Fox Run Redevelopment

Legal Description:

PT SE1/4 SEC 8 & SW1/4 SEC 9 T6N R19E COM SE COR SE1/4, N 153.02' TO BEG, N56 11'57 E 29.89', N22 19'E 198.74', N23 54'E 260.33',S85 41'32 W 206.36', N 183.94', S88 49'42 W 815',S1 10'18 E 433.16',N88 49'42 E 306.08', S1 10'18E 223.7', N88 49'42E418.32', N56 11'57 E 92.84'TO BEG DOC NO 4246692

PT SE1/4 SEC 8 T6N R19E COM SECOR SE1/4, S88 49'42 W ON S LI SE1/4 996.79', DUEN 358.51' TO BEG;DUE N 401.49';N89 49'42 E 181.79'; S1 10'18 E 433.16'; S88 49'42 W 93.92'; N1 10'18 W 31.75'; N88 49'42 E96.08' TO BEG 1.785 AC DOC NO 4246692

.

Sections 8 and 9, Township 6 North, Range 19 East,
City of Waukesha, Waukesha County, Wisconsin

STORM WATER MANAGEMENT PLAN

January 27, 2020

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STORMWATER MANAGEMENT PLAN NARRATIVE

FOX RUN REDEVELOPMENT
CITY OF WAUKESHA

Executive Summary:

A partnership of VJS Construction Services, Inc., Bedford Development LLC, and Somerstone LLC is proposing to redevelop the Fox Run Shopping Center. Under this plan, the strip mall, grocery store and restaurant are to be razed and the Chase Bank is to remain. The site is to be divided into 6 lots. A medical facility will possibly be located on Lot 1 (where Sentry is now), a future bank will possibly be located on Lot 3 (where Denny's is now), the Chase Bank will remain and 72-unit apartment complex is to be constructed on Lot 5. Lot 4 will be vacant for now and Outlot 6 will be used for storm water management. The parking lot and interior drive network have been reworked. The two existing access points for the property remain and a third right-in / right-out access point on Sunset Drive is being applied for from the County. This new access drive is located between the Lot 1 and the reservoir.

The proposed project is located in the southwest part of the City on the northwest corner of St. Paul Avenue and Sunset Drive and is part of the Southeast ¼ of Section 8 and the Southwest ¼ of Section 9, Township 6 North, Range 19 East. This project is located within the Middle Fox River Watershed.

This analysis will demonstrate that the site complies with the City's Storm Water Management Requirements.

Design Criteria:

This development is required to meet all the requirements found within the City of Waukesha's Stormwater Management and Erosion Control Ordinance (Chp. 23), and the Wisconsin Department of Natural Resources NR 151 and NR 216.

Peak Flow Reduction: The site was analyzed for peak flow reduction in which the 100-year, 10-year, 2-year and 1-year post-development runoff rates from site shall not exceed the corresponding pre-development rates.

Total Suspended Solids: Taxkey WAKC 1328999001 (11.637 acres 86.7% of the site) is classified as a redevelopment site. Taxkey WAKC 1328999002 (1.782 acres 13.3% of the site) is classified as new development. Therefore, the Total Suspended Solids (TSS) from the proposed paved areas must be reduced by 45.32% (blended rate) per Wisconsin NR 151 and the City's requirements.

Infiltration: This site is classified as High Imperviousness which has a requirement to infiltrate at least 60% of the predevelopment infiltration volume or use 2% of the site as the effective infiltration area or to the maximum extent practical.

Existing Conditions:

The existing site has a taxkey numbers of WAKC 1328999001 and 1328999002. The parcels add up to 13.3 acres and are zoned B-5. The existing soils on the site are predominantly Casco Loam (Type B), Colwood Silt Loam (Type C/D Hydric), Hochheim Loam (Type D), Loamy

Land (Type D), Martinton Silt Loam (Type C), Matherton Silt Loam (Type D) and Sebewa Silt Loam (Type D hydric) per the NRCS soil survey. See the soil map in the Appendix. Unfortunately, the main location of Casco Loam (Type B) soil is contaminated with PECs. See the Phase 2 Environmental Assessment.

Post-Development Conditions:

As mentioned above, the strip mall, grocery store and restaurant are to be razed and the Chase Bank is to remain. The site is to be divided into 6 lots. A medical facility will possibly be located on Lot 1 (where Sentry is now), a future bank will possibly be located on Lot 3 (where Denny's is now), the Chase Bank will remain and 72-unit apartment complex is to be constructed on Lot 5. Lot 4 will be vacant for now and Outlot 6 will be used for storm water management. The parking lot and interior drive network have been reworked. The two existing access points for the property remain and a third right-in / right-out access point on Sunset Drive is being applied for from the County. This new access drive is located between the Lot 1 and the reservoir.

The post-development conditions model uses blended CNs per soil type and percent impervious for each basin. This was done because the lot layouts are only conceptual at this point and an assumption had to be made for Lot 5 that has no interested buyer yet. Where possible, the conceptual impervious surface was measured and rounded. The percent impervious and blended CNs are as follows:

Basin	Percent Impervious
P1	65%/35%
P2	50%/50%
P3	80%/20%
P4	70%/30%
P5	80%/20%
P6	10%/90%

Blended CNs were created using 61, 71, and 78 respectively for lawn areas (B-D) and 98 for impervious areas regardless of the soil type. They are as follows:

Percent Impervious	Type B	Type C	Type D
10%/90%	65	74	89
50%/50%	85	87	88
65%/35%	85	89	91
70%/30%	87	90	92
80%/20%	91	93	94

Analysis Methods

HydroCAD (Version 10.00-22) software has been used to analyze stormwater characteristics for this stormwater management plan. HydroCAD uses the accepted TR-55 methodology for determining peak discharge runoff rates. Rainfall depths for the 1-year, 2-year, 10-year and 100-year storm events are 2.4", 2.7", 3.81 and 6.18" respectively, and were obtained from the City's Ordinance Chp. 32. Accordingly, the MSE 3 rainfall distribution curve was used for these models.

Peak Flow Analysis

The whole site and contributing off-site areas were analyzed for peak flow runoff rates in each basin both existing and proposed. The basin maps for the analysis can be found in the Appendix. The pre-development hydrologic parameters for the basins used in the model are as follows:

Pre-Development Hydrologic Parameters				
Subcatchment	Area, sf	Runoff CN	Impervious Area, sf	Time of Concentration, minutes
E1	151,236	87	78,050	4.3
E1A	69,403	82	15,519	8.1
E2	228,279	97	221,388	6.0
E2A	18,526	85	6,127	6.8
E3	102,726	94	83,489	4.2
E4	52,446	90	30,465	7.8
E5	50,737	89	28,041	2.8

The post-development hydrologic parameters for the basins used in the model are as follows:

Post-Development Hydrologic Parameters				
Subcatchment	Area, sf	Runoff CN	Impervious Percentage	Time of Concentration, minutes
P1	382,431	90	65%	8.2
P1A	86,183	83	25%	8.1
P2	9,957	87	50%	3.2
P3	98,621	94	80%	14.7
P4	41,373	92	70%	6.8
P5	28,163	94	80%	4.6
P6	30,596	79	10%	7.4

The results of this analysis are summarized below per discharge point from the site:

Pre / Post-Development Release Rate Comparison								
Discharge Point	Existing 1-yr Storm Q, cfs	Proposed 1-yr Storm Q, cfs	Existing 2-yr Storm Q, cfs	Proposed 2-yr Storm Q, cfs	Existing 10-yr Storm Q, cfs	Proposed 10-yr Storm Q, cfs	Existing 100-yr Storm Q, cfs	Proposed 100-yr Storm Q, cfs
24" Storm Sewer	18.19	1.17	20.69	2.98	29.92	18.37	49.52	46.92
Concrete Channel	10.12	0.91	12.27	1.16	20.50	2.18	38.52	4.55
Kohl's Pond	7.64	5.03	8.79	5.81	13.03	8.67	21.93	14.65
Highway Ditch	3.27	2.59	3.87	3.02	6.11	4.59	10.89	7.90
Highway Storm Sewer	2.90	2.05	3.42	2.36	5.35	3.50	9.46	5.90
TOTAL DISCHARGE with OFF-SITE	41.00	9.76	47.75	11.42	73.00	29.74	127.06	68.54

Note that the proposed release rates are lower for each storm respectively at all discharge points and the total discharge of the site including the off-site drainage that flows through the site.

It should be noted that the proposed site has less impervious surface than the existing site. Therefore, the bioretention pond is not necessary to meet the peak flow reduction criteria. It is needed to meet the water quality criteria.

Kohl's Pond

We will call the existing pond to the east the Kohl's pond because it was built when Kohl's was built, even though two other properties including Fox Run also discharge runoff to the pond. It should be noted that the 2001 Storm Water Management Plan for the pond incorrectly characterized the Fox Run property. The report states that 9.88 acres of Fox Run drain the culvert under St. Paul, of which 3.13 are captured by the new (Kohl's) pond. Our survey demonstrates that only 2.36 acres drain to the Kohl's pond (Basin E3) and that only 0.95 acre drain directly to the St. Paul culvert (Basin E4). The majority of the site drains to Pebble Creek either by the storm sewer or by the concrete channel.

The City staff has expressed skepticism about whether the Kohl's pond works as designed. While this analysis seems out of the scope of this project, what can be said is that this development will be sending less acreage to the Kohl's pond then it was designed to take and after redevelopment, the impervious surface will be significantly decreased as well.

Runoff Water Quality

A minimum of 45.32% (blended rate) TSS removal is required per NR 151 and the City's ordinance as discussed above. WinSLAMM (Version 10.3.4) was used for the analysis. By using the bio retention pond and the grassy swales, the reduction was achieved.

Sediment Load Reduction				
Area	Area (AC)	Sediment Load (LB)	Sediment Discharge (LB)	Sediment Reduction
Modeled Area	11.19	4418	1526	65.46%

This analysis was conducted for the entire site except for Basin P3, which drains to the Kohl's pond. For the purposes of this report, it is assumed that the Kohl's pond produces the TSS removal that it was designed to in the 2001 SWMP. For the sake of argument, the model was run including Basin P3 and the resulting sediment removal was 52.85%, which is still higher than the required removal rate.

The bottom line on the preliminary bio retention design is that it is oversized based on the City's storm water goals. The pond could be tightened up for the final design.

Infiltration

Most of the site has Type D soils, some with hydric components. There is one large area with Type B soils, however, that is where the contaminated soils are located. Therefore, this site is not suitable for infiltration. However, the bio retention pond will produce a small amount of infiltration.

Soils Investigation

Soil borings will be conducted for the final design of the storm water management. This preliminary SWMP relies solely on soil types for now.

Preserve Natural Topography

The site has been mass graded in the past. There is no natural topography to preserve.

Installation Schedule of Stormwater Management Practices

The bio retention pond without the engineered soil will be constructed first and the sides stabilized immediately. It will be used as a sediment basin during construction. After the areas upstream are substantially stabilized, the pond will be cleaned out and then engineered soils and plants installed. As the contractor grades the site, he will grade the grassy swales and immediately seed, install erosion mat and ditch checks.

Maintenance Plan and Cost Estimate

The bio retention pond will cost about $50,000 to construct. There will be the occasional wash out, silt build up, or shrub removal and plan replacement that will need to take place. The pond should be inspected on a yearly basis. It is estimated that one or more of these items will need to be address every 5 years at a present day cost of about $2,000 for small repairs to $20,000 for full replacement of engineered soil and plants.

Conclusion

The storm water management features for the development have been designed to comply with the storm water goals set forth by the Wisconsin Department of Natural Resources and the City of Waukesha.

APPENDIX A

SOIL MAP

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,240 if printed on A landscape (11" x 8.5") sheet.

N

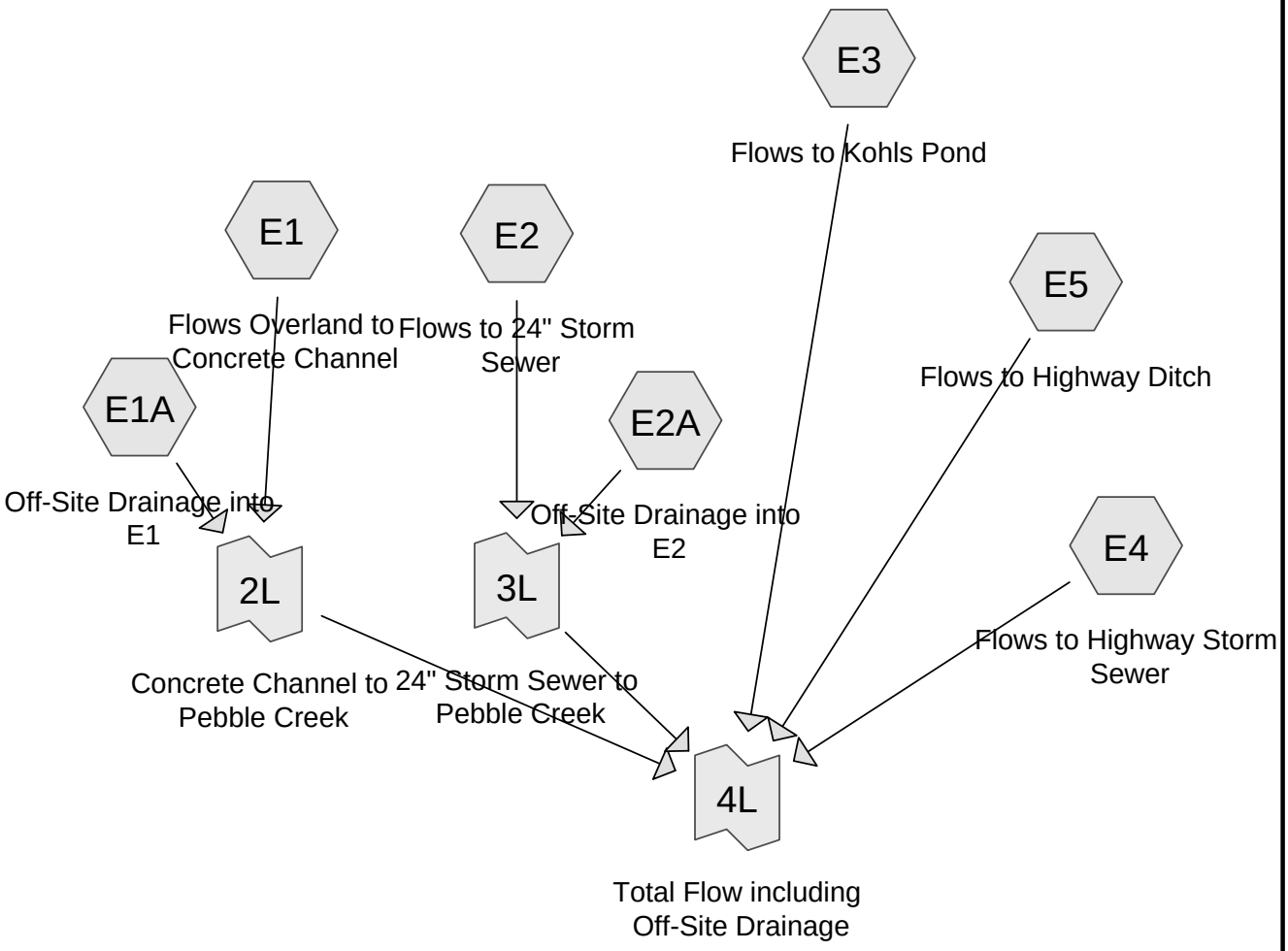
Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

APPENDIX B

PRE-DEVELOPMENT FLOW DATA



Subcat Reach Pond Link

Routing Diagram for Existing Conditions
Prepared by Microsoft, Printed 1/27/2020

Summary for Subcatchment E1: Flows Overland to Concrete Channel

Runoff = 8.13 cfs @ 12.11 hrs, Volume= 0.340 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
	3,652	61	>75% Grass cover, Good, HSG B
	20,009	98	Paved parking, HSG B
	448	98	Roofs, HSG B
*	12,835	71	>75% Grass cover, Good, HSG C
	867	98	Paved parking, HSG C
*	56,699	78	>75% Grass cover, Good, HSG D
	56,268	98	Paved parking, HSG D
	458	98	Roofs, HSG D
	151,236	87	Weighted Average
	73,186		48.39% Pervious Area
	78,050		51.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	8	0.0400	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.4	92	0.0150	1.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
0.4	67	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	170	0.0100	4.54	3.56	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.8	140	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.3	477	Total			

Summary for Subcatchment E1A: Off-Site Drainage into E1

Runoff = 2.43 cfs @ 12.16 hrs, Volume= 0.117 af, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	53,884	78	>75% Grass cover, Good, HSG D
	5,392	98	Paved parking, HSG D
	10,127	98	Roofs, HSG D
	69,403	82	Weighted Average
	53,884		77.64% Pervious Area
	15,519		22.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment E2: Flows to 24" Storm Sewer

Runoff = 17.39 cfs @ 12.13 hrs, Volume= 0.873 af, Depth> 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
	1,552	61	>75% Grass cover, Good, HSG B
	12,583	98	Paved parking, HSG B
	29,163	98	Roofs, HSG B
*	5,339	78	>75% Grass cover, Good, HSG D
	90,863	98	Paved parking, HSG D
	88,779	98	Roofs, HSG D
	228,279	97	Weighted Average
	6,891		3.02% Pervious Area
	221,388		96.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1200	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.6	50	0.0400	1.45		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.7	260	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	140	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
6.0	500	Total			

Summary for Subcatchment E2A: Off-Site Drainage into E2

Runoff = 0.82 cfs @ 12.14 hrs, Volume= 0.037 af, Depth> 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	12,399	78	>75% Grass cover, Good, HSG D
	6,127	98	Roofs, HSG D
	18,526	85	Weighted Average
	12,399		66.93% Pervious Area
	6,127		33.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	90	0.0500	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment E3: Flows to Kohls Pond

Runoff = 7.64 cfs @ 12.10 hrs, Volume= 0.337 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
	4,373	61	>75% Grass cover, Good, HSG B
	1,521	98	Paved parking, HSG B
*	14,864	78	>75% Grass cover, Good, HSG D
	74,374	98	Paved parking, HSG D
	3,543	98	Roofs, HSG D
	4,051	98	Water Surface, HSG D
	102,726	94	Weighted Average
	19,237		18.73% Pervious Area
	83,489		81.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.7	400	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	500	Total			

Summary for Subcatchment E4: Flows to Highway Storm Sewer

Runoff = 2.90 cfs @ 12.15 hrs, Volume= 0.139 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	21,981	78	>75% Grass cover, Good, HSG D
	30,299	98	Paved parking, HSG D
	166	98	Roofs, HSG D
	52,446	90	Weighted Average
	21,981		41.91% Pervious Area
	30,465		58.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1660	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.9	40	0.0400	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.2	50	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.7	320	0.1500	7.86		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.8	470	Total			

Summary for Subcatchment E5: Flows to Highway Ditch

Runoff = 3.27 cfs @ 12.09 hrs, Volume= 0.127 af, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	22,696	78	>75% Grass cover, Good, HSG D
	21,802	98	Paved parking, HSG D
	6,239	98	Roofs, HSG D
	50,737	89	Weighted Average
	22,696		44.73% Pervious Area
	28,041		55.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.1	160	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.8	305	Total			

Summary for Link 2L: Concrete Channel to Pebble Creek

Inflow Area = 5.065 ac, 42.41% Impervious, Inflow Depth > 1.08" for 1-YR event
Inflow = 10.12 cfs @ 12.12 hrs, Volume= 0.457 af
Primary = 10.12 cfs @ 12.12 hrs, Volume= 0.457 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: 24" Storm Sewer to Pebble Creek

Inflow Area = 5.666 ac, 92.18% Impervious, Inflow Depth > 1.93" for 1-YR event
Inflow = 18.19 cfs @ 12.13 hrs, Volume= 0.910 af
Primary = 18.19 cfs @ 12.13 hrs, Volume= 0.910 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4L: Total Flow including Off-Site Drainage

Inflow Area = 15.458 ac, 68.77% Impervious, Inflow Depth > 1.53" for 1-YR event
Inflow = 41.00 cfs @ 12.12 hrs, Volume= 1.970 af
Primary = 41.00 cfs @ 12.12 hrs, Volume= 1.970 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E1: Flows Overland to Concrete Channel

Runoff = 9.77 cfs @ 12.11 hrs, Volume= 0.411 af, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
	3,652	61	>75% Grass cover, Good, HSG B
	20,009	98	Paved parking, HSG B
	448	98	Roofs, HSG B
*	12,835	71	>75% Grass cover, Good, HSG C
	867	98	Paved parking, HSG C
*	56,699	78	>75% Grass cover, Good, HSG D
	56,268	98	Paved parking, HSG D
	458	98	Roofs, HSG D
	151,236	87	Weighted Average
	73,186		48.39% Pervious Area
	78,050		51.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	8	0.0400	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.4	92	0.0150	1.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
0.4	67	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	170	0.0100	4.54	3.56	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.8	140	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.3	477	Total			

Summary for Subcatchment E1A: Off-Site Drainage into E1

Runoff = 3.03 cfs @ 12.16 hrs, Volume= 0.145 af, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	53,884	78	>75% Grass cover, Good, HSG D
	5,392	98	Paved parking, HSG D
	10,127	98	Roofs, HSG D
	69,403	82	Weighted Average
	53,884		77.64% Pervious Area
	15,519		22.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment E2: Flows to 24" Storm Sewer

Runoff = 19.71 cfs @ 12.13 hrs, Volume= 0.998 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
	1,552	61	>75% Grass cover, Good, HSG B
	12,583	98	Paved parking, HSG B
	29,163	98	Roofs, HSG B
*	5,339	78	>75% Grass cover, Good, HSG D
	90,863	98	Paved parking, HSG D
	88,779	98	Roofs, HSG D
	228,279	97	Weighted Average
	6,891		3.02% Pervious Area
	221,388		96.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1200	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.6	50	0.0400	1.45		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.7	260	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	140	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
6.0	500	Total			

Summary for Subcatchment E2A: Off-Site Drainage into E2

Runoff = 1.00 cfs @ 12.14 hrs, Volume= 0.045 af, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	12,399	78	>75% Grass cover, Good, HSG D
	6,127	98	Roofs, HSG D
	18,526	85	Weighted Average
	12,399		66.93% Pervious Area
	6,127		33.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	90	0.0500	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment E3: Flows to Kohls Pond

Runoff = 8.79 cfs @ 12.10 hrs, Volume= 0.392 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
	4,373	61	>75% Grass cover, Good, HSG B
	1,521	98	Paved parking, HSG B
*	14,864	78	>75% Grass cover, Good, HSG D
	74,374	98	Paved parking, HSG D
	3,543	98	Roofs, HSG D
	4,051	98	Water Surface, HSG D
	102,726	94	Weighted Average
	19,237		18.73% Pervious Area
	83,489		81.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.7	400	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	500	Total			

Summary for Subcatchment E4: Flows to Highway Storm Sewer

Runoff = 3.42 cfs @ 12.15 hrs, Volume= 0.165 af, Depth> 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	21,981	78	>75% Grass cover, Good, HSG D
	30,299	98	Paved parking, HSG D
	166	98	Roofs, HSG D
	52,446	90	Weighted Average
	21,981		41.91% Pervious Area
	30,465		58.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1660	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.9	40	0.0400	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.2	50	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.7	320	0.1500	7.86		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.8	470	Total			

Summary for Subcatchment E5: Flows to Highway Ditch

Runoff = 3.87 cfs @ 12.09 hrs, Volume= 0.152 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	22,696	78	>75% Grass cover, Good, HSG D
	21,802	98	Paved parking, HSG D
	6,239	98	Roofs, HSG D
	50,737	89	Weighted Average
	22,696		44.73% Pervious Area
	28,041		55.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.1	160	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.8	305	Total			

Summary for Link 2L: Concrete Channel to Pebble Creek

Inflow Area = 5.065 ac, 42.41% Impervious, Inflow Depth > 1.32" for 2-YR event
Inflow = 12.27 cfs @ 12.12 hrs, Volume= 0.556 af
Primary = 12.27 cfs @ 12.12 hrs, Volume= 0.556 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: 24" Storm Sewer to Pebble Creek

Inflow Area = 5.666 ac, 92.18% Impervious, Inflow Depth > 2.21" for 2-YR event
Inflow = 20.69 cfs @ 12.13 hrs, Volume= 1.044 af
Primary = 20.69 cfs @ 12.13 hrs, Volume= 1.044 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4L: Total Flow including Off-Site Drainage

Inflow Area = 15.458 ac, 68.77% Impervious, Inflow Depth > 1.79" for 2-YR event
Inflow = 47.75 cfs @ 12.12 hrs, Volume= 2.308 af
Primary = 47.75 cfs @ 12.12 hrs, Volume= 2.308 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E1: Flows Overland to Concrete Channel

Runoff = 15.97 cfs @ 12.11 hrs, Volume= 0.686 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
	3,652	61	>75% Grass cover, Good, HSG B
	20,009	98	Paved parking, HSG B
	448	98	Roofs, HSG B
*	12,835	71	>75% Grass cover, Good, HSG C
	867	98	Paved parking, HSG C
*	56,699	78	>75% Grass cover, Good, HSG D
	56,268	98	Paved parking, HSG D
	458	98	Roofs, HSG D
	151,236	87	Weighted Average
	73,186		48.39% Pervious Area
	78,050		51.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	8	0.0400	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.4	92	0.0150	1.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
0.4	67	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	170	0.0100	4.54	3.56	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.8	140	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.3	477	Total			

Summary for Subcatchment E1A: Off-Site Drainage into E1

Runoff = 5.39 cfs @ 12.15 hrs, Volume= 0.260 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	53,884	78	>75% Grass cover, Good, HSG D
	5,392	98	Paved parking, HSG D
	10,127	98	Roofs, HSG D
	69,403	82	Weighted Average
	53,884		77.64% Pervious Area
	15,519		22.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment E2: Flows to 24" Storm Sewer

Runoff = 28.26 cfs @ 12.13 hrs, Volume= 1.461 af, Depth> 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
	1,552	61	>75% Grass cover, Good, HSG B
	12,583	98	Paved parking, HSG B
	29,163	98	Roofs, HSG B
*	5,339	78	>75% Grass cover, Good, HSG D
	90,863	98	Paved parking, HSG D
	88,779	98	Roofs, HSG D
	228,279	97	Weighted Average
	6,891		3.02% Pervious Area
	221,388		96.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1200	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.6	50	0.0400	1.45		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.7	260	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	140	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
6.0	500	Total			

Summary for Subcatchment E2A: Off-Site Drainage into E2

Runoff = 1.68 cfs @ 12.14 hrs, Volume= 0.078 af, Depth> 2.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	12,399	78	>75% Grass cover, Good, HSG D
	6,127	98	Roofs, HSG D
	18,526	85	Weighted Average
	12,399		66.93% Pervious Area
	6,127		33.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	90	0.0500	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment E3: Flows to Kohls Pond

Runoff = 13.03 cfs @ 12.10 hrs, Volume= 0.597 af, Depth> 3.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
	4,373	61	>75% Grass cover, Good, HSG B
	1,521	98	Paved parking, HSG B
*	14,864	78	>75% Grass cover, Good, HSG D
	74,374	98	Paved parking, HSG D
	3,543	98	Roofs, HSG D
	4,051	98	Water Surface, HSG D
	102,726	94	Weighted Average
	19,237		18.73% Pervious Area
	83,489		81.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.7	400	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	500	Total			

Summary for Subcatchment E4: Flows to Highway Storm Sewer

Runoff = 5.35 cfs @ 12.15 hrs, Volume= 0.265 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	21,981	78	>75% Grass cover, Good, HSG D
	30,299	98	Paved parking, HSG D
	166	98	Roofs, HSG D
	52,446	90	Weighted Average
	21,981		41.91% Pervious Area
	30,465		58.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1660	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.9	40	0.0400	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.2	50	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.7	320	0.1500	7.86		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.8	470	Total			

Summary for Subcatchment E5: Flows to Highway Ditch

Runoff = 6.11 cfs @ 12.09 hrs, Volume= 0.248 af, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	22,696	78	>75% Grass cover, Good, HSG D
	21,802	98	Paved parking, HSG D
	6,239	98	Roofs, HSG D
	50,737	89	Weighted Average
	22,696		44.73% Pervious Area
	28,041		55.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.1	160	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.8	305	Total			

Summary for Link 2L: Concrete Channel to Pebble Creek

Inflow Area = 5.065 ac, 42.41% Impervious, Inflow Depth > 2.24" for 10-YR event
Inflow = 20.50 cfs @ 12.11 hrs, Volume= 0.946 af
Primary = 20.50 cfs @ 12.11 hrs, Volume= 0.946 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: 24" Storm Sewer to Pebble Creek

Inflow Area = 5.666 ac, 92.18% Impervious, Inflow Depth > 3.26" for 10-YR event
Inflow = 29.92 cfs @ 12.13 hrs, Volume= 1.539 af
Primary = 29.92 cfs @ 12.13 hrs, Volume= 1.539 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4L: Total Flow including Off-Site Drainage

Inflow Area = 15.458 ac, 68.77% Impervious, Inflow Depth > 2.79" for 10-YR event
Inflow = 73.00 cfs @ 12.11 hrs, Volume= 3.595 af
Primary = 73.00 cfs @ 12.11 hrs, Volume= 3.595 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E1: Flows Overland to Concrete Channel

Runoff = 29.37 cfs @ 12.10 hrs, Volume= 1.311 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
	3,652	61	>75% Grass cover, Good, HSG B
	20,009	98	Paved parking, HSG B
	448	98	Roofs, HSG B
*	12,835	71	>75% Grass cover, Good, HSG C
	867	98	Paved parking, HSG C
*	56,699	78	>75% Grass cover, Good, HSG D
	56,268	98	Paved parking, HSG D
	458	98	Roofs, HSG D
	151,236	87	Weighted Average
	73,186		48.39% Pervious Area
	78,050		51.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	8	0.0400	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.4	92	0.0150	1.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
0.4	67	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	170	0.0100	4.54	3.56	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.8	140	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.3	477	Total			

Summary for Subcatchment E1A: Off-Site Drainage into E1

Runoff = 10.72 cfs @ 12.15 hrs, Volume= 0.531 af, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	53,884	78	>75% Grass cover, Good, HSG D
	5,392	98	Paved parking, HSG D
	10,127	98	Roofs, HSG D
	69,403	82	Weighted Average
	53,884		77.64% Pervious Area
	15,519		22.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment E2: Flows to 24" Storm Sewer

Runoff = 46.36 cfs @ 12.13 hrs, Volume= 2.447 af, Depth> 5.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
	1,552	61	>75% Grass cover, Good, HSG B
	12,583	98	Paved parking, HSG B
	29,163	98	Roofs, HSG B
*	5,339	78	>75% Grass cover, Good, HSG D
	90,863	98	Paved parking, HSG D
	88,779	98	Roofs, HSG D
	228,279	97	Weighted Average
	6,891		3.02% Pervious Area
	221,388		96.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1200	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.6	50	0.0400	1.45		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.7	260	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.7	140	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
6.0	500	Total			

Summary for Subcatchment E2A: Off-Site Drainage into E2

Runoff = 3.19 cfs @ 12.14 hrs, Volume= 0.153 af, Depth> 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	12,399	78	>75% Grass cover, Good, HSG D
	6,127	98	Roofs, HSG D
	18,526	85	Weighted Average
	12,399		66.93% Pervious Area
	6,127		33.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	90	0.0500	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment E3: Flows to Kohls Pond

Runoff = 21.93 cfs @ 12.10 hrs, Volume= 1.042 af, Depth> 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
	4,373	61	>75% Grass cover, Good, HSG B
	1,521	98	Paved parking, HSG B
*	14,864	78	>75% Grass cover, Good, HSG D
	74,374	98	Paved parking, HSG D
	3,543	98	Roofs, HSG D
	4,051	98	Water Surface, HSG D
	102,726	94	Weighted Average
	19,237		18.73% Pervious Area
	83,489		81.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.7	400	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	500	Total			

Summary for Subcatchment E4: Flows to Highway Storm Sewer

Runoff = 9.46 cfs @ 12.15 hrs, Volume= 0.487 af, Depth> 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	21,981	78	>75% Grass cover, Good, HSG D
	30,299	98	Paved parking, HSG D
	166	98	Roofs, HSG D
	52,446	90	Weighted Average
	21,981		41.91% Pervious Area
	30,465		58.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1660	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.9	40	0.0400	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.2	50	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.7	320	0.1500	7.86		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.8	470	Total			

Summary for Subcatchment E5: Flows to Highway Ditch

Runoff = 10.89 cfs @ 12.09 hrs, Volume= 0.461 af, Depth> 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	22,696	78	>75% Grass cover, Good, HSG D
	21,802	98	Paved parking, HSG D
	6,239	98	Roofs, HSG D
	50,737	89	Weighted Average
	22,696		44.73% Pervious Area
	28,041		55.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0150	1.13		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.1	160	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.8	305	Total			

Summary for Link 2L: Concrete Channel to Pebble Creek

Inflow Area = 5.065 ac, 42.41% Impervious, Inflow Depth > 4.36" for 100-YR event
Inflow = 38.52 cfs @ 12.11 hrs, Volume= 1.842 af
Primary = 38.52 cfs @ 12.11 hrs, Volume= 1.842 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: 24" Storm Sewer to Pebble Creek

Inflow Area = 5.666 ac, 92.18% Impervious, Inflow Depth > 5.51" for 100-YR event
Inflow = 49.52 cfs @ 12.13 hrs, Volume= 2.600 af
Primary = 49.52 cfs @ 12.13 hrs, Volume= 2.600 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

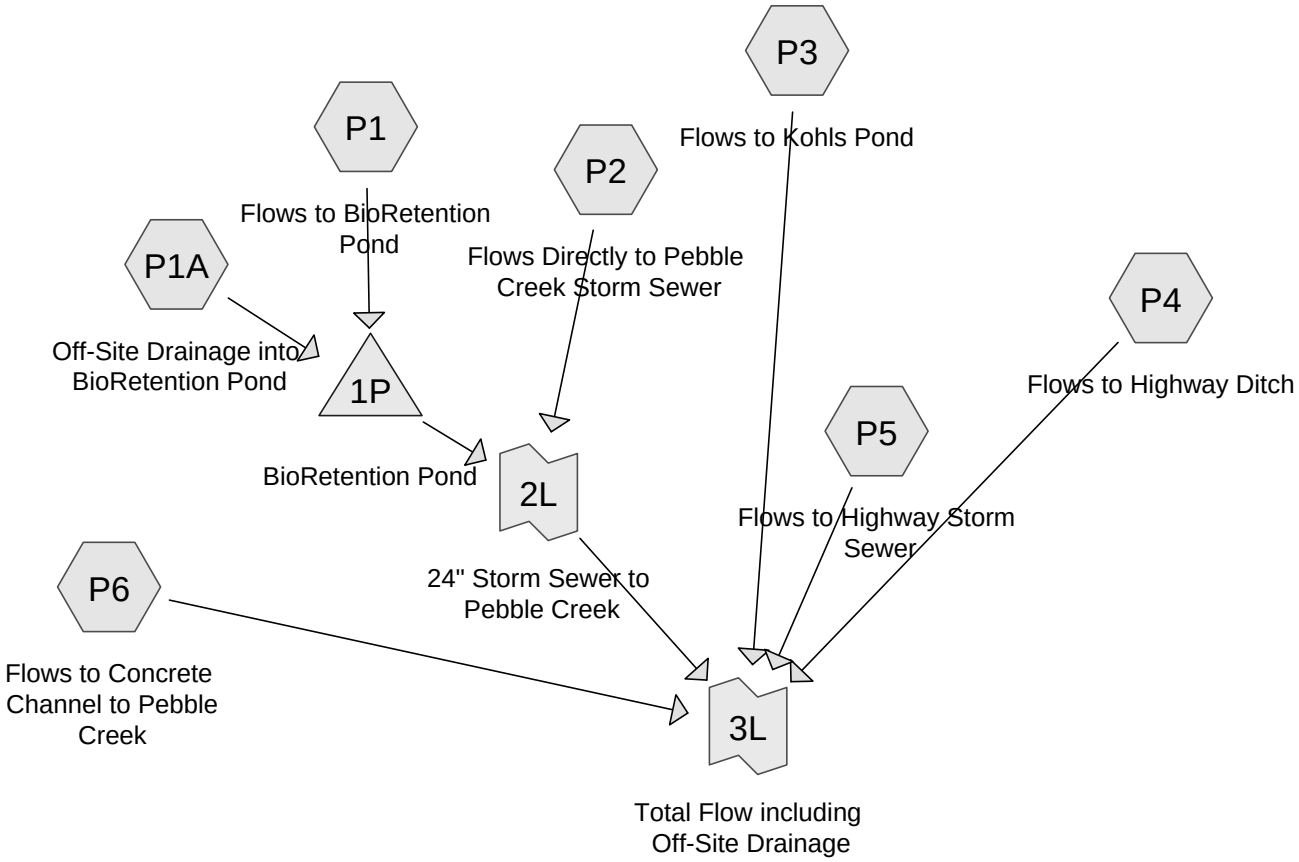
Summary for Link 4L: Total Flow including Off-Site Drainage

Inflow Area = 15.458 ac, 68.77% Impervious, Inflow Depth > 4.99" for 100-YR event
Inflow = 127.06 cfs @ 12.11 hrs, Volume= 6.433 af
Primary = 127.06 cfs @ 12.11 hrs, Volume= 6.433 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

APPENDIX C

POST-DEVELOPMENT FLOW DATA



Subcat Reach Pond Link

Routing Diagram for Proposed Conditions
Prepared by Microsoft, Printed 1/27/2020

Summary for Subcatchment P1: Flows to BioRetention Pond

Runoff = 20.77 cfs @ 12.15 hrs, Volume= 1.013 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	52,689	85	Type B 65%
*	10,870	89	Type C 65%
*	318,872	91	Type D 65%
	382,431	90	Weighted Average
	382,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	40	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.0	60	0.0150	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.1	480	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
8.2	580	Total			

Summary for Subcatchment P1A: Off-Site Drainage into BioRetention Pond

Runoff = 3.21 cfs @ 12.16 hrs, Volume= 0.154 af, Depth> 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	86,183	83	From Existing Conditions Model
	86,183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment P2: Flows Directly to Pebble Creek Storm Sewer

Runoff = 0.57 cfs @ 12.10 hrs, Volume= 0.022 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	4,051	85	Type B 50%
*	5,906	88	Type D 50%
	9,957	87	Weighted Average
	9,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	30	0.0500	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.4	40	0.0500	1.52		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
3.2	70	Total			

Summary for Subcatchment P3: Flows to Kohls Pond

Runoff = 5.03 cfs @ 12.23 hrs, Volume= 0.323 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	5,889	91	Type B 80%
*	92,732	94	Type D 80%
	98,621	94	Weighted Average
	98,621		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.1	280	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	270	0.0050	5.09	16.00	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.7	650	Total			

Summary for Subcatchment P4: Flows to Highway Ditch

Runoff = 2.59 cfs @ 12.14 hrs, Volume= 0.122 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	41,373	92	Type D 70%
	41,373		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	95	0.0550	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment P5: Flows to Highway Storm Sewer

Runoff = 2.05 cfs @ 12.11 hrs, Volume= 0.092 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	28,163	94	Type D 80%
	28,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	20	0.0400	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.2	80	0.0150	1.08		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.2	180	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.6	280	Total			

Summary for Subcatchment P6: Flows to Concrete Channel to Pebble Creek

Runoff = 0.91 cfs @ 12.15 hrs, Volume= 0.043 af, Depth> 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	10,693	65	Type B 10%
*	2,828	74	Type C 10%
*	17,075	89	Type D 10%
	30,596	79	Weighted Average
	30,596		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Pond 1P: BioRetention Pond

Inflow Area = 10.758 ac, 0.00% Impervious, Inflow Depth > 1.30" for 1-YR event
Inflow = 23.98 cfs @ 12.15 hrs, Volume= 1.167 af
Outflow = 1.53 cfs @ 13.39 hrs, Volume= 0.443 af, Atten= 94%, Lag= 74.2 min
Discarded = 0.39 cfs @ 13.39 hrs, Volume= 0.289 af
Primary = 1.14 cfs @ 13.39 hrs, Volume= 0.154 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 28.59' @ 13.39 hrs Surf.Area= 23,240 sf Storage= 34,416 cf

Plug-Flow detention time= 186.0 min calculated for 0.441 af (38% of inflow)
Center-of-Mass det. time= 118.0 min (898.6 - 780.6)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	82,838 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	20,018	0	0
29.00	24,068	44,086	44,086
30.00	26,457	25,263	69,349
30.50	27,500	13,489	82,838

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**24.0" Round Culvert** L= 200.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.00' / 24.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	28.50'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	29.80'	**Asymmetrical Weir, C= 3.27** Offset (feet) -100.00 0.00 100.00 Height (feet) 1.00 0.00 1.00
#4	Discarded	27.00'	**0.600 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'

Discarded OutFlow Max=0.39 cfs @ 13.39 hrs HW=28.59' (Free Discharge)
└**4=Exfiltration** (Controls 0.39 cfs)

Primary OutFlow Max=1.13 cfs @ 13.39 hrs HW=28.59' (Free Discharge)
└**1=Culvert** (Passes 1.13 cfs of 20.31 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.13 cfs @ 0.99 fps)
└**3=Asymmetrical Weir** (Controls 0.00 cfs)

Summary for Link 2L: 24" Storm Sewer to Pebble Creek

Inflow Area = 10.986 ac, 0.00% Impervious, Inflow Depth > 0.19" for 1-YR event
Inflow = 1.17 cfs @ 13.38 hrs, Volume= 0.177 af
Primary = 1.17 cfs @ 13.38 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Total Flow including Off-Site Drainage

Inflow Area = 15.549 ac, 0.00% Impervious, Inflow Depth > 0.58" for 1-YR event
Inflow = 9.76 cfs @ 12.15 hrs, Volume= 0.756 af
Primary = 9.76 cfs @ 12.15 hrs, Volume= 0.756 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P1: Flows to BioRetention Pond

Runoff = 24.50 cfs @ 12.15 hrs, Volume= 1.203 af, Depth> 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	52,689	85	Type B 65%
*	10,870	89	Type C 65%
*	318,872	91	Type D 65%
	382,431	90	Weighted Average
	382,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	40	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.0	60	0.0150	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.1	480	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
8.2	580	Total			

Summary for Subcatchment P1A: Off-Site Drainage into BioRetention Pond

Runoff = 3.97 cfs @ 12.16 hrs, Volume= 0.190 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	86,183	83	From Existing Conditions Model
	86,183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment P2: Flows Directly to Pebble Creek Storm Sewer

Runoff = 0.68 cfs @ 12.10 hrs, Volume= 0.027 af, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	4,051	85	Type B 50%
*	5,906	88	Type D 50%
	9,957	87	Weighted Average
	9,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	30	0.0500	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.4	40	0.0500	1.52		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
3.2	70	Total			

Summary for Subcatchment P3: Flows to Kohls Pond

Runoff = 5.81 cfs @ 12.23 hrs, Volume= 0.375 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	5,889	91	Type B 80%
*	92,732	94	Type D 80%
	98,621	94	Weighted Average
	98,621		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.1	280	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	270	0.0050	5.09	16.00	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.7	650	Total			

Summary for Subcatchment P4: Flows to Highway Ditch

Runoff = 3.02 cfs @ 12.14 hrs, Volume= 0.143 af, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	41,373	92	Type D 70%
	41,373		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	95	0.0550	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment P5: Flows to Highway Storm Sewer

Runoff = 2.36 cfs @ 12.11 hrs, Volume= 0.107 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	28,163	94	Type D 80%
	28,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	20	0.0400	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.2	80	0.0150	1.08		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.2	180	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.6	280	Total			

Summary for Subcatchment P6: Flows to Concrete Channel to Pebble Creek

Runoff = 1.16 cfs @ 12.15 hrs, Volume= 0.054 af, Depth> 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	10,693	65	Type B 10%
*	2,828	74	Type C 10%
*	17,075	89	Type D 10%
	30,596	79	Weighted Average
	30,596		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Pond 1P: BioRetention Pond

Inflow Area = 10.758 ac, 0.00% Impervious, Inflow Depth > 1.55" for 2-YR event
Inflow = 28.47 cfs @ 12.15 hrs, Volume= 1.393 af
Outflow = 3.32 cfs @ 12.68 hrs, Volume= 0.659 af, Atten= 88%, Lag= 31.4 min
Discarded = 0.40 cfs @ 12.68 hrs, Volume= 0.298 af
Primary = 2.93 cfs @ 12.68 hrs, Volume= 0.361 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 28.67' @ 12.68 hrs Surf.Area= 23,403 sf Storage= 36,295 cf

Plug-Flow detention time= 148.9 min calculated for 0.657 af (47% of inflow)
Center-of-Mass det. time= 85.6 min (863.3 - 777.7)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	82,838 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	20,018	0	0
29.00	24,068	44,086	44,086
30.00	26,457	25,263	69,349
30.50	27,500	13,489	82,838

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**24.0" Round Culvert** L= 200.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.00' / 24.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	28.50'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	29.80'	**Asymmetrical Weir, C= 3.27** Offset (feet) -100.00 0.00 100.00 Height (feet) 1.00 0.00 1.00
#4	Discarded	27.00'	**0.600 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'

Discarded OutFlow Max=0.40 cfs @ 12.68 hrs HW=28.67' (Free Discharge)
└**4=Exfiltration** (Controls 0.40 cfs)

Primary OutFlow Max=2.92 cfs @ 12.68 hrs HW=28.67' (Free Discharge)
└**1=Culvert** (Passes 2.92 cfs of 20.62 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 2.92 cfs @ 1.35 fps)
└**3=Asymmetrical Weir** (Controls 0.00 cfs)

Summary for Link 2L: 24" Storm Sewer to Pebble Creek

Inflow Area = 10.986 ac, 0.00% Impervious, Inflow Depth > 0.42" for 2-YR event
Inflow = 2.98 cfs @ 12.68 hrs, Volume= 0.388 af
Primary = 2.98 cfs @ 12.68 hrs, Volume= 0.388 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Total Flow including Off-Site Drainage

Inflow Area = 15.549 ac, 0.00% Impervious, Inflow Depth > 0.82" for 2-YR event
Inflow = 11.42 cfs @ 12.15 hrs, Volume= 1.068 af
Primary = 11.42 cfs @ 12.15 hrs, Volume= 1.068 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P1: Flows to BioRetention Pond

Runoff = 38.41 cfs @ 12.15 hrs, Volume= 1.933 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	52,689	85	Type B 65%
*	10,870	89	Type C 65%
*	318,872	91	Type D 65%
	382,431	90	Weighted Average
	382,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	40	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.0	60	0.0150	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.1	480	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
8.2	580	Total			

Summary for Subcatchment P1A: Off-Site Drainage into BioRetention Pond

Runoff = 6.94 cfs @ 12.15 hrs, Volume= 0.335 af, Depth> 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	86,183	83	From Existing Conditions Model
	86,183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment P2: Flows Directly to Pebble Creek Storm Sewer

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.045 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	4,051	85	Type B 50%
*	5,906	88	Type D 50%
	9,957	87	Weighted Average
	9,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	30	0.0500	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.4	40	0.0500	1.52		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
3.2	70	Total			

Summary for Subcatchment P3: Flows to Kohls Pond

Runoff = 8.67 cfs @ 12.22 hrs, Volume= 0.572 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	5,889	91	Type B 80%
*	92,732	94	Type D 80%
	98,621	94	Weighted Average
	98,621		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.1	280	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	270	0.0050	5.09	16.00	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.7	650	Total			

Summary for Subcatchment P4: Flows to Highway Ditch

Runoff = 4.59 cfs @ 12.14 hrs, Volume= 0.224 af, Depth> 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	41,373	92	Type D 70%
	41,373		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	95	0.0550	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment P5: Flows to Highway Storm Sewer

Runoff = 3.50 cfs @ 12.11 hrs, Volume= 0.164 af, Depth> 3.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	28,163	94	Type D 80%
	28,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	20	0.0400	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.2	80	0.0150	1.08		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.2	180	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.6	280	Total			

Summary for Subcatchment P6: Flows to Concrete Channel to Pebble Creek

Runoff = 2.18 cfs @ 12.15 hrs, Volume= 0.101 af, Depth> 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	10,693	65	Type B 10%
*	2,828	74	Type C 10%
*	17,075	89	Type D 10%
	30,596	79	Weighted Average
	30,596		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Pond 1P: BioRetention Pond

Inflow Area = 10.758 ac, 0.00% Impervious, Inflow Depth > 2.53" for 10-YR event
Inflow = 45.35 cfs @ 12.15 hrs, Volume= 2.268 af
Outflow = 18.56 cfs @ 12.32 hrs, Volume= 1.519 af, Atten= 59%, Lag= 9.9 min
Discarded = 0.43 cfs @ 12.32 hrs, Volume= 0.332 af
Primary = 18.13 cfs @ 12.32 hrs, Volume= 1.187 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 29.08' @ 12.32 hrs Surf.Area= 24,258 sf Storage= 46,007 cf

Plug-Flow detention time= 100.2 min calculated for 1.519 af (67% of inflow)
Center-of-Mass det. time= 45.8 min (815.5 - 769.7)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	82,838 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	20,018	0	0
29.00	24,068	44,086	44,086
30.00	26,457	25,263	69,349
30.50	27,500	13,489	82,838

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**24.0" Round Culvert** L= 200.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.00' / 24.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	28.50'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	29.80'	**Asymmetrical Weir, C= 3.27** Offset (feet) -100.00 0.00 100.00 Height (feet) 1.00 0.00 1.00
#4	Discarded	27.00'	**0.600 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'

Discarded OutFlow Max=0.43 cfs @ 12.32 hrs HW=29.07' (Free Discharge)
└**4=Exfiltration** (Controls 0.43 cfs)

Primary OutFlow Max=17.87 cfs @ 12.32 hrs HW=29.07' (Free Discharge)
└**1=Culvert** (Passes 17.87 cfs of 22.12 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 17.87 cfs @ 2.48 fps)
└**3=Asymmetrical Weir** (Controls 0.00 cfs)

Summary for Link 2L: 24" Storm Sewer to Pebble Creek

Inflow Area = 10.986 ac, 0.00% Impervious, Inflow Depth > 1.35" for 10-YR event
Inflow = 18.37 cfs @ 12.32 hrs, Volume= 1.233 af
Primary = 18.37 cfs @ 12.32 hrs, Volume= 1.233 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Total Flow including Off-Site Drainage

Inflow Area = 15.549 ac, 0.00% Impervious, Inflow Depth > 1.77" for 10-YR event
Inflow = 29.74 cfs @ 12.27 hrs, Volume= 2.294 af
Primary = 29.74 cfs @ 12.27 hrs, Volume= 2.294 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P1: Flows to BioRetention Pond

Runoff = 67.95 cfs @ 12.15 hrs, Volume= 3.554 af, Depth> 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	52,689	85	Type B 65%
*	10,870	89	Type C 65%
*	318,872	91	Type D 65%
	382,431	90	Weighted Average
	382,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	40	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.0	60	0.0150	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
2.1	480	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
8.2	580	Total			

Summary for Subcatchment P1A: Off-Site Drainage into BioRetention Pond

Runoff = 13.59 cfs @ 12.15 hrs, Volume= 0.676 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	86,183	83	From Existing Conditions Model
	86,183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0540	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.9	195	0.0540	3.49		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.1	295	Total			

Summary for Subcatchment P2: Flows Directly to Pebble Creek Storm Sewer

Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.086 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	4,051	85	Type B 50%
*	5,906	88	Type D 50%
	9,957	87	Weighted Average
	9,957		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	30	0.0500	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
0.4	40	0.0500	1.52		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
3.2	70	Total			

Summary for Subcatchment P3: Flows to Kohls Pond

Runoff = 14.65 cfs @ 12.22 hrs, Volume= 0.998 af, Depth> 5.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	5,889	91	Type B 80%
*	92,732	94	Type D 80%
	98,621	94	Weighted Average
	98,621		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
3.1	280	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	270	0.0050	5.09	16.00	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.7	650	Total			

Summary for Subcatchment P4: Flows to Highway Ditch

Runoff = 7.90 cfs @ 12.14 hrs, Volume= 0.402 af, Depth> 5.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	41,373	92	Type D 70%
	41,373		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	95	0.0550	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Subcatchment P5: Flows to Highway Storm Sewer

Runoff = 5.90 cfs @ 12.11 hrs, Volume= 0.286 af, Depth> 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	28,163	94	Type D 80%
	28,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	20	0.0400	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"
1.2	80	0.0150	1.08		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.70"
1.2	180	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.6	280	Total			

Summary for Subcatchment P6: Flows to Concrete Channel to Pebble Creek

Runoff = 4.55 cfs @ 12.15 hrs, Volume= 0.216 af, Depth> 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	10,693	65	Type B 10%
*	2,828	74	Type C 10%
*	17,075	89	Type D 10%
	30,596	79	Weighted Average
	30,596		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.70"

Summary for Pond 1P: BioRetention Pond

Inflow Area = 10.758 ac, 0.00% Impervious, Inflow Depth > 4.72" for 100-YR event
Inflow = 81.55 cfs @ 12.15 hrs, Volume= 4.230 af
Outflow = 46.93 cfs @ 12.26 hrs, Volume= 3.467 af, Atten= 42%, Lag= 6.8 min
Discarded = 0.52 cfs @ 12.27 hrs, Volume= 0.392 af
Primary = 46.42 cfs @ 12.26 hrs, Volume= 3.076 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 30.16' @ 12.27 hrs Surf.Area= 26,801 sf Storage= 73,742 cf

Plug-Flow detention time= 77.2 min calculated for 3.467 af (82% of inflow)
Center-of-Mass det. time= 35.0 min (794.0 - 759.0)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	82,838 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	20,018	0	0
29.00	24,068	44,086	44,086
30.00	26,457	25,263	69,349
30.50	27,500	13,489	82,838

Device	Routing	Invert	Outlet Devices
#1	Primary	25.00'	**24.0" Round Culvert** L= 200.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.00' / 24.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	28.50'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	29.80'	**Asymmetrical Weir, C= 3.27** Offset (feet) -100.00 0.00 100.00 Height (feet) 1.00 0.00 1.00
#4	Discarded	27.00'	**0.600 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'

Discarded OutFlow Max=0.51 cfs @ 12.27 hrs HW=30.15' (Free Discharge)
└**4=Exfiltration** (Controls 0.51 cfs)

Primary OutFlow Max=44.57 cfs @ 12.26 hrs HW=30.15' (Free Discharge)
└**1=Culvert** (Barrel Controls 25.70 cfs @ 8.18 fps)
└**2=Orifice/Grate** (Passes 25.70 cfs of 77.71 cfs potential flow)
└**3=Asymmetrical Weir** (Weir Controls 18.86 cfs @ 0.77 fps)

Summary for Link 2L: 24" Storm Sewer to Pebble Creek

Inflow Area = 10.986 ac, 0.00% Impervious, Inflow Depth > 3.45" for 100-YR event
Inflow = 46.92 cfs @ 12.26 hrs, Volume= 3.162 af
Primary = 46.92 cfs @ 12.26 hrs, Volume= 3.162 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3L: Total Flow including Off-Site Drainage

Inflow Area = 15.549 ac, 0.00% Impervious, Inflow Depth > 3.91" for 100-YR event
Inflow = 68.54 cfs @ 12.25 hrs, Volume= 5.064 af
Primary = 68.54 cfs @ 12.25 hrs, Volume= 5.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

APPENDIX D

WINSLAMM DATA

Data file name: P:\WinSLAMM v10\19-9043 Fox Run\Fox Run Redevelopment.mdb
WinSLAMM Version 10.3.4
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.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: 12/06 End of Winter Season: 03/28
Date: 01-27-2020 Time: 10:01:08
Site information:

LU# 1 - Commercial: Commercial 1 Total area (ac): 8.790
1 - Roofs 1: 1.430 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 1.430 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 2.860 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 3.070 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Commercial: Commercial 2 Total area (ac): 0.220
25 - Driveways 1: 0.110 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.110 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Commercial: Commercial 4 Total area (ac): 0.970
1 - Roofs 1: 0.170 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.170 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.340 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.290 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Commercial: Commercial 5 Total area (ac): 0.640
13 - Paved Parking 1: 0.170 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.340 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.130 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Commercial: Commercial 6 Total area (ac): 0.570
25 - Driveways 1: 0.060 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

45 - Large Landscaped Areas 1: 0.510 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Biofilter CP# 1 (DS) - DS Biofilters # 1

1. Top area (square feet) = 26457
2. Bottom aea (square feet) = 20018
3. Depth (ft): 5
4. Biofilter width (ft) - for Cost Purposes Only: 80
5. Infiltration rate (in/hr) = 0.5
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
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 13
12. Engineered soil depth (ft) = 2
13. Engineered soil porosity = 0.45
14. Percent solids reduction due to flow through engineered soil = 0
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

Sands 0.700

Compost as Amendment 0.300

Saturation water content percent (Porosity) = 0

Field capacity (%) = 0

Permanent Wilting Point (%) = 0

Infiltration rate (in/hr) = 13

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 4
2. Weir crest width (ft): 4
3. Height of datum to bottom of weir opening: 4.8

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 48
2. Stand pipe height above datum (ft): 3.5

Outlet type: Drain Tile/Underdrain

1. Underdrain outlet diameter (ft): 0.33
2. Invert elevation above datum (ft): 0
3. Number of underdrain outlets: 1

Control Practice 2: Grass Swale CP# 1 (DS) - DS Grass Swale # 1

Total drainage area (acres)= 8.790

Fraction of drainage area served by swales (ac) = 0.25

Swale density (ft/ac) = 88.80

Total swale length (ft) = 780
Average swale length to outlet (ft)= 70
Typical bottom width (ft) = 0.0
Typical swale side slope (_H:1V) = 4.0
Typical longitudinal slope (ft.H/ft.V) = 0.010
Swale retardance factor: D
Typical grass height (in) = 2.0
Swale dynamic infiltration rate (in/hr)= 0.600
Typical swale depth (ft) for cost analysis (optional) = 1.0
Particle size distribution file name: Not needed - calculated by program
Use total swale length instead of swale density for infiltration calculations: True

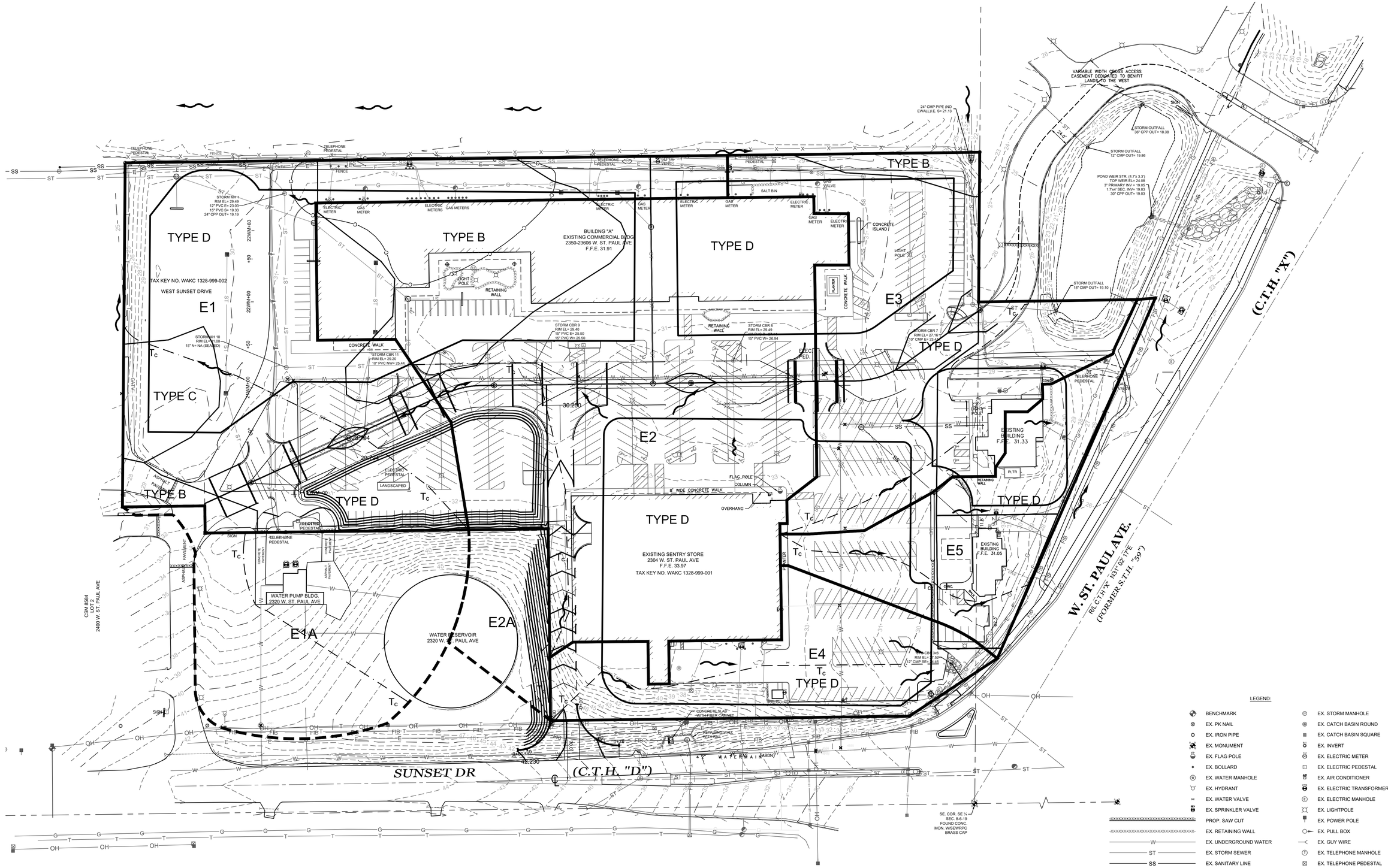
SLAMM for Windows Version 10.3.4

Data file name: P:\WinSLAMM v10\19-9043 Fox Run\Fox Run Redevelopment.mdb
Data file description:
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.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
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69
Date of run: 01-27-2020 Time of run: 10:00:42
Total Area Modeled (acres): 11.190
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Solids Reduction
Total of all Land Uses without Controls:	572873	-	123.5	4418	-
Outfall Total with Controls:	200539	64.99%	121.9	1526	65.46%
Annualized Total After Outfall Controls:	203324			1547	

APPENDIX E

BASIN MAPS



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SCALE IN FEET
0 50'

RE: VJS CONSTRUCTION SERVICES, INC.

DRAWN BY: A.C.L. | CHECKED BY: P.J.J. | JOB NUMBER: 19-9043 | DATE: JANUARY 27, 2020
FILE NUMBER: XXXXXXXX XXXX | BOOK NUMBER: WAUK 191/201 - PAGE NUMBER: 1-6

711 WEST MORELAND BOULEVARD, WAUKESHA, WISCONSIN 53188
PHONE #: (262) 542-5757 - EMAIL: SURVEY@JAHNKEANDJAHNKE.COM
WEBSITE: JAHNKEANDJAHNKE.COM

JAHNKE & JAHNKE ASSOCIATES, LLC.
ENGINEERS•PLANNERS•SURVEYORS
ENGINEERING SOLUTIONS SINCE 1964

EXISTING DRAINAGE BASIN

ADDRESS: 2300 WEST ST. PAUL AVENUE
PART OF THE SE 1/4 OF SECTION 8, T 6 N, R 19 E
& PART OF THE SW 1/4 OF SECTION 9, T 6 N, R 19 E
CITY OF WAUKESHA, WAUKESHA COUNTY, WISCONSIN.

REVISIONS

SHEET:
01 OF 01

FILE NAME: S:\projects\19-9043 (S8560)\dwg\19-9043_Basin.dwg

N
S
E
W

SCALE IN FEET
0 50'

RE: VJS CONSTRUCTION SERVICES, INC.

DRAWN BY: A.C.L.	CHECKED BY: P.J.J.	JOB NUMBER: 19-9043	DATE: JANUARY 27, 2020
FILE NUMBER:	XXXXXXXX XXXX	BOOK NUMBER: WAUK 191/201 - PAGE NUMBER: 1-6	

711 WEST MORELAND BOULEVARD, WAUKESHA, WISCONSIN 53188
PHONE #: (262) 542-5797 - EMAIL: SURVEY@JAHNKEANDJAHNKE.COM
WEBSITE: JAHNKEANDJAHNKE.COM

JAHNKE & JAHNKE
ASSOCIATES, LLC.
ENGINEERS•PLANNERS•SURVEYORS
ENGINEERING SOLUTIONS SINCE 1964

PROPOSED DRAINAGE BASIN

ADDRESS: 2300 WEST ST. PAUL AVENUE
PART OF THE SE 1/4 OF SECTION 8, T 6 N, R 19 E
& PART OF THE SW 1/4 OF SECTION 9, T 6 N, R 19 E
CITY OF WAUKESHA, WAUKESHA COUNTY, WISCONSIN.

REVISIONS

SHEET:
01 OF 01

FILE NAME: S:\projects\19-9043 (S8560)\dwg\Basin area calc\19-9043_PROP BASIN.dwg