



ENGINEERING, REIMAGINED

FINAL DRAINAGE REPORT

City of Grand Junction D ½ Road Traffic Capacity Improvements Project

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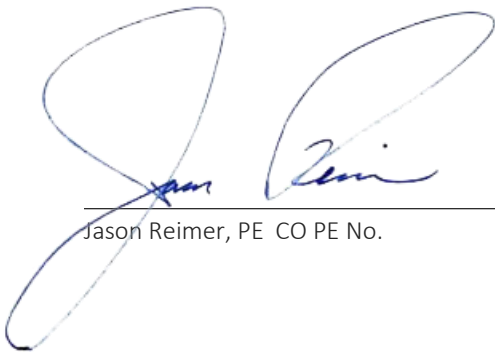
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Engineer's Certification

I hereby state that this Final Drainage Report for the design of City of Grand Junction 26 ½ Road Traffic Capacity Improvements project was prepared by me (or under my direct supervision) in accordance with the provisions of the *Stormwater Management Manual* for the owners thereof.



Jason Reimer, PE CO PE No.



I, _____ hereby certify that the drainage facilities for the City of Grand Junction D ½ Road Traffic Capacity Improvements project shall be constructed according to the design presented in this report. I understand that the City of Grand Junction does not and will not assume liability for the drainage facilities design and/or certified by my engineer. I understand that the City of Grand Junction reviews drainage plans but cannot, on behalf of the City of Grand Junction D ½ Road Traffic Capacity Improvements project and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Final Plat and/or Final Development Plan does not imply approval of my engineer's drainage design.

Name of Developer

Authorized Signature

Date

INTRODUCTION

Background

The purpose of this report is to document the hydrologic design process, regulations, assumptions, and calculations used to develop pre- and post-development drainage design associated with the City of Grand Junction's D ½ Road Traffic Capacity Improvements project.

Project Location and Description

The purpose of the D ½ Road Traffic Capacity Improvements (TCI) project is to widen the D ½ Road corridor to accommodate the addition of a center turn lane, bike lanes, and pedestrian facilities. The project is located within the incorporated city of Grand Junction, CO in Section 17, Township 1S, Range 1E of the Ute Meridian. D ½ Road is classified as a major collector. Figure 1 shows the approximate project location and limits. Existing center turn lane, bike lanes, and curb, gutter, and sidewalk currently extend from 29 Road to the west to 2924 D ½ Road to the east, where they terminate. This termination at 2924 D ½ Road is the western limit of the D ½ Road TCI project; proposed improvements will tie into existing improvements at this location. The eastern limit is the intersection of D ½ Road and 30 Road. The subdivisions adjacent to the project area are: Pear Park North, Central Village, Scottish Range, Brown's Minor, Wexford Estates, and Siena View. This project will also include utility work to resolve any utility conflicts.



Figure 1: General Location Map (Not to Scale)

Property Description

The proposed project is within existing City of Grand Junction right-of-way (ROW). The terminus of existing pedestrian facilities at 2924 D ½ Road constitutes the western limit of construction for this project. At this western end, D ½ Road consists of 30 feet of asphalt road with narrow shoulders and no sidewalk or curb and gutter on either side. The ROW along D ½ Road is inconsistent in width and placement. In most areas, ROW is 70 ft, but in some places it widens to 80 ft; in others the ROW narrows to 30 ft as parcels to the north or south intermittently extend to the road centerline. The project area is intersected both by the Beswick Drain, which intersects D ½ Road at STA 228+59.53 (adjacent to 2973 D ½ Road) and Odelberg Drain, which intersects D ½ Road at STA 205+01.03. Both drains are operated by Grand Valley Drainage District and ultimately flow to Mesa County Canal.

The area immediately adjacent to the road consists mainly of urban residential housing, driveways, and irrigated lawns with some areas of crops and sparsely vegetated tracts lying fallow. The Web Soil Survey data located in Appendix B indicates that the project area is Sagers silty clay loam of Hydrologic Soil Group C. The area is generally very flat; the average ground slope over the entire project site is roughly 0.9% with many areas closer to 0.6%.

Previous Investigations

There are no known previous investigations on this reach of D ½ Road. KLJ referenced the “Final Drainage Study for Pear Park North Subdivision” (2016, Colorado Civil Technologies) and used the detention basin outflow as inflow to the relevant street section.

This project overlaps FEMA Flood Insurance Rate Map (FIRM) Panels 08077C0810G and 08077C0828F. The project is located in Zone X. The most recent available Flood Insurance Study (FIS) covering the project area is FIS Number 08077CV000A from July 6, 2010, “Mesa County and Incorporated Areas, Colorado”.

DRAINAGE SYSTEM DESCRIPTION

Existing Drainage Conditions

The existing topography slopes from northeast to southwest at an average slope of 0.9%. The existing stormwater network is minimal. All stormwater discharge draining to the project west of Beswick Drain and north of D ½ Road flows to ditches and culverts in various states of function. All ditches and culverts in this area ultimately discharge at the western end of the project to Odelberg Drain, which itself drains to Mesa County Canal. Many culverts are completely buried and silted in, and in places the ditch disappears completely. An 8-in PVC irrigation line runs the length of the project parallel to the westbound side of D ½ Road. This 8-in PVC terminates at the manhole located at STA 205+31.80, offset 24.5 ft L. There is evidence of flooding in many areas on the westbound side of D ½ Road, but the intent is for all stormwater discharge draining to this portion of the site to eventually flow to Odelberg Drain, which is operated by Grand Valley Drainage District and crosses the D ½ Road centerline at STA 205+01.03.

There is evidence of ponding throughout the eastbound side of D ½ Road west of Beswick Drain. Stormwater generally sheets to adjacent properties to the south or ponds locally before overtopping local storage and sheeting to adjacent properties. In places, residents have constructed berms which prevent sheeting to those parcels. There is a defunct concrete drainage ditch beginning just west of Beswick Drain and ending at the eastern edge of the Wexford Estates subdivision. The ditch resumes at 2943 D ½ Road, just west of San Juan Street, and continues to the access to 2927 D ½ Road. The ditch is heavily silted in everywhere and in places supports well-established vegetation, including trees, particularly to the east of Wexford Estates. Discharge from the western portion of the ditch flows to the Odelberg Drain at 2929 D ½ Road, which at this point is south-flowing 10-in PVC ultimately discharging to Mesa County Canal. Discharge from the eastern portion of the ditch sheets to neighboring properties or infiltrates in situ. The

presence of the ditch throughout eastbound D ½ Road west of Beswick Drain (except where modern subdivisions are present) is an indication that roadway discharge here has historically flowed to Odelberg Drain.

Beginning 170 feet west of the intersection of D ½ Road with 30 Road, runoff from north of D ½ Road flows west to Beswick Drain via curb, gutter, inlets, and pipes. The westbound side of D ½ Road along the southern edge of Pear Park North flows via a curb inlet located at STA 234+26.72 to the subdivision's detention pond and continues back to the existing D ½ Road 18-in RCP before ultimately discharging to Beswick Drain, which itself drains to Mesa County Canal.

The portion of eastbound D ½ Road from the western edge of Pear Park North to a point 170 feet west of 30 Road drains via curb and gutter to Florence Road and Doris Road to the south.

The last 170 feet of D ½ Road before 30 Road drain via curb inlet to an existing south-flowing 30-in RCP under 30 Road.

The existing conditions subbasin delineation is included in Appendix A. There are seven existing subbasins in the project watershed. The subbasins are numbered from west to east, with DA01-EX being at the far western end of the watershed and DA07-EX being at the far eastern end of the watershed.

Master Drainage Plan

The 2023 Mesa County Master Plan and the 2020 One Grand Junction Comprehensive Plan (amended 2023) address Watershed Master Plans for the region. No Master Drainage Plans were found for the specific project area.

Offsite Tributary area

Offsite tributary runoff is from adjacent lots to the north. Surrounding topography drains southwest to the site from west of Beswick Drain and south of the Union Pacific Railroad. Additionally, Pear Park Subdivision, bordering on the westbound side of D ½ Road and the southbound side of 30 Road, drains to the D ½ Road sewer system via a detention basin. The area north of Pear Park Subdivision and east of Beswick Drain runs off via curb and gutter to the 30-in RCP storm sewer under 30 Road and does not affect the project site. There is no appreciable offsite flow to the project from the south.

Proposed Drainage System Description

The proposed basin delineation is included in Appendix A. Major changes to the drainage conditions include:

- A wider road section including sidewalk with curb and gutter on both sides of D ½ Road
- The addition of curb inlets and storm sewer the length of the project on the eastbound side of D ½ Road
- The addition of curb inlets and storm sewer on the westbound side of D ½ Road west of the Pear Park subdivision
- The addition of water quality manholes (manholes with very deep sumps for capturing sediment) on either side of Beswick Drain
- The addition of a water quality manhole at the western end of the project just upstream of Odelberg Drain
- The offset to the north of the existing west-flowing drainage ditch along the westbound side of D ½ Road

From the western terminus of the project to a point approximately 980 feet west of Beswick Drain, proposed curb, gutter, inlets, and storm sewer will now flow to existing 24-in RCP storm sewer, as will offsite stormwater runoff from west of Beswick Drain and south of the Union Pacific Railroad. From a point approximately 980 feet west of Beswick Drain east to Beswick Drain, proposed curb, gutter, inlets, and storm sewer will direct roadway discharge east to Beswick Drain. Westbound roadway runoff from east of Beswick Drain to a point approximately 300 feet west of

30 Road will continue to discharge to Beswick Drain, as will runoff from the Pear Park North subdivision detention pond. Local flooding of adjacent lots will be greatly reduced by the addition of curb, gutter, inlets, and storm sewer.

The proposed improvements to the eastbound side of D ½ Road west of Beswick Drain will alleviate local flooding and in situ infiltration. From the western terminus of the project to a point approximately 980 feet west of Beswick Drain, proposed curb, gutter, inlets, and sewer will flow via a water quality manhole to existing 24-in RCP storm sewer discharging to Mesa County Canal and will replace the historic function of the concrete drainage ditch in that area. From a point approximately 980 feet west of Beswick Drain east to Beswick Drain, proposed curb, gutter, inlets, and sewer will flow to Beswick Drain via a water quality manhole. All discharge to Beswick Drain will now be routed through one of the two water quality manholes.

On the eastbound side of D ½ Road east of Beswick Drain to a point approximately 300 feet west of 30 Road, proposed curb, gutter, inlets, and sewer will flow west to Beswick Drain via a water quality manhole. This infrastructure will intercept roadway stormwater runoff currently flowing to Florence Road and Doris Road.

The portion of both sides of the D ½ Road roadway draining to the 30-in RCP under 30 road will increase from approximately 170 feet to approximately 300 feet.

Drainage Facility Maintenance

Maintenance on facilities located within the ROW will be jointly conducted by the City of Grand Junction. Facilities located outside the ROW will be maintained by the property owner. Maintenance activities will include but are not limited to sediment and debris removal from grates, inlets, pipes, and manholes as needed.

The City of GJ is responsible for maintaining the proprietary water quality facilities (manholes). The ADS Water Quality Unit Inspection and Maintenance Guide (available at this link: <https://www.adspipe.com/resources/documents/>) recommends inspecting the unit four times a year and after major storm events. The unit should also be cleaned annually, or as needed by the sediment depth in the unit (Table 1 in the linked document).

DRAINAGE ANALYSIS AND DESIGN CRITERIA

Regulations

This analysis and design were prepared in accordance with the provisions of the Mesa County Stormwater Management Manual (MC SWMM). This guidance is also available in Grand Junction Municipal Code Title 28.

Development Criteria

Criteria from the Grand Junction Municipal Code Title 28 (Mesa County Stormwater Management Manual) section 28.16.150 states that the depth at the gutter flow line must be less than 0.5 foot during the 2-year event, and less than 1 foot during the 100-year event.

There are many utility conflicts identified in the project reach along D ½ Road. Best engineering judgment was used to design adequate capacity for the storm network that accommodated these conflicts. These conflicts are identified in the project plans.

Hydrologic Criteria

The MC SWMM was followed without deviation.

Hydrologic Modeling Methodology

The MC SWMM was used as guidance for the hydrologic analysis of the existing and proposed conditions. Autodesk Storm and Sanitary Analysis was used to conduct the analysis using:

- The US EPA SWMM hydrology engine
- SCS infiltration/loss methodology
- Hydrodynamic link routing, and
- The Hazen-Williams forcemain equation.

The US EPA SWMM method requires entry of the following variables for each subbasin area:

- Area (acres)
- Equivalent width (feet)
- Average slope (%)
- Impervious area (as a %)
- Impervious Manning's roughness
- Impervious area with no depression (as a %)
- Impervious depression depth (inches)
- Pervious depression depth (inches), and
- A pervious Manning's roughness.

The model uses this information to calculate the time of concentration, runoff, and peak flow from the subbasin.

When using the EPA-SWMM method in SSA, imperviousness can either be considered via the curve number (in the Curve Number tab in Subbasin Properties), or it can be considered via the Impervious Area parameter on the Physical Properties tab in the same dialog. If percent impervious is considered via curve number, then the Impervious Area parameter on the Physical Properties tab should be set to 0 (in which case all other parameters within the Impervious Area pane of the Physical Properties tab are unimportant). If percent impervious is considered via the Impervious Area parameter, then the curve number should not consider percent impervious. In this case, curve number should only consider pervious area, and the designer should assume that any proposed paved areas would have land uses similar to adjacent areas. Then the percent impervious area for the basin can be entered in the Impervious Area parameter on the Physical Properties tab, and the other parameters withing the Impervious Area pane must be considered. In the case of D.5 Road, to obtain a more precise model, most basins' percent impervious areas were considered via the Impervious Area parameter unless land use was very uniform.

Existing Hydrologic Analysis

The total area of the project corridor's watershed is 104.5 acres. The catchment was delineated using KLJ topographic and KLJ photogrammetric survey data captured by drone in Fall 2022. 2015 USGS digital elevation LiDAR data was also used. The catchment was divided into seven subbasins under existing conditions and 13 subbasins under proposed conditions based on culvert, inlet, and ditch locations. A map depicting the existing drainage basins is included in Appendix A.

The US EPA SWMM method uses the equivalent width (EW) variable to calculate the longest flow path and the time of concentration for each subbasin. The equivalent width is the width of a theoretical rectangle of area equal to the subbasin area and is calculated using the following formula:

$$EW = \left(2 - \frac{A_2 - A_1}{A_1 + A_2} \right) \cdot L_C.$$

The concentrated flowpath within the basin is used to develop two contributing areas within the basin (A_1 and A_2). The ratio of the difference to the sum of those areas is used with the length of the concentrated flow path (L_c) to calculate the equivalent width. The average slope within each existing and proposed subbasin was estimated using 2015 USGS digital elevation LiDAR data and topographic surface data provided by the City of Grand Junction. Equivalent widths for each subbasin are shown in Tables 1 and 3 as well as in the output in Appendix C.

The percent impervious area of each subbasin was determined using survey data and aerial imagery. The impervious areas in the catchment consist of roofs and pavements (concrete and asphalt). The impervious Manning's roughnesses were taken from the table within SSA and are based on pavement type. Where concrete and asphalt pavements are dominant under existing conditions, a Manning's value of 0.015 was used; for the same materials under proposed conditions, a Manning's value of 0.012 was used.

The area immediately adjacent to the road consists mainly of urban residential housing, driveways, and irrigated lawns with some areas of crops and sparsely vegetated tracts lying fallow. Ground cover varies from paved surfaces to sparsely covered bare dirt to lawns. In areas outside of the impervious surfaces (i.e., roofs, pavement, etc.), ground cover is generally described as sparsely vegetated or <50% grass cover in poor condition. Soil attributes were determined from the NRCS Web Soil Survey (WSS) (provided in Appendix B). Soils in the project area are Hydrologic Soil Group C soils.

The infiltration method for rainfall loss selected within the model was the SCS Curve Number. This method uses the composite curve number generated for the subbasin to predict rainfall losses. The composite SCS Curve Numbers for each subbasin were generated based on the soil type and vegetative cover. The composite curve numbers and other characteristics for the existing conditions subbasins are summarized in Table 1 below.

Table 1: Existing Subbasin Characteristics

Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Equivalent Width (ft)	Impervious Area (%)
DA01-EX	1.83	0.41	86.0	1731	60
DA02-EX	94.92	0.59	85.3	6100	24
DA03-EX	1.06	0.37	86.0	2383	100
DA04-EX	0.27	0.73	86.0	803	100
DA05-EX	5.06	0.75	86.0	1288	6
DA06-EX	0.13	2.00	86.0	190	90
DA07-EX	0.26	1.82	86.0	209	60

Existing Hydrologic Modeling Results

Table 2 shows a summary of the hydrologic modeling results for the 2-year and 100-year 24-hour storms. The watershed has seven outfalls. Outfalls are numbered according to the subbasins which drain directly to them. Out01-EX is the low spot in the southern end of the gravel lot at 2927 D ½ Road. Out02-EX is the low spot near the southeastern corner of 2926 D ½ Road (across D ½ Road from Out01-EX). Out03-EX is the existing storm inlet on the eastbound side of D ½ Road, just to the north of the Wexford Estates subdivision. Out04-EX is Beswick Drain; this outfall receives stormwater discharge from DA04-EX and DA05-EX. Out06-EX is a manhole in the south-flowing 30-in RCP storm sewer under 30 Road; this outfall receives stormwater discharge from both DA06-EX and DA07-EX.

Table 2: Existing Hydrologic Modelling Results

Subbasin/ Node ID	Runoff (ft ³)		Peak Flow (cfs)		Time of Concentration (mins) (d hh:mm)	
	2-Year	100-Year	2-Year	100-Year	2-Year	100-Year
DA01-EX	3122	10761	1.30	4.60	11.8	7.7
DA02-EX	93031	427254	20.21	103.15	126.6	83.0
DA03-EX	2617	7657	1.08	3.16	9.8	6.4
DA04-EX	666	1950	0.28	0.84	6.9	4.5
DA05-EX	3306	20388	0.51	6.62	58.7	38.5
DA06-EX	297	897	0.12	0.37	9.0	5.9
DA07-EX	444	1529	0.18	0.65	13.4	8.8
Out01-EX	NA	NA	1.30	4.60	0 11:56	0 11:55
Out02-EX	NA	NA	20.21	103.15	0 11:57	0 11:57
Out03-EX	NA	NA	1.08	3.16	0 11:55	0 11:54
Out04-EX	NA	NA	1.85	9.17	0 12:44	0 12:32
Out06-EX	NA	NA	0.29	1.01	0 11:56	0 11:55

*Time of Concentration values for the outfall nodes are the time to hydrograph peak.

Proposed Hydrologic Analysis

The new roadway improvements for 26 ½ Road will improve drainage conditions by keeping roadway runoff in the new curb and gutter, thereby reducing runoff onto adjacent properties. The total area for the proposed project watershed is 103.62 acres. The same methods described above for the existing hydrology were used to determine the basin characteristics in the proposed conditions. The catchment was divided into 13 proposed subbasins; the subbasins ranged in size from 0.21 to 58.12 acres. A map depicting the proposed drainage basins is included in Appendix A. Average slopes within the basins were determined from ground survey, drone survey, and 2015 USGS digital elevation LiDAR data. The basin characteristics for the proposed conditions are summarized in Table 3 below.

Table 3: Proposed Subbasin Characteristics

Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Equivalent Width (ft)	Impervious Area (%)
DA01-PR	1.52	0.6	86.0	1976	80
DA02-PR	1.82	0.6	86.0	2349	80
DA03-PR	25.55	0.6	86.0	2800	40
DA04-PR	8.78	0.6	79.8	2249	40
DA05-PR	58.12	0.5	86.0	4606	40
DA06-PR	0.85	0.7	86.0	1092	80
DA07-PR	0.63	0.7	86.0	834	80
DA08-PR	0.28	0.9	86.0	407	80
DA09-PR	0.38	0.9	86.0	550	80
DA10-PR	4.64	0.7	86.0	1307	25
DA11-PR	0.42	0.6	86.0	641	80
DA12-PR	0.21	0.7	86.0	306	80
DA13-PR	0.42	0.6	86.0	410	80

Proposed Hydrologic Modeling Results

Table 4 shows a summary of the hydrologic modelling results for the 2-year and 100-year 24-hour storms. Existing outfalls Out01-EX, Out04-EX, and Out06-EX correspond to proposed outfalls OUTFALL_STRUCTURE-(105),

OUTFALL_STM-02_FES-01, AND Out13-PR, respectively. The remainder of the existing outfalls now correspond to proposed junctions, inlets, and manholes. Table 5 summarizes the change in flow to these outfalls from existing to proposed conditions. More detailed modeling results are included in Appendix C.

Table 4: Proposed Hydrologic Modelling Results

Subbasin/ Node ID	Runoff (inches)		Peak Flow (cfs)		Time of Concentration (mins) (d hh:mm)	
	2-Year	100-Year	2-Year	100-Year	2-Year	100-Year
DA01-PR	3807	11035	1.55	4.54	10.4	6.8
DA02-PR	4559	13213	1.85	5.43	10.5	6.9
DA03-PR	28751	123353	7.37	37.33	85.3	55.9
DA04-PR	4462	29003	0.64	8.64	61.7	40.5
DA05-PR	54854	263720	12.01	64.61	118.3	77.5
DA06-PR	2129	6171	0.86	2.54	10.2	6.7
DA07-PR	1578	4574	0.64	1.89	10.0	6.5
DA08-PR	701	2033	0.28	0.83	8.5	5.5
DA09-PR	952	2759	0.39	1.15	8.7	5.7
DA10-PR	3200	18696	0.48	6.22	55.8	36.6
DA11-PR	1052	3049	0.42	1.23	9.4	6.1
DA12-PR	488	1456	0.20	0.62	12.9	8.5
DA13-PR	732	2470	0.29	1.06	16.9	11.1
Out13-PR	NA	NA	0.48	1.66	0 11:57	0 11:56
OUTFALL_STM-02_FES-01	NA	NA	2.98	14.70	0 11:58	0 11:58
OUTFALL_STRUCTURE-(105)	NA	NA	21.65	29.16	0 11:53	0 11:38

*Time of Concentration values for the outfall nodes are the time to hydrograph peak.

Table 5: Outfall Flowrate Comparison

Proposed Outfall	Existing Equivalent	Existing Flow (cfs)		Proposed Flow (cfs)		Variance (cfs)		Variance (%)	
		2-Year	100-Year	2-Year	100-Year	2-Year	100-Year	2-Year	100-Year
Out13-PR	Out06-EX	0.29	1.01	0.48	1.66	0.19	0.65	65.5%	64.4%
OUTFALL_STM-02_FES-01	Out04-EX	1.85	9.17	2.98	14.70	1.13	5.53	61.1%	60.3%
OUTFALL_STRUCTURE-(105)	Out01-EX	1.30	4.60	21.65	29.16	20.35	24.56	1565.4%	533.9%

Hydraulic Criteria

The MC SWMM was followed without deviation.

Proposed Hydraulic Analysis

The three unimproved subbasins to the north of D ½ Road were collected by three respective area inlets on the north side of D ½ Road, outside the roadway cross section. Area inlets are 24-in x 36-in rectangular inlets per City of Grand Junction Standard Detail D-10. Since SSA requires entry of gutter specifications to model sag inlets, proposed area inlets' gutter parameters were set to 40-ft gutter width to represent the large collection area of the inlets, 2-in depth, and 0.6% roadway and gutter cross slopes to approximate the very flat conditions present within and adjacent to the project area. Due to these flat conditions, gutter spread and gutter depth at area inlets STM-01_AI-01 (receiving discharge from DA03-PR), STM-01_AI-03 (receiving discharge from DA04-PR), and STM-01_AI-02 (receiving discharge from DA05-PR) are very high. These values are summarized in Table 5 below along with corresponding values for all

curb inlets and are highlighted and noted in Appendix C - Autodesk Storm and Sanitary Analysis Hydrologic and Hydraulic Models.

Curb inlets within the roadway cross section are modeled as 24-in x 36-in combination inlets per City of Grand Junction Standard Detail D-07. Inlets are modeled with 0% grate and 100% curb-opening clogging factors per City of Grand Junction Stormwater Management Manual (GJ-SWMM) Table 28.44.140. All gutter spread and freeboard results meet the requirements found in GJ-SWMM 28.16.150.

Pipes are modeled with the largest diameters and steepest slopes that utility conflicts and clearance requirements allow. These conditions generally allow a maximum pipe size of 24 in. In places, utility conflicts are such that slopes on the order of 0.25% had to be accepted. In other places, steeper slopes were possible.

Detention pond discharge from the Pear Park North subdivision (at the northwest corner of the intersection of D ½ Road with 30 Road) was added to junction Jun-98, the existing storm sewer manhole between the existing sidewalk and the southwest corner of the subdivision. Two- and 100-yr flows were generated from the hydrographs in the Pear Park North Drainage Report and passed as external flows to Jun-98. Since the westbound side of D ½ Road along the southern edge of Pear Park North flows to the subdivision's detention pond (per Pear Park North Drainage Report), this side of the road was not modeled by KLJ.

Proposed Hydraulic Modeling Results

Area and curb inlet gutter spread and gutter depth results are given in Table 6 below. The high spread values for the area inlets (STM-01_A1-01, STM-01_A1-02, STM-01_A1-03, not in the roadway) are theoretical and are caused by very flat conditions around the area inlets. These inlets were modeled to accept storm runoff from the drainage basins north of the roadway; greater depth and spread are proposed than for the curb inlets within the roadway. Reductions in spread and depth could be made by adding more inlets, but such additions would inundate stormwater infrastructure downstream. All curb inlets meet MC-SWMM gutter flowline depth criteria of less than 0.5 ft in the 2-year event and less than 1.0 ft in the 100-yr event.

Table 6: Inlet Gutter Spread and Depth Results

Inlet ID	Maximum Gutter Spread (ft)		Maximum Water Depth (ft)	
	2-Year	100-Year	2-Year	100-Year
Inlet14-PR	1.7	6.2	0.2	0.2
STM-01_AI-01	83.9	1822.8	2.1	12.5
STM-01_AI-02	103.8	2445.1	1.6	15.7
STM-01_AI-03	17.3	93.2	1.7	2.1
STM-01_INLET-01	8.2	17.4	0.3	0.5
STM-01_INLET-03	9.3	19.7	0.3	0.5
STM-02_INLET-01	1.9	7.3	0.2	0.3
STM-02_INLET-02	2.1	9.0	0.2	0.3
STM-03_INLET-01	1.7	2.4	0.2	0.2
STM-03_INLET-02	1.8	6.6	0.2	0.3
STM-03_INLET-03	1.9	6.9	0.2	0.3
STM-04_INLET-01	1.5	2.1	0.2	0.2

Outfall flowrates are shown in Table 5 below. Changes to peak outfall inflows are as follows:

Discharge to OUTFALL_STRUCTURE-(105) (at 2927 D ½ Road) is increased in the 2- and 100-year storms by 20.35 and 24.56 cfs, respectively, due to expansion of impervious area and the addition of curb and gutter, which removes the

current condition of local storage, infiltration, and flooding of adjacent parcels. Runoff from the large, unimproved, area north of D ½ Road is now being routed to this structure as well rather than to Odelberg Drain.

Discharge to OUTFALL_STM-02_FES-01 (Beswick Drain) is increased during the 2- and 100-year storm events by 1.13 and 5.53 cfs, respectively. This increase is due to the addition of curb, gutter, and sidewalk on both sides of the road.

Discharge to Out13-PR (the 30-in RCP under 30 Road) is increased during the 2- and 100-year storm events by 0.19 and 0.65 cfs, respectively, due to expansion of impervious area and the addition of curb and gutter on the eastbound side of D ½ Road.

Water Quality

Water quality was calculated using a proprietary ADS product. KLJ provided ADS with structure and pipe schematics and 2- and 100-year design flows; ADS then provided details and specifications for water quality manholes, which are included in the project sheetset. Proprietary manholes will be installed immediately upstream and on either side of Beswick Drain and immediately upstream of the proposed storm sewer system's discharge to the existing 24-in storm sewer at the western project limit.

CONCLUSIONS

This drainage design was completed in accordance with the City of Grand Junction Stormwater Management Manual. The entire project is outside the 500-year flood zone. Proposed improvements are effective to control impacts of stormwater runoff given the utility conflicts and status of downstream stormwater infrastructure. The project is outside of the FEMA 500-Year Floodplain.

This project will widen the D ½ Road corridor to accommodate the addition of a center turn lane, bike lanes, and pedestrian facilities. These improvements will add sidewalk, crosswalks, curb and gutter, additional lane width, and bike lanes to both sides of D ½ Road. Odelberg Drain and Beswick Drain are the primary existing means of conveying stormwater runoff from the project area; both conveyances are operated by Grand Valley Drainage District and drain to Mesa County Canal. This project will divert 20.35 cfs in the 2-year storm event and 24.56 cfs in the 100-year storm event from Odelberg Drain at D ½ Road to the existing 24-in RCP storm sewer discharging to Mesa County Canal due to the addition of curb, gutter, and sidewalk and the cessation of local pooling, infiltration, and flooding of adjacent properties. The project will increase flow to Beswick Drain at D ½ Road by 1.13 cfs in the 2-year storm event and by 5.53 cfs in the 100-year storm event. Increases in flow to the existing stormwater infrastructure under 30 Road are negligible.

REFERENCES

Mesa County Stormwater Management Manual

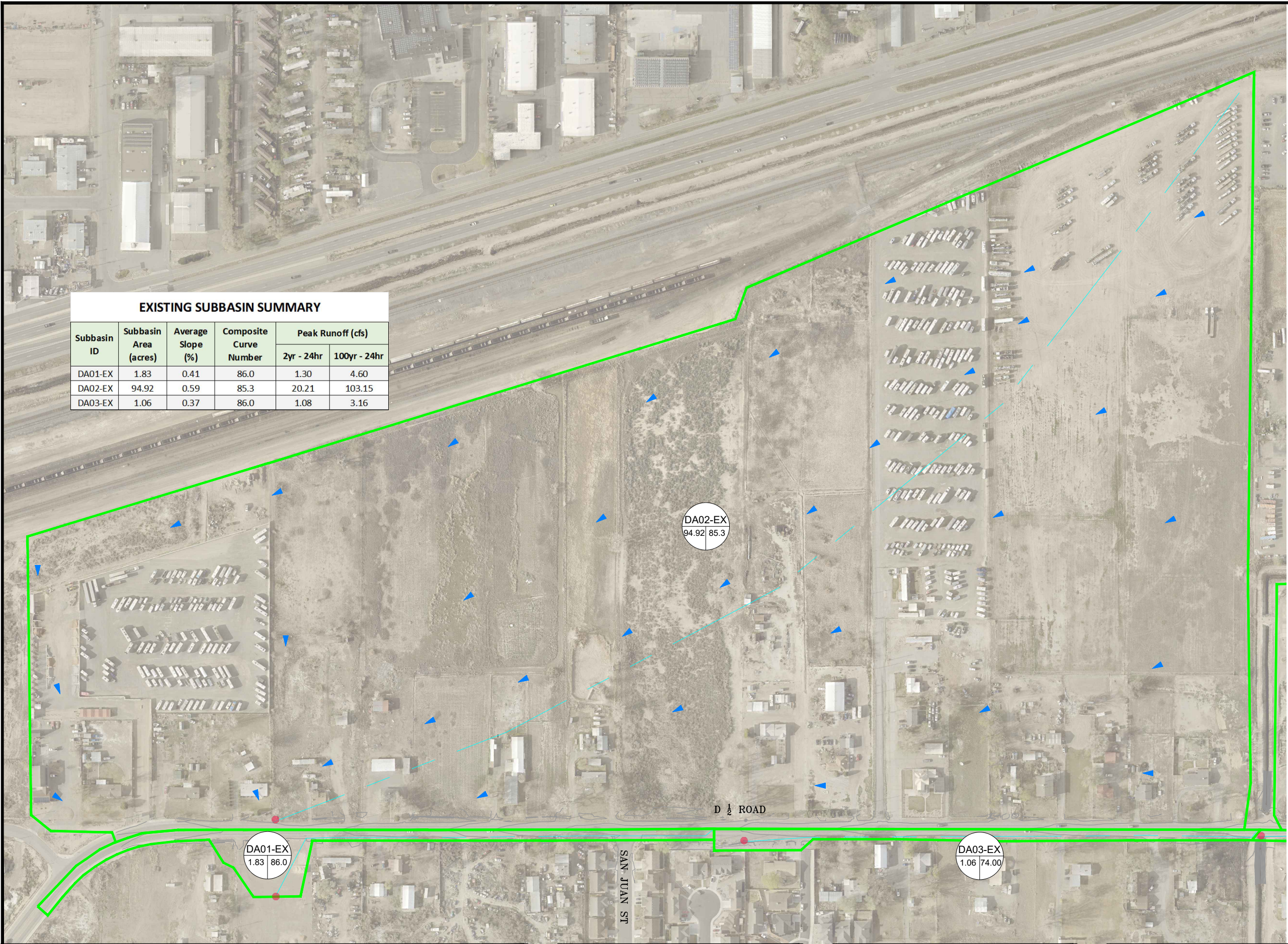
City of Grand Junction Stormwater Management Manual

City of Grand Junction Standard Details

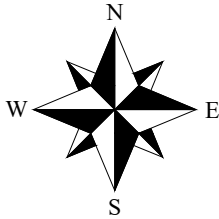
Pear Park North Drainage Report (Final Drainage Study for Pear Park North Subdivision, 2016, Colorado Civil Technologies)

APPENDIX A

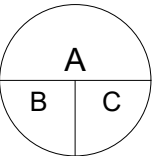
Drainage Basin Maps



EXISTING SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA01-EX	1.83	0.41	86.0	1.30	4.60
DA02-EX	94.92	0.59	85.3	20.21	103.15
DA03-EX	1.06	0.37	86.0	1.08	3.16



- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- ➡ CHANNELIZED FLOW
- ➡ SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

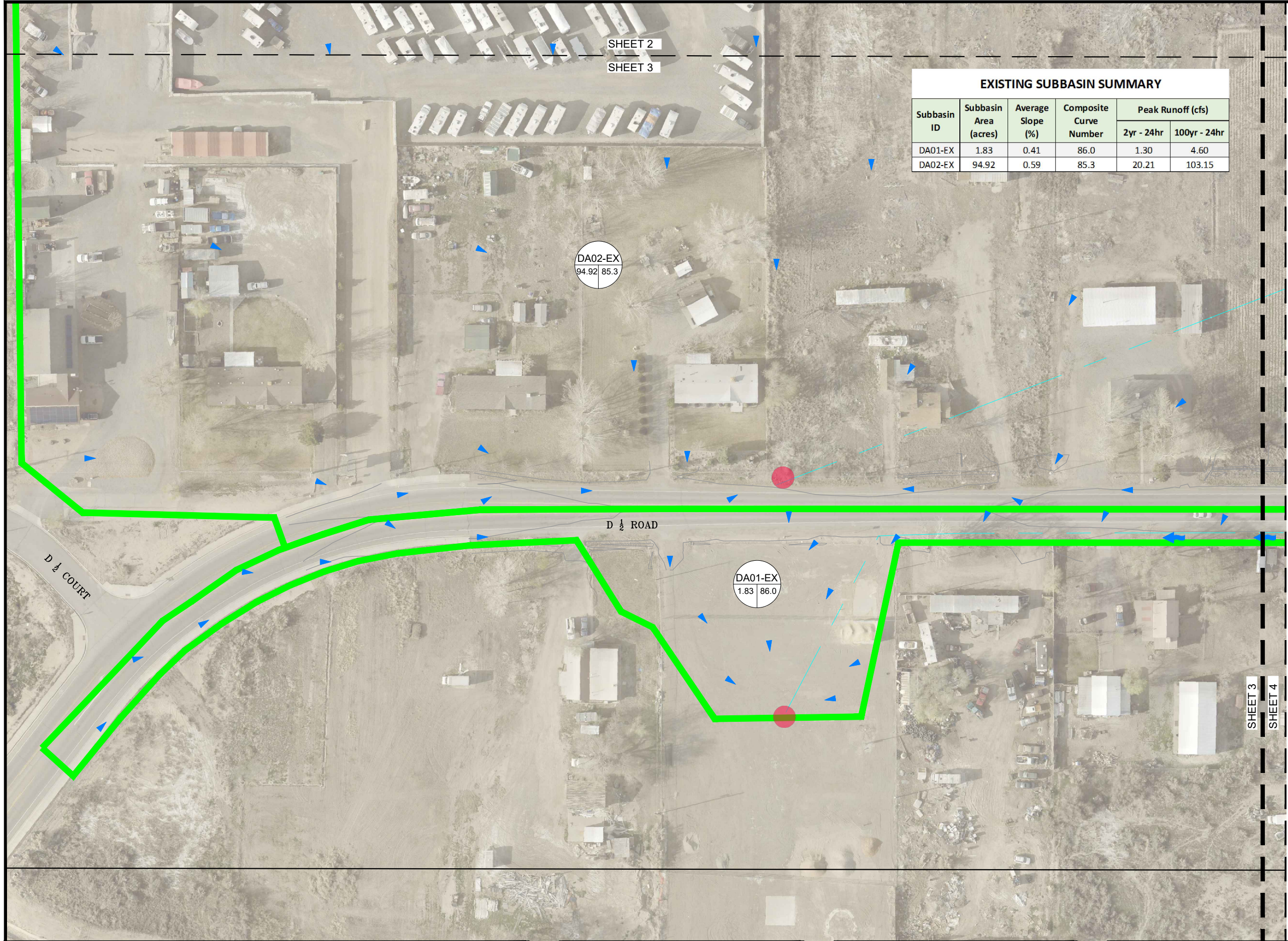
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REVISION 4	REV 4	DATE			

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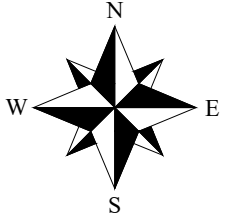


ENGINEERING &
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PROJECT NO. F210311

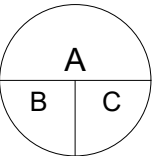
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EXSITING CONDITIONS DRAINAGE MAP



EXISTING SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA01-EX	1.83	0.41	86.0	1.30	4.60
DA02-EX	94.92	0.59	85.3	20.21	103.15



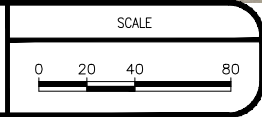
- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- ← CHANNELIZED FLOW
- ▲ SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

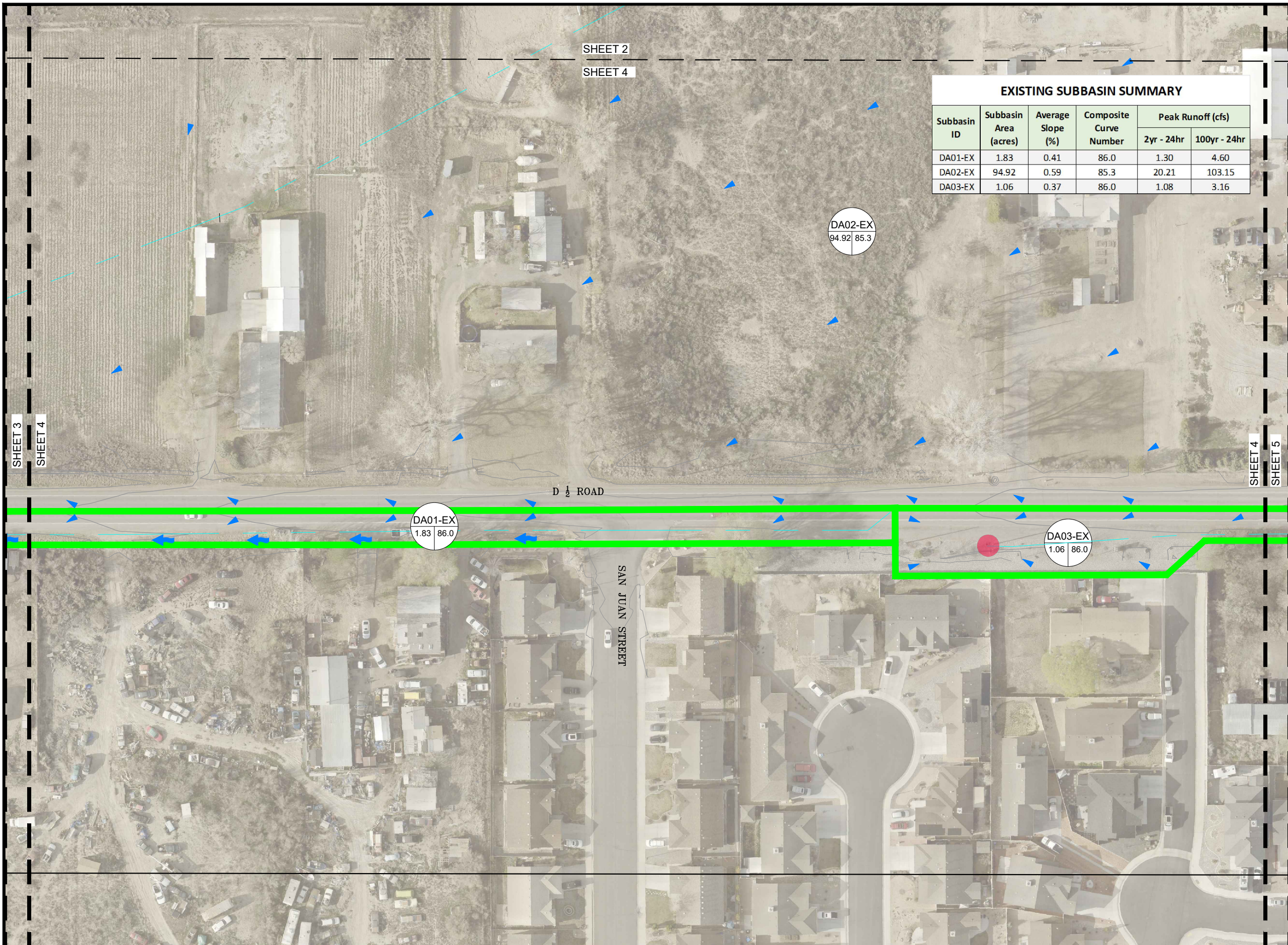


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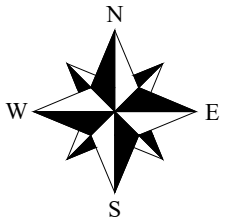


ENGINEERING &
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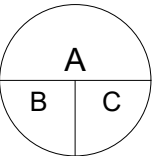
D 1/2 RD - 29 RD TO 30 RD
EXISTING CONDITIONS DRAINAGE MAP



EXISTING SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA01-EX	1.83	0.41	86.0	1.30	4.60
DA02-EX	94.92	0.59	85.3	20.21	103.15
DA03-EX	1.06	0.37	86.0	1.08	3.16



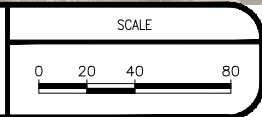
- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- ➡ CHANNELIZED FLOW
- ➡ SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

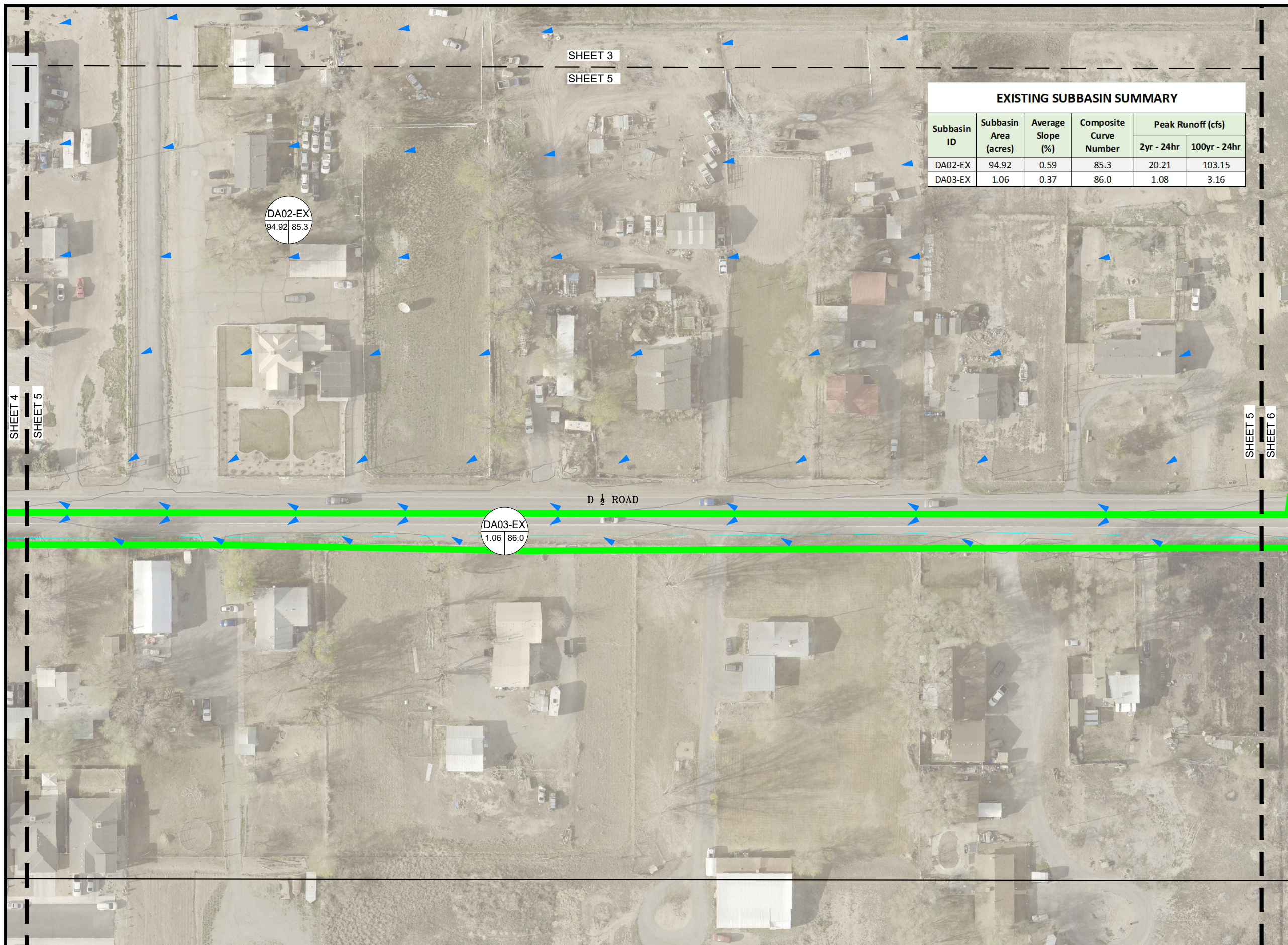


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REVISION 4	REV 4	DATE			

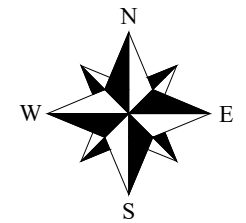


ENGINEERING &
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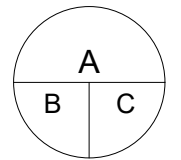
D 1/2 RD - 29 RD TO 30 RD
EXISTING CONDITIONS DRAINAGE MAP



EXISTING SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA02-EX	94.92	0.59	85.3	20.21	103.15
DA03-EX	1.06	0.37	86.0	1.08	3.16

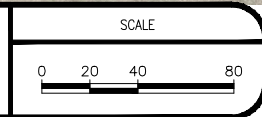


- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- ➡ CHANNELIZED FLOW
- ➡ SHEET FLOW



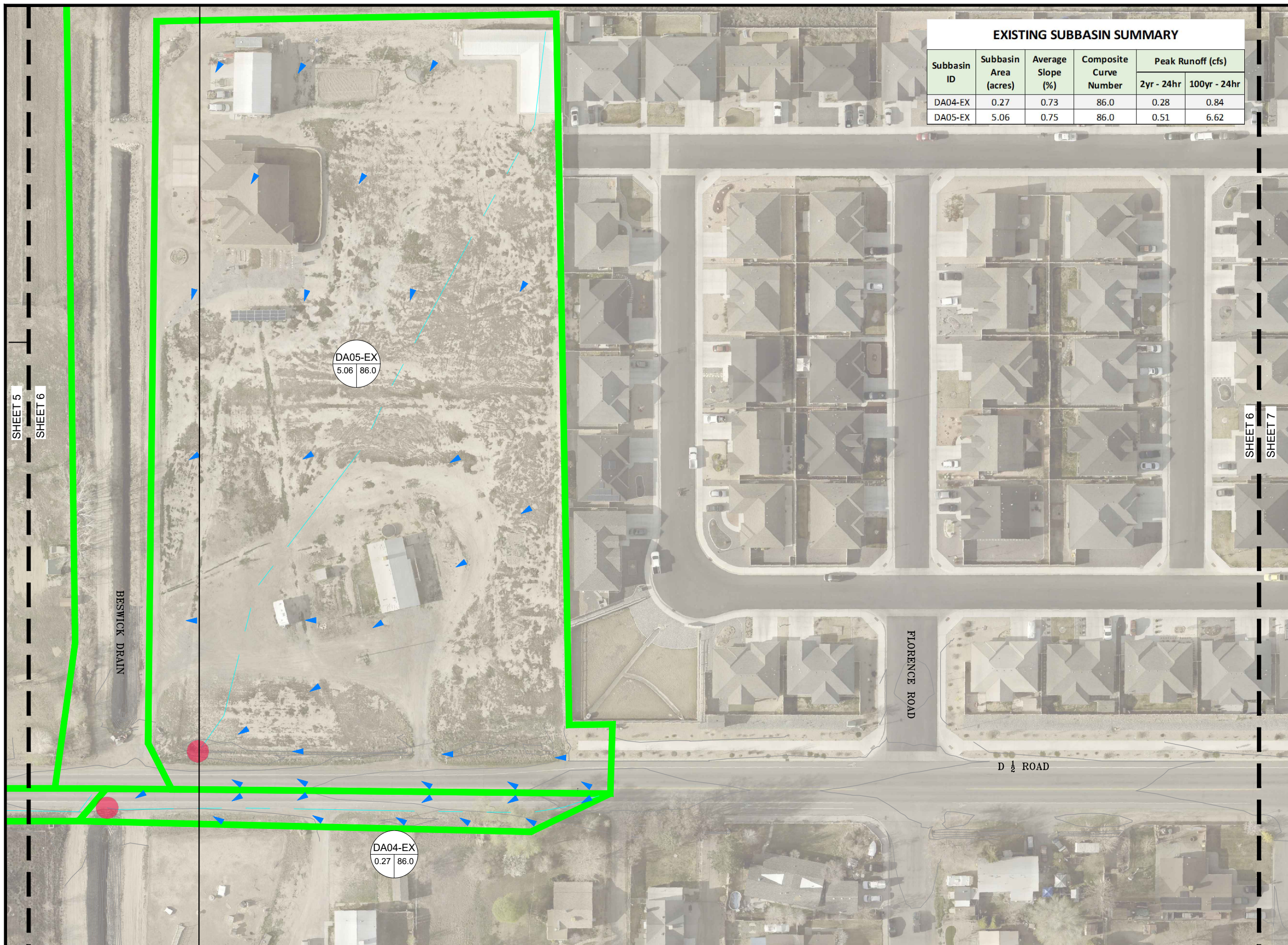
A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

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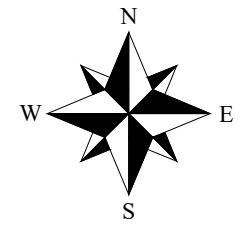


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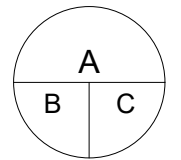
D 1/2 RD - 29 RD TO 30 RD
EXISTING CONDITIONS DRAINAGE MAP



EXISTING SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA04-EX	0.27	0.73	86.0	0.28	0.84
DA05-EX	5.06	0.75	86.0	0.51	6.62



- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- ➡ CHANNELIZED FLOW
- ➡ SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

REVISION	DATE	DESCRIPTION	DATE	DATE
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REVISION 4	10/09/2024			

DRAWN BY	ECL	DATE	10/09/2024
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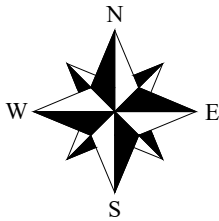
ENGINEERING &
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PROJECT NO. 2204-01020

D 1/2 RD - 29 RD TO 30 RD
EXISTING CONDITIONS DRAINAGE MAP

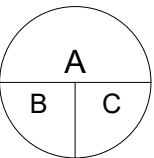


SHEET 6
SHEET 7

EXISTING SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA06-EX	0.13	2.00	86.0	0.12	0.37
DA07-EX	0.26	1.82	86.0	0.18	0.65



- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- ← CHANNELIZED FLOW
- ▶ SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER



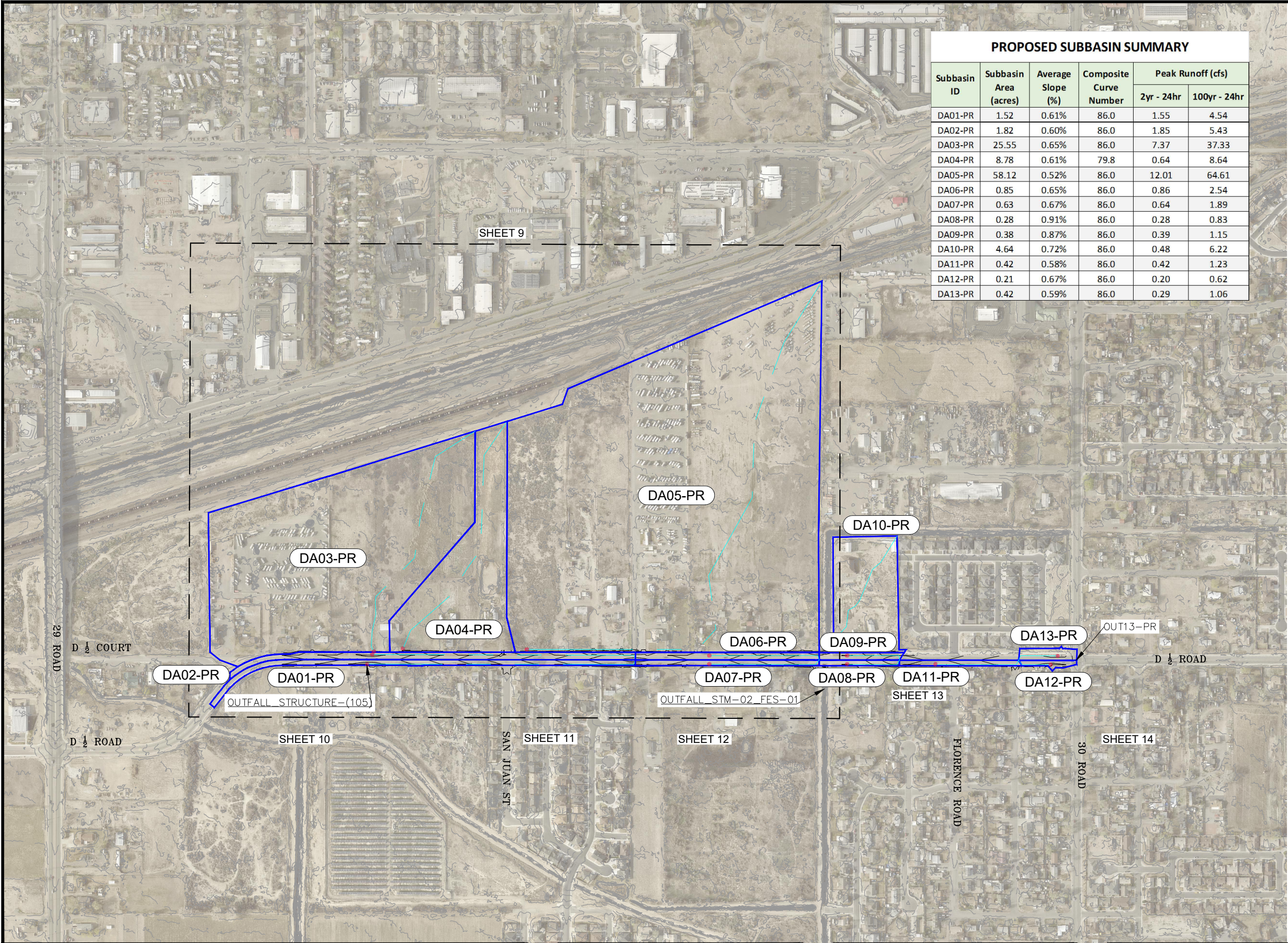
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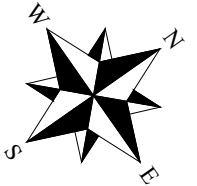


ENGINEERING &
TRANSPORTATION DIVISION
PROJECT NO. 2204-01020

D 1/2 RD - 29 RD TO 30 RD
EXISTING CONDITIONS DRAINAGE MAP



PROPOSED SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA01-PR	1.52	0.61%	86.0	1.55	4.54
DA02-PR	1.82	0.60%	86.0	1.85	5.43
DA03-PR	25.55	0.65%	86.0	7.37	37.33
DA04-PR	8.78	0.61%	79.8	0.64	8.64
DA05-PR	58.12	0.52%	86.0	12.01	64.61
DA06-PR	0.85	0.65%	86.0	0.86	2.54
DA07-PR	0.63	0.67%	86.0	0.64	1.89
DA08-PR	0.28	0.91%	86.0	0.28	0.83
DA09-PR	0.38	0.87%	86.0	0.39	1.15
DA10-PR	4.64	0.72%	86.0	0.48	6.22
DA11-PR	0.42	0.58%	86.0	0.42	1.23
DA12-PR	0.21	0.67%	86.0	0.20	0.62
DA13-PR	0.42	0.59%	86.0	0.29	1.06



- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY



REVISION	DESCRIPTION	DATE	DRAWN BY	DATE
REVISION A REV 1			ECL	10/09/2024
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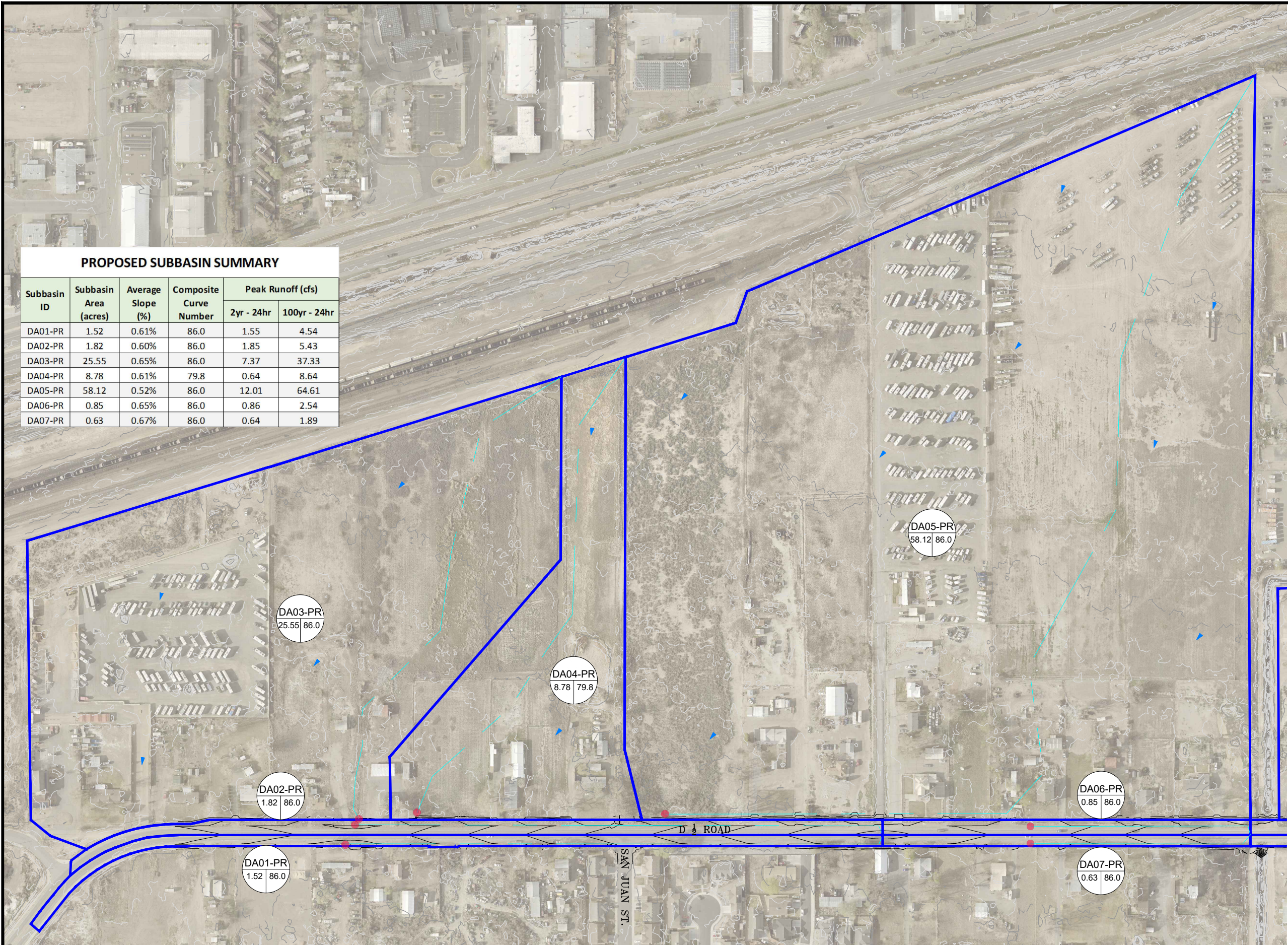
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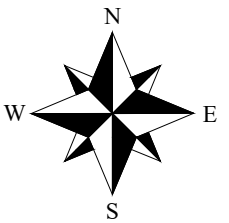
ENGINEERING & TRANSPORTATION DIVISION
PROJECT NO. F210305

D 1/2 RD - 29 RD TO 30 RD
PROPOSED CONDITIONS DRAINAGE MAP
OVERVIEW

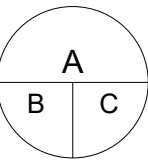
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PROPOSED SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA01-PR	1.52	0.61%	86.0	1.55	4.54
DA02-PR	1.82	0.60%	86.0	1.85	5.43
DA03-PR	25.55	0.65%	86.0	7.37	37.33
DA04-PR	8.78	0.61%	79.8	0.64	8.64
DA05-PR	58.12	0.52%	86.0	12.01	64.61
DA06-PR	0.85	0.65%	86.0	0.86	2.54
DA07-PR	0.63	0.67%	86.0	0.64	1.89



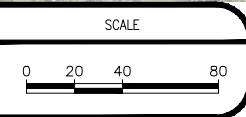
- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- CHANNELIZED FLOW
- SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

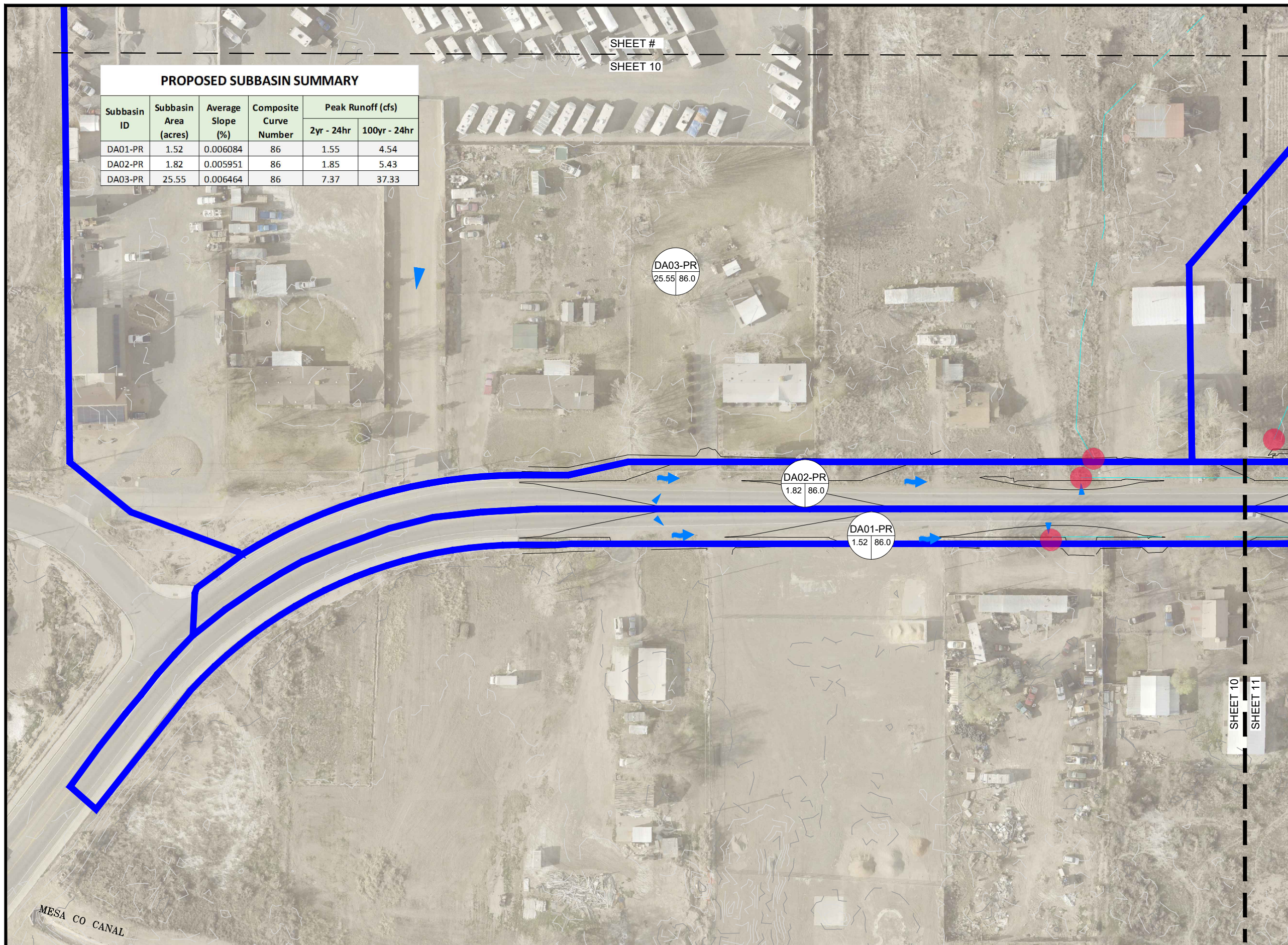


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REVISION 4	REV 4	10/09/2024			



ENGINEERING & TRANSPORTATION DIVISION
PROJECT NO. F210305

D 1/2 RD - 29 RD TO 30 RD
PROPOSED CONDITIONS DRAINAGE MAP



PROPOSED SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA01-PR	1.52	0.006084	86	1.55	4.54
DA02-PR	1.82	0.005951	86	1.85	5.43
DA03-PR	25.55	0.006464	86	7.37	37.33

SUBBASIN OUTFALL

FLOWPATH

SUBBASIN BOUNDARY

CHANNELIZED FLOW

SHEET FLOW

A

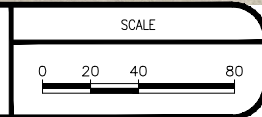
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B - AREA (ACRES)
C - CURVE NUMBER



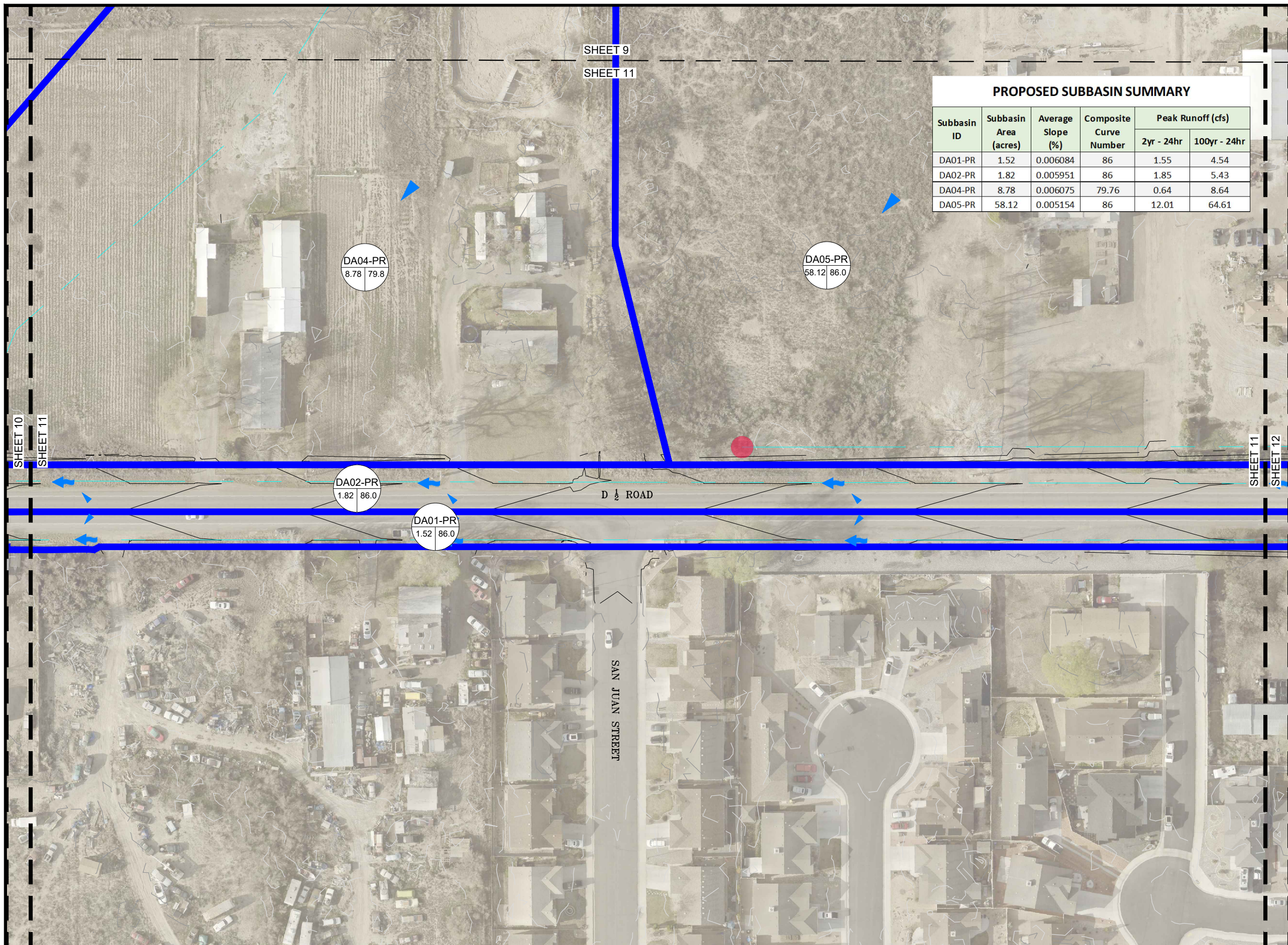
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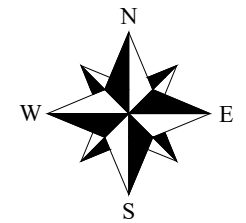
ENGINEERING &
TRANSPORTATION DIVISION
PROJECT NO. F210305

D 1/2 RD - 29 RD TO 30 RD
PROPOSED CONDITIONS DRAINAGE MAP

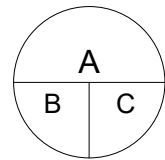
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PROPOSED SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA01-PR	1.52	0.006084	86	1.55	4.54
DA02-PR	1.82	0.005951	86	1.85	5.43
DA04-PR	8.78	0.006075	79.76	0.64	8.64
DA05-PR	58.12	0.005154	86	12.01	64.61



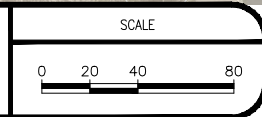
- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- CHANNELIZED FLOW
- SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

REVISION	DESCRIPTION	DATE
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REVISION 2	REV 2	DATE
REVISION 3	REV 3	DATE
REVISION 4	REV 4	DATE

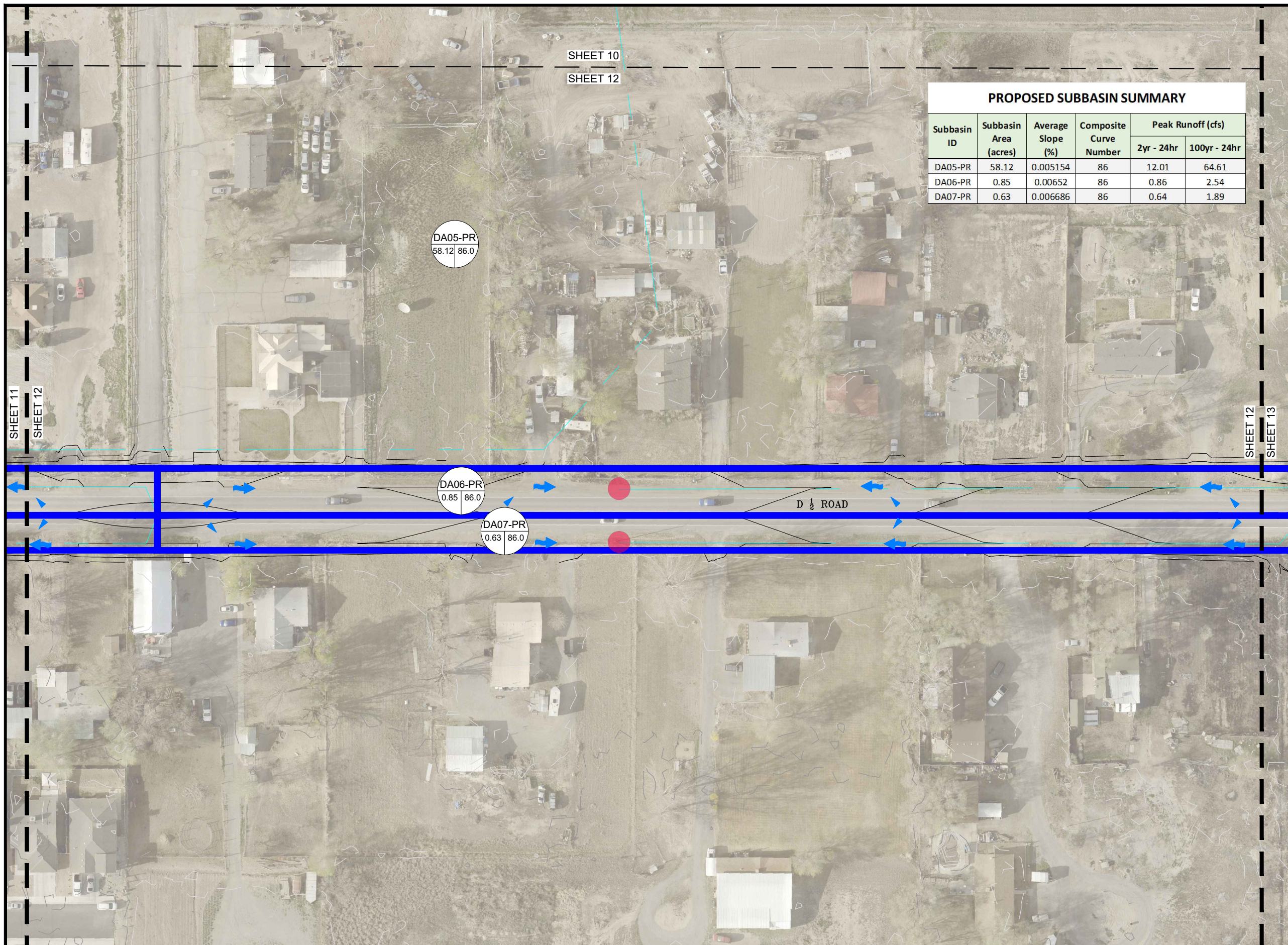
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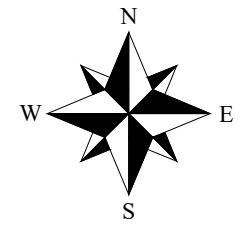
ENGINEERING &
TRANSPORTATION DIVISION
PROJECT NO. F210311

D 1/2 RD - 29 RD TO 30 RD
PROPOSED CONDITIONS DRAINAGE MAP

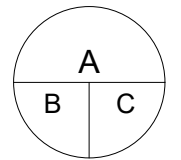
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PROPOSED SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA05-PR	58.12	0.005154	86	12.01	64.61
DA06-PR	0.85	0.00652	86	0.86	2.54
DA07-PR	0.63	0.006686	86	0.64	1.89



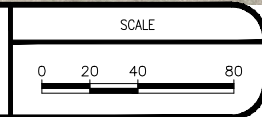
- SUBBASIN OUTFALL
- FLOWPATH
- ▬ SUBBASIN BOUNDARY
- ➡ CHANNELIZED FLOW
- SHEET FLOW



A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

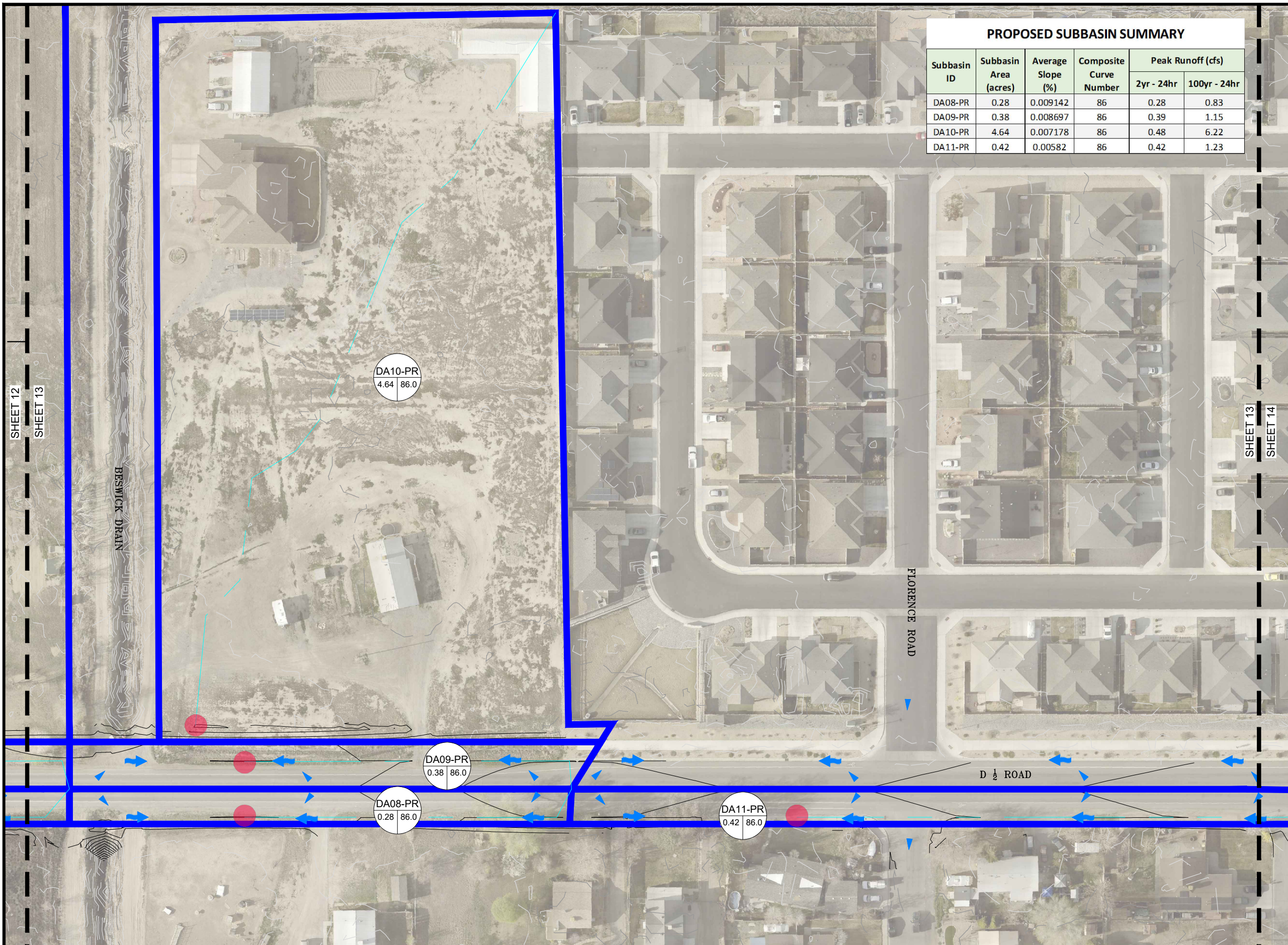


REVISION	DESCRIPTION	DATE	DRAWN BY	ECL	DATE
REVISION 1	REV 1	10/09/2024	ECL		10/09/2024
REVISION 2	REV 2	10/09/2024	ECL		10/09/2024
REVISION 3	REV 3	10/09/2024	JR		10/09/2024
REVISION 4	REV 4	10/09/2024	JR		10/09/2024

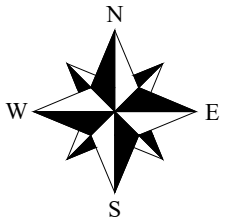


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PROJECT NO. 2204-01020

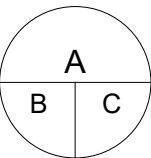
**D 1/2 RD - 29 RD TO 30 RD
PROPOSED CONDITIONS DRAINAGE MAP**



PROPOSED SUBBASIN SUMMARY					
Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA08-PR	0.28	0.009142	86	0.28	0.83
DA09-PR	0.38	0.008697	86	0.39	1.15
DA10-PR	4.64	0.007178	86	0.48	6.22
DA11-PR	0.42	0.00582	86	0.42	1.23

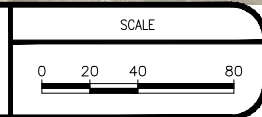


- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- CHANNELIZED FLOW
- SHEET FLOW



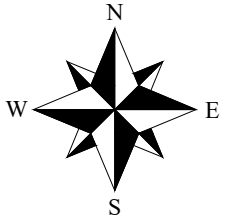
A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

REVISION	DATE	DESCRIPTION
REVISION 1	10/09/2024	DESIGNED BY ECL
REVISION 2	10/09/2024	CHECKED BY JR
REVISION 3	10/09/2024	APPROVED BY JR
REVISION 4	10/09/2024	

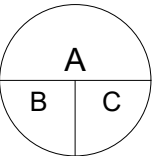


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PROJECT NO. 2204-01020

D 1/2 RD - 29 RD TO 30 RD
PROPOSED CONDITIONS DRAINAGE MAP



- SUBBASIN OUTFALL
- FLOWPATH
- SUBBASIN BOUNDARY
- CHANNELIZED FLOW
- SHEET FLOW

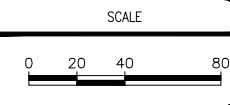


A - SUBBASIN ID
B - AREA (ACRES)
C - CURVE NUMBER

PROPOSED SUBBASIN SUMMARY

Subbasin ID	Subbasin Area (acres)	Average Slope (%)	Composite Curve Number	Peak Runoff (cfs)	
				2yr - 24hr	100yr - 24hr
DA12-PR	0.21	0.006668	86	0.2	0.62
DA13-PR	0.42	0.005872	86	0.29	1.06

REVISION	DESCRIPTION	DATE	DRAWN BY	ECL	DATE
REVISION 1	REV 1	DATE	DESIGNED BY	ECL	DATE
REVISION 2	REV 2	DATE	CHECKED BY	JR	DATE
REVISION 3	REV 3	DATE	APPROVED BY	JR	DATE
REVISION 4	REV 4	DATE			



ENGINEERING &
TRANSPORTATION DIVISION
PROJECT NO. 2204-01020

D 1/2 RD - 29 RD TO 30 RD
PROPOSED CONDITIONS DRAINAGE MAP

APPENDIX B

NRCS Web Soil Survey Soil Data



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Mesa County Area, Colorado**



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Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

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 1:24,000.

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: Mesa County Area, Colorado
Survey Area Data: Version 15, Sep 6, 2024

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

Date(s) aerial images were photographed: Jun 24, 2020—Jul 8, 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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ba	Massadona silty clay loam, 0 to 2 percent slopes	19.1	2.2%
Bc	Sagers silty clay loam, 0 to 2 percent slopes	207.8	24.3%
BcS	Sagers silty clay loam, saline, 0 to 2 percent slopes	373.8	43.7%
BcU	Sagers-Urban land complex, 0 to 2 percent slopes	254.3	29.7%
Totals for Area of Interest		855.0	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

Custom Soil Resource Report

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mesa County Area, Colorado

Ba—Massadona silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k06n
Elevation: 4,490 to 4,920 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Massadona and similar soils: 70 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Massadona

Setting

Landform: Fan remnants
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Cretaceous source alluvium derived from clayey shale

Typical profile

Ap - 0 to 2 inches: silty clay loam
Bw - 2 to 12 inches: silty clay
Bk_{yz} - 12 to 24 inches: silty clay
BCK_{yz}1 - 24 to 48 inches: fine sandy loam
BCK_{yz}2 - 48 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately low to moderately high (0.07 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Moderately saline to strongly saline (10.0 to 30.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R034BY103UT - Desert Clay (Castlevally saltbush)
Hydric soil rating: No

Bc—Sagers silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k0bq
Elevation: 4,490 to 5,900 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Sagers and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagers

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Cretaceous source alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 12 inches: silty clay loam
C - 12 to 25 inches: silty clay loam
Cy - 25 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R034BY106UT - Desert Loam (Shadscale)
Hydric soil rating: No

BcS—Sagers silty clay loam, saline, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k0bs
Elevation: 4,490 to 4,920 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Sagers, saline, and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagers, Saline

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Cretaceous source alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 12 inches: silty clay loam
C - 12 to 25 inches: silty clay loam
Cy - 25 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Strongly saline (16.0 to 32.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R034BY106UT - Desert Loam (Shadscale)
Hydric soil rating: No

BcU—Sagers-Urban land complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k1rq
Elevation: 4,490 to 4,920 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Sagers and similar soils: 55 percent
Urban land: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagers

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Cretaceous source alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 12 inches: silty clay loam
C - 12 to 25 inches: silty clay loam
Cy - 25 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R034BY106UT - Desert Loam (Shadscale)
Hydric soil rating: No

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

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APPENDIX C.1

Existing Conditions 2-Year Autodesk Storm and Sanitary Analysis Hydrologic and Hydraulic Model

Subbasin Hydrology

Subbasin : DA01-EX

Input Data

Area (ac)	1.81
Impervious Area (%)	60
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.41
Equivalent Width (ft)	1731
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.015
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

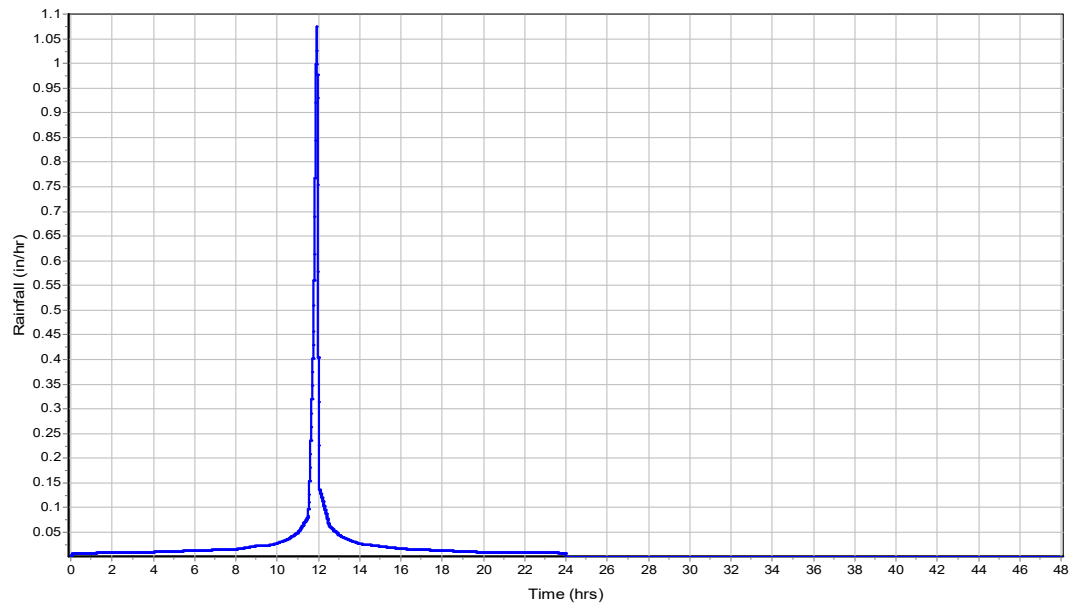
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.81	C	86
Composite Area & Weighted CN	1.81		86

Subbasin Runoff Results

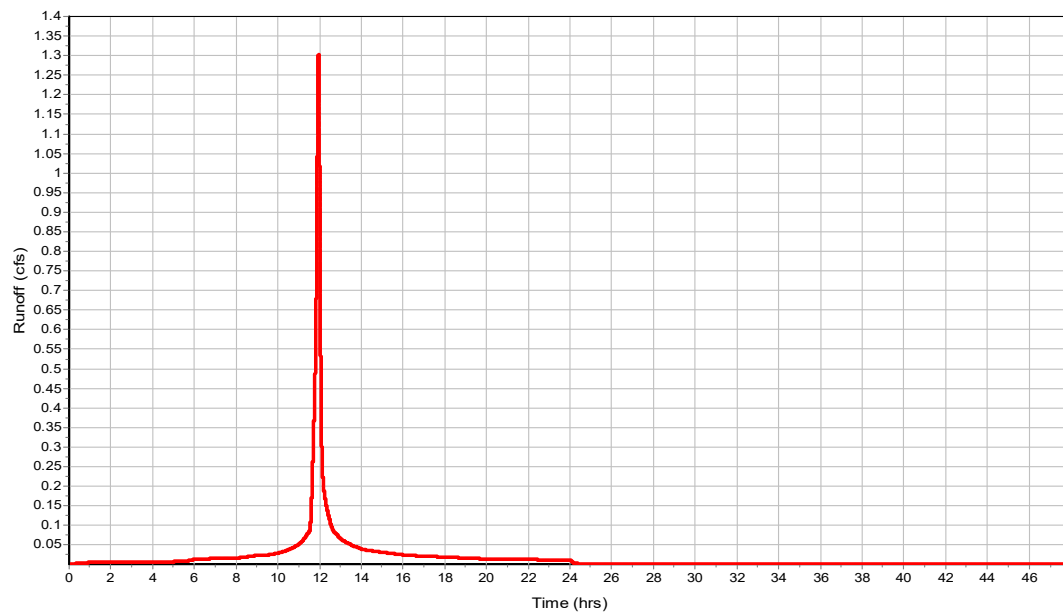
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.196
Total Runoff (in)	0.47
Peak Runoff (cfs)	1.3
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:11:48

Subbasin : DA01-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA02-EX

Input Data

Area (ac) 95
Impervious Area (%) 24
Weighted Curve Number 85.34
Conductivity (in/hr) 0.15
Drying Time (days) 7
Average Slope (%) 0.593
Equivalent Width (ft) 6100
Impervious Area
 Manning's Roughness 0.015
Pervious Area
 Manning's Roughness 0.05
Curb & Gutter Length (ft) 0
Rain Gage ID GrandValley

Composite Curve Number

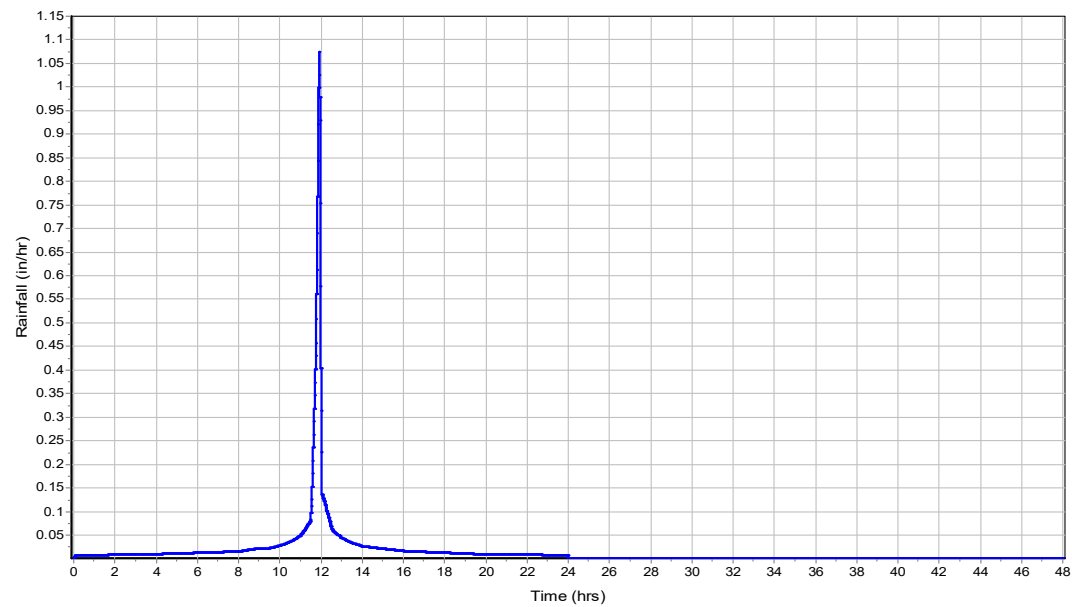
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	25.6	C	86
50 - 75% grass cover, Fair	9.02	C	79
< 50% grass cover, Poor	58.5	C	86
< 50% grass cover, Poor	1.88	C	86
Composite Area & Weighted CN	95		85.34

Subbasin Runoff Results

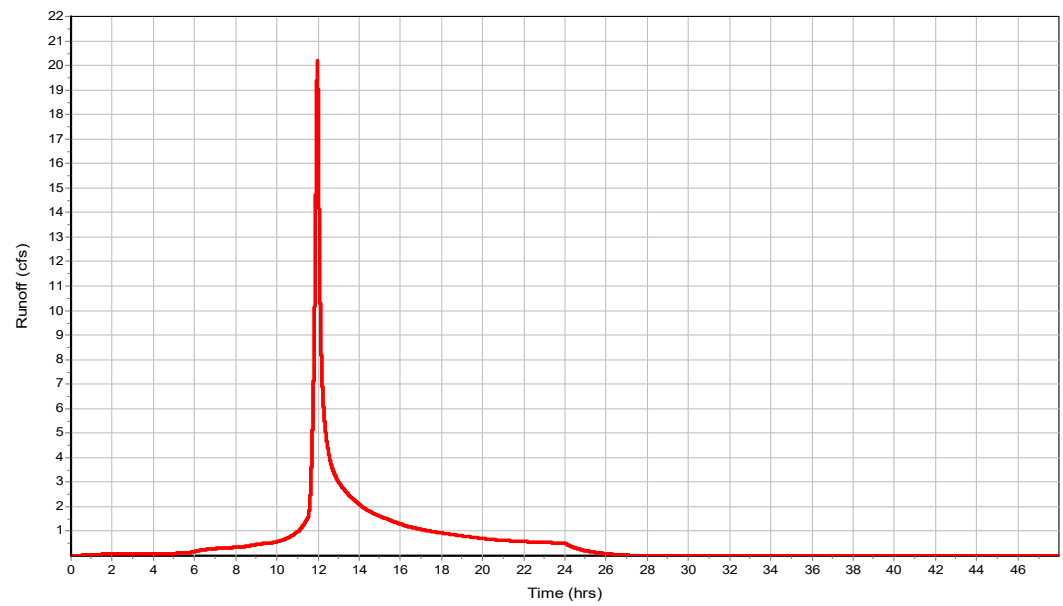
Total Rainfall (in) 0.7
Total Runon (in) 0
Total Evaporation (in) 0
Total Infiltration (in) 0.389
Total Runoff (in) 0.27
Peak Runoff (cfs) 20.21
Weighted Curve Number 85.34
Time of Concentration (days hh:mm:ss) 0 02:06:34

Subbasin : DA02-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA03-EX

Input Data

Area (ac)	1.06
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.375
Equivalent Width (ft)	2383
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

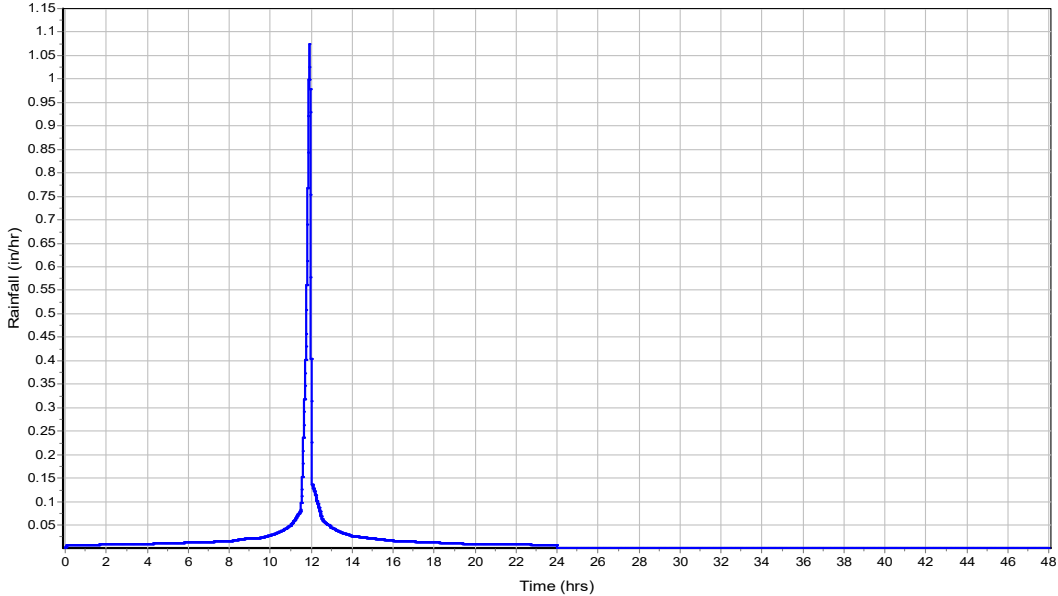
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.06	C	86
Composite Area & Weighted CN	1.06		86

Subbasin Runoff Results

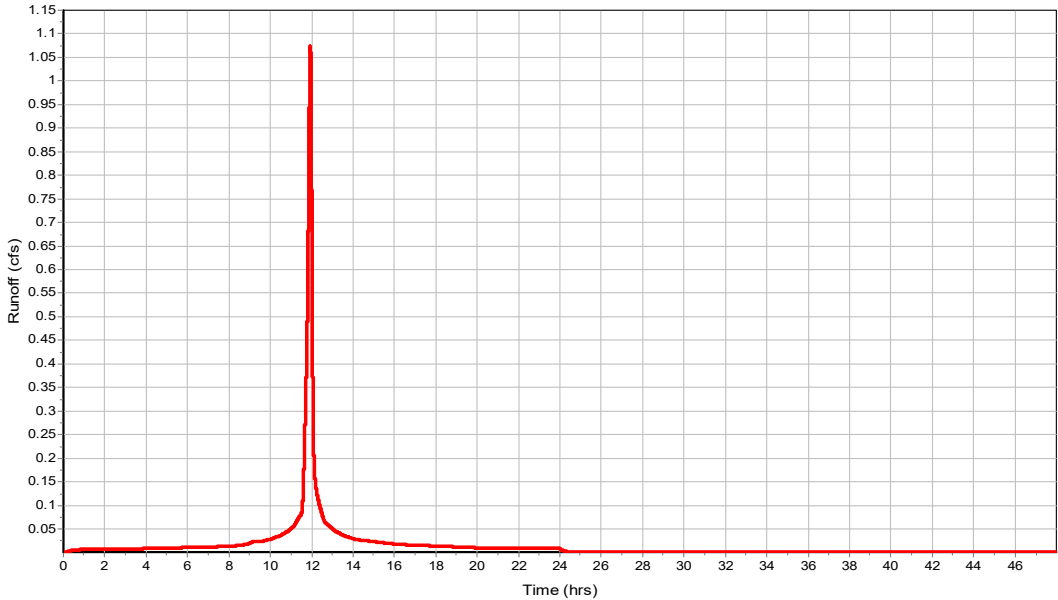
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.68
Peak Runoff (cfs)	1.08
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:09:49

Subbasin : DA03-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA04-EX

Input Data

Area (ac)	0.27
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.73
Equivalent Width (ft)	803
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

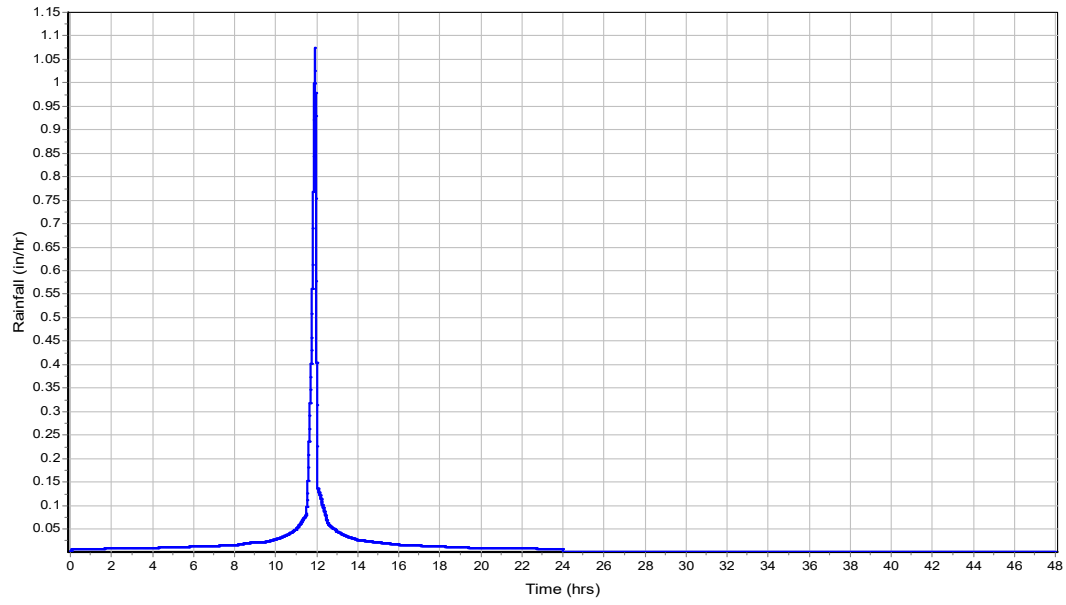
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.27	C	86
Composite Area & Weighted CN	0.27		86

Subbasin Runoff Results

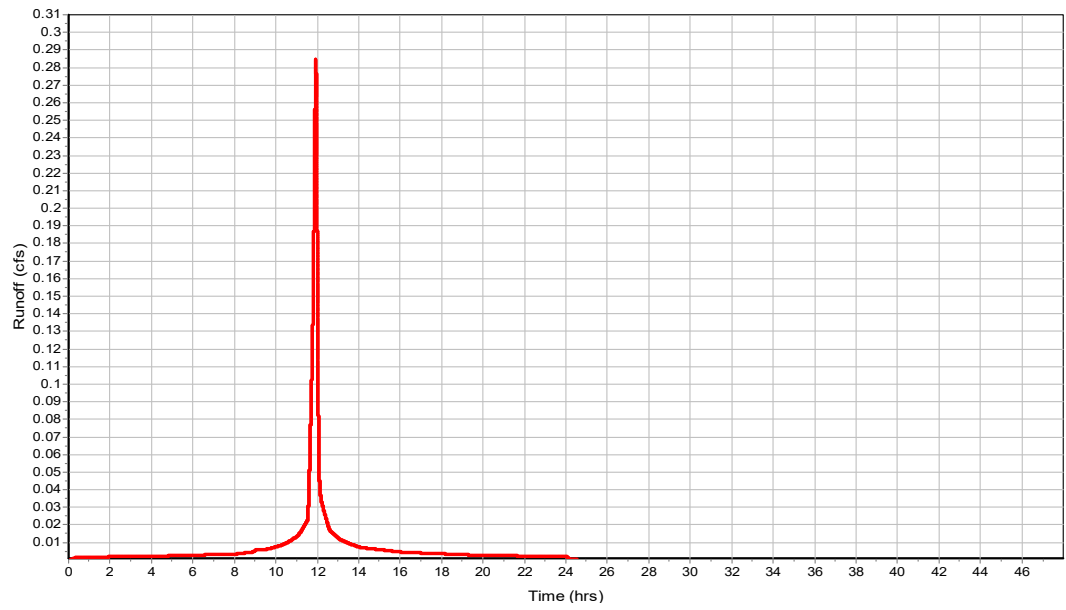
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.68
Peak Runoff (cfs)	0.28
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:06:53

Subbasin : DA04-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA05-EX

Input Data

Area (ac)	5.06
Impervious Area (%)	6
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.746
Equivalent Width (ft)	1288
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

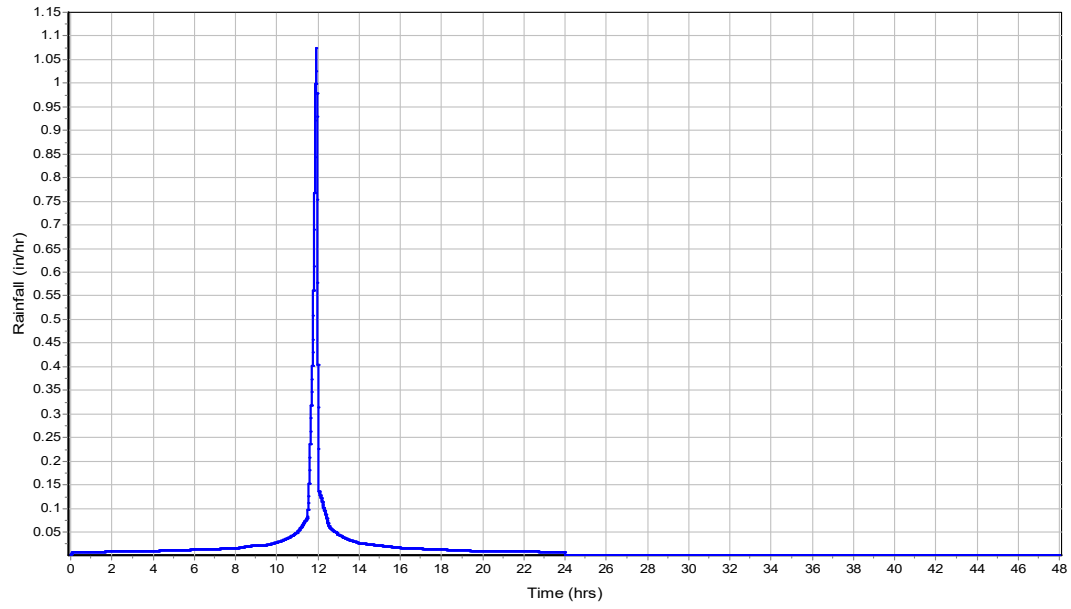
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	5.06	C	86
Composite Area & Weighted CN	5.06		86

Subbasin Runoff Results

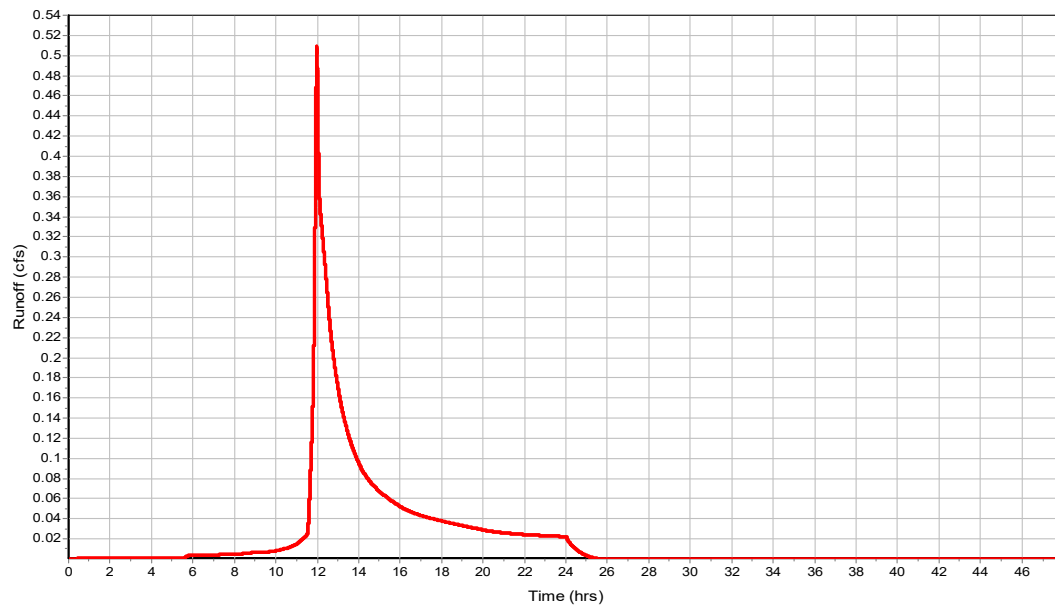
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.466
Total Runoff (in)	0.18
Peak Runoff (cfs)	0.51
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:58:42

Subbasin : DA05-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA06-EX

Input Data

Area (ac)	0.13
Impervious Area (%)	90
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	2
Equivalent Width (ft)	190
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.2
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

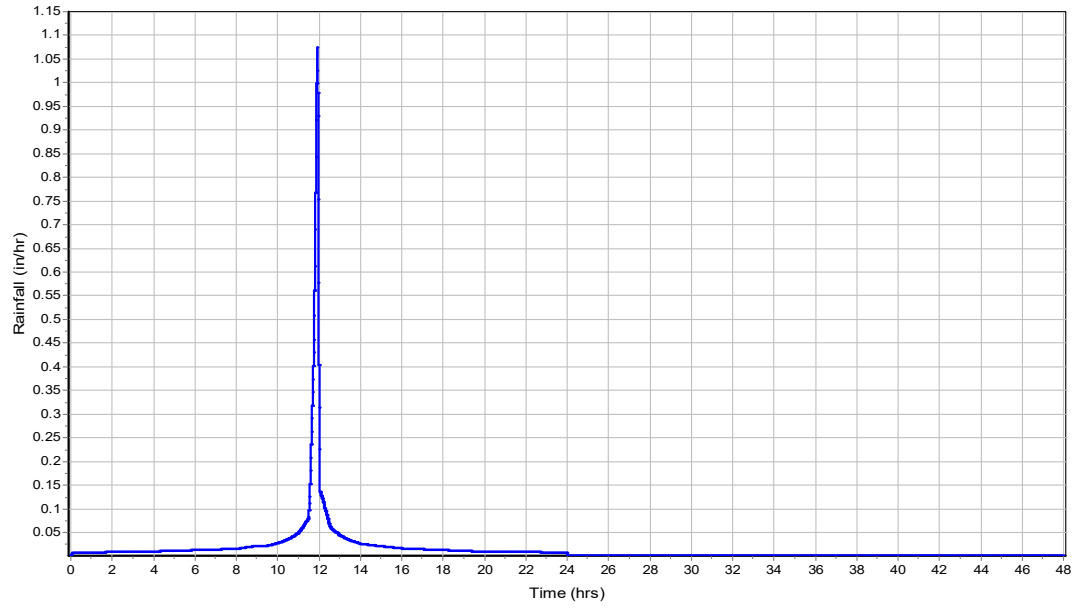
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.13	C	86
Composite Area & Weighted CN	0.13		86

Subbasin Runoff Results

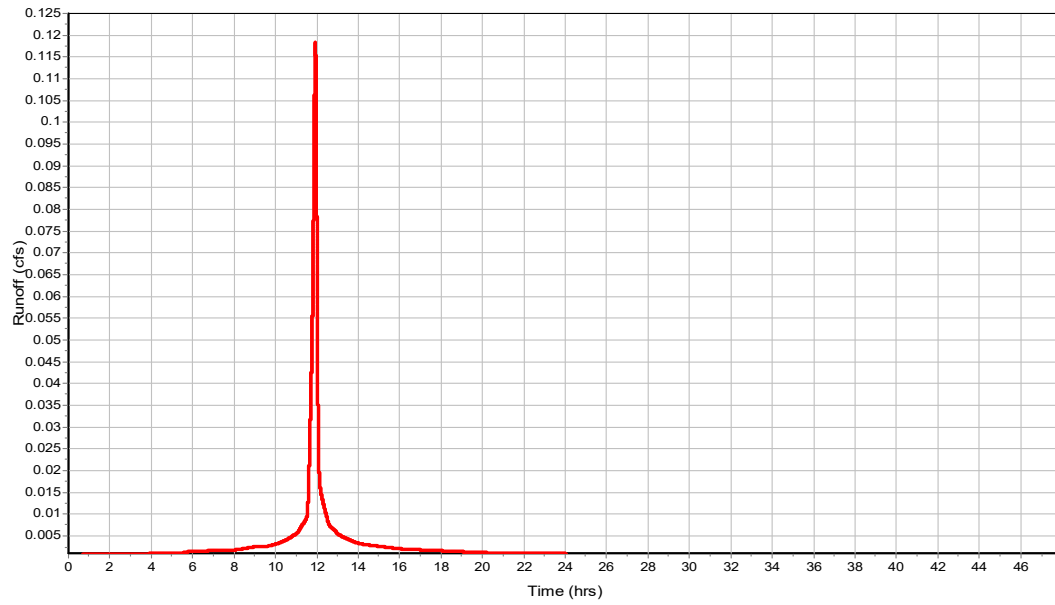
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.054
Total Runoff (in)	0.63
Peak Runoff (cfs)	0.12
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:09:02

Subbasin : DA06-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA07-EX

Input Data

Area (ac)	0.26
Impervious Area (%)	60
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	1.82
Equivalent Width (ft)	209
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

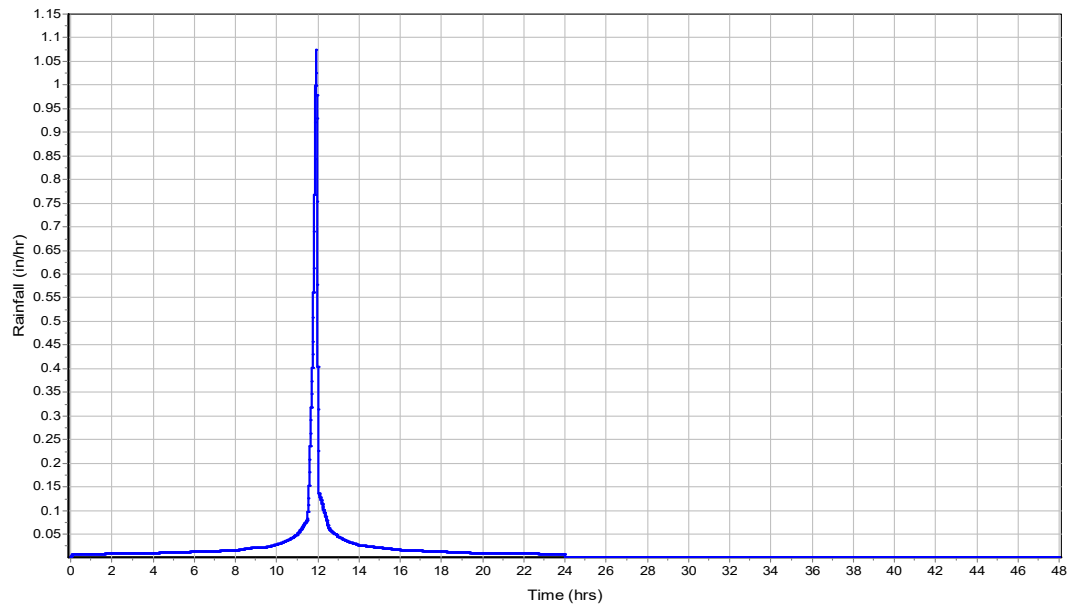
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.26	C	86
Composite Area & Weighted CN	0.26		86

Subbasin Runoff Results

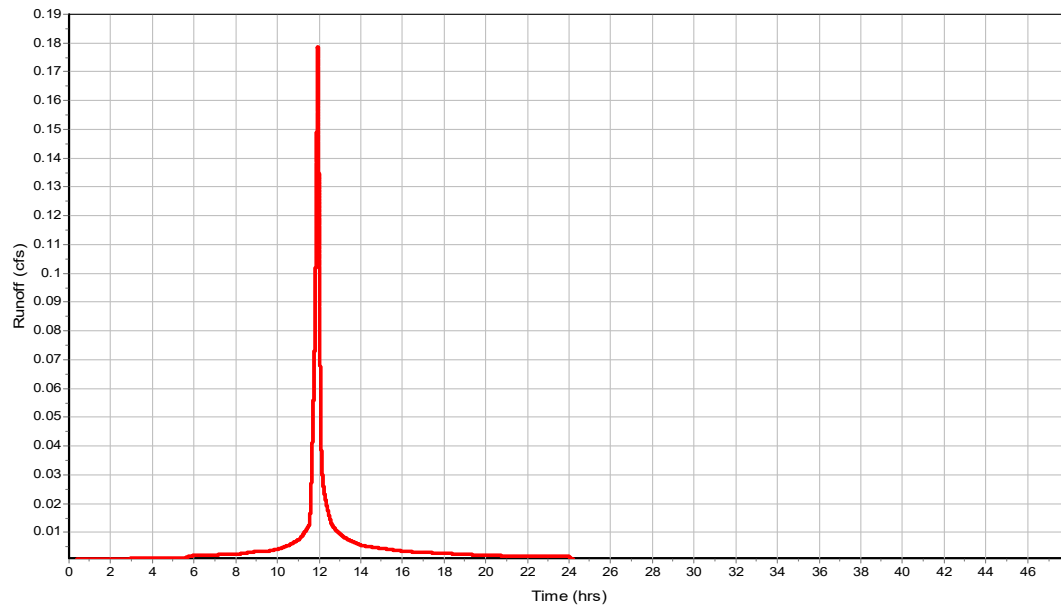
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.196
Total Runoff (in)	0.47
Peak Runoff (cfs)	0.18
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:13:22

Subbasin : DA07-EX

Rainfall Intensity Graph



Runoff Hydrograph



SN	Element ID	From (Inlet Node)	To (Outlet Node)	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence (days hh:mm)	Max Flow Velocity (ft/sec)	Travel Time (min)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Froude Number	Reported Condition
1	Link-100	64	Out06-EX	33.13	4625.52	0.00	4625.32	0.00	0.20	0.6000	CIRCULAR	18.000	18.00	0.0150	0.0000	0.8000	0.0000	0.00	NO	1.00	0.29	0 11:56	1.89	0.29	7.07	0.04	0.14	0.00	0.22	0.35	Calculated
2	Link-101	Inlet-11	64	24.56	4626.92	0.00	4626.81	1.29	0.11	0.4500	CIRCULAR	18.000	18.00	0.0120	0.5000	0.6000	0.0000	0.00	NO	1.00	0.12	0 11:56	1.52	0.27	7.62	0.02	0.09	0.00	0.13	0.53	Calculated
3	Link-104	64	64	178.98	4626.51	0.00	4624.89	0.00	1.62	0.9100	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	1.63	0 12:43	3.68	0.81	10.83	0.15	0.30	0.00	0.45	0.58	Calculated
4	Link-105	64	64	53.51	4624.22	0.00	4623.28	4.69	0.94	1.7600	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.62	0 12:44	5.24	0.17	15.08	0.11	0.23	0.00	0.35	1.01	Calculated
5	Link-112	64	64	143.22	4624.89	0.00	4624.26	0.04	0.63	0.4400	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.62	0 12:44	3.30	0.72	7.55	0.22	0.32	0.00	0.48	0.57	Calculated
6	Link-113	64	Out04-EX	65.00	4618.59	0.00	4618.41	0.00	0.18	0.2700	CIRCULAR	36.000	36.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	1.83	0 12:44	2.52	0.43	37.60	0.05	0.16	0.00	0.48	0.49	Calculated
7	Link-115	64	64	33.24	4626.21	0.00	4623.59	5.00	2.62	7.8800	CIRCULAR	12.000	12.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.51	0 11:58	6.64	0.08	10.84	0.05	0.15	0.00	0.15	1.62	Calculated
8	Link-98	Inlet-10	64	35.42	4630.23	0.00	4630.07	0.08	0.16	0.4500	CIRCULAR	12.000	12.00	0.0150	0.5000	0.6000	0.0000	0.00	NO	1.00	0.18	0 11:57	1.67	0.35	2.08	0.09	0.19	0.00	0.19	0.48	Calculated
9	Link-99	64	64	30.36	4629.99	0.00	4625.62	0.10	4.37	14.3900	CIRCULAR	12.000	12.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	0.18	0 11:57	5.17	0.10	14.64	0.01	0.10	0.00	0.10	1.76	Calculated

SN	Element ID	X Coordinate	Y Coordinate	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
				(ft)			(ft)	(cfs)	(cfs)	(ft)	(ft)
1	Out01-EX	106710.98	36635.03	0.00	NORMAL	NO		1.30	1.30	0.00	0.00
2	Out02-EX	106724.85	36830.06	0.00	NORMAL	NO		20.21	20.21	0.00	0.00
3	Out03-EX	107917.24	36770.89	0.00	NORMAL	NO		1.08	1.08	0.00	0.00
4	Out04-EX	109257.86	36765.62	4618.41	NORMAL	NO		1.85	0.28	0.45	4618.86
5	Out06-EX	110576.25	36802.04	4625.32	NORMAL	NO		0.29	0.00	0.21	4625.53

SN	Element ID	X Coordinate	Y Coordinate	Description	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation	Max (Rim) Elevation	Max (Rim) Offset	Initial Water Elevation	Initial Water Depth	Ponded Area	Grate Clogging Factor	Roadway Longitudinal Slope	Roadway Cross Slope	Roadway Manning's Roughness	Gutter Cross Slope	Gutter Width	Gutter Depression	Median Ditch Longitudinal Slope	Median Ditch Bottom Width	Median Ditch Left Side Slope	Median Ditch Right Side Slope	Median Ditch Manning's Roughness	Peak Flow	Peak Lateral Inflow	Peak Flow Intercepted by Inlet	Peak Flow Bypassing Inlet	Inlet Efficiency during Peak Flow	Allowable Spread	Max Gutter Spread during Peak Flow	Max Gutter Water Elev. during Peak Flow	Max Gutter Water Depth during Peak Flow	Time of Maximum Depth Occurrence	Total Flooded Volume	Total Time Flooded
									(ft)	(ft)	(ft)	(ft)	(ft)	(ft ²)	(%)	(ft/ft)	(ft/ft)		(ft/ft)	(ft)	(Inches)	(ft/ft)	(ft)	(V-H)	(V-H)		(cfs)	(cfs)	(cfs)	(cfs)	(%)	(ft)	(ft)	(ft)	(ft)	(days h:mm)	(ac-inches)	(minutes)
1	Inlet-10	110481.85	36813.74		FHWA HEC-22 GENERIC	N/A	On Sag	1	4630.23	4631.78	1.55	4630.23	0.00	1.00	0.00	N/A	0.0200	0.0160	0.0620	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.18	0.18	N/A	N/A	N/A	7.00	1.67	4631.92	0.14	0 11:57	0.00	0.00
2	Inlet-11	110527.10	36777.07		FHWA HEC-22 GENERIC	N/A	On Sag	1	4626.92	4631.81	4.89	4626.92	0.00	1.00	0.00	N/A	0.0200	0.0160	0.0620	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.12	0.12	N/A	N/A	N/A	7.00	1.51	4631.95	0.14	0 11:56	0.00	0.00

SN	Element ID	X Coordinate	Y Coordinate	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation	Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover	Peak Inflow	Peak Lateral Inflow	Maximum HGL Elevation Attained	Maximum HGL Depth Attained	Maximum Surcharge Depth Attained	Minimum Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Maximum HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-inches)	Total Time Flooded (minutes)
				(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft ²)	(inches)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
1	64	110516.96	36809.06	4629.99	4632.62	2.63	4629.99	0.00	5000.00	367.38	1.00	18.60	0.18	0.00	4630.07	0.08	0.00	2.55	4630.00	0.01	0 11:57	0 00:00	0.00	0.00
2	64	110543.87	36795.01	4625.52	4632.71	7.19	4625.52	0.00	5000.00	367.29	1.00	52.80	0.29	0.00	4625.74	0.22	0.00	6.97	4625.54	0.02	0 11:56	0 00:00	0.00	0.00
3	64	109649.23	36841.88	4626.51	4632.49	5.98	4626.51	0.00	5000.00	367.51	1.00	53.76	1.63	1.63	4626.91	0.40	0.00	5.58	4626.59	0.08	0 12:43	0 00:00	0.00	0.00
4	64	109327.04	36843.23	4624.22	4628.29	4.07	4624.22	0.00	5000.00	371.71	1.00	30.41	1.62	0.00	4624.58	0.36	0.00	3.71	4624.29	0.07	0 12:44	0 00:00	0.00	0.00
5	64	109275.70	36828.12	4618.59	4628.84	10.25	4618.59	0.00	5000.00	371.17	1.00	48.66	1.83	0.00	4619.10	0.51	0.00	9.74	4618.69	0.10	0 12:44	0 00:00	0.00	0.00
6	64	109470.26	36843.26	4624.89	4628.59	3.70	4624.89	0.00	5000.00	371.41	1.00	26.35	1.63	0.00	4625.38	0.49	0.00	3.20	4624.99	0.10	0 12:44	0 00:00	0.00	0.00
7	64	109303.09	36846.96	4626.21	4628.21	2.00	4626.21	0.00	5000.00	371.79	1.00	12.00	0.51	0.51	4626.37	0.16	0.00	1.84	4626.23	0.02	0 11:58	0 00:00	0.00	0.00

SN	Element ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period	Rainfall Depth	Rainfall Distribution
								(years)	(inches)	
1	GrandValley	Time Series	100YR-24HR	Cumulative	inches					User Defined

APPENDIX C.2

Existing Conditions 100-Year Autodesk Storm and Sanitary Analysis Hydrologic and Hydraulic Model

Subbasin Hydrology

Subbasin : DA01-EX

Input Data

Area (ac)	1.81
Impervious Area (%)	60
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.41
Equivalent Width (ft)	1731
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.015
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

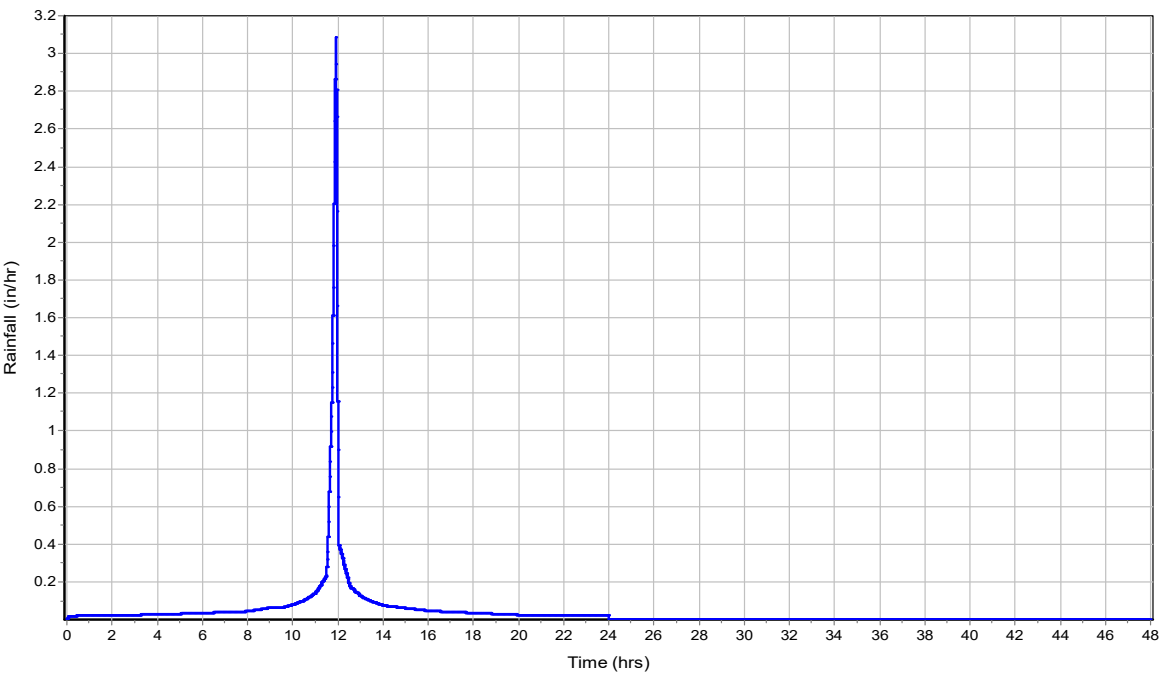
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.81	C	86
Composite Area & Weighted CN	1.81		86

Subbasin Runoff Results

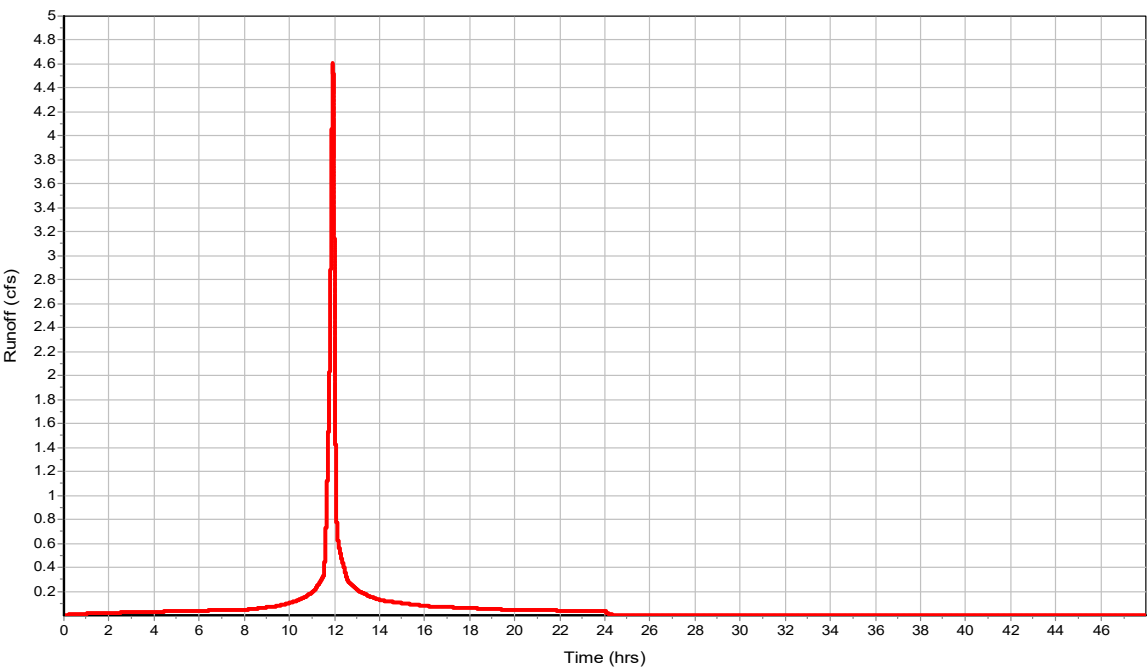
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.36
Total Runoff (in)	1.62
Peak Runoff (cfs)	4.6
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:07:44

Subbasin : DA01-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA02-EX

Input Data

Area (ac)	95
Impervious Area (%)	24
Weighted Curve Number	85.34
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.593
Equivalent Width (ft)	6100
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

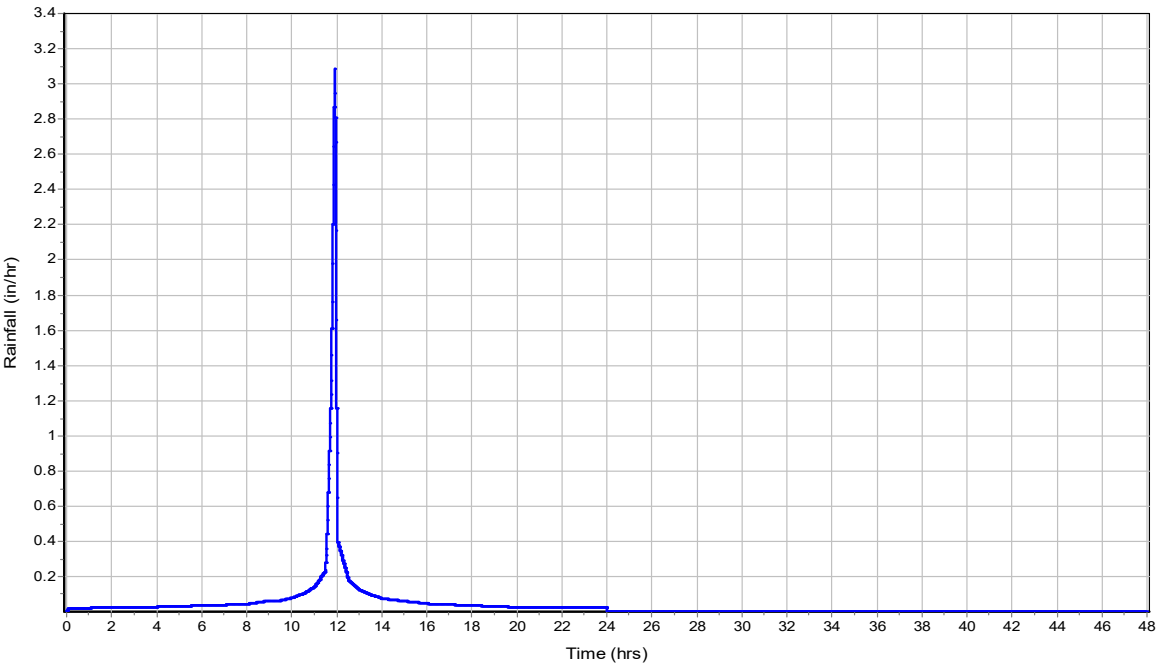
Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	25.6	C	86
50 - 75% grass cover, Fair	9.02	C	79
< 50% grass cover, Poor	58.5	C	86
< 50% grass cover, Poor	1.88	C	86
Composite Area & Weighted CN	95		85.34

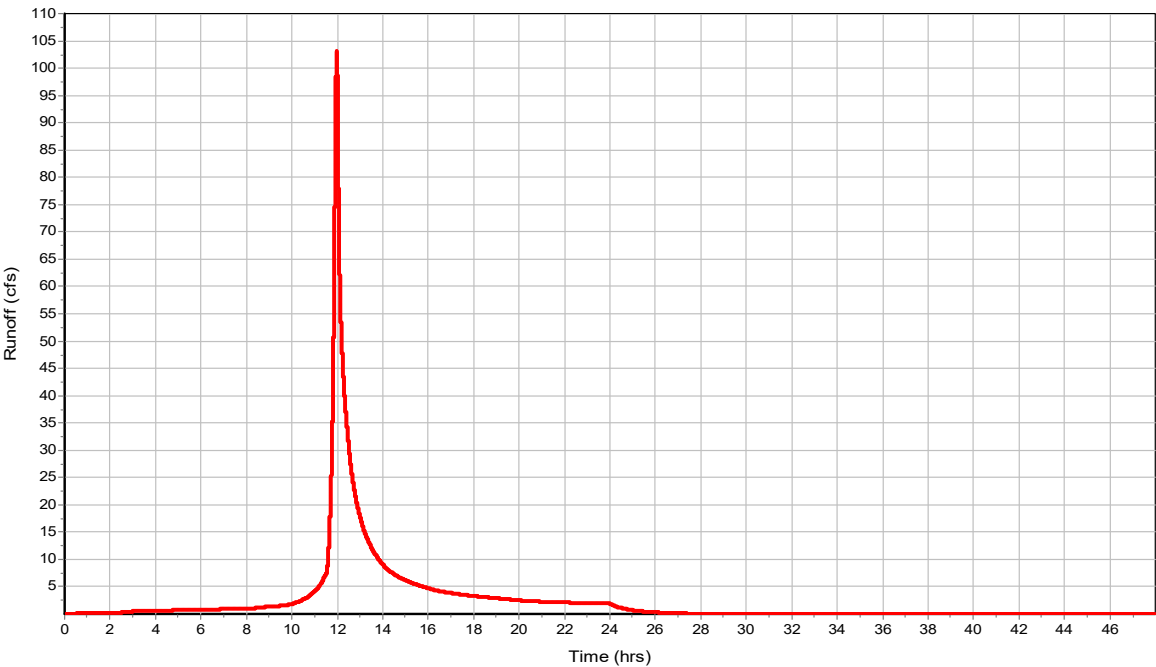
Subbasin Runoff Results

Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.722
Total Runoff (in)	1.24
Peak Runoff (cfs)	103.15
Weighted Curve Number	85.34
Time of Concentration (days hh:mm:ss)	0 01:22:59

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA03-EX

Input Data

Area (ac)	1.06
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.375
Equivalent Width (ft)	2383
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

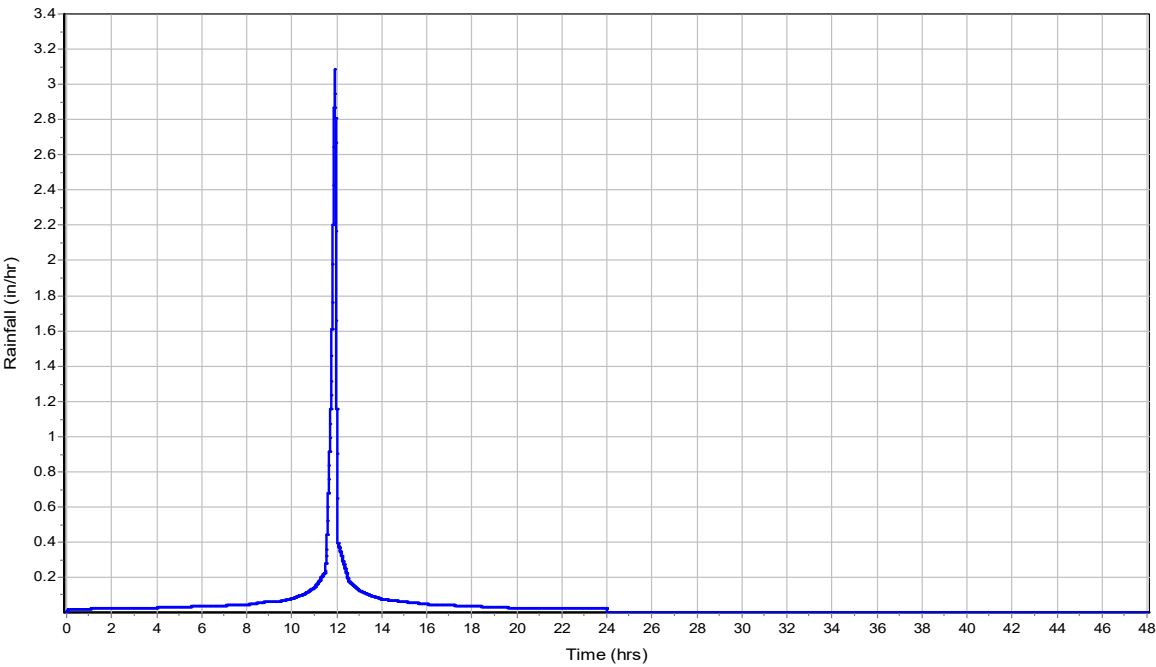
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.06	C	86
Composite Area & Weighted CN	1.06		86

Subbasin Runoff Results

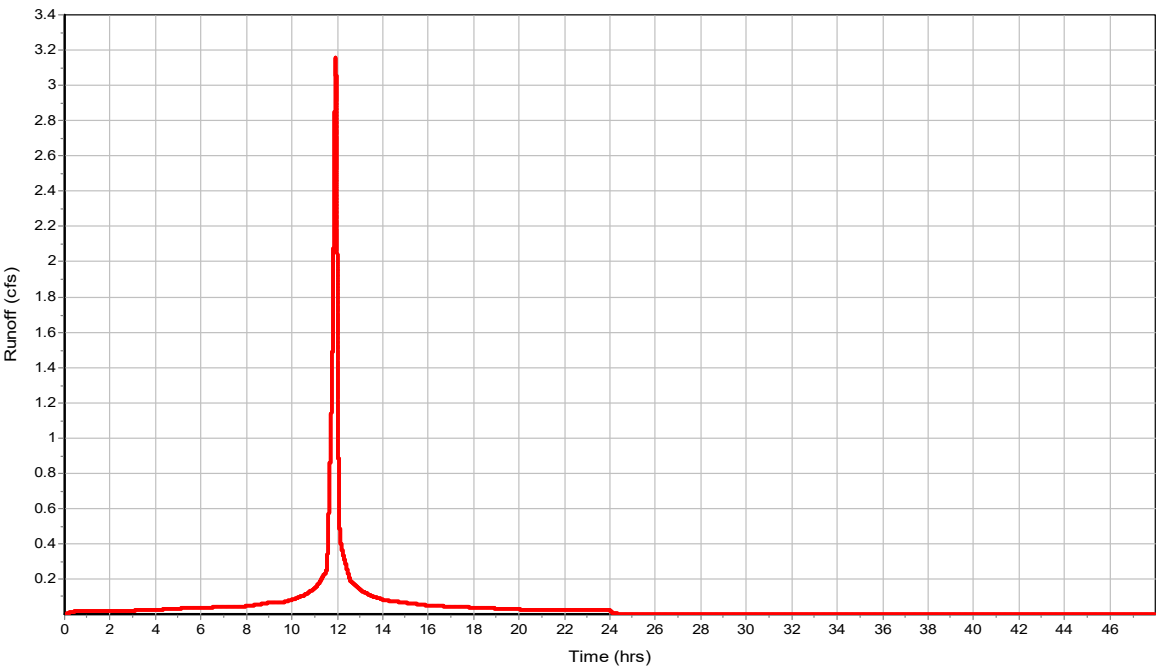
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	1.99
Peak Runoff (cfs)	3.16
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:06:26

Subbasin : DA03-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA04-EX

Input Data

Area (ac)	0.27
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.73
Equivalent Width (ft)	803
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.1
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

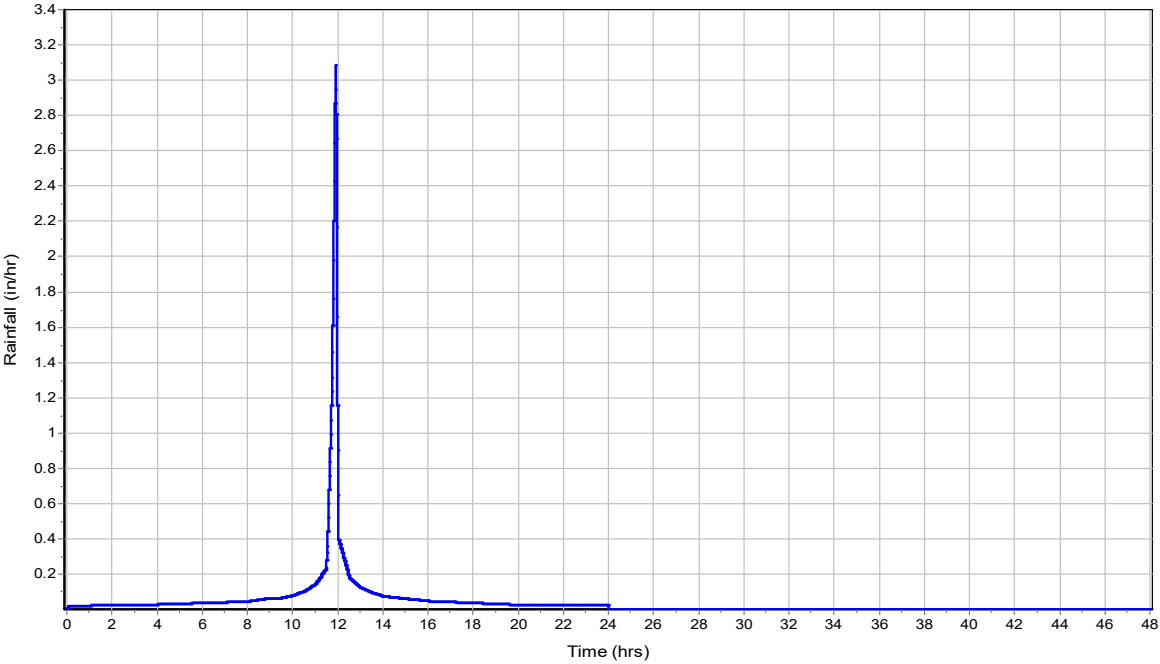
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.27	C	86
Composite Area & Weighted CN	0.27		86

Subbasin Runoff Results

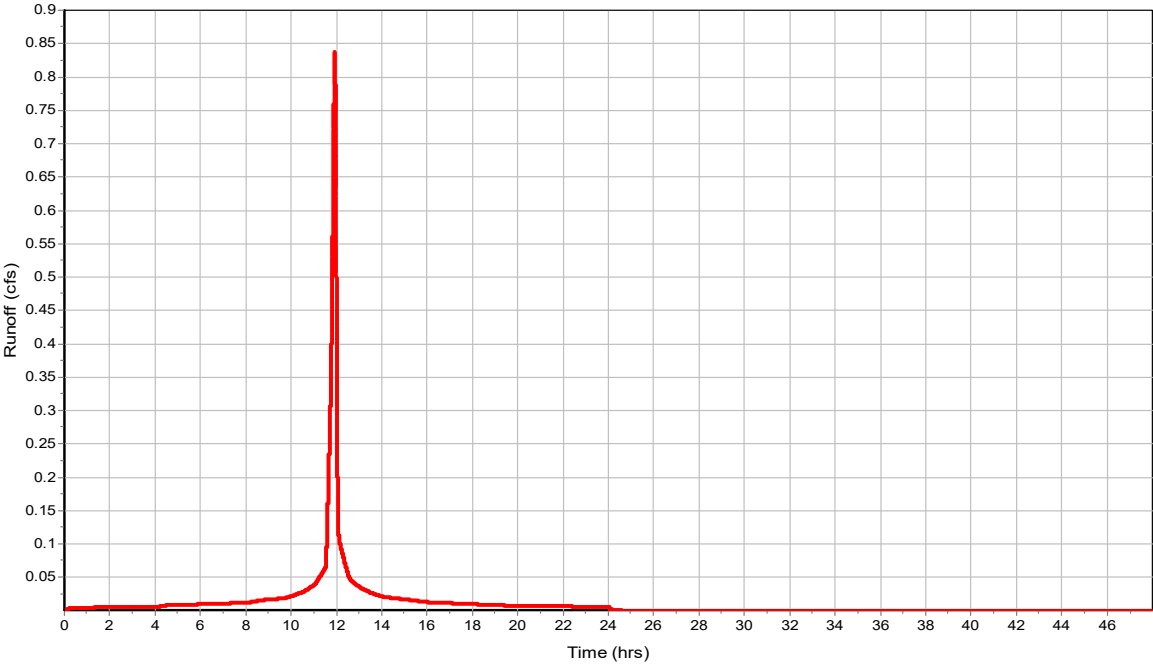
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	1.99
Peak Runoff (cfs)	0.84
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:04:30

Subbasin : DA04-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA05-EX

Input Data

Area (ac)	5.06
Impervious Area (%)	6
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.746
Equivalent Width (ft)	1288
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

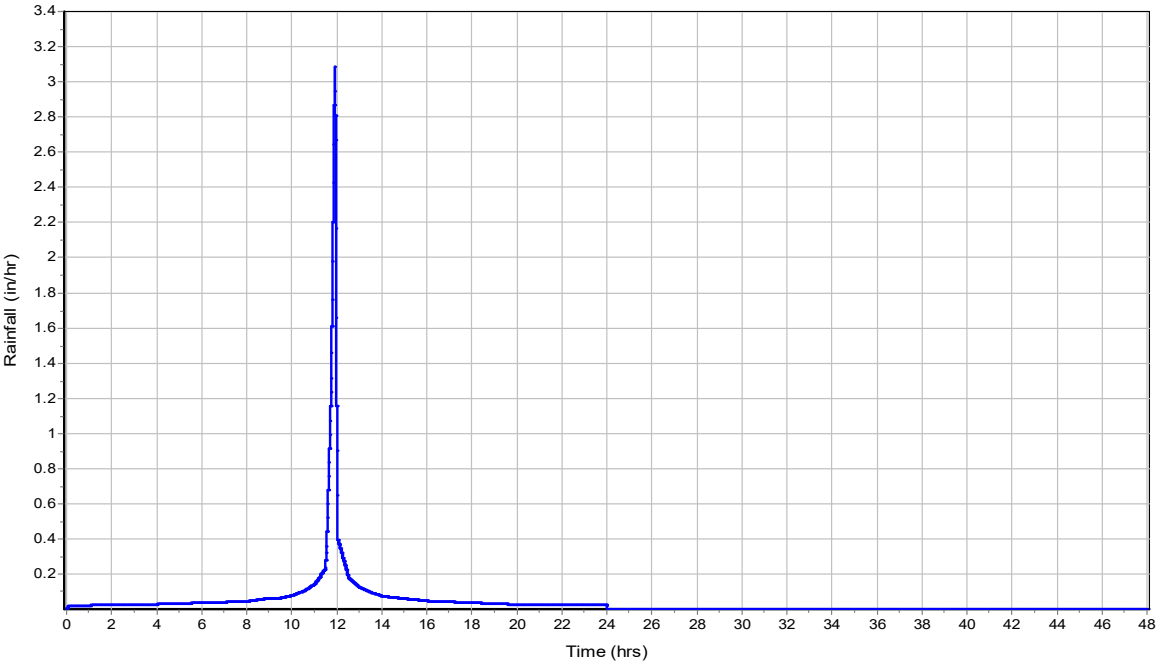
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	5.06	C	86
Composite Area & Weighted CN	5.06		86

Subbasin Runoff Results

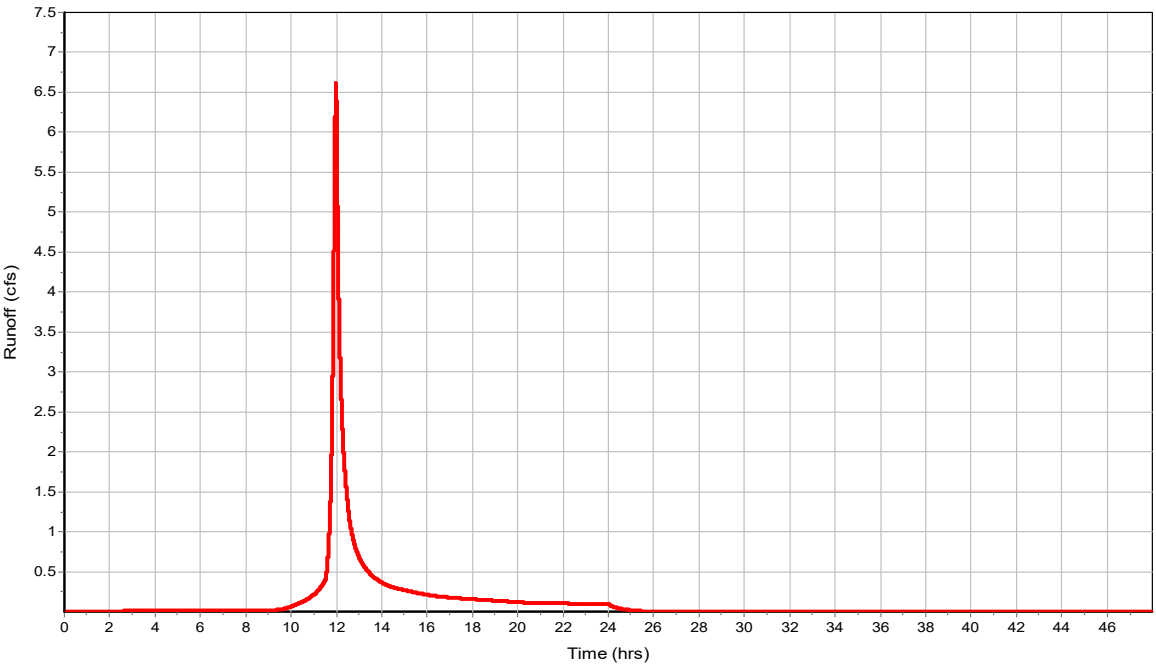
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.856
Total Runoff (in)	1.11
Peak Runoff (cfs)	6.62
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:38:29

Subbasin : DA05-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA06-EX

Input Data

Area (ac)	0.13
Impervious Area (%)	90
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	2
Equivalent Width (ft)	190
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.2
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

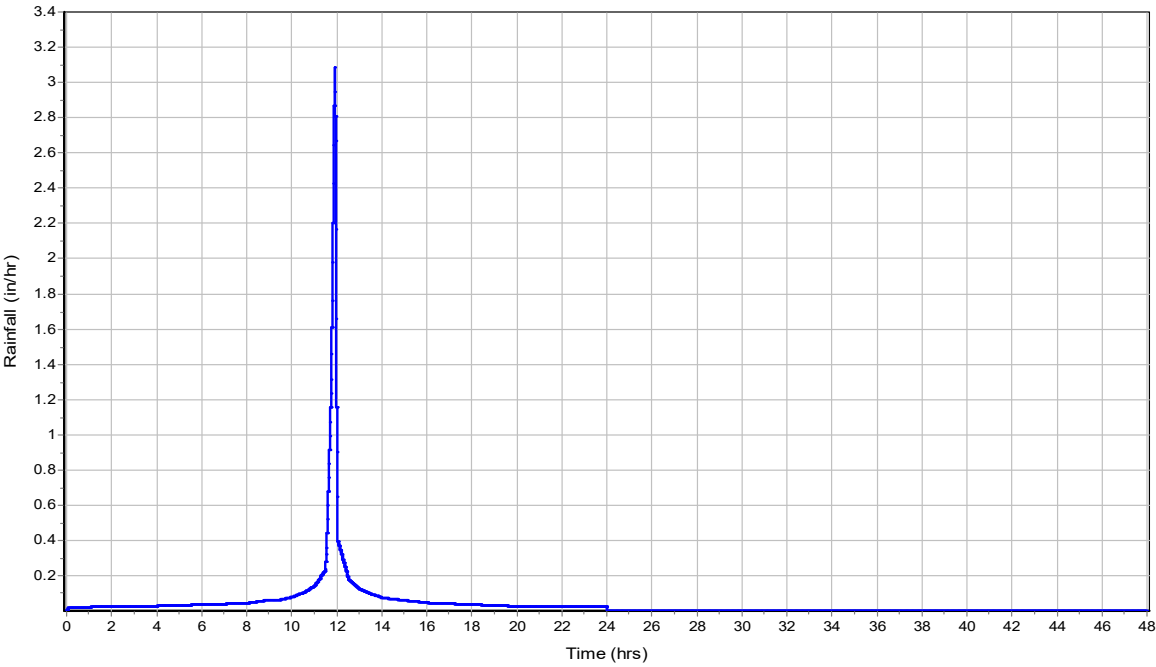
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.13	C	86
Composite Area & Weighted CN	0.13		86

Subbasin Runoff Results

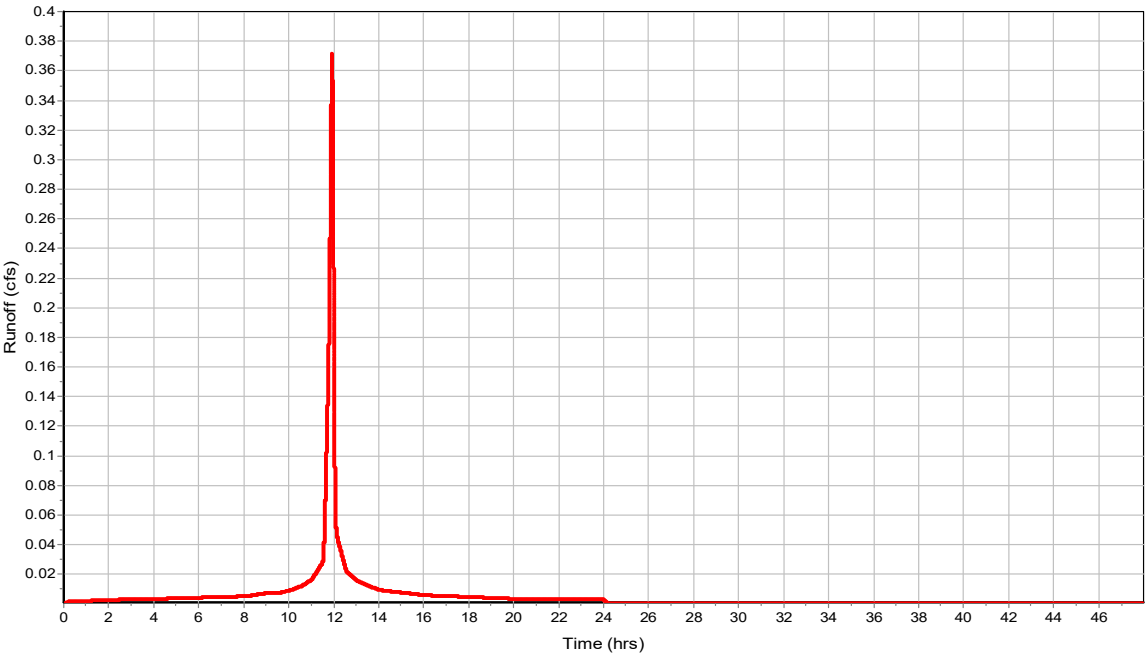
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.095
Total Runoff (in)	1.9
Peak Runoff (cfs)	0.37
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:05:55

Subbasin : DA06-EX

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA07-EX

Input Data

Area (ac)	0.26
Impervious Area (%)	60
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	1.82
Equivalent Width (ft)	209
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

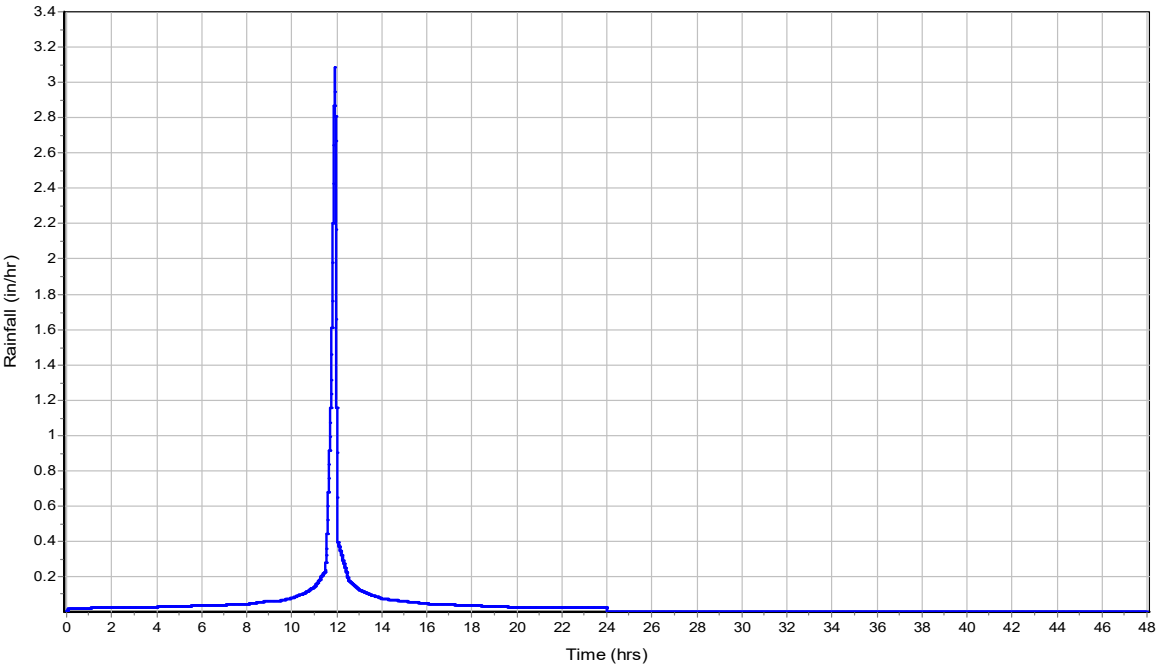
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.26	C	86
Composite Area & Weighted CN	0.26		86

Subbasin Runoff Results

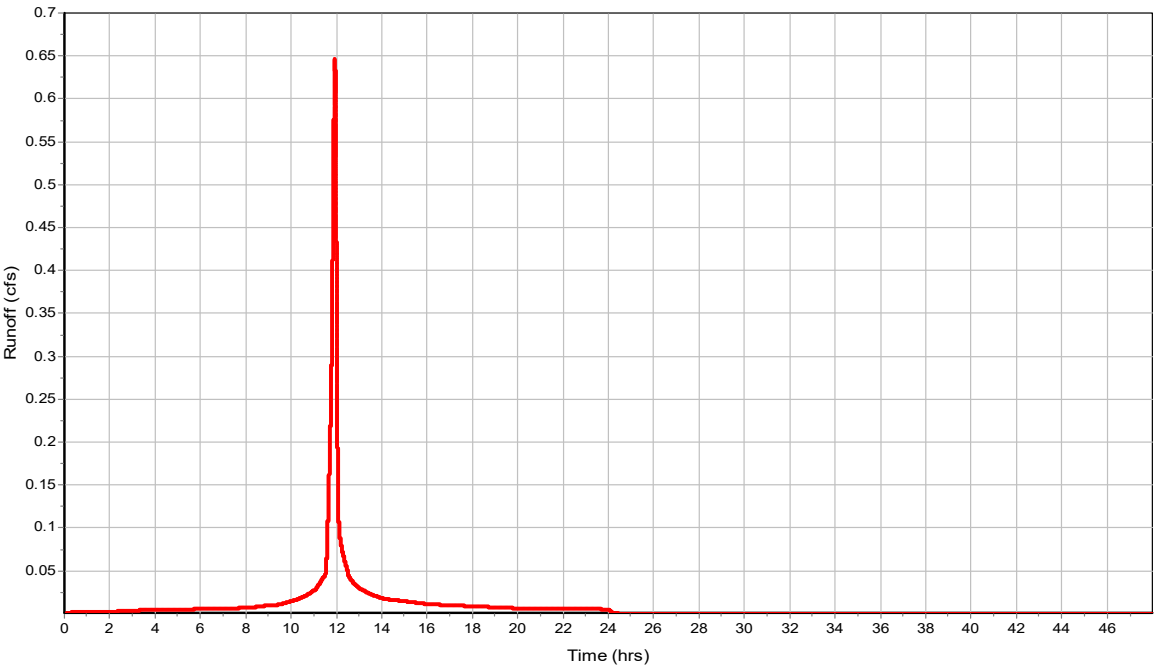
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.361
Total Runoff (in)	1.62
Peak Runoff (cfs)	0.65
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:08:46

Subbasin : DA07-EX

Rainfall Intensity Graph



Runoff Hydrograph



SN	Element ID	From (Inlet Node)	To (Outlet Node)	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence (days hh:mm)	Max Flow Velocity (ft/sec)	Travel Time (min)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Froude Number	Reported Condition
1	Link-100	64	Out06-EX	33.13	4625.52	0.00	4625.32	0.00	0.20	0.6000	CIRCULAR	18.000	18.00	0.0150	0.0000	0.8000	0.0000	0.00	NO	1.00	1.01	0 11:55	2.63	0.21	7.07	0.14	0.27	0.00	0.41	0.39	Calculated
2	Link-101	Inlet-11	64	24.56	4626.92	0.00	4626.81	1.29	0.11	0.4500	CIRCULAR	18.000	18.00	0.0120	0.5000	0.6000	0.0000	0.00	NO	1.00	0.37	0 11:55	2.02	0.20	7.62	0.05	0.16	0.00	0.24	0.61	Calculated
3	Link-104	64	64	178.98	4626.51	0.00	4624.89	0.00	1.62	0.9100	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	7.99	0 12:32	5.03	0.59	10.83	0.74	0.84	0.00	1.27	0.42	Calculated
4	Link-105	64	64	53.51	4624.22	0.00	4623.28	4.69	0.94	1.7600	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	7.88	0 12:32	7.59	0.12	15.08	0.52	0.57	0.00	0.85	0.72	Calculated
5	Link-112	64	64	143.22	4624.89	0.00	4624.26	0.04	0.63	0.4400	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	7.88	0 12:32	4.92	0.49	7.55	1.04	0.85	0.00	1.28	0.38	> CAPACITY
6	Link-113	64	Out04-EX	65.00	4618.59	0.00	4618.41	0.00	0.18	0.2700	CIRCULAR	36.000	36.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	9.12	0 12:32	3.83	0.28	37.60	0.24	0.37	0.00	1.11	0.42	Calculated
7	Link-115	64	64	33.24	4626.21	0.00	4623.59	5.00	2.62	7.8800	CIRCULAR	12.000	12.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	6.61	0 11:59	11.29	0.05	10.84	0.61	0.70	0.00	0.70	1.78	Calculated
8	Link-98	Inlet-10	64	35.42	4630.23	0.00	4630.07	0.08	0.16	0.4500	CIRCULAR	12.000	12.00	0.0150	0.5000	0.6000	0.0000	0.00	NO	1.00	0.65	0 11:56	2.35	0.25	2.08	0.31	0.38	0.00	0.38	0.43	Calculated
9	Link-99	64	64	30.36	4629.99	0.00	4625.62	0.10	4.37	14.3900	CIRCULAR	12.000	12.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	0.65	0 11:56	5.32	0.10	14.64	0.04	0.23	0.00	0.23	1.98	Calculated

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
					(ft)			(ft)	(cfs)	(cfs)	(ft)	(ft)
1	Out01-EX	106710.98	36635.03		0.00	NORMAL	NO		4.60	4.60	0.00	0.00
2	Out02-EX	106724.85	36830.06		0.00	NORMAL	NO		103.15	103.15	0.00	0.00
3	Out03-EX	107917.24	36770.89		0.00	NORMAL	NO		3.16	3.16	0.00	0.00
4	Out04-EX	109257.86	36765.62		4618.41	NORMAL	NO		9.17	0.84	1.01	4619.42
5	Out06-EX	110576.25	36802.04		4625.32	NORMAL	NO		1.01	0.00	0.38	4625.70

SN	Element ID	X Coordinate	Y Coordinate	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation	Max (Rim) Elevation	Max (Rim) Offset	Initial Water Elevation	Initial Water Depth	Ponded Area	Grate Clogging Factor	Roadway Longitudinal Slope	Roadway Cross Slope	Roadway Manning's Roughness	Gutter Cross Slope	Gutter Width	Gutter Depression	Median Ditch Longitudinal Slope	Median Ditch Bottom Width	Median Ditch Left Side Slope	Median Ditch Right Side Slope	Median Ditch Manning's Roughness	Peak Flow	Peak Lateral Inflow	Peak Flow Intercepted by Inlet	Peak Flow Bypassing Inlet	Inlet Efficiency during Peak Flow	Allowable Spread	Max Gutter Spread during Peak Flow	Max Gutter Water Elev. during Peak Flow	Max Gutter Water Depth during Peak Flow	Time of Maximum Depth Occurrence	Total Flooded Volume	Total Time Flooded
								(ft)	(ft)	(ft)	(ft)	(ft)	(ft ²)	(%)	(ft/ft)	(ft/ft)		(ft/ft)	(ft)	(inches)	(ft/ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(%)	(ft)	(ft)	(ft)	(ft)	(days h:mm)	(ac-inches)	(minutes)
1	Inlet-10	110481.85	36813.74	FHWA HEC-22 GENERIC	N/A	On Sag	1	4630.23	4631.78	1.55	4630.23	0.00	1.00	0.00	N/A	0.0200	0.0160	0.0620	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.65	0.65	N/A	N/A	N/A	7.00	2.58	4631.94	0.16	0 11:56	0.00	0.00
2	Inlet-11	110527.10	36777.07	FHWA HEC-22 GENERIC	N/A	On Sag	1	4626.92	4631.81	4.89	4626.92	0.00	1.00	0.00	N/A	0.0200	0.0160	0.0620	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.37	0.37	N/A	N/A	N/A	7.00	2.09	4631.96	0.15	0 11:55	0.00	0.00

SN	Element ID	X Coordinate	Y Coordinate	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation	Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover	Peak Inflow	Peak Lateral Inflow	Maximum HGL Elevation Attained	Maximum HGL Depth Attained	Maximum Surcharge Depth Attained	Minimum Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Maximum HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-inches)	Total Time Flooded (minutes)
				(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft ²)	(inches)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
1	64	110516.96	36809.06	4629.99	4632.62	2.63	4629.99	0.00	5000.00	367.38	1.00	18.60	0.65	0.00	4630.13	0.14	0.00	2.49	4630.00	0.01	0 11:56	0 00:00	0.00	0.00
2	64	110543.87	36795.01	4625.52	4632.71	7.19	4625.52	0.00	5000.00	367.29	1.00	52.80	1.01	0.00	4625.95	0.43	0.00	6.76	4625.55	0.03	0 11:55	0 00:00	0.00	0.00
3	64	109649.23	36841.88	4626.51	4632.49	5.98	4626.51	0.00	5000.00	367.51	1.00	53.76	8.02	8.02	4627.59	1.08	0.00	4.90	4626.61	0.10	0 12:32	0 00:00	0.00	0.00
4	64	109327.04	36843.23	4624.22	4628.29	4.07	4624.22	0.00	5000.00	371.71	1.00	30.41	7.88	0.00	4625.16	0.94	0.00	3.14	4624.31	0.09	0 12:32	0 00:00	0.00	0.00
5	64	109275.70	36828.12	4618.59	4628.84	10.25	4618.59	0.00	5000.00	371.17	1.00	48.66	9.12	0.00	4619.80	1.21	0.00	9.03	4618.73	0.14	0 12:32	0 00:00	0.00	0.00
6	64	109470.26	36843.26	4624.89	4628.59	3.70	4624.89	0.00	5000.00	371.41	1.00	26.35	7.99	0.00	4626.36	1.47	0.00	2.23	4625.01	0.12	0 12:32	0 00:00	0.00	0.00
7	64	109303.09	36846.96	4626.21	4628.21	2.00	4626.21	0.00	5000.00	371.79	1.00	12.00	6.62	6.62	4627.04	0.83	0.00	1.17	4626.25	0.04	0 11:59	0 00:00	0.00	0.00

SN	Element ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period	Rainfall Depth	Rainfall Distribution
								(years)	(inches)	
1	GrandValley	Time Series	100YR-24HR	Cumulative	inches					User Defined

SN	Element ID	Area	Drainage Node ID	Weighted Curve Number	Conductivity	Drying Time	Average Slope	Equivalent Width	Impervious Area	Impervious Area No Depression	Impervious Area Manning's Roughness	Impervious Area Manning's Roughness	Pervious Area Depression Depth	Pervious Area Manning's Roughness	Curb & Gutter Length	Rain Gage ID	Total Precipitation	Total Runon	Total Evaporation	Total Infiltration	Total Runoff	Peak Runoff	Time of Concentration
		(acres)			(inches/hr)	(days)	(%)	(ft)	(%)	(%)			(inches)		(ft)		(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(days hh:mm:ss)
1	DA01-EX	1.81	Out01-EX	86.00	0.1500	7.00	0.4100	1731.00	60.00	60.00	0.0500	0.0150	0.0500	0.0150	0.00	GrandValley	2.01	0.00	0.0000	0.3600	1.62	4.60	0 00:07:44
2	DA02-EX	95.00	Out02-EX	85.34	0.1500	7.00	0.5930	6100.00	24.00	40.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	0.7220	1.24	103.15	0 01:22:59
3	DA03-EX	1.06	Out03-EX	86.00	0.1500	7.00	0.3750	2383.00	100.00	80.00	0.1000	0.0150	0.1000	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	1.99	3.16	0 00:06:26
4	DA04-EX	0.27	Out04-EX	86.00	0.1500	7.00	0.7300	803.00	100.00	80.00	0.1000	0.0150	0.1000	0.1000	0.00	GrandValley	2.01	0.00	0.0000	0.0000	1.99	0.84	0 00:04:30
5	DA05-EX	5.06	64	86.00	0.1500	7.00	0.7460	1288.00	6.00	25.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	0.8560	1.11	6.62	0 00:38:29
6	DA06-EX	0.13	Inlet-11	86.00	0.1500	7.00	2.0000	190.00	90.00	80.00	0.0500	0.0150	0.1000	0.2000	0.00	GrandValley	2.01	0.00	0.0000	0.0950	1.90	0.37	0 00:05:55
7	DA07-EX	0.26	Inlet-10	86.00	0.1500	7.00	1.8200	209.00	60.00	60.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	0.3610	1.62	0.65	0 00:08:46

APPENDIX C.3

Proposed Conditions 2-Year Autodesk Storm and Sanitary Analysis Hydrologic and Hydraulic Model

Subbasin Hydrology

Subbasin : DA01-PR

Input Data

Area (ac)	1.53
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6084
Equivalent Width (ft)	1976
Impervious Area	
Manning's Roughness	0.012
Pervious Area	
Manning's Roughness	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

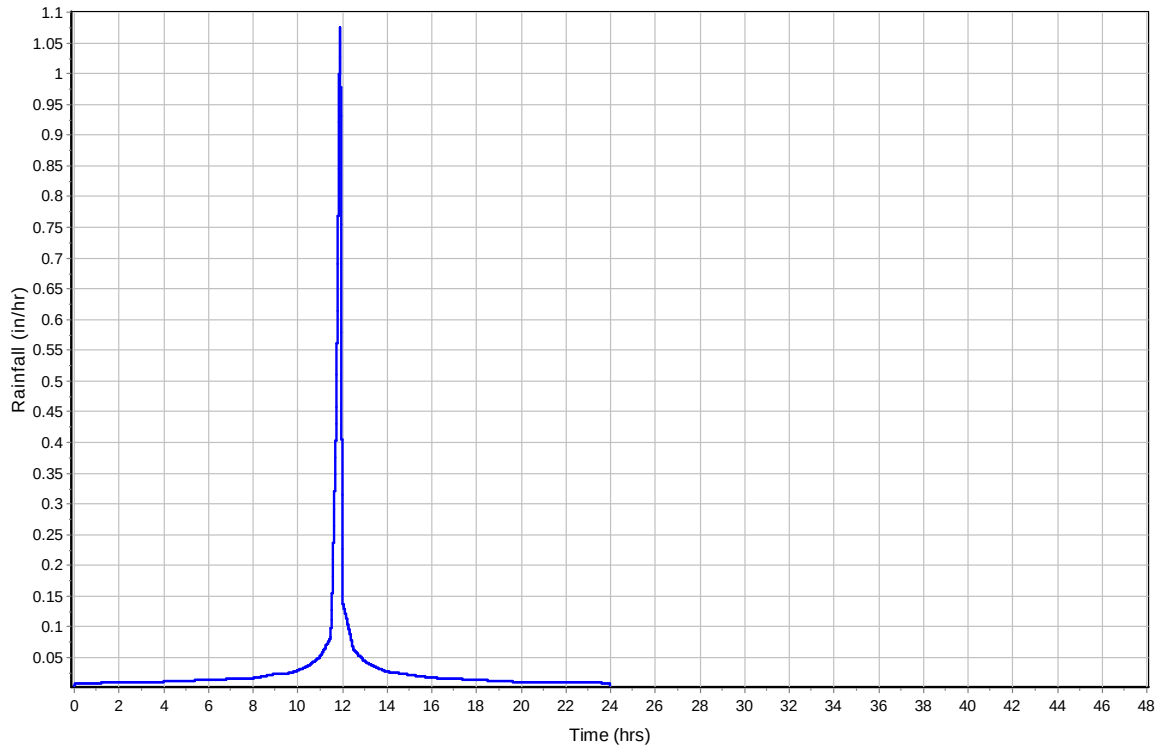
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.52	C	86
Composite Area & Weighted CN	1.52		86

Subbasin Runoff Results

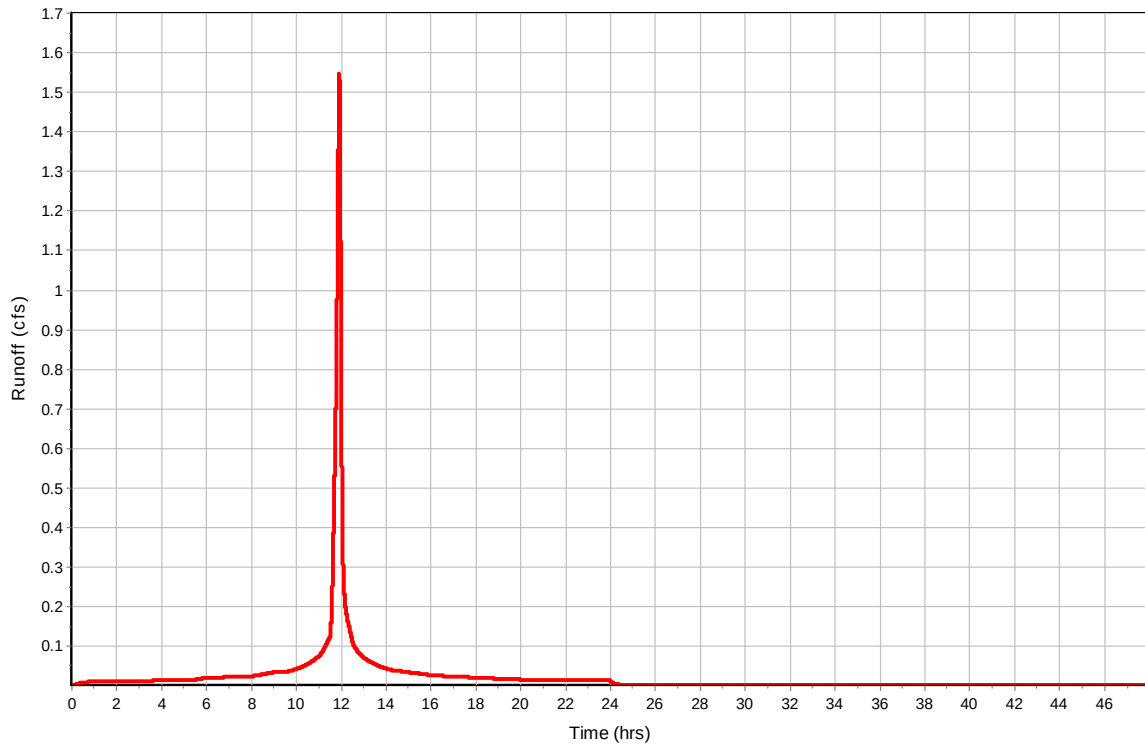
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.69
Peak Runoff (cfs)	1.55
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:10:22

Subbasin : DA01-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA02-PR**Input Data**

Area (ac)	1.82
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.5951
Equivalent Width (ft)	2349
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

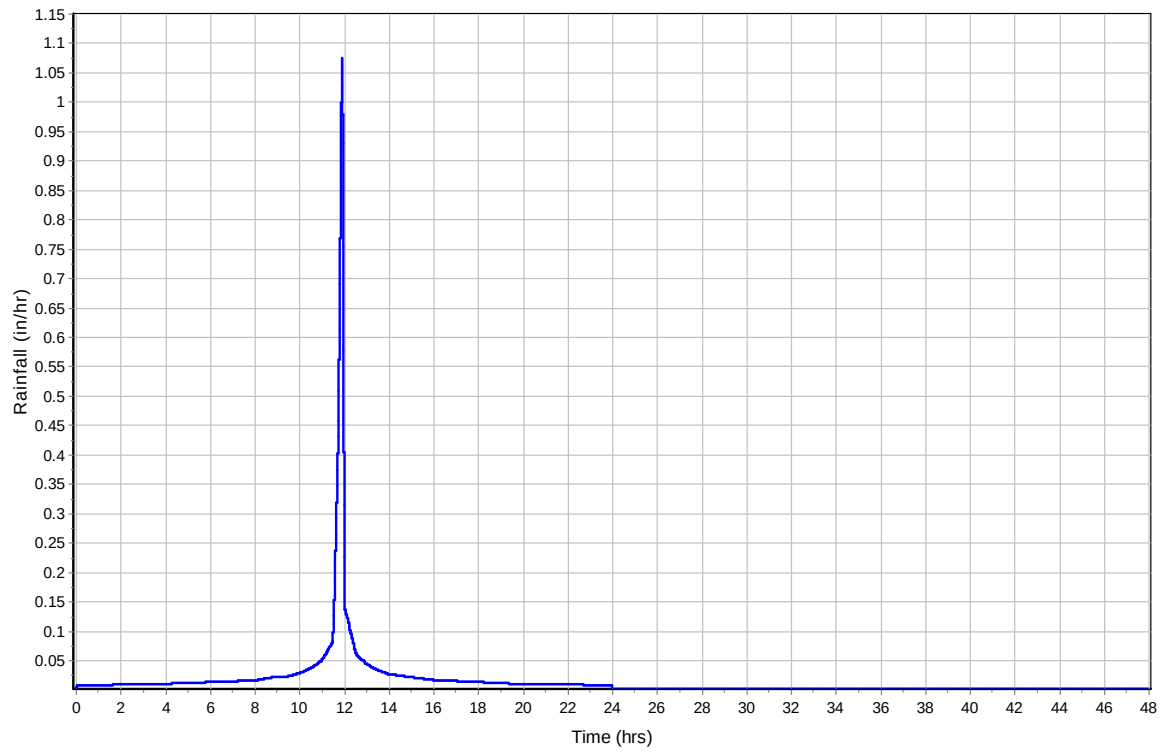
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.3	C	86
Composite Area & Weighted CN	1.3		86

Subbasin Runoff Results

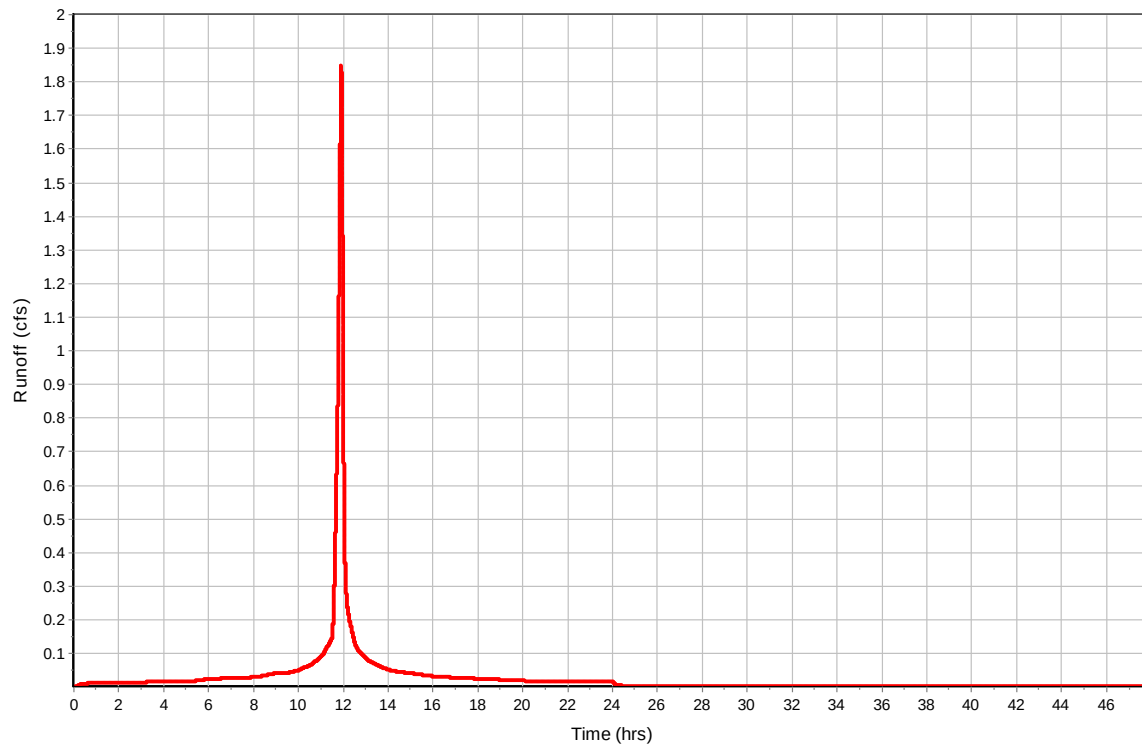
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.69
Peak Runoff (cfs)	1.85
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:10:28

Subbasin : DA02-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA03-PR**Input Data**

Area (ac)	25.58
Impervious Area (%)	30
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6464
Equivalent Width (ft)	2800
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

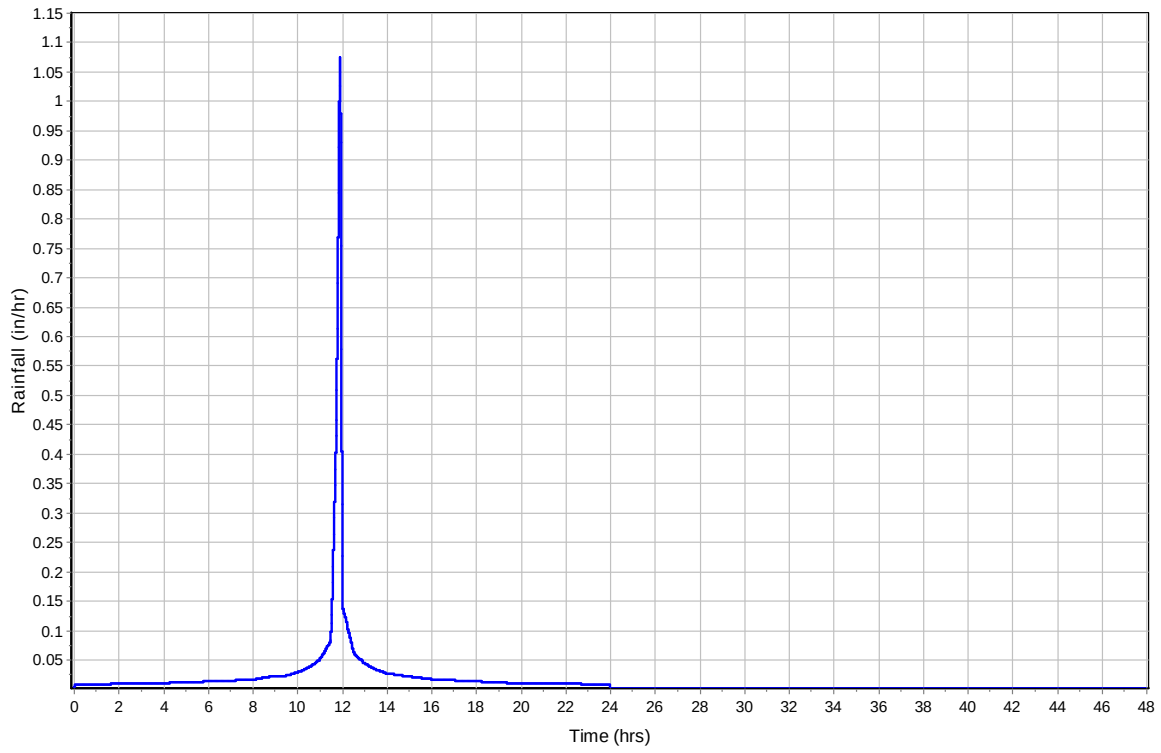
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	25.58	C	86
Composite Area & Weighted CN	25.58		86

Subbasin Runoff Results

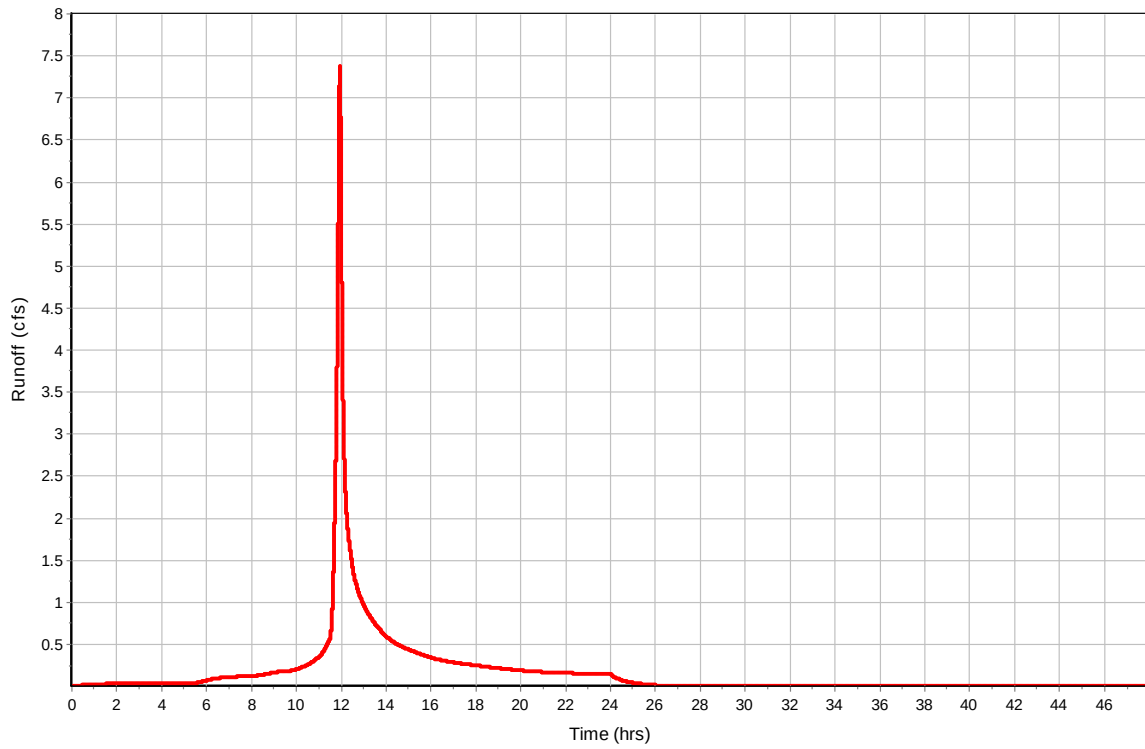
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.349
Total Runoff (in)	0.31
Peak Runoff (cfs)	7.37
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 01:25:15

Subbasin : DA03-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA04-PR**Input Data**

Area (ac)	8.76
Impervious Area (%)	7
Weighted Curve Number	79.76
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6075
Equivalent Width (ft)	2249
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

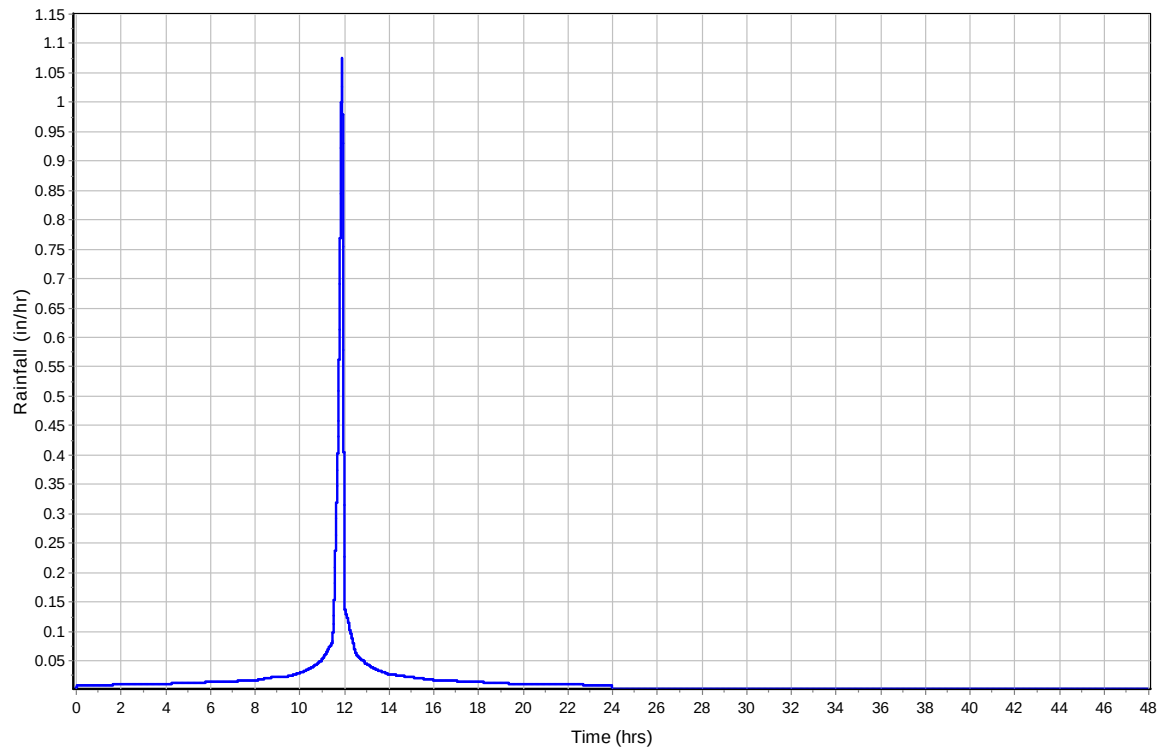
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
> 75% grass cover, Good	4.55	C	74
< 50% grass cover, Poor	4.2	C	86
Composite Area & Weighted CN	8.75		79.76

Subbasin Runoff Results

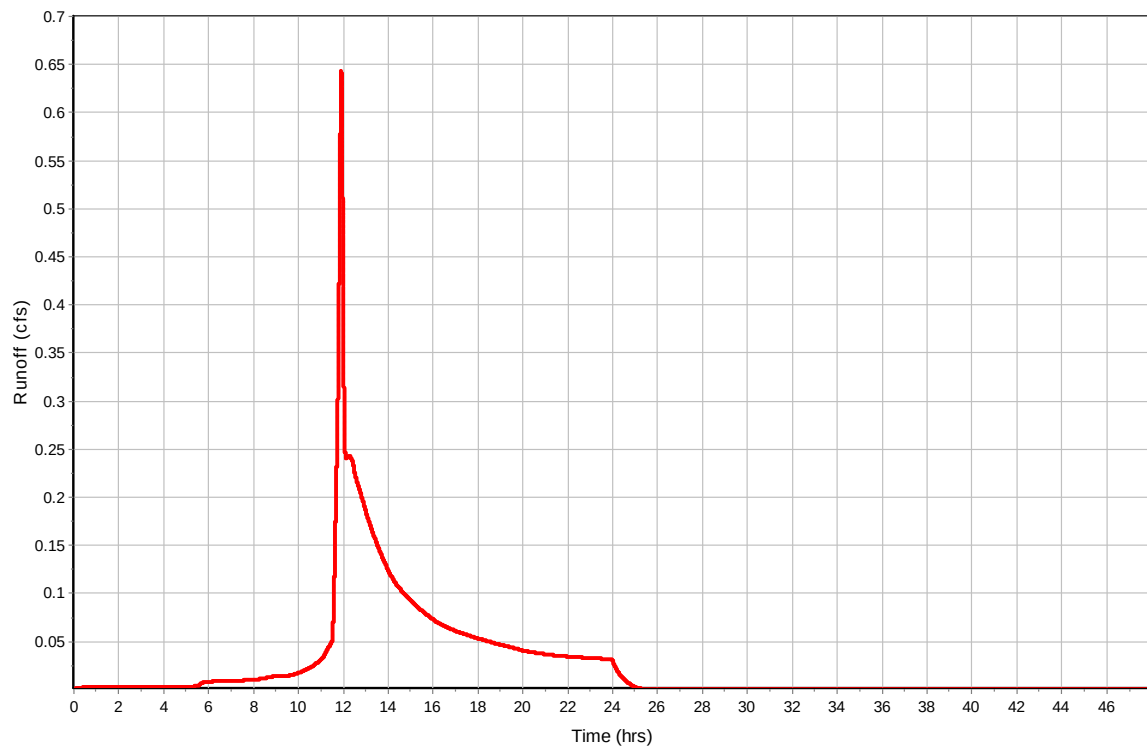
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.516
Total Runoff (in)	0.14
Peak Runoff (cfs)	0.64
Weighted Curve Number	79.76
Time of Concentration (days hh:mm:ss)	0 01:01:44

Subbasin : DA04-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA05-PR

Input Data

Area (ac)	58.18
Impervious Area (%)	22
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.5154
Equivalent Width (ft)	4606
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

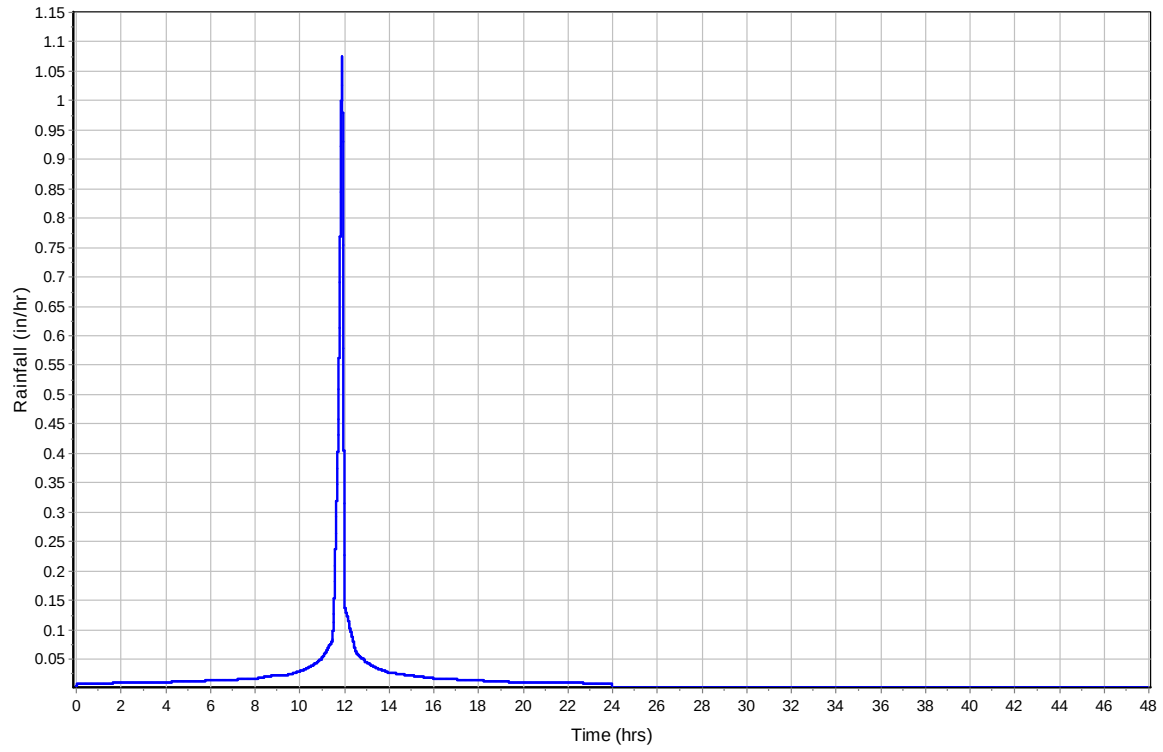
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	58.16	C	86
Composite Area & Weighted CN	58.16		86

Subbasin Runoff Results

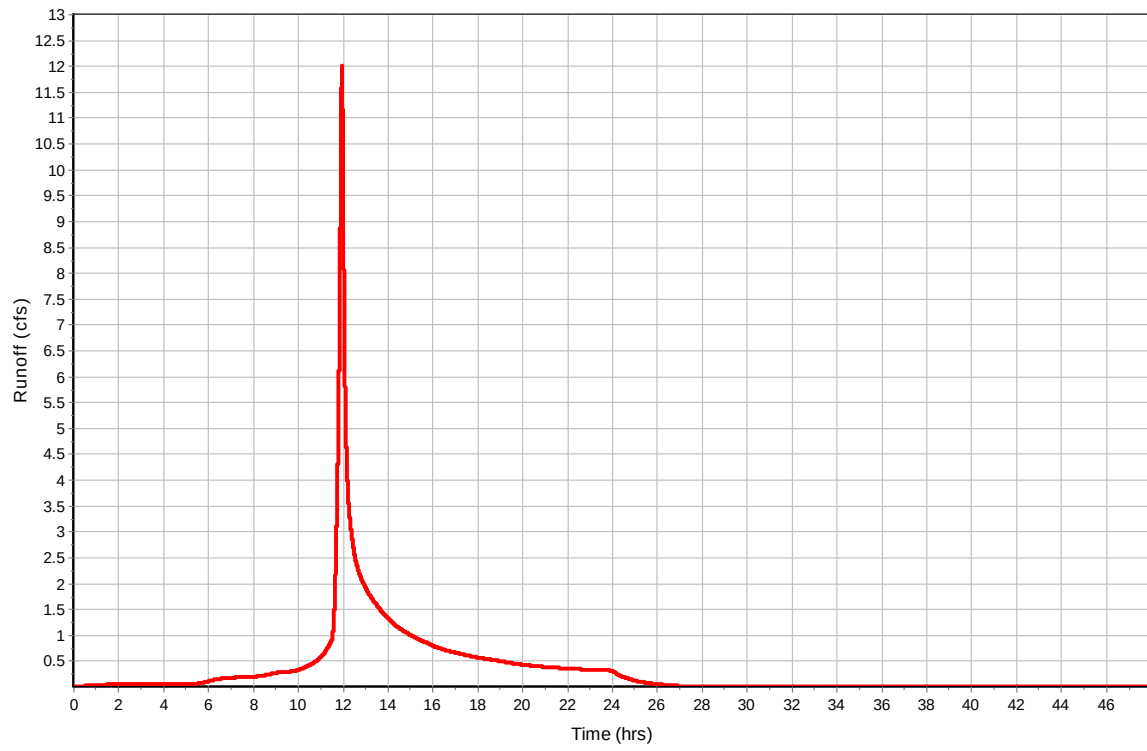
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.393
Total Runoff (in)	0.26
Peak Runoff (cfs)	12.01
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 01:58:16

Subbasin : DA05-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA06-PR

Input Data

Area (ac)	0.85
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.652
Equivalent Width (ft)	1092
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

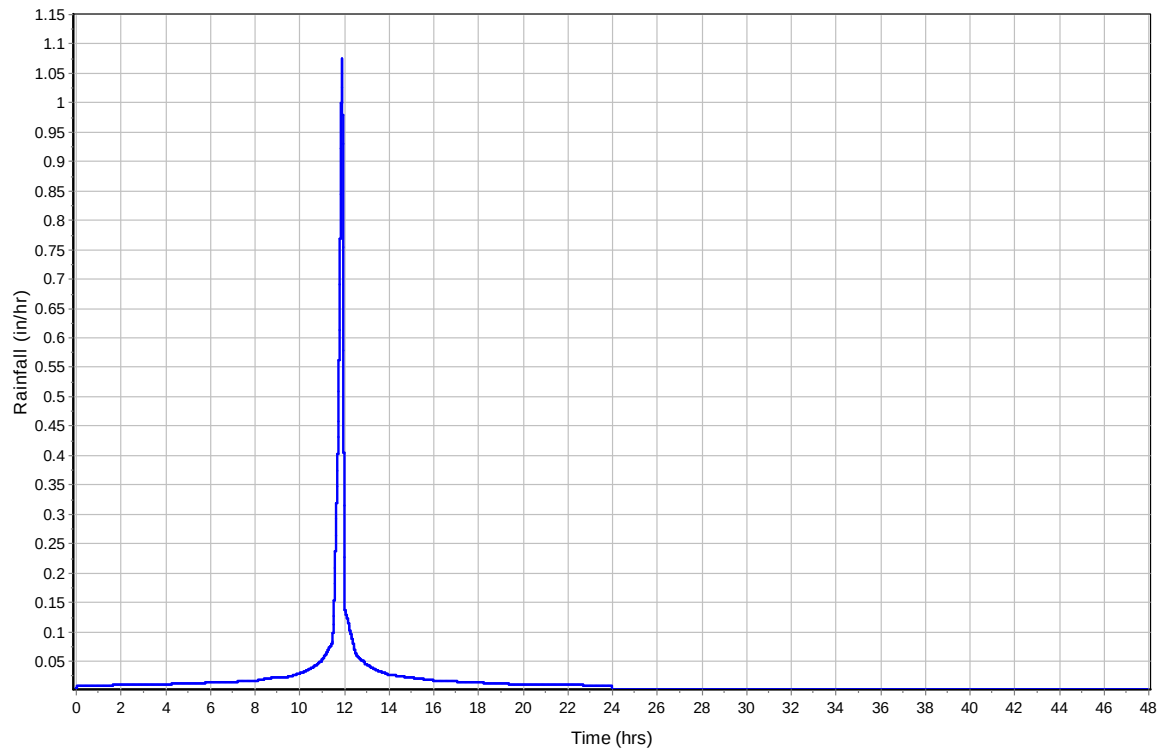
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.85	C	86
Composite Area & Weighted CN	0.85		86

Subbasin Runoff Results

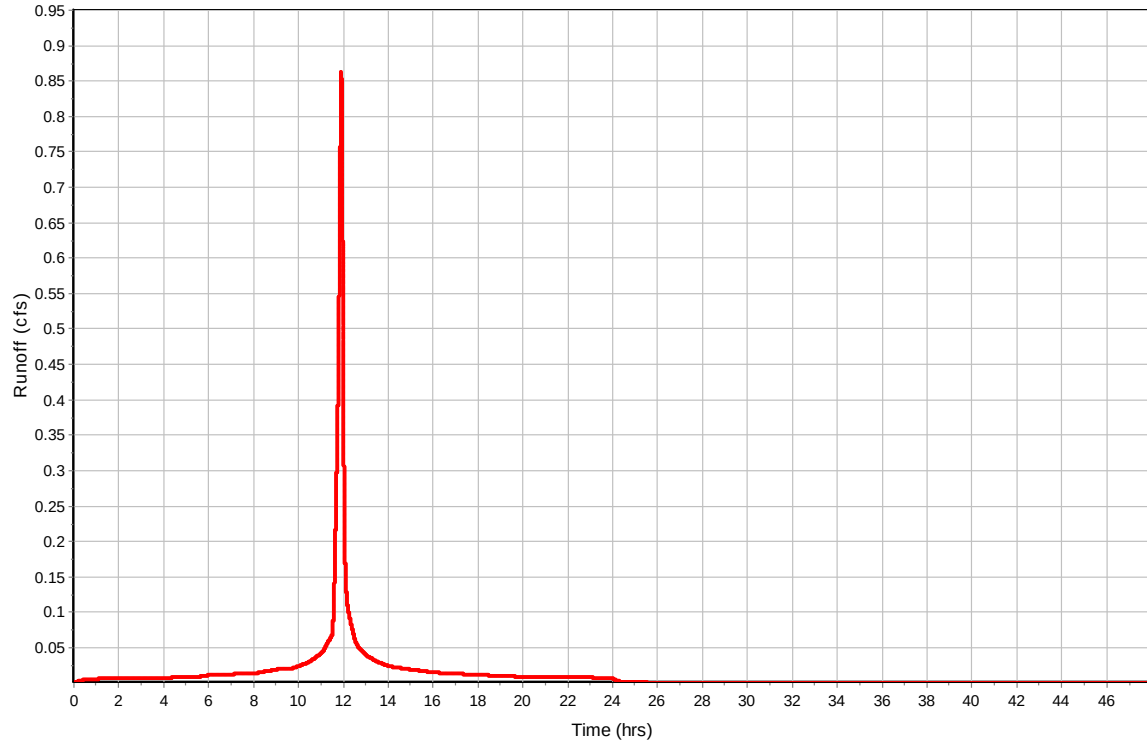
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.69
Peak Runoff (cfs)	0.86
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:10:12

Subbasin : DA06-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA07-PR**Input Data**

Area (ac)	0.63
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6686
Equivalent Width (ft)	834
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

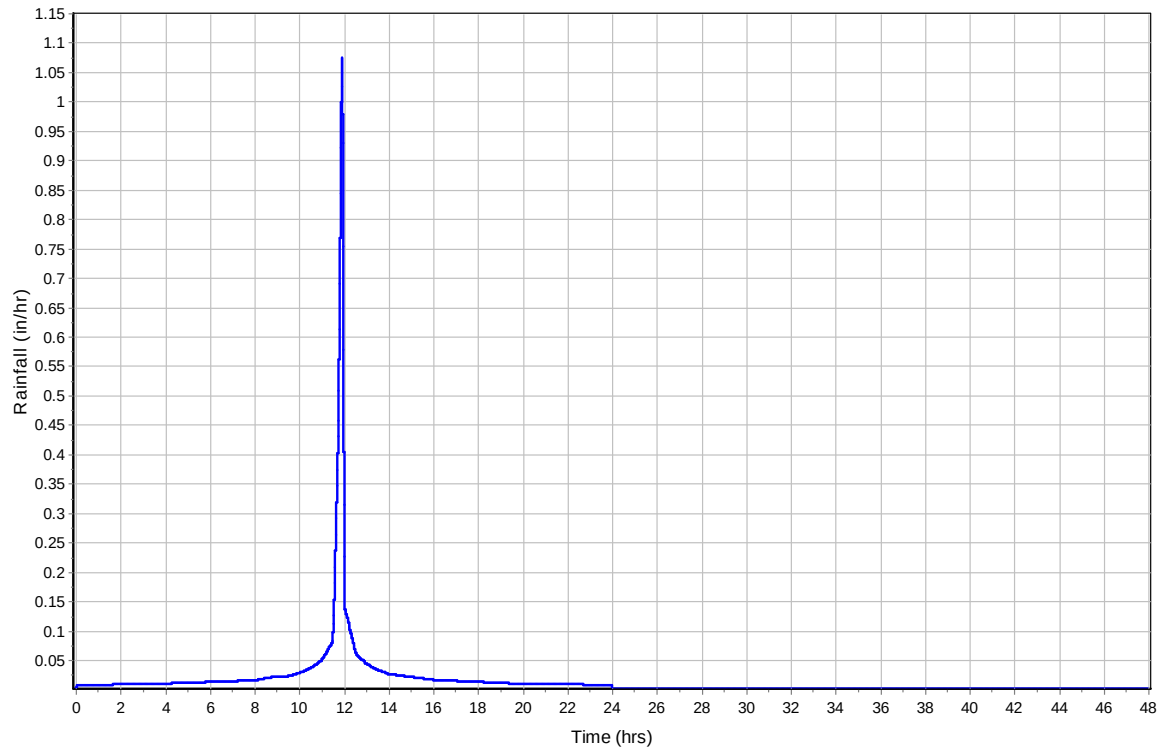
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.63	C	86
Composite Area & Weighted CN	0.63		86

Subbasin Runoff Results

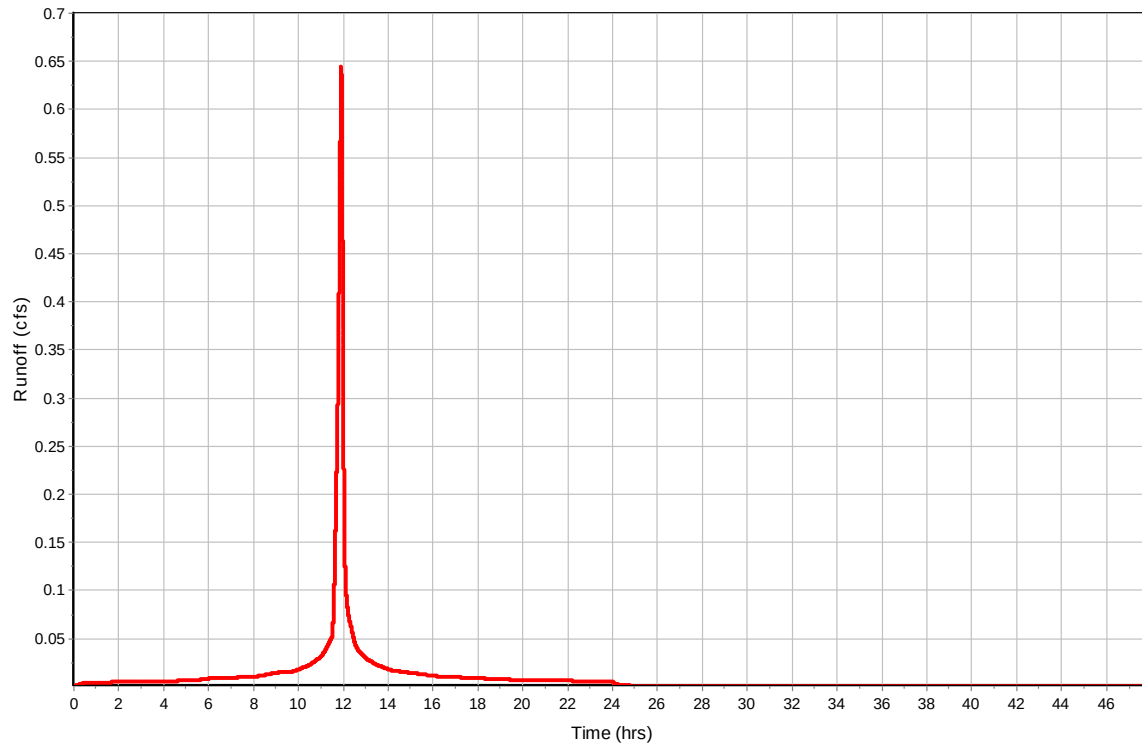
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.69
Peak Runoff (cfs)	0.64
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:09:59

Subbasin : DA07-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA08-PR

Input Data

Area (ac)	0.27
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.9142
Equivalent Width (ft)	407
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

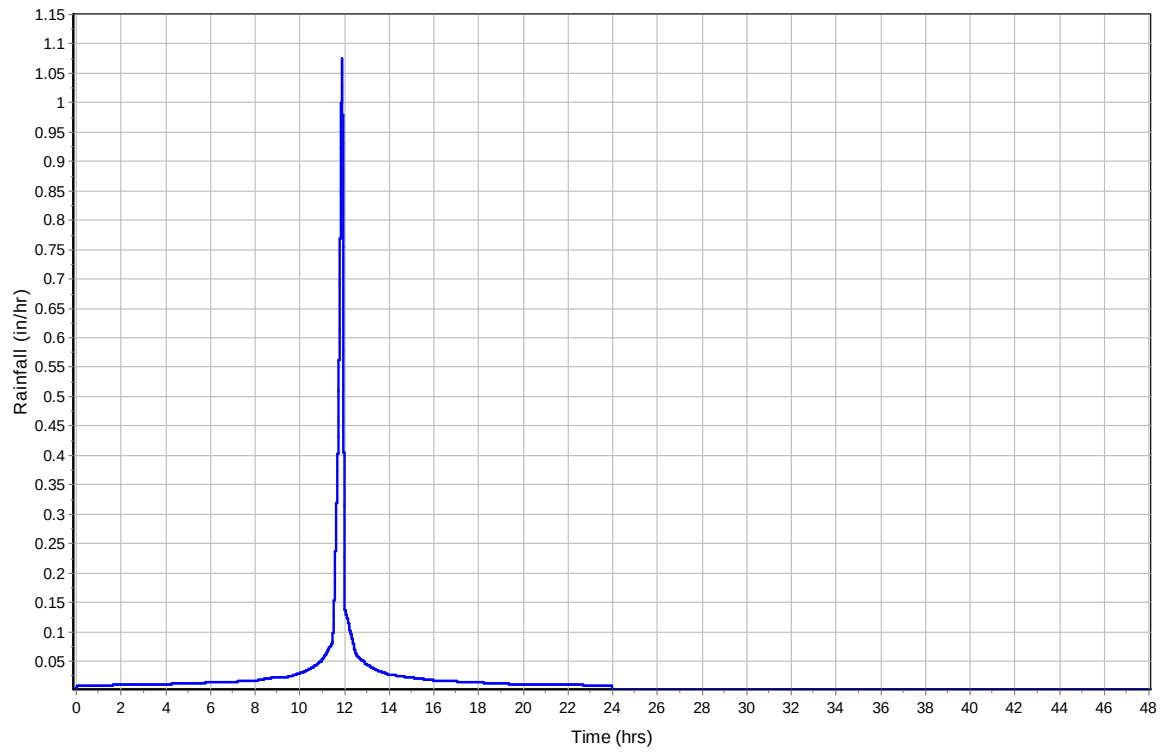
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.27	C	86
Composite Area & Weighted CN	0.27		86

Subbasin Runoff Results

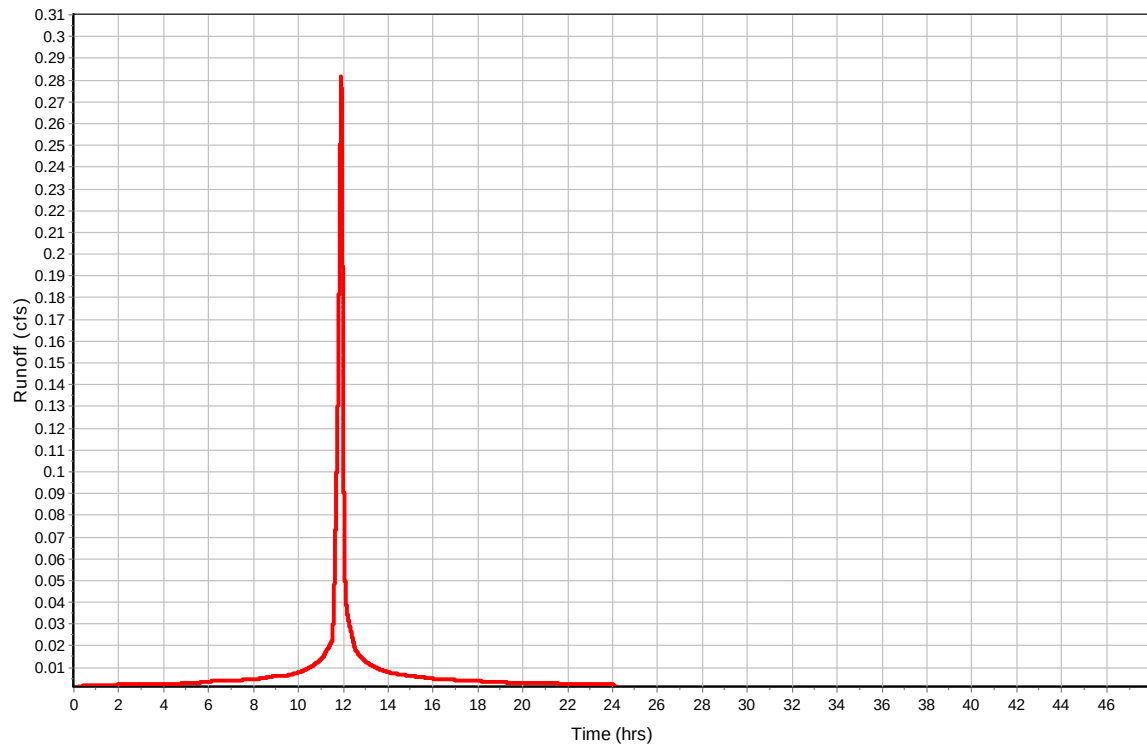
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.69
Peak Runoff (cfs)	0.28
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:08:27

Subbasin : DA08-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA09-PR

Input Data

Area (ac)	0.38
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.8697
Equivalent Width (ft)	550
Impervious Area	
Manning's Roughness	0.012
Pervious Area	
Manning's Roughness	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

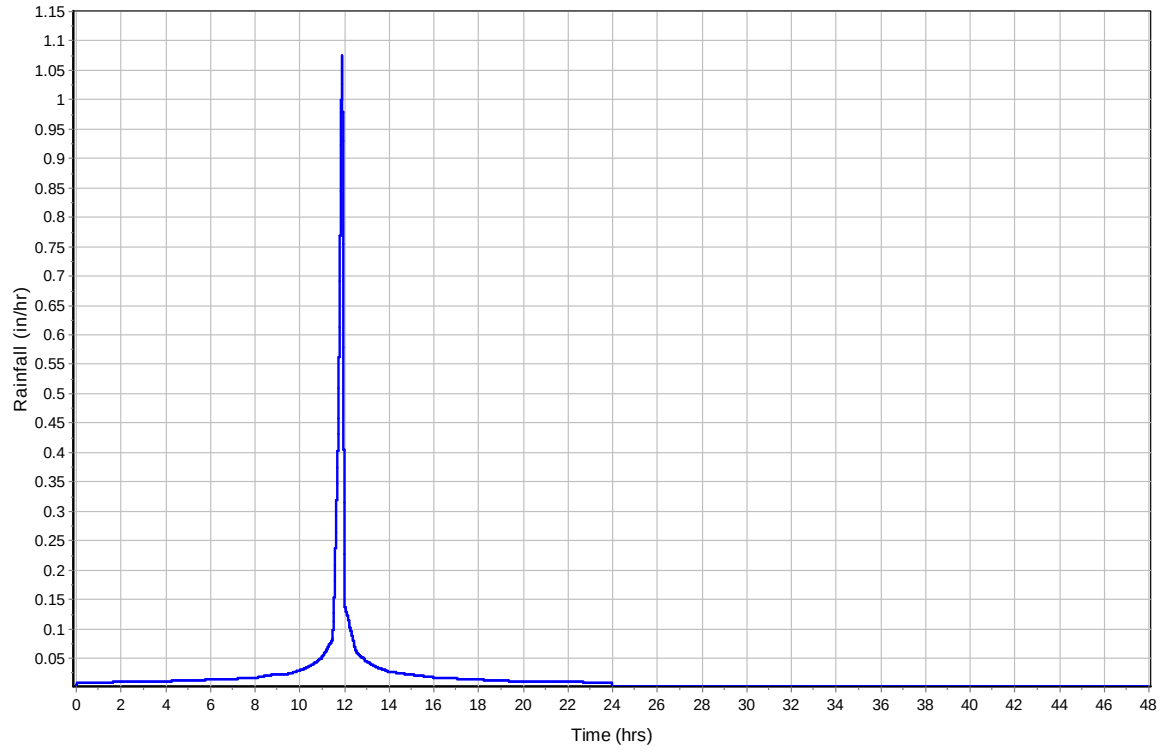
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.38	C	86
Composite Area & Weighted CN	0.38		86

Subbasin Runoff Results

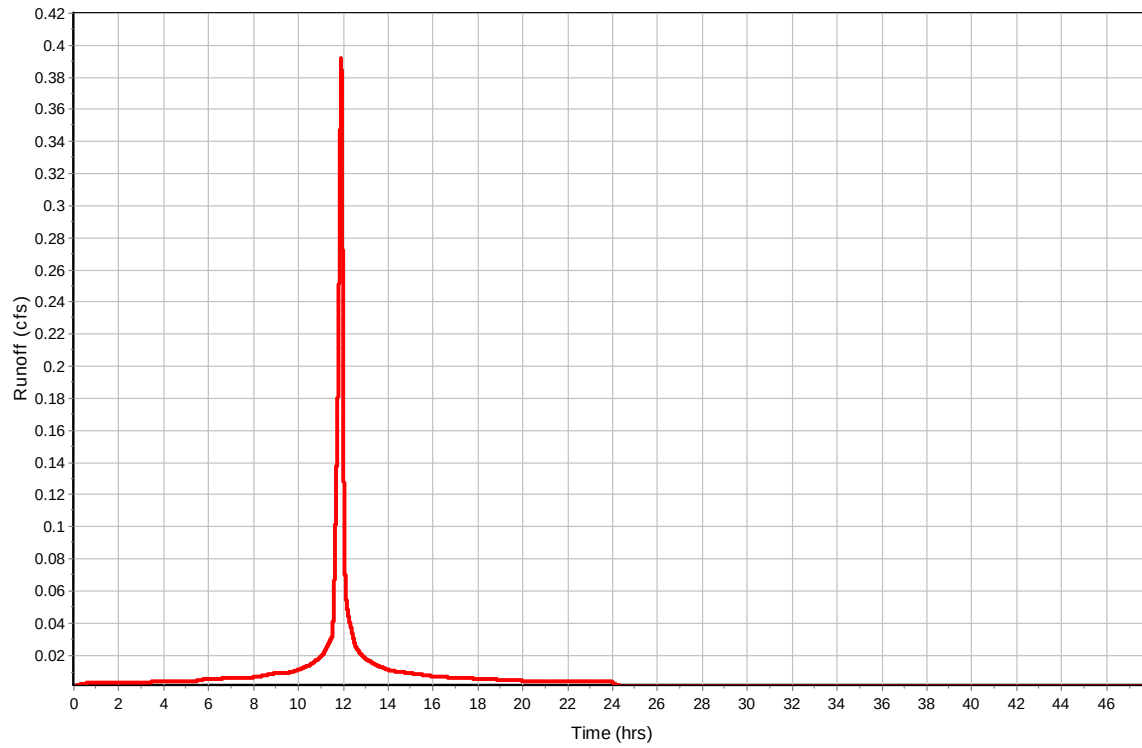
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.69
Peak Runoff (cfs)	0.39
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:08:44

Subbasin : DA09-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA10-PR**Input Data**

Area (ac)	4.63
Impervious Area (%)	6
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.7178
Equivalent Width (ft)	1307
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

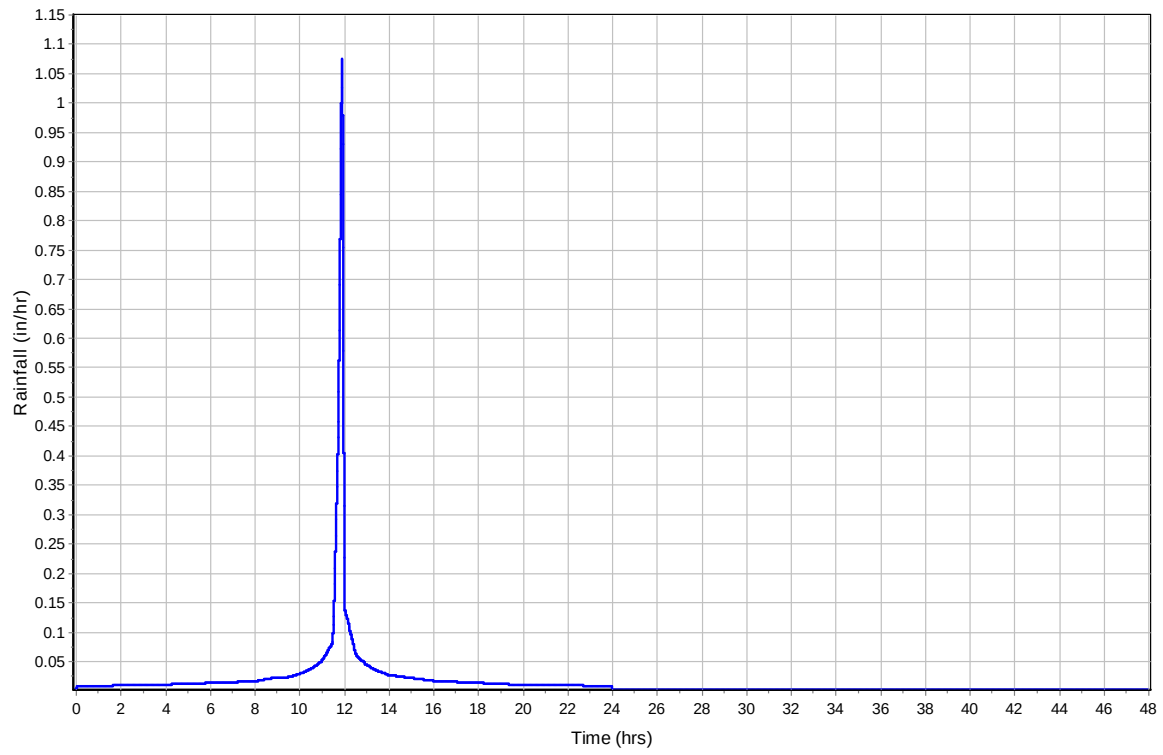
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	4.63	C	86
Composite Area & Weighted CN	4.63		86

Subbasin Runoff Results

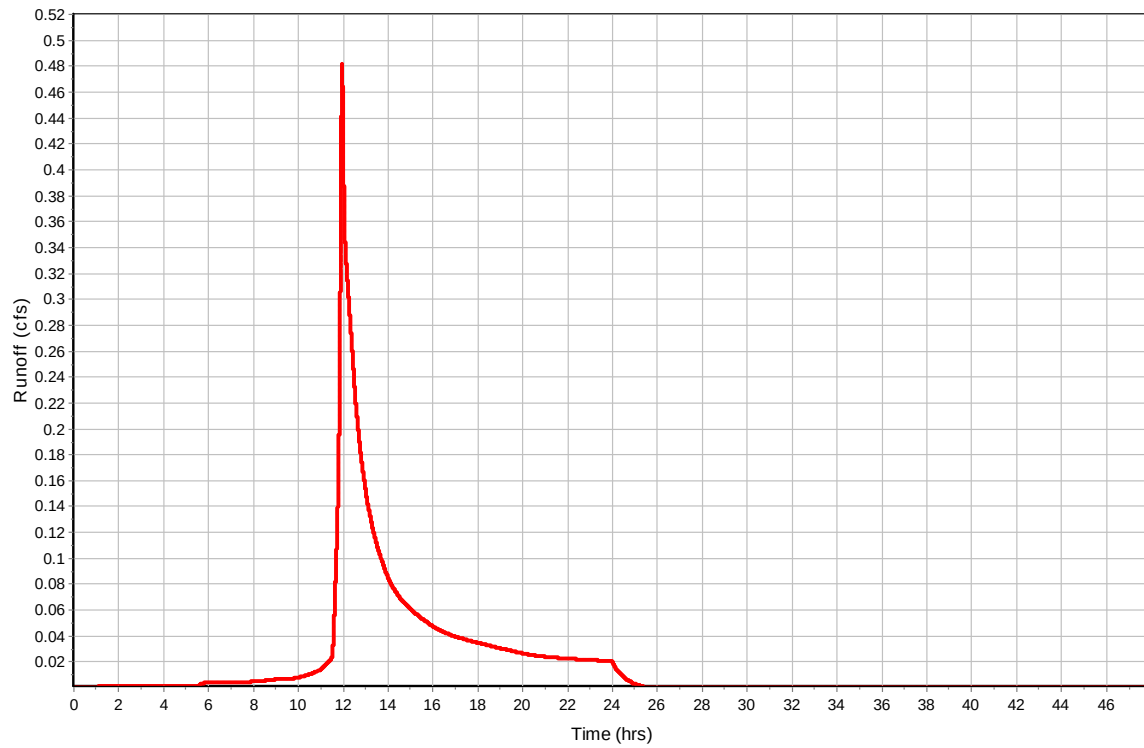
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.466
Total Runoff (in)	0.19
Peak Runoff (cfs)	0.48
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:55:49

Subbasin : DA10-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA11-PR**Input Data**

Area (ac)	0.41
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.582
Equivalent Width (ft)	641
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

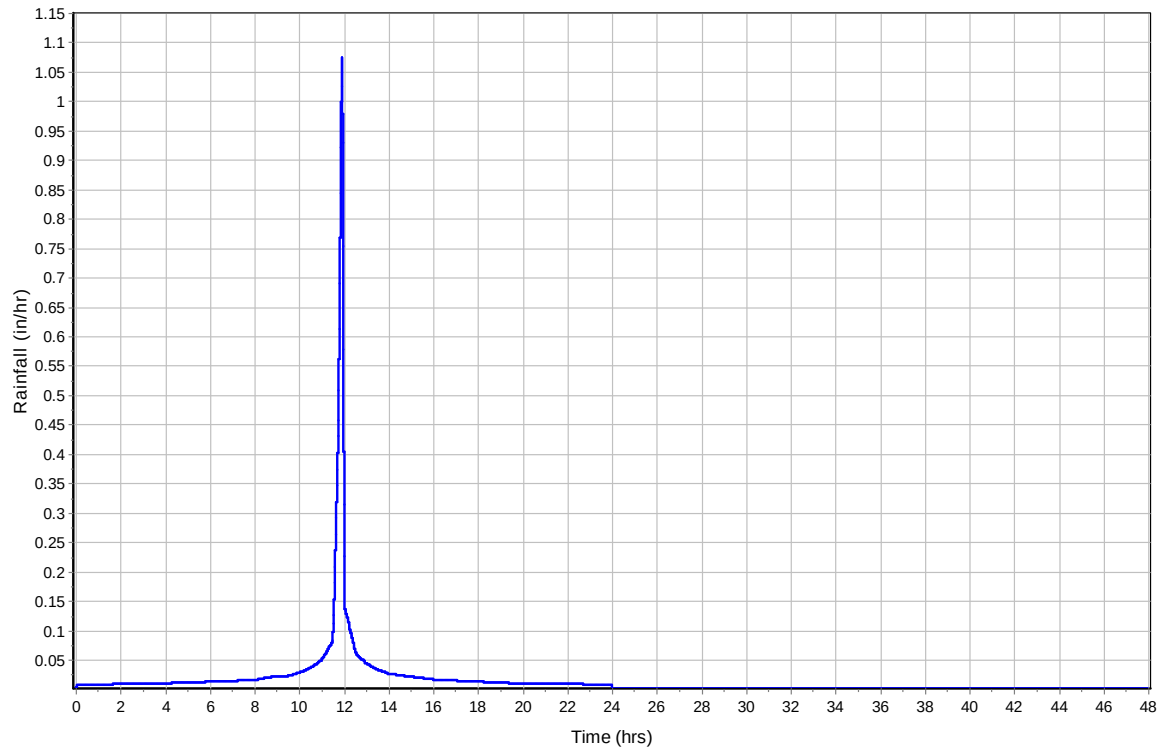
	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
< 50% grass cover, Poor		0.41	C	86
Composite Area & Weighted CN		0.41		86

Subbasin Runoff Results

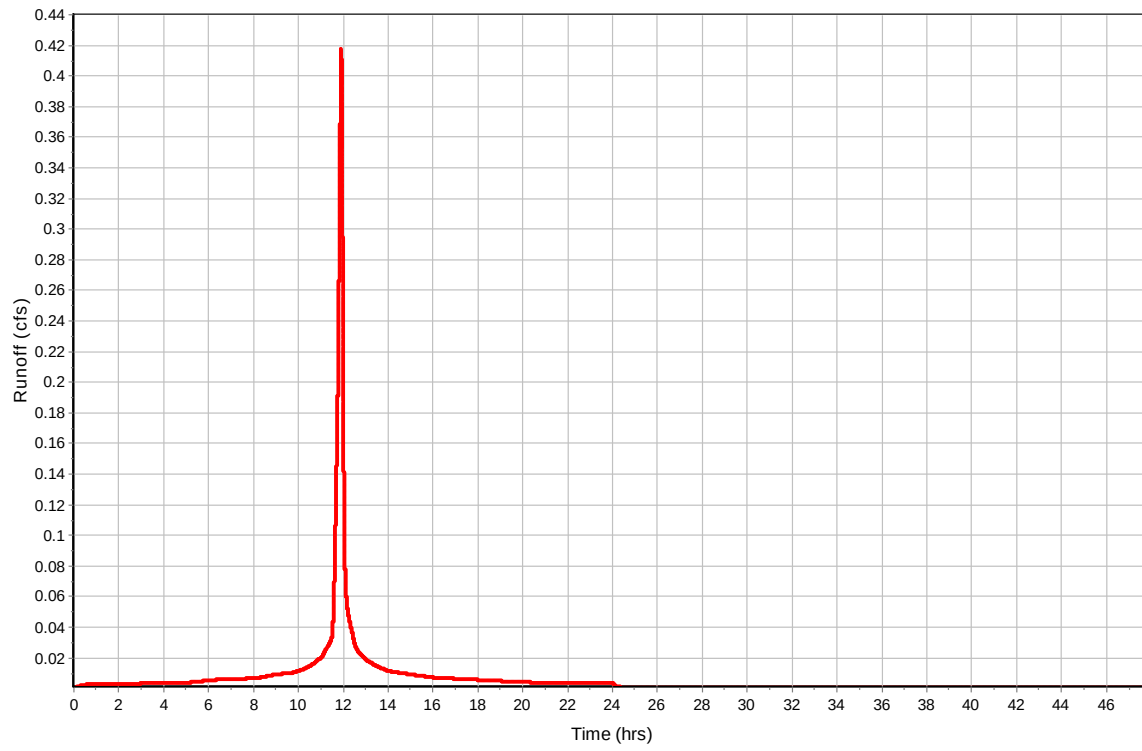
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	0.69
Peak Runoff (cfs)	0.42
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:09:22

Subbasin : DA11-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA12-PR**Input Data**

Area (ac)	0.21
Impervious Area (%)	90
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6668
Equivalent Width (ft)	306
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.2
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

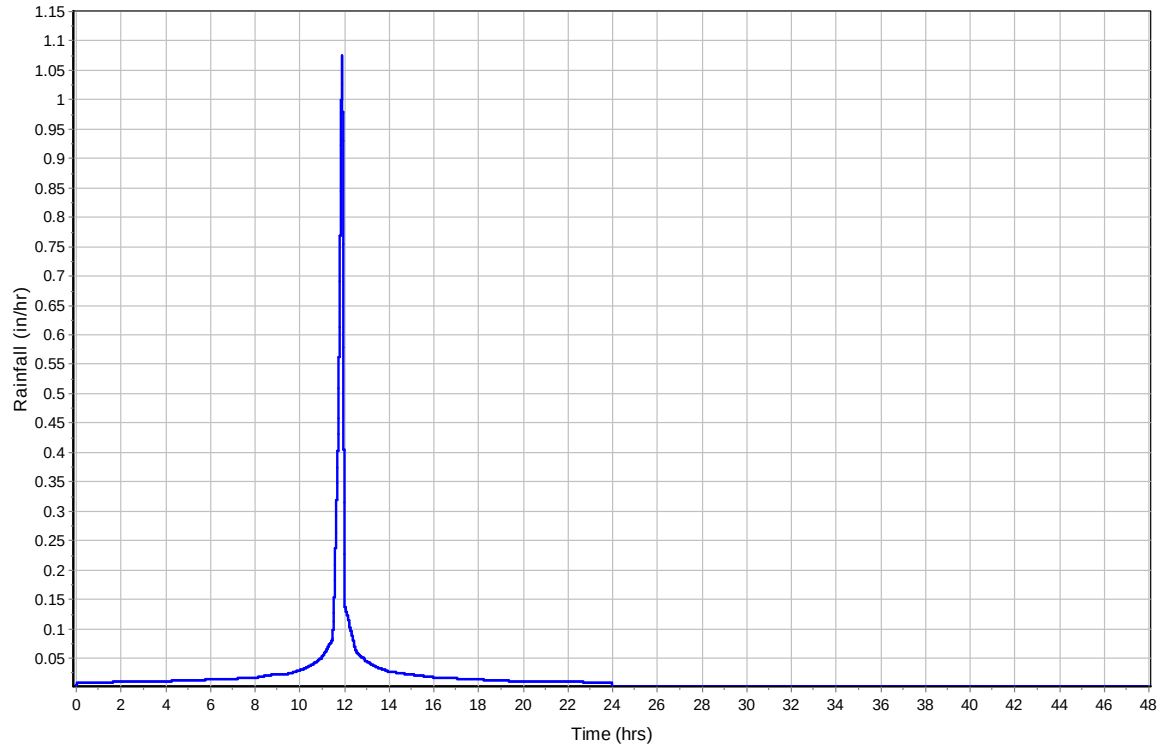
	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
< 50% grass cover, Poor		0.21	C	86
Composite Area & Weighted CN		0.21		86

Subbasin Runoff Results

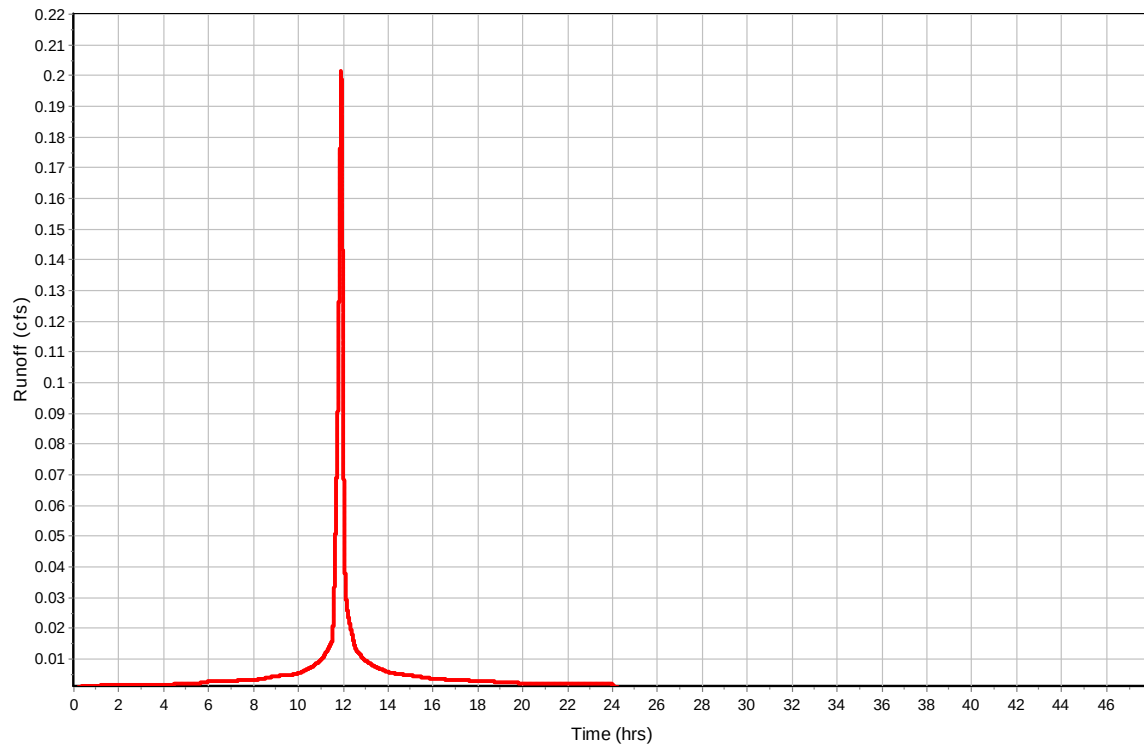
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.049
Total Runoff (in)	0.64
Peak Runoff (cfs)	0.2
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:12:53

Subbasin : DA12-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA13-PR**Input Data**

Area (ac)	0.42
Impervious Area (%)	60
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.5872
Equivalent Width (ft)	410
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

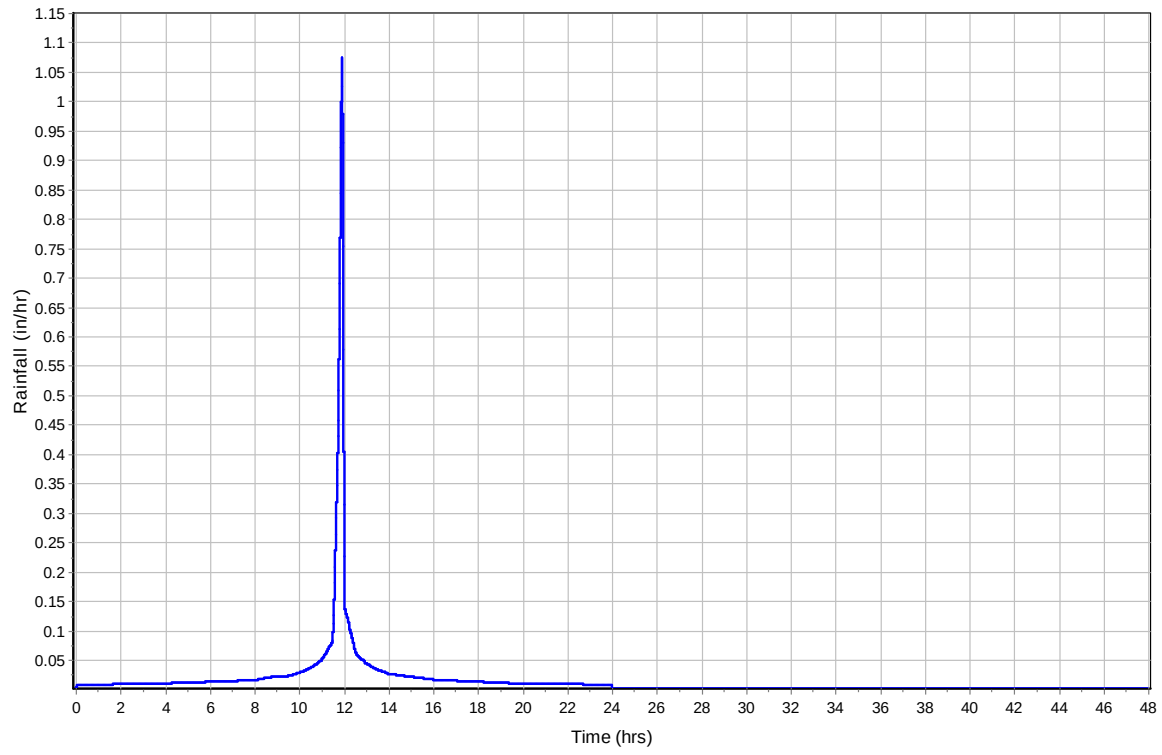
	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
< 50% grass cover, Poor		0.42	C	86
Composite Area & Weighted CN		0.42		86

Subbasin Runoff Results

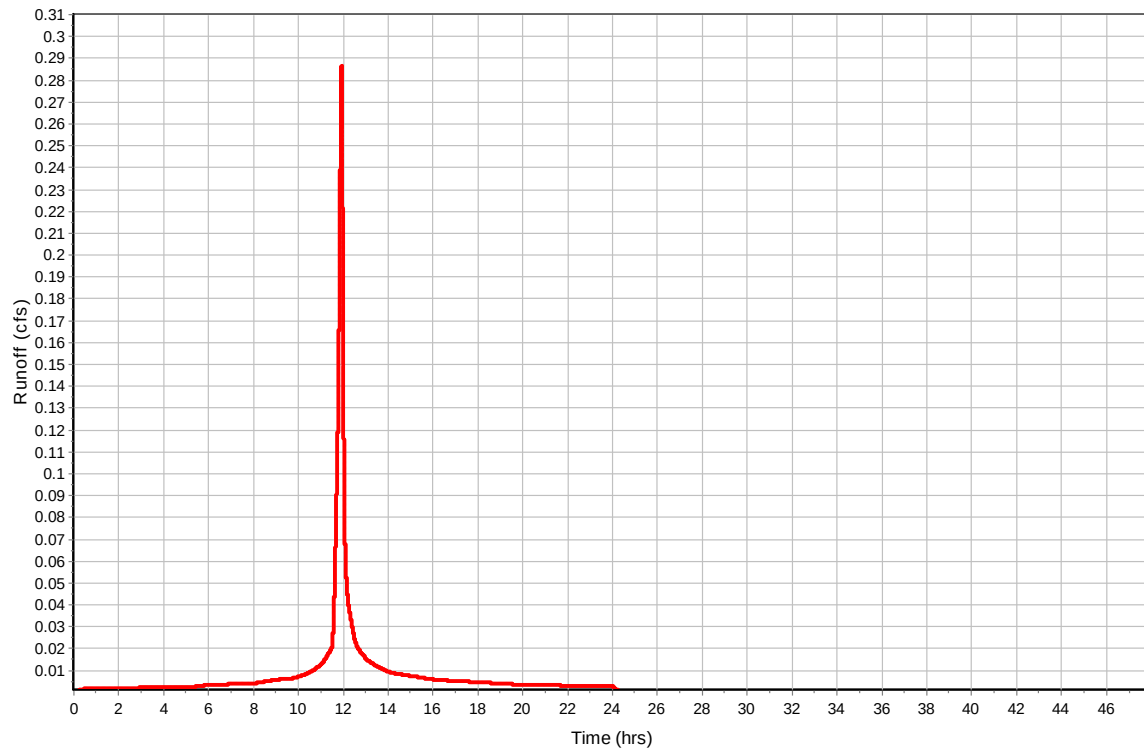
Total Rainfall (in)	0.7
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.197
Total Runoff (in)	0.48
Peak Runoff (cfs)	0.29
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:16:55

Subbasin : DA13-PR

Rainfall Intensity Graph



Runoff Hydrograph



SN	Element ID	From (Inlet Node)	To (Outlet Node)	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence (days hh:mm)	Max Flow Velocity (ft/sec)	Travel Time (min)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Froude Number	Reported Condition
				(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(inches)	(inches)					(cfs)			(cfs)										
1	EX-PIPE-105	64	EX-MH-01	77.97	4629.99	0.00	4626.81	1.29	3.18	4.0800	CIRCULAR	12.000	12.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	0.29	0 11:57	4.65	0.28	7.79	0.04	0.13	0.00	0.13	1.19	Calculated
2	Link-123	Inlet14-PR	64	20.16	4630.23	0.00	4630.07	0.08	0.16	0.7900	CIRCULAR	12.000	12.00	0.0150	0.5000	0.8000	0.0000	0.00	NO	1.00	0.29	0 11:57	2.05	0.16	2.75	0.10	0.23	0.00	0.23	0.60	Calculated
3	Link-125	EX-MH-01	Out13-PR	19.73	4625.52	0.00	4625.32	0.00	0.20	1.0100	CIRCULAR	18.000	18.00	0.0150	0.0000	0.8000	0.0000	0.00	NO	1.00	0.48	0 11:57	2.55	0.13	9.17	0.05	0.16	0.00	0.25	0.47	Calculated
4	Link-129	64	64	178.98	4626.51	0.00	4624.89	0.00	1.62	0.9100	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	1.63	0 12:43	3.68	0.81	10.83	0.15	0.30	0.00	0.45	0.58	Calculated
5	Link-130	64	Jun-100	143.22	4624.89	0.00	4624.26	0.04	0.63	0.4400	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.62	0 12:44	3.30	0.72	7.55	0.22	0.32	0.00	0.48	0.57	Calculated
6	Link-131	Out-10	Jun-101	10.06	4626.21	0.00	4623.59	6.00	2.62	26.0400	CIRCULAR	18.000	18.00	0.0120	0.5000	0.6000	0.0000	0.00	NO	1.00	0.48	0 11:59	8.73	0.02	58.07	0.01	0.07	0.00	0.11	2.50	Calculated
7	Link-132	Jun-100	Jun-101	53.52	4624.22	0.00	4623.28	5.69	0.94	1.7600	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.62	0 12:44	5.24	0.17	15.08	0.11	0.23	0.00	0.35	1.01	Calculated
8	Link-133	Jun-101	STM-02_MH-03	64.79	4618.59	1.00	4618.41	1.00	0.18	0.2800	CIRCULAR	36.000	36.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	1.81	0 12:44	2.27	0.48	38.09	0.05	0.18	0.00	0.54	0.42	Calculated
9	PIPE(49)	STM-02_MH-03	OUTFALL_STM-02_FES-01	17.45	4618.41	1.00	4618.35	0.00	0.06	0.3400	CIRCULAR	48.000	48.00	0.0120	0.0000	1.0000	0.0000	0.00	NO	1.00	2.98	0 11:58	2.79	0.10	91.25	0.03	0.14	0.00	0.56	0.53	Calculated
10	STM-01_PIPE-02	STM-01_MH-03	OUTFALL_STRUCTURE-(105)	61.46	4610.24	1.00	4610.08	0.00	0.16	0.2600	CIRCULAR	24.000	24.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	21.65	0 11:58	6.89	0.15	12.50	1.73	1.00	12.00	2.00	0.53	SURCHARGED
11	STM-01_PIPE-03	STM-01_MH-03	STM-01_MH-03	106.81	4610.63	1.00	4610.34	1.10	0.29	0.2700	CIRCULAR	24.000	24.00	0.0120	0.0000	0.8000	0.0000	0.00	NO	1.00	21.65	0 11:58	6.89	0.26	12.77	1.70	1.00	12.00	2.00	0.65	SURCHARGED
12	STM-01_PIPE-04	zeas	STM-01_MH-10	160.51	4611.06	1.00	4610.75	1.12	0.31	0.1900	CIRCULAR	24.000	24.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	21.65	0 11:58	6.89	0.39	10.77	2.01	1.00	12.00	2.00	0.57	SURCHARGED
13	STM-01_PIPE-05	STM-01_MH-05	zeas	171.74	4611.52	1.00	4611.06	1.00	0.46	0.2700	CIRCULAR	24.000	24.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	11.80	0 11:56	3.76	0.76	12.68	0.93	1.00	12.00	2.00	0.34	SURCHARGED
14	STM-01_PIPE-05N1	STM-01_INLET-03	zeas	48.35	4611.80	1.00	4611.56	1.50	0.24	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	9.10	0 11:58	5.15	0.16	8.02	1.13	1.00	13.00	1.50	0.77	SURCHARGED
15	STM-01_PIPE-05N2	STM-01_AI-01	STM-01_INLET-03	18.62	4617.40	1.00	4616.83	6.03	0.57	3.0600	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	7.37	0 11:58	7.57	0.04	19.91	0.37	0.54	0.00	0.81	1.67	Calculated
16	STM-01_PIPE-05S	STM-01_INLET-01	zeas	7.86	4615.60	1.00	4615.50	5.44	0.10	1.2700	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	1.55	0 11:56	3.63	0.04	12.84	0.12	0.34	0.00	0.51	0.78	Calculated
17	STM-01_PIPE-06	STM-01_MH-06	STM-01_MH-05	327.69	4612.90	1.00	4612.02	1.50	0.88	0.2700	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	10.96	0 11:55	6.20	0.88	5.90	1.86	1.00	12.00	1.50	0.62	SURCHARGED
18	STM-01_PIPE-06N2	STM-01_AI-03	STM-01_MH-05	74.58	4614.40	1.00	4611.80	1.28	2.60	3.4900	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5600	0.0000	0.00	NO	1.00	1.03	0 12:02	2.68	0.46	21.25	0.05	1.00	5.00	1.50	0.98	SURCHARGED
19	STM-01_PIPE-07	STM-01_MH-07	STM-01_MH-06	327.03	4613.78	7.08	4612.90	1.00	0.88	0.2700	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	10.96	0 11:55	6.20	0.88	5.90	1.86	1.00	14.00	1.50	0.48	SURCHARGED
20	STM-01_PIPE-08	STM-01_AI-02	STM-01_MH-07	68.89	4613.95	1.00	4613.78	7.08	0.17	0.2500	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	10.96	0 11:55	6.20	0.19	5.65	1.94	1.00	15.00	1.50	0.53	SURCHARGED
21	STM-02_PIPE-01	STM-02_MH-01	STM-02_MH-02	270.03	4621.33	1.00	4620.25	1.00	1.08	0.4000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	1.48	0 11:57	3.19	1.41	7.20	0.21	0.31	0.00	0.46	0.46	Calculated
22	STM-02_PIPE-01N	STM-02_INLET-02	STM-02_MH-01	38.78	4621.70	1.00	4621.50	1.17	0.20	0.5200	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	0.86	0 11:56	2.66	0.24	8.17	0.11	0.24	0.00	0.36	0.63	Calculated
23	STM-02_PIPE-01S	STM-02_INLET-01	STM-02_MH-01	5.38	4621.70	1.00	4621.62	1.29	0.08	1.4900	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	0.64	0 11:56	2.98	0.03	13.88	0.05	0.18	0.00	0.27	0.84	Calculated
24	STM-02_PIPE-02	STM-02_MH-02	STM-02_WQMH-02	315.68	4620.25	1.00	4618.67	1.00	1.58	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.48	0 11:57	3.14	1.68	8.05	0.18	0.32	0.00	0.47	0.43	Calculated
25	STM-02_PIPE-02(1)(1)	STM-02_WQMH-02	STM-02_MH-03	19.51	4618.67	1.00	4618.57	1.16	0.10	0.5100	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.46	0 11:59	2.93	0.11	8.15	0.18	0.33	0.00	0.49	0.45	Calculated
26	STM-02_PIPE-04	STM-03_MH-02	STM-02_WQMH-03	67.87	4620.25	1.10	4619.91	1.00	0.34	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.06	0 11:57	2.86	0.40	8.05	0.13	0.26	0.00	0.39	0.41	Calculated
27	STM-02_PIPE-04(1)	STM-02_WQMH-03	STM-02_MH-03	50.06	4619.91	1.00	4619.66	2.25	0.25	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.06	0 11:57	2.99	0.28	8.04	0.13	0.25	0.00	0.38	0.54	Calculated
28	STM-03_PIPE-03	STM-03_MH-03	STM-03_MH-02	228.53	4621.40	1.00	4620.25	1.10	1.15	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	0.41	0 11:57	1.54	2.47	8.07	0.05	0.21	0.00	0.31	0.24	Calculated
29	STM-03_PIPE-03N	STM-03_INLET-02	STM-03_MH-02	34.01	4624.50	1.00	4623.16	4.01	1.34	3.9400	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	0.39	0 11:56	4.48	0.13	22.59	0.02	0.10	0.00	0.14	1.15	Calculated
30	STM-03_PIPE-03S	STM-03_INLET-01	STM-03_MH-02	12.02	4620.39	1.00	4620.15	1.00	0.24	2.0000	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	0.28	0 11:55	1.02	0.20	16.08	0.02	0.25	0.00	0.37	0.06	Calculated
31	STM-03_PIPE-04	STM-03_MH-04	STM-03_MH-03	228.86	4623.68	1.00	4621.40	1.00	2.28	1.0000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	0.41	0 11:56	2.74	1.39	11.36	0.04	0.14	0.00	0.21	0.47	Calculated
32	STM-03_PIPE-04S	STM-03_INLET-03	STM-03_MH-04	11.73	4624.08	1.00	4623.68	1.00	0.40	3.4100	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	0.42	0 11:56	3.28	0.06	21.01	0.02	0.13	0.00	0.19	0.73	Calculated
33	STM-04_PIPE-01	STM-04_INLET-01	EX-MH-01	110.34	4626.92	1.00	4626.81	1.29	0.11	0.1000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	0.20	0 11:57	1.30	1.41	3.59	0.05	0.14	0.00	0.21	0.20	Calculated

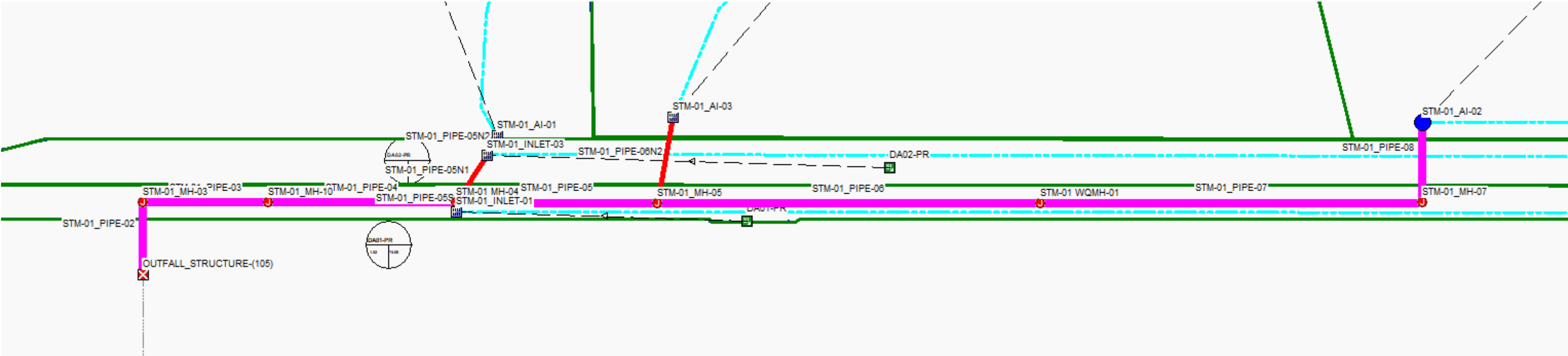
SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
					(ft)			(ft)	(cfs)	(cfs)	(ft)	(ft)
1	Out13-PR	110557.10	36779.04		4625.32	NORMAL	NO		0.48	0.00	0.23	4625.55
2	OUTFALL_STM-02_FES-01	109257.13	36748.36		4618.35	NORMAL	NO		2.98	0.00	0.49	4618.84
3	OUTFALL_STRUCTURE-(105)	106620.72	36723.26		4610.08	NORMAL	NO		21.65	0.00	2.00	4612.08

SN	Element ID	X Coordinate	Y Coordinate	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation	Max (Rim) Elevation	Max (Rim) Offset	Initial Water Elevation	Initial Water Depth	Ponded Area	Grate Clogging Factor	Roadway Longitudinal Slope	Roadway Cross Slope	Roadway Manning's Roughness	Gutter Cross Slope	Gutter Width	Gutter Depression	Median Ditch Longitudinal Slope	Median Ditch Bottom Width	Median Ditch Left Side Slope	Median Ditch Right Side Slope	Median Ditch Manning's Roughness	Peak Flow	Peak Lateral Inflow	Peak Flow Intercepted by Inlet	Peak Flow Bypassing Inlet	Inlet Efficiency during	Allowable Spread	Max Gutter Spread during	Max Gutter Water Elev. during	Max Gutter Water Depth during	Time of Maximum Depth Occurrence	Total Flooded Volume	Total Time Flooded
								(ft)	(ft)	(ft)	(ft)	(ft)	(ft ²)	(%)	(ft/ft)	(ft/ft)	(ft/ft)	(ft)	(inches)		(ft/ft)	(ft)	(V:H)	(V:H)		(cfs)	(cfs)	(cfs)	(cfs)	(%)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-inches)	(minutes)
1	Inlet14-PR	110463.87	36822.19	FHWA HEC-22 GENERIC	N/A	On Sag	1	4630.23	4631.78	1.55	4630.23	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.29	0.29	N/A	N/A	N/A	7.00	1.68	4631.93	0.15	0 11:57	0.00	0.00
2	STM-01_AI-01	106923.12	36841.13	FHWA HEC-22 GENERIC	N/A	On Sag	1	4616.40	4619.90	3.50	4616.40	0.00	1.00	0.00	N/A	0.0060	0.0300	0.0060	40.00	2.0000	45.0000	45.0000	64	64	45.0000	7.37	7.37	N/A	N/A	N/A	7.00	83.90	4621.95	2.05	0 11:58	0.00	0.00
3	STM-01_AI-02	107714.72	36853.08	FHWA HEC-22 GENERIC	N/A	On Sag	1	4612.95	4623.95	11.00	4612.95	0.00	1.00	0.00	N/A	0.0060	0.0300	0.0060	40.00	2.0000	45.0000	45.0000	64	64	45.0000	12.01	12.01	N/A	N/A	N/A	7.00	103.75	4625.56	1.61	0 11:55	0.07	5.00
4	STM-01_AI-03	107073.18	36856.99	FHWA HEC-22 GENERIC	N/A	On Sag	1	4613.40	4622.22	8.82	4613.40	0.00	1.00	0.00	N/A	0.0060	0.0300	0.0060	40.00	2.0000	45.0000	45.0000	64	64	45.0000	0.64	0.64	N/A	N/A	N/A	7.00	17.29	4623.87	1.65	0 11:55	0.00	0.00
5	STM-01_INLET-01	106887.86	36776.27	FHWA HEC-22 GENERIC	N/A	On Sag	1	4614.60	4619.57	4.97	4614.60	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	1.55	1.55	N/A	N/A	N/A	7.00	8.20	4619.85	0.28	0 11:58	0.00	0.00
6	STM-01_INLET-03	106914.20	36824.79	FHWA HEC-22 GENERIC	N/A	On Sag	1	4610.80	4619.66	8.86	4610.80	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	1.85	1.85	N/A	N/A	N/A	7.00	9.30	4619.96	0.30	0 11:58	0.00	0.00
7	STM-02_INLET-01	108659.80	36776.81	FHWA HEC-22 GENERIC	N/A	On Sag	2	4620.70	4626.00	5.30	4620.70	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.64	0.64	N/A	N/A	N/A	7.00	1.93	4626.15	0.15	0 11:56	0.00	0.00
8	STM-02_INLET-02	108659.93	36820.97	FHWA HEC-22 GENERIC	N/A	On Sag	2	4620.70	4626.00	5.30	4620.70	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.86	0.86	N/A	N/A	N/A	7.00	2.13	4626.16	0.16	0 11:56	0.00	0.00
9	STM-03_INLET-01	109373.16	36775.88	FHWA HEC-22 GENERIC	N/A	On Sag	1	4619.39	4628.88	9.49	4619.39	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.28	0.28	N/A	N/A	N/A	7.00	1.68	4629.03	0.15	0 11:57	0.00	0.00
10	STM-03_INLET-02	109373.03	36821.91	FHWA HEC-22 GENERIC	N/A	On Sag	1	4623.50	4628.88	5.38	4623.50	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.39	0.39	N/A	N/A	N/A	7.00	1.84	4629.03	0.15	0 11:56	0.00	0.00
11	STM-03_INLET-03	109830.54	36775.84	FHWA HEC-22 GENERIC	N/A	On Sag	1	4623.08	4630.26	7.18	4623.08	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.42	0.42	N/A	N/A	N/A	7.00	1.88	4630.41	0.15	0 11:56	0.00	0.00
12	STM-04_INLET-01	110427.25	36775.76	FHWA HEC-22 GENERIC	N/A	On Sag	1	4625.92	4631.65	5.73	4625.92	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.20	0.20	N/A	N/A	N/A	7.00	1.54	4631.80	0.15	0 11:57	0.00	0.00

SN	Element ID	X Coordinate	Y Coordinate	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation	Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover	Peak Inflow	Peak Lateral Inflow	Maximum HGL Attained	Maximum HGL Depth	Maximum Surcharge Depth	Minimum Freeboard Attained	Average HGL Attained	Average HGL Depth	Time of Maximum HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
				(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft²)	(inches)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
1	EX-MH-01	110537.59	36776.10	4625.52	4632.78	7.26	4625.52	0.00	5000.00	367.22	1.00	53.64	0.48	0.00	4625.78	0.26	0.00	7.00	4625.54	0.02	0 11:57	0 00:00	0.00	0.00
2	Jun-100	109327.04	36843.23	4624.22	4628.29	4.07	4624.22	0.00	5000.00	371.71	1.00	30.41	1.62	0.00	4624.58	0.36	0.00	3.71	4624.29	0.07	0 12:44	0 00:00	0.00	0.00
3	Jun-101	109275.70	36828.12	4617.59	4628.84	11.25	4617.59	0.00	5000.00	371.17	1.00	44.94	1.81	0.00	4619.10	1.51	0.00	9.73	4618.63	1.04	0 12:44	0 00:00	0.00	0.00
4	Jun-94	110464.06	36802.03	4629.99	4632.62	2.63	4629.99	0.00	5000.00	367.38	1.00	18.60	0.29	0.00	4630.12	0.13	0.00	2.50	4630.00	0.01	0 11:57	0 00:00	0.00	0.00
5	Jun-98	109649.23	36841.88	4626.51	4632.49	5.98	4626.51	0.00	5000.00	367.51	1.00	53.76	1.63	1.63	4626.91	0.40	0.00	5.58	4626.59	0.08	0 12:43	0 00:00	0.00	0.00
6	Jun-99	109470.26	36843.26	4624.89	4628.59	3.70	4624.89	0.00	5000.00	371.41	1.00	26.35	1.63	0.00	4625.38	0.49	0.00	3.20	4624.99	0.10	0 12:44	0 00:00	0.00	0.00
7	Out-10	109303.09	36846.96	4626.21	4628.21	2.00	4626.21	0.00	5000.00	371.79	1.00	6.00	0.48	0.48	4626.32	0.11	0.00	1.89	4626.22	0.01	0 11:58	0 00:00	0.00	0.00
8	STM-01_MH-03	106620.72	36784.72	4609.24	4621.31	12.07	4609.24	0.00	5000.00	378.69	1.00	107.64	21.65	0.00	4613.04	3.80	0.00	8.27	4610.41	1.17	0 11:53	0 00:00	0.00	0.00
9	STM-01_MH-05	107059.78	36783.62	4610.52	4620.76	10.24	4610.52	0.00	5000.00	379.24	1.00	86.88	11.79	0.00	4616.46	5.94	0.00	4.30	4611.63	1.11	0 11:56	0 00:00	0.00	0.00
10	STM-01_WQMH-01	107387.47	36783.99	4611.90	4622.94	11.04	4611.90	0.00	5000.00	377.06	1.00	102.48	10.96	0.00	4619.55	7.65	0.00	3.39	4613.04	1.14	0 11:56	0 00:00	0.00	0.00
11	STM-01_MH-07	107714.50	36784.19	4606.70	4624.91	18.21	4606.70	0.00	5000.00	375.09	1.00	115.56	10.96	0.00	4622.63	15.93	0.00	2.28	4613.79	7.09	0 11:58	0 00:00	0.00	0.00
12	STM-01_MH-10	106727.53	36784.42	4609.63	4620.70	11.07	4609.63	0.00	5000.00	379.30	1.00	95.40	21.65	0.00	4614.35	4.72	0.00	6.35	4610.81	1.18	0 11:58	0 00:00	0.00	0.00
13	STM-02_MH-01	108659.80	36782.19	4620.33	4626.28	5.95	4620.33	0.00	5000.00	373.72	1.00	37.92	1.50	0.00	4621.80	1.47	0.00	4.48	4621.34	1.01	0 11:57	0 00:00	0.00	0.00
14	STM-02_MH-02	108929.83	36780.98	4619.25	4627.85	8.60	4619.25	0.00	5000.00	372.15	1.00	73.20	1.48	0.00	4620.69	1.44	0.00	7.16	4620.24	0.99	0 11:57	0 00:00	0.00	0.00
15	STM-02_MH-03	109258.02	36765.79	4617.41	4630.20	12.79	4617.41	0.00	5000.00	369.80	1.00	93.48	2.99	0.00	4619.04	1.63	0.00	11.16	4618.47	1.06	0 11:58	0 00:00	0.00	0.00
16	STM-02_WQMH-02	109245.51	36780.76	4617.67	4629.71	12.04	4617.67	0.00	5000.00	370.29	1.00	114.48	1.48	0.00	4619.18	1.51	0.00	10.53	4618.66	0.99	0 11:58	0 00:00	0.00	0.00
17	STM-02_WQMH-03	109305.67	36781.15	4618.91	4629.39	10.48	4618.91	0.00	5000.00	370.61	1.00	95.76	1.06	0.00	4620.31	1.40	0.00	9.08	4619.87	0.96	0 11:57	0 00:00	0.00	0.00
18	STM-03_MH-02	109373.20	36787.90	4619.15	4629.28	10.13	4619.15	0.00	5000.00	370.72	1.00	55.44	1.07	0.00	4620.64	1.49	0.00	8.64	4620.22	1.07	0 11:57	0 00:00	0.00	0.00
19	STM-03_MH-03	109601.73	36787.57	4620.40	4631.20	10.80	4620.40	0.00	5000.00	368.80	1.00	99.60	0.41	0.00	4621.63	1.23	0.00	9.57	4621.34	0.94	0 11:57	0 00:00	0.00	0.00
20	STM-03_MH-04	109830.59	36787.57	4622.68	4630.65	7.97	4622.68	0.00	5000.00	369.35	1.00	65.64	0.42	0.00	4623.88	1.20	0.00	6.77	4623.64	0.96	0 11:56	0 00:00	0.00	0.00
21	STM-01 MH-04	106888.04	36784.13	4610.06	4619.95	9.89	4610.06	0.00	5000.00	380.05	1.00	35.40	21.79	0.00	4615.98	5.92	0.00	3.97	4611.26	1.20	0 11:58	0 00:00	0.00	0.00

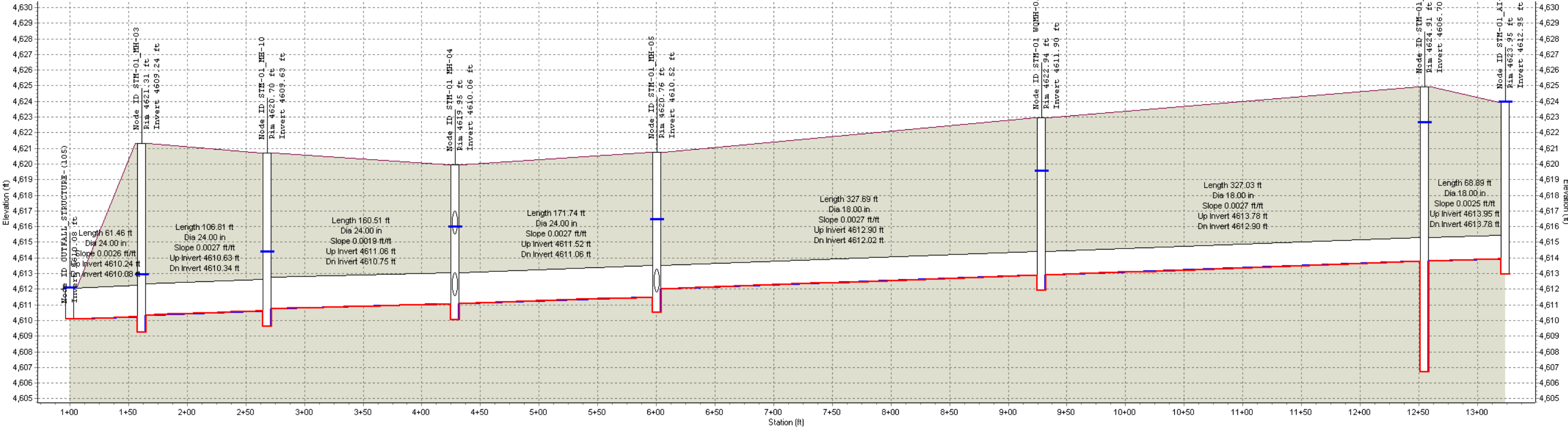
SN	Element ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period	Rainfall Depth	Rainfall Distribution
								(years)	(inches)	
1	GrandValley	Time Series	5YR-24HR	Cumulative	inches				0	

SN	Element ID	Area	Drainage Node ID	Weighted Curve Number	Conductivity	Drying Time	Average Slope	Equivalent Width	Impervious Area	Impervious Area No Depression	Impervious Area Depression	Impervious Area Manning's Roughness	Pervious Area	Pervious Area Manning's Roughness	Curb & Gutter Length	Rain Gage ID	Total Precipitation	Total Runon	Total Evaporation	Total Infiltration	Total Runoff	Peak Runoff	Time of Concentration
		(acres)			(inches/hr)	(days)	(%)	(ft)	(%)	(%)	(inches)		(inches)		(ft)		(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(days hh:mm:ss)
1	DA01-PR	1.53	STM-01_INLET-01	86.00	0.1500	7.00	0.6084	1976.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	0.70	0.00	0.0000	0.0000	0.69	1.55	0 00:10:22
2	DA02-PR	1.82	STM-01_INLET-03	86.00	0.1500	7.00	0.5951	2349.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	0.70	0.00	0.0000	0.0000	0.69	1.85	0 00:10:28
3	DA03-PR	25.58	STM-01_AI-01	86.00	0.1500	7.00	0.6464	2800.00	30.00	40.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	0.70	0.00	0.0000	0.3490	0.31	7.37	0 01:25:15
4	DA04-PR	8.76	STM-01_AI-03	79.76	0.1500	7.00	0.6075	2249.00	7.00	40.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	0.70	0.00	0.0000	0.5160	0.14	0.64	0 01:01:44
5	DA05-PR	58.18	STM-01_AI-02	86.00	0.1500	7.00	0.5154	4606.00	22.00	40.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	0.70	0.00	0.0000	0.3930	0.26	12.01	0 01:58:16
6	DA06-PR	0.85	STM-02_INLET-02	86.00	0.1500	7.00	0.6520	1092.00	100.00	80.00	0.0500	0.0120	0.1000	0.0120	0.00	GrandValley	0.70	0.00	0.0000	0.0000	0.69	0.86	0 00:10:12
7	DA07-PR	0.63	STM-02_INLET-01	86.00	0.1500	7.00	0.6686	834.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	0.70	0.00	0.0000	0.0000	0.69	0.64	0 00:09:59
8	DA08-PR	0.27	STM-03_INLET-01	86.00	0.1500	7.00	0.9142	407.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	0.70	0.00	0.0000	0.0000	0.69	0.28	0 00:08:27
9	DA09-PR	0.38	STM-03_INLET-02	86.00	0.1500	7.00	0.8697	550.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	0.70	0.00	0.0000	0.0000	0.69	0.39	0 00:08:44
10	DA10-PR	4.63	Out-10	86.00	0.1500	7.00	0.7178	1307.00	6.00	25.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	0.70	0.00	0.0000	0.4660	0.19	0.48	0 00:55:49
11	DA11-PR	0.41	STM-03_INLET-03	86.00	0.1500	7.00	0.5820	641.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	0.70	0.00	0.0000	0.0000	0.69	0.42	0 00:09:22
12	DA12-PR	0.21	STM-04_INLET-01	86.00	0.1500	7.00	0.6668	306.00	90.00	80.00	0.0500	0.0120	0.0500	0.2000	0.00	GrandValley	0.70	0.00	0.0000	0.0490	0.64	0.20	0 00:12:53
13	DA13-PR	0.42	Inlet14-PR	86.00	0.1500	7.00	0.5872	410.00	60.00	80.00	0.0500	0.0120	0.0500	0.0500	0.00	GrandValley	0.70	0.00	0.0000	0.1970	0.48	0.29	0 00:16:55

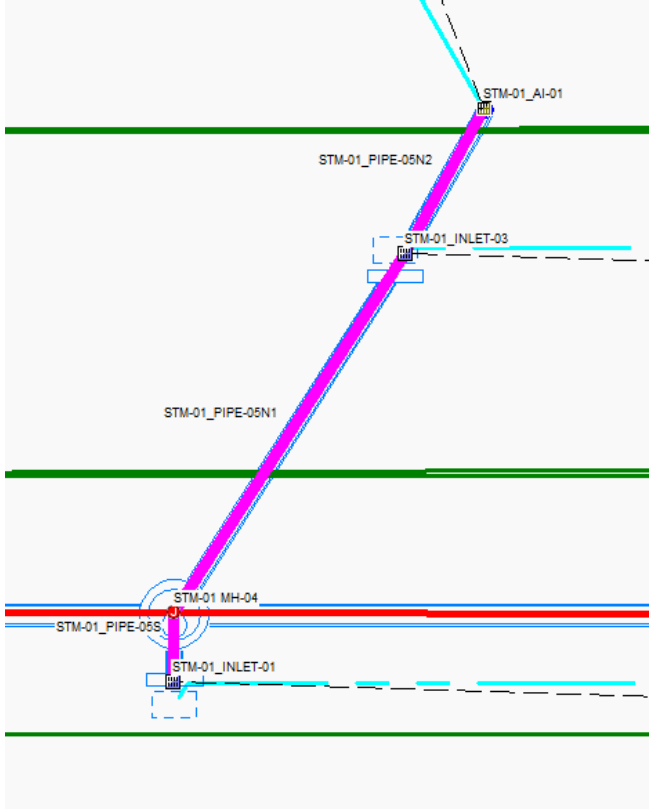


01_BeswickDrain_Central
Main Street Storm Sewer

12/14/2022 00:00:01

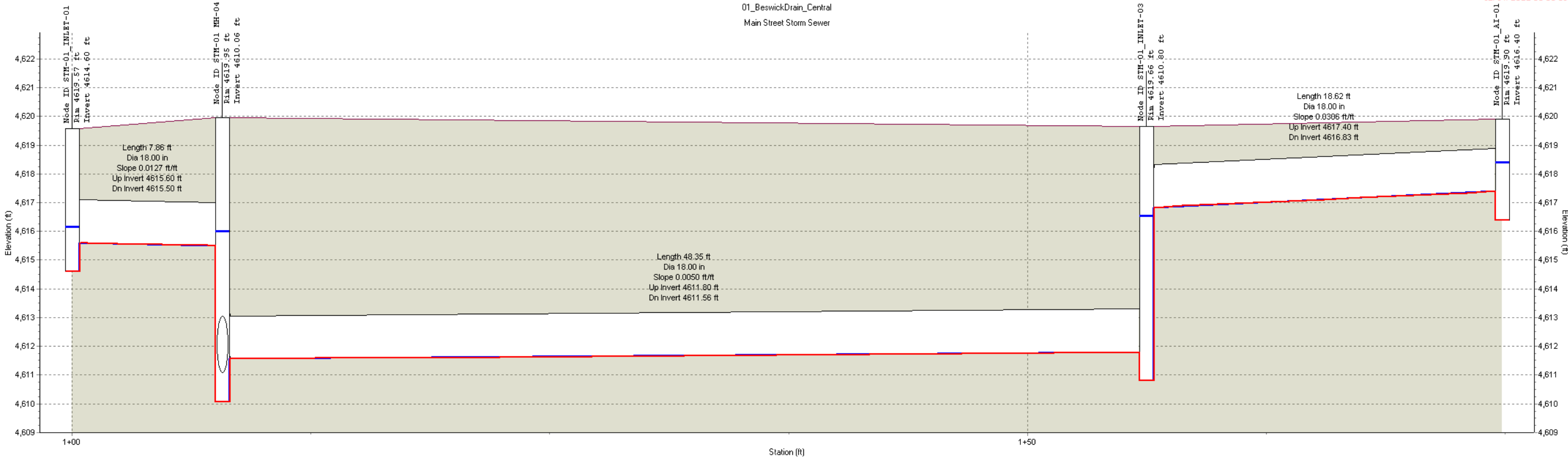


Node ID:		STM-01_MH-03	STM-01_MH-10	STM-01_MH-04	STM-01_MH-05	STM-01_WQMH-01	STM-01_MH-07	STM-01_AI-02
Rim (ft):		4621.31	4620.70	4619.95	4620.76	4622.94	4624.91	4623.95
Invert (ft):		4609.24	4609.63	4610.06	4610.52	4611.90	4606.70	4612.95
Min Pipe Cover (ft):		8.97	7.95	2.95	7.24	8.54	9.63	
Max HGL (ft):		4613.04	4614.35	4615.98	4616.46	4619.55	4622.63	4623.95
Link ID:	STM-01_PIPE-02	STM-01_PIPE-03	STM-01_PIPE-04	STM-01_PIPE-05	STM-01_PIPE-06	STM-01_PIPE-07	STM-01_PIPE-08	
Length (ft):	61.46	106.81	160.51	171.74	327.69	327.03	68.89	
Dia (in):	24.00	24.00	24.00	24.00	18.00	18.00	18.00	
Slope (ft/ft):	0.0026	0.0027	0.0019	0.0027	0.0027	0.0027	0.0025	
Up Invert (ft):	4610.24	4610.63	4611.06	4611.52	4612.90	4613.78	4613.95	
Dn Invert (ft):	4610.08	4610.34	4610.75	4611.06	4612.02	4612.90	4613.78	
Max Q (cfs):	21.65	21.65	21.65	11.80	10.96	10.96	10.96	
Max Vel (ft/s):	6.89	6.89	6.89	3.76	6.20	6.20	6.20	
Max Depth (ft):	2.00	2.00	2.00	2.00	1.50	1.50	1.50	

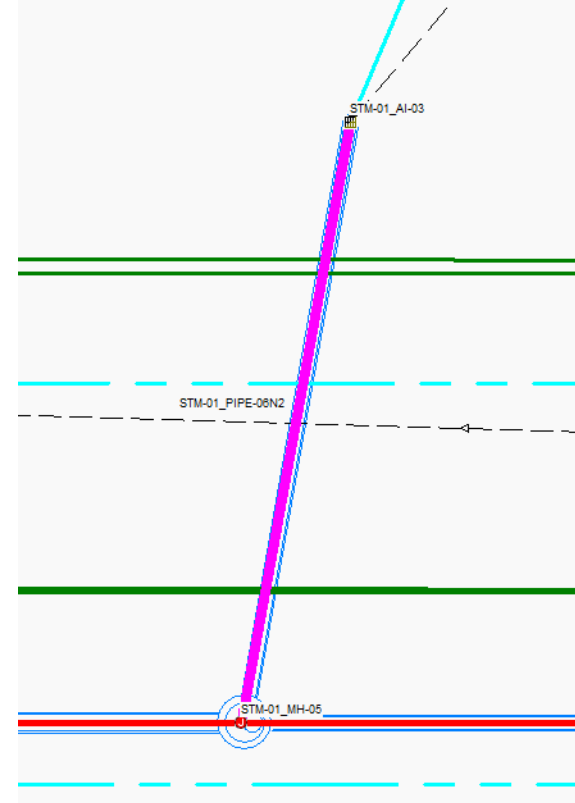


01_BeswickDrain_Central
Main Street Storm Sewer

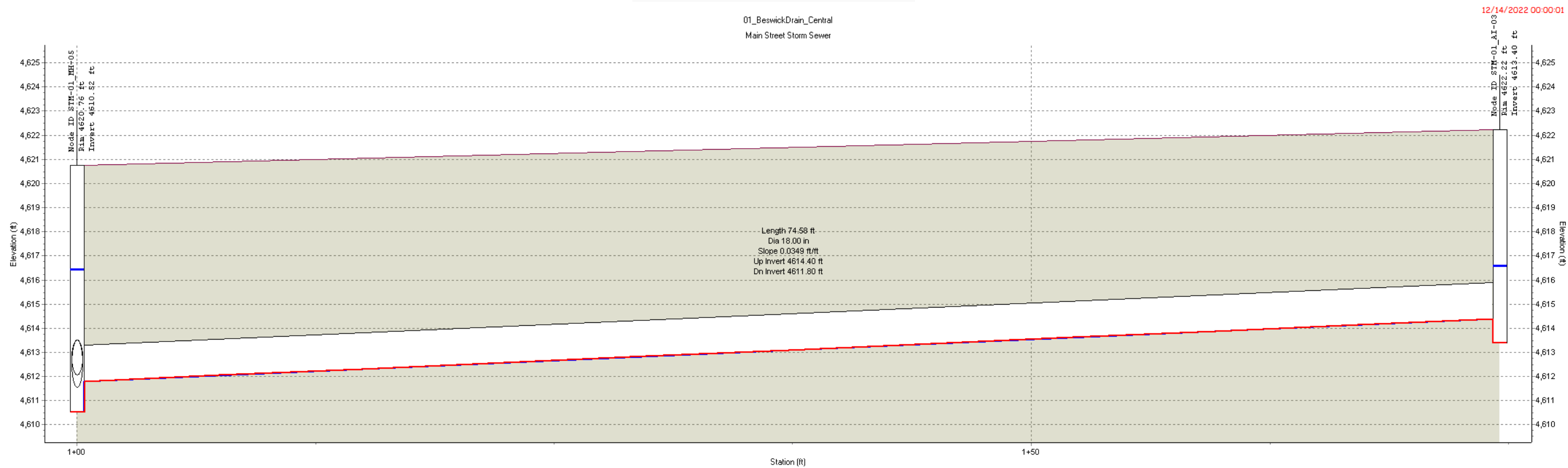
12/14/2022 00:00:01



Node ID:	STM-01 MH-04		STM-01_INLET-03		STM-01_AI-01	
Rim (ft):	4619.57	4619.95	4619.66	4619.90	4619.90	4619.90
Invert (ft):	4614.60	4610.06	4610.80	4610.80	4616.40	4616.40
Min Pipe Cover (ft):	2.95					
Max HGL (ft):	4616.15	4615.98	4616.53	4616.53	4618.39	4618.39
Link ID:	STM-01_PIPE-05S		STM-01_PIPE-05N1		STM-01_PIPE-05N2	
Length (ft):	7.86		48.35		18.62	
Dia (in):	18.00		18.00		18.00	
Slope (ft/ft):	0.0127		0.0050		0.0306	
Up Invert (ft):	4615.60		4611.80		4617.40	
Dn Invert (ft):	4615.50		4611.56		4616.83	
Max Q (cfs):	1.55		9.10		7.37	
Max Vel (ft/s):	3.63		5.15		7.57	
Max Depth (ft):	0.51		1.50		0.81	



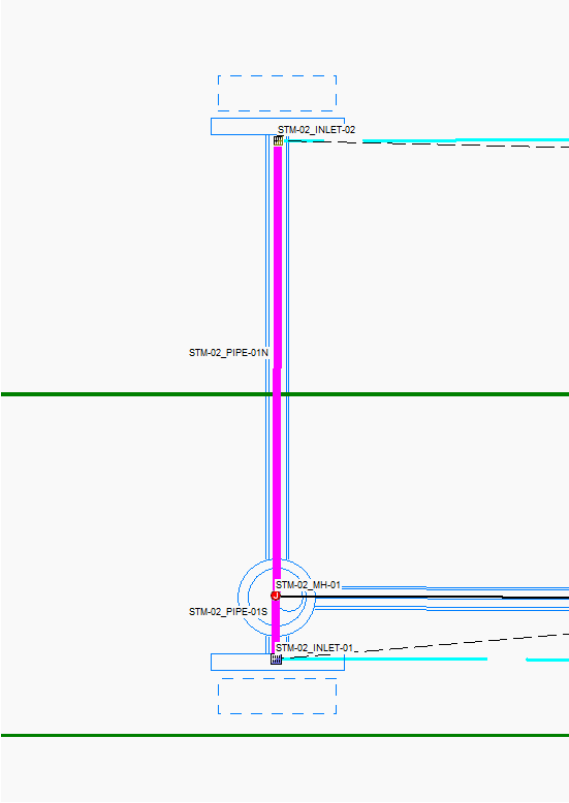
01_BeswickDrain_Central
Main Street Storm Sewer



Node ID:	STM-01_MH-05	STM-01_AI-03
Rim (ft):	4620.76	4622.22
Invert (ft):	4610.52	4613.40
Min Pipe Cover (ft):	7.24	
Max HGL (ft):	4616.46	4616.58
Link ID:	STM-01_PIPE-06N2	
Length (ft):	74.58	
Dia (in):	18.00	
Slope (ft/ft):	0.0349	
Up Invert (ft):	4614.40	
Dn Invert (ft):	4611.80	
Max Q (cfs):	1.03	
Max Vel (ft/s):	2.68	
Max Depth (ft):	1.50	

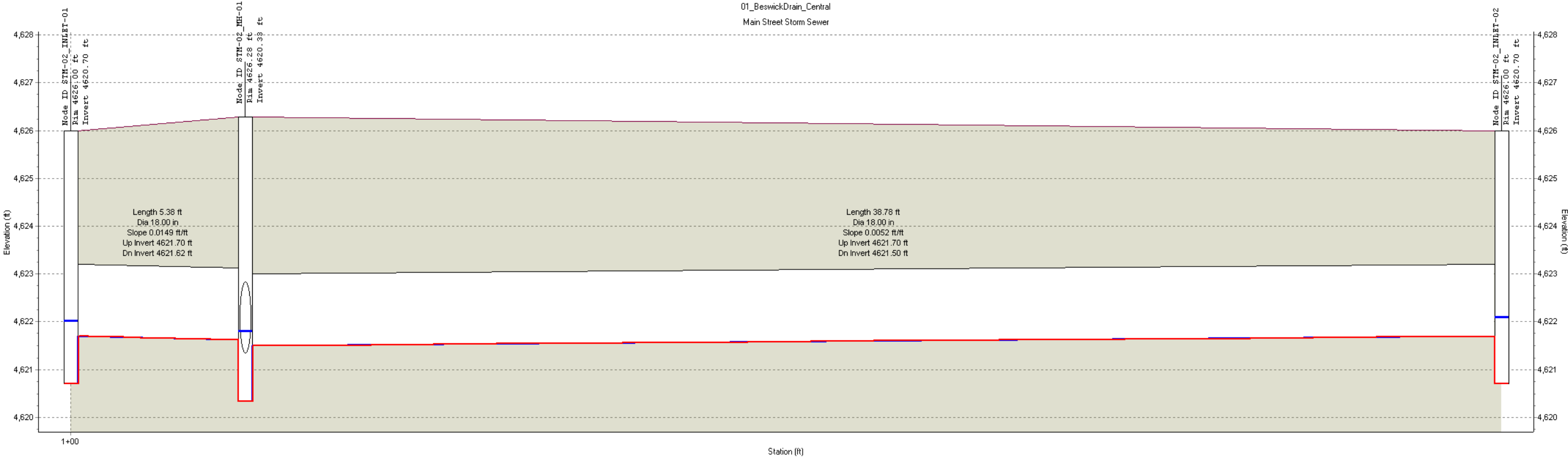


Node ID:	STM-02_MH-02 w/QMH-02			STM-02_MH-02			STM-02_MH-01		
Rim (ft):	4630.20	4629.71		4627.85			4626.28		
Invert (ft):	4618.35	4617.41	4617.67	4619.25			4620.33		
Min Pipe Cover (ft):		7.79	9.54	6.10			3.16		
Max HGL (ft):	4618.84	4619.04	4619.18	4620.69			4621.80		
Link ID:	PIPE-02_PIPE-02(1)(1)			STM-02_PIPE-02			STM-02_PIPE-01		
Length (ft):	17.45	19.51		315.68			270.03		
Dia (in):	48.00	18.00		18.00			18.00		
Slope (ft/ft):	0.0034	0.0051		0.0050			0.0040		
Up Invert (ft):	4618.41	4618.67		4620.25			4621.33		
Dn Invert (ft):	4618.35	4618.57		4618.67			4620.25		
Max Q (cfs):	2.98	1.46		1.48			1.48		
Max Vel (ft/s):	2.79	2.93		3.14			3.19		
Max Depth (ft):	0.56	0.49		0.47			0.46		

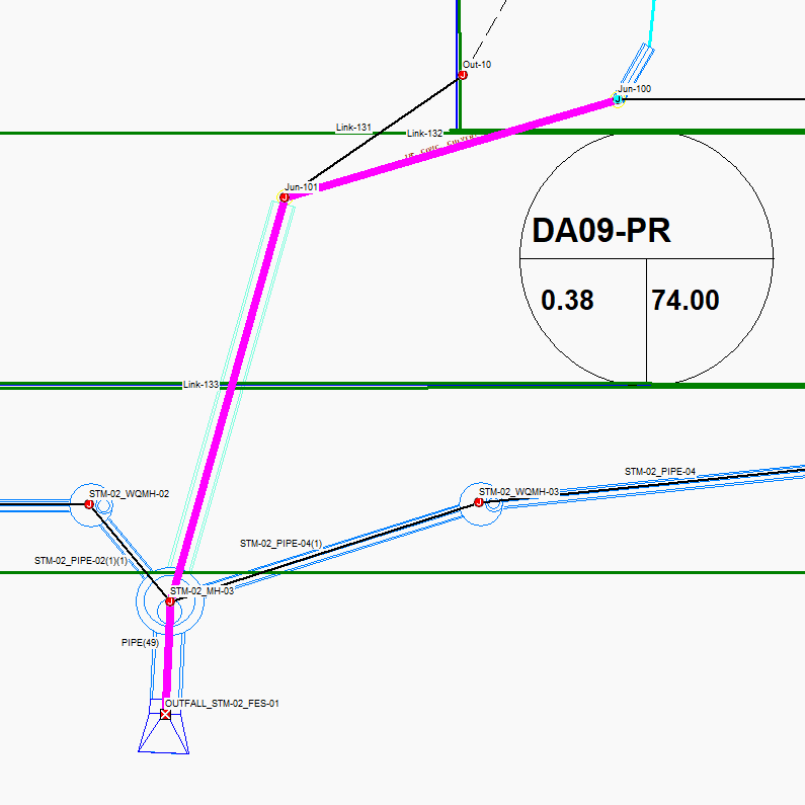


01_BeswickDrain_Central
Main Street Storm Sewer

12/14/2022 00:00:01

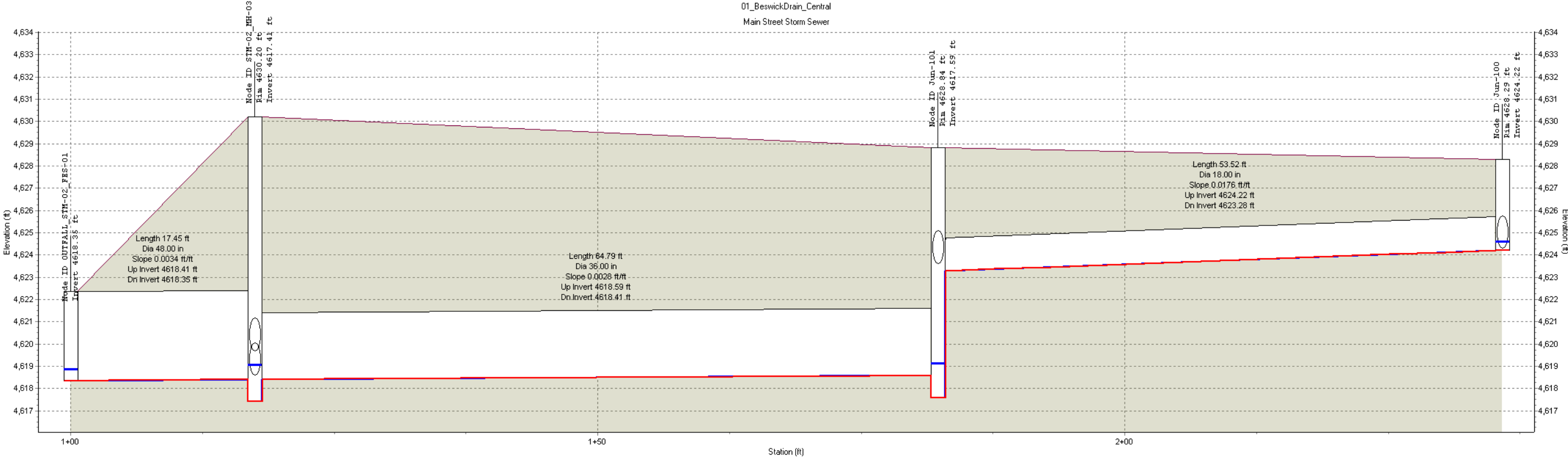


Node ID:	STM-02_MH-01		
	Rim (ft):	4626.28	4626.00
	Invert (ft):	4620.33	4620.70
	Min Pipe Cover (ft):	3.16	
Max HGL (ft):	4622.02	4621.80	4622.09
Link ID:	STM-02_PIPE-01S	STM-02_PIPE-01N	
Length (ft):	5.38	38.78	
Dia (in):	18.00	18.00	
Slope (ft/ft):	0.0149	0.0052	
Up Invert (ft):	4621.70	4621.70	
Dn Invert (ft):	4621.62	4621.50	
Max Q (cfs):	0.64	0.86	
Max Vel (ft/s):	2.98	2.66	
Max Depth (ft):	0.27	0.36	

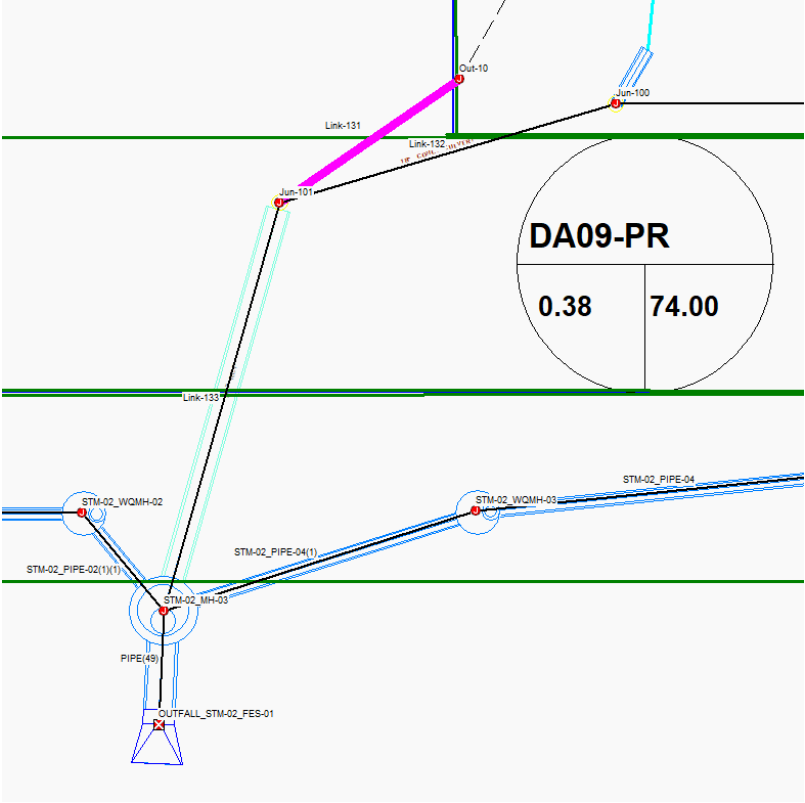


01_BeswickDrain_Central
Main Street Storm Sewer

12/14/2022 00:00:01

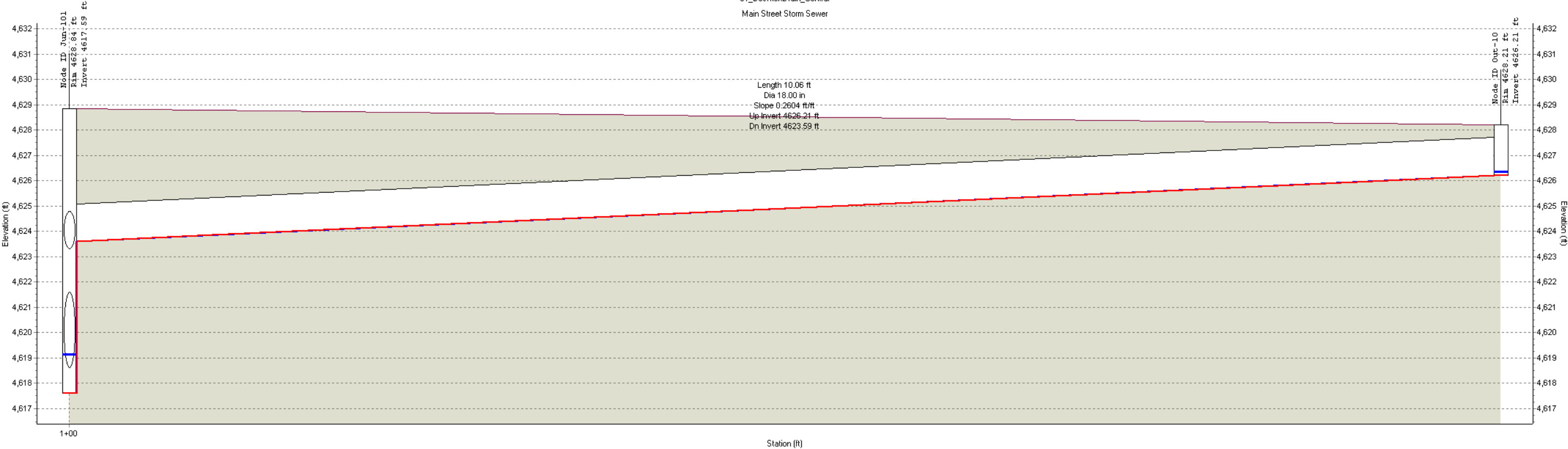


Node ID:	STM-02_MH-03		Jun-101	Jun-100
Rim (ft):	4630.20		4628.84	4628.29
Invert (ft):	4618.35	4617.41	4617.59	4624.22
Min Pipe Cover (ft):	7.79		3.75	2.53
Max HGL (ft):	4619.04		4619.10	4624.58
Link ID:	PIPE(49)	Link-133	Link-132	
Length (ft):	17.45	64.79	53.52	
Dia (in):	48.00	36.00	18.00	
Slope (ft/ft):	0.0034	0.0028	0.0176	
Up Invert (ft):	4618.41	4618.59	4624.22	
Dn Invert (ft):	4618.35	4618.41	4623.28	
Max Q (cfs):	2.98	1.81	1.62	
Max Vel (ft/s):	2.79	2.27	5.24	
Max Depth (ft):	0.56	0.54	0.35	

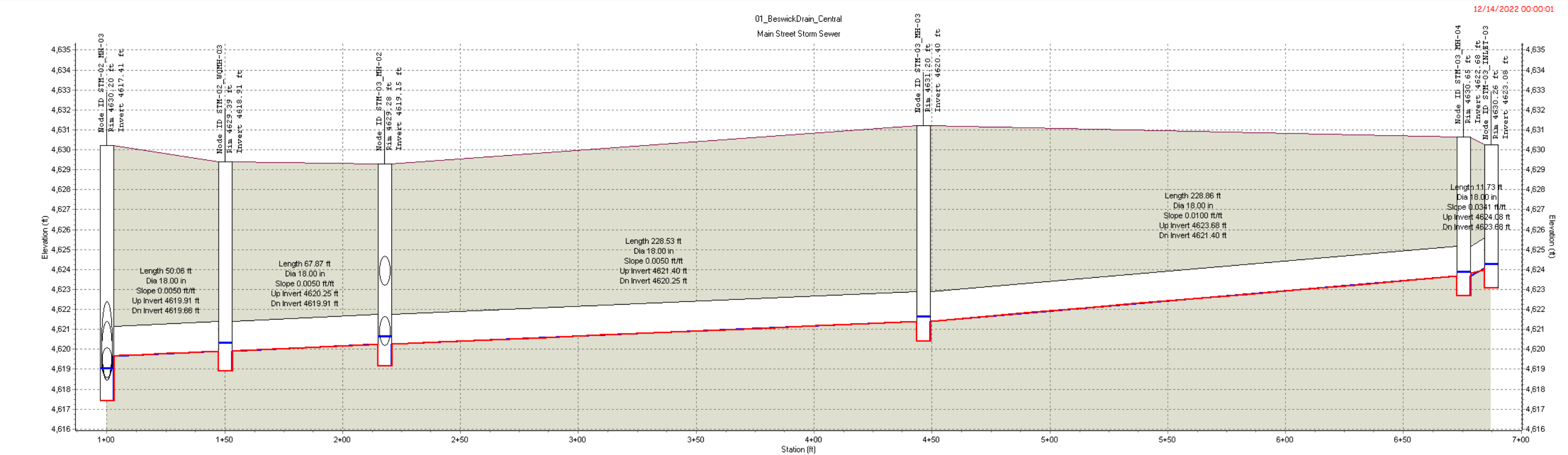
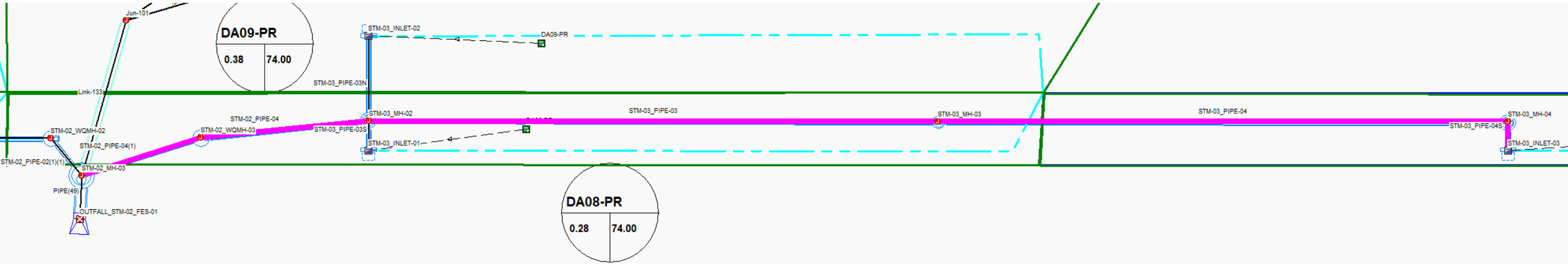


01_BeswickDrain_Central
Main Street Storm Sewer

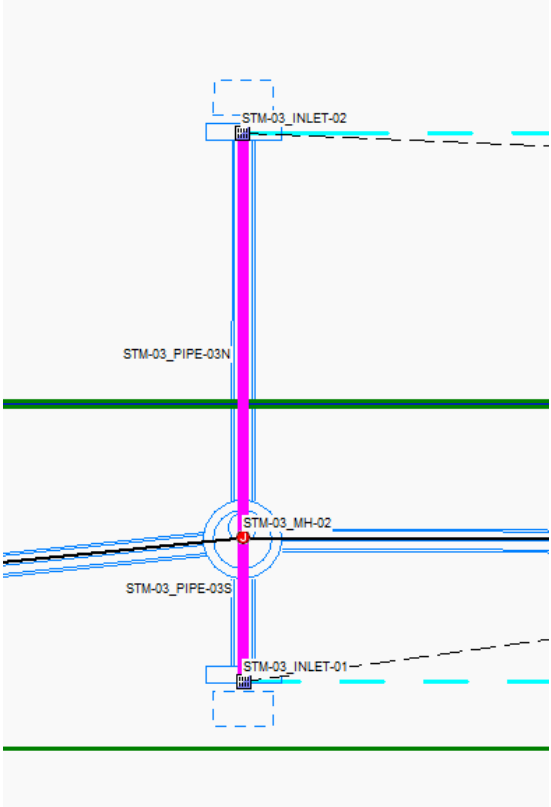
12/14/2022 00:00:01



Node ID:	Jun-101	Out-10
Rim (ft):	4628.84	4628.21
Invert (ft):	4617.59	4626.21
Min Pipe Cover (ft):	3.75	0.50
Max HGL (ft):	4619.10	4626.32
Link ID:	Link-131	
Length (ft):	10.06	
Dia (in):	18.00	
Slope (ft/ft):	0.2604	
Up Invert (ft):	4626.21	
Dn Invert (ft):	4623.59	
Max Q (cfs):	0.48	
Max Vel (ft/s):	8.73	
Max Depth (ft):	0.11	

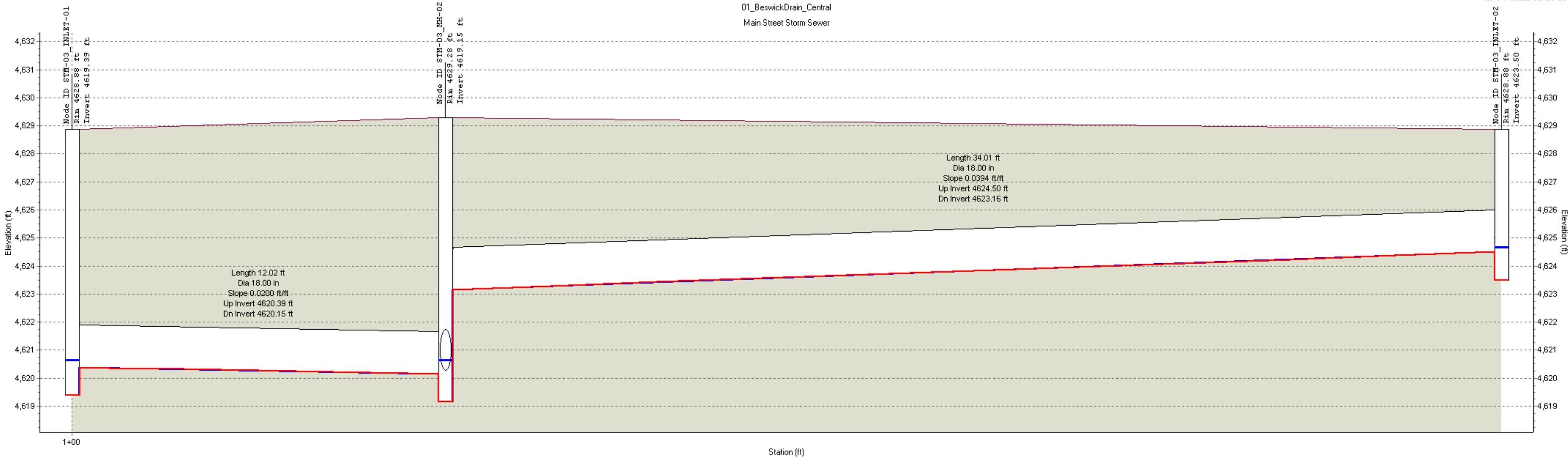


Node ID:	STM-02_MH-03	STM-02_WQMH-03	STM-03_MH-02	STM-03_MH-03	STM-03_MH-04
Rim (ft):	4630.20	4629.39	4629.28	4631.20	4630.65
Invert (ft):	4617.41	4618.91	4619.15	4620.40	4622.68
Min Pipe Cover (ft):	7.79	7.98	4.62	8.30	5.47
Max HGL (ft):	4619.04	4620.31	4620.64	4621.63	4623.88
Link ID:	STM-02_PIPE-04(1)	STM-02_PIPE-04	STM-03_PIPE-03	STM-03_PIPE-04	STM-03_PIPE-04S
Length (ft):	50.06	67.87	228.53	228.86	11.73
Dia (in):	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0050	0.0050	0.0050	0.0100	0.0341
Up Invert (ft):	4619.91	4620.25	4621.40	4623.68	4624.08
Dn Invert (ft):	4619.66	4619.91	4620.25	4621.40	4623.68
Max Q (cfs):	1.06	1.06	0.41	0.41	0.42
Max Vel (ft/s):	2.99	2.86	1.54	2.74	3.28
Max Depth (ft):	0.38	0.39	0.31	0.21	0.19

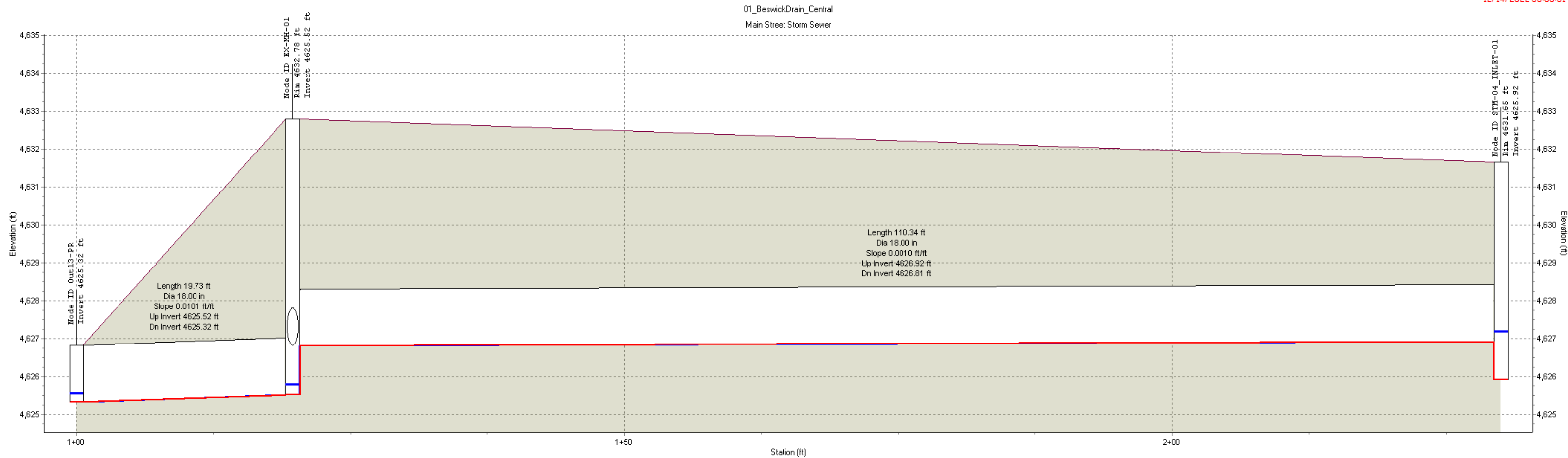
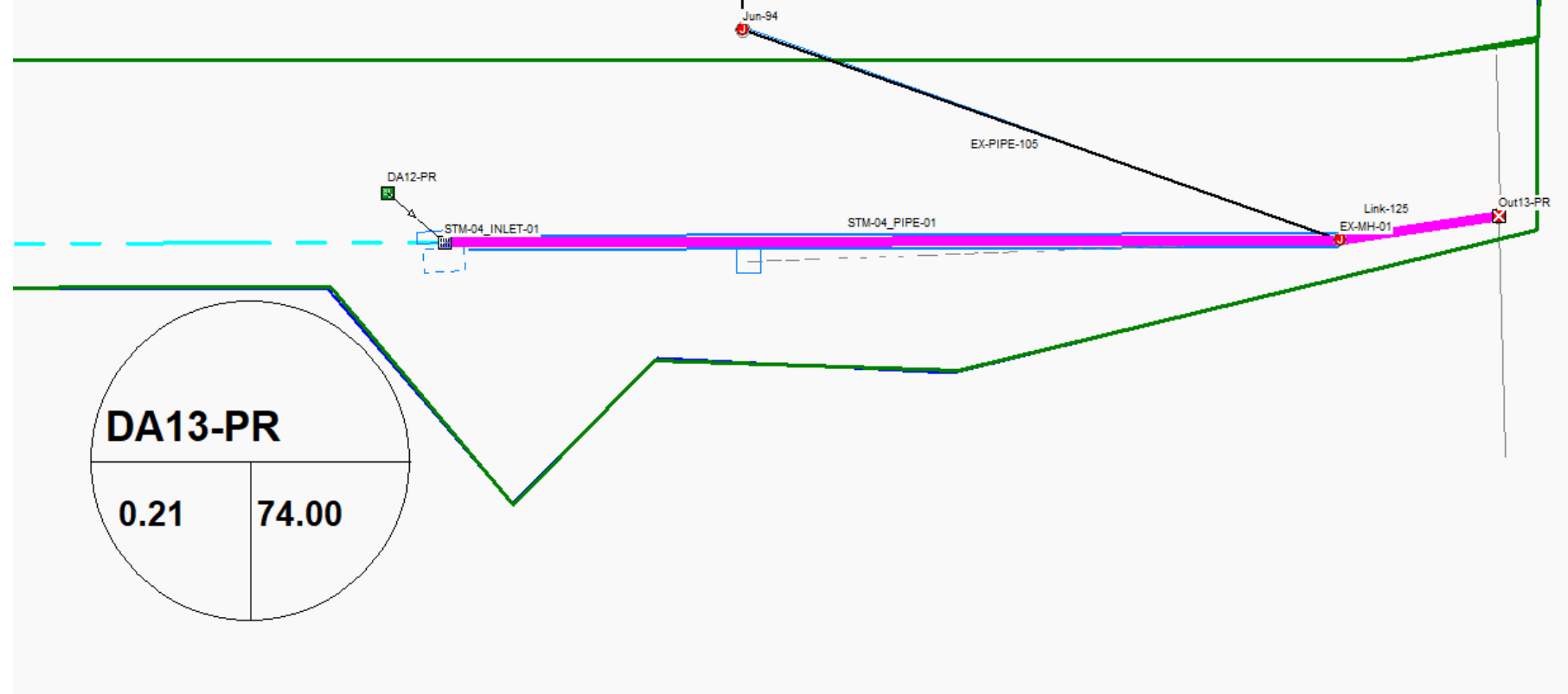


01_BeswickDrain_Central
Main Street Storm Sewer

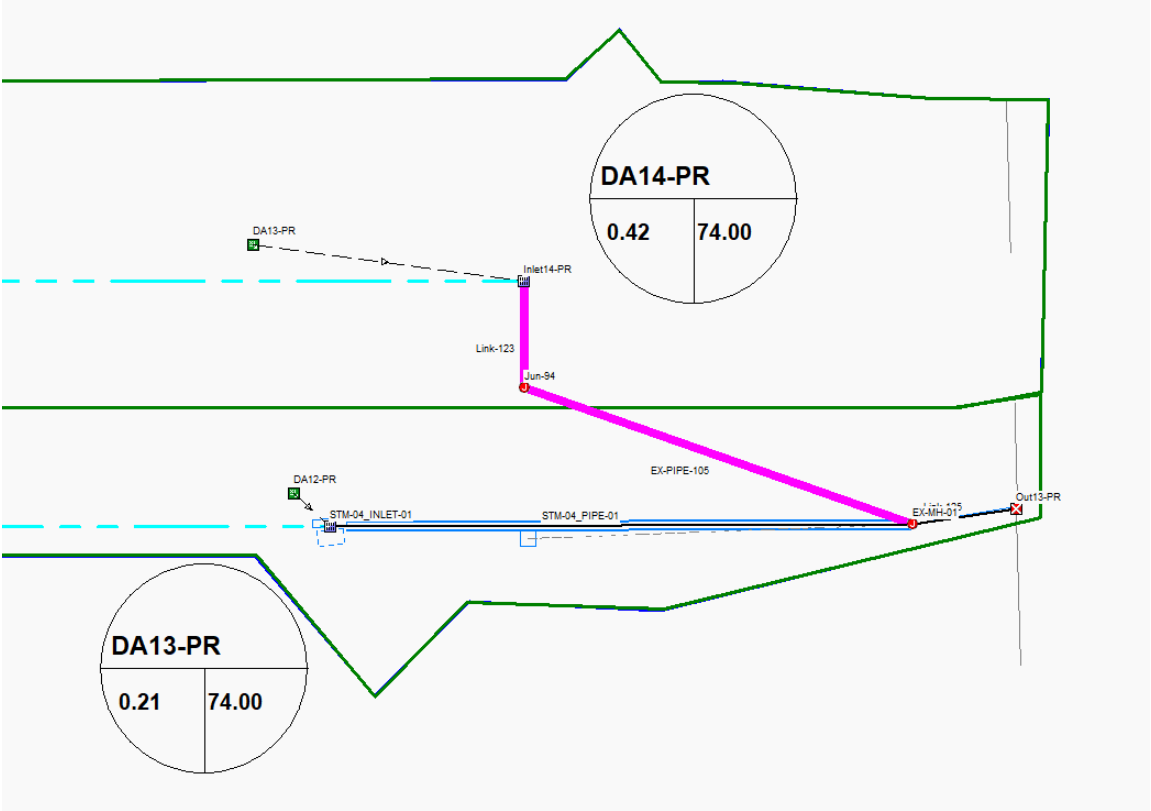
12/14/2022 00:00:01



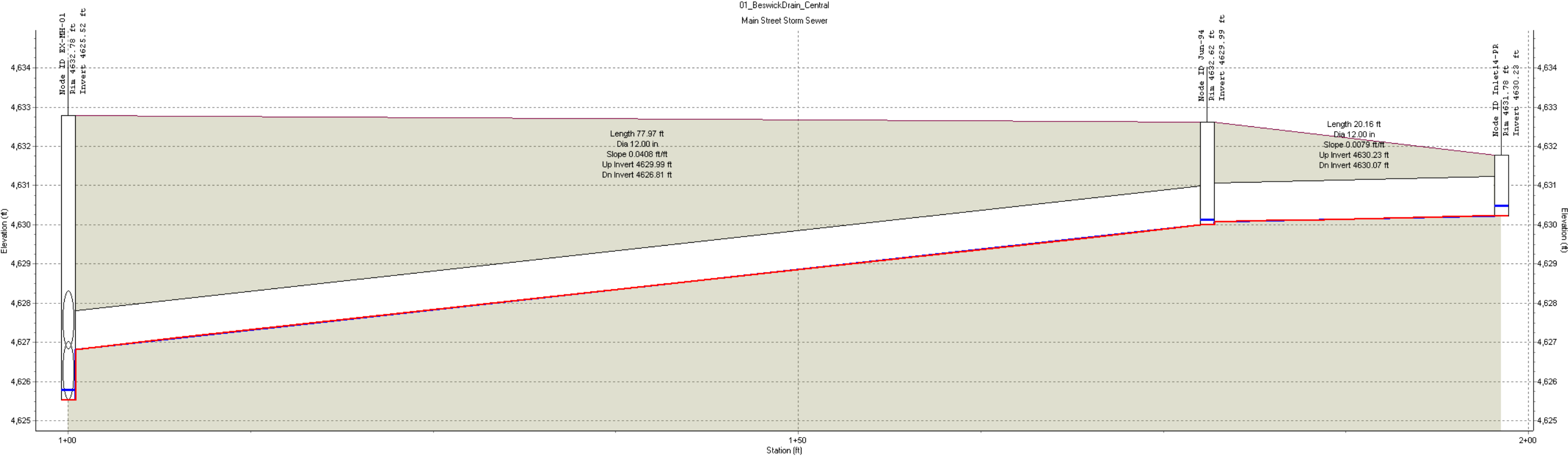
Node ID:	STM-03_MH-02		
Rim (ft):	4628.88	4629.28	4628.88
Invert (ft):	4619.39	4619.15	4623.50
Min Pipe Cover (ft):	4.62		
Max HGL (ft):	4620.64	4620.64	4624.65
Link ID:	STM-03_PIPE-03S		STM-03_PIPE-03N
Length (ft):	12.02		34.01
Dia (in):	18.00		18.00
Slope (ft/ft):	0.0200		0.0394
Up Invert (ft):	4620.39		4624.50
Dn Invert (ft):	4620.15		4623.16
Max Q (cfs):	0.28		0.39
Max Vel (ft/s):	1.02		4.48
Max Depth (ft):	0.37		0.14



Node ID:	Out13-PR	EX-MH-01	
Rim (ft):		4632.78	4631.65
Invert (ft):	4625.32	4625.52	4625.92
Min Pipe Cover (ft):		4.47	
Max HGL (ft):	4625.55	4625.78	4627.18
Link ID:	Link-125	STM-04_PIPE-01	
Length (ft):	19.73	110.34	
Dia (in):	18.00	18.00	
Slope (ft/ft):	0.0101	0.0010	
Up Invert (ft):	4625.52	4626.92	
Dn Invert (ft):	4625.32	4626.81	
Max Q (cfs):	0.48	0.20	
Max Vel (ft/s):	2.55	1.30	
Max Depth (ft):	0.25	0.21	



12/14/2022 00:00:01



Node ID:	EX-MH-01		Jun-94	Inlet14-PR
Rim (ft):	4632.78		4632.62	4631.78
Invert (ft):	4625.52		4629.99	4630.23
Min Pipe Cover (ft):	4.47		1.55	
Max HGL (ft):	4625.78		4630.12	4630.48
Link ID:	EX-PIPE-105		Link-123	
Length (ft):	77.97		20.16	
Dia (in):	12.00		12.00	
Slope (ft/ft):	0.0408		0.0079	
Up Invert (ft):	4629.99		4630.23	
Dn Invert (ft):	4626.81		4630.07	
Max Q (cfs):	0.29		0.29	
Max Vel (ft/s):	4.65		2.05	
Max Depth (ft):	0.13		0.23	

APPENDIX C.4

Proposed Conditions 100-Year Autodesk Storm and Sanitary Analysis Hydrologic and Hydraulic Model

Subbasin Hydrology

Subbasin : DA01-PR

Input Data

Area (ac)	1.53
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6084
Equivalent Width (ft)	1976
Impervious Area	
Manning's Roughness	0.012
Pervious Area	
Manning's Roughness	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

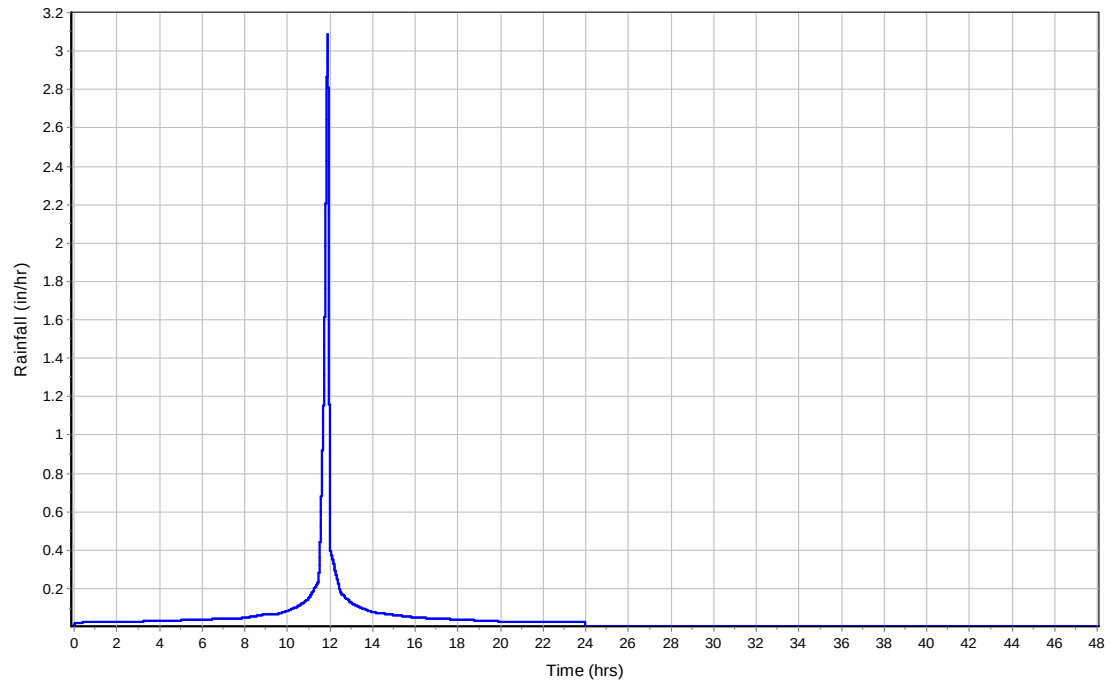
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.52	C	86
Composite Area & Weighted CN	1.52		86

Subbasin Runoff Results

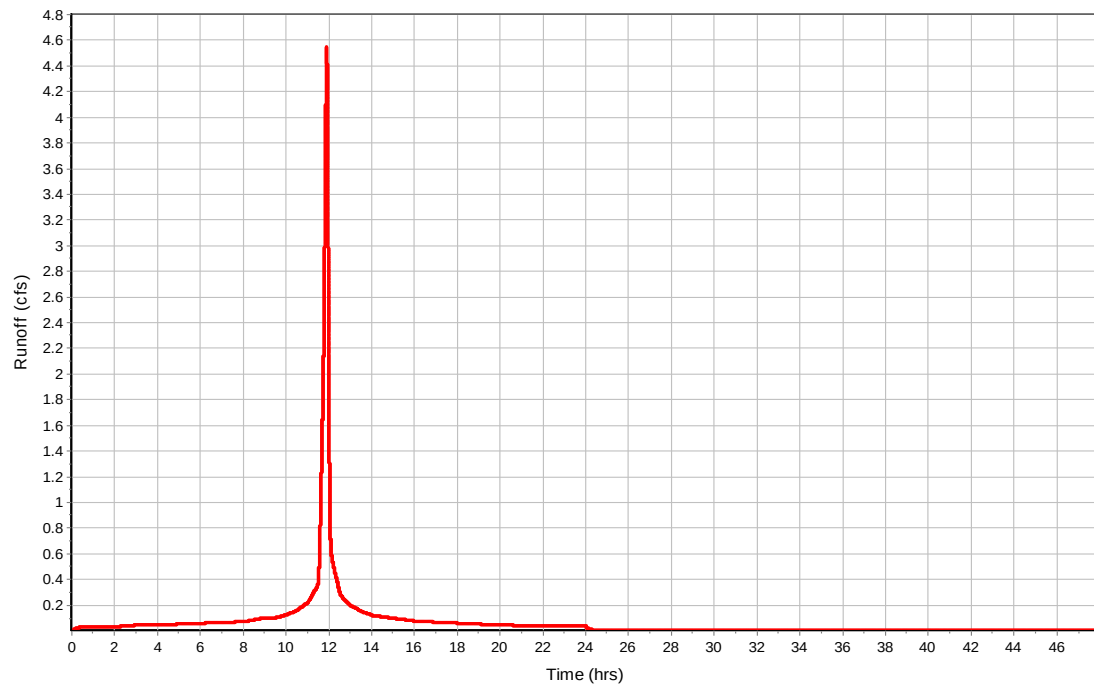
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	2
Peak Runoff (cfs)	4.54
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:06:47

Subbasin : DA01-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA02-PR**Input Data**

Area (ac)	1.82
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.5951
Equivalent Width (ft)	2349
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

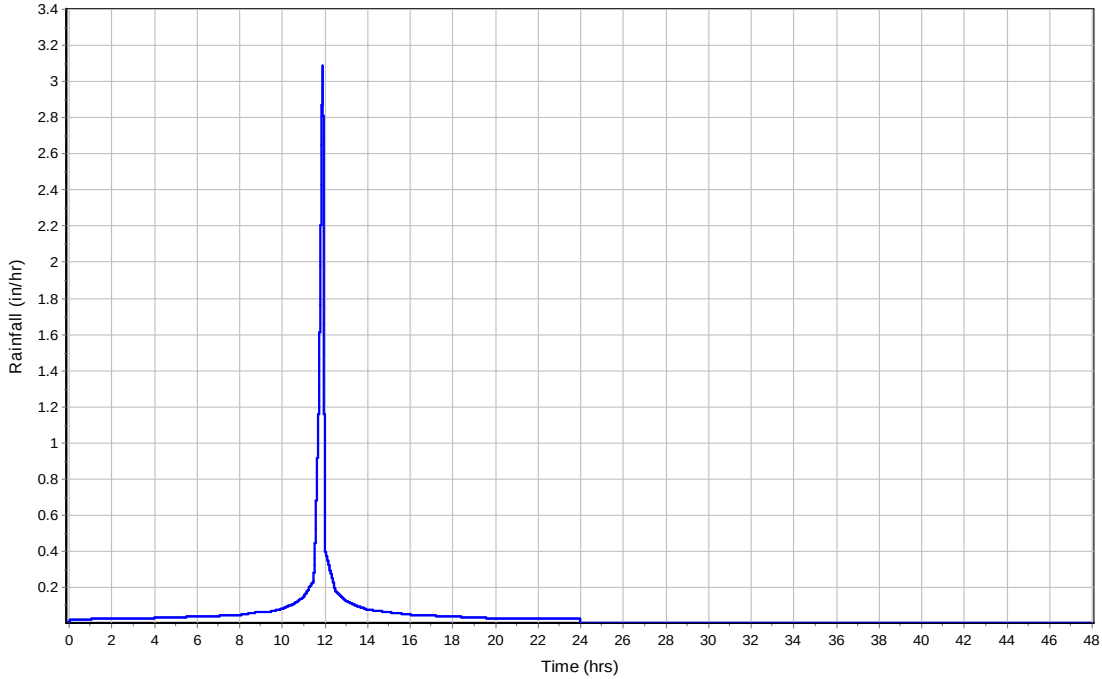
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	1.3	C	86
Composite Area & Weighted CN	1.3		86

Subbasin Runoff Results

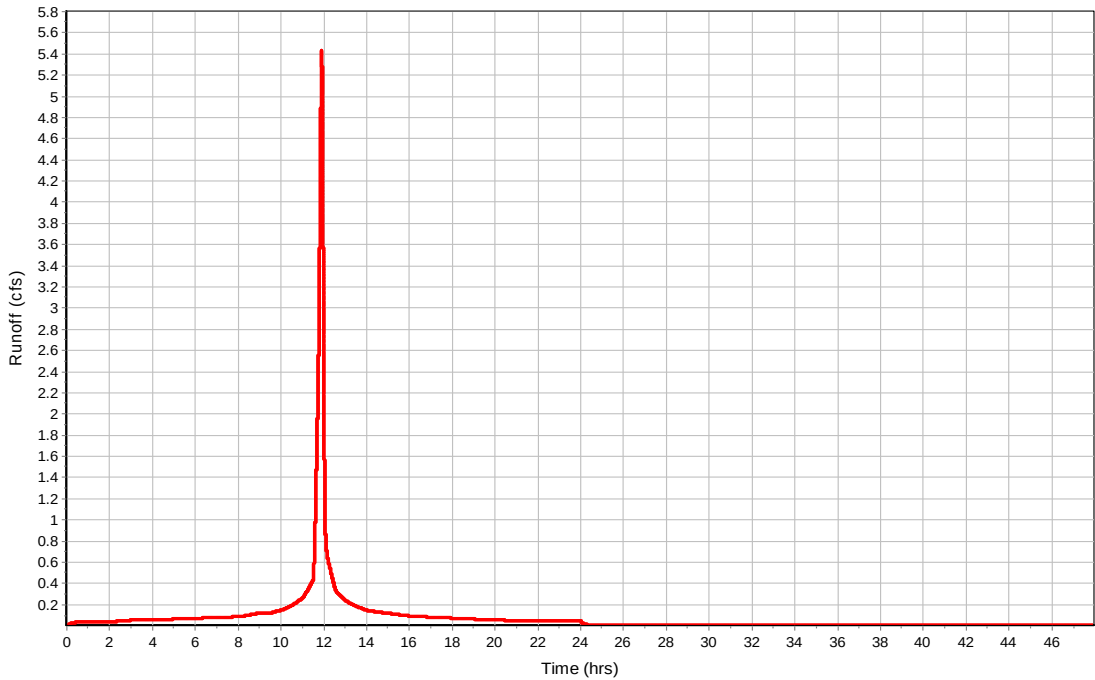
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	2
Peak Runoff (cfs)	5.43
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:06:51

Subbasin : DA02-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA03-PR

Input Data

Area (ac)	25.58
Impervious Area (%)	30
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6464
Equivalent Width (ft)	2800
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

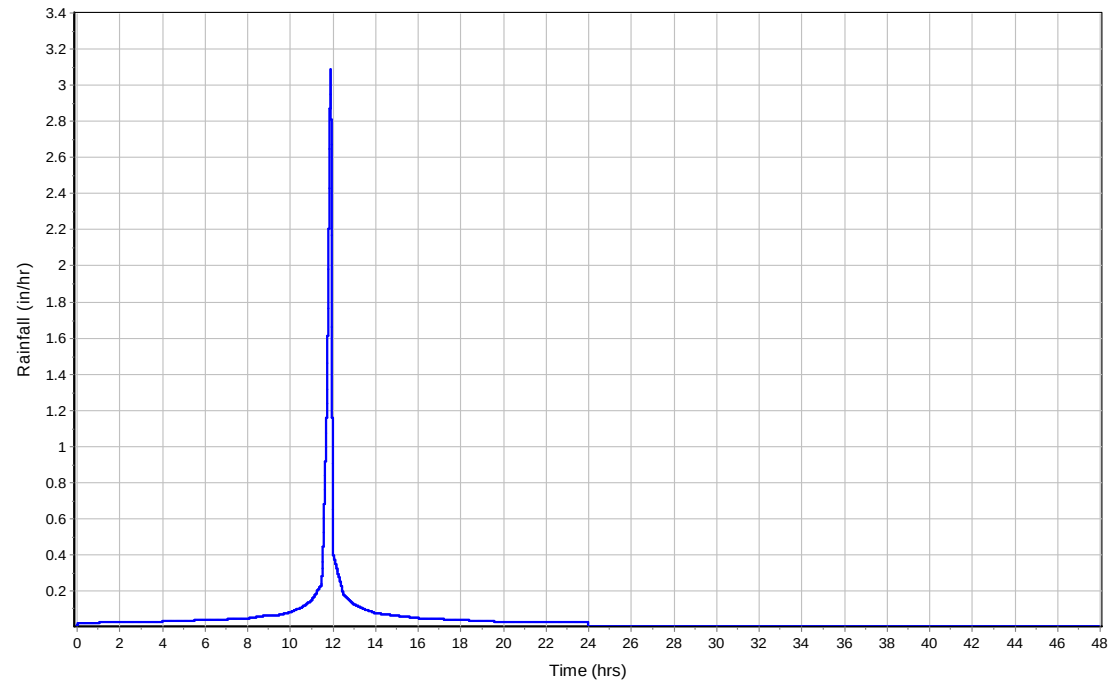
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	25.58	C	86
Composite Area & Weighted CN	25.58		86

Subbasin Runoff Results

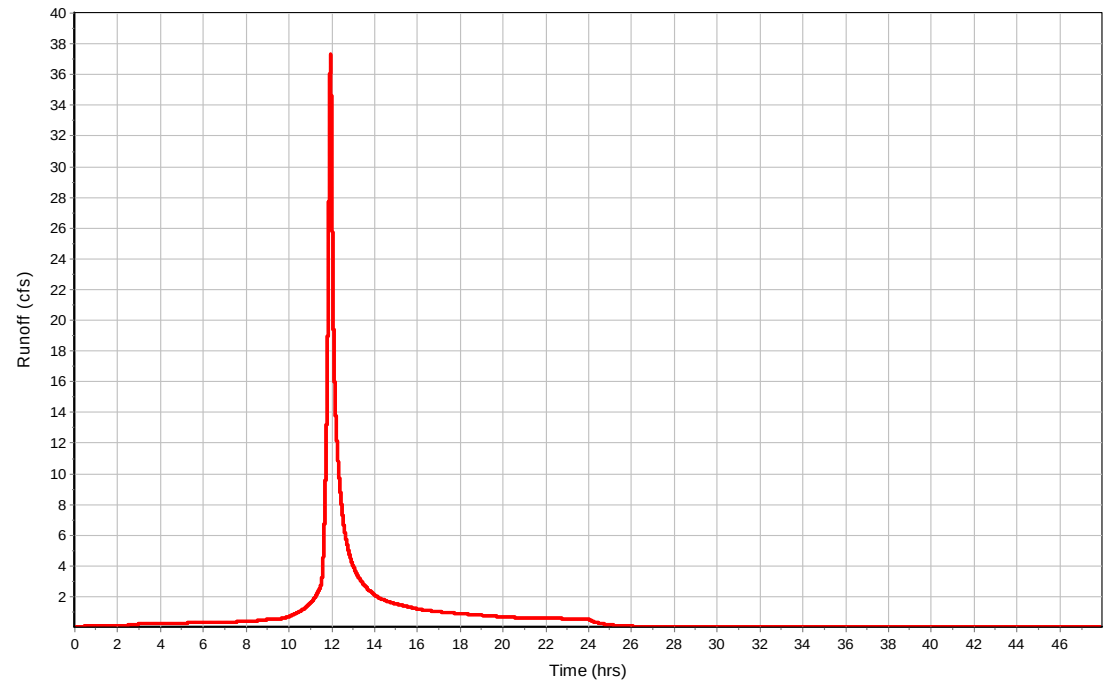
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.641
Total Runoff (in)	1.33
Peak Runoff (cfs)	37.33
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:55:53

Subbasin : DA03-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA04-PR**Input Data**

Area (ac) 8.76
Impervious Area (%) 7
Weighted Curve Number 79.76
Conductivity (in/hr) 0.15
Drying Time (days) 7
Average Slope (%) 0.6075
Equivalent Width (ft) 2249
Impervious Area
 Manning's Roughness 0.015
Pervious Area
 Manning's Roughness 0.05
Curb & Gutter Length (ft) 0
Rain Gage ID GrandValley

Composite Curve Number

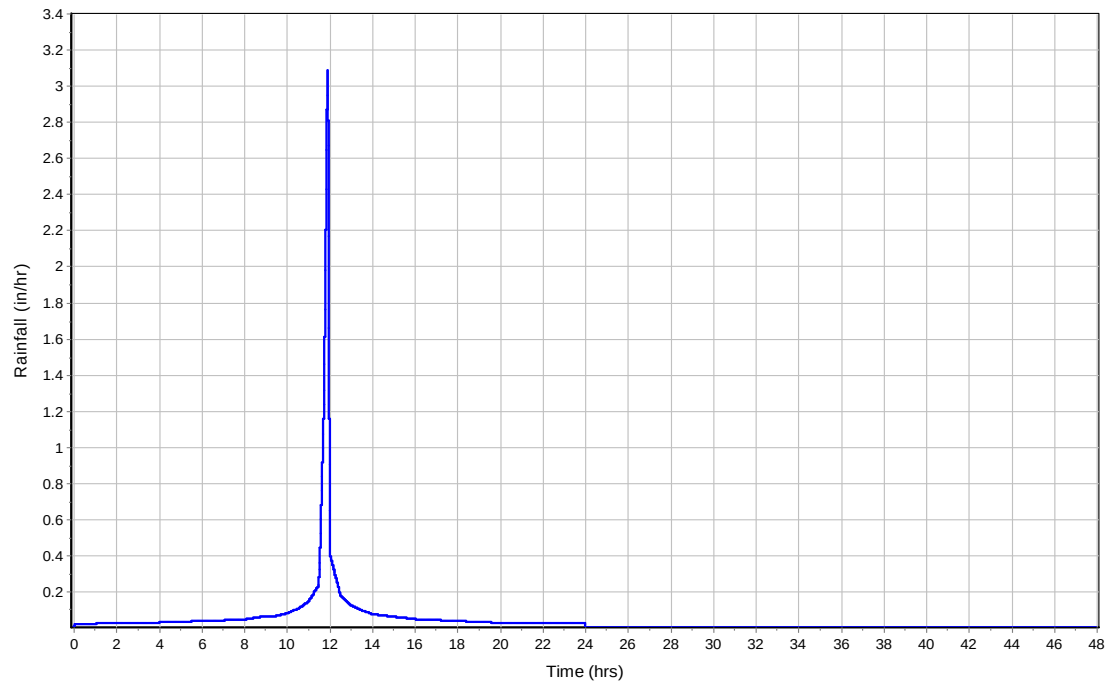
32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
> 75% grass cover, Good	4.55	C	74
< 50% grass cover, Poor	4.2	C	86
Composite Area & Weighted CN	8.75		79.76

Subbasin Runoff Results

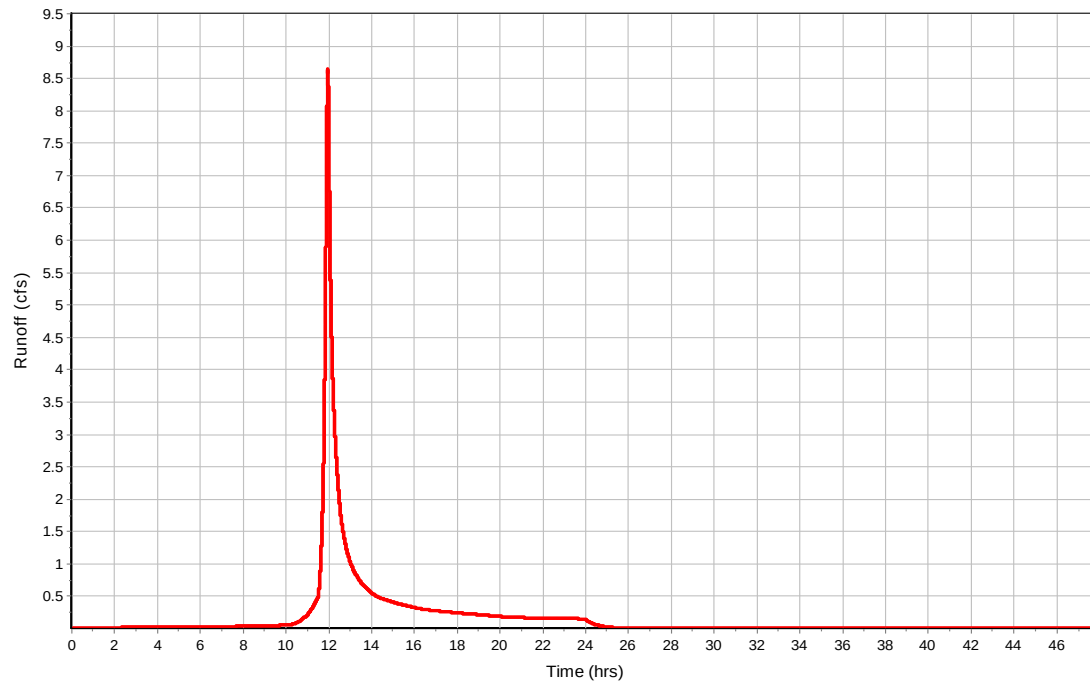
Total Rainfall (in) 2.01
Total Runon (in) 0
Total Evaporation (in) 0
Total Infiltration (in) 1.055
Total Runoff (in) 0.91
Peak Runoff (cfs) 8.64
Weighted Curve Number 79.76
Time of Concentration (days hh:mm:ss) 0 00:40:28

Subbasin : DA04-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA05-PR

Input Data

Area (ac)	58.18
Impervious Area (%)	22
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.5154
Equivalent Width (ft)	4606
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

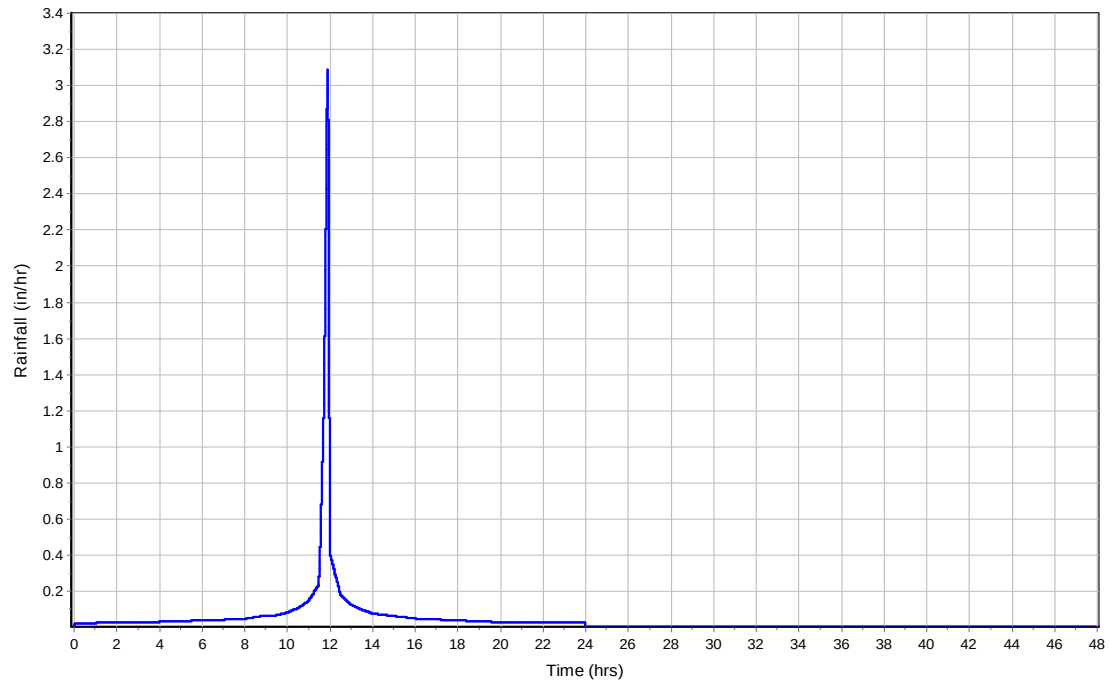
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	58.16	C	86
Composite Area & Weighted CN	58.16		86

Subbasin Runoff Results

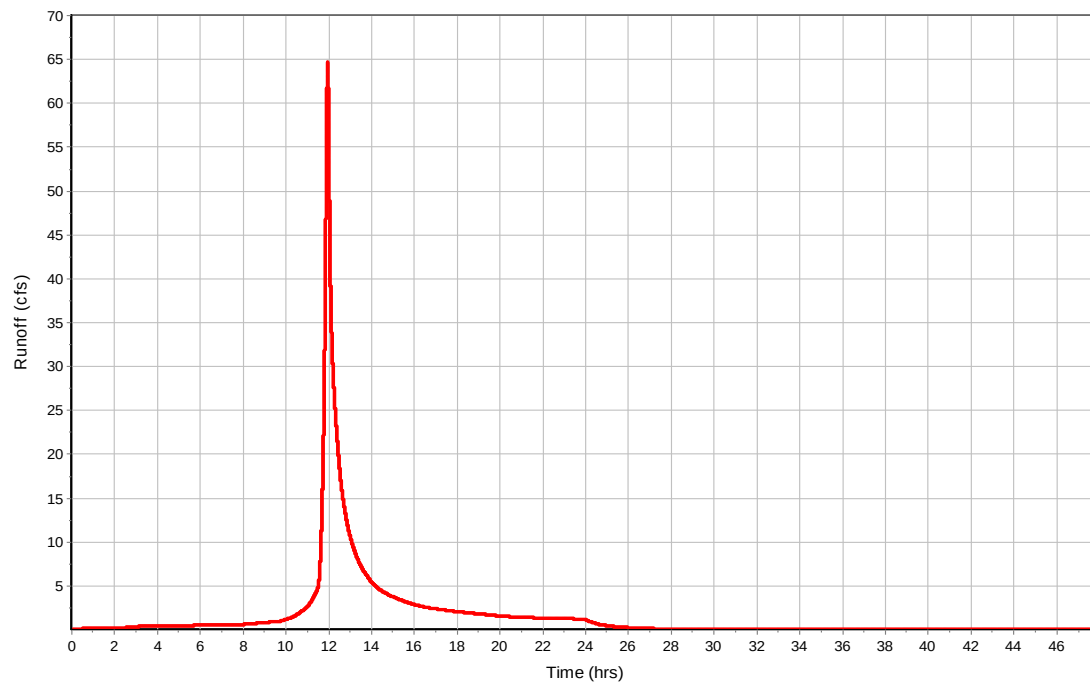
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.719
Total Runoff (in)	1.25
Peak Runoff (cfs)	64.61
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 01:17:32

Subbasin : DA05-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA06-PR

Input Data

Area (ac)	0.85
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.652
Equivalent Width (ft)	1092
Impervious Area	
Manning's Roughness	0.012
Pervious Area	
Manning's Roughness	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

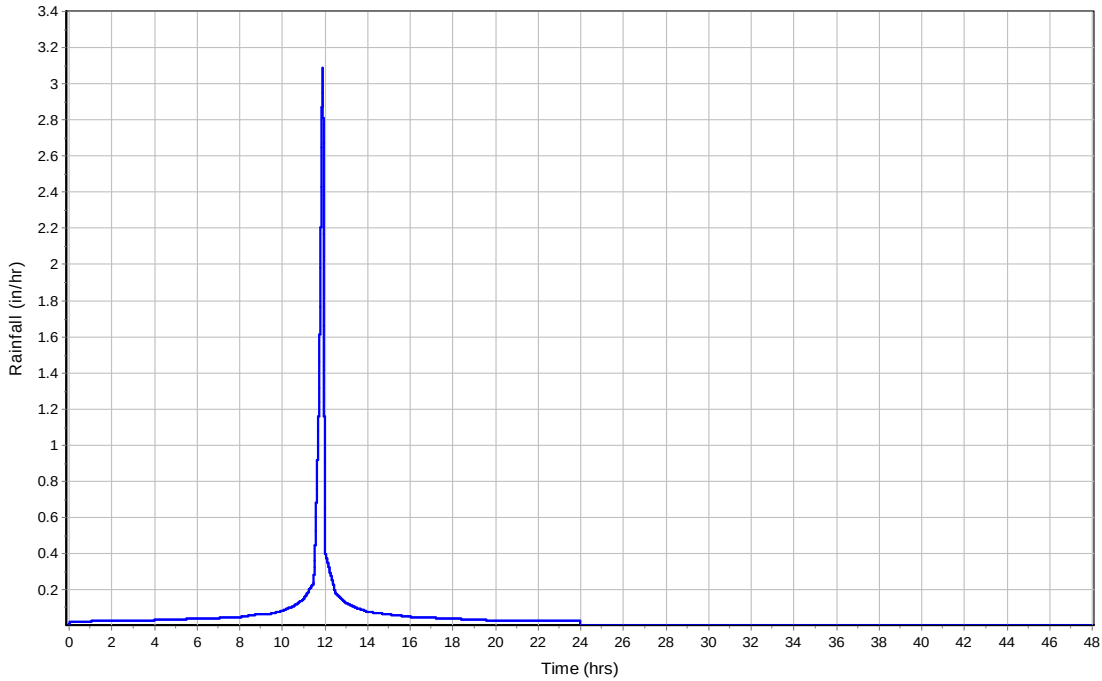
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.85	C	86
Composite Area & Weighted CN	0.85		86

Subbasin Runoff Results

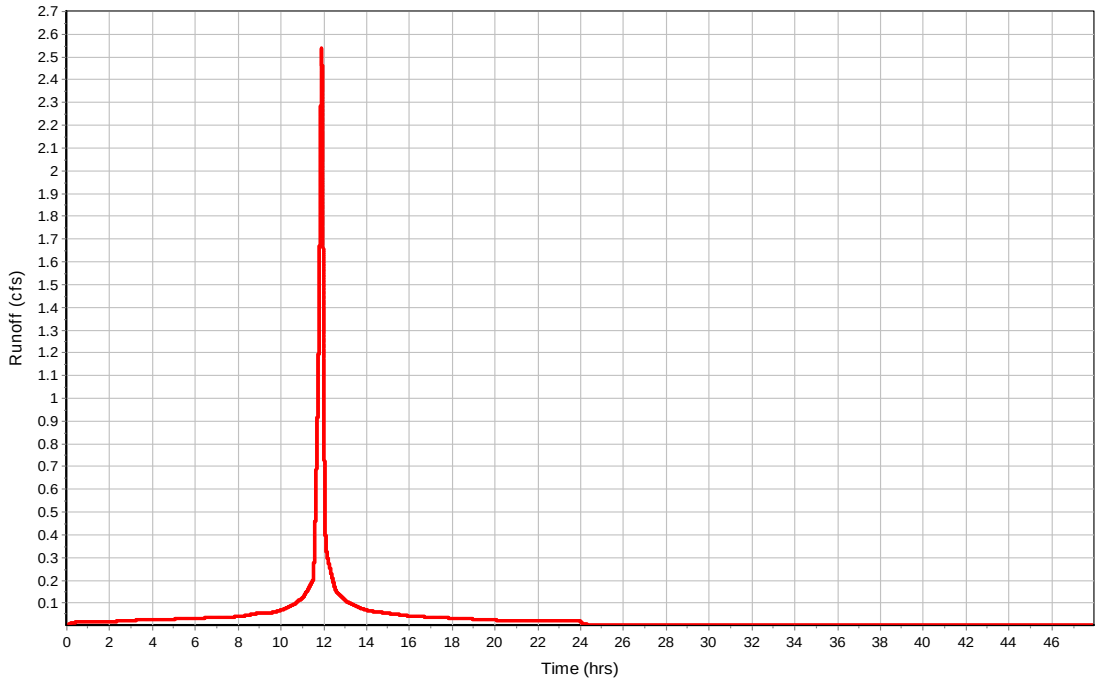
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	2
Peak Runoff (cfs)	2.54
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:06:41

Subbasin : DA06-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA07-PR**Input Data**

Area (ac)	0.63
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6686
Equivalent Width (ft)	834
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

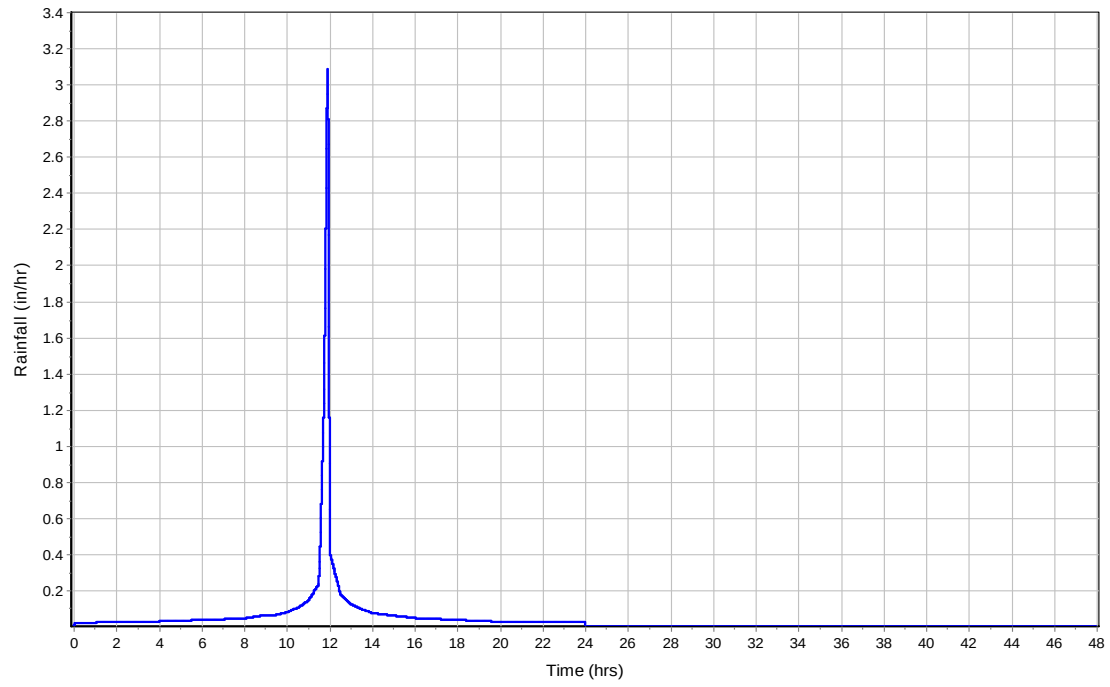
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.63	C	86
Composite Area & Weighted CN	0.63		86

Subbasin Runoff Results

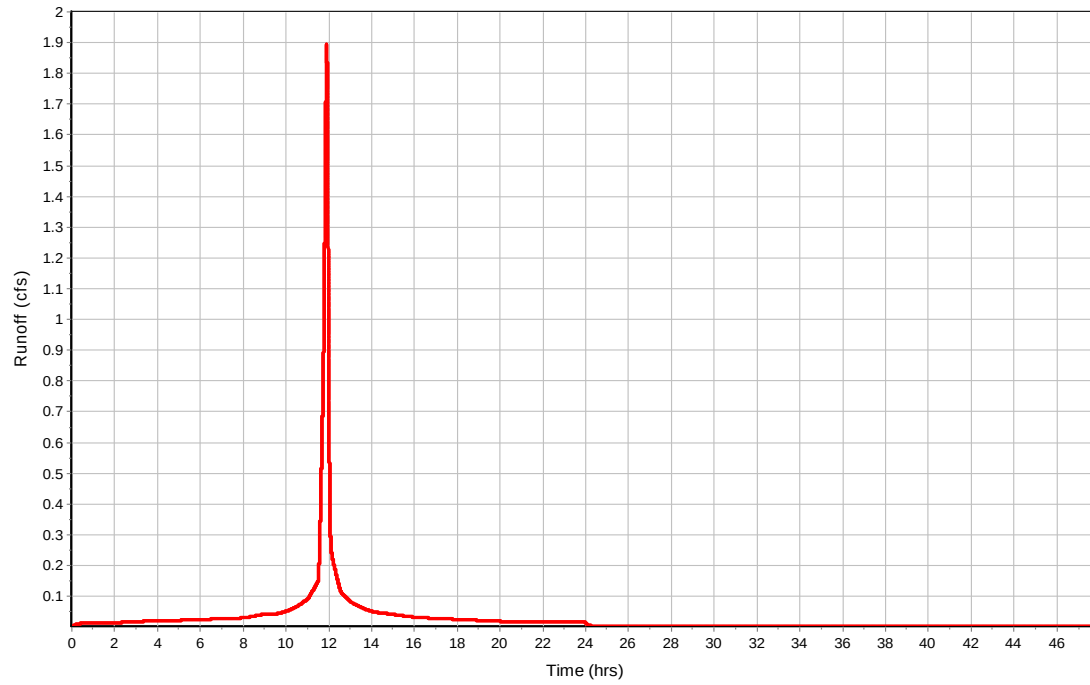
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	2
Peak Runoff (cfs)	1.89
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:06:32

Subbasin : DA07-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA08-PR

Input Data

Area (ac)	0.27
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.9142
Equivalent Width (ft)	407
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

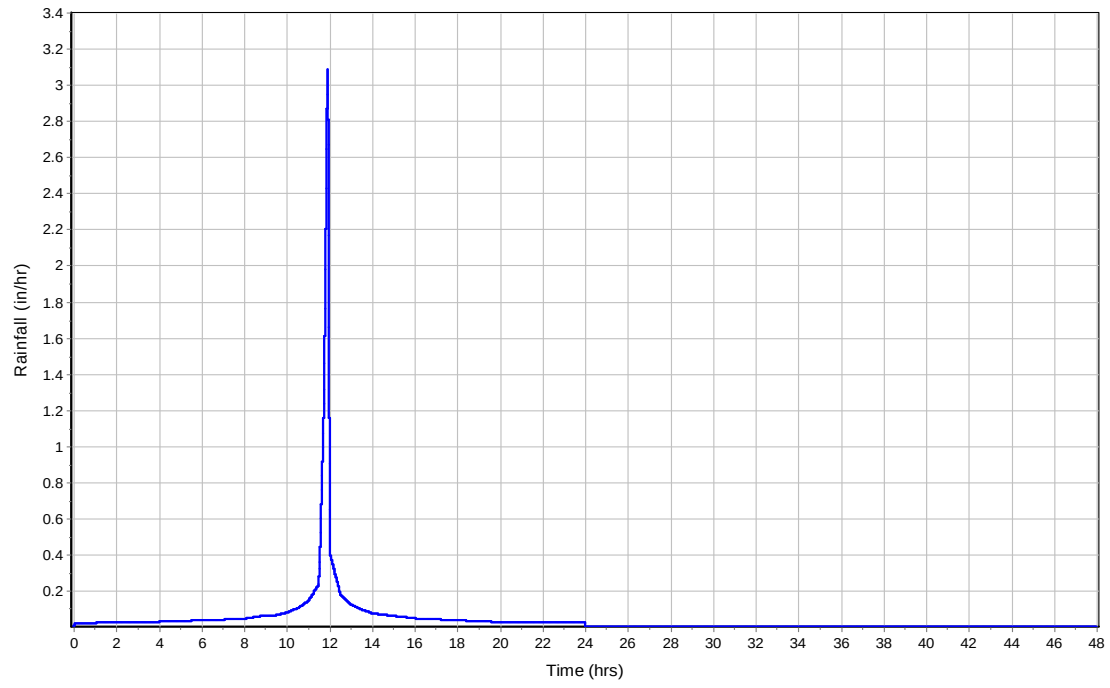
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.27	C	86
Composite Area & Weighted CN	0.27		86

Subbasin Runoff Results

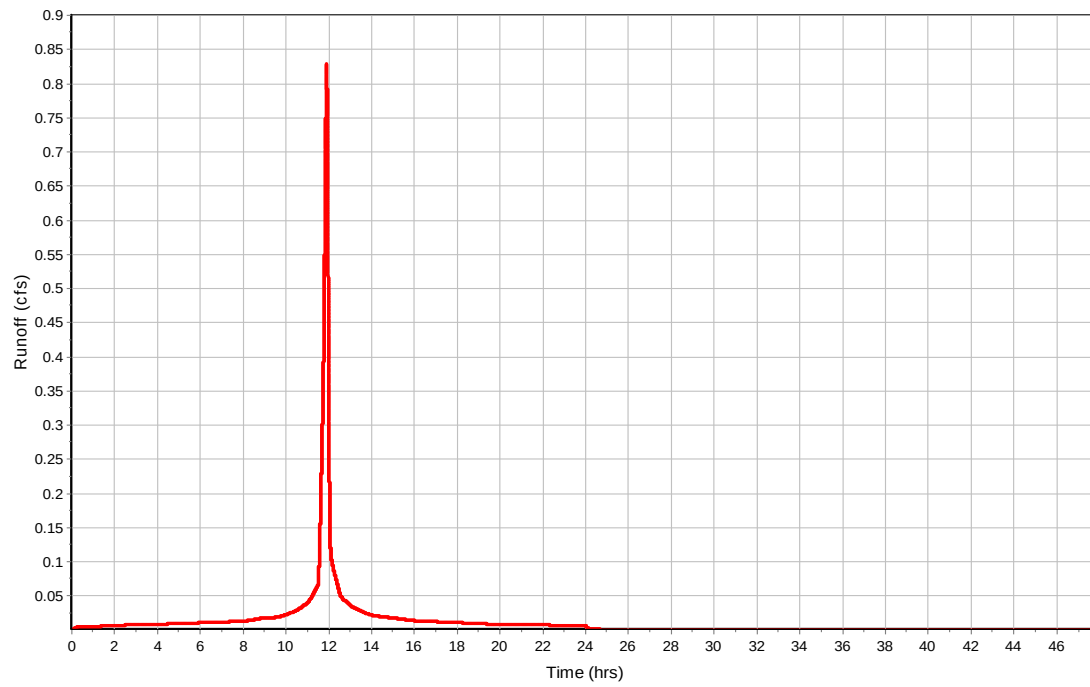
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	2
Peak Runoff (cfs)	0.83
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:05:32

Subbasin : DA08-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA09-PR**Input Data**

Area (ac) 0.38
Impervious Area (%) 100
Weighted Curve Number 86
Conductivity (in/hr) 0.15
Drying Time (days) 7
Average Slope (%) 0.8697
Equivalent Width (ft) 550
Impervious Area
 Manning's Roughness 0.012
Pervious Area
 Manning's Roughness 0.012
Curb & Gutter Length (ft) 0
Rain Gage ID GrandValley

Composite Curve Number

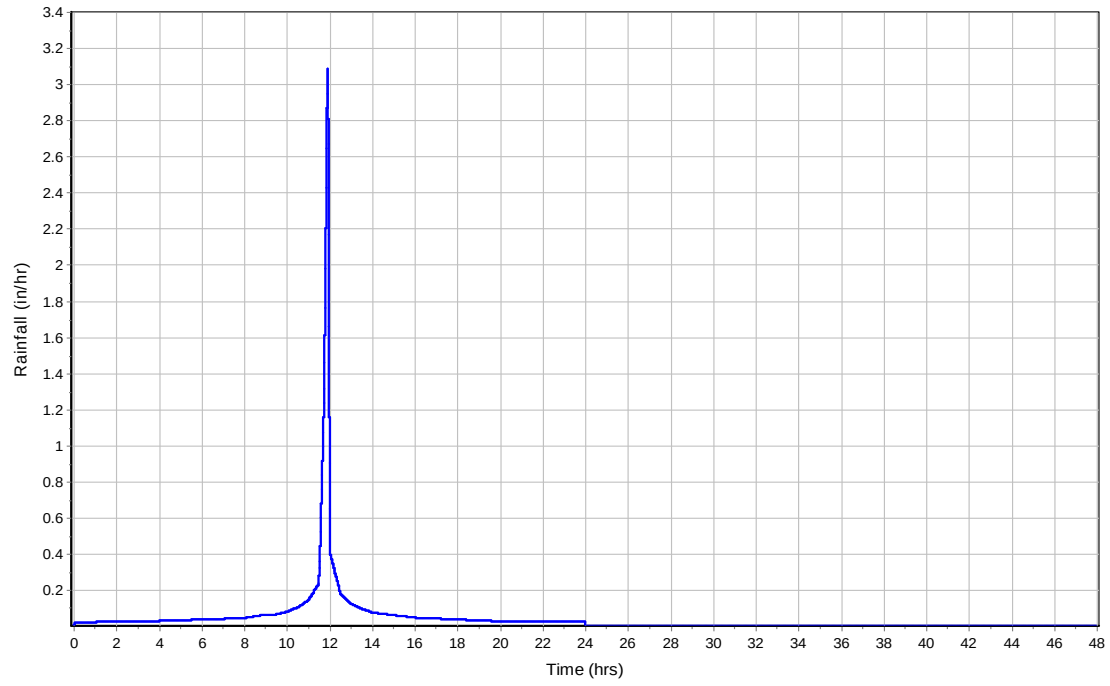
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	0.38	C	86
Composite Area & Weighted CN	0.38		86

Subbasin Runoff Results

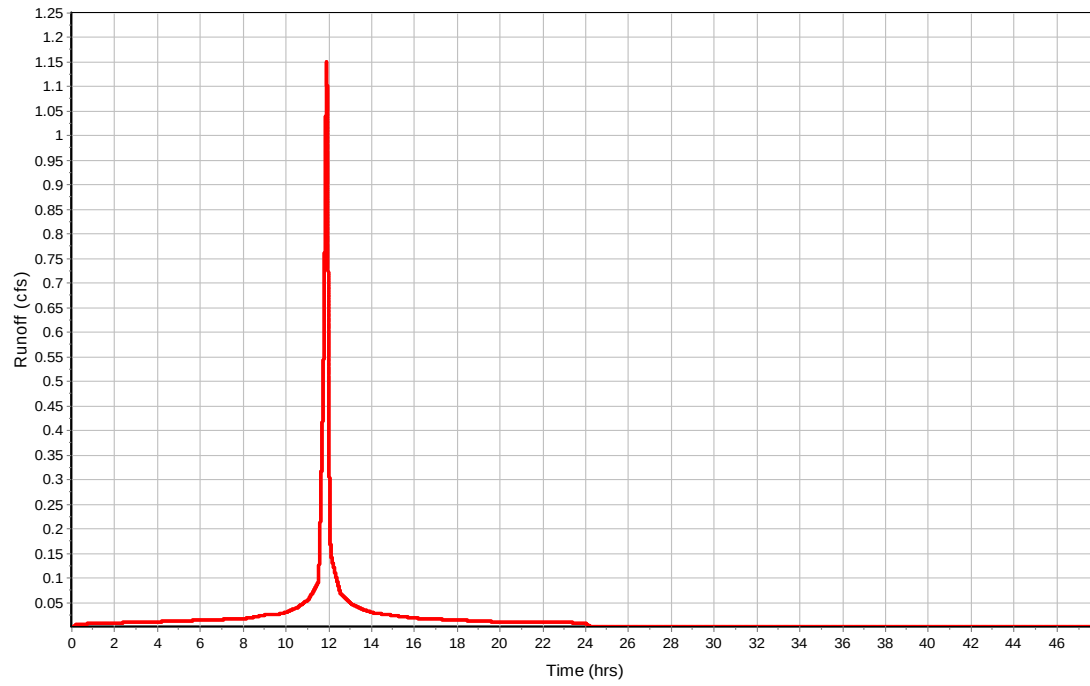
Total Rainfall (in) 2.01
Total Runon (in) 0
Total Evaporation (in) 0
Total Infiltration (in) 0
Total Runoff (in) 2
Peak Runoff (cfs) 1.15
Weighted Curve Number 86
Time of Concentration (days hh:mm:ss) 0 00:05:43

Subbasin : DA09-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA10-PR**Input Data**

Area (ac)	4.63
Impervious Area (%)	6
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.7178
Equivalent Width (ft)	1307
Impervious Area	
<i>Manning's Roughness</i>	0.015
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

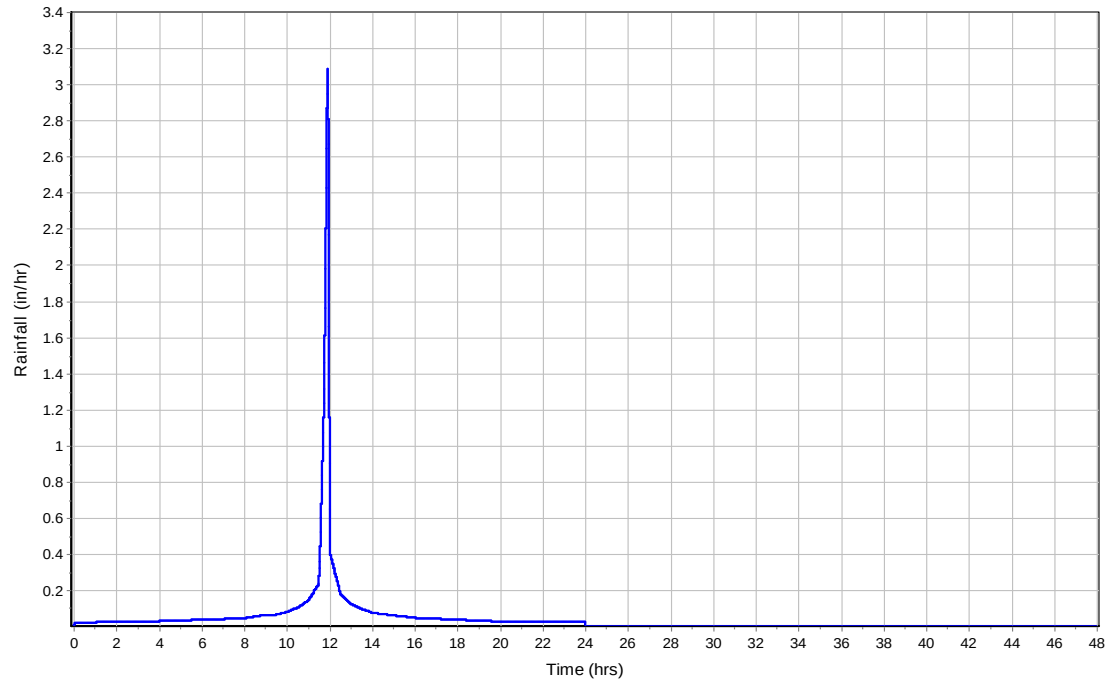
32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
< 50% grass cover, Poor	4.63	C	86
Composite Area & Weighted CN	4.63		86

Subbasin Runoff Results

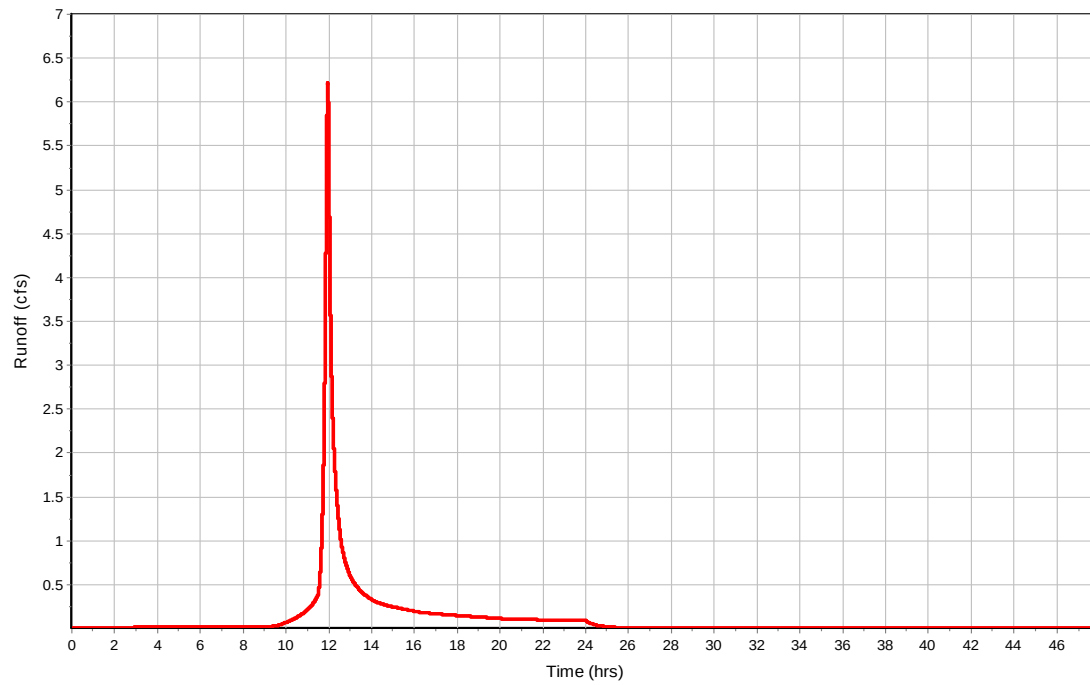
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.855
Total Runoff (in)	1.11
Peak Runoff (cfs)	6.22
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:36:35

Subbasin : DA10-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA11-PR**Input Data**

Area (ac)	0.41
Impervious Area (%)	100
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.582
Equivalent Width (ft)	641
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.012
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

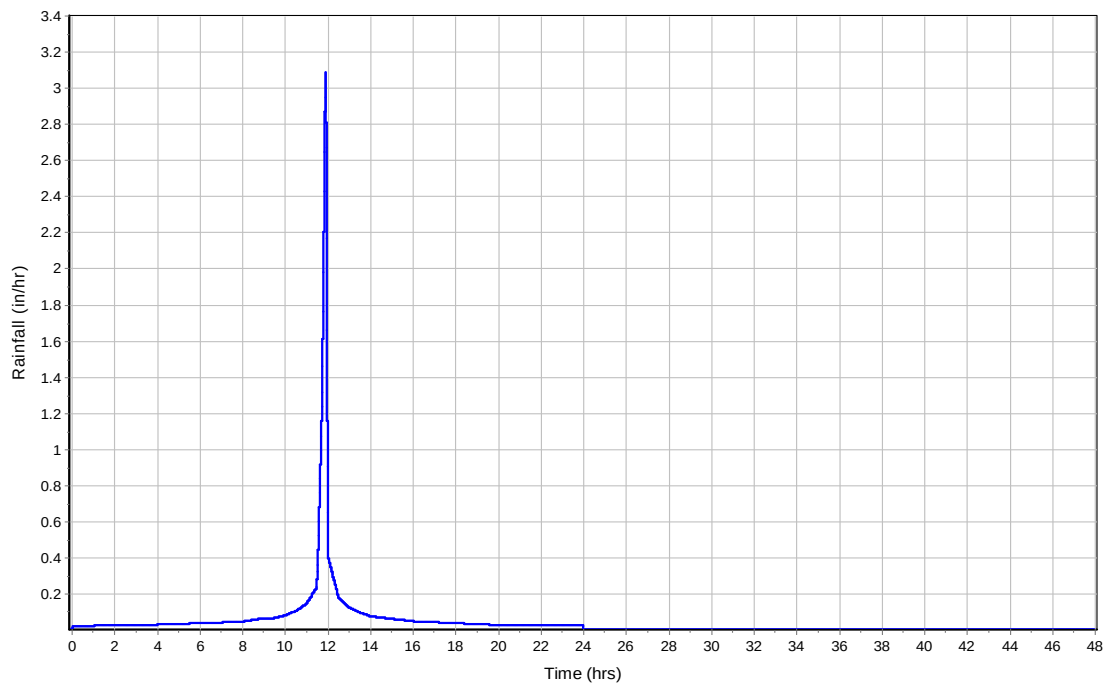
	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
< 50% grass cover, Poor		0.41	C	86
Composite Area & Weighted CN		0.41		86

Subbasin Runoff Results

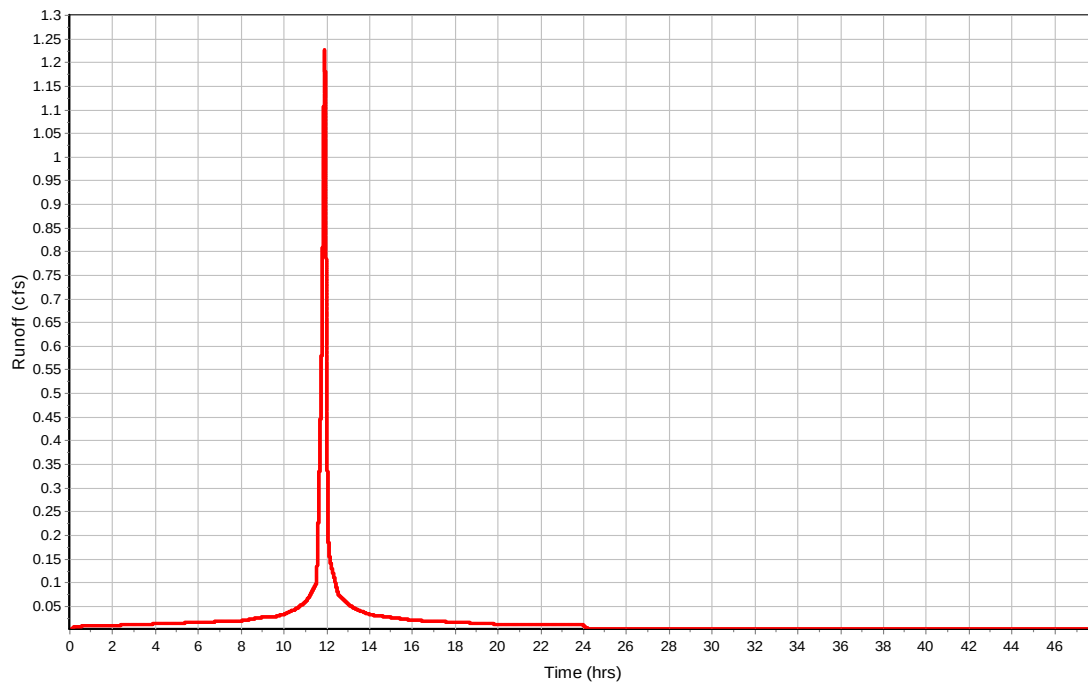
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0
Total Runoff (in)	2
Peak Runoff (cfs)	1.23
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:06:08

Subbasin : DA11-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA12-PR

Input Data

Area (ac)	0.21
Impervious Area (%)	90
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.6668
Equivalent Width (ft)	306
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.2
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

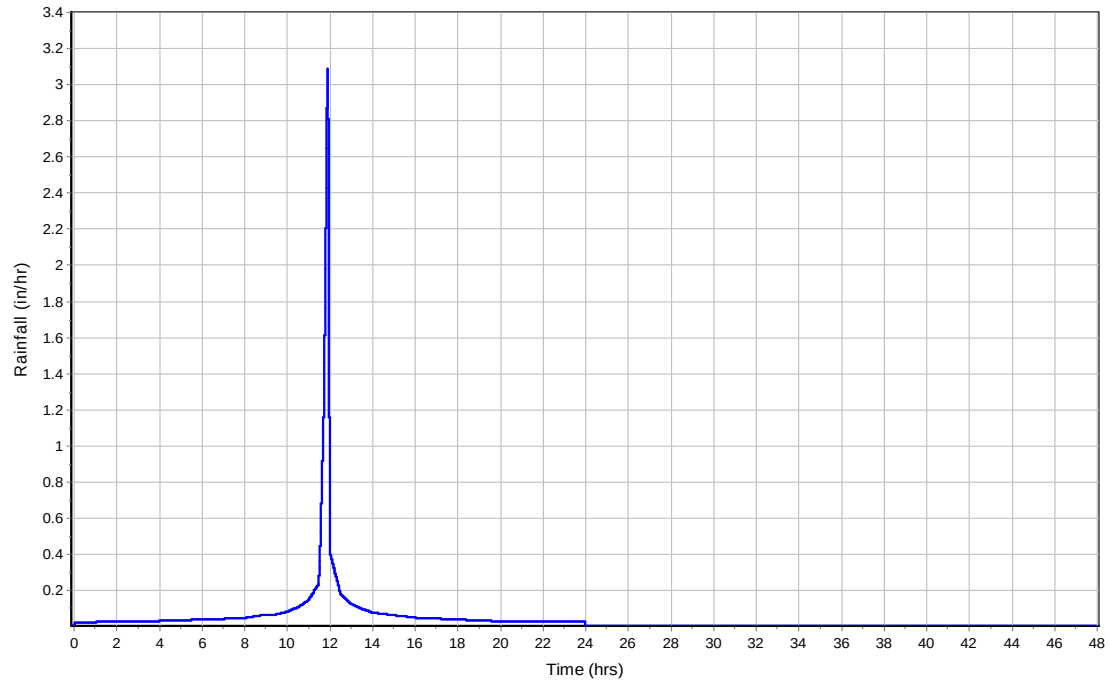
	32	Area (acres)	Soil Group	Curve Number
Soil/Surface Description				
< 50% grass cover, Poor		0.21	C	86
Composite Area & Weighted CN		0.21		86

Subbasin Runoff Results

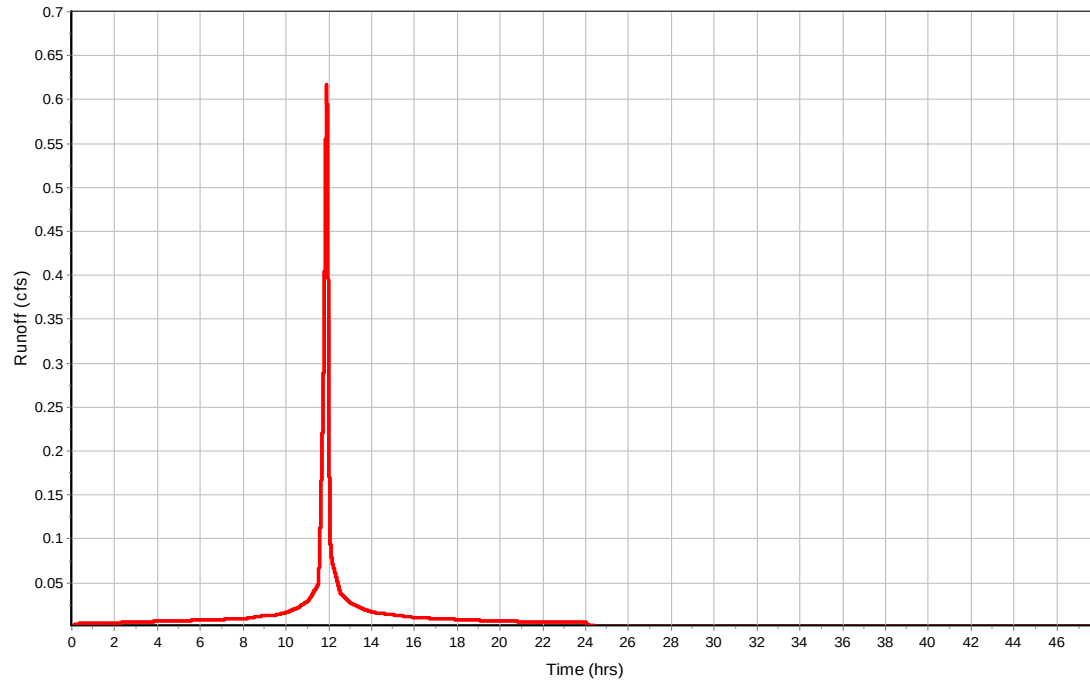
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.09
Total Runoff (in)	1.91
Peak Runoff (cfs)	0.62
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:08:27

Subbasin : DA12-PR

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DA13-PR**Input Data**

Area (ac)	0.42
Impervious Area (%)	60
Weighted Curve Number	86
Conductivity (in/hr)	0.15
Drying Time (days)	7
Average Slope (%)	0.5872
Equivalent Width (ft)	410
Impervious Area	
<i>Manning's Roughness</i>	0.012
Pervious Area	
<i>Manning's Roughness</i>	0.05
Curb & Gutter Length (ft)	0
Rain Gage ID	GrandValley

Composite Curve Number

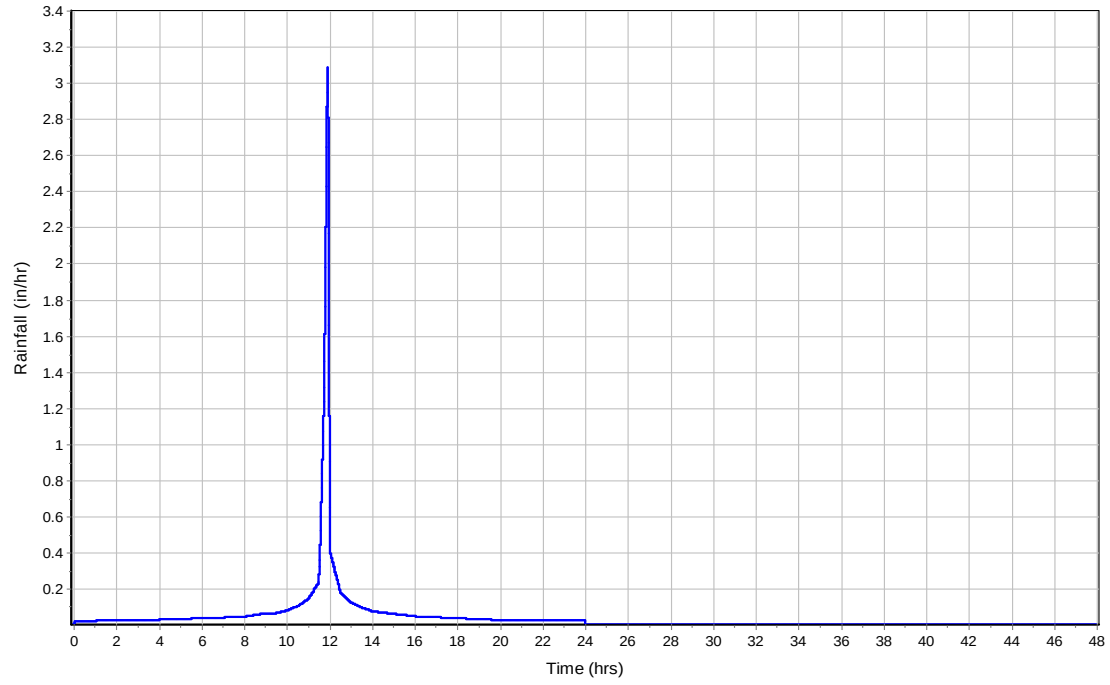
	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
< 50% grass cover, Poor		0.42	C	86
Composite Area & Weighted CN		0.42		86

Subbasin Runoff Results

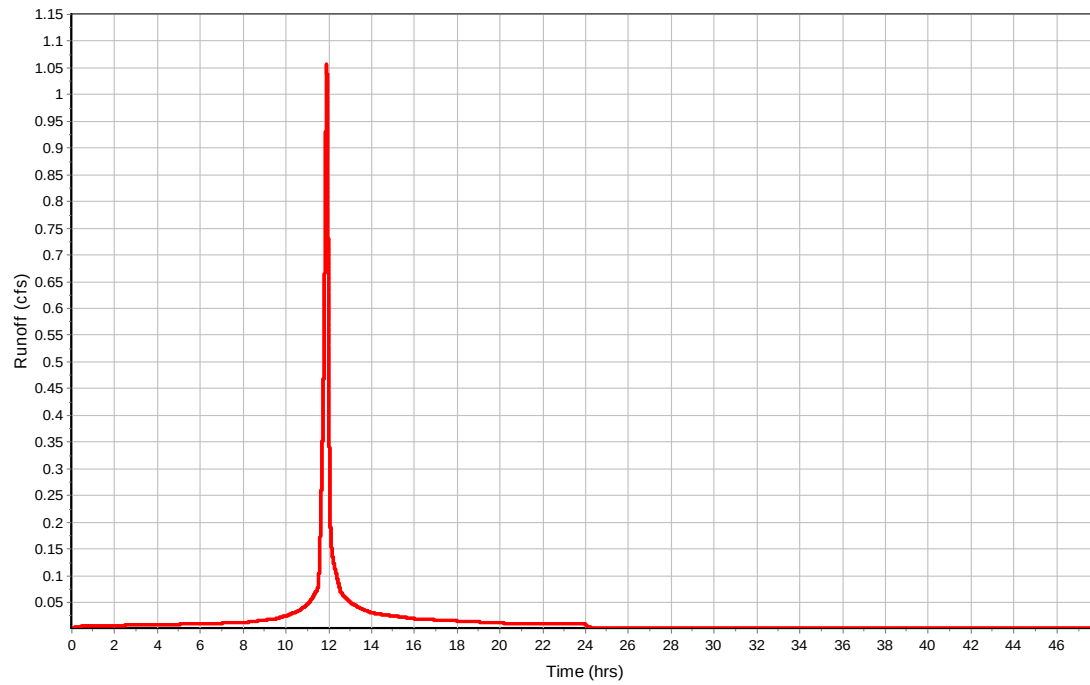
Total Rainfall (in)	2.01
Total Runon (in)	0
Total Evaporation (in)	0
Total Infiltration (in)	0.361
Total Runoff (in)	1.62
Peak Runoff (cfs)	1.06
Weighted Curve Number	86
Time of Concentration (days hh:mm:ss)	0 00:11:05

Subbasin : DA13-PR

Rainfall Intensity Graph



Runoff Hydrograph



SN	Element ID	From (Inlet Node)	To (Outlet Node)	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence (days hh:mm)	Max Flow Velocity (ft/sec)	Travel Time (min)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Froude Number	Reported Condition
1	EX-PIPE-105	64	EX-MH-01	77.97	4629.99	0.00	4626.81	1.29	3.18	4.0800	CIRCULAR	12.000	12.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.05	0 11:56	6.72	0.19	7.79	0.14	0.25	0.00	0.25	1.23	Calculated
2	Link-123	Inlet14-PR	64	20.16	4630.23	0.00	4630.07	0.08	0.16	0.7900	CIRCULAR	12.000	12.00	0.0150	0.5000	0.8000	0.0000	0.00	NO	1.00	1.05	0 11:56	2.79	0.12	2.75	0.38	0.48	0.00	0.48	0.51	Calculated
3	Link-125	EX-MH-01	Out13-PR	19.73	4625.52	0.00	4625.32	0.00	0.20	1.0100	CIRCULAR	18.000	18.00	0.0150	0.0000	0.8000	0.0000	0.00	NO	1.00	1.66	0 11:56	3.50	0.09	9.17	0.18	0.31	0.00	0.47	0.52	Calculated
4	Link-129	64	64	178.98	4626.51	0.00	4624.89	0.00	1.62	0.9100	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	7.99	0 12:32	5.03	0.59	10.83	0.74	0.84	0.00	1.27	0.48	Calculated
5	Link-130	64	Jun-100	143.22	4624.89	0.00	4624.26	0.04	0.63	0.4400	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	7.88	0 12:32	4.92	0.49	7.55	1.04	0.85	0.00	1.28	0.45	> CAPACITY
6	Link-131	Out-10	Jun-101	10.06	4626.21	0.00	4623.59	6.00	2.62	26.0400	CIRCULAR	18.000	18.00	0.0120	0.5000	0.6000	0.0000	0.00	NO	1.00	6.21	0 11:59	13.19	0.01	58.07	0.11	0.31	0.00	0.47	2.81	Calculated
7	Link-132	Jun-100	Jun-101	53.52	4624.22	0.00	4623.28	5.69	0.94	1.7600	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	7.88	0 12:32	7.59	0.12	15.08	0.52	0.57	0.00	0.85	0.82	Calculated
8	Link-133	Jun-101	STM-02_MH-03	64.79	4618.59	1.00	4618.41	1.00	0.18	0.2800	CIRCULAR	36.000	36.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	8.98	0 12:32	3.37	0.32	38.09	0.24	0.47	0.00	1.42	0.36	Calculated
9	PIPE(49)	STM-02_MH-03	OUTFALL_STM-02_FES-01	17.45	4618.41	1.00	4618.35	0.00	0.06	0.3400	CIRCULAR	48.000	48.00	0.0120	0.0000	1.0000	0.0000	0.00	NO	1.00	14.70	0 11:58	4.28	0.07	91.25	0.16	0.32	0.00	1.27	0.50	Calculated
10	STM-01_PIPE-02	STM-01_MH-03	OUTFALL_STRUCTURE-(105)	61.46	4610.24	1.00	4610.08	0.00	0.16	0.2600	CIRCULAR	24.000	24.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	29.16	0 11:58	9.28	0.11	12.50	2.33	1.00	104.00	2.00	0.52	SURCHARGED
11	STM-01_PIPE-03	STM-01_MH-03	STM-01_MH-03	106.81	4610.63	1.00	4610.34	1.10	0.29	0.2700	CIRCULAR	24.000	24.00	0.0120	0.0000	0.8000	0.0000	0.00	NO	1.00	29.16	0 11:58	9.28	0.19	12.77	2.28	1.00	103.00	2.00	0.61	SURCHARGED
12	STM-01_PIPE-04	zeas	STM-01_MH-10	160.51	4611.06	1.00	4610.75	1.12	0.31	0.1900	CIRCULAR	24.000	24.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	29.16	0 11:58	9.28	0.29	10.77	2.71	1.00	105.00	2.00	0.56	SURCHARGED
13	STM-01_PIPE-05	STM-01_MH-05	zeas	171.74	4611.52	1.00	4611.06	1.00	0.46	0.2700	CIRCULAR	24.000	24.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	16.24	0 11:59	5.17	0.55	12.68	1.28	1.00	106.00	2.00	0.36	SURCHARGED
14	STM-01_PIPE-05N1	STM-01_INLET-03	zeas	48.35	4611.80	1.00	4611.56	1.50	0.24	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	13.38	0 11:45	7.57	0.11	8.02	1.67	1.00	107.00	1.50	0.73	SURCHARGED
15	STM-01_PIPE-05N2	STM-01_AI-01	STM-01_INLET-03	18.62	4617.40	1.00	4616.83	6.03	0.57	3.0600	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	12.45	0 12:15	8.03	0.04	19.91	0.63	1.00	32.00	1.50	1.66	SURCHARGED
16	STM-01_PIPE-05S	STM-01_INLET-01	zeas	7.86	4615.60	1.00	4615.50	5.44	0.10	1.2700	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	4.55	0 11:55	3.52	0.04	12.84	0.35	1.00	35.00	1.50	0.72	SURCHARGED
17	STM-01_PIPE-06	STM-01_MH-06	STM-01_MH-05	327.69	4612.90	1.00	4612.02	1.50	0.88	0.2700	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	11.42	0 12:56	6.46	0.85	5.90	1.94	1.00	106.00	1.50	0.61	SURCHARGED
18	STM-01_PIPE-06N2	STM-01_AI-03	STM-01_MH-05	74.58	4614.40	1.00	4611.80	1.28	2.60	3.4900	CIRCULAR	18.000	18.00	0.0120	0.5000	0.5600	0.0000	0.00	NO	1.00	8.64	0 11:59	4.89	0.25	21.25	0.41	1.00	56.00	1.50	0.69	SURCHARGED
19	STM-01_PIPE-07	STM-01_MH-07	STM-01_MH-06	327.03	4613.78	7.08	4612.90	1.00	0.88	0.2700	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	11.42	0 12:56	6.46	0.84	5.90	1.93	1.00	125.00	1.50	0.48	SURCHARGED
20	STM-01_PIPE-08	STM-01_AI-02	STM-01_MH-07	68.89	4613.95	1.00	4613.78	7.08	0.17	0.2500	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	11.42	0 12:56	6.46	0.18	5.65	2.02	1.00	130.00	1.50	0.50	SURCHARGED
21	STM-02_PIPE-01	STM-02_MH-01	STM-02_MH-02	270.03	4621.33	1.00	4620.25	1.00	1.08	0.4000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	4.36	0 11:56	4.28	1.05	7.20	0.61	0.56	0.00	0.84	0.50	Calculated
22	STM-02_PIPE-01N	STM-02_INLET-02	STM-02_MH-01	38.78	4621.70	1.00	4621.50	1.17	0.20	0.5200	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	2.53	0 11:55	2.98	0.22	8.17	0.31	0.50	0.00	0.74	0.55	Calculated
23	STM-02_PIPE-01S	STM-02_INLET-01	STM-02_MH-01	5.38	4621.70	1.00	4621.62	1.29	0.08	1.4900	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	1.89	0 11:55	3.23	0.03	13.88	0.14	0.43	0.00	0.64	0.74	Calculated
24	STM-02_PIPE-02	STM-02_MH-02	STM-02_WQMH-02	315.68	4620.25	1.00	4618.67	1.00	1.58	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	4.35	0 11:57	3.46	1.52	8.05	0.54	0.69	0.00	1.03	0.45	Calculated
25	STM-02_PIPE-02(1)(1)	STM-02_WQMH-02	STM-02_MH-03	19.51	4618.67	1.00	4618.57	1.16	0.10	0.5100	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	4.24	0 11:57	2.65	0.12	8.15	0.52	0.86	0.00	1.29	0.38	Calculated
26	STM-02_PIPE-04	STM-03_MH-02	STM-02_WQMH-03	67.87	4620.25	1.10	4619.91	1.00	0.34	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	3.13	0 11:56	3.64	0.31	8.05	0.39	0.49	0.00	0.73	0.48	Calculated
27	STM-02_PIPE-04(1)	STM-02_WQMH-03	STM-02_MH-03	50.06	4619.91	1.00	4619.66	2.25	0.25	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	3.13	0 11:56	3.94	0.21	8.04	0.39	0.46	0.00	0.69	0.53	Calculated
28	STM-03_PIPE-03	STM-03_MH-03	STM-03_MH-02	228.53	4621.40	1.00	4620.25	1.10	1.15	0.5000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	1.21	0 11:56	1.99	1.91	8.07	0.15	0.38	0.00	0.56	0.28	Calculated
29	STM-03_PIPE-03N	STM-03_INLET-02	STM-03_MH-02	34.01	4624.50	1.00	4623.16	4.01	1.34	3.9400	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	1.15	0 11:55	5.87	0.10	22.59	0.05	0.17	0.00	0.25	1.19	Calculated
30	STM-03_PIPE-03S	STM-03_INLET-01	STM-03_MH-02	12.02	4620.39	1.00	4620.15	1.00	0.24	2.0000	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	0.82	0 11:55	1.29	0.16	16.08	0.05	0.48	0.00	0.72	0.08	Calculated
31	STM-03_PIPE-04	STM-03_MH-04	STM-03_MH-03	228.86	4623.68	1.00	4621.40	1.00	2.28	1.0000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.5000	0.0000	0.00	NO	1.00	1.22	0 11:55	3.75	1.02	11.36	0.11	0.24	0.00	0.36	0.54	Calculated
32	STM-03_PIPE-04S	STM-03_INLET-03	STM-03_MH-04	11.73	4624.08	1.00	4623.68	1.00	0.40	3.4100	CIRCULAR	18.000	18.00	0.0120	0.5000	0.8000	0.0000	0.00	NO	1.00	1.23	0 11:55	4.07	0.05	21.01	0.06	0.23	0.00	0.34	0.82	Calculated
33	STM-04_PIPE-01	STM-04_INLET-01	EX-MH-01	110.34	4626.92	1.00	4626.81	1.29	0.11	0.1000	CIRCULAR	18.000	18.00	0.0120	0.0000	0.6000	0.0000	0.00	NO	1.00	0.61	0 11:56	1.87	0.98	3.59	0.17	0.24	0.00	0.36	0.24	Calculated

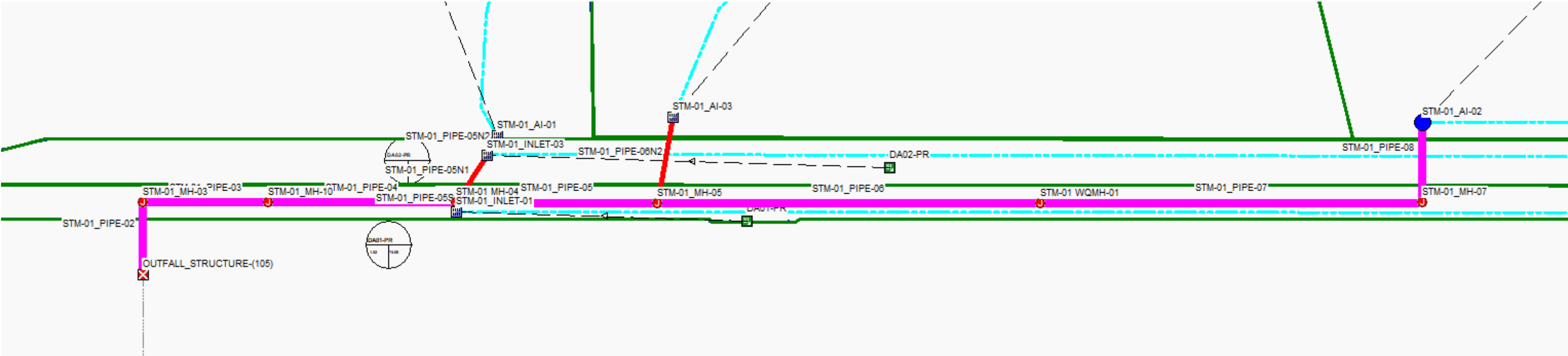
SN	Element ID	X Coordinate	Y Coordinate	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
				(ft)			(ft)	(cfs)	(cfs)	(ft)	(ft)
1	Out13-PR	110557.10	36779.04	4625.32	NORMAL	NO		1.66	0.00	0.43	4625.75
2	OUTFALL_STM-02_FES-01	109257.13	36748.36	4618.35	NORMAL	NO		14.70	0.00	1.09	4619.44
3	OUTFALL_STRUCTURE-(105)	106620.72	36723.26	4610.08	NORMAL	NO		29.16	0.00	2.00	4612.08

SN	Element ID	X Coordinate	Y Coordinate	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation	Max (Rim) Elevation	Max (Rim) Offset	Initial Water Elevation	Initial Water Depth	Ponded Area	Grate Clogging Factor	Roadway Longitudinal Slope	Roadway Cross Slope	Roadway Manning's Roughness	Gutter Cross Slope	Gutter Width	Gutter Depression	Median Ditch Longitudinal Slope	Median Ditch Bottom Width	Median Ditch Left Side Slope	Median Ditch Right Side Slope	Median Ditch Manning's Roughness	Peak Flow	Peak Lateral Inflow	Peak Flow Intercepted by Inlet	Peak Flow Bypassing Inlet	Inlet Efficiency during	Allowable Spread	Max Gutter Spread during	Max Gutter Water Elev. during	Max Gutter Water Depth during	Time of Maximum Depth Occurrence	Total Flooded Volume	Total Time Flooded
								(ft)	(ft)	(ft)	(ft)	(ft)	(ft ²)	(%)	(ft/ft)	(ft/ft)	(ft/ft)	(ft)	(inches)		(ft/ft)	(ft)	(V:H)	(V:H)		(cfs)	(cfs)	(cfs)	(cfs)	(%)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-inches)	(minutes)
1	Inlet14-PR	110463.87	36822.19	FHWA HEC-22 GENERIC	N/A	On Sag	1	4630.23	4631.78	1.55	4630.23	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	1.06	1.06	N/A	N/A	N/A	7.00	6.22	4632.02	0.24	0 11:56	0.00	0.00
2	STM-01_AI-01	106923.12	36841.13	FHWA HEC-22 GENERIC	N/A	On Sag	1	4616.40	4619.90	3.50	4616.40	0.00	1.00	0.00	N/A	0.0060	0.0300	0.0060	40.00	2.0000	45.0000	45.0000	64	64	45.0000	37.33	37.33	N/A	N/A	N/A	7.00	1822.81	4632.38	12.48	0 11:45	6.45	30.00
3	STM-01_AI-02	107714.72	36853.08	FHWA HEC-22 GENERIC	N/A	On Sag	1	4612.95	4623.95	11.00	4612.95	0.00	1.00	0.00	N/A	0.0060	0.0300	0.0060	40.00	2.0000	45.0000	45.0000	64	64	45.0000	64.61	64.61	N/A	N/A	N/A	7.00	2445.12	4639.61	15.66	0 11:40	21.34	76.00
4	STM-01_AI-03	107073.18	36856.99	FHWA HEC-22 GENERIC	N/A	On Sag	1	4613.40	4622.22	8.82	4613.40	0.00	1.00	0.00	N/A	0.0060	0.0300	0.0060	40.00	2.0000	45.0000	45.0000	64	64	45.0000	8.64	8.64	N/A	N/A	N/A	7.00	93.18	4624.33	2.11	0 11:57	0.00	0.00
5	STM-01_INLET-01	106887.86	36776.27	FHWA HEC-22 GENERIC	N/A	On Sag	1	4614.60	4619.57	4.97	4614.60	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	4.54	4.54	N/A	N/A	N/A	7.00	17.43	4620.03	0.46	0 11:57	0.00	0.00
6	STM-01_INLET-03	106914.20	36824.79	FHWA HEC-22 GENERIC	N/A	On Sag	1	4610.80	4619.66	8.86	4610.80	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	5.43	5.43	N/A	N/A	N/A	7.00	19.69	4620.17	0.51	0 11:53	0.18	7.00
7	STM-02_INLET-01	108659.80	36776.81	FHWA HEC-22 GENERIC	N/A	On Sag	2	4620.70	4626.00	5.30	4620.70	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	1.89	1.89	N/A	N/A	N/A	7.00	7.34	4626.26	0.26	0 11:56	0.00	0.00
8	STM-02_INLET-02	108659.93	36820.97	FHWA HEC-22 GENERIC	N/A	On Sag	2	4620.70	4626.00	5.30	4620.70	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	2.54	2.54	N/A	N/A	N/A	7.00	9.04	4626.30	0.30	0 11:56	0.00	0.00
9	STM-03_INLET-01	109373.16	36775.88	FHWA HEC-22 GENERIC	N/A	On Sag	1	4619.39	4628.88	9.49	4619.39	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.83	0.83	N/A	N/A	N/A	7.00	2.39	4629.04	0.16	0 11:56	0.00	0.00
10	STM-03_INLET-02	109373.03	36821.91	FHWA HEC-22 GENERIC	N/A	On Sag	1	4623.50	4628.88	5.38	4623.50	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	1.15	1.15	N/A	N/A	N/A	7.00	6.62	4629.13	0.25	0 11:55	0.00	0.00
11	STM-03_INLET-03	109830.54	36775.84	FHWA HEC-22 GENERIC	N/A	On Sag	1	4623.08	4630.26	7.18	4623.08	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	1.23	1.23	N/A	N/A	N/A	7.00	6.93	4630.51	0.25	0 11:55	0.00	0.00
12	STM-04_INLET-01	110427.25	36775.76	FHWA HEC-22 GENERIC	N/A	On Sag	1	4625.92	4631.65	5.73	4625.92	0.00	1.00	0.00	N/A	0.0200	0.0120	0.0833	1.50	2.0000	45.0000	45.0000	64	64	45.0000	0.62	0.62	N/A	N/A	N/A	7.00	2.14	4631.81	0.16	0 11:56	0.00	0.00

SN	Element ID	X Coordinate	Y Coordinate	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation	Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover	Peak Inflow	Peak Lateral	Peak HGL Attained	Maximum HGL Depth	Maximum Surcharge Depth	Minimum Freeboard Attained	Average HGL Elevation	Average HGL Depth	Time of Maximum HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
				(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft²)	(inches)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
1	EX-MH-01	110537.59	36776.10	4625.52	4632.78	7.26	4625.52	0.00	5000.00	367.22	1.00	53.64	1.66	0.00	4626.03	0.51	0.00	6.75	4625.55	0.03	0 11:56	0 00:00	0.00	0.00
2	Jun-100	109327.04	36843.23	4624.22	4628.29	4.07	4624.22	0.00	5000.00	371.71	1.00	30.41	7.88	0.00	4625.16	0.94	0.00	3.14	4624.31	0.09	0 12:32	0 00:00	0.00	0.00
3	Jun-101	109275.70	36828.12	4617.59	4628.84	11.25	4617.59	0.00	5000.00	371.17	1.00	44.94	8.98	0.00	4619.98	2.39	0.00	8.86	4618.72	1.13	0 11:59	0 00:00	0.00	0.00
4	Jun-94	110464.06	36802.03	4629.99	4632.62	2.63	4629.99	0.00	5000.00	367.38	1.00	18.60	1.05	0.00	4630.25	0.26	0.00	2.37	4630.01	0.02	0 11:56	0 00:00	0.00	0.00
5	Jun-98	109649.23	36841.88	4626.51	4632.49	5.98	4626.51	0.00	5000.00	367.51	1.00	53.76	8.02	8.02	4627.59	1.08	0.00	4.90	4626.61	0.10	0 12:32	0 00:00	0.00	0.00
6	Jun-99	109470.26	36843.26	4624.89	4628.59	3.70	4624.89	0.00	5000.00	371.41	1.00	26.35	7.99	0.00	4626.36	1.47	0.00	2.23	4625.02	0.13	0 12:32	0 00:00	0.00	0.00
7	Out-10	109303.09	36846.96	4626.21	4628.21	2.00	4626.21	0.00	5000.00	371.79	1.00	6.00	6.22	6.22	4626.81	0.60	0.00	1.40	4626.24	0.03	0 11:59	0 00:00	0.00	0.00
8	STM-01_MH-03	106620.72	36784.72	4609.24	4621.31	12.07	4609.24	0.00	5000.00	378.69	1.00	107.64	29.16	0.00	4613.62	4.38	0.00	7.69	4610.65	1.41	0 11:58	0 00:00	0.00	0.00
9	STM-01_MH-05	107059.78	36783.62	4610.52	4620.76	10.24	4610.52	0.00	5000.00	379.24	1.00	86.88	16.24	0.00	4620.11	9.59	0.00	0.65	4611.97	1.45	0 11:58	0 00:00	0.00	0.00
10	STM-01_WQMH-01	107387.47	36783.99	4611.90	4622.94	11.04	4611.90	0.00	5000.00	377.06	1.00	102.48	11.42	0.00	4621.70	9.80	0.00	1.24	4613.43	1.53	0 11:58	0 00:00	0.00	0.00
11	STM-01_MH-07	107714.50	36784.19	4606.70	4624.91	18.21	4606.70	0.00	5000.00	375.09	1.00	115.56	11.42	0.00	4623.28	16.58	0.00	1.63	4614.31	7.61	0 11:58	0 00:00	0.00	0.00
12	STM-01_MH-10	106727.53	36784.42	4609.63	4620.70	11.07	4609.63	0.00	5000.00	379.30	1.00	95.40	29.16	0.00	4616.20	6.57	0.00	4.50	4611.10	1.47	0 11:58	0 00:00	0.00	0.00
13	STM-02_MH-01	108659.80	36782.19	4620.33	4626.28	5.95	4620.33	0.00	5000.00	373.72	1.00	37.92	4.42	0.00	4622.21	1.88	0.00	4.07	4621.38	1.05	0 11:56	0 00:00	0.00	0.00
14	STM-02_MH-02	108929.83	36780.98	4619.25	4627.85	8.60	4619.25	0.00	5000.00	372.15	1.00	73.20	4.36	0.00	4621.04	1.79	0.00	6.81	4620.29	1.04	0 11:57	0 00:00	0.00	0.00
15	STM-02_MH-03	109258.02	36765.79	4617.41	4630.20	12.79	4617.41	0.00	5000.00	369.80	1.00	93.48	14.70	0.00	4619.87	2.46	0.00	10.33	4618.56	1.15	0 11:58	0 00:00	0.00	0.00
16	STM-02_WQMH-02	109245.51	36780.76	4617.67	4629.71	12.04	4617.67	0.00	5000.00	370.29	1.00	114.48	4.35	0.00	4619.95	2.28	0.00	9.76	4618.73	1.06	0 11:58	0 00:00	0.00	0.00
17	STM-02_WQMH-03	109305.67	36781.15	4618.91	4629.39	10.48	4618.91	0.00	5000.00	370.61	1.00	95.76	3.13	0.00	4620.64	1.73	0.00	8.75	4619.93	1.02	0 11:56	0 00:00	0.00	0.00
18	STM-03_MH-02	109373.20	36787.90	4619.15	4629.28	10.13	4619.15	0.00	5000.00	370.72	1.00	55.44	3.15	0.00	4620.99	1.84	0.00	8.29	4620.28	1.13	0 11:56	0 00:00	0.00	0.00
19	STM-03_MH-03	109601.73	36787.57	4620.40	4631.20	10.80	4620.40	0.00	5000.00	368.80	1.00	99.60	1.22	0.00	4621.79	1.39	0.00	9.41	4621.40	1.00	0 11:56	0 00:00	0.00	0.00
20	STM-03_MH-04	109830.59	36787.57	4622.68	4630.65	7.97	4622.68	0.00	5000.00	369.35	1.00	65.64	1.23	0.00	4624.01	1.33	0.00	6.64	4623.69	1.01	0 11:55	0 00:00	0.00	0.00
21	STM-01 MH-04	106888.04	36784.13	4610.06	4619.95	9.89	4610.06	0.00	5000.00	380.05	1.00	35.40	29.16	0.00	4619.15	9.09	0.00	0.80	4611.61	1.55	0 11:58	0 00:00	0.00	0.00

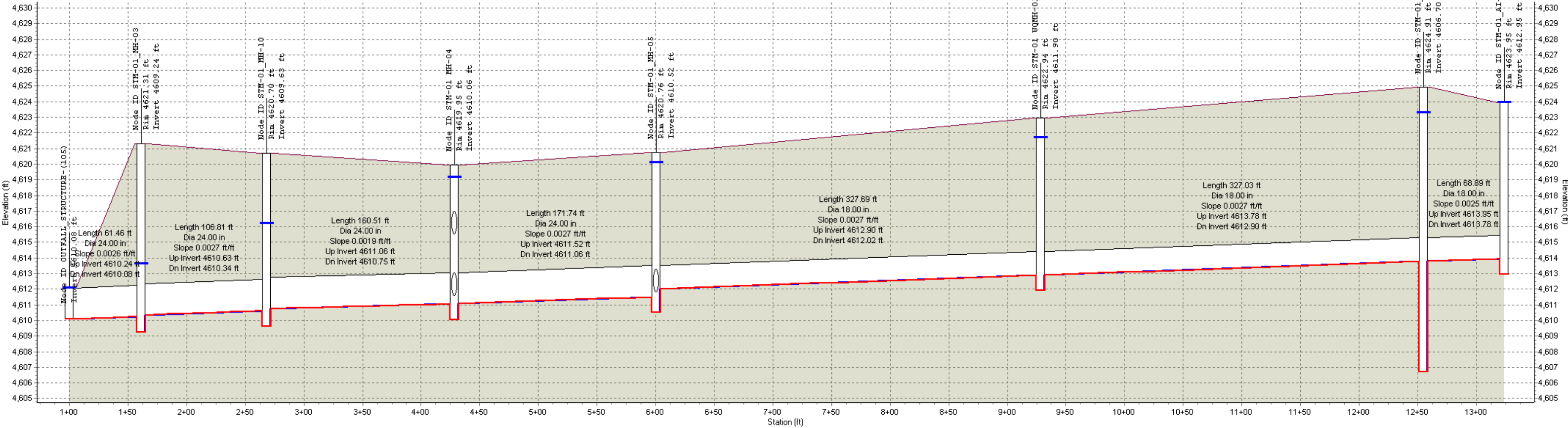
SN	Element ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period	Rainfall Depth	Rainfall Distribution
								(years)	(inches)	
1	GrandValley	Time Series	5YR-24HR	Cumulative	inches				0	

SN	Element ID	Area	Drainage Node ID	Weighted Curve Number	Conductivity	Drying Time	Average Slope	Equivalent Width	Impervious Area	Impervious Area No Depression	Impervious Area Depression Depth	Impervious Area Manning's Roughness	Pervious Area Depression Depth	Pervious Area Manning's Roughness	Curb & Gutter Length	Rain Gage ID	Total Precipitation	Total Runon	Total Evaporation	Total Infiltration	Total Runoff	Peak Runoff	Time of Concentration
		(acres)			(inches/hr)	(days)	(%)	(ft)	(%)	(%)	(inches)		(inches)		(ft)		(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(days hh:mm:ss)
1	DA01-PR	1.53	STM-01_INLET-01	86.00	0.1500	7.00	0.6084	1976.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	2.00	4.54	0 00:06:47
2	DA02-PR	1.82	STM-01_INLET-03	86.00	0.1500	7.00	0.5951	2349.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	2.00	5.43	0 00:06:51
3	DA03-PR	25.58	STM-01_AI-01	86.00	0.1500	7.00	0.6464	2800.00	30.00	40.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	0.6410	1.33	37.33	0 00:55:53
4	DA04-PR	8.76	STM-01_AI-03	79.76	0.1500	7.00	0.6075	2249.00	7.00	40.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	1.0550	0.91	8.64	0 00:40:28
5	DA05-PR	58.18	STM-01_AI-02	86.00	0.1500	7.00	0.5154	4606.00	22.00	40.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	0.7190	1.25	64.61	0 01:17:32
6	DA06-PR	0.85	STM-02_INLET-02	86.00	0.1500	7.00	0.6520	1092.00	100.00	80.00	0.0500	0.0120	0.1000	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	2.00	2.54	0 00:06:41
7	DA07-PR	0.63	STM-02_INLET-01	86.00	0.1500	7.00	0.6686	834.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	2.00	1.89	0 00:06:32
8	DA08-PR	0.27	STM-03_INLET-01	86.00	0.1500	7.00	0.9142	407.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	2.00	0.83	0 00:05:32
9	DA09-PR	0.38	STM-03_INLET-02	86.00	0.1500	7.00	0.8697	550.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	2.00	1.15	0 00:05:43
10	DA10-PR	4.63	Out-10	86.00	0.1500	7.00	0.7178	1307.00	6.00	25.00	0.0500	0.0150	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	0.8550	1.11	6.22	0 00:36:35
11	DA11-PR	0.41	STM-03_INLET-03	86.00	0.1500	7.00	0.5820	641.00	100.00	80.00	0.0500	0.0120	0.0500	0.0120	0.00	GrandValley	2.01	0.00	0.0000	0.0000	2.00	1.23	0 00:06:08
12	DA12-PR	0.21	STM-04_INLET-01	86.00	0.1500	7.00	0.6668	306.00	90.00	80.00	0.0500	0.0120	0.0500	0.2000	0.00	GrandValley	2.01	0.00	0.0000	0.0900	1.91	0.62	0 00:08:27
13	DA13-PR	0.42	Inlet14-PR	86.00	0.1500	7.00	0.5872	410.00	60.00	80.00	0.0500	0.0120	0.0500	0.0500	0.00	GrandValley	2.01	0.00	0.0000	0.3610	1.62	1.06	0 00:11:05

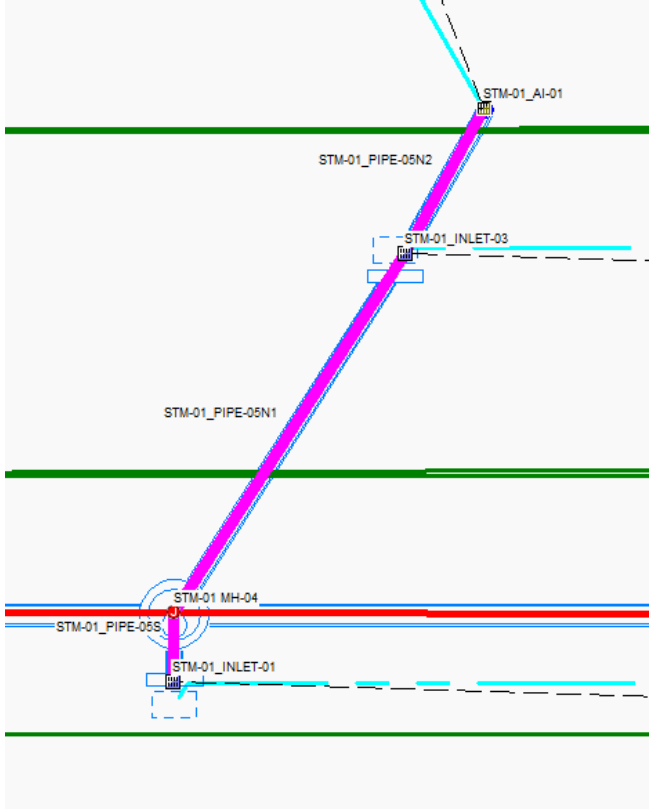


12/14/2022 00:00:01

01_BeswickDrain_Central
Main Street Storm Sewer

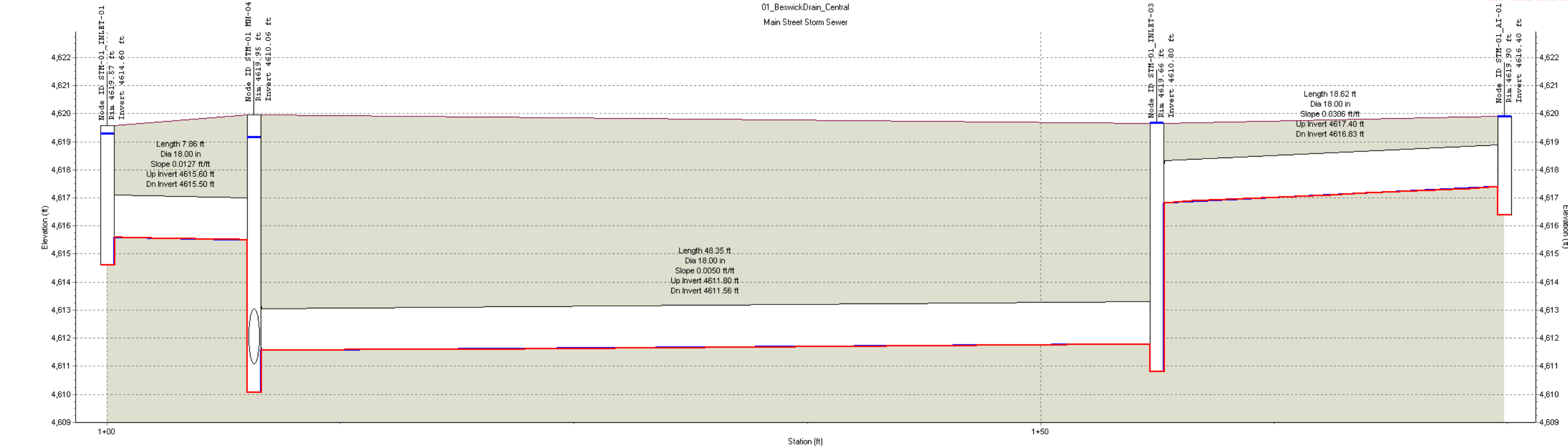


Node ID:	STM-01_MH-03	STM-01_MH-10	STM-01_MH-04	STM-01_MH-05	STM-01_WQMH-01	STM-01_MH-07	STM-01_AI-02
Rim (ft):	4621.31	4620.70	4619.95	4620.76	4622.94	4624.91	4623.95
Invert (ft):	4609.24	4609.63	4610.06	4610.52	4611.90	4606.70	4612.95
Min Pipe Cover (ft):	8.97	7.95	2.95	7.24	8.54	9.63	
Max HGL (ft):	4612.08	4613.62	4616.20	4619.15	4620.11	4623.28	4623.95
Link ID:	STM-01_PIPE-02	STM-01_PIPE-03	STM-01_PIPE-04	STM-01_PIPE-05	STM-01_PIPE-06	STM-01_PIPE-07	STM-01_PIPE-08
Length (ft):	61.46	106.81	160.51	171.74	327.69	327.03	68.89
Dia (in):	24.00	24.00	24.00	24.00	18.00	18.00	18.00
Slope (ft/ft):	0.0026	0.0027	0.0019	0.0027	0.0027	0.0027	0.0025
Up Invert (ft):	4610.24	4610.63	4611.06	4611.52	4612.90	4613.78	4613.95
Dn Invert (ft):	4610.08	4610.34	4610.75	4611.06	4612.02	4612.90	4613.78
Max Q (cfs):	29.16	29.16	29.16	16.24	11.42	11.42	11.42
Max Vel (ft/s):	9.28	9.28	9.28	5.17	6.46	6.46	6.46
Max Depth (ft):	2.00	2.00	2.00	2.00	1.50	1.50	1.50

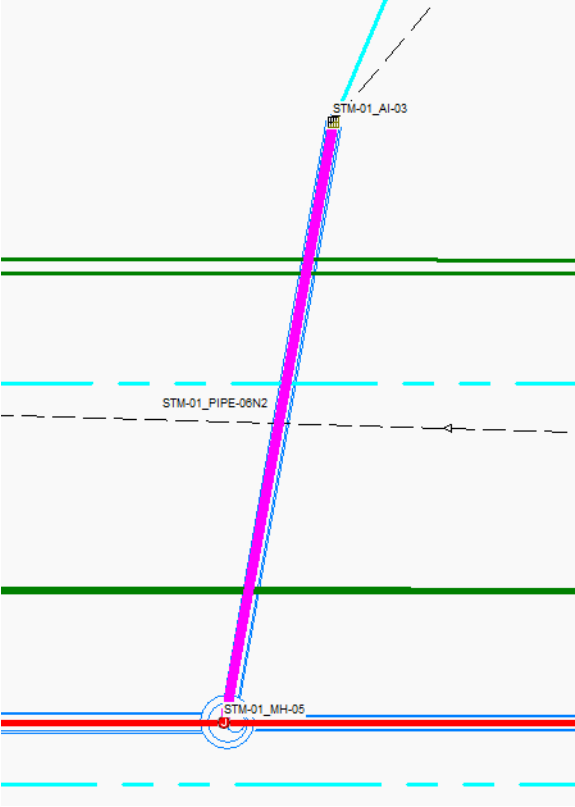


01_BeswickDrain_Central
Main Street Storm Sewer

12/14/2022 00:00:01

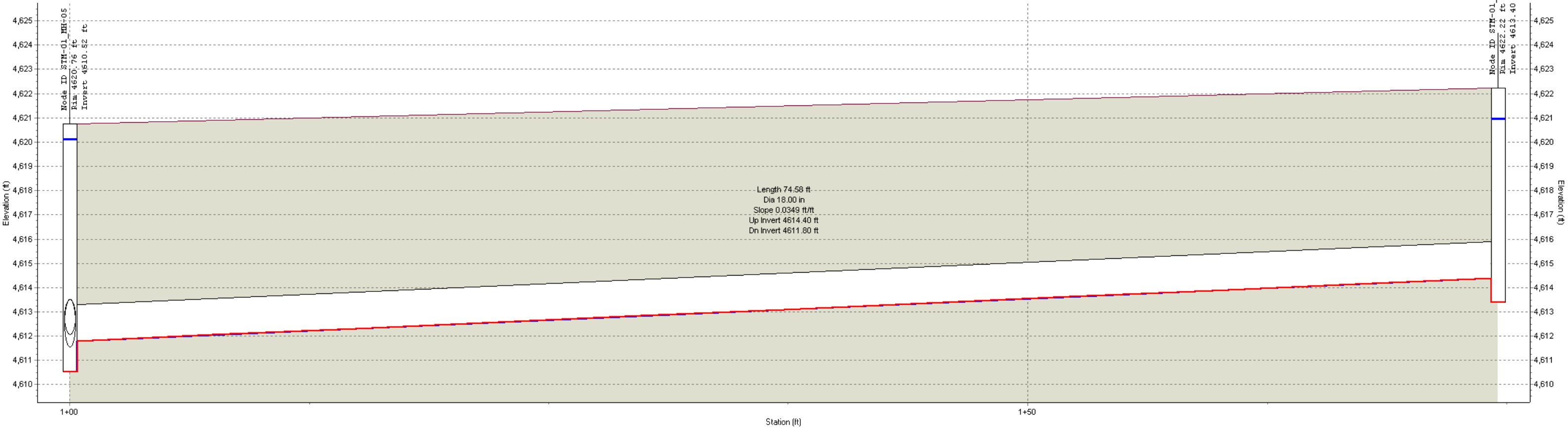


Node ID:	STM-01 MH-04		STM-01_INLET-03		STM-01_AI-01
Rim (ft):	4619.57	4619.95	4619.66	4619.90	
Invert (ft):	4614.60	4610.06	4610.80	4616.40	
Min Pipe Cover (ft):		2.95			
Max HGL (ft):	4619.27	4619.15	4619.66	4619.90	
Link ID:	STM-01_PIPE-05S		STM-01_PIPE-05N1	STM-01_PIPE-05N2	
Length (ft):	7.86		48.35	18.62	
Dia (in):	18.00		18.00	18.00	
Slope (ft/ft):	0.0127		0.0050	0.0306	
Up Invert (ft):	4615.60		4611.80	4617.40	
Dn Invert (ft):	4615.50		4611.56	4616.83	
Max Q (cfs):	4.55		13.38	12.45	
Max Vel (ft/s):	3.52		7.57	8.03	
Max Depth (ft):	1.50		1.50	1.50	

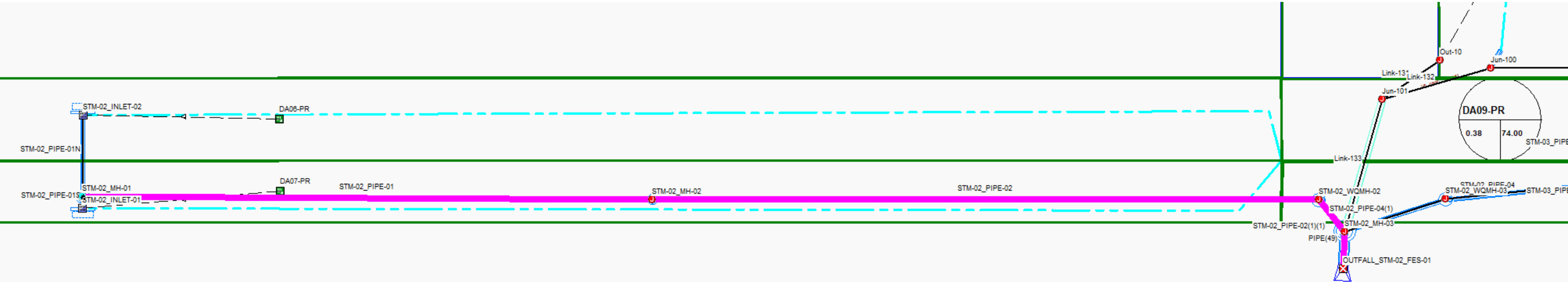


01_BeswickDrain_Central
Main Street Storm Sewer

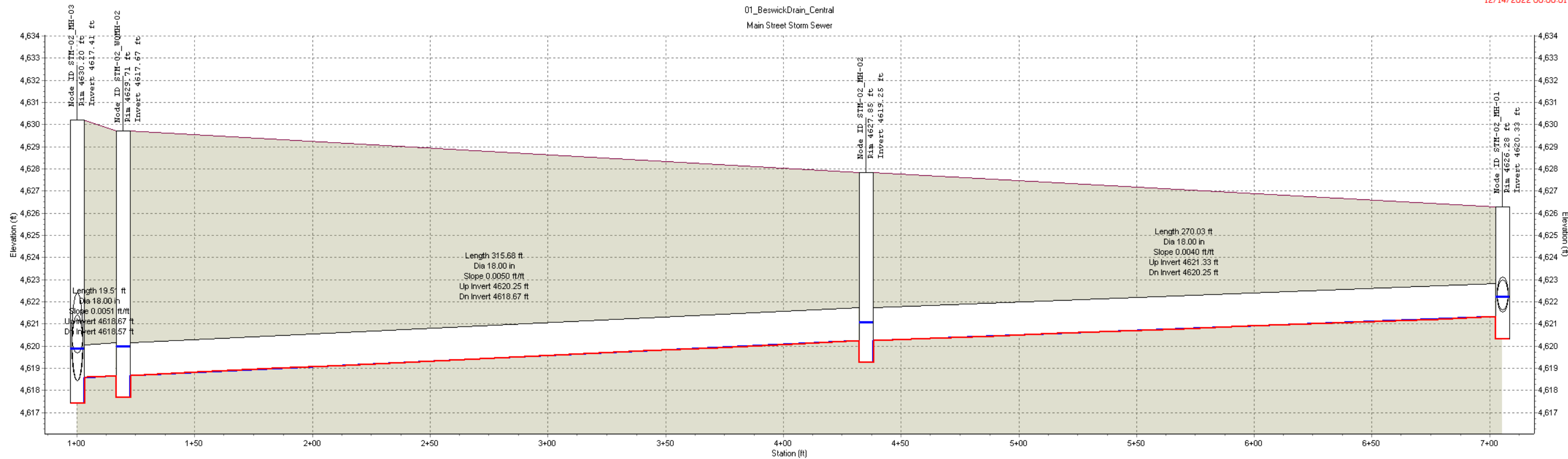
12/14/2022 00:00:01



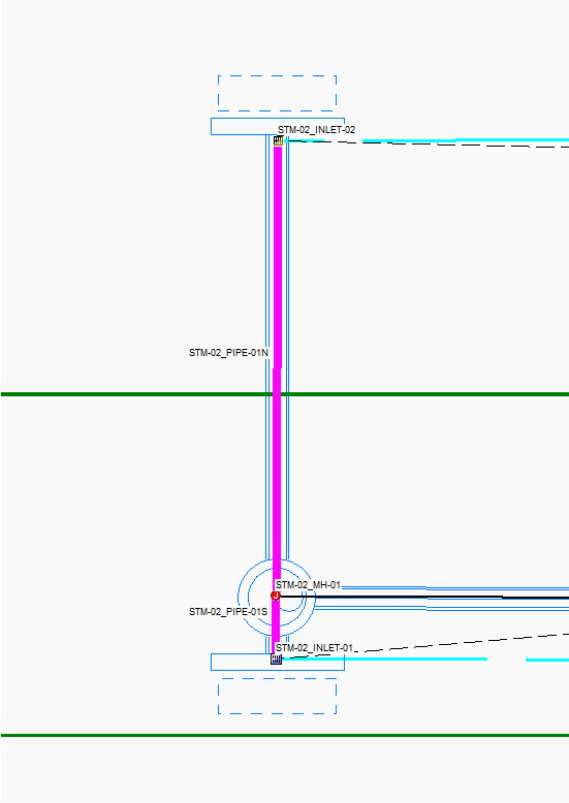
Node ID:	STM-01_MH-05	STM-01_AI-03
Rim (ft):	4620.76	4622.22
Invert (ft):	4610.52	4613.40
Min Pipe Cover (ft):	7.24	
Max HGL (ft):	4620.11	4620.94
Link ID:	STM-01_PIPE-06N2	
Length (ft):	74.58	
Dia (in):	18.00	
Slope (ft/ft):	0.0349	
Up Invert (ft):	4614.40	
Dn Invert (ft):	4611.80	
Max Q (cfs):	8.64	
Max Vel (ft/s):	4.89	
Max Depth (ft):	1.50	



12/14/2022 00:00:01

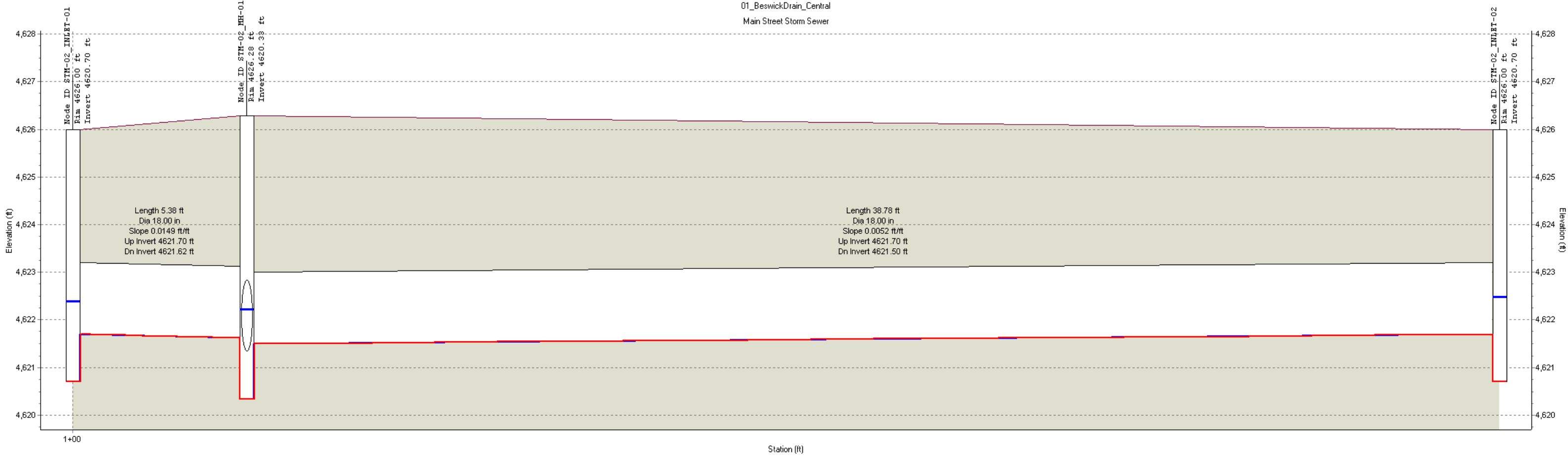


Node ID:	STM-02_MH-01	STM-02_WQMH-02	STM-02_PIPE-01	STM-02_PIPE-02	STM-02_PIPE-04(1)	STM-02_MH-02	STM-02_MH-03	STM-02_MH-04
Rim (ft):	4630.20	4629.71	4620.33	4620.25	4620.25	4627.85	4626.28	4626.28
Invert (ft):	4617.41	4617.67	4620.33	4620.25	4620.25	4619.25	4620.33	4620.33
Min Pipe Cover (ft):	7.79	9.54	3.16	3.16	3.16	6.10	3.16	3.16
Max HGL (ft):	4619.87	4619.95	4622.21	4622.21	4622.21	4621.04	4622.21	4622.21
Link ID:	STM-02_PIPE-01	STM-02_PIPE-02	STM-02_PIPE-04(1)	STM-02_PIPE-02(1)	STM-02_PIPE-02(1)	STM-02_PIPE-04(1)	STM-02_PIPE-02(1)	STM-02_PIPE-04(1)
Length (ft):	19.51	315.68	270.03	315.68	315.68	270.03	315.68	315.68
Dia (in):	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0051	0.0050	0.0040	0.0050	0.0050	0.0040	0.0050	0.0050
Up Invert (ft):	4618.67	4620.25	4621.33	4620.25	4620.25	4621.33	4620.25	4620.25
Dn Invert (ft):	4618.57	4618.67	4620.25	4618.67	4618.67	4620.25	4618.67	4618.67
Max Q (cfs):	4.24	4.35	4.36	4.35	4.35	4.36	4.35	4.35
Max Vel (ft/s):	2.65	3.46	4.28	3.46	3.46	4.28	3.46	3.46
Max Depth (ft):	1.29	1.03	0.84	1.03	1.03	0.84	1.03	1.03

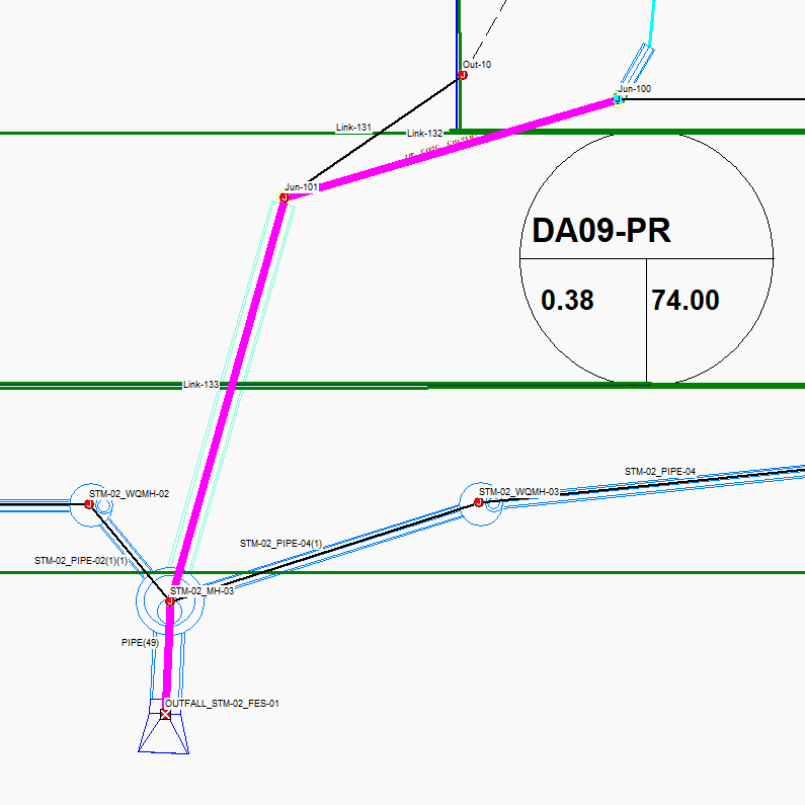


01_BeswickDrain_Central
Main Street Storm Sewer

12/14/2022 00:00:01

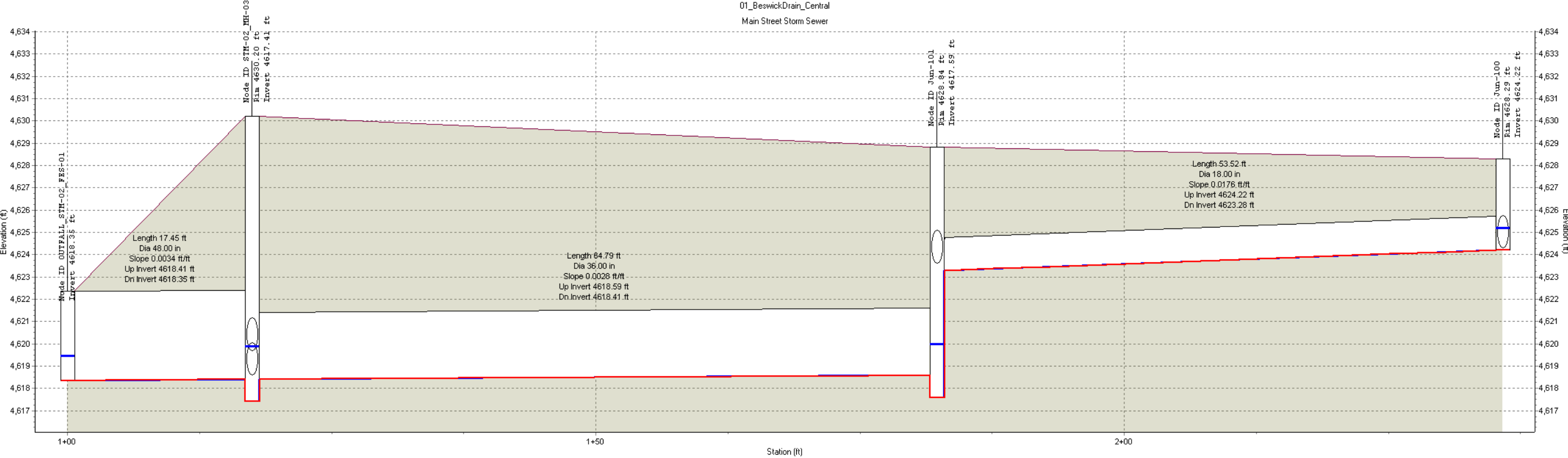


Node ID:	STM-02_MH-01		
Rim (ft):	4626.00	4626.28	4626.00
Invert (ft):	4620.70	4620.33	4620.70
Min Pipe Cover (ft):		3.16	
Max HGL (ft):	4622.39	4622.21	4622.47
Link ID:	STM-02_PIPE-01S	STM-02_PIPE-01N	
Length (ft):	5.38	38.78	
Dia (in):	18.00	18.00	
Slope (ft/ft):	0.0149	0.0052	
Up Invert (ft):	4621.70	4621.70	
Dn Invert (ft):	4621.62	4621.50	
Max Q (cfs):	1.89	2.53	
Max Vel (ft/s):	3.23	2.98	
Max Depth (ft):	0.64	0.74	

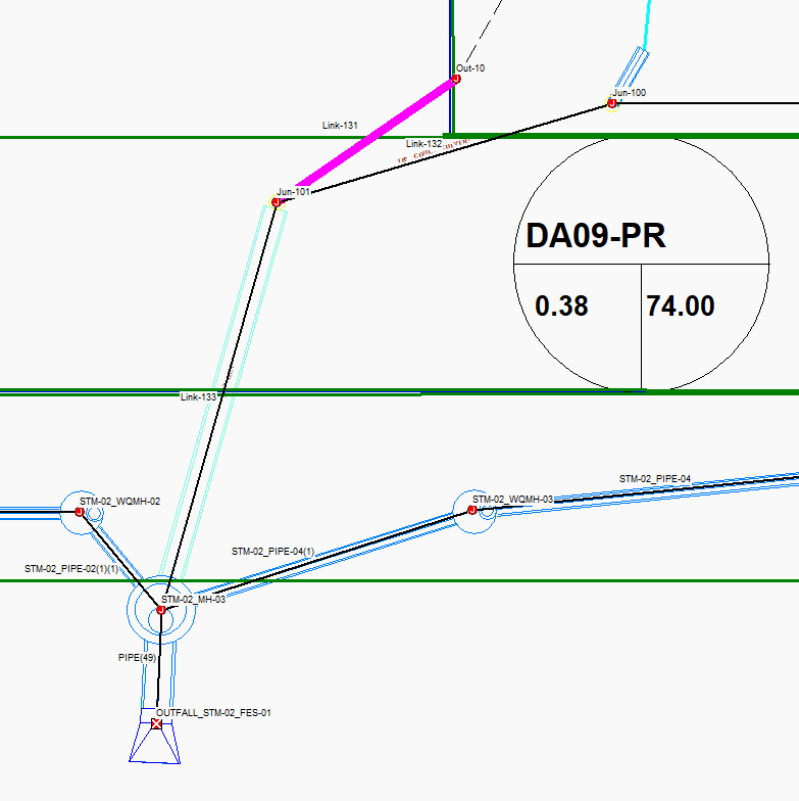


01_BeswickDrain_Central
Main Street Storm Sewer

12/14/2022 00:00:01

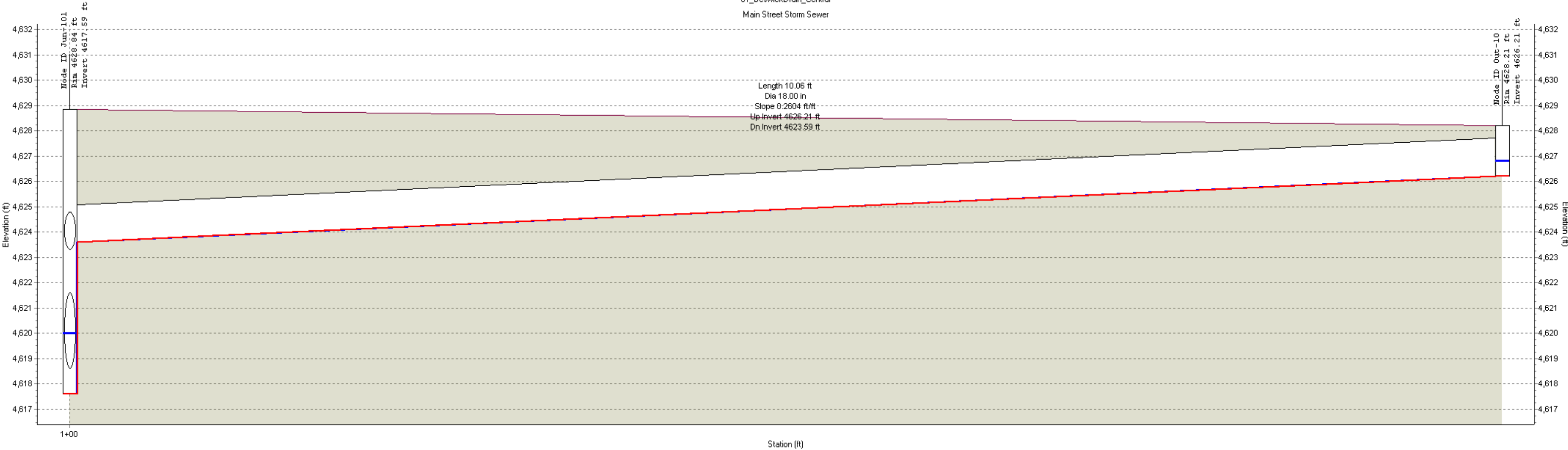


Node ID:	STM-02_MH-03		Jun-101	Jun-100
Rim (ft):	4630.20		4628.84	4628.29
Invert (ft):	4618.35	4617.41	4617.59	4624.22
Min Pipe Cover (ft):	7.79		3.75	2.53
Max HGL (ft):	4619.44	4619.87	4619.98	4625.16
Link ID:	PIPE(49)	Link-133	Link-132	
Length (ft):	17.45	64.79	53.52	
Dia (in):	48.00	36.00	18.00	
Slope (ft/ft):	0.0034	0.0028	0.0176	
Up Invert (ft):	4618.41	4618.59	4624.22	
Dn Invert (ft):	4618.35	4618.41	4623.28	
Max Q (cfs):	14.70	8.98	7.88	
Max Vel (ft/s):	4.28	3.37	7.59	
Max Depth (ft):	1.27	1.42	0.85	

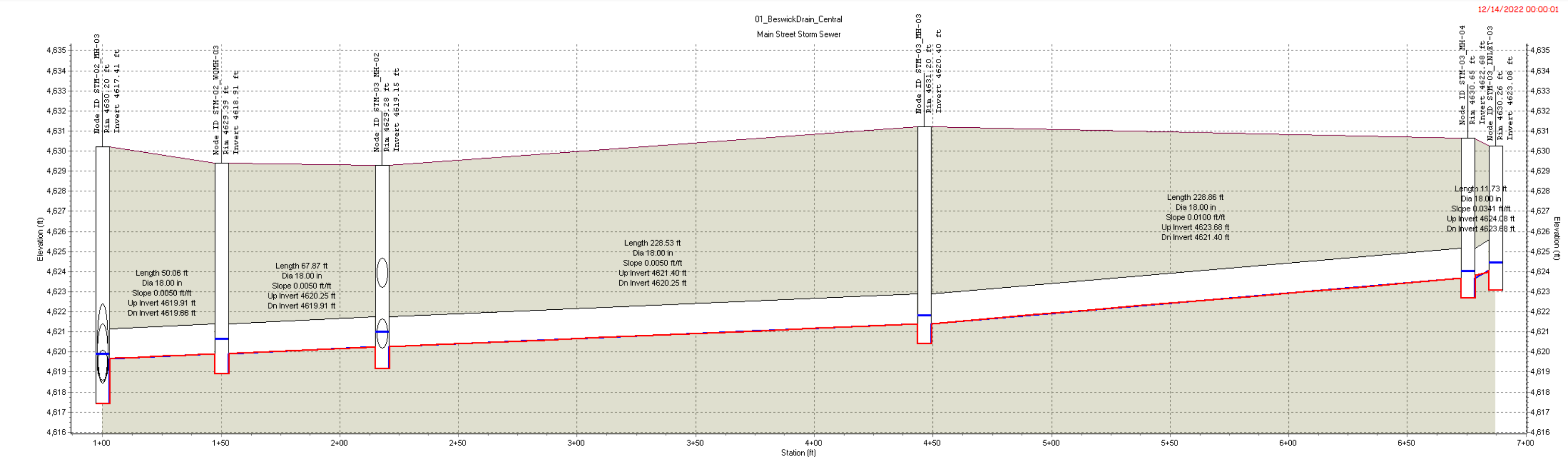
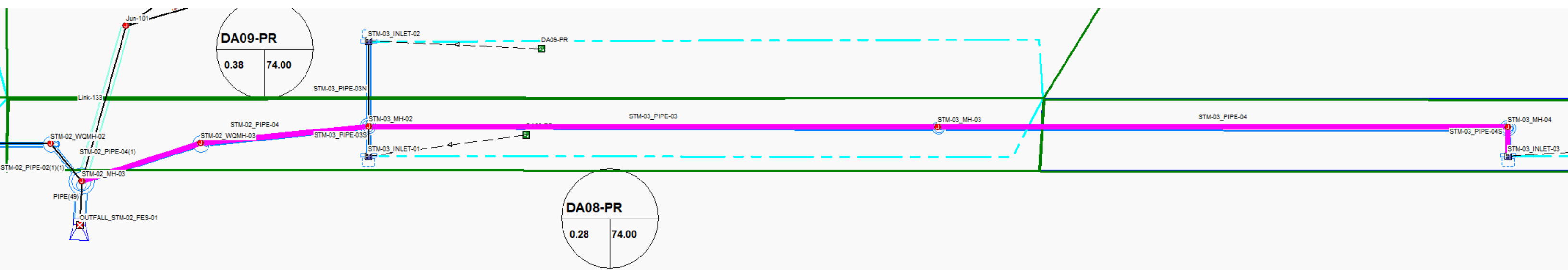


01_BeswickDrain_Central
Main Street Storm Sewer

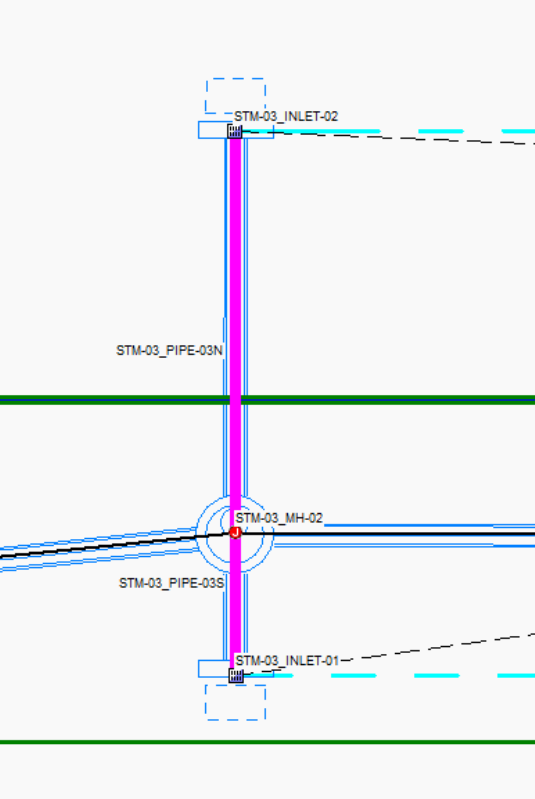
12/14/2022 00:00:01



Node ID:	Jun-101	Out-10
Rim (ft):	4628.84	4628.21
Invert (ft):	4617.59	4626.21
Min Pipe Cover (ft):	3.75	0.50
Max HGL (ft):	4619.98	4626.81
Link ID:	Link-131	
Length (ft):	10.06	
Dia (in):	18.00	
Slope (ft/ft):	0.2604	
Up Invert (ft):	4626.21	
Dn Invert (ft):	4623.59	
Max Q (cfs):	6.21	
Max Vel (ft/s):	13.19	
Max Depth (ft):	0.47	

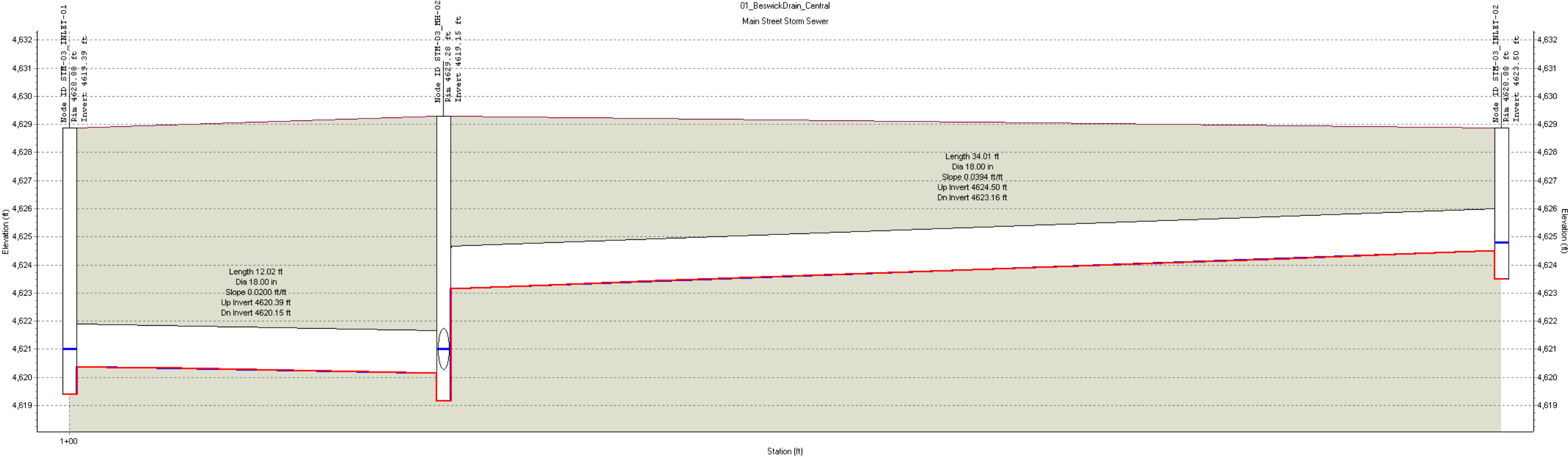


Node ID:	STM-02_MH-03	STM-02_WQMH-03	STM-03_MH-02	STM-03_MH-03	STM-03_MH-04
Rim (ft):	4630.20	4629.39	4629.28	4631.20	4630.65
Invert (ft):	4617.41	4618.91	4619.15	4620.40	4622.68
Min Pipe Cover (ft):	7.79	7.98	4.62	8.30	5.47
Max HGL (ft):	4619.87	4620.64	4620.99	4621.79	4624.01
Link ID:	STM-02_PIPE-04(1)	STM-02_PIPE-04	STM-03_PIPE-03	STM-03_PIPE-04	STM-03_PIPE-04S
Length (ft):	50.06	67.87	228.53	228.86	11.73
Dia (in):	18.00	18.00	18.00	18.00	18.00
Slope (ft/ft):	0.0050	0.0050	0.0050	0.0100	0.0341
Up Invert (ft):	4619.91	4620.25	4621.40	4623.68	4624.08
Dn Invert (ft):	4619.66	4619.91	4620.25	4621.40	4623.68
Max Q (cfs):	3.13	3.13	1.21	1.22	1.23
Max Vel (ft/s):	3.94	3.64	1.99	3.75	4.07
Max Depth (ft):	0.69	0.73	0.56	0.36	0.34

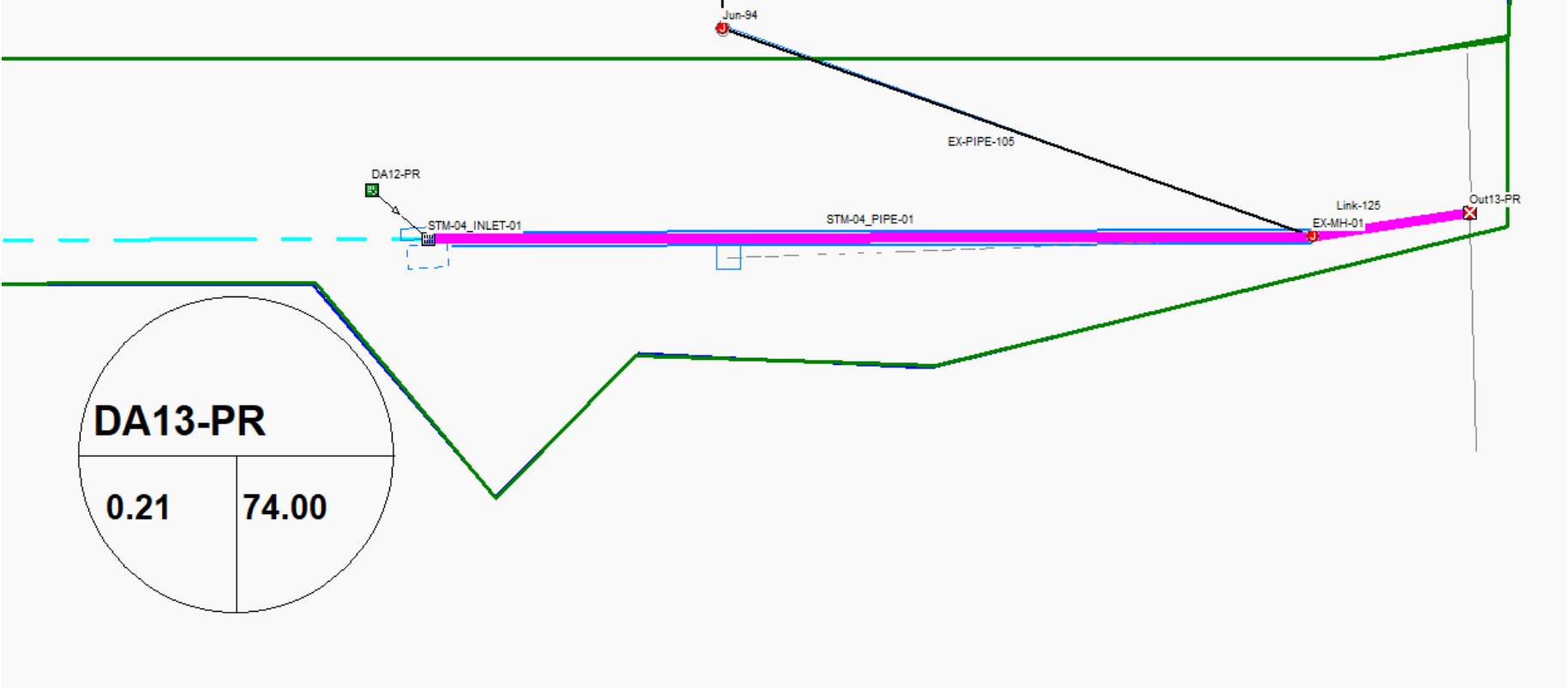


01_BeswickDrain_Central
Main Street Storm Sewer

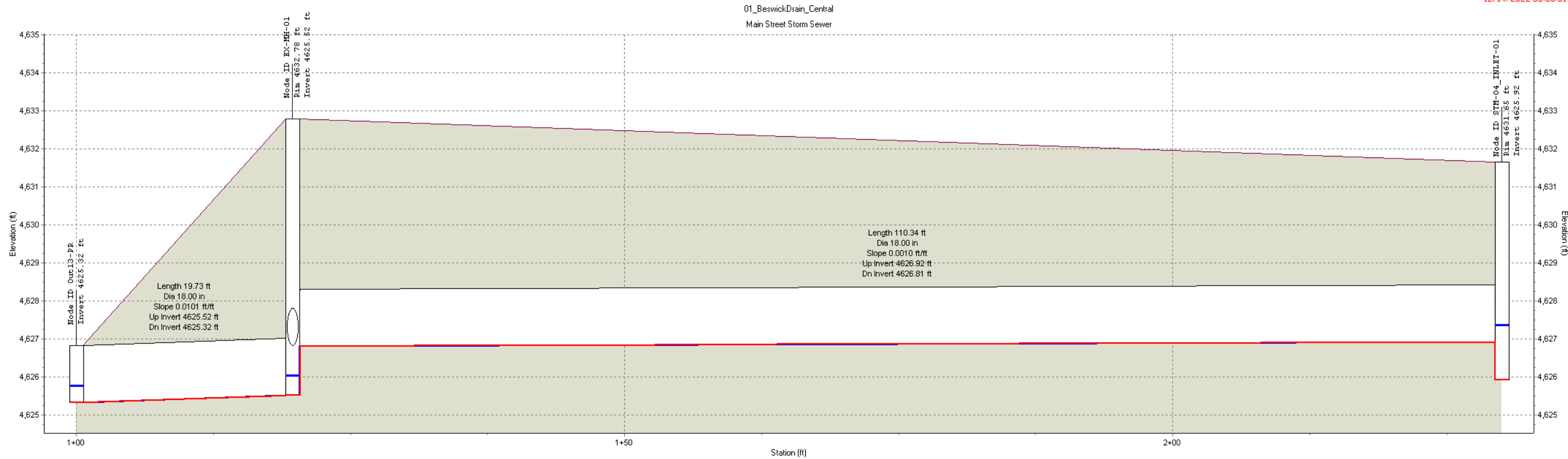
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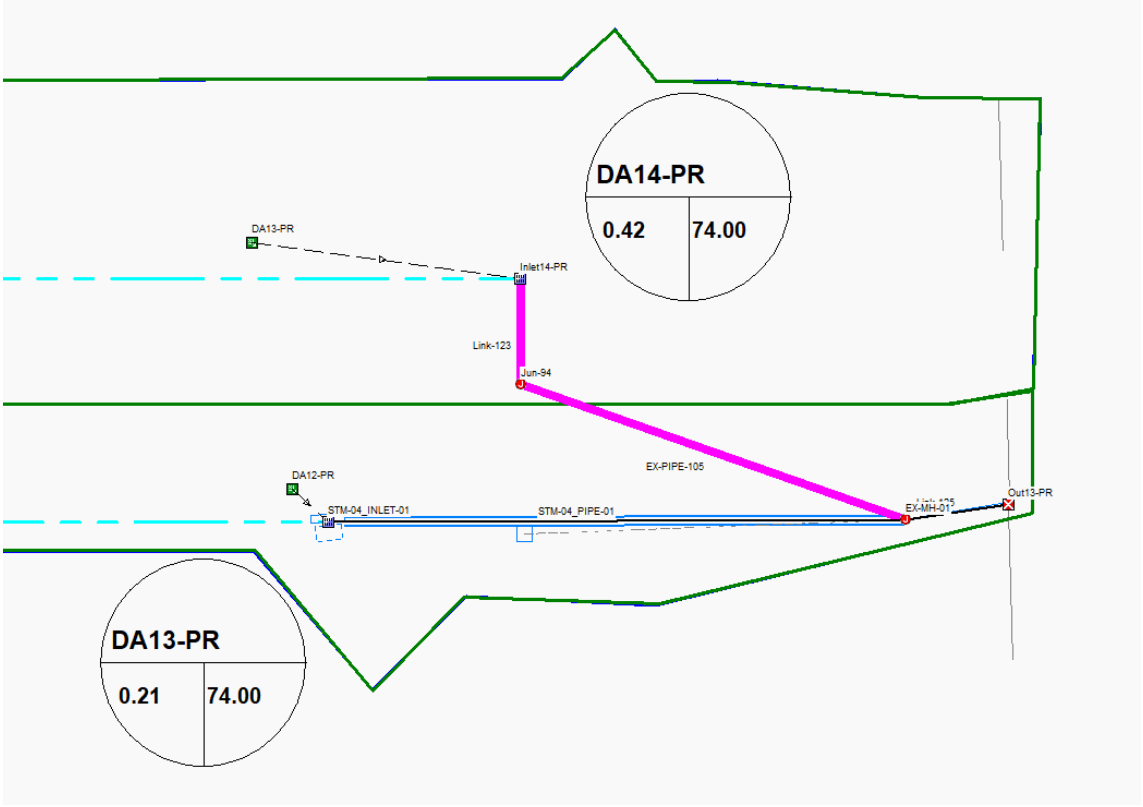
Node ID:	STM-03_MH-02		
Rim (ft):	4628.88	4629.28	4628.88
Invert (ft):	4619.39	4619.15	4623.50
Min Pipe Cover (ft):		4.62	
Max HGL (ft):	4621.00	4620.99	4624.77
Link ID:	STM-03_PIPE-03S		STM-03_PIPE-03N
Length (ft):	12.02		34.01
Dia (in):	18.00		18.00
Slope (ft/ft):	0.0200		0.0394
Up Invert (ft):	4620.39		4624.50
Dn Invert (ft):	4620.15		4623.16
Max Q (cfs):	0.82		1.15
Max Vel (ft/s):	1.29		5.87
Max Depth (ft):	0.72		0.25



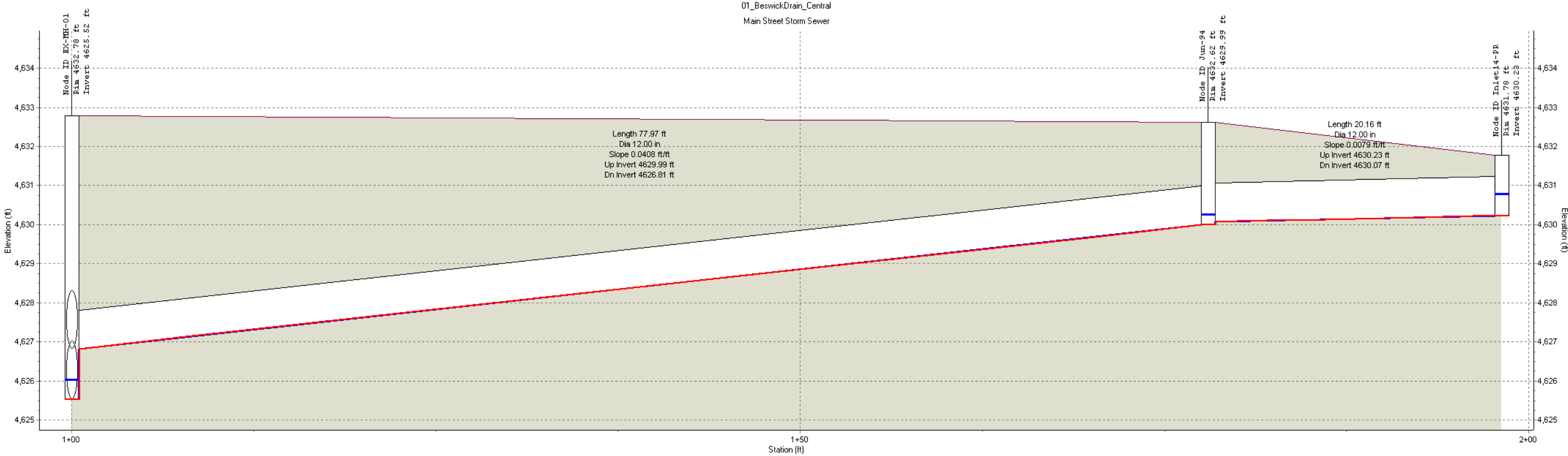
12/14/2022 00:00:01



Node ID: Rim (ft): Invert (ft): Min Pipe Cover (ft): Max HGL (ft):	Out13-PR		EX-MH-01		STM-04_PIPE-01	
			4632.78		4631.65	
	4625.32		4625.52		4625.92	
			4.47			
	4625.75		4626.03		4627.35	
Link ID:	Link-125				STM-04_PIPE-01	
Length (ft):	19.73				110.34	
Dia (in):	18.00				18.00	
Slope (ft/ft):	0.0101				0.0010	
Up Invert (ft):	4625.52				4626.92	
Dn Invert (ft):	4625.32				4626.81	
Max Q (cfs):	1.66				0.61	
Max Vel (ft/s):	3.50				1.87	
Max Depth (ft):	0.47				0.36	



12/14/2022 00:00:01



Node ID:	EX-MH-01		Jun-94		Inlet14-PR
Rim (ft):	4632.78		4632.62		4631.78
Invert (ft):	4625.52		4629.99		4630.23
Min Pipe Cover (ft):	4.47		1.55		
Max HGL (ft):	4626.03		4630.25		4630.77
Link ID:	EX-PIPE-105			Link-123	
Length (ft):	77.97			20.16	
Dia (in):	12.00			12.00	
Slope (ft/ft):	0.0408			0.0079	
Up Invert (ft):	4629.99			4630.23	
Dn Invert (ft):	4626.81			4630.07	
Max Q (cfs):	1.05			1.05	
Max Vel (ft/s):	6.72			2.79	
Max Depth (ft):	0.25			0.48	

APPENDIX D

Manhole Calculations

Manhole Calculation Summary

Date: May 29, 2025

To:

From: KLJ (Jason Reimer)

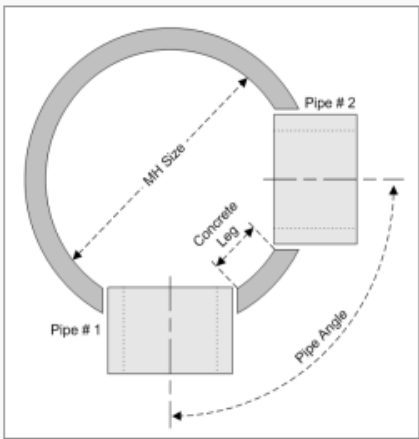
RE:

STM-01 MH-01

STA 202+22.13, 394.74 RT

Cretex Manhole Calculator

Manhole Sizing Calculations Cretex Concrete Products



60" MANHOLE
Minimum Diameter Required
Leg Width (inches): 14.1

Pipe 1 Type: RCP
Size (inches): 24
Hole Req'd (inches): 34
48" Minimum Manhole Required For Size Specified

Pipe 2 Type: RCP
Size (inches): 24
Hole Req'd (inches): 34
48" Minimum Manhole Required For Size Specified

Pipe Angle (degrees): 96

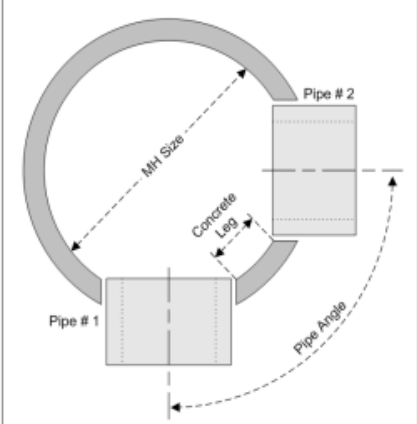
Print Calculate Reset

STM-01 MH-02

STA 201+37.56, 403.76 RT


Cretex Manhole Calculator

Manhole Sizing Calculations
Cretex Concrete Products



60" MANHOLE
Minimum Diameter Required
Leg Width (inches): 13.1

Pipe 1 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe 2 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe Angle (degrees): 94

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

Print Calculate Reset

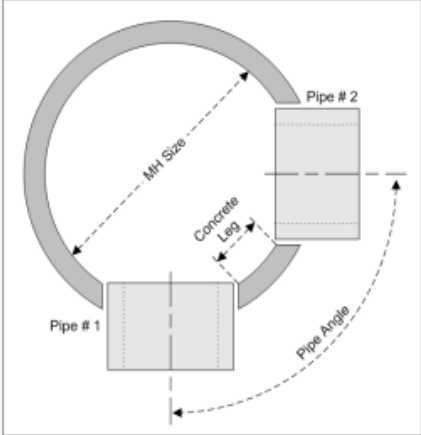
STM-01 MH-03

STA 202+23.48, 15.04 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



60" MANHOLE
Minimum Diameter Required
Leg Width (inches): 11

Pipe 1 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe 2 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe Angle (degrees): 90

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

Print Calculate Reset

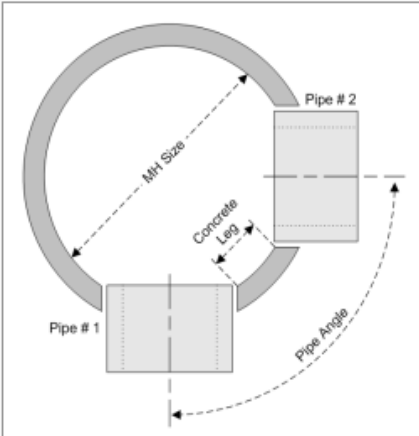
STM-01 MH-04

STA 204+90.74, 15.58 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



72" MANHOLE
Minimum Diameter Required
Leg Width (inches): 8

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe Angle (degrees): 62

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

Print

Calculate

Reset

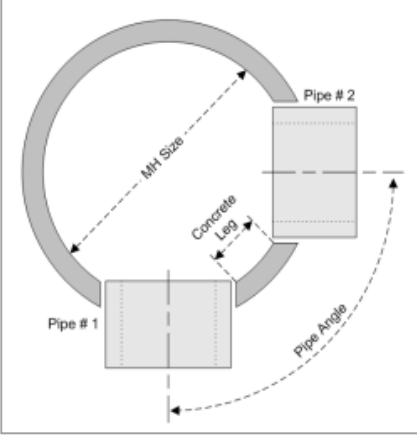
STM-01 MH-05

STA 206+62.86, 15.77 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 6

Pipe 1 Type: RCP
Size (inches): 18
Hole Req'd (inches): 26

Pipe 2 Type: RCP
Size (inches): 18
Hole Req'd (inches): 26

Pipe Angle (degrees): 80

Print

Calculate

Reset

48" Minimum Manhole Required For Size Specified

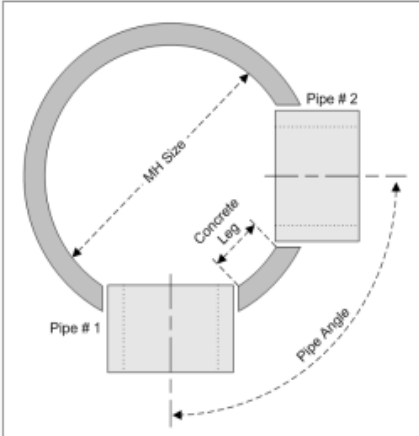
48" Minimum Manhole Required For Size Specified

STM-01 MH-07
STA 213+17.43 15.71 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 10.2

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 90

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

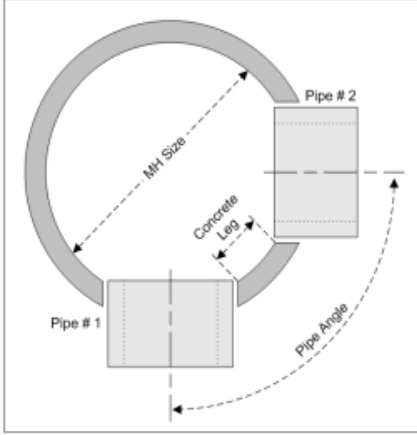
Print Calculate Reset

STM-01 MH-10

STA 203+30.07, 15.25 RT


Cretex Manhole Calculator

Manhole Sizing Calculations
Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 37.6

Pipe 1 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe 2 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe Angle (degrees): 180

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

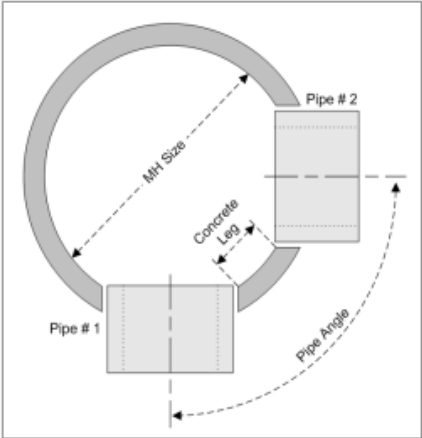
STM-01 MH-11

STA 202+22.40, 325.52 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 37.6

Pipe 1 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe 2 Type: RCP

Size (inches): 24

Hole Req'd (inches): 34

Pipe Angle (degrees): 180

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

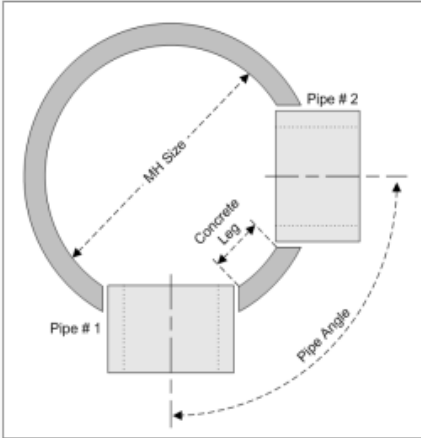
Print Calculate Reset

STM-01 WQMH-01
STA 209+90.14 15.74 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 47.9

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 180

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

Print Calculate Reset

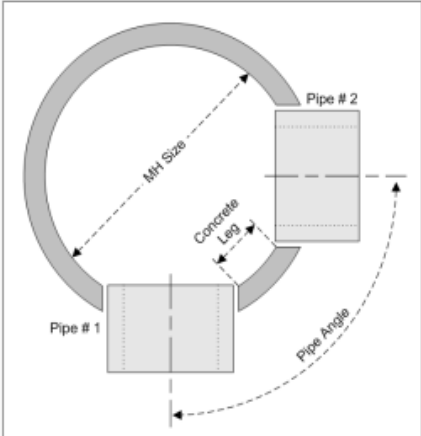
STM-02 MH-01

STA 222+62.50, 17.32 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 10.2

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 90

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

Print Calculate Reset

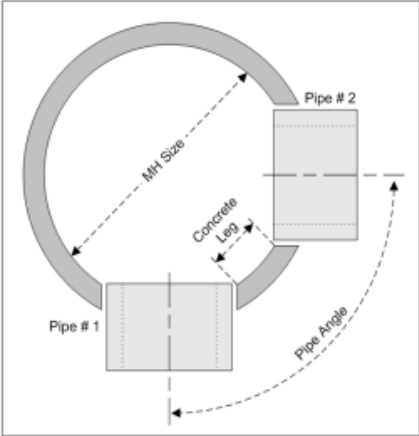
STM-02 MH-02

STA 225+32.65, 18.50 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 47.9

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 180

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

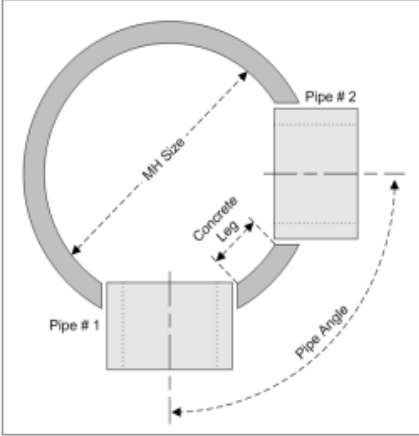
Print Calculate Reset

STM-02 MH-03

STA 225+32.65, 18.50 RT

Cretex Manhole Calculator

Manhole Sizing Calculations
Cretex Concrete Products



96" MANHOLE
Minimum Diameter Required
Leg Width (inches): 7.8

Pipe 1 Type: RCP

Size (inches): 36

Hole Req'd (inches): 48

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 55

60" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

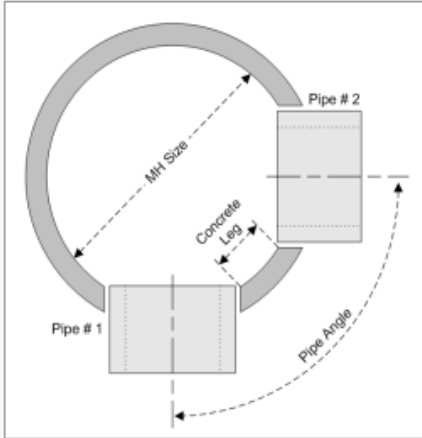
Print Calculate Reset

STM-02 WQMH-02

STA 228+60.53, 33.48 RT


Cretex Manhole Calculator

Manhole Sizing Calculations
Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 27

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 130

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

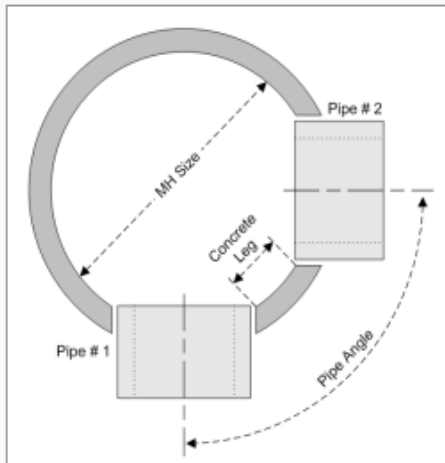
Print Calculate Reset

STM-02 WQMH-03

STA 229+08.53, 18.41 RT

Cretex Manhole Calculator

Manhole Sizing Calculations Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 42.9

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

48" Minimum
Manhole Required
For Size Specified

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

48" Minimum
Manhole Required
For Size Specified

Pipe Angle (degrees): 168

Print

Calculate

Reset

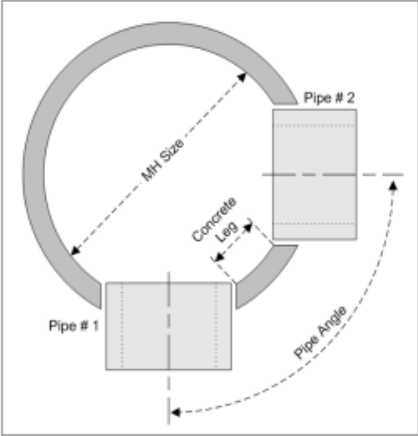
STM-03 MH-02

STA 229+75.76, 11.498 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 7.7

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 84

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

Print Calculate Reset

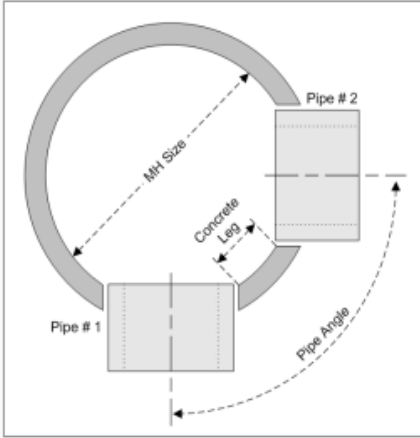
STM-03 MH-03

STA 232+04.80, 12.09 RT

 Cretex Manhole Calculator

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE
Minimum Diameter Required
Leg Width (inches): 47.9

Pipe 1 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe 2 Type: RCP

Size (inches): 18

Hole Req'd (inches): 26

Pipe Angle (degrees): 180

48" Minimum Manhole Required For Size Specified

48" Minimum Manhole Required For Size Specified

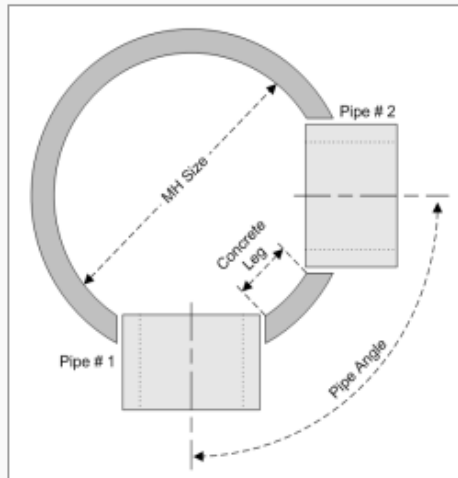
Print Calculate Reset

STM-03 MH-04

STA 234+33.26, 12.18 RT

Manhole Sizing Calculations

Cretex Concrete Products



48" MANHOLE

Minimum Diameter Required

Leg Width (inches): 10.2

Pipe 1 Type:

RCP

48" Minimum
Manhole Required
For Size Specified

Size (inches):

18

Hole Req'd (inches):

26

Pipe 2 Type:

RCP

48" Minimum
Manhole Required
For Size Specified

Size (inches):

18

Hole Req'd (inches):

26

Pipe Angle (degrees):

90

Print

Calculate

Reset

APPENDIX E

Completed Mesa County Stormwater Management Manual Checklist

Table 302
Stormwater Management Manual
Drainage Report Checklist

- Instructions:**
1. Applicant to identify with a "check-mark" if information is provided with report. If applicant believes information is not required, indicate with "n/a" and attach separate sheet with explanation
 2. The reviewer will determine if information labeled "n/a" is required and whether information must be submitted.
 3. Those items noted with an "asterisk" are not typically required for conceptual/preliminary report. Applicant shall confirm this with local jurisdiction.
 4. Submit three (3) copies of report and include copy of check list bound with report.

TITLE PAGE

- A. Type of report (Conceptual/Preliminary or Final Drainage Report).
- B. Project Name.
- C. Preparer name, firm, address, number, and date.
- D. Professional Engineer's seal of preparer.
- E. Certifications (see SWMM Section 303.1)

I. INTRODUCTION

- A. Background
 1. Identify report preparer and purpose.
 2. Identify date of letter with previous County comments.
- B. Project Location
 1. Identify Township, Range, and Section.
 2. Identify adjacent street and subdivision names.
 3. Reference to General Location Map.
- C. Property Description
 1. Identify area in acres of entire contiguous ownership.
 2. Describe existing ground cover, vegetation, soils, topography and slopes.
 3. Describe existing drainage facilities, such as channels, detention areas, or structures.
 4. Describe existing irrigation facilities, such as ditches, head-gates, or diversions.
 5. Identify proposed types of land use and encumbrances.
- D. Previous Investigations
 1. Identify drainage master plans that include the project area, including floodplain studies.
 2. Identify drainage reports for adjacent development.

II. DRAINAGE SYSTEM DESCRIPTION

- A. Existing Drainage Conditions
 1. Describe existing topography and provide map with contours extending a minimum of 100 feet beyond property limits.
 2. Identify major drainageway or outfall drainageway and describe map showing location of proposed development within the drainageways.
 3. Identify pre-developed drainage patterns and describe map showing pre-developed sub-basins and concentrated discharge locations. Provide calculations of pre-developed peak flows entering and leaving the site.
- B. Master Drainage Plan
 1. Describe location of the project relative to a previously prepared master drainage plan, including drainage plans prepared for adjacent development.
- C. Offsite Tributary Area

✓
N/A

✓
✓
✓

✓
✓

✓
✓
✓

✓
✓

✓

✓

✓

N/A

✓

✓

✓

✓
N/A *

N/A *

✓

✓

✓ *

✓ *

✓ *

✓ *

III. DRAINAGE ANALYSIS AND DESIGN CRITERIA

A. Regulations

✓

✓

1. Identify that analysis and design was prepared in accordance with the provisions of the Manual.
2. Identify other regulations or criteria which have been used to prepare analysis and design.

B. Development Criteria

✓

✓

1. Identify drainage constraints placed on the project, such as by a major drainage study, floodplain study or other drainage reports relevant to the project.
2. Identify drainage constraints placed on the project, such as from major street alignments, utilities, existing structures, and other developments.

C. Hydrologic Criteria

(If Manual was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information where the criteria used deviates from the Manual.)

✓

✓

✓

1. Identify developed storm runoff peak flows and volumes and how they were determined, including rainfall intensity or design storm.
2. Identify which storm events were used for minor and major flood analysis and design.
3. Identify how and why any other deviations from the Manual occurred.

D. Hydraulic Criteria

(If Manual was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information where the criteria used deviates from the Manual.)

✓ *

✓ *

1. Identify type(s) of streets within and adjacent to development and source for allowable street capacity.
2. Identify which type(s) of storm inlets were analyzed or designed and source for allowable capacity.
3. Identify which type of storm sewers which were analyzed or designed and

- ☒ * Manning's n-values used.
- ☒ * 4. Identify which method was used to determine detention volume requirements and how allowable release rates were determined.
- ☒ * 5. Identify how the capacity of open channels and culverts were determined.
- ☒ * 6. Identify any special analysis or design requirements not contained with the Manual.
- ☒ * 7. Identify how and why any other deviations from the Manual occurred.
- E. Variance from Criteria
 - ☒ 1. Identify any provisions of the Manual for which a variance is requested.
 - ☒ 2. Identify pre-existing conditions which cause the variance request.

***IV. POST CONSTRUCTION STORMWATER MANAGEMENT. See Manual Section 1600 for requirements.**

Note: This section of the Final Drainage Report identifies additional information required by Mesa County's, City of Grand Junction's, and Town of Palisade's, Permit for Stormwater Discharges Associated with Municipal Separate Storm Sewer Systems (MS4s), permit No. COR-090000. The Final Drainage Plan and the Construction SWMP (see SWMM Section 1500) meets the requirements of the MS4s Permit. In general, this section identifies permanent BMP practices to control the discharge of pollutants after construction is complete.

- *A. Stormwater Quality Control Measures
 - ☒ * 1. Describe the post-construction BMPs to control discharge of pollutants from the project site.
 - ☒ * 2. If compensating detention is provided, discuss practices to address water quality from area not tributary to detention area.
 - ☒ * 3. If underground detention is proposed, discuss how water quality facilities will be provided on the surface.
 - ☒ 4. If proprietary BMPs are proposed, provide the justification and sizing requirements (see SWMM Section 1603.3).
- *B. Calculations
 - ☒ 1. Provide methods and calculations for WQCV, sediment storage, and water quality outlet structure.

V. CONCLUSIONS

- A. Compliance with Manual
 - ☒ Compliance with Manual and other approved documents, such as drainage plans and floodplain studies.
- B. Design Effectiveness
 - ☒ Effectiveness of drainage design to control impacts of storm runoff.
- C. Areas in Flood Hazard Zone
 - ☒ Meet requirements of Floodplain Regulations: Mesa County Land Development Code, Section 7.13; City of Grand Junction Zoning and Development Code, Section 7.1.
- D. Variances from Manual
 - ☒ Applicant shall identify any requested variances and provide basis for approving variance. If no variances are requested, applicant shall state that none are requested.

VII. REFERENCES

Provide a reference list of all criteria, master plans, drainage reports, and technical information used.

TABLES

Include copy of all tables prepared for report.

FIGURES

- A. General Location Map (See Section 303.2a)

N/A
 ✓
 ✓

- B. Flood Plain Information
 C. Drainage Plan (See Section 303.2b)
 D. Other pertinent figures.

APPENDICIES

A. DESIGN CHARTS

1. Provide copy of all design charts (i.e.: tables, figures, charts from other criteria) used for the report.

✓

B. HYDROLOGIC CALCULATIONS (see Manual Sections 600 and 700)

1. Land use assumptions for off-site runoff calculations.
 2. Time of concentration and runoff coefficients for pre-existing and post development conditions.
 3. Pre-developed hydrologic computations.
 4. Developed conditions hydrologic computations.

✓

✓

✓

✓

C. HYDRAULIC CALCULATIONS

1. Capacity of existing channels, streets, storm sewers, inlets, culverts and other facilities.
 2. Calculations for existing storm sewer and open channel.
 3. Irrigation ditch flows and ditch system capacity.
 4. Detention pond design (see Manual, Section 1400 for requirements).
 a. Storage volume, release rates, and pool elevations for 10-year and 100-year storm.
 b. Outlet structure dimensions, orifice diameter, weir lengths, pipe headwater and other data.
 c. Outlet velocity and energy dissipation requirements.
 d. Routing of outlet flows and emergency spillway flows.
 5. Street capacity calculations, if data in Manual not used (see Section 1100).
 6. Storm inlet capacity calculations, if data in Manual not used (see Section 1100).
 7. Storm sewer capacity calculations, if data in Manual not used (see Section 1000).
 8. Channel capacity calculations, if data in Manual not used (see Section 800).
 9. Culvert capacity calculations (see Manual, Section 1200).
 10. Other hydraulic structure calculations (see Manual, Section 900).

✓

✓

N/A *

N/A *

N/A *

N/A *

N/A *

✓ *

✓ *

✓ *

✓ *

✓ *

✓ *

D. STORMWATER QUALITY CALCULATIONS

1. Water Quality Capture Volume (WQCV).
 2. Storage volume for sediment volume and pool elevations for WQCV.
 3. Outlet calculations for required area per row, diameter of individual holes, number of holes per row, and number of holes per column.

✓

✓ *

*

✓

CERTIFICATION – PROFESSIONAL ENGINEER’S SEAL AND SIGNATURE

ACKNOWLEDGEMENTS

Drainage Report checklist was prepared by: _____

Table 303
Stormwater Management Manual
Drainage Plan Checklist

- Instructions:**
1. Applicant to identify with a "check-mark" if information is provided. If applicant believes information is not required, indicate with "n/a".
 2. County will determine if information labeled "n/a" is required and whether information must be submitted.

I. EXISTING FACILITIES

- | | | |
|---|--|---|
| ✓ | | A. Contours at two foot intervals, based on USGS datum. Contours to extend at least 50 feet past property line. |
| ✓ | | B. Location and elevation of USGS benchmarks or benchmarks referenced to USGS. |
| ✓ | | C. Property lines. |
| ✓ | | D. Drainage easements. |
| ✓ | | E. Street names. |
| ✓ | | F. Major and minor channels and floodplains. |
| ✓ | | G. A historic drainage plan including historic basin boundaries and flow paths. |

II. PROPOSED FACILITIES

- | | | |
|-----|--|---|
| ✓ | | A. Contours at two-foot intervals, based on USGS datum. |
| ✓ | | B. Property lines. |
| ✓ | | C. Drainage easements. |
| ✓ | | D. Street names and grades. |
| ✓ | | E. Right of way and easement. |
| ✓ | | F. Finished floor elevations for protection from major storm run-off. |
| N/A | | G. Detention pond information: |
| N/A | | 1. Location of each detention pond with site at 1"=50' scale or larger with 2-foot contour intervals. |
| N/A | | 2. Inlet and outlet structure, and trickle channel design details. |
| N/A | | 3. Details of emergency spillway and channel. |
| N/A | | 4. Landscape information, including side slopes, vegetation and planting requirements. |
| N/A | | 5. Details of water quality outlet structure. |
| ✓ | | H. Channel Information: |
| ✓ | | 1. Profiles with existing and proposed grades. |
| ✓ | | 2. Cross sections on 100-foot stations showing existing and proposed topography and required rights of way. |
| ✓ | | 3. Locations and size of all existing and proposed structures. |
| ✓ | | 4. Locations and profiles of adjacent utilities. |
| ✓ | | 5. Typical channel section and lining details. |
| ✓ | | I. Storm sewer information: |
| ✓ | | 1. Alignment and location of manholes, inlets, and outlet structures. |
| ✓ | | 2. Profile of invert and pipe crown. |
| ✓ | | 3. Invert elevations at manholes and inlets. |
| ✓ | | 4. Lengths and grades between manholes and inlets. |
| ✓ | | 5. Locations and elevations of utilities adjacent to and crossing storm sewer. |
| ✓ | | 6. Easement and other O&M access geometry. |
| ✓ | | 7. Outlet details, such as end sections, headwall and wingwalls, erosion control, and vegetation. |
| ✓ | | J. Street cross sections with design 100-year flood depth. |
| ✓ | | K. Other drainage related structures and facilities, including underdrains and sump pump discharge lines. |
| ✓ | | L. Other permanent BMP measures to control pollutant discharges to the County's MS4 system. |

III. HYDRAULIC AND HYDROLOGIC INFORMATION

- A. Routing and accumulative runoff peaks at upstream and downstream ends of the site and at various critical points onsite for initial and major storms. Inflow and outflow from each subbasin shall be shown for both initial and major storms.
- B. Street cross sections showing 100-year flood levels.
- C. Major and minor channels and floodplains.
- D. Detention pond data:
 - 1. Release rates for 10- and 100-year storm events.
 - 2. Required and provided volumes for 10- and 100-year storm events.
 - 3. Design depths for 10- and 100-year storm events.
 - 4. Water quality capture volume and pool elevation.
- E. Channel data:
 - 1. Water surface profiles.
 - 2. Representative 100-year flow velocity and Froude number.
- F. Storm sewer data:
 - 1. Profile of water surface for design flow rate.
 - 2. Peak flows for design flow, 2-year and 100-year storm events.

IV. STANDARD NOTES

- A. No building, structure, or fill will be placed in the detention areas and no changes or alterations affecting the hydraulic characteristics of the detention areas will be made without the approval of the County.
- B. Maintenance and operation of the detention and water quality areas is the responsibility of property owner. If owner fails in this responsibility, the County has the right to enter the property, maintain the detention areas, and be reimbursed for costs incurred.
- C. Detention pond volumes, all drainage appurtenances, and basin boundaries shall be verified. As-built drawings shall be prepared by a registered professional engineer prior to issuance of certificate of occupancy for any structure within the development.
- D. Permission to reproduce these plans is hereby given to Mesa County for County purposes associated with plan review, approval, permitting, inspection and construction of work.

V. PROFESSIONAL ENGINEER'S SEAL AND SIGNATURE

VI. OTHER

- A. Horizontal and vertical control information and ties to existing and proposed features.

ACKNOWLEDGEMENTS

Drainage Plan checklist was prepared by: _____

Not Applicable Explanation	
Item	Comment
DRAINAGE REPORT CHECKLIST	
I.A.2	No previous comments provided from County
II.B.1	No previous master drainage plan available
II.D.3	No detention structures
II.D.4	No ponds
VII.B	Project not within floodplain
VII.C.4	No detention structures
DRAINAGE PLAN CHECKLIST	
II.G	No ponds
III.B	Outside of 100-yr floodplain
III.D	No ponds
III.E	No channels modeled
IV	City project, not developer

APPENDIX F

Stormwater Quality Manhole Flow Calculations

	Peak Flow(cfs)				Peak Flow(cfs)	
	2-Year	100-Year			2-Year	100-Year
DA01-EX	1.30	4.60		DA01-PR	1.55	4.54
DA02-EX	20.21	103.15		DA02-PR	1.85	5.43
DA03-EX	1.08	3.16		DA03-PR	7.37	37.33
DA04-EX	0.28	0.84		DA04-PR	0.64	8.64
DA05-EX	0.51	6.62		DA05-PR	12.01	64.61
DA06-EX	0.12	0.37		DA06-PR	0.86	2.54
DA07-EX	0.18	0.65		DA07-PR	0.64	1.89
				DA08-PR	0.28	0.83
				DA09-PR	0.39	1.15
				DA10-PR	0.48	6.22
				DA11-PR	0.42	1.23
				DA12-PR	0.2	0.62
				DA13-PR	0.29	1.06
	23.68	119.39			26.98	136.09
	Variance (PR minus EX)					
West Basin (Odelberg Drain)	0.83	9.64				
Center Basin (Beswick Drain)	2.28	6.40				
East Basin (30 Rd)	0.19	0.66				
Total:	3.30	16.70				
Manhole			Contributing Subbasins		Location	
STM 01 - WQMH 01	12.01	6.62	DA05		West Basin	
STM 02 - WQMH 02	1.5	4.43	DA06 & DA07		West Side Boswick Drain	
STM 02 - WQMH 03	1.09	3.21	DA08, DA09, DA11		East Side Boswick Drain	
	14.6	14.26				
Left to Treat/Overtreated	-11.3					

APPENDIX F

Storm Sewer Water Quality Manhole Calculations

	Peak Flow(cfs)				Peak Flow(cfs)	
	2-Year	100-Year			2-Year	100-Year
DA01-EX	1.30	4.60		DA01-PR	1.55	4.54
DA02-EX	20.21	103.15		DA02-PR	1.85	5.43
DA03-EX	1.08	3.16		DA03-PR	7.37	37.33
DA04-EX	0.28	0.84		DA04-PR	0.64	8.64
DA05-EX	0.51	6.62		DA05-PR	12.01	64.61
DA06-EX	0.12	0.37		DA06-PR	0.86	2.54
DA07-EX	0.18	0.65		DA07-PR	0.64	1.89
				DA08-PR	0.28	0.83
				DA09-PR	0.39	1.15
				DA10-PR	0.48	6.22
				DA11-PR	0.42	1.23
				DA12-PR	0.2	0.62
				DA13-PR	0.29	1.06
	23.68	119.39			26.98	136.09
	Variance (PR minus EX)					
West Basin (Odelberg Drain)	0.83	9.64				
Center Basin (Beswick Drain)	2.28	6.40	cfs			
East Basin (30 Rd)	0.19	0.66				
Total:	3.30	16.70	cfs			
Manhole	WQVC Design	100-year	Contributing Subbasins	Location		
STM 01 - WQMH 01	12.01	64.61	DA05	West Basin		
STM 02 - WQMH 02	1.50	4.43	DA06 & DA07	West Side Boswick Drain		
STM 02 - WQMH 03	1.09	3.21	DA08, DA09, DA11	East Side Boswick Drain		
	14.6	72.25				
Left to Treat/Overtreated	-11.3					