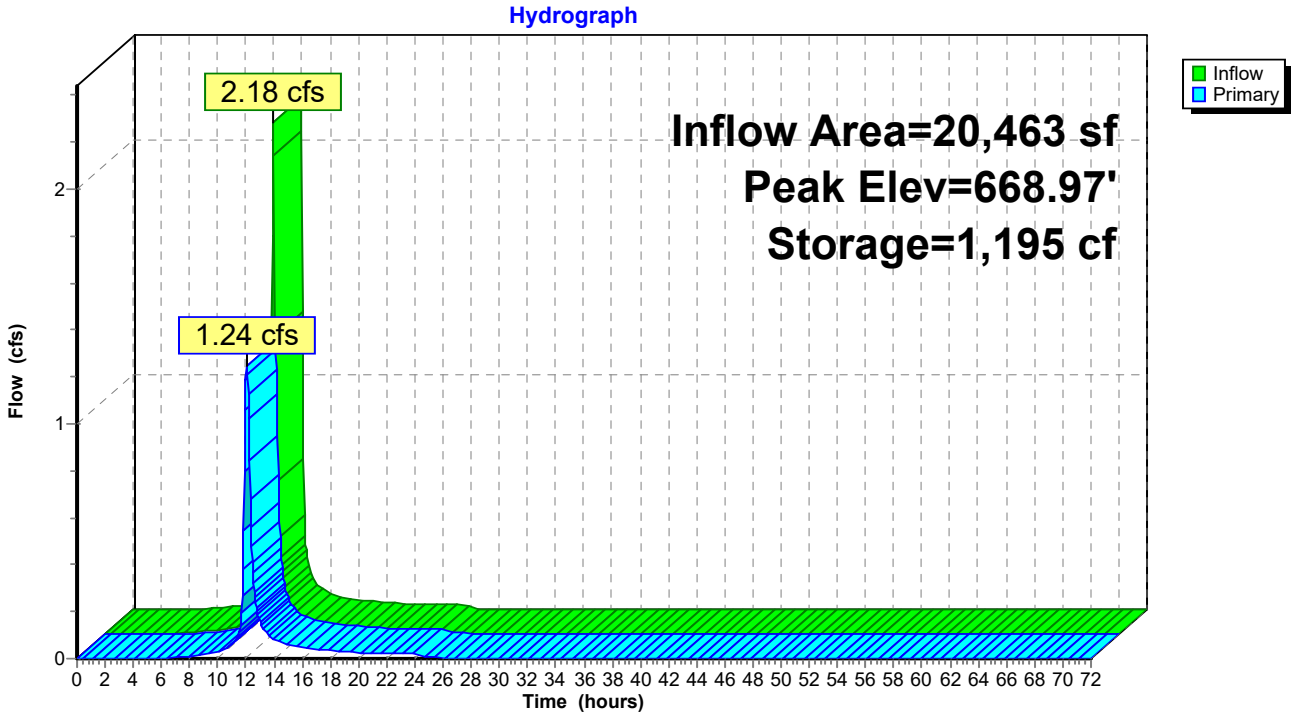
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.68	5,595	0	0
669.93	5,595	1,399	1,399

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.93	1,560	0	0
670.87	1,560	1,466	1,466

Device	Routing	Invert	Outlet Devices
#0	Primary	670.87'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.26'	**12.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 668.26' / 667.26' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	668.26'	**4.0" Vert. 4" Drain Tile X 4.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.24 cfs @ 12.06 hrs HW=668.97' (Free Discharge)
└**1=Culvert** (Passes 1.24 cfs of 1.70 cfs potential flow)
└**2=4" Drain Tile** (Orifice Controls 1.24 cfs @ 3.54 fps)

Pond PP1: Permeable Pavers (North)



Summary for Pond PP2: Permeable Pavers (Center)

Inflow Area = 24,281 sf, 88.23% Impervious, Inflow Depth = 3.17" for 10-Year event
Inflow = 2.75 cfs @ 11.96 hrs, Volume= 6,404 cf
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 6,404 cf, Atten= 62%, Lag= 7.6 min
Primary = 1.04 cfs @ 12.09 hrs, Volume= 6,404 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 668.89' @ 12.09 hrs Surf.Area= 8,265 sf Storage= 2,085 cf

Plug-Flow detention time= 66.6 min calculated for 6,400 cf (100% of inflow)
Center-of-Mass det. time= 67.8 min (840.7 - 772.9)

Volume	Invert	Avail.Storage	Storage Description
#1	668.05'	2,480 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 8,265 cf Overall x 30.0% Voids
#2	669.05'	1,146 cf	**Bedding (Prismatic)** Listed below (Recalc) 3,471 cf Overall x 33.0% Voids
#3	669.47'	517 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 2,066 cf Overall x 25.0% Voids
#4	669.72'	2,253 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		6,394 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.05	8,265	0	0
669.05	8,265	8,265	8,265

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.05	8,265	0	0
669.47	8,265	3,471	3,471

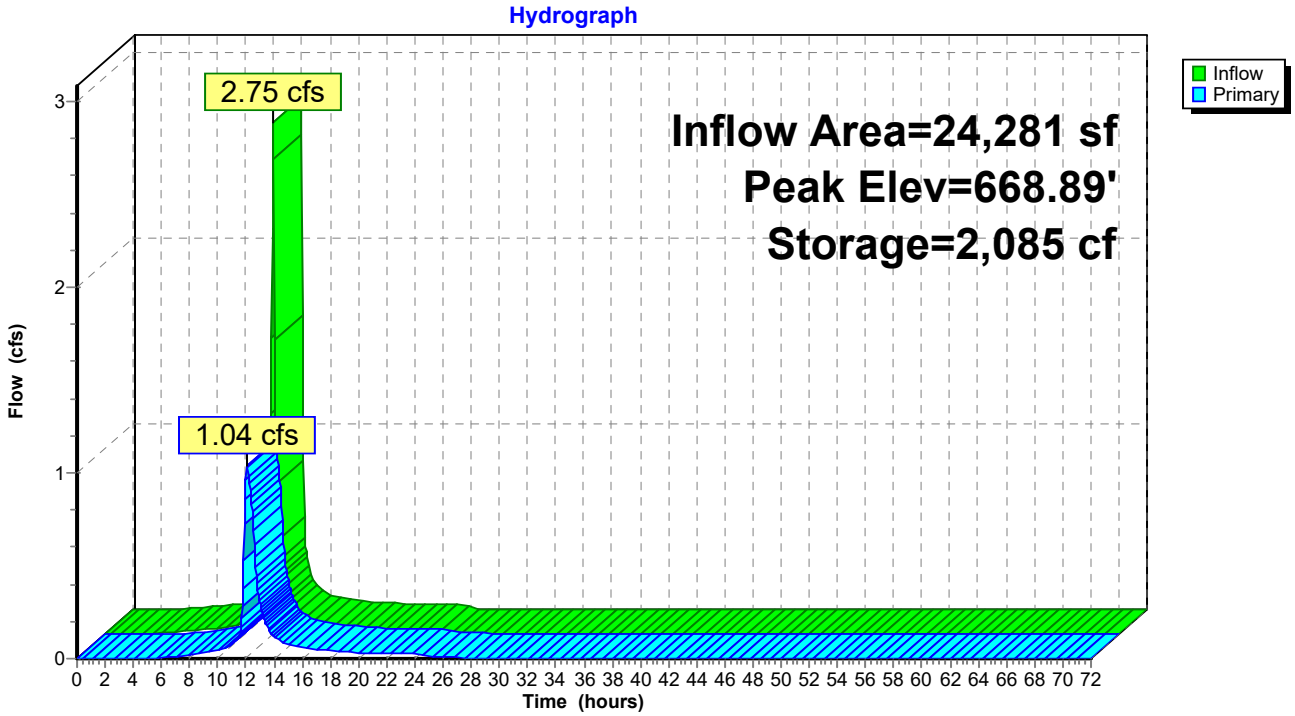
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.47	8,265	0	0
669.72	8,265	2,066	2,066

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.72	1,959	0	0
670.87	1,959	2,253	2,253

Device	Routing	Invert	Outlet Devices
#0	Primary	670.87'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.05'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 668.05' / 667.97' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	668.05'	**4.0" Vert. 4" Drain Tile X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.03 cfs @ 12.09 hrs HW=668.89' (Free Discharge)
└**1=Culvert** (Passes 1.03 cfs of 1.73 cfs potential flow)
└**2=4" Drain Tile** (Orifice Controls 1.03 cfs @ 3.94 fps)

Pond PP2: Permeable Pavers (Center)



Summary for Pond PP3: Permeable Pavers (South)

Inflow Area = 16,684 sf, 75.67% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 1.77 cfs @ 11.96 hrs, Volume= 3,973 cf
Outflow = 1.09 cfs @ 12.05 hrs, Volume= 3,973 cf, Atten= 39%, Lag= 5.1 min
Primary = 1.09 cfs @ 12.05 hrs, Volume= 3,973 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 668.69' @ 12.05 hrs Surf.Area= 5,437 sf Storage= 952 cf

Plug-Flow detention time= 44.1 min calculated for 3,973 cf (100% of inflow)
Center-of-Mass det. time= 43.6 min (832.8 - 789.2)

Volume	Invert	Avail.Storage	Storage Description
#1	668.11'	1,631 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 5,437 cf Overall x 30.0% Voids
#2	669.11'	754 cf	**Bedding (Prismatic)** Listed below (Recalc) 2,284 cf Overall x 33.0% Voids
#3	669.53'	340 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 1,359 cf Overall x 25.0% Voids
#4	669.78'	377 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		3,101 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.11	5,437	0	0
669.11	5,437	5,437	5,437

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.11	5,437	0	0
669.53	5,437	2,284	2,284

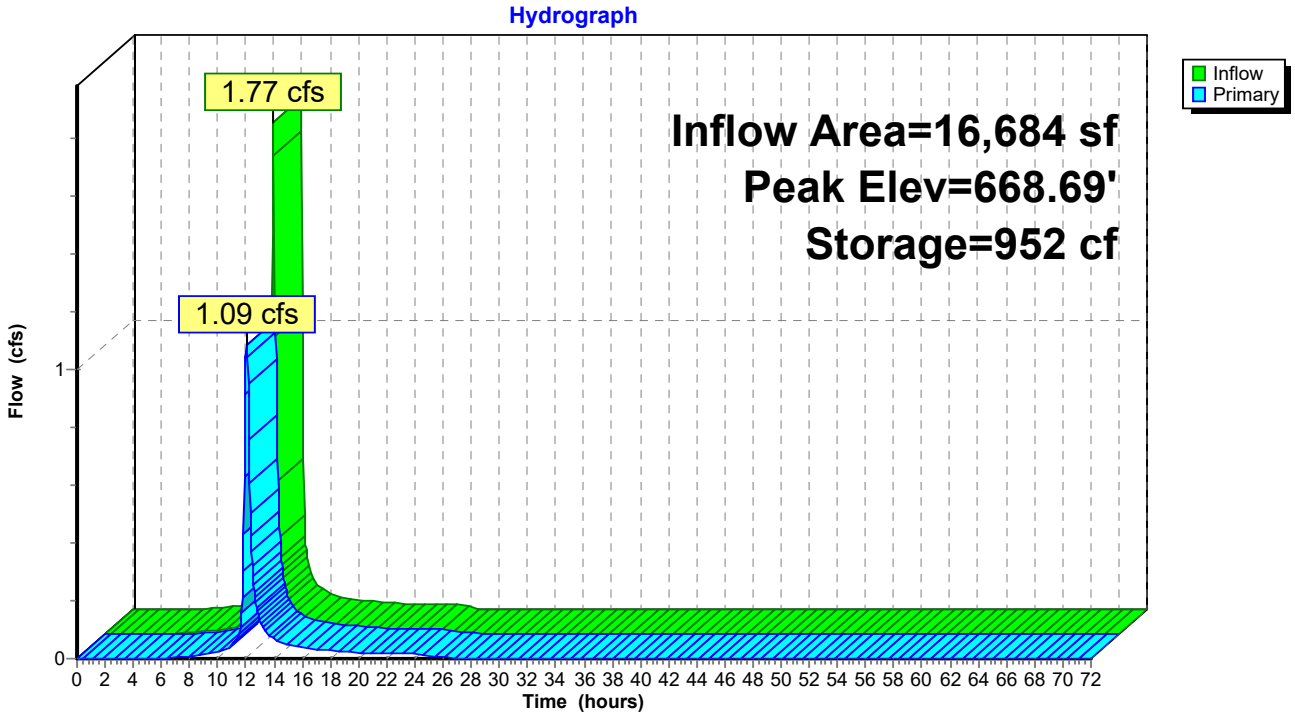
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.53	5,437	0	0
669.78	5,437	1,359	1,359

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.78	1,345	0	0
670.06	1,345	377	377

Device	Routing	Invert	Outlet Devices
#0	Primary	670.06'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.11'	**24.0" Round 12" Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 668.11' / 668.03' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	668.11'	**4.0" Vert. 4" Drain Tile X 4.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.09 cfs @ 12.05 hrs HW=668.69' (Free Discharge)
└**1=12" Culvert** (Passes 1.09 cfs of 1.34 cfs potential flow)
└**2=4" Drain Tile** (Orifice Controls 1.09 cfs @ 3.11 fps)

Pond PP3: Permeable Pavers (South)

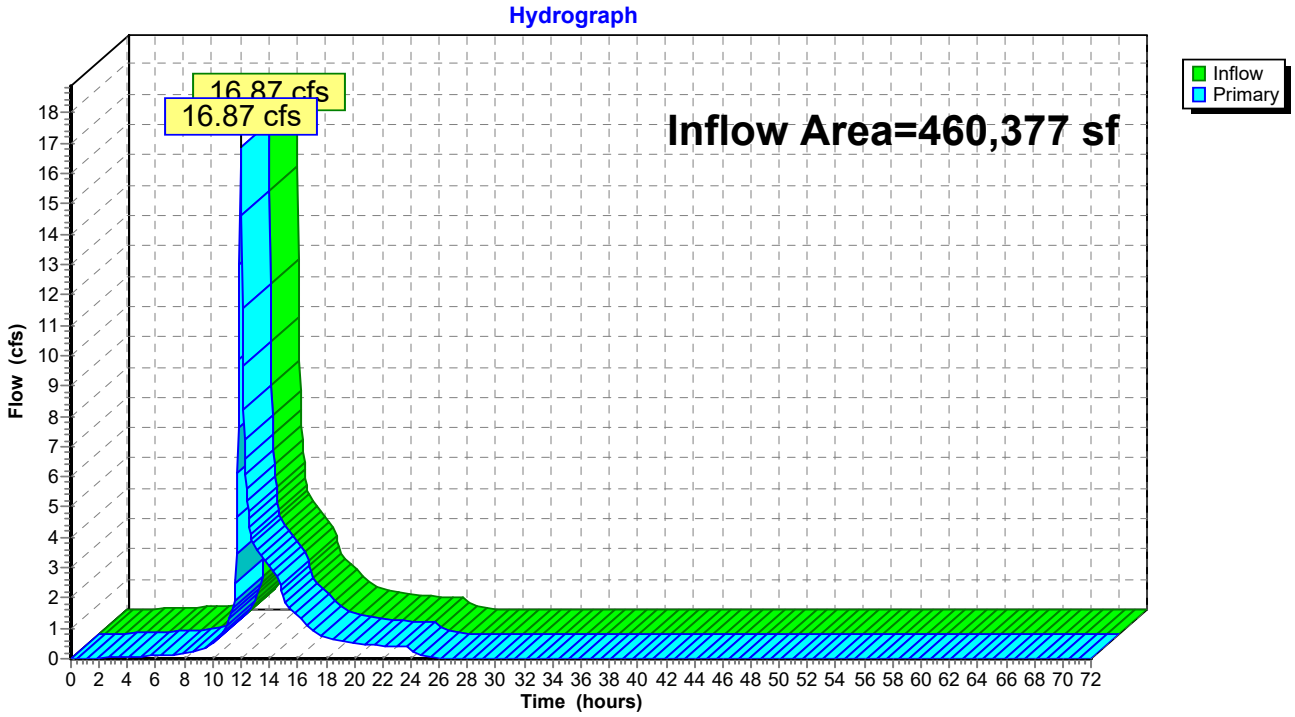


Summary for Link 3L: Proposed to King Rd. Storm Sewer

Inflow Area = 460,377 sf, 51.52% Impervious, Inflow Depth = 2.39" for 10-Year event
Inflow = 16.87 cfs @ 11.98 hrs, Volume= 91,800 cf
Primary = 16.87 cfs @ 11.98 hrs, Volume= 91,800 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 3L: Proposed to King Rd. Storm Sewer

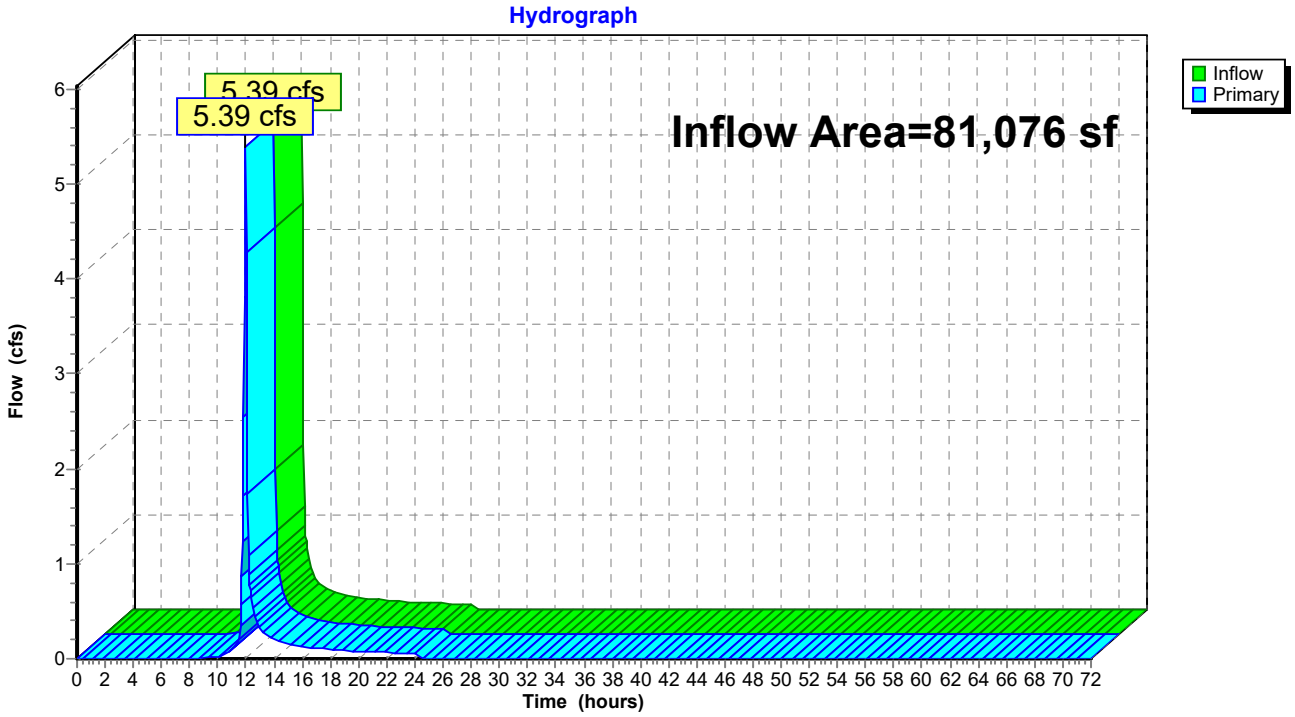


Summary for Link 4L: Proposed to Ellsworth Park Storm Water Basin

Inflow Area = 81,076 sf, 17.37% Impervious, Inflow Depth = 1.68" for 10-Year event
Inflow = 5.39 cfs @ 11.97 hrs, Volume= 11,372 cf
Primary = 5.39 cfs @ 11.97 hrs, Volume= 11,372 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 4L: Proposed to Ellsworth Park Storm Water Basin

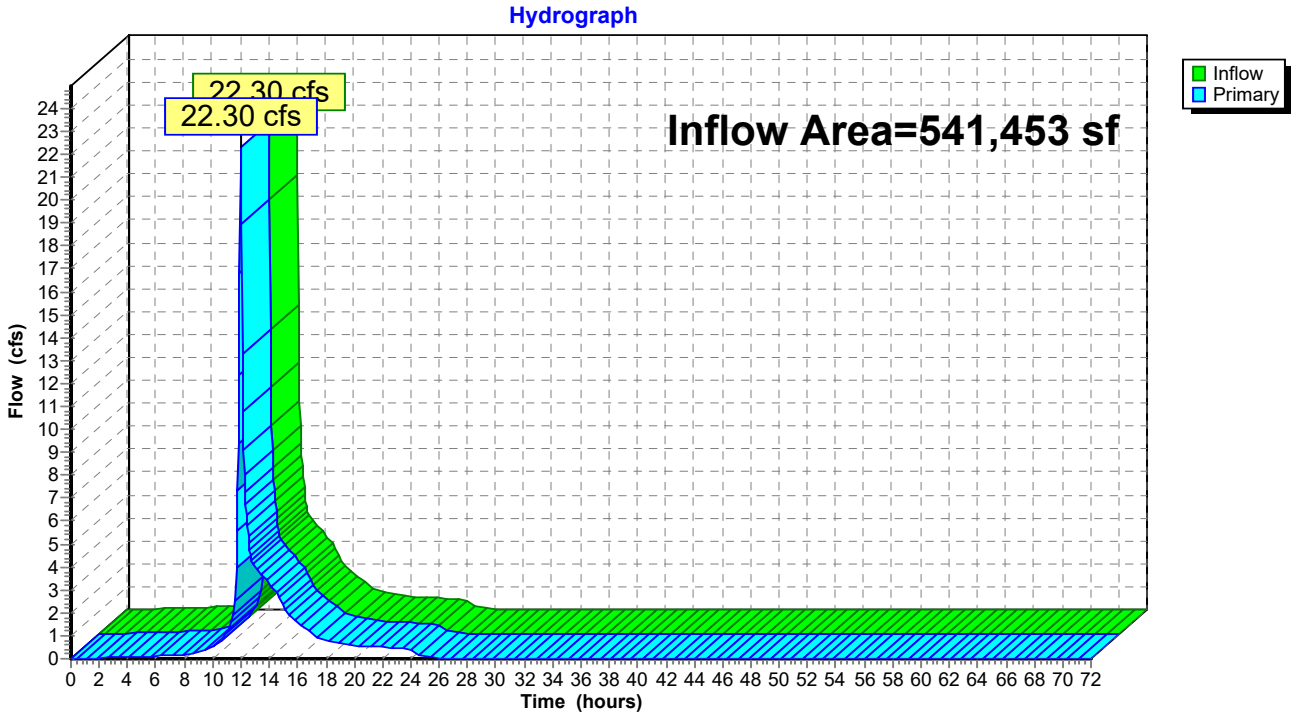


Summary for Link TPO: Total Proposed Outfall

Inflow Area = 541,453 sf, 46.41% Impervious, Inflow Depth = 2.29" for 10-Year event
Inflow = 22.30 cfs @ 11.98 hrs, Volume= 103,172 cf
Primary = 22.30 cfs @ 11.98 hrs, Volume= 103,172 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link TPO: Total Proposed Outfall



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Proposed Building to Runoff Area=85,438 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=16.86 cfs 42,446 cf

Subcatchment P2: Proposed to Bio-1 Runoff Area=152,166 sf 27.69% Impervious Runoff Depth=4.07"
Flow Length=212' Tc=14.2 min CN=81 Runoff=18.53 cfs 51,565 cf

Subcatchment P3: Proposed to Runoff Area=101,769 sf 38.44% Impervious Runoff Depth=4.28"
Tc=6.0 min CN=83 Runoff=16.62 cfs 36,275 cf

Subcatchment P4: Proposed to Ellsworth Runoff Area=40,804 sf 29.98% Impervious Runoff Depth=4.07"
Tc=6.0 min CN=81 Runoff=6.40 cfs 13,827 cf

Subcatchment P5: Proposed to Permeable Runoff Area=20,463 sf 74.70% Impervious Runoff Depth=5.27"
Tc=6.0 min CN=92 Runoff=3.86 cfs 8,980 cf

Subcatchment P6: Proposed to Permeable Runoff Area=24,281 sf 88.23% Impervious Runoff Depth=5.61"
Tc=6.0 min CN=95 Runoff=4.71 cfs 11,352 cf

Subcatchment P7: Proposed to Permeable Runoff Area=16,684 sf 75.67% Impervious Runoff Depth=5.27"
Tc=6.0 min CN=92 Runoff=3.14 cfs 7,322 cf

Subcatchment P8: Uncaptured Runoff Area=59,576 sf 35.55% Impervious Runoff Depth=4.28"
Flow Length=352' Tc=8.7 min CN=83 Runoff=9.05 cfs 21,236 cf

Subcatchment P9: Offite Area Runoff Area=40,272 sf 4.59% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=75 Runoff=5.46 cfs 11,589 cf

Pond BIO-1: Bioretention Basin-1 (North) Peak Elev=665.35' Storage=15,887 cf Inflow=18.53 cfs 51,565 cf
Primary=14.11 cfs 51,565 cf Secondary=0.00 cfs 0 cf Outflow=14.11 cfs 51,565 cf

Pond BIO-2: Bioretention Basin-2 (South) Peak Elev=666.91' Storage=11,564 cf Inflow=20.82 cfs 63,929 cf
Outflow=13.58 cfs 63,929 cf

Pond PP1: Permeable Pavers (North) Peak Elev=669.55' Storage=2,218 cf Inflow=3.86 cfs 8,980 cf
Outflow=1.78 cfs 8,980 cf

Pond PP2: Permeable Pavers (Center) Peak Elev=669.49' Storage=3,672 cf Inflow=4.71 cfs 11,352 cf
Outflow=1.42 cfs 11,352 cf

Pond PP3: Permeable Pavers (South) Peak Elev=669.16' Storage=1,728 cf Inflow=3.14 cfs 7,322 cf
Outflow=1.58 cfs 7,322 cf

Link 3L: Proposed to King Rd. Storm Sewer Inflow=39.97 cfs 179,175 cf
Primary=39.97 cfs 179,175 cf

Link 4L: Proposed to Ellsworth Park Storm Water Basin Inflow=11.86 cfs 25,416 cf
Primary=11.86 cfs 25,416 cf

Link TPO: Total Proposed Outfall

Inflow=52.77 cfs 204,591 cf
Primary=52.77 cfs 204,591 cf

Total Runoff Area = 541,453 sf Runoff Volume = 204,591 cf Average Runoff Depth = 4.53"
53.59% Pervious = 290,169 sf 46.41% Impervious = 251,284 sf

Summary for Subcatchment P1: Proposed Building to King Rd

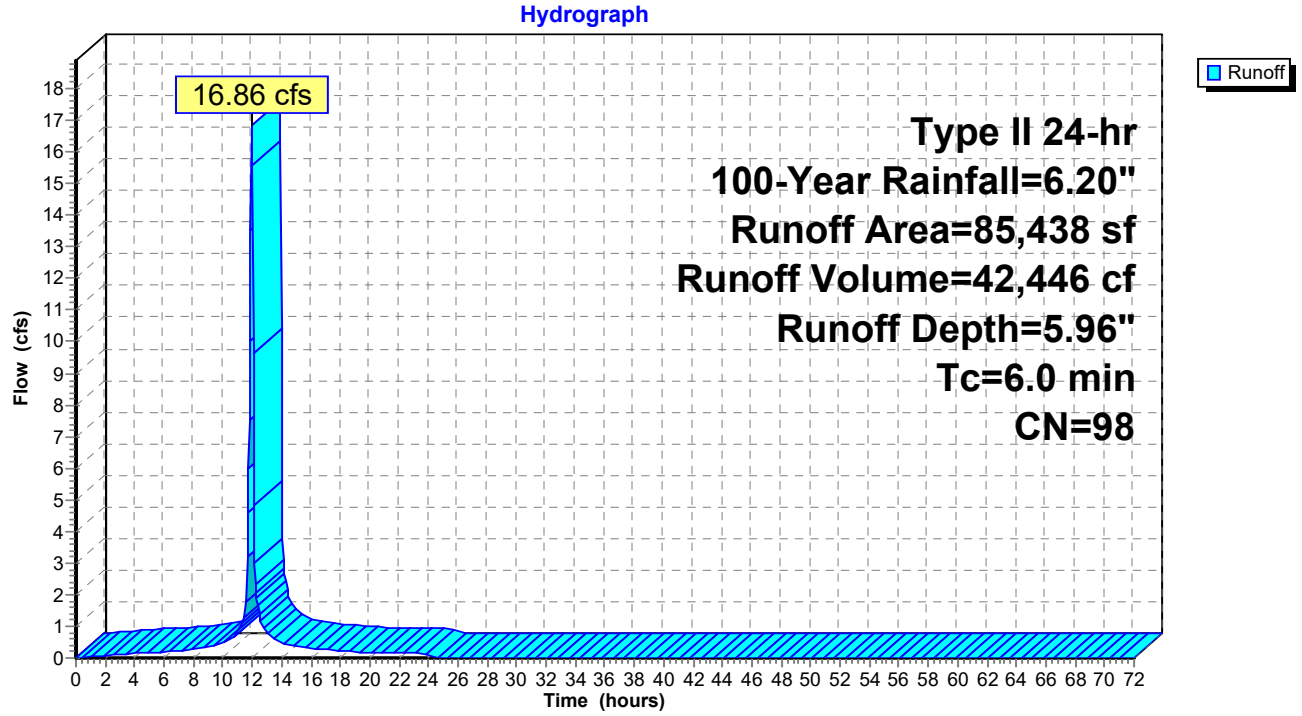
Runoff = 16.86 cfs @ 11.96 hrs, Volume= 42,446 cf, Depth= 5.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

Area (sf)	CN	Description
85,438	98	Roofs, HSG C
85,438		100.00% Impervious Area

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

Subcatchment P1: Proposed Building to King Rd



Summary for Subcatchment P2: Proposed to Bio-1

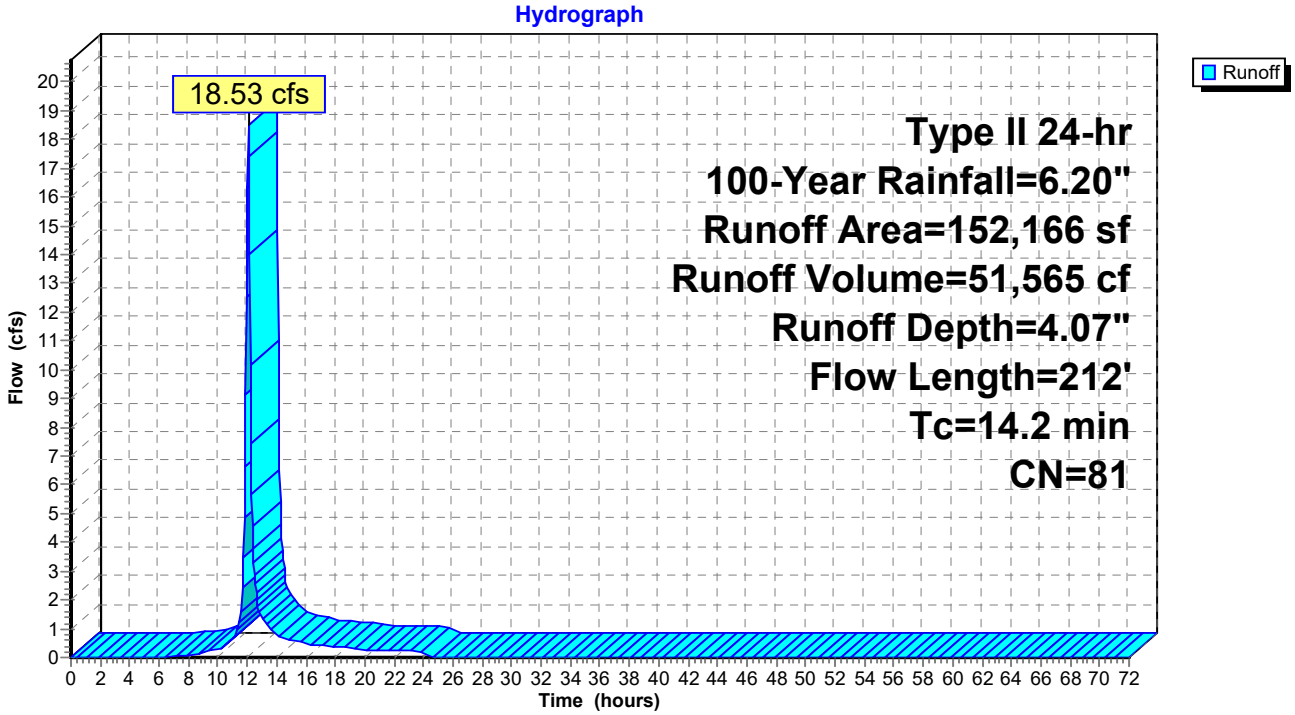
Runoff = 18.53 cfs @ 12.06 hrs, Volume= 51,565 cf, Depth= 4.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	9,071	98	Paved parking, HSG C
*	33,060	98	Sidewalks, HSG C
	110,035	74	>75% Grass cover, Good, HSG C
	152,166	81	Weighted Average
	110,035		72.31% Pervious Area
	42,131		27.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0120	0.13		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
0.3	34	0.0900	2.10		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Short Grass Pasture Kv= 7.0 fps
0.6	78	0.0200	2.12		**Shallow Concentrated Flow, Shallow Concentrated Flow-2** Grassed Waterway Kv= 15.0 fps
14.2	212	Total			

Subcatchment P2: Proposed to Bio-1



Summary for Subcatchment P3: Proposed to Bioretention Bio-2

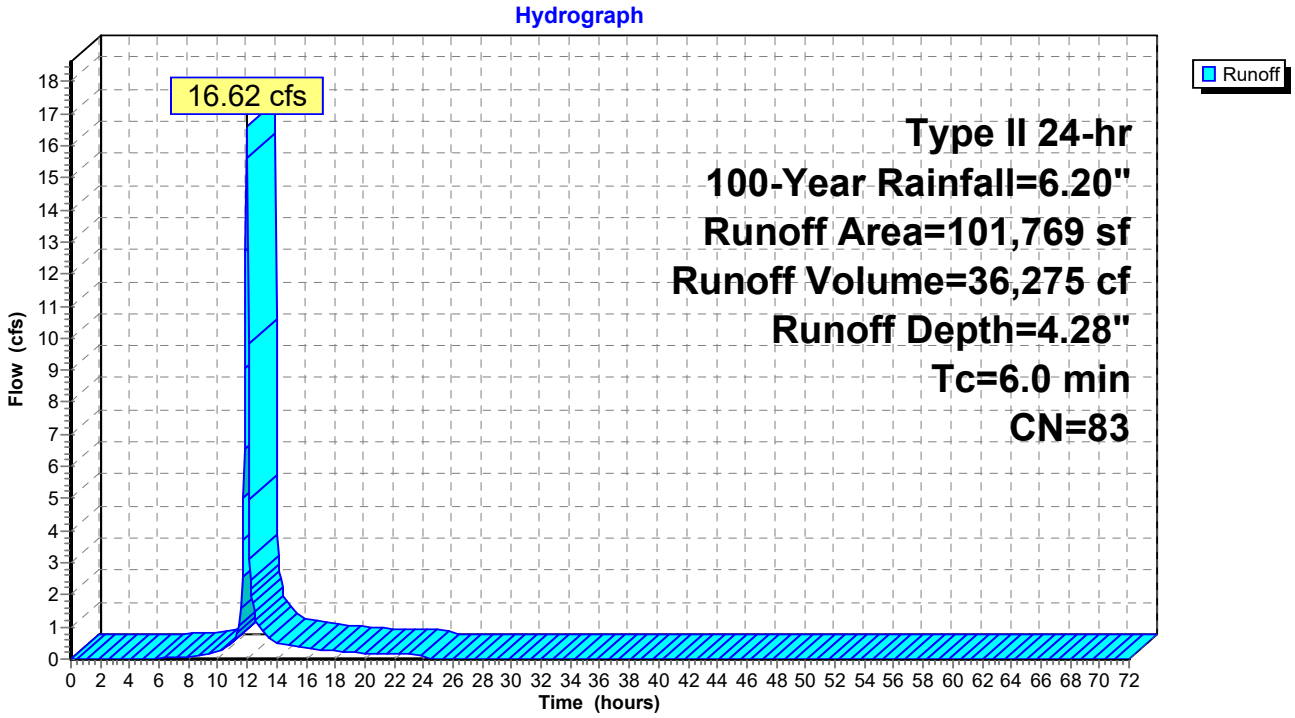
Runoff = 16.62 cfs @ 11.97 hrs, Volume= 36,275 cf, Depth= 4.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	25,743	98	Paved parking, HSG C
*	13,375	98	Sidewalks, HSG C
	62,651	74	>75% Grass cover, Good, HSG C
	101,769	83	Weighted Average
	62,651		61.56% Pervious Area
	39,118		38.44% Impervious Area

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

Subcatchment P3: Proposed to Bioretention Bio-2



Summary for Subcatchment P4: Proposed to Ellsworth Park Storm Water Basin

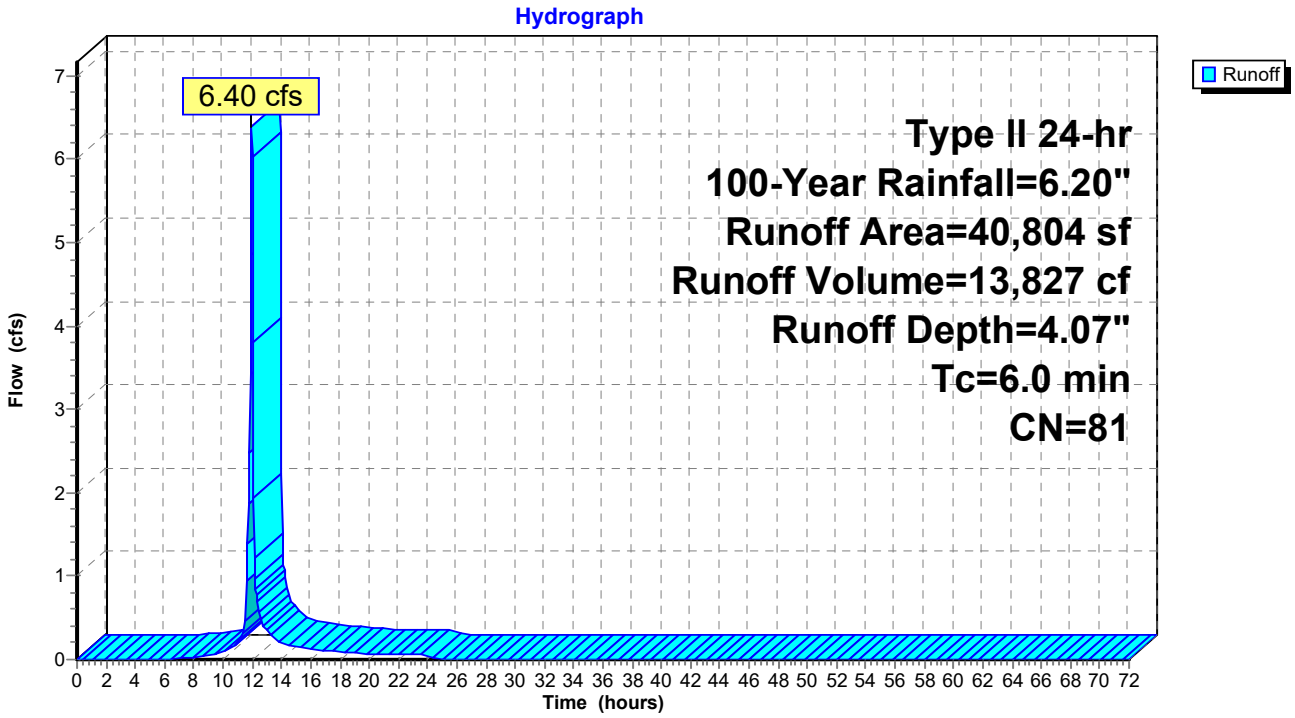
Runoff = 6.40 cfs @ 11.97 hrs, Volume= 13,827 cf, Depth= 4.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

Area (sf)	CN	Description
12,234	98	Paved parking, HSG C
28,570	74	>75% Grass cover, Good, HSG C
40,804	81	Weighted Average
28,570		70.02% Pervious Area
12,234		29.98% Impervious Area

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

Subcatchment P4: Proposed to Ellsworth Park Storm Water Basin



Summary for Subcatchment P5: Proposed to Permeable Pavers 1 (North)

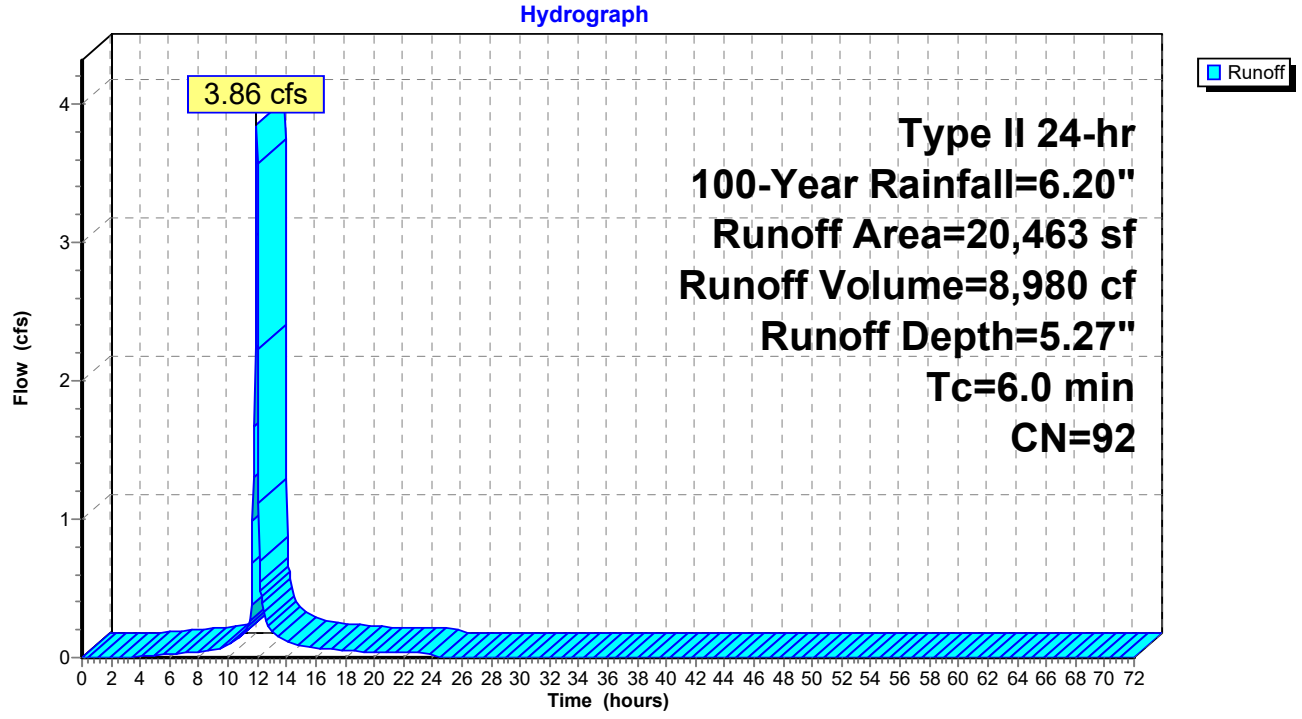
Runoff = 3.86 cfs @ 11.96 hrs, Volume= 8,980 cf, Depth= 5.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	9,020	98	Paved parking, HSG C
*	5,595	98	Pervious Pavers, HSG C
*	671	98	Sidewalks, HSG C
	5,177	74	>75% Grass cover, Good, HSG C
	20,463	92	Weighted Average
	5,177		25.30% Pervious Area
	15,286		74.70% Impervious Area

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

Subcatchment P5: Proposed to Permeable Pavers 1 (North)



Summary for Subcatchment P6: Proposed to Permeable Pavers 2 (Center)

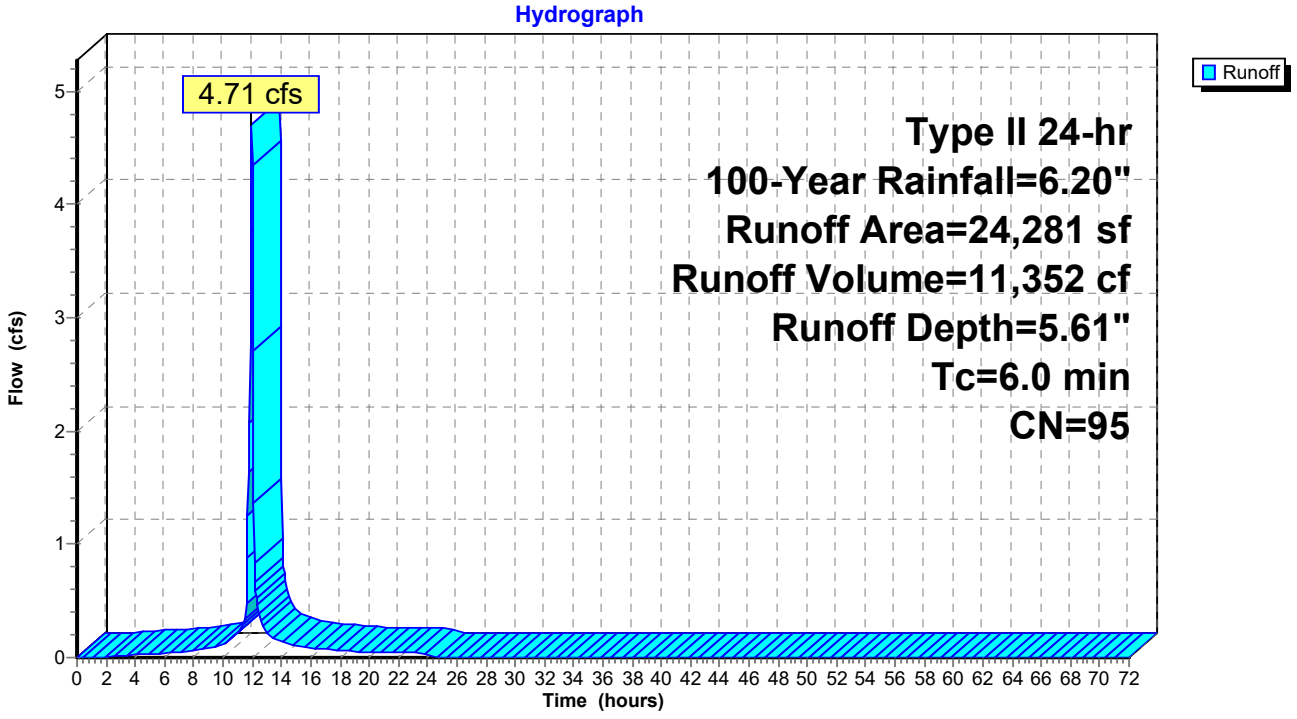
Runoff = 4.71 cfs @ 11.96 hrs, Volume= 11,352 cf, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	12,052	98	Paved parking, HSG C
*	8,265	98	Pervious Pavers, HSG C
*	1,107	98	Sidewalks, HSG C
	2,857	74	>75% Grass cover, Good, HSG C
	24,281	95	Weighted Average
	2,857		11.77% Pervious Area
	21,424		88.23% Impervious Area

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

Subcatchment P6: Proposed to Permeable Pavers 2 (Center)



Summary for Subcatchment P7: Proposed to Permeable Pavers 3 (South)

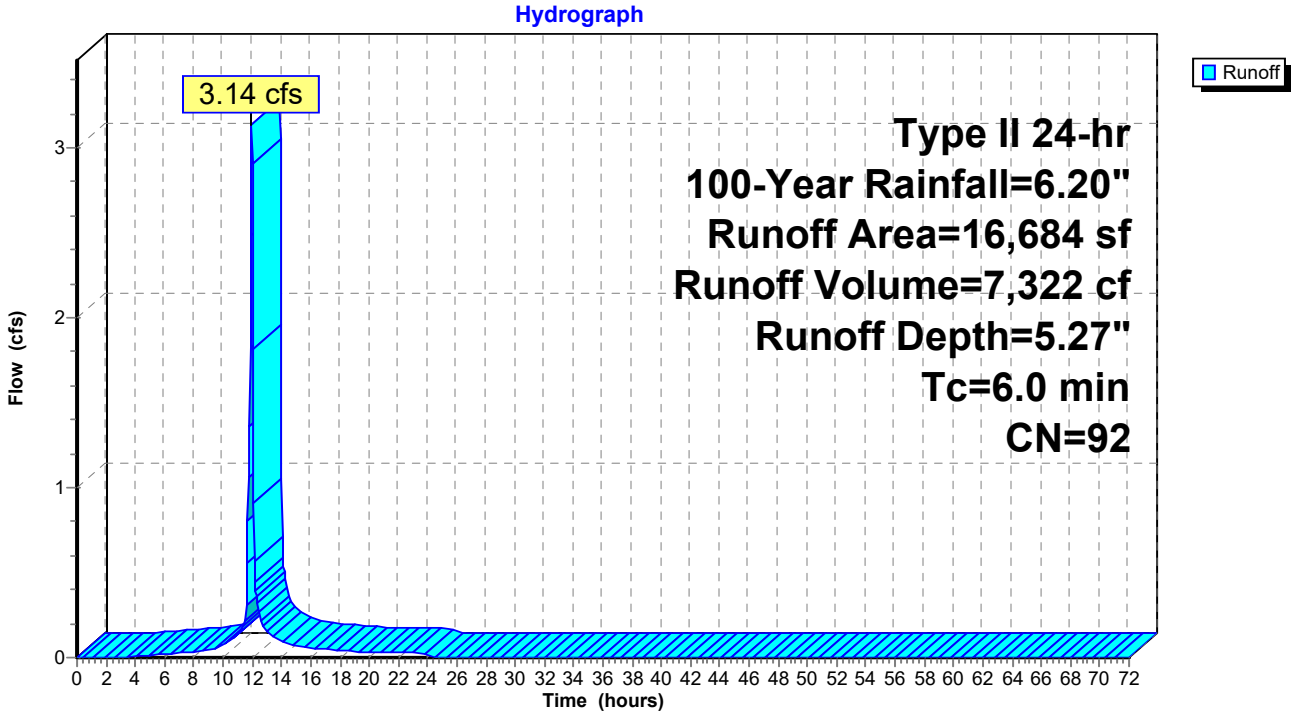
Runoff = 3.14 cfs @ 11.96 hrs, Volume= 7,322 cf, Depth= 5.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	6,584	98	Paved parking, HSG C
*	5,437	98	Pervious Pavers, HSG C
*	603	98	Sidewalks, HSG C
	4,060	74	>75% Grass cover, Good, HSG C
	16,684	92	Weighted Average
	4,060		24.33% Pervious Area
	12,624		75.67% Impervious Area

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

Subcatchment P7: Proposed to Permeable Pavers 3 (South)



Summary for Subcatchment P8: Uncaptured

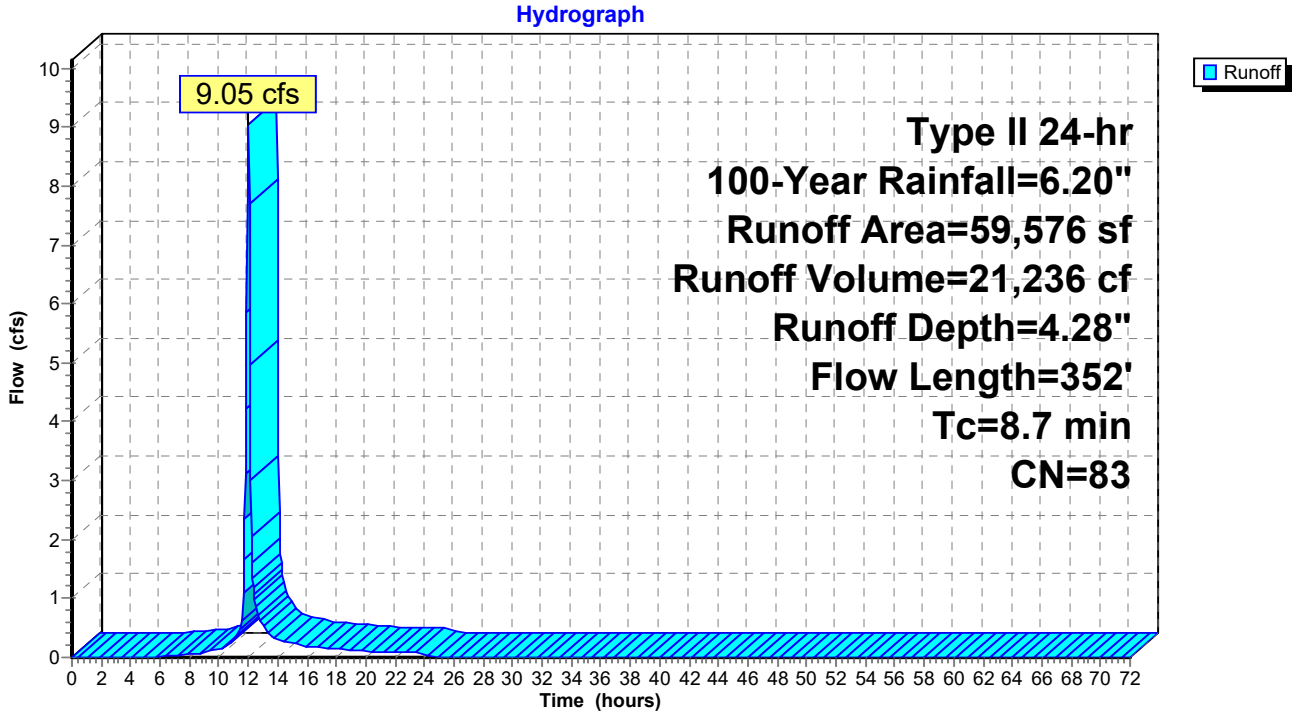
Runoff = 9.05 cfs @ 12.00 hrs, Volume= 21,236 cf, Depth= 4.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
	9,901	98	Paved parking, HSG C
*	11,278	98	Sidewalks, HSG C
	38,397	74	>75% Grass cover, Good, HSG C
	59,576	83	Weighted Average
	38,397		64.45% Pervious Area
	21,179		35.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	39	0.0187	0.12		**Sheet Flow, Sheet Flow-1** Grass: Short n= 0.150 P2= 2.62"
3.5	313	0.0100	1.50		**Shallow Concentrated Flow, Shallow Concentrated Flow-1** Grassed Waterway Kv= 15.0 fps
8.7	352	Total			

Subcatchment P8: Uncaptured



Summary for Subcatchment P9: Offite Area

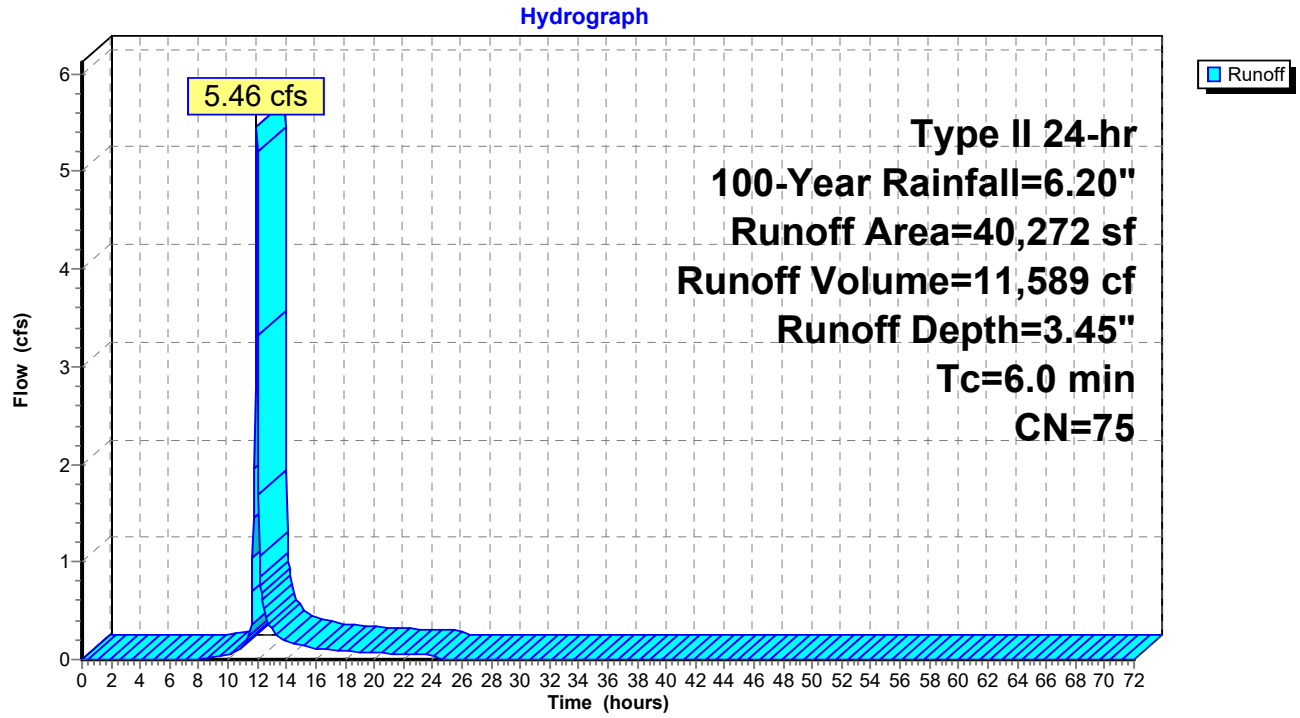
Runoff = 5.46 cfs @ 11.97 hrs, Volume= 11,589 cf, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.20"

	Area (sf)	CN	Description
*	1,850	98	Sidewalks, HSG C
	38,422	74	>75% Grass cover, Good, HSG C
	40,272	75	Weighted Average
	38,422		95.41% Pervious Area
	1,850		4.59% Impervious Area

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

Subcatchment P9: Offite Area



Summary for Pond BIO-1: Bioretention Basin-1 (North)

Inflow Area = 152,166 sf, 27.69% Impervious, Inflow Depth = 4.07" for 100-Year event
Inflow = 18.53 cfs @ 12.06 hrs, Volume= 51,565 cf
Outflow = 14.11 cfs @ 12.17 hrs, Volume= 51,565 cf, Atten= 24%, Lag= 6.5 min
Primary = 14.11 cfs @ 12.17 hrs, Volume= 51,565 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 665.35' @ 12.17 hrs Surf.Area= 15,848 sf Storage= 15,887 cf

Plug-Flow detention time= 83.9 min calculated for 51,529 cf (100% of inflow)
Center-of-Mass det. time= 84.1 min (898.9 - 814.8)

Volume	Invert	Avail.Storage	Storage Description
#1	661.00'	734 cf	**Stone Storage (Prismatic)**Listed below (Recalc) 2,224 cf Overall x 33.0% Voids
#2	661.50'	1,801 cf	**Engineered Soil (Prismatic)**Listed below (Recalc) 6,671 cf Overall x 27.0% Voids
#3	663.00'	26,143 cf	**Open Storage (Prismatic)**Listed below (Recalc)
		28,678 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
661.00	4,447	0	0
661.50	4,447	2,224	2,224

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
661.50	4,447	0	0
663.00	4,447	6,671	6,671

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
663.00	4,447	0	0
664.00	5,417	4,932	4,932
665.00	6,643	6,030	10,962
666.00	7,526	7,085	18,047
667.00	8,667	8,097	26,143

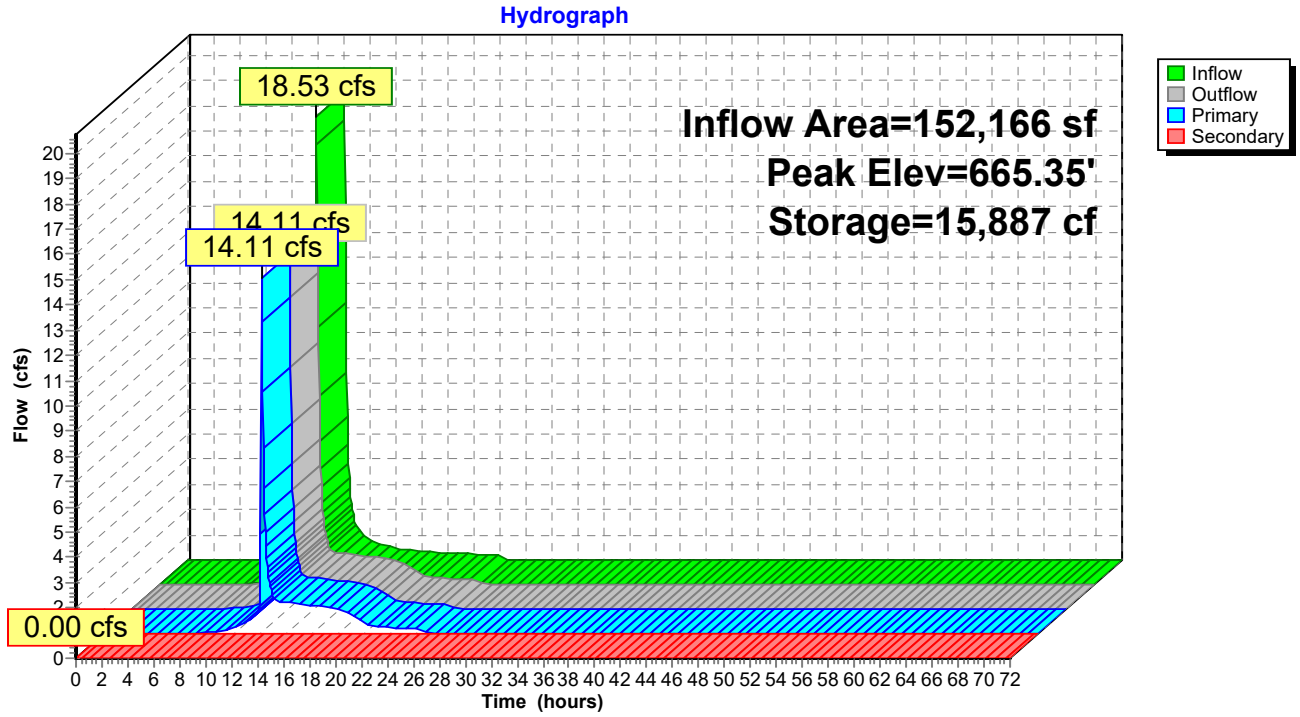
Device	Routing	Invert	Outlet Devices
#1	Primary	661.00'	**18.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 661.00' / 660.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	661.00'	**5.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	665.00'	**72.0" Horiz. 72" Standpipe** C= 0.600 Limited to weir flow at low heads
#4	Secondary	666.50'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65

2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=13.15 cfs @ 12.17 hrs HW=665.33' (Free Discharge)
└**1=Culvert** (Passes 13.15 cfs of 16.10 cfs potential flow)
└**2=6" Orifice** (Orifice Controls 1.33 cfs @ 9.78 fps)
└**3=72" Standpipe** (Weir Controls 11.82 cfs @ 1.89 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=661.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BIO-1: Bioretention Basin-1 (North)



Summary for Pond BIO-2: Bioretention Basin-2 (South)

Inflow Area = 163,197 sf, 54.20% Impervious, Inflow Depth = 4.70" for 100-Year event
Inflow = 20.82 cfs @ 11.97 hrs, Volume= 63,929 cf
Outflow = 13.58 cfs @ 12.06 hrs, Volume= 63,929 cf, Atten= 35%, Lag= 5.4 min
Primary = 13.58 cfs @ 12.06 hrs, Volume= 63,929 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 666.91' @ 12.06 hrs Surf.Area= 9,300 sf Storage= 11,564 cf

Plug-Flow detention time= 26.4 min calculated for 63,929 cf (100% of inflow)
Center-of-Mass det. time= 26.4 min (832.5 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1	662.00'	348 cf	**Stone Storage (Prismatic)**Listed below (Recalc) 1,054 cf Overall x 33.0% Voids
#2	662.50'	853 cf	**Engineered Soil (Prismatic)**Listed below (Recalc) 3,161 cf Overall x 27.0% Voids
#3	664.00'	23,494 cf	**Open Storage (Prismatic)**Listed below (Recalc)
		24,695 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.00	2,107	0	0
662.50	2,107	1,054	1,054

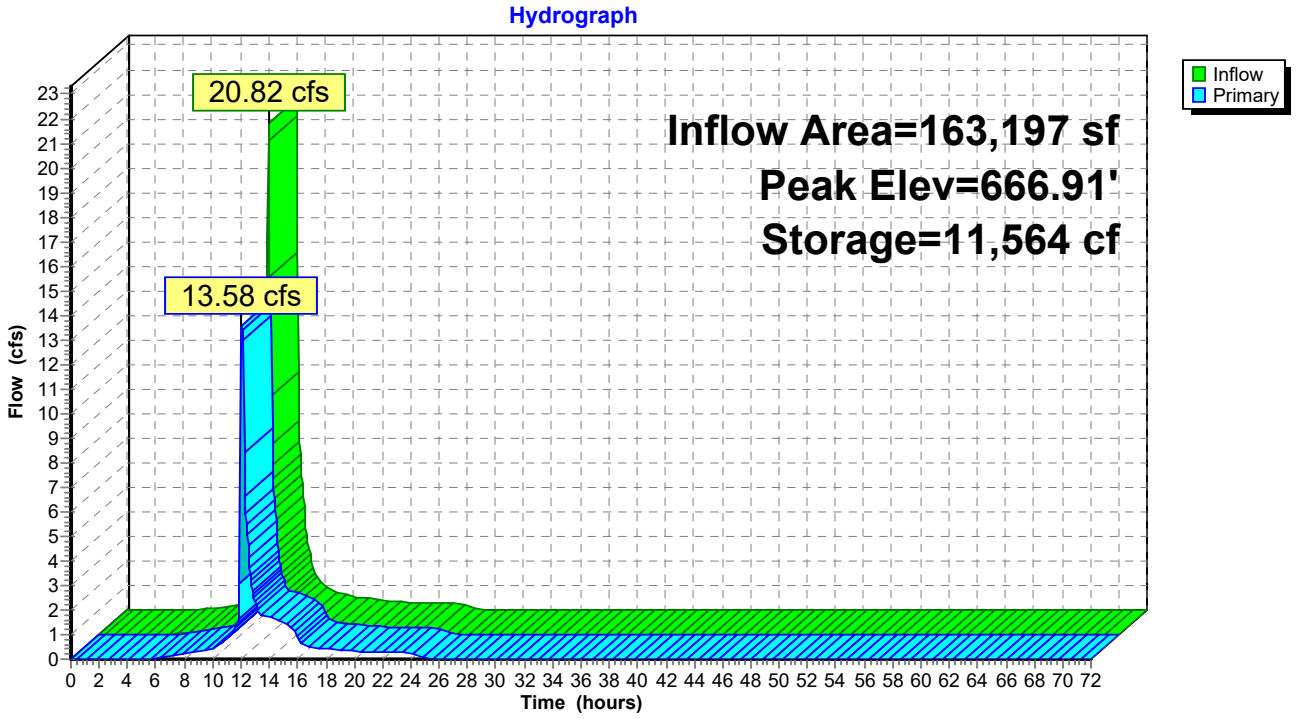
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.50	2,107	0	0
664.00	2,107	3,161	3,161

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
664.00	2,107	0	0
665.00	3,076	2,592	2,592
666.00	4,101	3,589	6,180
667.00	5,183	4,642	10,822
668.00	6,322	5,753	16,575
669.00	7,517	6,920	23,494

Device	Routing	Invert	Outlet Devices
#1	Primary	662.00'	**18.0" Round Culvert** L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 662.00' / 659.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	662.00'	**6.0" Vert. 6" Drain Tile** C= 0.600 Limited to weir flow at low heads
#3	Device 1	666.00'	**48.0" Horiz. 48" Standpipe** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=13.57 cfs @ 12.06 hrs HW=666.89' (Free Discharge)
└**1=Culvert** (Barrel Controls 13.57 cfs @ 7.68 fps)
└**2=6" Drain Tile** (Passes < 2.04 cfs potential flow)
└**3=48" Standpipe** (Passes < 34.72 cfs potential flow)

Pond BIO-2: Bioretention Basin-2 (South)



Summary for Pond PP1: Permeable Pavers (North)

Inflow Area = 20,463 sf, 74.70% Impervious, Inflow Depth = 5.27" for 100-Year event
Inflow = 3.86 cfs @ 11.96 hrs, Volume= 8,980 cf
Outflow = 1.78 cfs @ 12.07 hrs, Volume= 8,980 cf, Atten= 54%, Lag= 6.5 min
Primary = 1.78 cfs @ 12.07 hrs, Volume= 8,980 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 669.55' @ 12.07 hrs Surf.Area= 11,190 sf Storage= 2,218 cf

Plug-Flow detention time= 36.2 min calculated for 8,980 cf (100% of inflow)
Center-of-Mass det. time= 35.7 min (808.4 - 772.7)

Volume	Invert	Avail.Storage	Storage Description
#1	668.26'	1,679 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 5,595 cf Overall x 30.0% Voids
#2	669.26'	775 cf	**Bedding (Prismatic)** Listed below (Recalc) 2,350 cf Overall x 33.0% Voids
#3	669.68'	350 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 1,399 cf Overall x 25.0% Voids
#4	669.93'	1,466 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		4,270 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.26	5,595	0	0
669.26	5,595	5,595	5,595

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.26	5,595	0	0
669.68	5,595	2,350	2,350

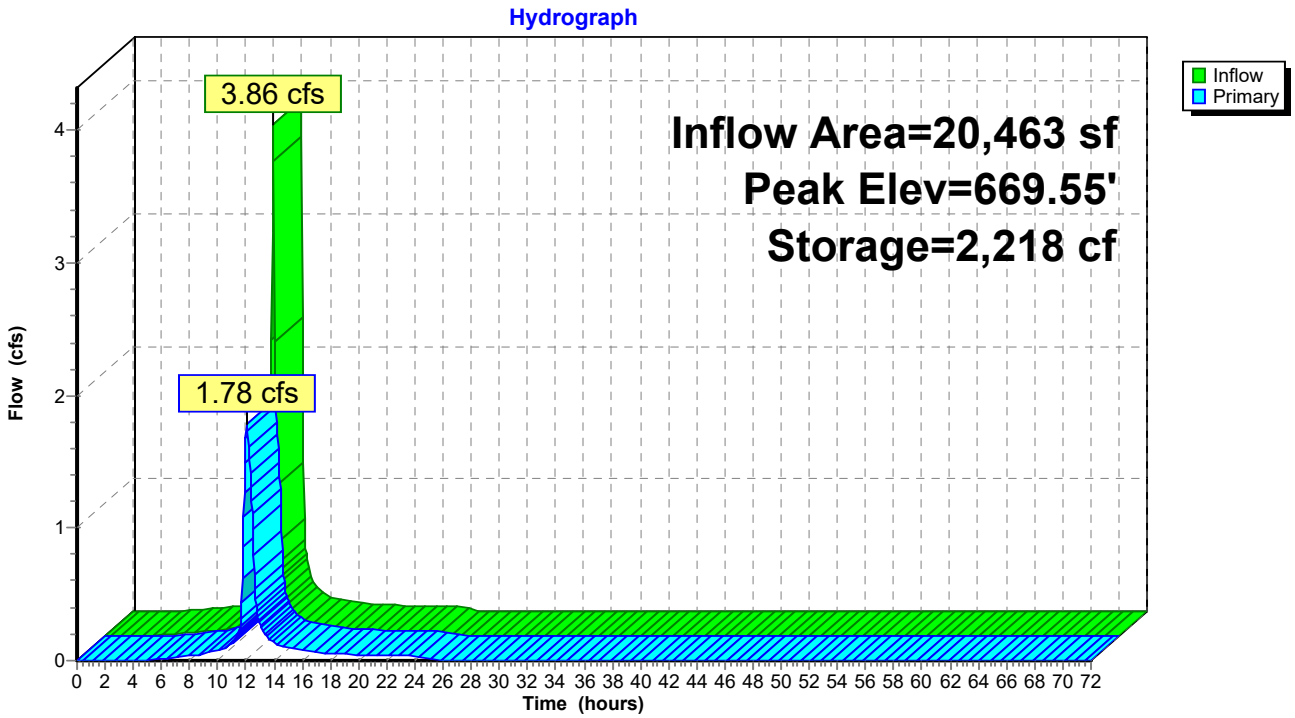
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.68	5,595	0	0
669.93	5,595	1,399	1,399

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.93	1,560	0	0
670.87	1,560	1,466	1,466

Device	Routing	Invert	Outlet Devices
#0	Primary	670.87'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.26'	**12.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 668.26' / 667.26' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	668.26'	**4.0" Vert. 4" Drain Tile X 4.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.77 cfs @ 12.07 hrs HW=669.54' (Free Discharge)
└**1=Culvert** (Passes 1.77 cfs of 3.33 cfs potential flow)
└**2=4" Drain Tile** (Orifice Controls 1.77 cfs @ 5.07 fps)

Pond PP1: Permeable Pavers (North)



Summary for Pond PP2: Permeable Pavers (Center)

Inflow Area = 24,281 sf, 88.23% Impervious, Inflow Depth = 5.61" for 100-Year event
Inflow = 4.71 cfs @ 11.96 hrs, Volume= 11,352 cf
Outflow = 1.42 cfs @ 12.11 hrs, Volume= 11,352 cf, Atten= 70%, Lag= 8.7 min
Primary = 1.42 cfs @ 12.11 hrs, Volume= 11,352 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 669.49' @ 12.11 hrs Surf.Area= 24,795 sf Storage= 3,672 cf

Plug-Flow detention time= 56.6 min calculated for 11,344 cf (100% of inflow)
Center-of-Mass det. time= 57.7 min (816.7 - 759.1)

Volume	Invert	Avail.Storage	Storage Description
#1	668.05'	2,480 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 8,265 cf Overall x 30.0% Voids
#2	669.05'	1,146 cf	**Bedding (Prismatic)** Listed below (Recalc) 3,471 cf Overall x 33.0% Voids
#3	669.47'	517 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 2,066 cf Overall x 25.0% Voids
#4	669.72'	2,253 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		6,394 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.05	8,265	0	0
669.05	8,265	8,265	8,265

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.05	8,265	0	0
669.47	8,265	3,471	3,471

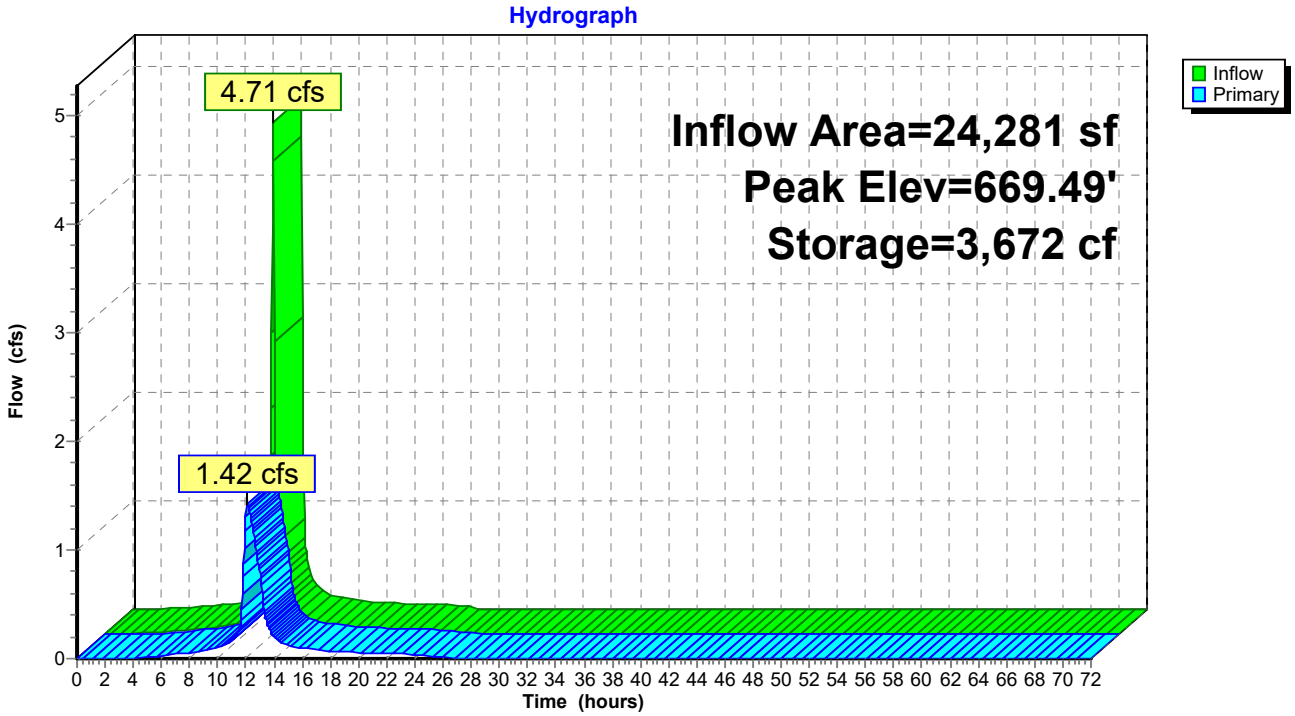
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.47	8,265	0	0
669.72	8,265	2,066	2,066

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.72	1,959	0	0
670.87	1,959	2,253	2,253

Device	Routing	Invert	Outlet Devices
#0	Primary	670.87'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.05'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 668.05' / 667.97' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	668.05'	**4.0" Vert. 4" Drain Tile X 3.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.42 cfs @ 12.11 hrs HW=669.49' (Free Discharge)
└**1=Culvert** (Passes 1.42 cfs of 3.47 cfs potential flow)
└**2=4" Drain Tile** (Orifice Controls 1.42 cfs @ 5.43 fps)

Pond PP2: Permeable Pavers (Center)



Summary for Pond PP3: Permeable Pavers (South)

Inflow Area = 16,684 sf, 75.67% Impervious, Inflow Depth = 5.27" for 100-Year event
Inflow = 3.14 cfs @ 11.96 hrs, Volume= 7,322 cf
Outflow = 1.58 cfs @ 12.07 hrs, Volume= 7,322 cf, Atten= 50%, Lag= 6.1 min
Primary = 1.58 cfs @ 12.07 hrs, Volume= 7,322 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 669.16' @ 12.07 hrs Surf.Area= 10,874 sf Storage= 1,728 cf

Plug-Flow detention time= 34.3 min calculated for 7,317 cf (100% of inflow)
Center-of-Mass det. time= 35.0 min (807.7 - 772.7)

Volume	Invert	Avail.Storage	Storage Description
#1	668.11'	1,631 cf	**Aggregate Base (Prismatic)** Listed below (Recalc) 5,437 cf Overall x 30.0% Voids
#2	669.11'	754 cf	**Bedding (Prismatic)** Listed below (Recalc) 2,284 cf Overall x 33.0% Voids
#3	669.53'	340 cf	**Permeable Block System (Prismatic)** Listed below (Recalc) 1,359 cf Overall x 25.0% Voids
#4	669.78'	377 cf	**Open Storage (Prismatic)** Listed below (Recalc)
		3,101 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
668.11	5,437	0	0
669.11	5,437	5,437	5,437

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.11	5,437	0	0
669.53	5,437	2,284	2,284

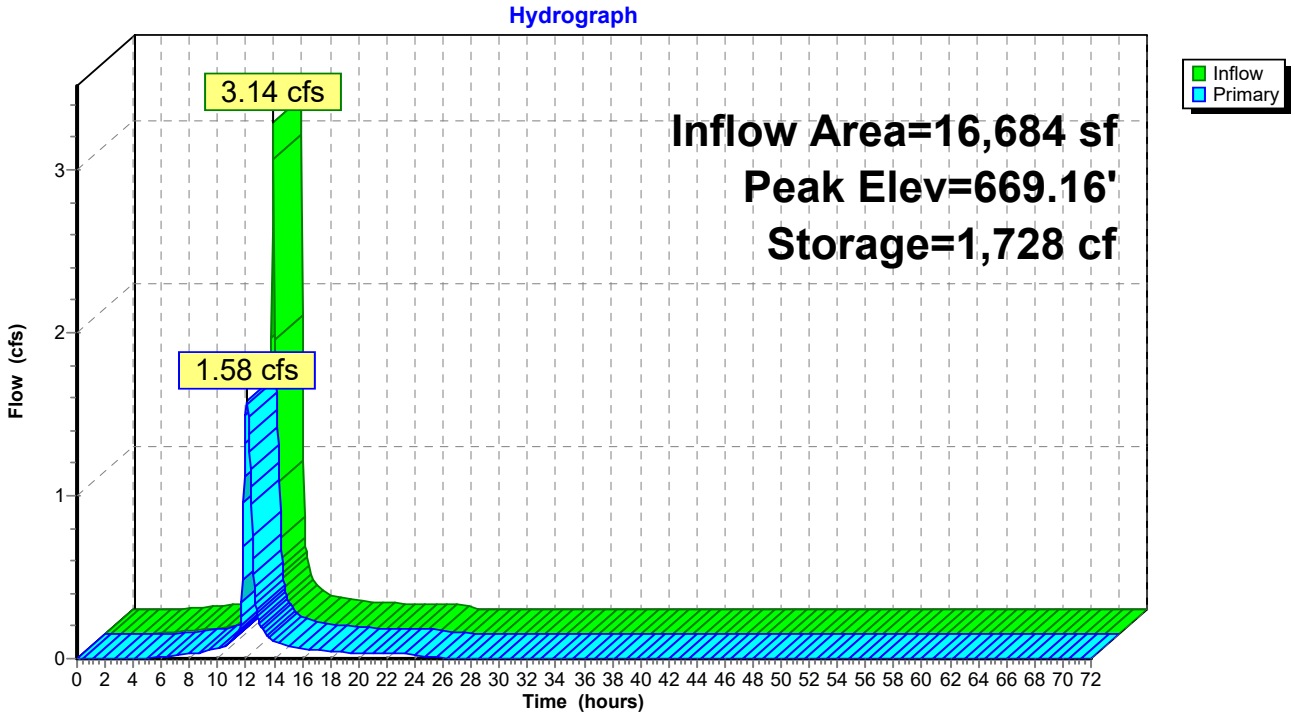
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.53	5,437	0	0
669.78	5,437	1,359	1,359

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.78	1,345	0	0
670.06	1,345	377	377

Device	Routing	Invert	Outlet Devices
#0	Primary	670.06'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	668.11'	**24.0" Round 12" Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 668.11' / 668.03' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	668.11'	**4.0" Vert. 4" Drain Tile X 4.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.57 cfs @ 12.07 hrs HW=669.15' (Free Discharge)
└**1=12" Culvert** (Passes 1.57 cfs of 3.76 cfs potential flow)
└**2=4" Drain Tile** (Orifice Controls 1.57 cfs @ 4.51 fps)

Pond PP3: Permeable Pavers (South)

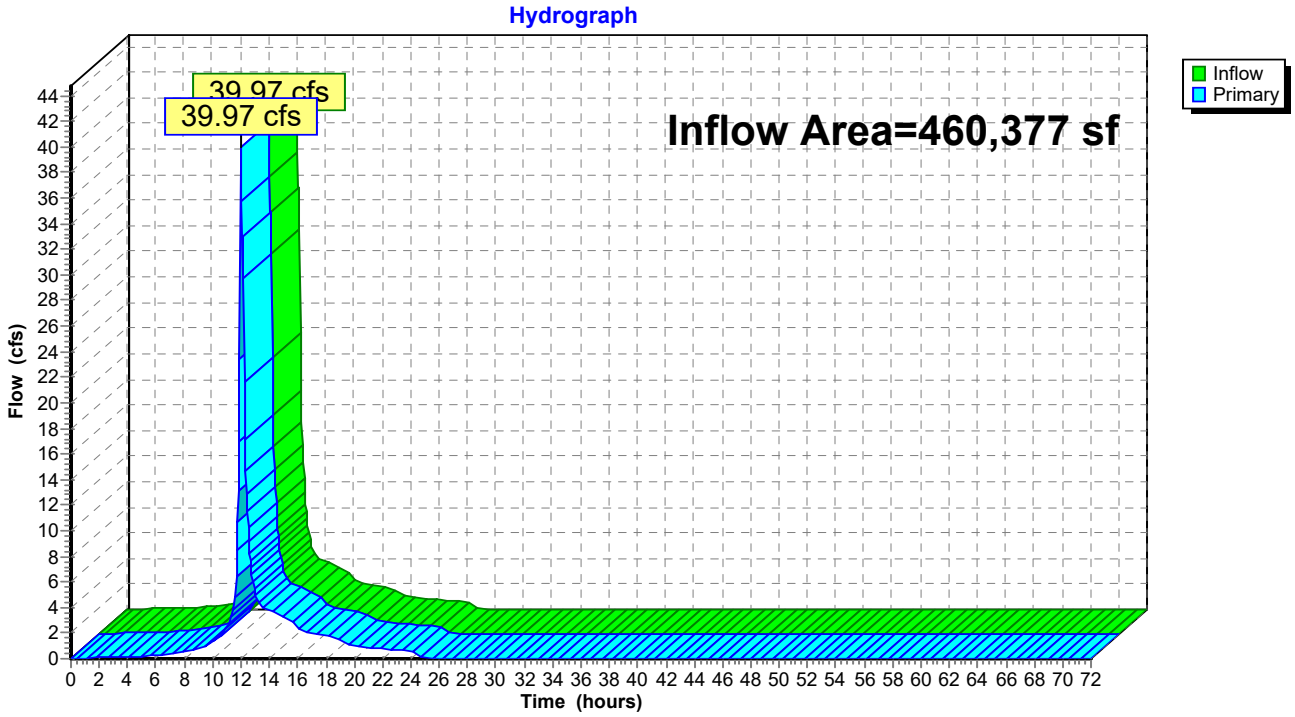


Summary for Link 3L: Proposed to King Rd. Storm Sewer

Inflow Area = 460,377 sf, 51.52% Impervious, Inflow Depth = 4.67" for 100-Year event
Inflow = 39.97 cfs @ 11.98 hrs, Volume= 179,175 cf
Primary = 39.97 cfs @ 11.98 hrs, Volume= 179,175 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 3L: Proposed to King Rd. Storm Sewer

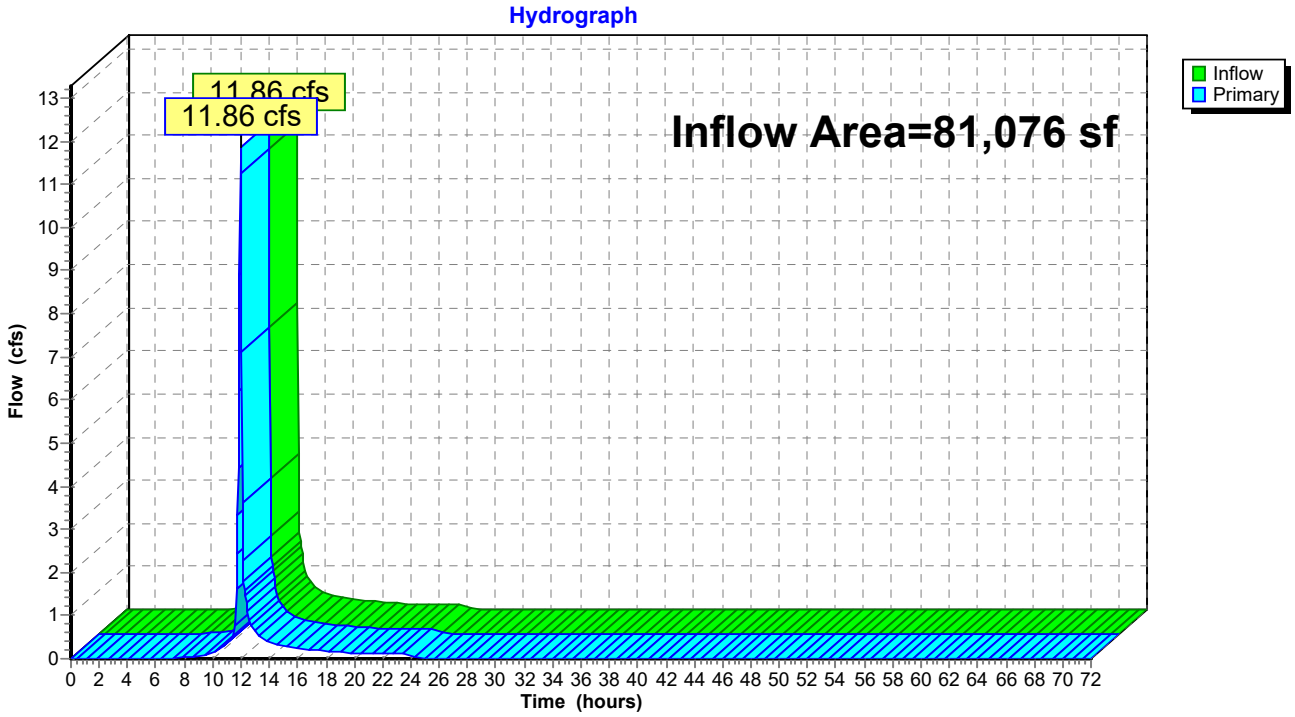


Summary for Link 4L: Proposed to Ellsworth Park Storm Water Basin

Inflow Area = 81,076 sf, 17.37% Impervious, Inflow Depth = 3.76" for 100-Year event
Inflow = 11.86 cfs @ 11.97 hrs, Volume= 25,416 cf
Primary = 11.86 cfs @ 11.97 hrs, Volume= 25,416 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 4L: Proposed to Ellsworth Park Storm Water Basin

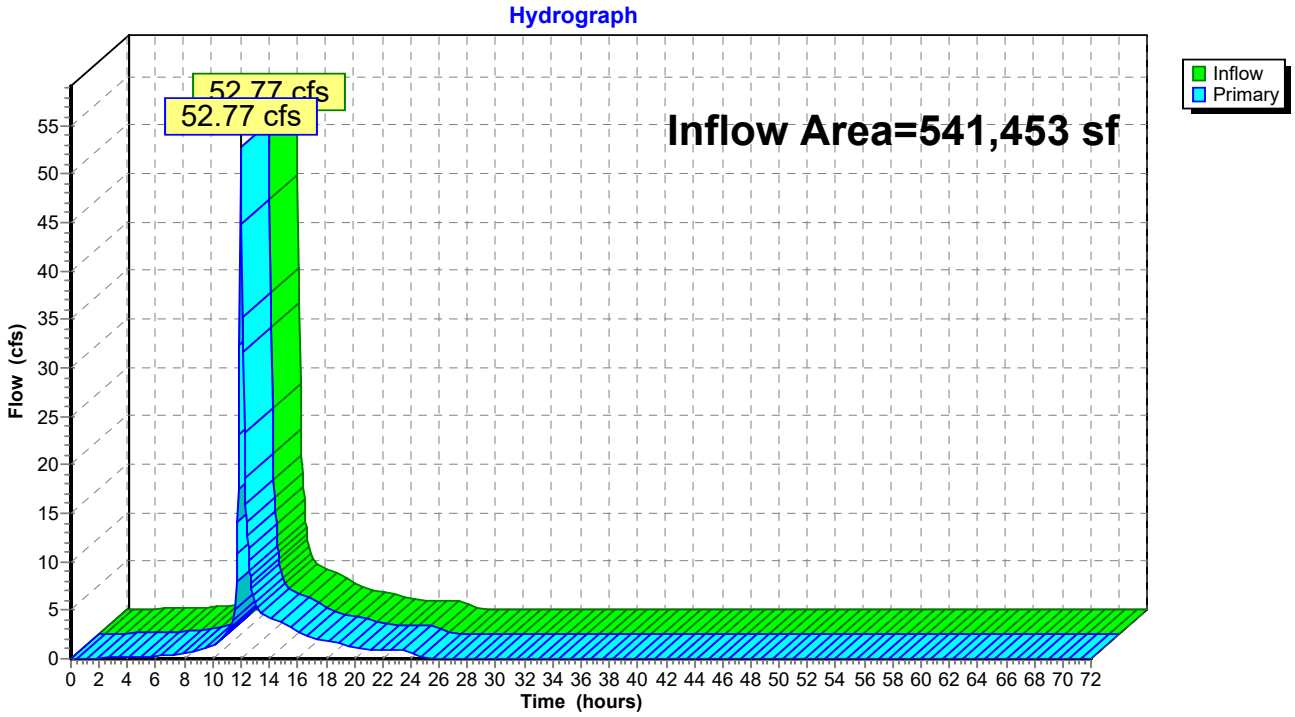


Summary for Link TPO: Total Proposed Outfall

Inflow Area = 541,453 sf, 46.41% Impervious, Inflow Depth = 4.53" for 100-Year event
Inflow = 52.77 cfs @ 11.97 hrs, Volume= 204,591 cf
Primary = 52.77 cfs @ 11.97 hrs, Volume= 204,591 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

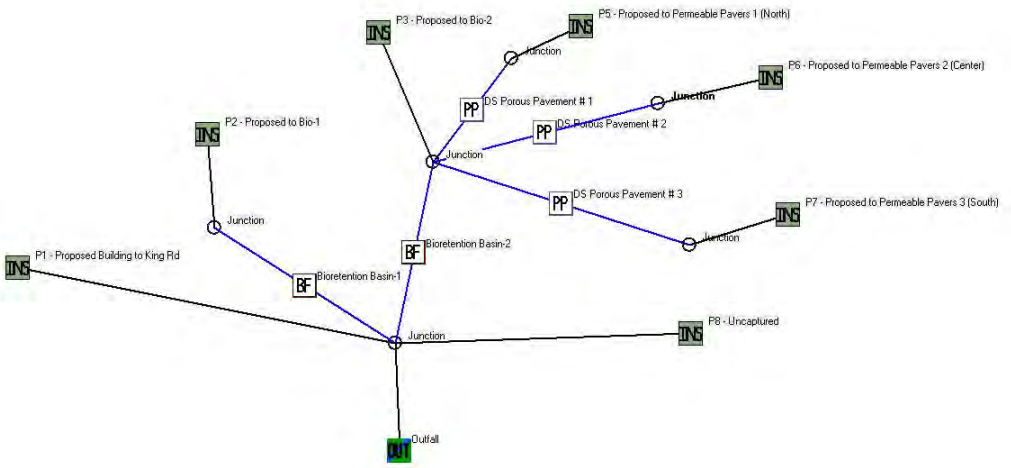
Link TPO: Total Proposed Outfall



Appendix D

SLAMM Analysis

Bayside Middle School – SLAMM Analysis



Data file name: S:_SiteDsgn\Eppstein\220126 Fox Point Bayside SD\SWMP\WinSLAMM\200458_SLAMM.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WI Milwaukee 69.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 01-13-2023 Time: 11:21:58
Site information:

LU# 1 - Institutional: P1 - Proposed Building to King Rd Total area (ac): 1.961
1 - Roofs 1: 1.961 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Institutional: P2 - Proposed to Bio-1 Total area (ac): 1.223
13 - Paved Parking 1: 0.208 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.759 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
71 - Other Pervious Areas 1: 0.256 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Institutional: P3 - Proposed to Bio-2 Total area (ac): 2.336
13 - Paved Parking 1: 0.591 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.307 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 1.438 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Institutional: P8 - Uncaptured Total area (ac): 1.367
13 - Paved Parking 1: 0.227 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.259 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
71 - Other Pervious Areas 1: 0.881 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Institutional: P5 - Proposed to Permeable Pavers 1 (North) Total area (ac): 0.469
13 - Paved Parking 1: 0.207 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
14 - Permeable Pavers: 0.128 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.015 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.119 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 6 - Institutional: P7 - Proposed to Permeable Pavers 3 (South) Total area (ac): 0.383
13 - Paved Parking 1: 0.151 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
14 - Permeable Pavers: 0.125 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.014 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.093 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 7 - Institutional: P6 - Proposed to Permeable Pavers 2 (Center) Total area (ac): 0.558

13 - Paved Parking 1: 0.277 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
14 - Permeable Pavers: 0.190 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.025 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.066 ac. Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Biofilter CP# 1 (DS) - Bioretention Basin-2

1. Top area (square feet) = 7517
2. Bottom aea (square feet) = 2107
3. Depth (ft): 7
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0.5
10. Porosity of rock filled volume = 0.33
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 1.5
13. Engineered soil porosity = 0.27
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil
User-Defined Soil Type 1.000
Saturation water content percent (Porosity) = 0
Field capacity (%) = 0
Permanent Wilting Point (%) = 0
Infiltration rate (in/hr) = 3.6

Biofilter Outlet/Discharge Characteristics:
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 10
2. Weir crest width (ft): 5
3. Height of datum to bottom of weir opening: 6.5

Outlet type: Vertical Stand Pipe
1. Stand pipe diameter (ft): 4
2. Stand pipe height above datum (ft): 4

Outlet type: Drain Tile/Underdrain
1. Underdrain outlet diameter (ft): 0.5

2. Invert elevation above datum (ft): 0
3. Number of underdrain outlets: 1

Control Practice 2: Biofilter CP# 2 (DS) - Bioretention Basin-1

1. Top area (square feet) = 8667
2. Bottom aea (square feet) = 4447
3. Depth (ft): 6
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0.5
10. Porosity of rock filled volume = 0.33
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 1.5
13. Engineered soil porosity = 0.27
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

User-Defined Soil Type 1.000

Saturation water content percent (Porosity) = 0

Field capacity (%) = 0

Permanent Wilting Point (%) = 0

Infiltration rate (in/hr) = 3.6

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 5.5
3. Height of datum to bottom of weir opening: 5

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 6
2. Stand pipe height above datum (ft): 4

Outlet type: Drain Tile/Underdrain

1. Underdrain outlet diameter (ft): 0.5
2. Invert elevation above datum (ft): 0
3. Number of underdrain outlets: 1

Control Practice 3: Porous Pavement CP# 1 (DS) - DS Porous Pavement # 1

Porous pavement area (ac): 0.128
Inflow hydrograph peak to average flow ratio: 3.8
Porous pavement thickness (in): 3
Porous pavement porosity: 0.25
Aggregate bedding thickness (in): 5
Aggregate bedding porosity: 0.33
Aggregate base reservoir thickness (in): 12
Aggregate base reservoir porosity: 0.3
Porous pavement surface area to aggregate base area ratio: 1
Underdrain diameter (in): 4
Underdrain outlet invert elevation (inches above datum): 0
Number of underdrains: 4
Subgrade seepage rate (in/hr): 0.02
Use random number generation to account for uncertainty in seepage rate: 0
Subgrade seepage rate COV: 2
Surface pavement initial infiltration rate (in/hr): 100
Surface Pavement Percent Solids Removal Upon Cleaning: 50
Porous pavement surface clogging load (lbs/sf): 0.6
Porous pavement restorative cleaning frequency: Semi-annually
TSS concentration reduction percentage through underdrain: 65
Porous pavement particle size distribution file name: Not needed - calculated by program

Control Practice 4: Porous Pavement CP# 2 (DS) - DS Porous Pavement # 2
Porous pavement area (ac): 0.19
Inflow hydrograph peak to average flow ratio: 3.8
Porous pavement thickness (in): 3
Porous pavement porosity: 0.25
Aggregate bedding thickness (in): 5
Aggregate bedding porosity: 0.33
Aggregate base reservoir thickness (in): 12
Aggregate base reservoir porosity: 0.3
Porous pavement surface area to aggregate base area ratio: 1
Underdrain diameter (in): 4
Underdrain outlet invert elevation (inches above datum): 0
Number of underdrains: 4
Subgrade seepage rate (in/hr): 0.02
Use random number generation to account for uncertainty in seepage rate: 0
Subgrade seepage rate COV: 2
Surface pavement initial infiltration rate (in/hr): 100
Surface Pavement Percent Solids Removal Upon Cleaning: 50
Porous pavement surface clogging load (lbs/sf): 0.6
Porous pavement restorative cleaning frequency: Semi-annually
TSS concentration reduction percentage through underdrain: 0

Porous pavement particle size distribution file name: Not needed - calculated by program

Control Practice 5: Porous Pavement CP# 3 (DS) - DS Porous Pavement # 3
Porous pavement area (ac): 0.125
Inflow hydrograph peak to average flow ratio: 3.8
Porous pavement thickness (in): 3
Porous pavement porosity: 0.25
Aggregate bedding thickness (in): 5
Aggregate bedding porosity: 0.33
Aggregate base reservoir thickness (in): 12
Aggregate base reservoir porosity: 0.3
Porous pavement surface area to aggregate base area ratio: 1
Underdrain diameter (in): 4
Underdrain outlet invert elevation (inches above datum): 0
Number of underdrains: 4
Subgrade seepage rate (in/hr): 0.02
Use random number generation to account for uncertainty in seepage rate: 0
Subgrade seepage rate COV: 2
Surface pavement initial infiltration rate (in/hr): 100
Surface Pavement Percent Solids Removal Upon Cleaning: 50
Porous pavement surface clogging load (lbs/sf): 0.6
Porous pavement restorative cleaning frequency: Semi-annually
TSS concentration reduction percentage through underdrain: 0
Porous pavement particle size distribution file name: Not needed - calculated by program

SLAMM for Windows Version 10.4.1

Data file name: S:_SiteDsgn\Eppstein\220126 Fox Point Bayside SD\SWMP\WinSLAMM\200458_SLAMM.mdb

Data file description:

Rain file name: C:\WinSLAMM Files\Rain Files\WI Milwaukee 69.RAN

Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx

Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx

Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx

Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std

Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std

Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std

Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std

Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std

Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std

Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False

Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv

Cost Data file name:

Seed for random number generator: -42

Start of Winter Season: 12/02 End of Winter Season: 03/12

Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69

Date of run: 01-13-2023 Time of run: 11:18:36

Total Area Modeled (acres): 8.297

Years in Model Run: 0.99

	Runoff Volume	Percent Runoff Volume Reduction	Particulate Solids Conc	Particulate Solids Yield	Percent Particulate Solids Reduction
	(cu ft)		(mg/L)	(lbs)	
Total of all Land Uses without Controls:	460,091	-	87.06	2,501	-
Outfall Total with Controls:	454,186	1.28%	33.81	958.7	61.67%
Annualized Total After Outfall Controls:	460,494			972.0	

Appendix E

SWMP-1	**Aerial View of Pre-Developed Site Conditions**
SWMP-2	**Pre-Developed Site Conditions**
SWMP-3	**Post-Developed Site Conditions**
SWMP-4	**Pre-Developed Drainage Conditions**
SWMP-5	**Post-Developed Drainage Conditions**
SWMP-6	**Post-Developed Green Infrastructure**
SWMP-7	**Post-Developed Open Space**
SWMP-8	**Pre-Developed Aerial with Street Names**
SWMP-9	**Post-Developed Aerial with Street Names**

eua

milwaukee 333 East Chicago Street
Milwaukee, Wisconsin 53202
414.271.5350

madison 309 West Johnson Street, Suite 202
Madison, Wisconsin 53703
608.442.5350

denver 1899 Wynkoop Street, Suite 700
Denver, Colorado 80202
303.595.4500

PROJECT INFORMATION

BAYSIDE MIDDLE SCHOOL

601 E ELLSWORTH LN, BAYSIDE, WI 53217

ISSUANCE AND REVISIONS

DATE	DESCRIPTION
09/16/2022	50% DESIGN DEVELOPMENT
11/18/2022	75% DESIGN DEVELOPMENT
11/28/2022	ARC SUBMISSION
12/09/2022	100% DESIGN DEVELOPMENT

KEY PLAN

kapur

7711 N. Port Washington Road
Milwaukee, Wisconsin 53217

kapurinc.com

N

Scale: 0 25 50 100

Scale: 1" = 50'

DIGGERS HOTLINE

Dial 811 or (800)242-8511

www.DiggersHotline.com

LEGEND

SWMP LIMITS

SHEET INFORMATION

PROGRESS DOCUMENTS NOT FOR CONSTRUCTION

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PROJECT MANAGER TS

PROJECT NUMBER 19314-02

AERIAL VIEW OF PRE-DEVELOPED SITE CONDITIONS

SWMP-1

eua

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SWMP LIMITS

PROPOSED PERVIOUS VS. IMPERVIOUS AREAS

	SQUARE FEET	ACRES
AREA OF SUBJECT SITE (SWMP LIMITS)	541,453 SQUARE FEET	12.43 ACRES
IMPERVIOUS AREAS		
BUILDING / ALTERNATE BUILDING AREA	87,648 SQUARE FEET	2.01 ACRES
DRIVEWAY / ROADWAY AREA	125,648 SQUARE FEET	2.89 ACRES
SIDEWALK / PEDESTRIAN AREAS	25,417 SQUARE FEET	0.59 ACRES
TOTAL PROPOSED IMPERVIOUS AREA	238,713 SQUARE FEET	5.49 ACRES
PERVIOUS AREAS		
TOTAL PROPOSED PERVIOUS AREA	302,740 SQUARE FEET	6.94 ACRES

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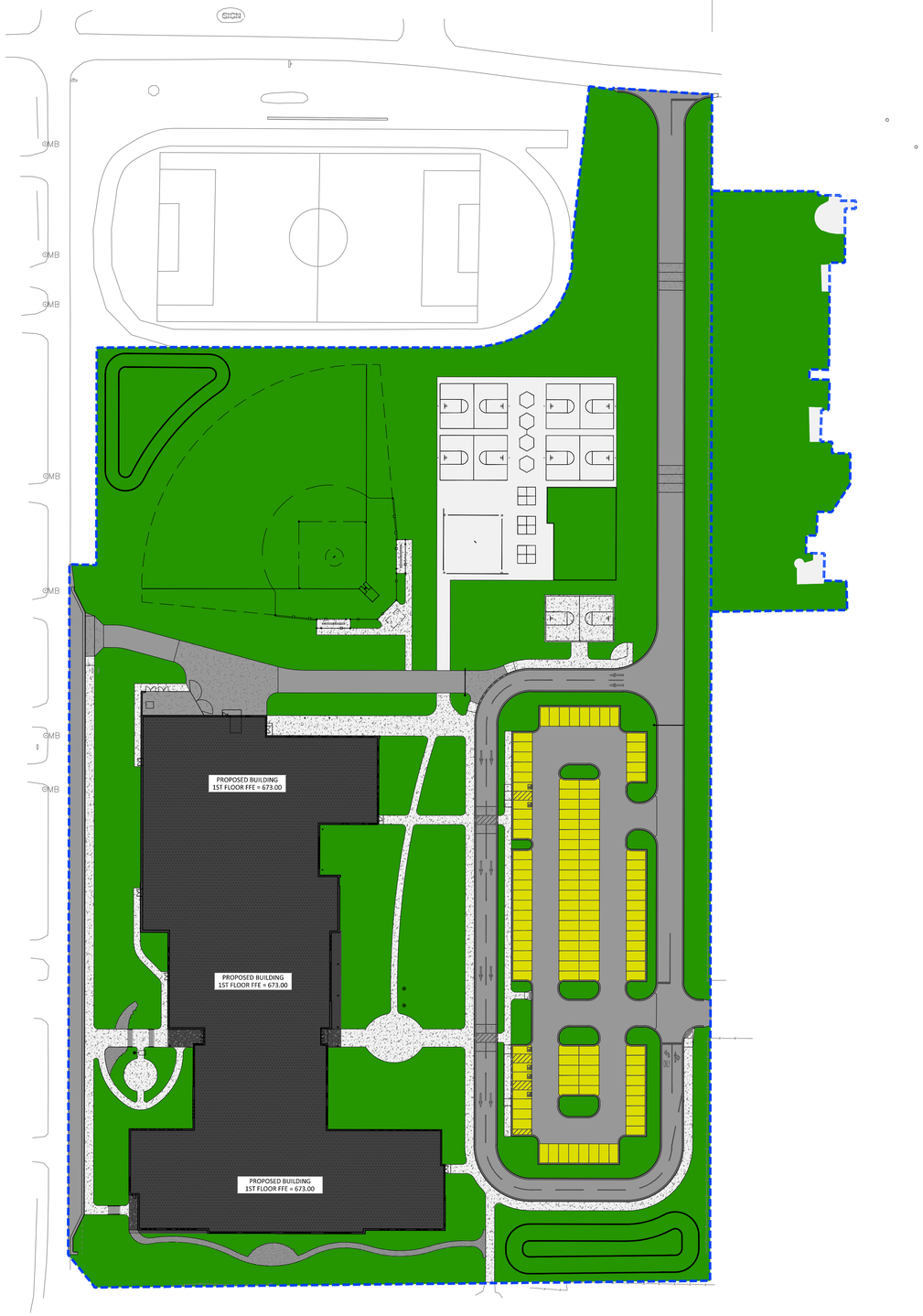
PROJECT MANAGER TS

PROJECT NUMBER 19314-02

PRE-DEVELOPED SITE CONDITIONS

SWMP-2



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PROJECT INFORMATION

BAYSIDE MIDDLE SCHOOL

601 E ELLSWORTH LN, BAYSIDE, WI 53217

ISSUANCE AND REVISIONS

DATE	DESCRIPTION
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01/16/2022	ARC SUBMISSION

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LEGEND

SWMP LIMITS

PROPOSED PERVIOUS VS. IMPERVIOUS AREAS

		SQUARE FEET	ACRES
AREA OF SUBJECT SITE (SWMP LIMITS)		541,453 SQUARE FEET	12.43 ACRES
IMPERVIOUS AREAS			
BUILDING / ALTERNATE BUILDING AREA		85,438 SQUARE FEET	1.96 ACRES
DRIVEWAY / ROADWAY AREA		84,605 SQUARE FEET	1.94 ACRES
PERMEABLE PAVERS AREA		19,297 SQUARE FEET	0.45 ACRES
SIDEWALK / PEDESTRIAN AREAS		61,944 SQUARE FEET	1.42 ACRES
TOTAL PROPOSED IMPERVIOUS AREA		251,284 SQUARE FEET	5.77 ACRES
PERVIOUS AREAS			
TOTAL PROPOSED PERVIOUS AREA		290,169 SQUARE FEET	6.66 ACRES

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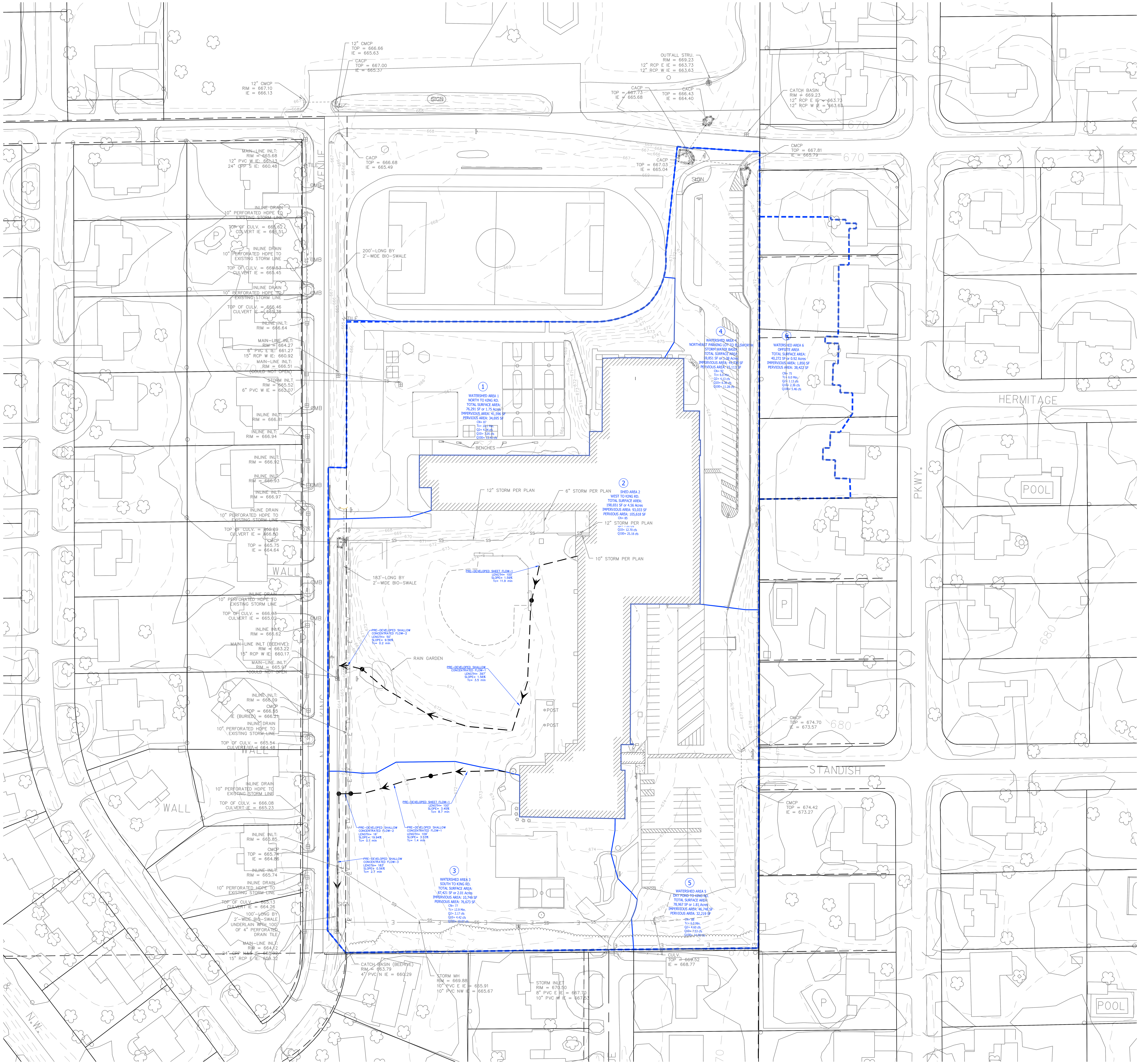
PROJECT MANAGER TS

PROJECT NUMBER 19314-02

POST-DEVELOPED SITE CONDITIONS

SWMP-3



Scale: 0 25 50 100

Scale: 1" = 50'

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SWMP LIMITS

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madison — 309 West Johnson Street, Suite 202, Madison, Wisconsin 53703, 608.442.5350

denver — 1899 Wynkoop Street, Suite 700, Denver, Colorado 80202, 303.595.4500

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ISSUANCE AND REVISIONS

DATE	DESCRIPTION
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12/09/2022	100% DESIGN DEVELOPMENT
01/16/2022	ARC SUBMISSION

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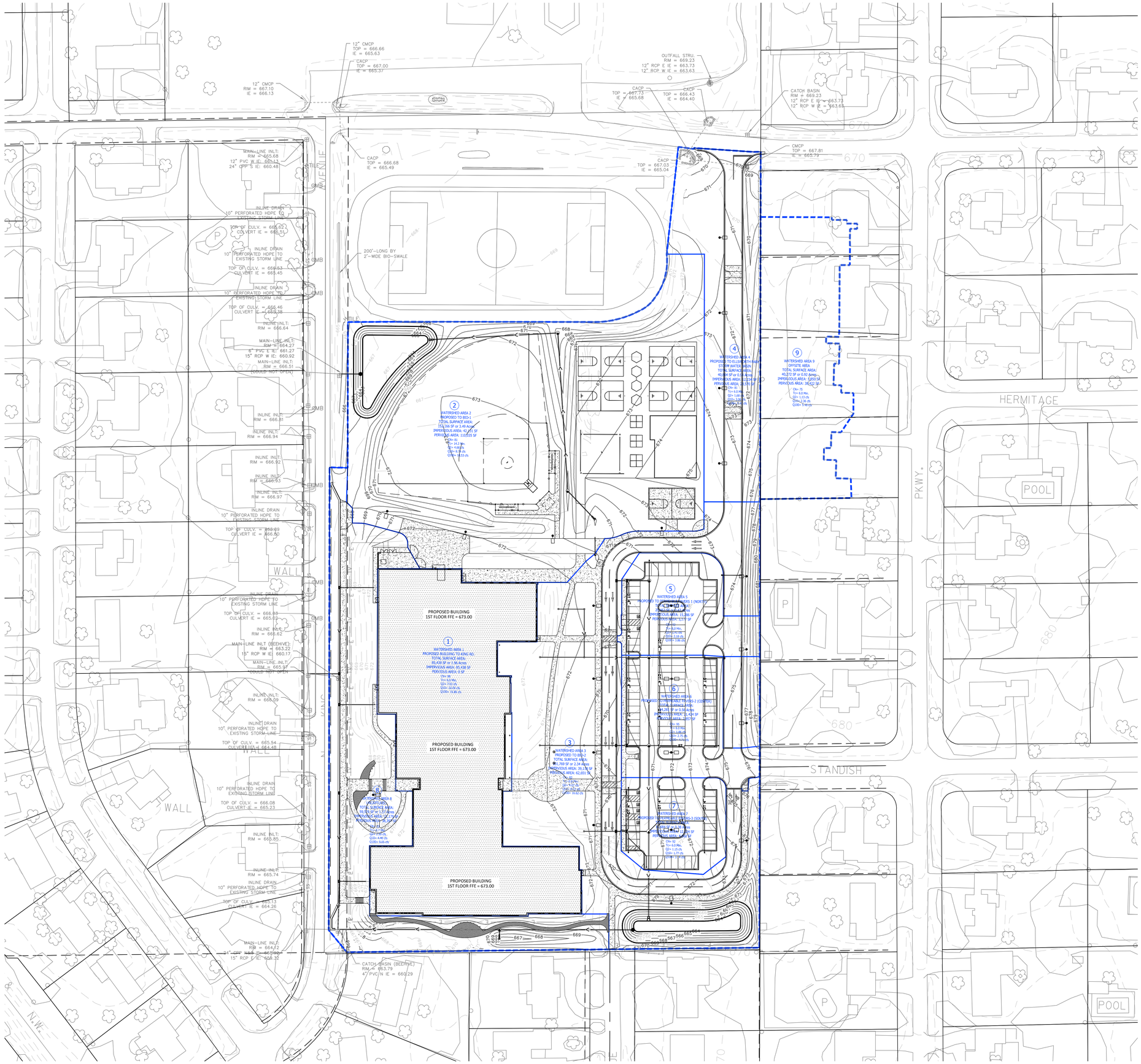
PROJECT MANAGER TS

PROJECT NUMBER 19314-02

PRE-DEVELOPED DRAINAGE CONDITIONS

SWMP-4



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LEGEND

SWMP LIMITS

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denver 1899 Wynkoop Street, Suite 700 Denver, Colorado 80202 303.595.4500

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11/18/2022	75% DESIGN DEVELOPMENT
11/28/2022	ARC SUBMISSION
12/09/2022	100% DESIGN DEVELOPMENT
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SHEET INFORMATION

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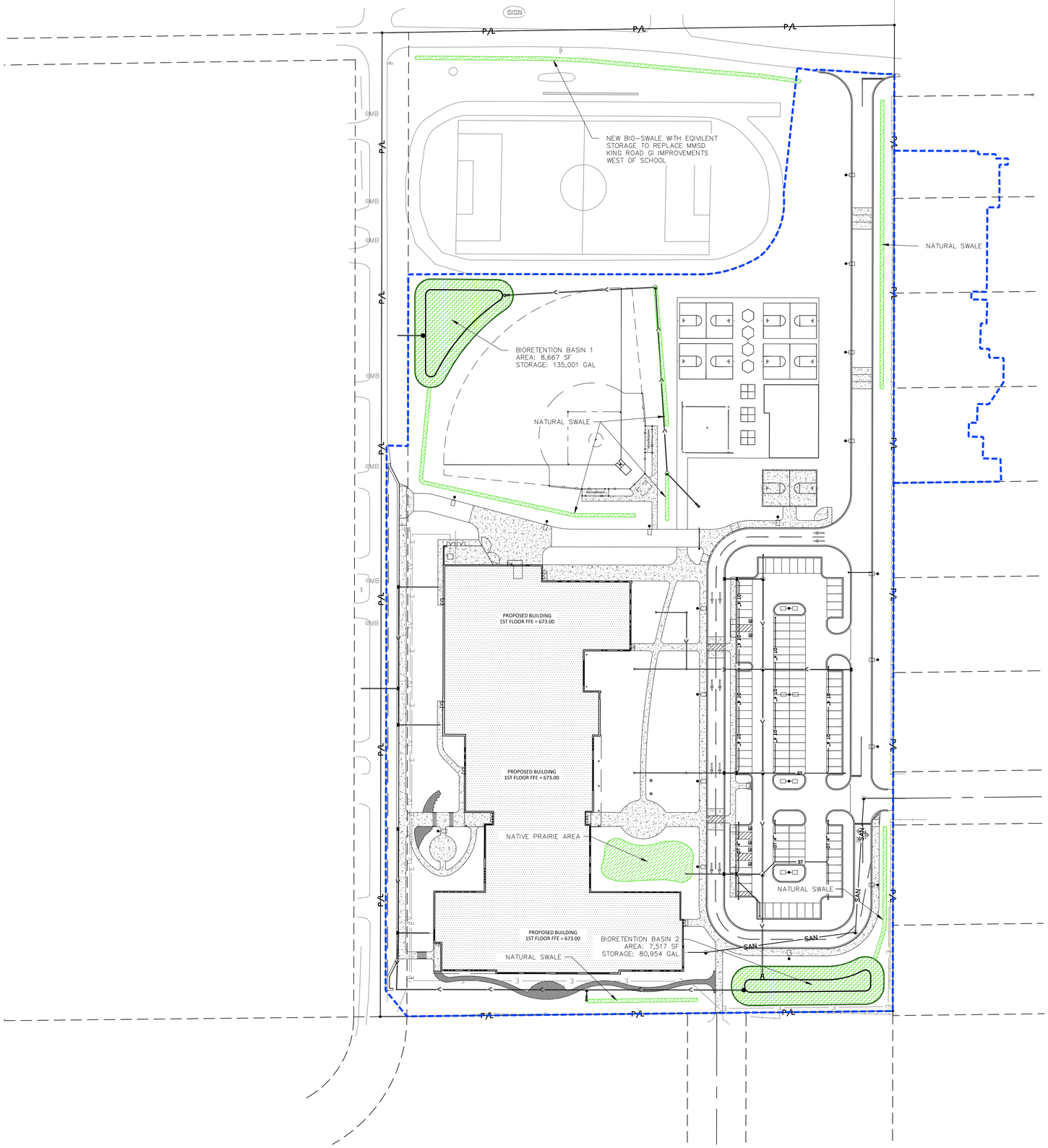
PROJECT MANAGER	TS
PROJECT NUMBER	19314-02

POST-DEVELOPED DRAINAGE CONDITIONS

SWMP-5



eua

milwaukee 333 East Chicago Street Milwaukee, Wisconsin 53202 414.271.5350

madison 309 West Johnson Street, Suite 202 Madison, Wisconsin 53703 608.442.5350

denver 1899 Wynkoop Street, Suite 700 Denver, Colorado 80202 303.595.4500

PROJECT INFORMATION

BAYSIDE MIDDLE SCHOOL

601 E ELLSWORTH LN, BAYSIDE, WI 53217

ISSUANCE AND REVISIONS

DATE	DESCRIPTION
09/16/2022	50% DESIGN DEVELOPMENT
11/18/2022	75% DESIGN DEVELOPMENT
11/28/2022	ARC SUBMISSION
12/09/2022	100% DESIGN DEVELOPMENT
01/16/2022	ARC SUBMISSION

KEY PLAN

kapur

7711 N. Port Washington Road
Milwaukee, Wisconsin 53217

kapurinc.com

N

Scale: 0 25 50 100

Scale: 1" = 50'

DIGGERS HOTLINE

Dial 811 or (800)242-8511

www.DiggersHotline.com

LEGEND

SWMP LIMITS

SHEET INFORMATION

PROGRESS DOCUMENTS NOT FOR CONSTRUCTION

These documents reflect progress and intent and may be subject to change, including additional detail. These are not final construction documents and shall not be used for final bidding or construction-related purposes.

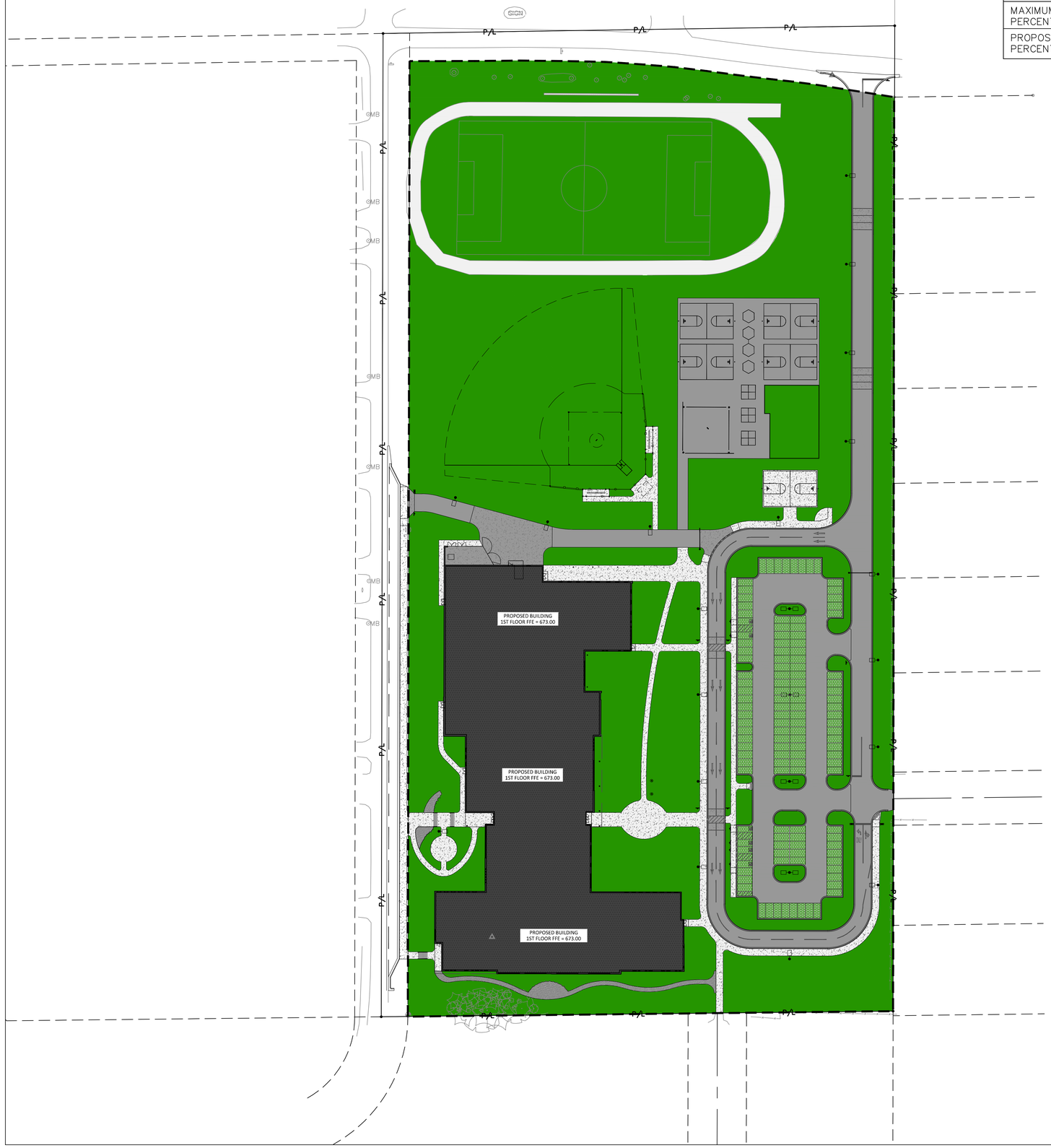
PROJECT MANAGER TS

PROJECT NUMBER 19314-02

POST-DEVELOPED GREEN INFRASTRUCTURE

SWMP-6

WHOLE PROPERTY IMPERVIOUS SURFACE SUMMARY	
PROPOSED IMPERVIOUS AREA	232,938 SF
PROPOSED PERVIOUS PAVERS	19,297 SF
PROPOSED PERVIOUS GREEN SPACE	330,948 SF
TOTAL PROPOSED PERVIOUS AREA	350,245 SF
MAXIMUM IMPERVIOUS AREA PERCENTAGE OF SITE PER CODE	40.00%
PROPOSED IMPERVIOUS AREA PERCENTAGE OF SITE	39.94%



eua

milwaukee 333 East Chicago Street Milwaukee, Wisconsin 53202 414.271.5350

madison 309 West Johnson Street, Suite 202 Madison, Wisconsin 53703 608.442.5350

denver 1899 Wynkoop Street, Suite 700 Denver, Colorado 80202 303.595.4500

PROJECT INFORMATION

BAYSIDE MIDDLE SCHOOL

601 E ELLSWORTH LN, BAYSIDE, WI 53217

ISSUANCE AND REVISIONS

DATE	DESCRIPTION
09/16/2022	50% DESIGN DEVELOPMENT
11/18/2022	75% DESIGN DEVELOPMENT
11/28/2022	ARC SUBMISSION
12/09/2022	100% DESIGN DEVELOPMENT
01/16/2022	ARC SUBMISSION

KEY PLAN

kapur

7711 N. Port Washington Road
Milwaukee, Wisconsin 53217

kapurinc.com

N

Scale: 0 25 50 100

Scale: 1" = 50'

DIGGERS HOTLINE
Dial 811 or (800)242-8511
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LEGEND

------ IMPERVIOUS SURFACE CALCULATION LIMITS

SHEET INFORMATION

PROGRESS DOCUMENTS NOT FOR CONSTRUCTION

These documents reflect progress and intent and may be subject to change, including additional detail. These are not final construction documents and shall not be used for final bidding or construction-related purposes.

PROJECT MANAGER TS

PROJECT NUMBER 19314-02

POST-DEVELOPED IMPERVIOUS SURFACE SUMMARY

SWMP-7

Appendix F

Civil Engineering Plan Set

Appendix G

MMSD Volumetric Analysis Calculations

Existing 2-year King Rd

Hydrograph for Link 1L: Existing to King Rd. Storm Sewer

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	0
3.00	0.00	0.00	0.00	0
3.25	0.00	0.00	0.00	0
3.50	0.00	0.00	0.00	0
3.75	0.00	0.00	0.00	0
4.00	0.00	0.00	0.00	0
4.25	0.00	0.00	0.00	0
4.50	0.00	0.00	0.00	0
4.75	0.00	0.00	0.00	0
5.00	0.00	0.00	0.00	0
5.25	0.00	0.00	0.00	0
5.50	0.00	0.00	0.00	0
5.75	0.00	0.00	0.00	0
6.00	0.00	0.00	0.00	0
6.25	0.00	0.00	0.00	0
6.50	0.00	0.00	0.00	0
6.75	0.00	0.00	0.00	0
7.00	0.00	0.00	0.00	0
7.25	0.00	0.00	0.00	0
7.50	0.00	0.00	0.00	0
7.75	0.00	0.00	0.00	3
8.00	0.01	0.00	0.01	7
8.25	0.01	0.00	0.01	16
8.50	0.02	0.00	0.02	29
8.75	0.03	0.00	0.03	49
9.00	0.04	0.00	0.04	79
9.25	0.06	0.00	0.06	124
9.50	0.07	0.00	0.07	184
9.75	0.09	0.00	0.09	258
10.00	0.12	0.00	0.12	357
10.25	0.16	0.00	0.16	485
10.50	0.21	0.00	0.21	654
10.75	0.28	0.00	0.28	876
11.00	0.37	0.00	0.37	1,173
11.25	0.53	0.00	0.53	1,581
11.50	0.79	0.00	0.79	2,193
11.75	3.27	0.00	3.27	3,864
12.00	**13.48**	0.00	**13.48**	11,715
12.25	**6.77**	0.00	**6.77**	21,000
12.50	3.59	0.00	3.59	25,050
12.75	1.69	0.00	1.69	27,114
13.00	1.35	0.00	1.35	28,422

Hydrograph for Link 1L: Existing to King Rd. Storm Sewer (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	1.15	0.00	1.15	29,518
13.50	1.01	0.00	1.01	30,476
13.75	0.89	0.00	0.89	31,320
14.00	0.80	0.00	0.80	32,073
14.25	0.73	0.00	0.73	32,748
14.50	0.69	0.00	0.69	33,382
14.75	0.66	0.00	0.66	33,985
15.00	0.63	0.00	0.63	34,560
15.25	0.59	0.00	0.59	35,104
15.50	0.56	0.00	0.56	35,619
15.75	0.53	0.00	0.53	36,104
16.00	0.49	0.00	0.49	36,558
16.25	0.47	0.00	0.47	36,985
16.50	0.45	0.00	0.45	37,396
16.75	0.44	0.00	0.44	37,797
17.00	0.43	0.00	0.43	38,186
17.25	0.42	0.00	0.42	38,565
17.50	0.40	0.00	0.40	38,933
17.75	0.39	0.00	0.39	39,291
18.00	0.38	0.00	0.38	39,637
18.25	0.37	0.00	0.37	39,973
18.50	0.36	0.00	0.36	40,297
18.75	0.34	0.00	0.34	40,611
19.00	0.33	0.00	0.33	40,913
19.25	0.32	0.00	0.32	41,204
19.50	0.31	0.00	0.31	41,483
19.75	0.29	0.00	0.29	41,752
20.00	0.28	0.00	0.28	42,009
20.25	0.27	0.00	0.27	42,256
20.50	0.27	0.00	0.27	42,498
20.75	0.27	0.00	0.27	42,738
21.00	0.26	0.00	0.26	42,977
21.25	0.26	0.00	0.26	43,213
21.50	0.26	0.00	0.26	43,447
21.75	0.26	0.00	0.26	43,679
22.00	0.25	0.00	0.25	43,908
22.25	0.25	0.00	0.25	44,136
22.50	0.25	0.00	0.25	44,362
22.75	0.25	0.00	0.25	44,585
23.00	0.24	0.00	0.24	44,806
23.25	0.24	0.00	0.24	45,025
23.50	0.24	0.00	0.24	45,242
23.75	0.24	0.00	0.24	45,457
24.00	0.24	0.00	0.24	45,669
24.25	0.05	0.00	0.05	45,786
24.50	0.00	0.00	0.00	45,799
24.75	0.00	0.00	0.00	**45,800**
25.00	0.00	0.00	0.00	**45,800**
25.25	0.00	0.00	0.00	45,800
25.50	0.00	0.00	0.00	45,800
25.75	0.00	0.00	0.00	45,800
26.00	0.00	0.00	0.00	45,800
26.25	0.00	0.00	0.00	45,800

Existing 100-year King Rd

Hydrograph for Link 1L: Existing to King Rd. Storm Sewer

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	0
3.00	0.00	0.00	0.00	0
3.25	0.00	0.00	0.00	0
3.50	0.00	0.00	0.00	0
3.75	0.00	0.00	0.00	0
4.00	0.00	0.00	0.00	2
4.25	0.01	0.00	0.01	9
4.50	0.02	0.00	0.02	24
4.75	0.03	0.00	0.03	49
5.00	0.05	0.00	0.05	87
5.25	0.07	0.00	0.07	145
5.50	0.10	0.00	0.10	225
5.75	0.12	0.00	0.12	328
6.00	0.15	0.00	0.15	455
6.25	0.18	0.00	0.18	606
6.50	0.21	0.00	0.21	783
6.75	0.24	0.00	0.24	986
7.00	0.27	0.00	0.27	1,215
7.25	0.30	0.00	0.30	1,474
7.50	0.34	0.00	0.34	1,766
7.75	0.38	0.00	0.38	2,090
8.00	0.41	0.00	0.41	2,449
8.25	0.47	0.00	0.47	2,849
8.50	0.55	0.00	0.55	3,315
8.75	0.65	0.00	0.65	3,863
9.00	0.75	0.00	0.75	4,499
9.25	0.83	0.00	0.83	5,224
9.50	0.89	0.00	0.89	6,004
9.75	0.98	0.00	0.98	6,842
10.00	1.14	0.00	1.14	7,805
10.25	1.34	0.00	1.34	8,934
10.50	1.60	0.00	1.60	10,282
10.75	1.95	0.00	1.95	11,899
11.00	2.40	0.00	2.40	13,891
11.25	3.11	0.00	3.11	16,394
11.50	4.18	0.00	4.18	19,760
11.75	12.47	0.00	12.47	26,675
12.00	**56.58**	0.00	**56.58**	56,202
12.25	19.13	0.00	19.13	87,665
12.50	8.91	0.00	8.91	98,140
12.75	6.18	0.00	6.18	104,461
13.00	5.26	0.00	5.26	109,482

Hydrograph for Link 1L: Existing to King Rd. Storm Sewer (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	4.61	0.00	4.61	113,851
13.50	4.07	0.00	4.07	117,713
13.75	3.22	0.00	3.22	120,979
14.00	2.36	0.00	2.36	123,231
14.25	2.14	0.00	2.14	125,221
14.50	2.02	0.00	2.02	127,081
14.75	1.92	0.00	1.92	128,847
15.00	1.82	0.00	1.82	130,525
15.25	1.72	0.00	1.72	132,112
15.50	1.62	0.00	1.62	133,609
15.75	1.52	0.00	1.52	135,015
16.00	1.42	0.00	1.42	136,330
16.25	1.34	0.00	1.34	137,563
16.50	1.30	0.00	1.30	138,749
16.75	1.27	0.00	1.27	139,902
17.00	1.23	0.00	1.23	141,023
17.25	1.19	0.00	1.19	142,111
17.50	1.16	0.00	1.16	143,167
17.75	1.12	0.00	1.12	144,191
18.00	1.09	0.00	1.09	145,182
18.25	1.05	0.00	1.05	146,140
18.50	1.01	0.00	1.01	147,066
18.75	0.98	0.00	0.98	147,959
19.00	0.94	0.00	0.94	148,820
19.25	0.90	0.00	0.90	149,647
19.50	0.87	0.00	0.87	150,442
19.75	0.83	0.00	0.83	151,204
20.00	0.80	0.00	0.80	151,933
20.25	0.77	0.00	0.77	152,633
20.50	0.76	0.00	0.76	153,320
20.75	0.75	0.00	0.75	154,000
21.00	0.75	0.00	0.75	154,673
21.25	0.74	0.00	0.74	155,340
21.50	0.73	0.00	0.73	156,001
21.75	0.72	0.00	0.72	156,655
22.00	0.72	0.00	0.72	157,303
22.25	0.71	0.00	0.71	157,944
22.50	0.70	0.00	0.70	158,579
22.75	0.70	0.00	0.70	159,207
23.00	0.69	0.00	0.69	159,829
23.25	0.68	0.00	0.68	160,444
23.50	0.67	0.00	0.67	161,053
23.75	0.67	0.00	0.67	161,655
24.00	0.66	0.00	0.66	162,251
24.25	0.15	0.00	0.15	162,581
24.50	0.01	0.00	0.01	162,618
24.75	0.00	0.00	0.00	**162,621**
25.00	0.00	0.00	0.00	**162,621**
25.25	0.00	0.00	0.00	162,621
25.50	0.00	0.00	0.00	162,621
25.75	0.00	0.00	0.00	162,621
26.00	0.00	0.00	0.00	162,621
26.25	0.00	0.00	0.00	162,621

Proposed 2-year King Rd

Hydrograph for Link 3L: Proposed to King Rd. Storm Sewer

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	2
2.00	0.01	0.00	0.01	7
2.25	0.01	0.00	0.01	16
2.50	0.02	0.00	0.02	29
2.75	0.02	0.00	0.02	44
3.00	0.02	0.00	0.02	63
3.25	0.03	0.00	0.03	85
3.50	0.03	0.00	0.03	110
3.75	0.03	0.00	0.03	138
4.00	0.04	0.00	0.04	169
4.25	0.04	0.00	0.04	203
4.50	0.04	0.00	0.04	239
4.75	0.05	0.00	0.05	279
5.00	0.05	0.00	0.05	323
5.25	0.05	0.00	0.05	369
5.50	0.06	0.00	0.06	420
5.75	0.06	0.00	0.06	473
6.00	0.06	0.00	0.06	530
6.25	0.07	0.00	0.07	590
6.50	0.07	0.00	0.07	654
6.75	0.08	0.00	0.08	721
7.00	0.08	0.00	0.08	791
7.25	0.08	0.00	0.08	866
7.50	0.09	0.00	0.09	943
7.75	0.09	0.00	0.09	1,025
8.00	0.10	0.00	0.10	1,110
8.25	0.11	0.00	0.11	1,202
8.50	0.12	0.00	0.12	1,305
8.75	0.13	0.00	0.13	1,420
9.00	0.15	0.00	0.15	1,549
9.25	0.16	0.00	0.16	1,688
9.50	0.17	0.00	0.17	1,834
9.75	0.19	0.00	0.19	1,995
10.00	0.22	0.00	0.22	2,184
10.25	0.27	0.00	0.27	2,408
10.50	0.32	0.00	0.32	2,679
10.75	0.40	0.00	0.40	3,011
11.00	0.50	0.00	0.50	3,427
11.25	0.68	0.00	0.68	3,966
11.50	0.95	0.00	0.95	4,717
11.75	3.72	0.00	3.72	6,679
12.00	**11.15**	0.00	**11.15**	14,250
12.25	3.98	0.00	3.98	19,201
12.50	3.48	0.00	3.48	22,495
12.75	3.19	0.00	3.19	25,446
13.00	3.01	0.00	3.01	28,219

Hydrograph for Link 3L: Proposed to King Rd. Storm Sewer (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	2.83	0.00	2.83	30,827
13.50	2.65	0.00	2.65	33,278
13.75	2.41	0.00	2.41	35,544
14.00	1.86	0.00	1.86	37,424
14.25	1.39	0.00	1.39	38,832
14.50	1.13	0.00	1.13	39,929
14.75	0.97	0.00	0.97	40,854
15.00	0.86	0.00	0.86	41,665
15.25	0.78	0.00	0.78	42,393
15.50	0.70	0.00	0.70	43,052
15.75	0.64	0.00	0.64	43,650
16.00	0.59	0.00	0.59	44,197
16.25	0.55	0.00	0.55	44,705
16.50	0.52	0.00	0.52	45,185
16.75	0.50	0.00	0.50	45,646
17.00	0.49	0.00	0.49	46,090
17.25	0.47	0.00	0.47	46,519
17.50	0.46	0.00	0.46	46,935
17.75	0.44	0.00	0.44	47,338
18.00	0.43	0.00	0.43	47,729
18.25	0.41	0.00	0.41	48,107
18.50	0.40	0.00	0.40	48,473
18.75	0.39	0.00	0.39	48,827
19.00	0.37	0.00	0.37	49,169
19.25	0.36	0.00	0.36	49,499
19.50	0.35	0.00	0.35	49,816
19.75	0.33	0.00	0.33	50,122
20.00	0.32	0.00	0.32	50,415
20.25	0.31	0.00	0.31	50,698
20.50	0.30	0.00	0.30	50,973
20.75	0.30	0.00	0.30	51,243
21.00	0.29	0.00	0.29	51,509
21.25	0.29	0.00	0.29	51,771
21.50	0.29	0.00	0.29	52,030
21.75	0.28	0.00	0.28	52,286
22.00	0.28	0.00	0.28	52,539
22.25	0.28	0.00	0.28	52,789
22.50	0.27	0.00	0.27	53,037
22.75	0.27	0.00	0.27	53,283
23.00	0.27	0.00	0.27	53,526
23.25	0.27	0.00	0.27	53,766
23.50	0.26	0.00	0.26	54,004
23.75	0.26	0.00	0.26	54,240
24.00	0.26	0.00	0.26	54,473
24.25	0.14	0.00	0.14	54,637
24.50	0.09	0.00	0.09	54,733
24.75	0.07	0.00	0.07	54,801
25.00	0.05	0.00	0.05	54,854
25.25	0.04	0.00	0.04	54,895
25.50	0.03	0.00	0.03	54,928
25.75	0.03	0.00	0.03	54,955
26.00	0.02	0.00	0.02	54,978
26.25	0.02	0.00	0.02	54,999

Proposed 100-year King Rd

Hydrograph for Link 3L: Proposed to King Rd. Storm Sewer

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	1
1.00	0.02	0.00	0.02	13
1.25	0.04	0.00	0.04	40
1.50	0.05	0.00	0.05	82
1.75	0.06	0.00	0.06	135
2.00	0.08	0.00	0.08	198
2.25	0.09	0.00	0.09	271
2.50	0.09	0.00	0.09	353
2.75	0.10	0.00	0.10	442
3.00	0.11	0.00	0.11	539
3.25	0.12	0.00	0.12	643
3.50	0.13	0.00	0.13	753
3.75	0.13	0.00	0.13	869
4.00	0.14	0.00	0.14	991
4.25	0.15	0.00	0.15	1,120
4.50	0.16	0.00	0.16	1,258
4.75	0.17	0.00	0.17	1,405
5.00	0.18	0.00	0.18	1,561
5.25	0.19	0.00	0.19	1,727
5.50	0.21	0.00	0.21	1,909
5.75	0.23	0.00	0.23	2,112
6.00	0.26	0.00	0.26	2,336
6.25	0.29	0.00	0.29	2,585
6.50	0.32	0.00	0.32	2,862
6.75	0.35	0.00	0.35	3,165
7.00	0.38	0.00	0.38	3,495
7.25	0.41	0.00	0.41	3,854
7.50	0.45	0.00	0.45	4,247
7.75	0.49	0.00	0.49	4,675
8.00	0.53	0.00	0.53	5,140
8.25	0.60	0.00	0.60	5,651
8.50	0.68	0.00	0.68	6,231
8.75	0.78	0.00	0.78	6,895
9.00	0.88	0.00	0.88	7,652
9.25	0.97	0.00	0.97	8,499
9.50	1.04	0.00	1.04	9,410
9.75	1.13	0.00	1.13	10,389
10.00	1.28	0.00	1.28	11,484
10.25	1.46	0.00	1.46	12,731
10.50	1.70	0.00	1.70	14,173
10.75	2.00	0.00	2.00	15,853
11.00	2.38	0.00	2.38	17,855
11.25	2.96	0.00	2.96	20,282
11.50	3.76	0.00	3.76	23,369
11.75	10.71	0.00	10.71	29,550
12.00	**39.20**	0.00	**39.20**	53,249
12.25	21.66	0.00	21.66	79,612
12.50	10.28	0.00	10.28	91,567
12.75	6.59	0.00	6.59	98,523
13.00	5.15	0.00	5.15	103,590

Hydrograph for Link 3L: Proposed to King Rd. Storm Sewer (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	4.28	0.00	4.28	107,742
13.50	4.08	0.00	4.08	111,477
13.75	3.93	0.00	3.93	115,064
14.00	3.77	0.00	3.77	118,515
14.25	3.65	0.00	3.65	121,836
14.50	3.54	0.00	3.54	125,060
14.75	3.42	0.00	3.42	128,183
15.00	3.30	0.00	3.30	131,199
15.25	3.17	0.00	3.17	134,102
15.50	3.03	0.00	3.03	136,883
15.75	2.81	0.00	2.81	139,515
16.00	2.46	0.00	2.46	141,845
16.25	2.22	0.00	2.22	143,920
16.50	2.09	0.00	2.09	145,842
16.75	2.01	0.00	2.01	147,678
17.00	1.95	0.00	1.95	149,455
17.25	1.90	0.00	1.90	151,183
17.50	1.85	0.00	1.85	152,866
17.75	1.80	0.00	1.80	154,502
18.00	1.75	0.00	1.75	156,092
18.25	1.69	0.00	1.69	157,635
18.50	1.64	0.00	1.64	159,132
18.75	1.57	0.00	1.57	160,578
19.00	1.45	0.00	1.45	161,926
19.25	1.33	0.00	1.33	163,167
19.50	1.22	0.00	1.22	164,305
19.75	1.12	0.00	1.12	165,348
20.00	1.02	0.00	1.02	166,303
20.25	0.95	0.00	0.95	167,181
20.50	0.90	0.00	0.90	168,004
20.75	0.86	0.00	0.86	168,789
21.00	0.83	0.00	0.83	169,546
21.25	0.81	0.00	0.81	170,281
21.50	0.79	0.00	0.79	171,001
21.75	0.78	0.00	0.78	171,707
22.00	0.77	0.00	0.77	172,402
22.25	0.76	0.00	0.76	173,088
22.50	0.75	0.00	0.75	173,765
22.75	0.74	0.00	0.74	174,434
23.00	0.73	0.00	0.73	175,095
23.25	0.72	0.00	0.72	175,750
23.50	0.72	0.00	0.72	176,397
23.75	0.71	0.00	0.71	177,038
24.00	0.70	0.00	0.70	177,671
24.25	0.35	0.00	0.35	178,112
24.50	0.21	0.00	0.21	178,343
24.75	0.13	0.00	0.13	178,486
25.00	0.10	0.00	0.10	178,585
25.25	0.07	0.00	0.07	178,657
25.50	0.06	0.00	0.06	178,715
25.75	0.05	0.00	0.05	178,760
26.00	0.04	0.00	0.04	178,797
26.25	0.03	0.00	0.03	178,827

Existing 2-year Ellsworth Park

Hydrograph for Link 2L: Existing to Ellsworth Park Storm Water Basin

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	0
3.00	0.00	0.00	0.00	0
3.25	0.00	0.00	0.00	0
3.50	0.00	0.00	0.00	0
3.75	0.00	0.00	0.00	0
4.00	0.00	0.00	0.00	0
4.25	0.00	0.00	0.00	0
4.50	0.00	0.00	0.00	0
4.75	0.00	0.00	0.00	0
5.00	0.00	0.00	0.00	0
5.25	0.00	0.00	0.00	0
5.50	0.00	0.00	0.00	1
5.75	0.00	0.00	0.00	2
6.00	0.00	0.00	0.00	6
6.25	0.01	0.00	0.01	11
6.50	0.01	0.00	0.01	17
6.75	0.01	0.00	0.01	25
7.00	0.01	0.00	0.01	35
7.25	0.01	0.00	0.01	47
7.50	0.02	0.00	0.02	60
7.75	0.02	0.00	0.02	75
8.00	0.02	0.00	0.02	93
8.25	0.02	0.00	0.02	112
8.50	0.03	0.00	0.03	136
8.75	0.03	0.00	0.03	163
9.00	0.04	0.00	0.04	196
9.25	0.04	0.00	0.04	234
9.50	0.05	0.00	0.05	273
9.75	0.05	0.00	0.05	317
10.00	0.06	0.00	0.06	369
10.25	0.07	0.00	0.07	431
10.50	0.09	0.00	0.09	505
10.75	0.11	0.00	0.11	595
11.00	0.14	0.00	0.14	708
11.25	0.18	0.00	0.18	853
11.50	0.26	0.00	0.26	1,057
11.75	**1.39**	0.00	**1.39**	1,736
12.00	**4.99**	0.00	**4.99**	5,056
12.25	0.72	0.00	0.72	6,382
12.50	0.47	0.00	0.47	6,893
12.75	0.35	0.00	0.35	7,234
13.00	0.29	0.00	0.29	7,518

Hydrograph for Link 2L: Existing to Ellsworth Park Storm Water Basin (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	0.25	0.00	0.25	7,758
13.50	0.22	0.00	0.22	7,971
13.75	0.20	0.00	0.20	8,158
14.00	0.18	0.00	0.18	8,325
14.25	0.16	0.00	0.16	8,476
14.50	0.16	0.00	0.16	8,620
14.75	0.15	0.00	0.15	8,757
15.00	0.14	0.00	0.14	8,887
15.25	0.13	0.00	0.13	9,010
15.50	0.13	0.00	0.13	9,127
15.75	0.12	0.00	0.12	9,236
16.00	0.11	0.00	0.11	9,338
16.25	0.11	0.00	0.11	9,434
16.50	0.10	0.00	0.10	9,528
16.75	0.10	0.00	0.10	9,619
17.00	0.10	0.00	0.10	9,708
17.25	0.09	0.00	0.09	9,794
17.50	0.09	0.00	0.09	9,878
17.75	0.09	0.00	0.09	9,959
18.00	0.09	0.00	0.09	10,038
18.25	0.08	0.00	0.08	10,114
18.50	0.08	0.00	0.08	10,188
18.75	0.08	0.00	0.08	10,259
19.00	0.07	0.00	0.07	10,327
19.25	0.07	0.00	0.07	10,393
19.50	0.07	0.00	0.07	10,456
19.75	0.07	0.00	0.07	10,517
20.00	0.06	0.00	0.06	10,575
20.25	0.06	0.00	0.06	10,631
20.50	0.06	0.00	0.06	10,686
20.75	0.06	0.00	0.06	10,741
21.00	0.06	0.00	0.06	10,795
21.25	0.06	0.00	0.06	10,849
21.50	0.06	0.00	0.06	10,903
21.75	0.06	0.00	0.06	10,956
22.00	0.06	0.00	0.06	11,008
22.25	0.06	0.00	0.06	11,060
22.50	0.06	0.00	0.06	11,111
22.75	0.06	0.00	0.06	11,162
23.00	0.06	0.00	0.06	11,213
23.25	0.06	0.00	0.06	11,263
23.50	0.05	0.00	0.05	11,312
23.75	0.05	0.00	0.05	11,361
24.00	0.05	0.00	0.05	11,410
24.25	0.00	0.00	0.00	**11,423**
24.50	0.00	0.00	0.00	**11,423**
24.75	0.00	0.00	0.00	11,423
25.00	0.00	0.00	0.00	11,423
25.25	0.00	0.00	0.00	11,423
25.50	0.00	0.00	0.00	11,423
25.75	0.00	0.00	0.00	11,423
26.00	0.00	0.00	0.00	11,423
26.25	0.00	0.00	0.00	11,423

Existing 100-year Ellsworth Park

Hydrograph for Link 2L: Existing to Ellsworth Park Storm Water Basin

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	1
3.00	0.01	0.00	0.01	7
3.25	0.01	0.00	0.01	16
3.50	0.02	0.00	0.02	30
3.75	0.02	0.00	0.02	48
4.00	0.03	0.00	0.03	70
4.25	0.03	0.00	0.03	97
4.50	0.04	0.00	0.04	127
4.75	0.04	0.00	0.04	163
5.00	0.05	0.00	0.05	204
5.25	0.05	0.00	0.05	249
5.50	0.06	0.00	0.06	300
5.75	0.06	0.00	0.06	356
6.00	0.07	0.00	0.07	417
6.25	0.08	0.00	0.08	483
6.50	0.08	0.00	0.08	555
6.75	0.09	0.00	0.09	632
7.00	0.09	0.00	0.09	714
7.25	0.10	0.00	0.10	802
7.50	0.11	0.00	0.11	895
7.75	0.11	0.00	0.11	994
8.00	0.12	0.00	0.12	1,102
8.25	0.14	0.00	0.14	1,219
8.50	0.16	0.00	0.16	1,356
8.75	0.18	0.00	0.18	1,513
9.00	0.21	0.00	0.21	1,692
9.25	0.22	0.00	0.22	1,890
9.50	0.23	0.00	0.23	2,097
9.75	0.26	0.00	0.26	2,319
10.00	0.30	0.00	0.30	2,576
10.25	0.36	0.00	0.36	2,874
10.50	0.42	0.00	0.42	3,228
10.75	0.51	0.00	0.51	3,650
11.00	0.62	0.00	0.62	4,167
11.25	0.82	0.00	0.82	4,821
11.50	1.09	0.00	1.09	5,705
11.75	**5.27**	0.00	**5.27**	8,378
12.00	**15.67**	0.00	**15.67**	19,404
12.25	2.15	0.00	2.15	23,451
12.50	1.39	0.00	1.39	24,965
12.75	1.02	0.00	1.02	25,968
13.00	0.85	0.00	0.85	26,797

Hydrograph for Link 2L: Existing to Ellsworth Park Storm Water Basin (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	0.74	0.00	0.74	27,496
13.50	0.65	0.00	0.65	28,111
13.75	0.57	0.00	0.57	28,651
14.00	0.51	0.00	0.51	29,133
14.25	0.47	0.00	0.47	29,566
14.50	0.45	0.00	0.45	29,978
14.75	0.43	0.00	0.43	30,370
15.00	0.40	0.00	0.40	30,741
15.25	0.38	0.00	0.38	31,092
15.50	0.36	0.00	0.36	31,423
15.75	0.34	0.00	0.34	31,733
16.00	0.31	0.00	0.31	32,023
16.25	0.30	0.00	0.30	32,295
16.50	0.29	0.00	0.29	32,560
16.75	0.28	0.00	0.28	32,818
17.00	0.27	0.00	0.27	33,068
17.25	0.27	0.00	0.27	33,311
17.50	0.26	0.00	0.26	33,547
17.75	0.25	0.00	0.25	33,775
18.00	0.24	0.00	0.24	33,996
18.25	0.23	0.00	0.23	34,210
18.50	0.23	0.00	0.23	34,417
18.75	0.22	0.00	0.22	34,616
19.00	0.21	0.00	0.21	34,807
19.25	0.20	0.00	0.20	34,991
19.50	0.19	0.00	0.19	35,168
19.75	0.18	0.00	0.18	35,337
20.00	0.18	0.00	0.18	35,499
20.25	0.17	0.00	0.17	35,655
20.50	0.17	0.00	0.17	35,810
20.75	0.17	0.00	0.17	35,963
21.00	0.17	0.00	0.17	36,114
21.25	0.17	0.00	0.17	36,264
21.50	0.16	0.00	0.16	36,413
21.75	0.16	0.00	0.16	36,560
22.00	0.16	0.00	0.16	36,705
22.25	0.16	0.00	0.16	36,850
22.50	0.16	0.00	0.16	36,992
22.75	0.16	0.00	0.16	37,134
23.00	0.15	0.00	0.15	37,274
23.25	0.15	0.00	0.15	37,412
23.50	0.15	0.00	0.15	37,549
23.75	0.15	0.00	0.15	37,684
24.00	0.15	0.00	0.15	37,818
24.25	0.00	0.00	0.00	**37,854**
24.50	0.00	0.00	0.00	**37,854**
24.75	0.00	0.00	0.00	37,854
25.00	0.00	0.00	0.00	37,854
25.25	0.00	0.00	0.00	37,854
25.50	0.00	0.00	0.00	37,854
25.75	0.00	0.00	0.00	37,854
26.00	0.00	0.00	0.00	37,854
26.25	0.00	0.00	0.00	37,854

Proposed 2-year Ellsworth Park

Hydrograph for Link 4L: Proposed to Ellsworth Park Storm Water Basin

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	0
3.00	0.00	0.00	0.00	0
3.25	0.00	0.00	0.00	0
3.50	0.00	0.00	0.00	0
3.75	0.00	0.00	0.00	0
4.00	0.00	0.00	0.00	0
4.25	0.00	0.00	0.00	0
4.50	0.00	0.00	0.00	0
4.75	0.00	0.00	0.00	0
5.00	0.00	0.00	0.00	0
5.25	0.00	0.00	0.00	0
5.50	0.00	0.00	0.00	0
5.75	0.00	0.00	0.00	0
6.00	0.00	0.00	0.00	0
6.25	0.00	0.00	0.00	0
6.50	0.00	0.00	0.00	0
6.75	0.00	0.00	0.00	0
7.00	0.00	0.00	0.00	0
7.25	0.00	0.00	0.00	0
7.50	0.00	0.00	0.00	0
7.75	0.00	0.00	0.00	0
8.00	0.00	0.00	0.00	0
8.25	0.00	0.00	0.00	0
8.50	0.00	0.00	0.00	0
8.75	0.00	0.00	0.00	0
9.00	0.00	0.00	0.00	0
9.25	0.00	0.00	0.00	0
9.50	0.00	0.00	0.00	0
9.75	0.00	0.00	0.00	0
10.00	0.00	0.00	0.00	0
10.25	0.00	0.00	0.00	1
10.50	0.01	0.00	0.01	5
10.75	0.01	0.00	0.01	12
11.00	0.02	0.00	0.02	25
11.25	0.03	0.00	0.03	46
11.50	0.06	0.00	0.06	86
11.75	0.48	0.00	0.48	295
12.00	**2.72**	0.00	**2.72**	1,920
12.25	0.43	0.00	0.43	2,683
12.50	0.29	0.00	0.29	2,992
12.75	0.21	0.00	0.21	3,201
13.00	0.18	0.00	0.18	3,377

Hydrograph for Link 4L: Proposed to Ellsworth Park Storm Water Basin (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	0.16	0.00	0.16	3,528
13.50	0.14	0.00	0.14	3,661
13.75	0.13	0.00	0.13	3,780
14.00	0.11	0.00	0.11	3,886
14.25	0.10	0.00	0.10	3,982
14.50	0.10	0.00	0.10	4,074
14.75	0.10	0.00	0.10	4,162
15.00	0.09	0.00	0.09	4,246
15.25	0.09	0.00	0.09	4,325
15.50	0.08	0.00	0.08	4,401
15.75	0.08	0.00	0.08	4,471
16.00	0.07	0.00	0.07	4,538
16.25	0.07	0.00	0.07	4,601
16.50	0.07	0.00	0.07	4,662
16.75	0.07	0.00	0.07	4,721
17.00	0.06	0.00	0.06	4,779
17.25	0.06	0.00	0.06	4,836
17.50	0.06	0.00	0.06	4,891
17.75	0.06	0.00	0.06	4,945
18.00	0.06	0.00	0.06	4,996
18.25	0.06	0.00	0.06	5,047
18.50	0.05	0.00	0.05	5,095
18.75	0.05	0.00	0.05	5,142
19.00	0.05	0.00	0.05	5,188
19.25	0.05	0.00	0.05	5,231
19.50	0.05	0.00	0.05	5,273
19.75	0.04	0.00	0.04	5,314
20.00	0.04	0.00	0.04	5,352
20.25	0.04	0.00	0.04	5,390
20.50	0.04	0.00	0.04	5,426
20.75	0.04	0.00	0.04	5,463
21.00	0.04	0.00	0.04	5,499
21.25	0.04	0.00	0.04	5,535
21.50	0.04	0.00	0.04	5,571
21.75	0.04	0.00	0.04	5,607
22.00	0.04	0.00	0.04	5,642
22.25	0.04	0.00	0.04	5,677
22.50	0.04	0.00	0.04	5,711
22.75	0.04	0.00	0.04	5,745
23.00	0.04	0.00	0.04	5,779
23.25	0.04	0.00	0.04	5,813
23.50	0.04	0.00	0.04	5,846
23.75	0.04	0.00	0.04	5,879
24.00	0.04	0.00	0.04	5,912
24.25	0.00	0.00	0.00	**5,920**
24.50	0.00	0.00	0.00	**5,920**
24.75	0.00	0.00	0.00	5,920
25.00	0.00	0.00	0.00	5,920
25.25	0.00	0.00	0.00	5,920
25.50	0.00	0.00	0.00	5,920
25.75	0.00	0.00	0.00	5,920
26.00	0.00	0.00	0.00	5,920
26.25	0.00	0.00	0.00	5,920

Proposed 100-year Ellsworth Park

Hydrograph for Link 4L: Proposed to Ellsworth Park Storm Water Basin

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	0
3.00	0.00	0.00	0.00	0
3.25	0.00	0.00	0.00	0
3.50	0.00	0.00	0.00	0
3.75	0.00	0.00	0.00	0
4.00	0.00	0.00	0.00	0
4.25	0.00	0.00	0.00	0
4.50	0.00	0.00	0.00	0
4.75	0.00	0.00	0.00	0
5.00	0.00	0.00	0.00	0
5.25	0.00	0.00	0.00	0
5.50	0.00	0.00	0.00	0
5.75	0.00	0.00	0.00	0
6.00	0.00	0.00	0.00	1
6.25	0.00	0.00	0.00	3
6.50	0.01	0.00	0.01	8
6.75	0.01	0.00	0.01	16
7.00	0.01	0.00	0.01	25
7.25	0.02	0.00	0.02	38
7.50	0.02	0.00	0.02	53
7.75	0.02	0.00	0.02	72
8.00	0.03	0.00	0.03	97
8.25	0.04	0.00	0.04	127
8.50	0.05	0.00	0.05	166
8.75	0.06	0.00	0.06	215
9.00	0.07	0.00	0.07	276
9.25	0.08	0.00	0.08	349
9.50	0.09	0.00	0.09	430
9.75	0.11	0.00	0.11	522
10.00	0.13	0.00	0.13	634
10.25	0.17	0.00	0.17	770
10.50	0.20	0.00	0.20	939
10.75	0.26	0.00	0.26	1,150
11.00	0.33	0.00	0.33	1,420
11.25	0.46	0.00	0.46	1,777
11.50	0.64	0.00	0.64	2,282
11.75	**3.33**	0.00	**3.33**	3,925
12.00	**11.24**	0.00	**11.24**	11,553
12.25	1.59	0.00	1.59	14,509
12.50	1.04	0.00	1.04	15,634
12.75	0.76	0.00	0.76	16,383
13.00	0.64	0.00	0.64	17,003

Hydrograph for Link 4L: Proposed to Ellsworth Park Storm Water Basin (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	0.55	0.00	0.55	17,528
13.50	0.49	0.00	0.49	17,991
13.75	0.43	0.00	0.43	18,398
14.00	0.38	0.00	0.38	18,761
14.25	0.36	0.00	0.36	19,089
14.50	0.34	0.00	0.34	19,401
14.75	0.32	0.00	0.32	19,697
15.00	0.31	0.00	0.31	19,979
15.25	0.29	0.00	0.29	20,245
15.50	0.27	0.00	0.27	20,496
15.75	0.26	0.00	0.26	20,732
16.00	0.24	0.00	0.24	20,952
16.25	0.23	0.00	0.23	21,160
16.50	0.22	0.00	0.22	21,362
16.75	0.22	0.00	0.22	21,558
17.00	0.21	0.00	0.21	21,749
17.25	0.20	0.00	0.20	21,934
17.50	0.20	0.00	0.20	22,114
17.75	0.19	0.00	0.19	22,288
18.00	0.19	0.00	0.19	22,457
18.25	0.18	0.00	0.18	22,621
18.50	0.17	0.00	0.17	22,778
18.75	0.17	0.00	0.17	22,931
19.00	0.16	0.00	0.16	23,077
19.25	0.15	0.00	0.15	23,218
19.50	0.15	0.00	0.15	23,353
19.75	0.14	0.00	0.14	23,483
20.00	0.14	0.00	0.14	23,607
20.25	0.13	0.00	0.13	23,727
20.50	0.13	0.00	0.13	23,845
20.75	0.13	0.00	0.13	23,963
21.00	0.13	0.00	0.13	24,079
21.25	0.13	0.00	0.13	24,194
21.50	0.13	0.00	0.13	24,308
21.75	0.13	0.00	0.13	24,421
22.00	0.12	0.00	0.12	24,533
22.25	0.12	0.00	0.12	24,644
22.50	0.12	0.00	0.12	24,753
22.75	0.12	0.00	0.12	24,862
23.00	0.12	0.00	0.12	24,969
23.25	0.12	0.00	0.12	25,076
23.50	0.12	0.00	0.12	25,181
23.75	0.12	0.00	0.12	25,285
24.00	0.11	0.00	0.11	25,388
24.25	0.00	0.00	0.00	**25,416**
24.50	0.00	0.00	0.00	**25,416**
24.75	0.00	0.00	0.00	25,416
25.00	0.00	0.00	0.00	25,416
25.25	0.00	0.00	0.00	25,416
25.50	0.00	0.00	0.00	25,416
25.75	0.00	0.00	0.00	25,416
26.00	0.00	0.00	0.00	25,416
26.25	0.00	0.00	0.00	25,416

Existing 2-year TOTAL

Hydrograph for Link TEO: Total Existing Outfall

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	0
3.00	0.00	0.00	0.00	0
3.25	0.00	0.00	0.00	0
3.50	0.00	0.00	0.00	0
3.75	0.00	0.00	0.00	0
4.00	0.00	0.00	0.00	0
4.25	0.00	0.00	0.00	0
4.50	0.00	0.00	0.00	0
4.75	0.00	0.00	0.00	0
5.00	0.00	0.00	0.00	0
5.25	0.00	0.00	0.00	0
5.50	0.00	0.00	0.00	1
5.75	0.00	0.00	0.00	2
6.00	0.00	0.00	0.00	6
6.25	0.01	0.00	0.01	11
6.50	0.01	0.00	0.01	17
6.75	0.01	0.00	0.01	25
7.00	0.01	0.00	0.01	35
7.25	0.01	0.00	0.01	47
7.50	0.02	0.00	0.02	61
7.75	0.02	0.00	0.02	78
8.00	0.03	0.00	0.03	100
8.25	0.03	0.00	0.03	128
8.50	0.05	0.00	0.05	165
8.75	0.06	0.00	0.06	213
9.00	0.08	0.00	0.08	276
9.25	0.10	0.00	0.10	358
9.50	0.12	0.00	0.12	457
9.75	0.14	0.00	0.14	576
10.00	0.18	0.00	0.18	726
10.25	0.23	0.00	0.23	915
10.50	0.30	0.00	0.30	1,159
10.75	0.39	0.00	0.39	1,471
11.00	0.50	0.00	0.50	1,881
11.25	0.71	0.00	0.71	2,435
11.50	1.05	0.00	1.05	3,250
11.75	4.66	0.00	4.66	5,600
12.00	**18.47**	0.00	**18.47**	16,771
12.25	7.49	0.00	7.49	27,382
12.50	4.06	0.00	4.06	31,943
12.75	2.04	0.00	2.04	34,348
13.00	1.64	0.00	1.64	35,939

Hydrograph for Link TEO: Total Existing Outfall (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	1.40	0.00	1.40	37,276
13.50	1.23	0.00	1.23	38,446
13.75	1.09	0.00	1.09	39,478
14.00	0.98	0.00	0.98	40,398
14.25	0.89	0.00	0.89	41,224
14.50	0.85	0.00	0.85	42,002
14.75	0.81	0.00	0.81	42,742
15.00	0.77	0.00	0.77	43,447
15.25	0.73	0.00	0.73	44,115
15.50	0.68	0.00	0.68	44,746
15.75	0.64	0.00	0.64	45,340
16.00	0.60	0.00	0.60	45,896
16.25	0.57	0.00	0.57	46,419
16.50	0.55	0.00	0.55	46,924
16.75	0.54	0.00	0.54	47,416
17.00	0.53	0.00	0.53	47,894
17.25	0.51	0.00	0.51	48,359
17.50	0.50	0.00	0.50	48,811
17.75	0.48	0.00	0.48	49,250
18.00	0.47	0.00	0.47	49,675
18.25	0.45	0.00	0.45	50,087
18.50	0.44	0.00	0.44	50,485
18.75	0.42	0.00	0.42	50,869
19.00	0.41	0.00	0.41	51,240
19.25	0.39	0.00	0.39	51,596
19.50	0.37	0.00	0.37	51,939
19.75	0.36	0.00	0.36	52,268
20.00	0.34	0.00	0.34	52,583
20.25	0.33	0.00	0.33	52,886
20.50	0.33	0.00	0.33	53,184
20.75	0.33	0.00	0.33	53,479
21.00	0.32	0.00	0.32	53,772
21.25	0.32	0.00	0.32	54,062
21.50	0.32	0.00	0.32	54,349
21.75	0.32	0.00	0.32	54,634
22.00	0.31	0.00	0.31	54,916
22.25	0.31	0.00	0.31	55,196
22.50	0.31	0.00	0.31	55,473
22.75	0.30	0.00	0.30	55,747
23.00	0.30	0.00	0.30	56,019
23.25	0.30	0.00	0.30	56,288
23.50	0.29	0.00	0.29	56,554
23.75	0.29	0.00	0.29	56,818
24.00	0.29	0.00	0.29	57,079
24.25	0.05	0.00	0.05	57,208
24.50	0.00	0.00	0.00	57,221
24.75	0.00	0.00	0.00	**57,222**
25.00	0.00	0.00	0.00	**57,222**
25.25	0.00	0.00	0.00	57,222
25.50	0.00	0.00	0.00	57,222
25.75	0.00	0.00	0.00	57,222
26.00	0.00	0.00	0.00	57,222
26.25	0.00	0.00	0.00	57,222

Existing 100-year TOTAL

Hydrograph for Link TEO: Total Existing Outfall

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	0
2.00	0.00	0.00	0.00	0
2.25	0.00	0.00	0.00	0
2.50	0.00	0.00	0.00	0
2.75	0.00	0.00	0.00	1
3.00	0.01	0.00	0.01	7
3.25	0.01	0.00	0.01	16
3.50	0.02	0.00	0.02	30
3.75	0.02	0.00	0.02	48
4.00	0.03	0.00	0.03	72
4.25	0.04	0.00	0.04	105
4.50	0.06	0.00	0.06	152
4.75	0.07	0.00	0.07	212
5.00	0.10	0.00	0.10	291
5.25	0.13	0.00	0.13	394
5.50	0.16	0.00	0.16	525
5.75	0.19	0.00	0.19	684
6.00	0.22	0.00	0.22	871
6.25	0.26	0.00	0.26	1,089
6.50	0.29	0.00	0.29	1,337
6.75	0.33	0.00	0.33	1,617
7.00	0.36	0.00	0.36	1,929
7.25	0.40	0.00	0.40	2,276
7.50	0.44	0.00	0.44	2,660
7.75	0.49	0.00	0.49	3,085
8.00	0.54	0.00	0.54	3,551
8.25	0.61	0.00	0.61	4,068
8.50	0.71	0.00	0.71	4,671
8.75	0.83	0.00	0.83	5,376
9.00	0.96	0.00	0.96	6,192
9.25	1.06	0.00	1.06	7,114
9.50	1.12	0.00	1.12	8,101
9.75	1.24	0.00	1.24	9,162
10.00	1.44	0.00	1.44	10,381
10.25	1.70	0.00	1.70	11,809
10.50	2.02	0.00	2.02	13,510
10.75	2.46	0.00	2.46	15,549
11.00	3.02	0.00	3.02	18,058
11.25	3.93	0.00	3.93	21,215
11.50	5.28	0.00	5.28	25,465
11.75	17.74	0.00	17.74	35,052
12.00	**72.25**	0.00	**72.25**	75,607
12.25	21.28	0.00	21.28	111,117
12.50	10.30	0.00	10.30	123,105
12.75	7.20	0.00	7.20	130,429
13.00	6.11	0.00	6.11	136,279

Hydrograph for Link TEO: Total Existing Outfall (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	5.35	0.00	5.35	141,347
13.50	4.71	0.00	4.71	145,824
13.75	3.79	0.00	3.79	149,630
14.00	2.87	0.00	2.87	152,363
14.25	2.61	0.00	2.61	154,787
14.50	2.47	0.00	2.47	157,059
14.75	2.35	0.00	2.35	159,217
15.00	2.23	0.00	2.23	161,266
15.25	2.10	0.00	2.10	163,204
15.50	1.98	0.00	1.98	165,031
15.75	1.86	0.00	1.86	166,748
16.00	1.73	0.00	1.73	168,353
16.25	1.64	0.00	1.64	169,859
16.50	1.59	0.00	1.59	171,310
16.75	1.55	0.00	1.55	172,720
17.00	1.51	0.00	1.51	174,091
17.25	1.46	0.00	1.46	175,422
17.50	1.42	0.00	1.42	176,714
17.75	1.37	0.00	1.37	177,966
18.00	1.33	0.00	1.33	179,178
18.25	1.28	0.00	1.28	180,350
18.50	1.24	0.00	1.24	181,482
18.75	1.20	0.00	1.20	182,575
19.00	1.15	0.00	1.15	183,627
19.25	1.11	0.00	1.11	184,638
19.50	1.06	0.00	1.06	185,610
19.75	1.02	0.00	1.02	186,541
20.00	0.97	0.00	0.97	187,432
20.25	0.94	0.00	0.94	188,288
20.50	0.93	0.00	0.93	189,129
20.75	0.92	0.00	0.92	189,962
21.00	0.91	0.00	0.91	190,787
21.25	0.90	0.00	0.90	191,604
21.50	0.90	0.00	0.90	192,413
21.75	0.89	0.00	0.89	193,215
22.00	0.88	0.00	0.88	194,008
22.25	0.87	0.00	0.87	194,794
22.50	0.86	0.00	0.86	195,571
22.75	0.85	0.00	0.85	196,341
23.00	0.84	0.00	0.84	197,102
23.25	0.83	0.00	0.83	197,856
23.50	0.83	0.00	0.83	198,602
23.75	0.82	0.00	0.82	199,340
24.00	0.81	0.00	0.81	200,069
24.25	0.15	0.00	0.15	200,435
24.50	0.01	0.00	0.01	200,473
24.75	0.00	0.00	0.00	**200,476**
25.00	0.00	0.00	0.00	**200,476**
25.25	0.00	0.00	0.00	200,476
25.50	0.00	0.00	0.00	200,476
25.75	0.00	0.00	0.00	200,476
26.00	0.00	0.00	0.00	200,476
26.25	0.00	0.00	0.00	200,476

Proposed 2-year TOTAL

Hydrograph for Link TPO: Total Proposed Outfall

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	0
1.00	0.00	0.00	0.00	0
1.25	0.00	0.00	0.00	0
1.50	0.00	0.00	0.00	0
1.75	0.00	0.00	0.00	2
2.00	0.01	0.00	0.01	7
2.25	0.01	0.00	0.01	16
2.50	0.02	0.00	0.02	29
2.75	0.02	0.00	0.02	44
3.00	0.02	0.00	0.02	63
3.25	0.03	0.00	0.03	85
3.50	0.03	0.00	0.03	110
3.75	0.03	0.00	0.03	138
4.00	0.04	0.00	0.04	169
4.25	0.04	0.00	0.04	203
4.50	0.04	0.00	0.04	239
4.75	0.05	0.00	0.05	279
5.00	0.05	0.00	0.05	323
5.25	0.05	0.00	0.05	369
5.50	0.06	0.00	0.06	420
5.75	0.06	0.00	0.06	473
6.00	0.06	0.00	0.06	530
6.25	0.07	0.00	0.07	590
6.50	0.07	0.00	0.07	654
6.75	0.08	0.00	0.08	721
7.00	0.08	0.00	0.08	791
7.25	0.08	0.00	0.08	866
7.50	0.09	0.00	0.09	943
7.75	0.09	0.00	0.09	1,025
8.00	0.10	0.00	0.10	1,110
8.25	0.11	0.00	0.11	1,202
8.50	0.12	0.00	0.12	1,305
8.75	0.13	0.00	0.13	1,420
9.00	0.15	0.00	0.15	1,549
9.25	0.16	0.00	0.16	1,688
9.50	0.17	0.00	0.17	1,834
9.75	0.19	0.00	0.19	1,995
10.00	0.22	0.00	0.22	2,184
10.25	0.27	0.00	0.27	2,409
10.50	0.33	0.00	0.33	2,683
10.75	0.41	0.00	0.41	3,023
11.00	0.52	0.00	0.52	3,452
11.25	0.71	0.00	0.71	4,012
11.50	1.00	0.00	1.00	4,803
11.75	4.21	0.00	4.21	6,974
12.00	**13.87**	0.00	**13.87**	16,170
12.25	4.41	0.00	4.41	21,883
12.50	3.77	0.00	3.77	25,487
12.75	3.41	0.00	3.41	28,647
13.00	3.19	0.00	3.19	31,597

Hydrograph for Link TPO: Total Proposed Outfall (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	2.99	0.00	2.99	34,354
13.50	2.79	0.00	2.79	36,940
13.75	2.54	0.00	2.54	39,323
14.00	1.97	0.00	1.97	41,310
14.25	1.50	0.00	1.50	42,814
14.50	1.23	0.00	1.23	44,003
14.75	1.07	0.00	1.07	45,016
15.00	0.95	0.00	0.95	45,911
15.25	0.86	0.00	0.86	46,718
15.50	0.79	0.00	0.79	47,452
15.75	0.72	0.00	0.72	48,121
16.00	0.66	0.00	0.66	48,735
16.25	0.62	0.00	0.62	49,305
16.50	0.59	0.00	0.59	49,847
16.75	0.57	0.00	0.57	50,367
17.00	0.55	0.00	0.55	50,869
17.25	0.53	0.00	0.53	51,355
17.50	0.52	0.00	0.52	51,826
17.75	0.50	0.00	0.50	52,283
18.00	0.49	0.00	0.49	52,725
18.25	0.47	0.00	0.47	53,154
18.50	0.45	0.00	0.45	53,569
18.75	0.44	0.00	0.44	53,970
19.00	0.42	0.00	0.42	54,357
19.25	0.41	0.00	0.41	54,730
19.50	0.39	0.00	0.39	55,090
19.75	0.38	0.00	0.38	55,436
20.00	0.36	0.00	0.36	55,767
20.25	0.35	0.00	0.35	56,087
20.50	0.34	0.00	0.34	56,399
20.75	0.34	0.00	0.34	56,706
21.00	0.33	0.00	0.33	57,008
21.25	0.33	0.00	0.33	57,306
21.50	0.33	0.00	0.33	57,601
21.75	0.32	0.00	0.32	57,892
22.00	0.32	0.00	0.32	58,180
22.25	0.32	0.00	0.32	58,466
22.50	0.31	0.00	0.31	58,748
22.75	0.31	0.00	0.31	59,028
23.00	0.31	0.00	0.31	59,305
23.25	0.30	0.00	0.30	59,579
23.50	0.30	0.00	0.30	59,850
23.75	0.30	0.00	0.30	60,119
24.00	0.29	0.00	0.29	60,385
24.25	0.14	0.00	0.14	60,557
24.50	0.09	0.00	0.09	60,653
24.75	0.07	0.00	0.07	60,722
25.00	0.05	0.00	0.05	60,774
25.25	0.04	0.00	0.04	60,816
25.50	0.03	0.00	0.03	60,849
25.75	0.03	0.00	0.03	60,876
26.00	0.02	0.00	0.02	60,898
26.25	0.02	0.00	0.02	60,919

Proposed 100-year TOTAL

Hydrograph for Link TPO: Total Proposed Outfall

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
0.00	0.00	**0.00**	0.00	0
0.25	0.00	0.00	0.00	0
0.50	0.00	0.00	0.00	0
0.75	0.00	0.00	0.00	1
1.00	0.02	0.00	0.02	13
1.25	0.04	0.00	0.04	40
1.50	0.05	0.00	0.05	82
1.75	0.06	0.00	0.06	135
2.00	0.08	0.00	0.08	198
2.25	0.09	0.00	0.09	271
2.50	0.09	0.00	0.09	353
2.75	0.10	0.00	0.10	442
3.00	0.11	0.00	0.11	539
3.25	0.12	0.00	0.12	643
3.50	0.13	0.00	0.13	753
3.75	0.13	0.00	0.13	869
4.00	0.14	0.00	0.14	991
4.25	0.15	0.00	0.15	1,120
4.50	0.16	0.00	0.16	1,258
4.75	0.17	0.00	0.17	1,405
5.00	0.18	0.00	0.18	1,561
5.25	0.19	0.00	0.19	1,727
5.50	0.21	0.00	0.21	1,909
5.75	0.23	0.00	0.23	2,112
6.00	0.26	0.00	0.26	2,337
6.25	0.29	0.00	0.29	2,588
6.50	0.33	0.00	0.33	2,870
6.75	0.36	0.00	0.36	3,181
7.00	0.39	0.00	0.39	3,521
7.25	0.43	0.00	0.43	3,892
7.50	0.47	0.00	0.47	4,300
7.75	0.51	0.00	0.51	4,748
8.00	0.56	0.00	0.56	5,236
8.25	0.63	0.00	0.63	5,777
8.50	0.73	0.00	0.73	6,397
8.75	0.84	0.00	0.84	7,110
9.00	0.96	0.00	0.96	7,928
9.25	1.06	0.00	1.06	8,848
9.50	1.13	0.00	1.13	9,840
9.75	1.24	0.00	1.24	10,911
10.00	1.41	0.00	1.41	12,118
10.25	1.63	0.00	1.63	13,501
10.50	1.90	0.00	1.90	15,112
10.75	2.26	0.00	2.26	17,004
11.00	2.71	0.00	2.71	19,275
11.25	3.42	0.00	3.42	22,059
11.50	4.40	0.00	4.40	25,652
11.75	**14.03**	0.00	**14.03**	33,475
12.00	**50.44**	0.00	**50.44**	64,803
12.25	23.25	0.00	23.25	94,121
12.50	11.32	0.00	11.32	107,200
12.75	7.35	0.00	7.35	114,905
13.00	5.79	0.00	5.79	120,594

Hydrograph for Link TPO: Total Proposed Outfall (continued)

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Primary-Volume (cubic-feet)
13.25	4.84	0.00	4.84	125,270
13.50	4.57	0.00	4.57	129,468
13.75	4.36	0.00	4.36	133,462
14.00	4.16	0.00	4.16	137,276
14.25	4.00	0.00	4.00	140,926
14.50	3.88	0.00	3.88	144,460
14.75	3.75	0.00	3.75	147,880
15.00	3.61	0.00	3.61	151,178
15.25	3.46	0.00	3.46	154,347
15.50	3.31	0.00	3.31	157,379
15.75	3.06	0.00	3.06	160,247
16.00	2.70	0.00	2.70	162,798
16.25	2.45	0.00	2.45	165,080
16.50	2.31	0.00	2.31	167,204
16.75	2.23	0.00	2.23	169,236
17.00	2.16	0.00	2.16	171,204
17.25	2.10	0.00	2.10	173,117
17.50	2.05	0.00	2.05	174,980
17.75	1.99	0.00	1.99	176,791
18.00	1.93	0.00	1.93	178,549
18.25	1.87	0.00	1.87	180,256
18.50	1.81	0.00	1.81	181,910
18.75	1.74	0.00	1.74	183,509
19.00	1.61	0.00	1.61	185,004
19.25	1.49	0.00	1.49	186,385
19.50	1.37	0.00	1.37	187,658
19.75	1.26	0.00	1.26	188,831
20.00	1.16	0.00	1.16	189,910
20.25	1.08	0.00	1.08	190,908
20.50	1.03	0.00	1.03	191,849
20.75	0.99	0.00	0.99	192,751
21.00	0.96	0.00	0.96	193,625
21.25	0.94	0.00	0.94	194,475
21.50	0.92	0.00	0.92	195,309
21.75	0.90	0.00	0.90	196,128
22.00	0.89	0.00	0.89	196,935
22.25	0.88	0.00	0.88	197,731
22.50	0.87	0.00	0.87	198,518
22.75	0.86	0.00	0.86	199,295
23.00	0.85	0.00	0.85	200,065
23.25	0.84	0.00	0.84	200,826
23.50	0.83	0.00	0.83	201,578
23.75	0.82	0.00	0.82	202,323
24.00	0.81	0.00	0.81	203,060
24.25	0.35	0.00	0.35	203,528
24.50	0.21	0.00	0.21	203,759
24.75	0.13	0.00	0.13	203,902
25.00	0.10	0.00	0.10	204,001
25.25	0.07	0.00	0.07	204,073
25.50	0.06	0.00	0.06	204,131
25.75	0.05	0.00	0.05	204,176
26.00	0.04	0.00	0.04	204,213
26.25	0.03	0.00	0.03	204,243

Appendix H

Storm Sewer Sizing Calculations

Storm Sewer Computation Sheet - Bayside Middle School (10-Year Storm Event)

Structure		Length (ft)	Drainage Area "A" (Acres)		Runoff Coefficient "C"	"A" x "C"		Flow Time (min)			Velocity (fps)		Rainfall Intensity "I" (in/hr)	Q(cfs)=CIA	Total Runoff (Q)	GPM	Diameter Pipe (in)	Slope of Sewer (ft/ft)	Manning's (n)	Capacity Full (cfs)	Design Flow (Q)	Design Check
From	To		Increment	Total		Increment	Total	To Upper End	In Section	Total	Flowing Full	Design Flow										
ST BLDG-1	CB-1	45.0	0.00	0.00	0.00	0.00	0.00	6.00	0.08	6.08	11.71	9.37	6.64	0.00	2.05	920.04	10	0.0500	0.0100	6.37	2.05	OK
CB-1	CB-3	114.6	0.34	0.34	0.61	0.21	0.21	6.08	0.48	6.56	4.93	3.94	6.46	1.35	3.40	1526.97	12	0.0100	0.0120	3.86	3.40	OK
ST BLDG-2	CB-2	46.7	0.00	0.00	0.00	0.00	0.00	6.00	0.08	6.08	11.71	9.37	6.64	0.00	2.04	915.55	10	0.0500	0.0100	6.37	2.04	OK
CB-2	CB-3	49.0	0.15	0.15	0.50	0.08	0.08	6.08	0.21	6.29	4.93	3.94	6.56	0.50	2.54	1138.14	12	0.0100	0.0120	3.86	2.54	OK
CB-3	EX ST INLT-1	42.0	0.12	0.12	0.49	0.06	0.06	6.56	0.17	6.73	5.28	4.22	6.39	0.39	6.33	2840.74	15	0.0100	0.0130	6.46	6.33	OK
CB-4	CB-5	117.4	0.30	0.30	0.57	0.17	0.17	6.00	0.50	6.50	4.93	3.94	6.48	1.10	1.10	494.13	12	0.0100	0.0120	3.86	1.10	OK
ST BLDG-3	CB-5	34.3	0.00	0.00	0.00	0.00	0.00	6.00	0.12	6.12	5.91	4.73	6.62	0.00	3.54	1588.75	12	0.0100	0.0100	4.63	3.54	OK
CB-5	EX INLT-2	63.9	0.15	0.15	0.56	0.08	0.08	6.50	0.17	6.67	7.79	6.23	6.42	0.54	5.18	2323.78	15	0.0218	0.0130	9.54	5.18	OK
CB-6	CB-7	13.0	0.42	0.42	0.70	0.30	0.30	6.00	0.05	6.05	4.93	3.94	6.65	1.98	1.98	890.26	12	0.0100	0.0120	3.86	1.98	OK
CB-7	ST MH-1	30.0	0.49	0.49	0.70	0.34	0.34	6.05	0.15	6.21	4.04	3.23	6.59	2.27	4.26	1910.63	15	0.0050	0.0120	4.95	4.26	OK
ST MH-1	ST MH-2	101.8	0.00	0.00	0.00	0.00	0.00	6.21	0.52	6.73	4.04	3.23	6.39	0.00	4.26	1910.63	15	0.0050	0.0120	4.95	4.26	OK
CB-8	CB-9	34.3	0.06	0.06	0.20	0.01	0.01	6.00	0.16	6.16	4.51	3.61	6.61	0.08	0.08	33.81	8	0.0100	0.0100	1.57	0.08	OK
CB-9	CB-11	64.0	0.07	0.07	0.31	0.02	0.02	6.16	0.30	6.45	4.51	3.61	6.50	0.14	0.21	94.96	8	0.0100	0.0100	1.57	0.21	OK
CB-10	CB-11	58.7	0.12	0.12	0.20	0.02	0.02	6.00	0.27	6.27	4.51	3.61	6.57	0.15	0.15	68.92	8	0.0100	0.0100	1.57	0.15	OK
CB-11	ST MH-2	86.1	0.14	0.14	0.31	0.04	0.04	6.45	0.40	6.85	4.51	3.61	6.35	0.27	0.63	283.89	8	0.0100	0.0100	1.57	0.63	OK
CB-12	ST MH-2	99.0	0.13	0.13	0.56	0.08	0.08	6.00	0.42	6.42	4.93	3.94	6.51	0.49	0.49	221.58	12	0.0100	0.0120	3.86	0.49	OK
ST MH-2	ST MH-3	117.1	0.00	0.00	0.00	0.00	0.00	6.85	0.76	7.61	3.23	2.58	6.06	0.00	5.38	2416.10	18	0.0025	0.0120	5.69	5.38	OK
CB-13	CB-14	58.7	0.12	0.12	0.20	0.02	0.02	6.00	0.27	6.27	4.51	3.61	6.57	0.15	0.15	68.92	8	0.0100	0.0100	1.57	0.15	OK
CB-14	CB-15	43.1	0.14	0.14	0.31	0.04	0.04	6.27	0.20	6.47	4.51	3.61	6.49	0.27	0.43	191.63	8	0.0100	0.0100	1.57	0.43	OK
CB-15	CB-16	13.0	0.16	0.16	0.79	0.12	0.12	6.47	0.05	6.52	4.93	3.94	6.47	0.80	1.38	619.84	12	0.0100	0.0120	3.86	1.38	OK
CB-16	ST MH-3	30.0	0.56	0.56	0.82	0.46	0.46	6.52	0.11	6.63	5.72	4.57	6.43	2.94	4.32	1938.65	15	0.0100	0.0120	7.00	4.32	OK
ST-MH-3	ST MH-4	114.1	0.00	0.00	0.00	0.00	0.00	7.61	0.61	8.22	3.91	3.13	5.83	0.00	9.70	4354.75	24	0.0025	0.0120	12.25	9.70	OK
CB-17	CB-18	43.0	0.21	0.21	0.24	0.05	0.05	6.00	0.20	6.20	4.51	3.61	6.60	0.33	0.33	146.14	8	0.0100	0.0100	1.57	0.33	OK
CB-18	CB-19	13.0	0.41	0.41	0.76	0.31	0.31	6.20	0.05	6.25	4.93	3.94	6.57	2.05	2.37	1064.55	12	0.0100	0.0120	3.86	2.37	OK
CB-19	ST MH-4	30.0	0.38	0.38	0.73	0.28	0.28	6.25	0.11	6.36	5.72	4.57	6.53	1.83	4.20	1886.67	15	0.0100	0.0120	7.00	4.20	OK
ST MH-4	FES-1	113.1	0.00	0.00	0.00	0.00	0.00	8.22	0.47	8.69	5.00	4.00	5.66	0.00	13.91	6241.42	24	0.0048	0.0130	15.67	13.91	OK
FES-2	CB-20	46.8	0.31	0.31	0.46	0.14	0.14	6.00	0.08	6.08	12.23	9.78	6.64	0.95	0.95	428.43	12	0.0723	0.0130	9.58	0.95	OK
CB-20	CB-21	210.2	0.20	0.20	0.41	0.08	0.08	15.00	1.26	16.26	3.48	2.79	4.10	0.34	1.30	581.58	12	0.0050	0.0120	2.73	1.30	OK
CB-21	FES-3	166.9	1.28	1.28	0.55	0.70	0.70	16.26	0.66	16.92	5.28	4.22	4.04	2.85	4.14	1859.52	15	0.0100	0.0130	6.46	4.14	OK
OS-1	EX ST INLT-3	28.3	0.00	0.00	0.00	0.00	0.00	6.00	0.21	6.21	2.79	2.23	6.59	0.00	1.18	529.58	15	0.0028	0.0130	3.42	1.18	OK
OS-2	ST MH-5	177.1	0.00	0.00	0.00	0.00	0.00	6.00	0.81	6.81	4.57	3.65	6.37	0.00	5.26	2360.69	18	0.0050	0.0120	8.05	5.26	OK
FES-4	ST MH-5	6.8	0.17	0.17	0.28	0.05	0.05	6.00	0.03	6.03	4.55	3.64	6.66	0.33	0.33	147.89	12	0.0100	0.0130	3.56	0.33	OK
ST MH-5	EX ST INLT-2	214.6	0.00	0.00	0.00	0.00	0.00	6.81	1.06	7.87	4.21	3.37	5.97	0.00	5.59	2508.58	18	0.0050	0.0130	7.43	5.59	OK