MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT

For

SHILOH MESA AT WOODMEN HEIGHTS

And

FINAL DRAINAGE REPORT

For

SHILOH MESA COMMERCIAL FILING NO. 1

Prepared for:
City of Colorado Springs
Engineering Development Review Division Team
30 South Nevada Avenue, Suite 401
Colorado Springs, CO 80903

On Behalf of:
Center for Strategic Ministry
8292 Woodmen Valley View
Colorado Springs, CO 80908

Prepared by:

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January 2018

Project No. 16.900.001

22492-56

Engineer's Statement:

This report and plan for the drainage design of Shiloh Mesa at Woodmen Heights and Shiloh Mesa Commercial Filing No. 1 was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

2/26/18

Gregory G. Shaner — Date
Registered Professional Engineer
State of Colorado
No. 36307

SEAL

Developer's Statement:

Center for Strategic Ministry hereby certifies that the drainage facilities for Shiloh Mesa at Woodmen Heights and Shiloh Mesa Commercial Filing No. 1 shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of Shiloh Mesa Woodmen Heights and Shiloh Mesa Commercial Filing No. 1, guarantee that final drainage design review will absolve Center for Strategic Ministry and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Center for Strategic Ministry
Business Name

By: _____
Les Krohnfeldt

Title: _____

Address: 8292 Woodmen Valley View
Colorado Springs, CO 80908

City of Colorado Springs:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

_____ 3/8/18
For the City Engineer — Date

Conditions:

TABLE OF CONTENTS

I. Introduction

Shiloh Mesa at Woodmen Heights is comprised of 112.88 acres of mixed-use development which includes uses of residential, commercial, public assembly, open space, and public right-of-way. The site was annexed into the City of Colorado Springs in August of 2004, as part of the Woodmen Heights Metropolitan District in northeastern Colorado Springs, Colorado. The entirety of the site was originally platted as Woodmen Heights No. 3, but has since undergone development of Shiloh Mesa Filing No. 1 which encompasses the entire northern half of Shiloh Mesa at Woodmen Heights, including the Marksheffel Road corridor, for a total of approximately 63 acres. Shiloh Mesa Filing No. 1 is a single-family residential development separated into four phases. Also developed is the existing Woodmen Valley Chapel, that runs along the east side of the site, bordering Mustang Road. The church plans to expand their current building footprint as well as parking accommodations. The church expansion parcel as well as the remaining area of Shiloh Mesa at Woodmen Heights (Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1) total approximately 46 acres and will contain single-family residential, commercial, and open space developments.

A. PURPOSE AND SCOPE OF STUDY

The purpose of this Master Development Drainage Plan Amendment is to identify and evaluate the offsite and onsite drainage patterns associated with the remaining undeveloped land in Shiloh Mesa at Woodmen Heights and to provide updated hydrologic and hydraulic analyses of this area to ensure compliance with the City of Colorado Springs Drainage Criteria Manual (DCM) as well as provide effective, safe routing to the downstream outfall. In addition to the MDDP, this report will also serve as a Final Drainage Report for Shiloh Mesa Commercial Filing No. 1 in order to support the Shiloh Mesa Commercial Filing No. 1 Final Plat. All individual lots will also be required to complete their own Final Drainage Report.

There have been multiple approved studies completed on the area including **"The Master Development Drainage Plan for Woodmen Heights"**, completed by Classic Engineers and Surveyors, dated June 2004 *(MDDP-Classic)*, **"The Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4"**, by Engineering and Surveying Inc, dated February, 2006 *(MDDP-ESI)*, and the **"Master Development Drainage Plan for Shiloh Mesa at Woodmen Heights"**, prepared by Matrix Design Group, Inc. dated November, 2009 *(MDDP-Matrix)*. This study will also reference the analysis completed in the approved **"Master Development Drainage Plan and Final Drainage Report for Shiloh Mesa & Shiloh Mesa Filing No. 1"**, prepared by M&S Civil Consultants, Inc., dated December, 2015 *(MDDP-F1)*. This final drainage report and amendment to the previous MDDP has completed calculations for the entire northern half of the Shiloh Mesa at Woodmen Heights parcel. As such, this report will use the approved *MDDP-F1* calculations for any design point runoff that will discharge directly onto Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1. In this report, updated analysis has been completed only for Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial

Filing No. 1. Reference has also been made to the ***"Final Hydrology and Hydraulics Report for Woodmen Road Powers to US 24"*** dated October 4, 2007 prepared by DMJM Harris – AECOM (H&H Woodmen).

B. DBPS-RELATED INVESTIGATIONS

The site lies in the upper western sub-basin of the Sand Creek Drainage Basin. This drainage basin was studied in **"*Preliminary Design of Selected Alternative, Sand Creek Drainage Basin Planning Study*"**, by Kiowa Engineering, dated March 1996 (DBPS-1996). This study will adhere to the parameters set forth in this DBPS.

C. STAKEHOLDER PROCESS

As no amendment to the most recent Drainage Basin Planning Study (DBPS-1996) is being proposed, there is no required stakeholder process.

D. AGENCY JURISDICTIONS

This project is located within the City of Colorado Springs and is subject to the design criteria set forth in the ***City of Colorado Springs Drainage & El Paso County Criteria Manual, Volumes I and II, dated May 2014 (DCM).***

E. GENERAL PROJECT DESCRIPTION

Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1 are located at the northeastern intersection of Woodmen Road and Marksheffel Road. In this study, the portion that is to be amended from the original MDDP includes the Shiloh Mesa at Woodmen Heights development south of Kenosha Drive. More specifically, the site is located as follows:

1. General Location: Southwest ¼ of Section 4, Township 13 South, Range 65 West of the 6th P.M. in the City of Colorado Springs, County of El Paso, State of Colorado.
2. Surrounding Streets: Marksheffel Road and Woodmen Road make up the western and southern boundaries of the site, respectively. The site is bound on the east side by Mustang Road and Kenosha Drive separates Shiloh Mesa Filing No. 1 from the Shiloh Mesa Commercial Filing No. 1.
3. Drainageway: As previously mentioned, the site is located in the Sand Creek Drainage Basin. Majority of the runoff from the commercial portion drains to the southwest towards the intersection of Woodmen Road and Marksheffel Road, where it is conveyed (through a combination of culvert systems and open channels) to the west, under Marksheffel Road, and then to the south, under Woodmen Road, and ultimately into the Sand Creek Channel.
4. Surrounding Developments: The site is bound by the aforementioned streets on the south, west, and east, as well as partially the north. The remainder of the site (Shiloh Mesa Filing No. 5) is bound to the north by Shiloh Mesa Filing No. 1. Bar J-B Acres is an existing single-family development located on the east side of Mustang Road.

Refer to Appendix D for the Vicinity Map.

F. DATA SOURCES

Topographical information for the site was found using a combination of ***United States Geological Survey*** (USGS) mapping as well as field surveying. The ***Web Soil Survey,*** created by the ***Natural Resources Conservation Service*** was utilized to investigate the existing general soil types within the site.

G. APPLICABLE CRITERIA AND STANDARDS

This report has been prepared in accordance to the criteria set forth in the aforementioned DCM. In addition to the DCM, the ***Urban Storm Drainage Criteria Manuals, Volumes 1 through 3***, dated 2016 have been used to supplement the City Criteria Manual.

II. Project Characteristics

A. BASIN LOCATION AND FLOWS

Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1 are located within the Sand Creek Drainage Basin, specifically the Upper Basin of Sand Creek as specified in the most recent DBPS study (DBPS-1996) completed in 1996. This study states that with any development of properties within Shiloh Mesa that release any undetained stormwater flows directly into Sand Creek will require improvements to the Sand Creek Channel as well as the design of the regional detention facility referred to as Pond #3.

B. COMPLIANCE WITH DBPS

This study complies with the latest DBPS study (DBPS-1996) of the Sand Creek basin as all developed runoff will be treated for both water quality and detention before leaving the site and discharging into Sand Creek.

C. GEOLOGY

Majority of the site is currently undeveloped and consists of natural vegetative land cover.

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group “A” is characterized by deep, well-drained coarse grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group “D” typically has a clay layer at or near to the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. See Soils Map; Appendix D. The following soil types are present in the development area:

Table 1.1 – NRCS Soil Survey for El Paso County

Soil ID Number	***Soil***	***Hydrologic Classification***	***Permeability***	***Percent on Site***
8	Blakeland loamy sand (1% - 9% slopes)	A	Rapid	16.3%
19	Columbine gravelly sandy loam (0% - 3% slopes)	A	Rapid	53.1%
71	Pring coarse sandy loam (3% - 8% slopes)	B	Moderately Rapid	30.6%

D. MAJOR DRAINAGEWAYS

As previously mentioned, Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1 are located within the Sand Creek Drainage Basin. The site is divided into three major drainageways, two of which flow in a northeastern to southwestern direction to a final onsite culmination point. The remaining drainage way also flows in a general northeast to southwest pattern before flowing offsite to the south.

The first existing natural drainage channel begins at the most northeastern corner of the site, collecting sheet flow drainage, and directing it to the southwest until reaching the intersection between Marksheffel Road and the existing road that leads to Woodmen Valley Chapel. Once flows reach this point, they are directed south by an existing culvert that runs from the north to the south underneath the existing church access road as well as the existing curb and gutter infrastructure located in the Marksheffel Road corridor to an existing D-10-R sump inlet located at the northeast intersection of Marksheffel Road and Woodmen Road.

This inlet is also the receiving point for the waters that are captured in the second natural drainageway on the site. This drainageway starts near existing Woodmen Valley Chapel and runs in the same northeastern to southwestern pattern, collecting sheet flow from the north and south as it progresses.

From this inlet, flows are routed west underneath Marksheffel Road via existing storm infrastructure before releasing the flows into three existing 48” culverts that route the runoff to the south underneath Woodmen Road and, eventually, to Sand Creek.

The remaining portion of the site (refer to Sub-basin J in the Existing Conditions Drainage Map) flows from the northeast to the southwest at slopes ranging from one to five percent. In the current conditions, this runoff appears to sheet flow to the south and exit the site before being collected in the area inlets located along the northern side of Woodmen Road. Flows are then conveyed to the south and west via existing storm infrastructure before being released into Sand Creek.

E. LAND USES

Presently, the site is unplatted and consists mostly of undeveloped land, with the exception of the existing Woodmen Valley Chapel (located along the eastern boundary of the site) and its associated paved entrance drives. Woodmen Valley Chapel plans to expand the church footprint and associated parking lots within an approximate 10.5-acre lot. The existing access drives are to be removed and access will be provided to the church by the proposed Shiloh Mesa Drive and Mulberry Wood Drive.

Shiloh Mesa Filing No. 5 is a proposed 43 lot single family residential development that consists of approximately 9.9 acres of vacant land included in the Shiloh Mesa at Woodmen Heights development. Development of utilities and roadways are to be included in this parcel.

Shiloh Mesa Commercial Filing No. 1 accounts for the remaining 25.7-acres of undeveloped land on the site. The commercial filing has been broken down to include 5 commercial lot boundaries as well as multiple road corridors with associated utilities and curb and gutter improvements.

III. Hydrologic Analysis

A. MAJOR BASINS AND SUBBASINS

Drainage generated by Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1 presently flows from the northeast to the southwest where it is captured in existing storm infrastructure and routed to Sand Creek for release. In order to adhere to the previously approved drainage studies, onsite flows will be routed to and captured in multiple onsite full spectrum detention ponds before being released in rates equal to those occurring in the current conditions.

The Water Quality Capture Volume is comprised of an Extended Detention Basin, where the “initial flush” of storm water will be drained over a 40-hour time period. The onsite ponds have been evaluated to reduce the developed flows from the site to a maximum of the historic peak flows. The detention ponds have been sized and evaluated based upon the 100-year storm events in accordance with City Criteria.

B. METHODOLOGY

Due to the multiple onsite detention facilities, the hydrology for this project uses the U.S. Environmental Protection Agency Stormwater Management Model (EPA SWMM) as

recommended by the Drainage Criteria Manual for the minor and major storms. The EPA SWMM Method is used for drainage basins less than 650-acres in size.

The EPA SWMM Method uses a variation of the Manning's which is as follows:

$$Q = \frac{1.49}{n} W S^{\frac{1}{2}} (d - d_s)^{\frac{5}{3}}$$

Where:

Q	=	Runoff flow rate in cubic feet per second (cfs)
n	=	Runoff coefficient
W	=	Average subcatchment width (ft)
$d-d_s$	=	Height (ft)
S	=	Average slope of subcatchment (ft)

Percentages of imperviousness were used based on the anticipated use of each subcatchment in the runoff calculations.

The hypothetical rainfall depths for the 1-hour storm duration were derived in the Hydrometerological Design Studies Center Precipitation Frequency Data Server (PFDS) from the NOAA Atlas 14, Volume 8, Version 2. Table 2.1 lists the rainfall depth for each of the 1-hour storm events. These 1-hour rainfall depths were used to calculated the 2-hour design storm using Table 6-3 found in the DCM which lists the "2-Hour Storm Distribution" (see Appendix B).

Table 2.1 - Colorado Springs 1-Hour Rainfall Depth

Storm Recurrence Interval	Rainfall Depth (inches)
5-year	1.50
100-year	2.52

C. BASIN HYDROLOGY

a. The ***existing conditions*** for the site have been analyzed and are presented by design points and are described as follows:

In the existing conditions, the site flows in a general northeast to southwest pattern until reaching the existing curb and gutter in Marksheffel Road at the southwest corner of the site, **Design Point 1**(Q_5 = 8.1 cfs, Q_{100} = 45.3 cfs), an existing 14' D-10R sump inlet. Design Point 1 also includes runoff from Design Point OSD2, which is an at grade inlet located at the southeastern corner of Kenosha Drive and Mulberry Wood Drive. The flowby runoff generated at this location (Q_5 = 4.8 cfs, Q_{100} = 7.2 cfs) continues south onto the site and joins with the runoff from Sub-basin EX1. Runoff from offsite Sub-basin OSD6 (1.65 acres; Q_5 = 3.0 cfs, Q_{100} = 6.3 cfs) sheet flows to the south before joining with the runoff from Sub-basin EX1. These offsite flows have been included in the design model of the onsite detention ponds. Refer to the table below for the area and storm event runoff generated by each sub-basin that contributes to Design Point 1. Due to the existing Woodmen Valley Chapel and associated parking lots, and imperviousness of 12% has been calculated for Sub-basin EX1. However, per the DCM,

an imperviousness of 2% has been used for all undeveloped calculations. Refer to Existing Conditions Drainage Map for imperviousness acreage.

Sub-Basin	Area (AC)	% Impervious	Runoff (CFS)	
			Q5	Q100
OSD6	1.65		3.0	**6.3**
EX1	34.02	2	8.1	**45.3**
EX2	14.42	2	6.6	**33.0**
L	2.35	100	7.9	**15.7**

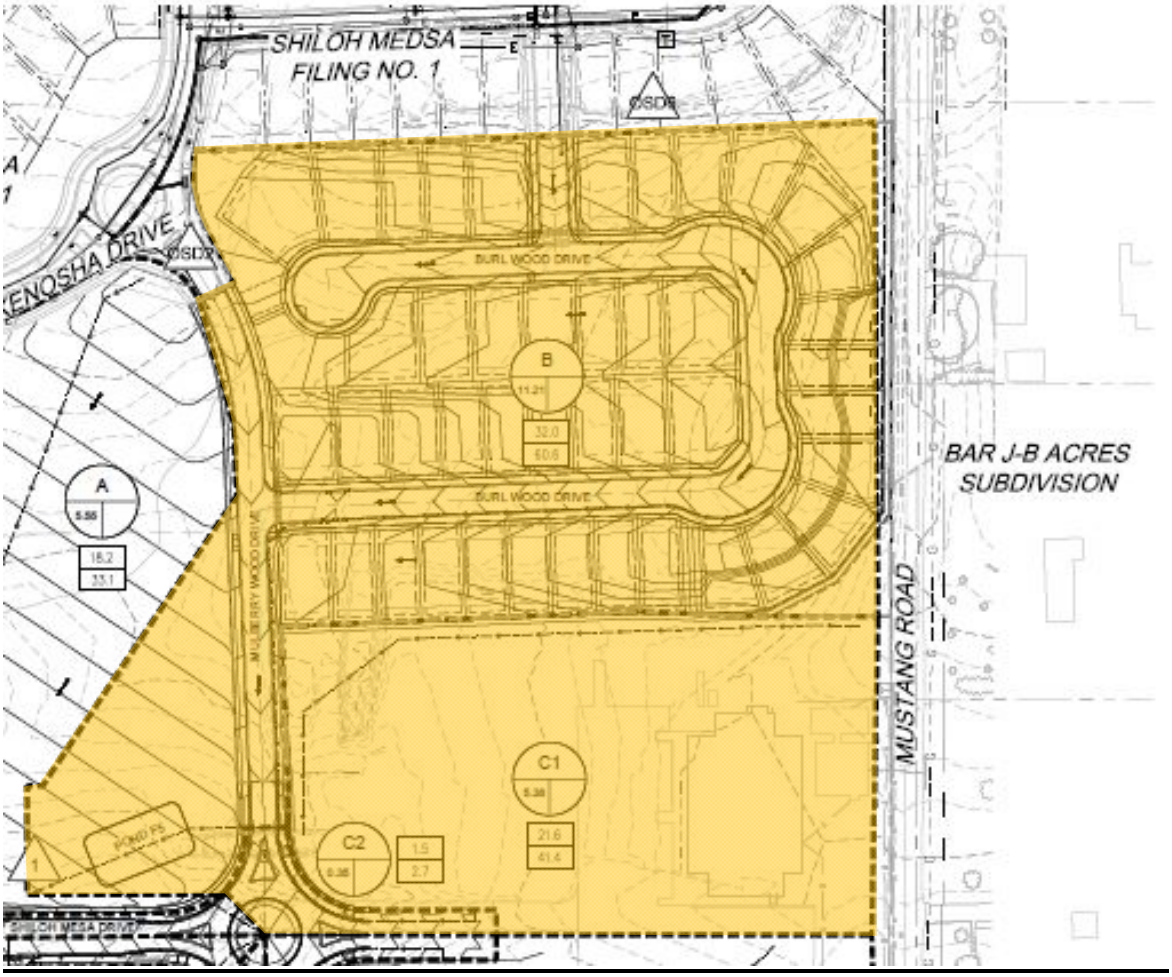
Design Point 2 is located just to the west of DP1 at a 10' D-10R sump inlet. This inlet will collect the subsurface flows from DP1 as well as the paved surface runoff from offsite Sub-basin L (2.35 acres; Q_5 = 7.9 cfs, Q_{100} = 15.7 cfs). This Sub-basin has been included to ensure that the existing storm infrastructure can accommodate the developed flows, but has not been included in any detention calculations as it does not enter onto the site. From this point, flows are directed to the west and then south via the existing storm network until being released into Sand Creek. The total site runoff calculated is equal to 15.9 cfs and 62.7 cfs in the 5-year and 100-year storm events, respectively.

Design Point 3 (Q_5 = 6.6 cfs, Q_{100} = 31.5 cfs) is located at the south end of the site where existing Sub-basin EX2 currently flows offsite, and is captured by existing storm infrastructure that conveys is to the south and west until releasing into Sand Creek. Sub-basin EX2 is comprised of 14.42 acres that flow from the northeast to the southwest. Approximately 27% of the site is impervious area from existing Woodmen Valley Chapel, as well as associated parking lots and access roads. As previously stated, and imperviousness of 2% was used for the undeveloped sub-basins which results in 6.6 cfs and 33.0 cfs in the minor and major storm events, respectively.

b. The ***fully developed conditions*** for the site are as follows:

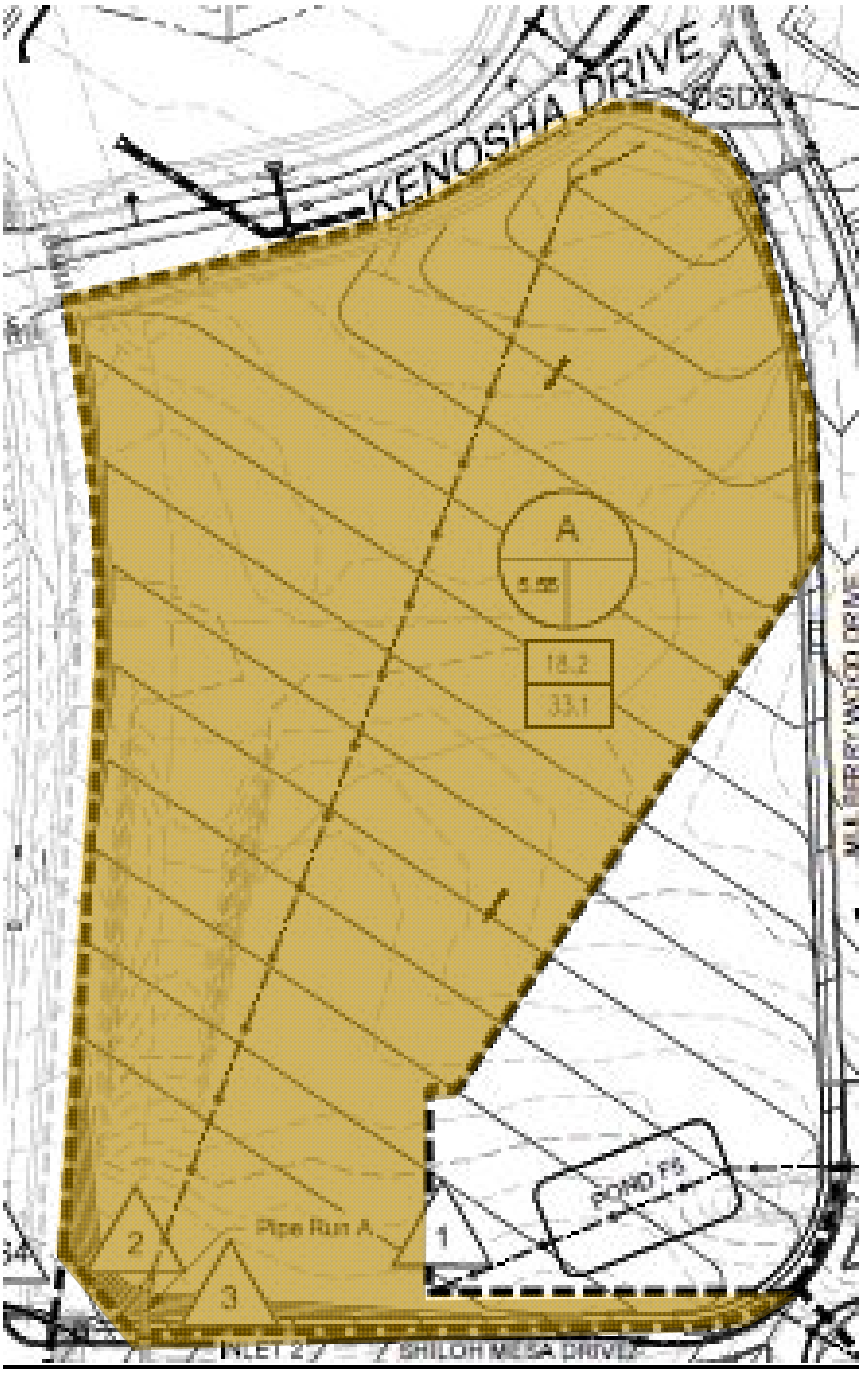
Design Point 1, shown on the next page, (Q_5 = 1.9 cfs, Q_{100} = 16.8 cfs) is located at the outlet of Pond F5. Pond F5 will accept flows from the pair of D-10R sump inlets found on Mulberry Wood Drive, just north of the proposed roundabout. These inlets will collect the street surface runoff from Mulberry Wood Drive, in addition to subsurface flow in proposed storm systems from Sub-basins B, C1, and C2. Offsite flows that contribute to this design point include Design Point OSD2 (Q_5 = 5.5 cfs, Q_{100} = 7.2 cfs) and Design Point OSD6 (Q_5 = 3.0 cfs, Q_{100} = 6.3 cfs) per ***MDDP-F1***. These flows have been integrated into the detailed design of **"Preliminary/Final Drainage Report for Shiloh Mesa Filing No. 5"** ***(FDR-F5)***, approved July 2017. Majority of Sub-basin B (11.21 acres; Q_5 = 32.0 cfs, Q_{100} = 60.6 cfs) is comprised of the proposed single-family development, Shiloh Mesa Filing No. 5. The remainder of Sub-basin B consists of proposed park and Pond F5. Runoff from this basin is collected in the subdivision's proposed curb and gutter, then conveyed to a series of sump inlets which then direct the flow in a southerly direction, to Design Point 1. ***(FDR-F5)*****,** contains specific hydraulic and hydrologic analysis of this subdivision.

Sub-basin C1 (5.38 acres; Q_5 = 21.6 cfs, Q_{100} = 52.0 cfs) contains the existing building footprint for the Woodmen Valley Chapel. In the proposed conditions, Sub-basin C1 will include additional paved parking lot and landscaped medians to accommodate the church expansion. Drainage from this sub-basin will be directed either by curb and gutter or an interior storm system to the west until it reaches the inlets of Design Point 1. Sub-basin C2 (0.35 acres; Q_5 = 1.5 cfs, Q_{100} = 3.4 cfs) collects runoff from the northeastern quarter of the proposed roundabout. Runoff from this basin drains away from the center median until reaching the proposed curb and gutter, which conveys the runoff to the proposed inlets at Design Point 1.



Design Point 2, below, (Q_5 = 18.2 cfs, Q_{100} = 42.5 cfs) is located at the proposed headwall near the northeast intersection of the existing Marksheffel Road and the proposed Shiloh Mesa Drive. This headwall collects the runoff that is released from Pond F5 and runoff from Sub-basin A (5.55 acres; Q_5 = 18.2 cfs, Q_{100} = 40.9 cfs). In the developed conditions, Sub-basin A will have multiple uses that include neighborhood

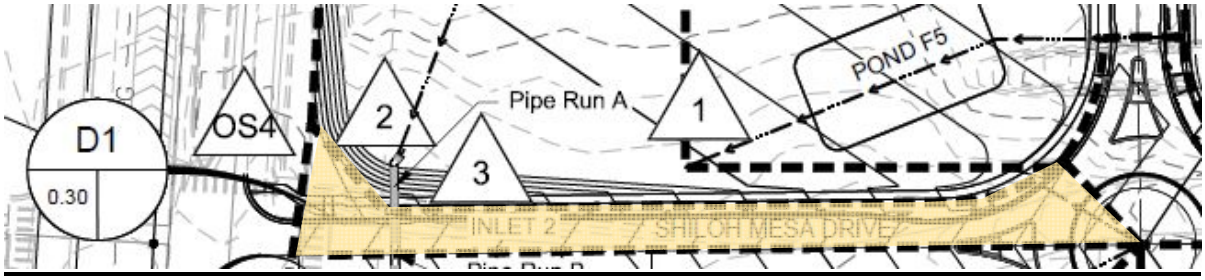
commercial area as well as a proposed park. Pipe Run A (34”x53”) will direct the collected runoff south to Design Point 3.



Design Point 3, below, (Q_5 = 19.7 cfs, Q_{100} = 45.7 cfs) is a proposed 6’ D-10R inlet in a sump condition located on the north side of Shiloh Mesa Drive, near its intersection with the Marksheffel Road corridor. This inlet, Inlet D1, subsists entirely of paved surface runoff from Sub-basin D1 (0.35 acres; Q_5 = 1.5 cfs, Q_{100} = 3.2 cfs) as well as offsite

Design Point OS4 (Q_5 = 4.0 cfs, Q_{100} = 7.6 cfs) for a total surface runoff of 5.1 cfs and 10.1 cfs in the 5-year and 100-year storm events, respectively. According to DCM Figure 8-12 (see Appendix B), this amount of surface flow requires a 6' D-10R inlet. However, per the UDFCD spreadsheet for inlet sizing, a 10' D-10R would be required to meet the design discharge. As the project is located within the City of Colorado Springs, Figure 8-12 of the DCM will be used as the governing document for all inlet sizing discrepancies.

Surface flows are combined with runoff from Design Point 2 and conveyed to the south via Pipe Run B (34" x 53" elliptical) to Inlet D2.

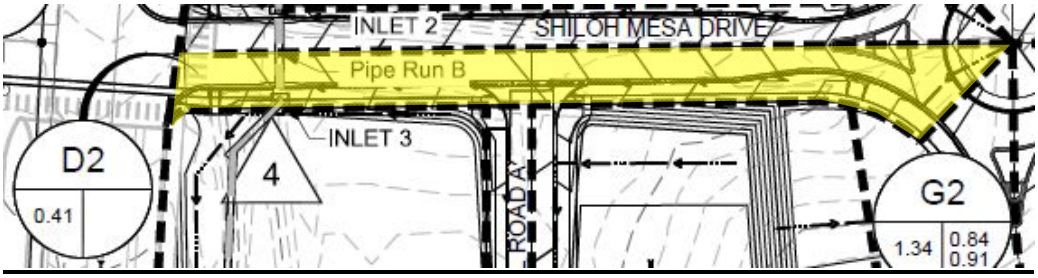


Design Point 4, on the next page, is also a D-10R sump inlet (Q_5 = 21.7 cfs, Q_{100} = 50.1 cfs). Flows from Design Point 3 combine with the surface runoff from Sub-basin D2 (0.30 acres; Q_5 = 2.0 cfs, Q_{100} = 4.4 cfs), which consists entirely of paved roadway. The surface flows will be collected by Inlet D2, which has been conservatively designed with a 6' length.

In the previously approved ***MDDP-Matrix***, runoff collected from this point is to be conveyed west via a 54" storm drain until being released into Detention Pond #3. Detention Pond #3 is an inline facility located in a portion of Sand Creek near the northwest intersection of Marksheffel Road and Woodmen Road. Per multiple previously approved drainage reports, including ***MDDP-Classic*** and ***MDDP-ESI***, Detention Pond #3 was designed to accommodate the detention and water quality required for the runoff generated from the Shiloh Mesa at Woodmen Heights Development and an eastern portion of the Woodmen Heights Metropolitan District.

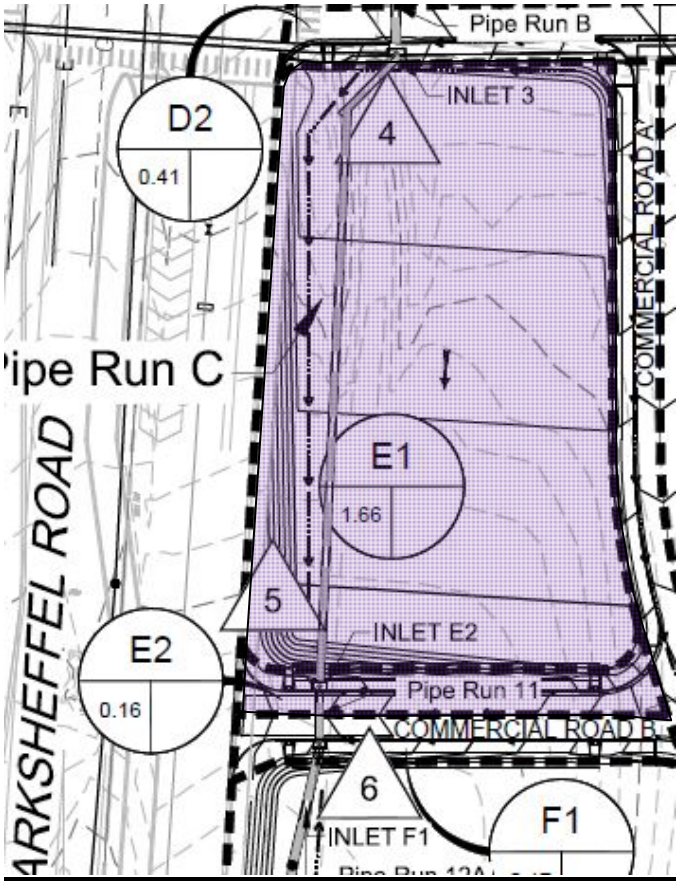
Due to budget constraints, the construction of Sand Creek Pond 3 was broken down into two phases. The first phase, which was completed in 2016, provides full spectrum detention for specific drainage basins west of Sand Creek (including water quality for approximately 128 acres and 100-year storage volume for 278 acres). The second phase, which will provide full spectrum detention for specific drainage basins east of Sand Creek to include the Shiloh Mesa at Woodmen Heights Development, is scheduled to be constructed in the future. With the development of Shiloh Mesa Filing No. 1, an onsite pond was utilized to meet the water quality and detention requirements for the filing. Similarly, Pond F5 will be used to treat the runoff from Shiloh Mesa Filing No. 5 and a portion of the Woodmen Valley Chapel site expansion.

Due to the fact that Detention Pond #3 has not yet been constructed, the runoff leaving Design Point 4 will continue to the south via Pipe Run C (34" x 53" elliptical) until releasing into Pond F.



Design Point 5, on the next page, (Q_5 = 29.5 cfs, Q_{100} = 67.9 cfs) is an 8' D-10R at grade inlet. This inlet collects the street runoff from Sub-basin E2 (0.16 acres; Q_5 = 0.8 cfs, Q_{100} = 1.8 cfs) as well as the surface runoff from commercially developed Sub-basin E1 (1.66 acres; Q_5 = 7.3 cfs, Q_{100} = 16.5 cfs). Flow-by from this inlet (Q_5 = 0.0 cfs, Q_{100} = 0.4 cfs) will be collected in the proposed pan located at the intersection of Commercial Road B and Marksheffel Road and conveyed south to Design Point 6B.

From this point, flows are carried to the south via Pipe Run 11 (42") until reaching the inlet at Design Point 6

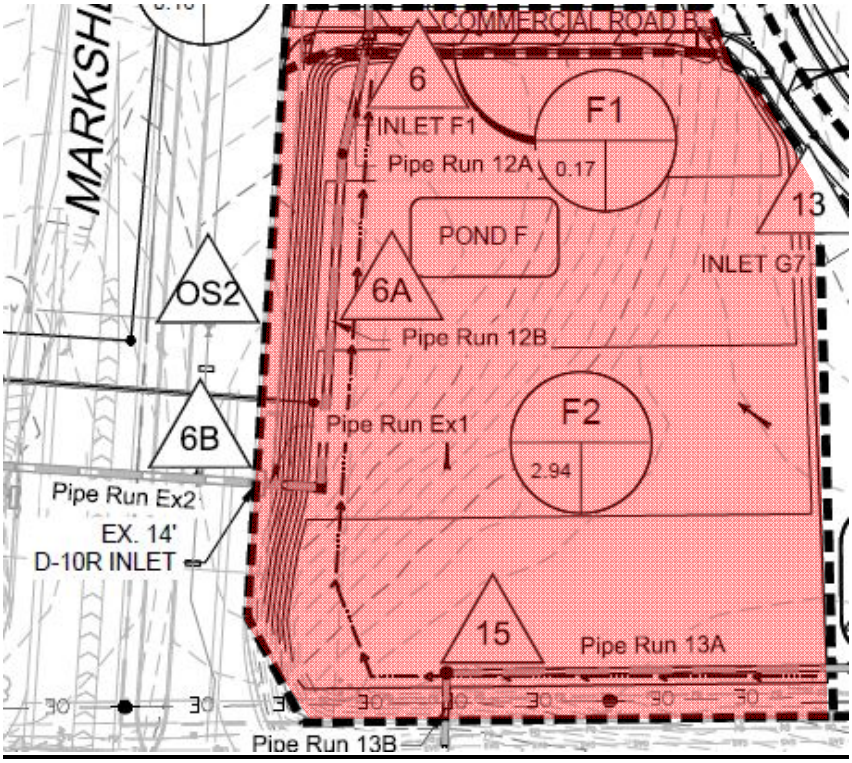


Design Point 6, on the next page, (Q_5 = 30.2 cfs, Q_{100} = 69.3 cfs), a 6' D-10R inlet in an at-grade condition, located along the southern curb and gutter of Commercial Road B. In addition to the flows entering the inlet from Design Point 5, this inlet also collects street pavement surface runoff from Sub-basin F1 (0.17 acres; Q_5 = 0.5 cfs, Q_{100} = 1.9 cfs). There is no flow-by by this inlet in the 5-year storm event. In the 100-year storm event, 0.4 cfs is produced and will be intercepted by the proposed pan and conveyed south to Design Point 6B. These flows are released into Pond F along with the runoff from Sub-basin F2.

Sub-basin F2 encompasses 2.94 acres of commercial land in the developed condition which has been calculated to generate 12.2 cfs and 28.1 cfs in the minor and major storm events, respectively. Sub-basins F1 and F2 along with the flows from DP5 will be released into Pond F.

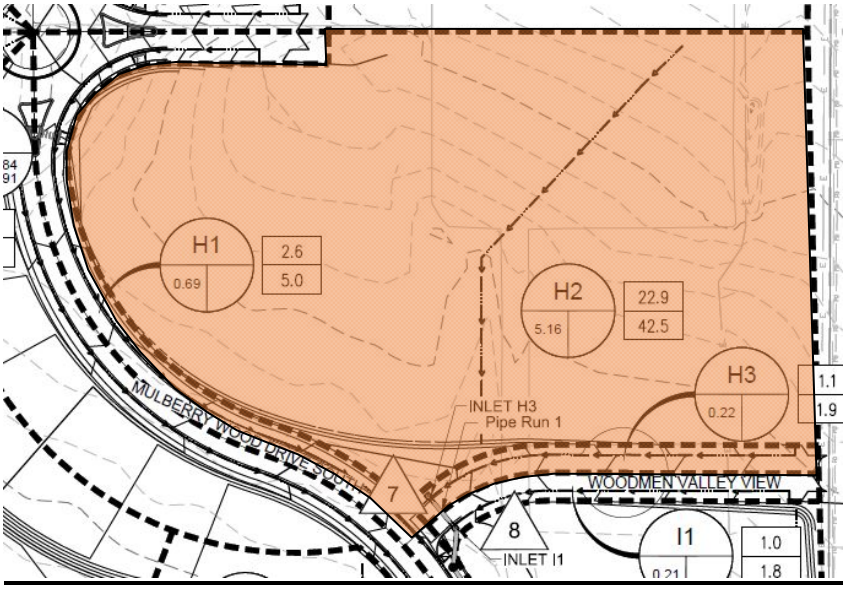
In the undeveloped conditions, approximately 45.3 cfs reached this point of the site, allowing for a lesser or equal release rate from the onsite detention ponds in the proposed conditions. Due to existing storm infrastructure capacities as well as WQ and EURV release rates, Pond F releases 5.6 cfs in the 5-year storm and 25.0 cfs in the 100-year storm conditions (Design Point 6A).

Flows leaving Design Point 6A are joined by the surface runoff from OS2 at the existing D-10R inlet on the northeast corner of Marksheffel Road and Woodmen Road (Design Point 6B; Q_5 = 10.1 cfs, Q_{100} = 31.2 cfs). From here, the flows are conveyed west by an existing 38"x60" elliptical and 60" storm drains until reaching the triple 48" culverts that carry the flows south across Woodmen Road and eventually release into Sand Creek.



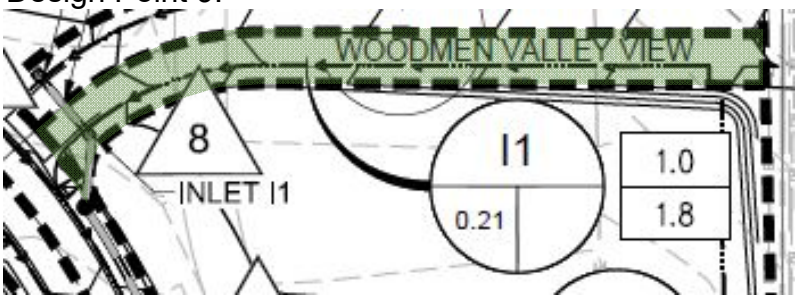
Design Point 7, on the next page, (Q_5 = 23.9 cfs, Q_{100} = 55.3 cfs) is the combination of street surface runoff from Sub-basin H3 (0.22 acres; Q_5 = 1.1 cfs, Q_{100} = 2.4 cfs) that is collected in a 6' D-10R at-grade inlet, as well as additional subsurface runoff from Sub-basin H2 (5.16acres; Q_5 = 22.9 cfs, Q_{100} = 52.9 cfs). These flows will be collected and then conveyed to the south via Pipe Run 1 (36").

Sub-basin H3 is delineated to include the pavement surface of Woodmen Valley View from the crown of the road to the northern flowline and will be captured by Inlet H3. Inlet H3 will have 0.0 cfs and 0.4 cfs of flow-by in the 5-year and 100-year storm events, respectively.



Design Point 8, below, (Q_5 = 25.0 cfs, Q_{100} = 57.5 cfs) is located at the southeast intersection of Mulberry Wood Drive and Woodmen Valley View at Inlet I1. In addition to the flows from Design Point 7, this 6' D-10R inlet, in an at-grade condition, captures the pavement surface runoff from Sub-basin I1 (0.21 acres; Q_5 = 0.8 cfs, Q_{100} = 2.3 cfs). This inlet produces 0.0 cfs of flow-by in the minor storm and 0.4 cfs of flow-by in the major storm.

36" storm drain will direct the combined runoff to the west and south (Pipe Runs 2A-C) before reaching Design Point 9.

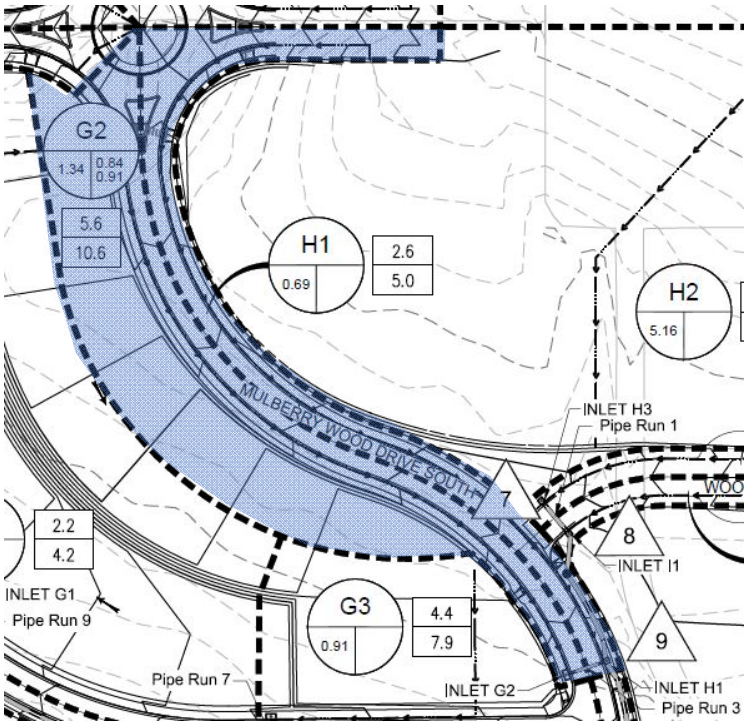


Design Point 9, below, (Q_5 = 33.1 cfs, Q_{100} = 76.8 cfs) is the convergence point of runoff from Design Point 8, Sub-basin G2, Sub-basin H1, and flow-by from Inlets H3 and I1. Flows generated in the commercially developed Sub-basin G2 (1.34 acres; Q_5 = 5.6 cfs, Q_{100} = 13.2 cfs) will sheet flow from west to east until reaching the proposed curb and gutter in Mulberry Wood Drive. This infrastructure will route the flows to the south until reaching Inlet G2, an 8' D-10R at-grade inlet. Inlet G2 produces 0.6 cfs and 2.8 cfs of flow-by in the minor and major storms, respectively. This flow-by will be conveyed south and then west via curb and gutter until reaching Inlet G3.

From here, Pipe Run 3 (18") will carry the flow to the east to Inlet H1 (8' D-10R, at-grade). Additional surface flow that reaches Inlet H1 is generated in Sub-basin H1 (0.69

acres; Q_5 = 2.4 cfs, Q_{100} = 6.3 cfs), consisting of the southeastern half of the Mulberry Wood Drive road corridor.

Once collected in Inlet H1, flows in Design Point 9 are routed to the south via 42" storm drain (Pipe Runs 4 A and B) to Inlet I3. Flow-by generated at Inlet H1 (Q_5 = 0.1 cfs, Q_{100} = 2.6 cfs) will be also directed south via curb and gutter until reaching Inlet I3.

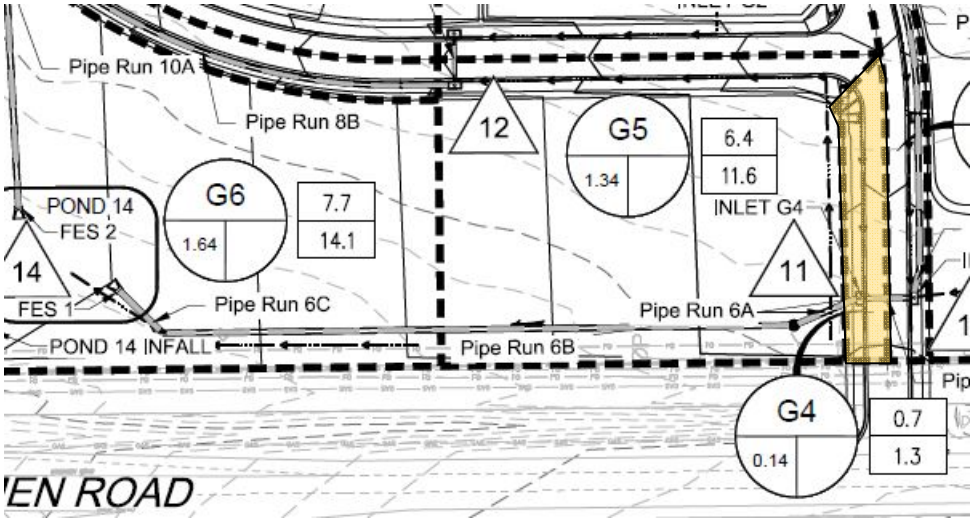


Design Point 10, below, (Q_5 = 46.0 cfs, Q_{100} = 106.2 cfs) is found near the northeastern intersection of Mulberry Wood Drive and Woodmen Road at Inlet I3. This inlet, Inlet I3, collects paved street surface runoff from Sub-basin I3 (0.18 acres; Q_5 = 0.9 cfs, Q_{100} = 2.0 cfs) as well as flow-by from upstream Inlet H1 and has been conservatively sized with an 8' curb cut length.

Additional subsurface flows from Sub-Basin I2 (2.65 acres; Q_5 = 9.1 cfs, Q_{100} = 27.9 cfs) will be routed to this inlet via an individual storm system. According to DCM Figure 8-12 (see Appendix B), this amount of surface flow requires a 4' D-10R inlet. However, in an effort to be conservative, Inlet I3 has been designed with an 8' curb cut length.

The total flows captured in this inlet are routed to the west via 42" storm drain (Pipe Run 5) until reaching Design Point 11.

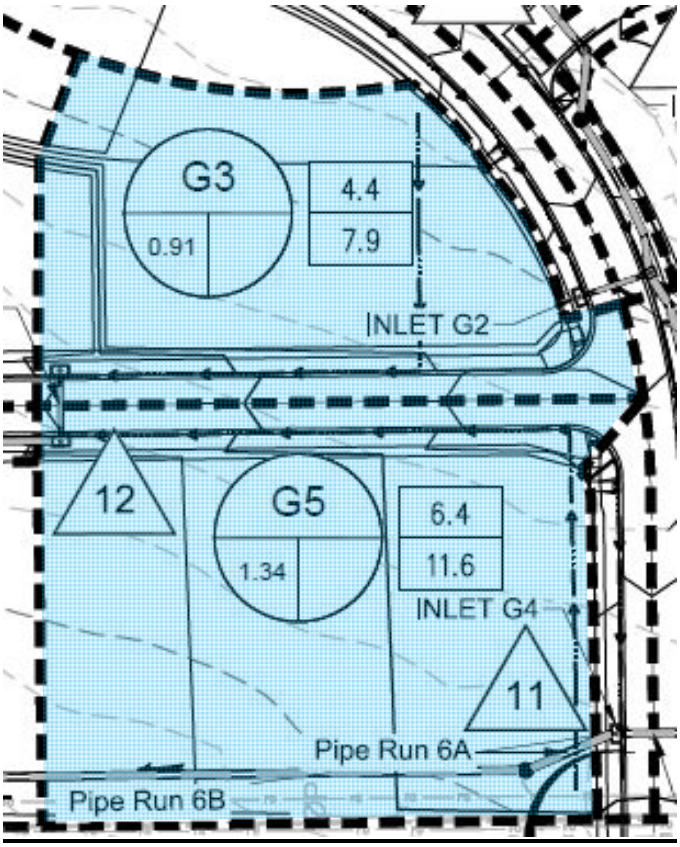
Design Point 11, below, (Q_5 = 46.6 cfs, Q_{100} = 107.5 cfs) is also an inlet in sump condition, Inlet G4. This inlet captures the paved roadway surface flow from Sub-basin G4 (0.14 acres; Q_5 = 0.7 cfs, Q_{100} = 1.5 cfs, resulting in a 6' D-10R inlet, per DCM standards. The surface runoff from Sub-basin G4 combines with the flows from Design Point 10 and is directed to the west through Pipe Run 6 (48") until being released from a flared-end section that will release all of the upstream flows into Pond 14. The flows from Design Point 11 that are to be treated in this pond include Sub-basins G2, H1-H3, I1-I3, and G4.



Design Point 12, on the next page, (Q_5 = 10.8 cfs, Q_{100} = 24.1 cfs), Inlet G5, is a 12' D-10R at-grade inlet. Runoff from Sub-basin G5 (1.34 acres; Q_5 = 6.4 cfs, Q_{100} = 14.4 cfs) will sheet flow from the south to the north until reaching the proposed curb and gutter

infrastructure which will convey the flows to Inlet G5. Discharge from Sub-basin G3 (0.91 acres; Q_5 = 4.4 cfs, Q_{100} = 9.7 cfs) will sheet flow from the north to south until reaching the curb and gutter proposed adjacent to the sub-basin, and will be routed to Inlet G3, an 8' D-10R inlet in an at-grade condition. Flow-by created at Inlet G3 (Q_5 = 0.2 cfs, Q_{100} = 5.3 cfs) will continue to be routed via curb and gutter to the west until being collected in sump Inlet G7.

Runoff that is collected in Inlet G3 will be routed to the south via 18" storm drain (Pipe Run 7) to Inlet G5 (12' D-10R, at-grade). Flow-by generated by Inlet G5 has been calculated to be 0.7 cfs in the 5-year storm event and 5.3 cfs in the 100-year storm event. This flow-by will be directed via curb and gutter to the west until reaching Inlet G1. Sub-surface flow collected in Inlet G5 will be carried west via 30" storm drain (Pipe Runs 8A and 8B) to Inlet G1. Both Sub-basin G3 and Sub-basin G5 are proposed commercial developments.

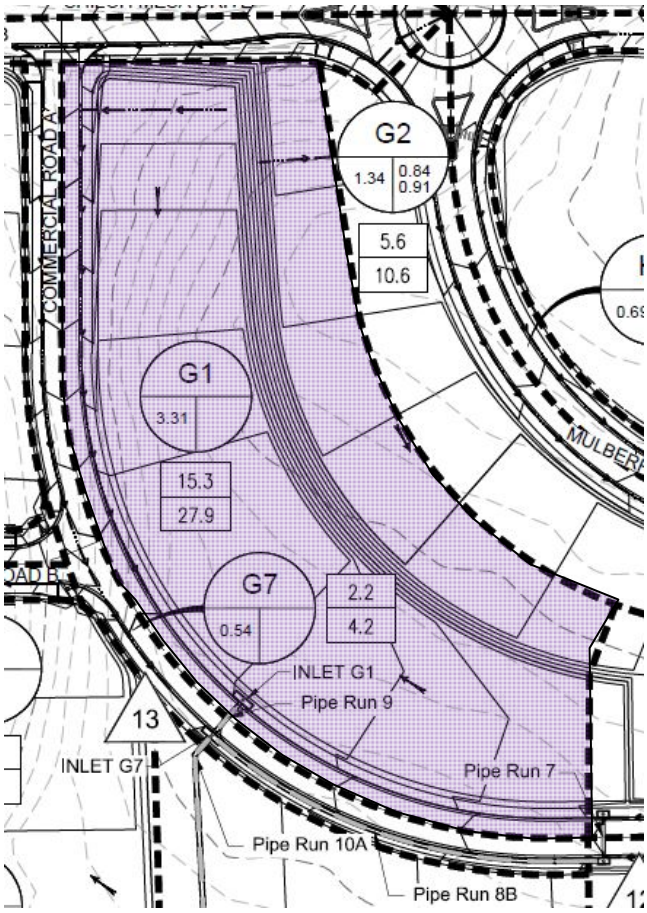


Design Point 13, on the next page, (Q_5 = 35.8 cfs, Q_{100} = 81.1 cfs) collects flows from Sub-basin G1 (3.31 acres; Q_5 = 15.1 cfs, Q_{100} = 34.6 cfs) which consists of commercial development as well as surface runoff from half of Commercial Road A, and Sub-basin G7 (0.54 acres; (Q_5 = 2.2 cfs, Q_{100} = 5.2 cfs) which is the remaining half of Commercial Road A. Runoff produced by commercially developed Sub-basin G1 will sheet flow from

the east to the west until it is collected in the proposed curb and gutter of Commercial Road A. From this point, the runoff drains to the southeast until being collected in Inlet G1.

In addition to the surface flow from Sub-basin G1, Inlet G1 (sump condition) captures the flow-by generated at Inlet G3. In order to capture the entirety of surface flow that reaches this inlet (Q_5 = 15.5 cfs, Q_{100} = 39.9 cfs), the DCM requires a 16' D-10R inlet.

From Inlet G1, flows are routed via Pipe Run 9 (36") to the southwest until reaching Inlet G7, located at Design Point 13. This inlet collects the surface flows from Sub-basin G7 (consisting of Commercial Road A, from the crown to the western flowline) as well as flow-by produced by Inlet G5, for a total of 2.9 cfs and 10.5 cfs in the minor and major storms, respectively. In a conservative, Inlet G7 has been designed as an 8' D-10R. The surface runoff from Sub-basin G7, flow-by from Inlet G5, and the subsurface flow routed from Inlet G1 combine at Inlet G7 and are then conveyed south via a 42" storm drain (Pipe Run 10) until being released by FES 2 (42" FES) and into Pond 14.

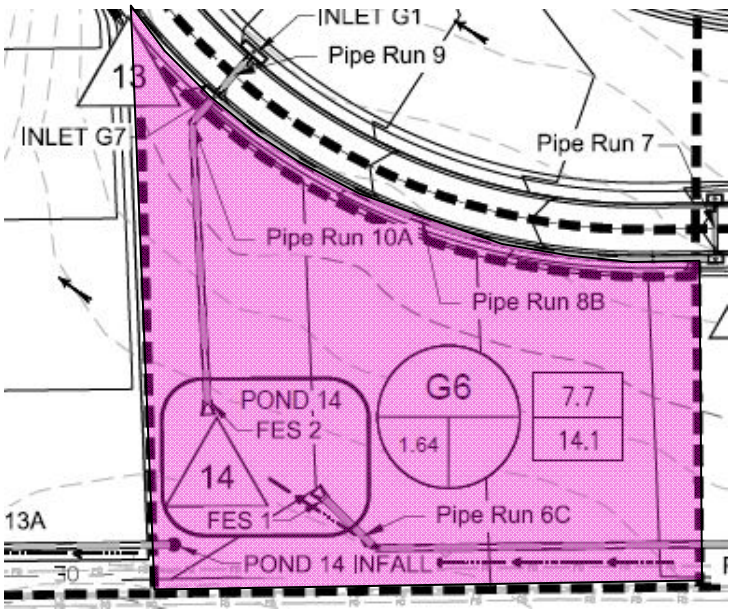


All runoff that is collected in Design Points 12 and 13 will be treated for detention and water quality upon reaching Pond 14, which is also the location of **Design Point 14**, below. In addition to these flows, runoff generated by Sub-basin G6 (1.64 acres; Q_5 =

7.7 cfs, Q_{100} = 14.4 cfs), consisting of commercial development, will sheet flow to the west until entering Pond 14 to be treated for detention and water quality as well.

Pond 14 will treat Sub-basins G1 through G7, H1 through H3, and I1 through I3 for detention and water quality. The total area of the basins that will be treated by Pond 14 is equal to 18.57 acres, which is comprised of commercial area and paved roadway for an imperviousness of 95%.

In the undeveloped conditions, this point of the site receives 33.0 cfs. In the developed conditions, Pond 14 has been designed to release 6.5 cfs in the 5-year storm event, and 29.3 cfs in the 100-year storm event. These flows are below the undeveloped conditions and allow for sufficient capacity of downstream infrastructure.



Design Point 15 will carry the treated release from Pond 14 at the rates calculated above. Runoff from the pond will be directly released into Pipe Run 13A (36” RCP), directing it to the west and south. This pipe will connect into an existing 36” RCP stub located on the north side of Woodmen Road. This stub runs to the south where it connects into an existing grated storm inlet.

This existing inlet collects flows from 17.6 undeveloped acres of the Shiloh Mesa Commercial development and then directed it to the south, underneath Woodmen Road, and then to the east, underneath Marksheffel Road where it is released into Sand Creek. There are additional inlets located within Woodmen Road that collect flows from the paved roadway, totaling 2.7 cfs in the minor storm event and 5.7 cfs in the major storm event, according to the approved ***H&H Woodmen*** report. The existing 36” RCP pipe that will carry the treated runoff from Shiloh Mesa Commercial has a minimum slope of 0.5%, which will allow for a full flow capacity of 49.91 cfs, exceeding the anticipated release flows from Pond 14.

A summation of the proposed detention and water quality ponds is found below. Due to the nature of the existing grades on the site, the runoff amount totaling 74.3 cfs in the undeveloped conditions has been used for the combined developed runoff of Ponds F5 and F. These two ponds release at a combined rate of 35.7 cfs. These numbers are preliminary and will be finalized in each lots individual Final Drainage Reports, as will actual pond locations and volumes.

Pond Summary Table													
Pond	Contributing	EX 2-YR	PR 2-YR	EX 5-YR	PR 5-YR	EX 10-YR	PR 10-YR	EX 25-YR	PR 25-YR	EX 50-YR	PR 50-YR	EX 100-YR	PR 100-YR
ID	Basins	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)
Pond F5	B, C1, C2												16.2
Pond F	A, D1, D2, E1, E2, F1, F2		0.9		**1.9**		3.4		6.6		11.5		**16.8**
F5 & F		4.44	2.7	8.1	**5.6**	12.2	8.8	21.6	14.2	32.2	18.3	45.3	**25.0**
Pond 14	G1-G7, H1-H3, I1-I3	3.88	4.94	6.6	**6.5**	9.6	9.2	16.1	14.5	23.2	21.3	33.0	**29.3**

IV. Hydraulic Analysis

A. MAJOR DRAINAGEWAYS

The entirety of the site is located within the Sand Creek Drainage Basin and all drainage that leaves the site will ultimately release into Sand Creek. In the developed conditions, Design Point 6A and Design Point 15 represent the two major offsite exit points for the drainage of Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1.

The discharge from Design Point 15 will be routed to the south via an existing 36” RCP storm drain, which runs at a minimum of 0.5% to the south and west until reaching Sand Creek.

The discharge from Design Point 6A is routed to the west through an existing storm drain system which includes the 38” x 60” elliptical pipe that directs the flow underneath Marksheffel Road. Once reaching the western side of Marksheffel Road, the storm drain transitions to a size of 60”, running south and then west until discharging approximately 600’ west of Woodmen Road and Marksheffel Road intersection. This discharge location is in very close proximity to the 3 - 48” storm drains that will collect the flows and convey them north to south underneath Woodmen Road. Flows are released and collected in a drainage swale that carries them to Sand Creek.

Hydraulic analysis has been completed on the existing and proposed storm sewer, both onsite and offsite. Proposed storm drains and inlets have been sized according to the DCM. Refer to the storm system profiles and inlet sizing spreadsheets located in Appendix A.

B. METHODOLOGY

A hydraulic analysis has been completed as part of this study to determine the required storm pipe sizing for the site. Hydraulic grade lines were calculated using the HEC 22

Energy method. Initial sizing of the on-site detention ponds was completed using EPA SWMM Method. Each of the ponds has been evaluated to determine the peak release rates from the proposed detention pond and the storage required for the 100-year storm event. Majority of the pipes have been upsized to accommodate larger flows as a conservative design.

C. STRUCTURE IMPROVEMENTS

The existing storm infrastructure located at the intersection of Marksheffel Road and Woodmen Road has been analyzed and proved capable of conveying the developed flows from the site. As all flows from that reach this point have been treated for water quality and detention onsite, no structure improvements are required for this portion of the site.

Because all flows from Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1 are to be treated for water quality and detention on site, the construction of Detention Pond 3 is not required.

D. FLOODPLAINS

Per the ***Flood Insurance Rate Map (FIRM) 08041CO535 F***, effective date March 17, 1997, published by the Federal Emergency Management Agency (FEMA), no portion of Shiloh Mesa lies within any designated 100-year floodplain. In addition, ***Preliminary FIRM Map 08041CO535 G,*** dated July 29, 2015 shows that Shiloh Mesa is not located within the floodplain. Refer to the maps in Appendix D.

V. Environmental Evaluations

A. WETLAND IMPACTS

There are no designated wetland or riparian areas on site, and no anticipated impacts.

B. STORMWATER QUALITY

All on-site detention facilities shall be designed to accommodate water quality requirements. As the development of each parcel progresses, the detention guidelines outlined in this report are to be upheld.

Per the DCM Chapter 1, Section 4, the City of Colorado Springs requires the UDFCD Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

Step 1: Reduce runoff by disconnecting impervious area, eliminating "unnecessary" impervious area and encouraging infiltration into soils that are suitable.

- Site specific landscaping will be done on each lot to decrease the connectivity of impervious areas. Grass lined swales will be used where possible to allow ground infiltration. An IRF spreadsheet has been

completed for the entirety of the site based on the residential use of Shiloh Mesa Filing No. 5 as well as the general commercial use of Shiloh Mesa Commercial Filing No. 1. However, each lot will be responsible for completing a separate spreadsheet once site layouts are complete.

Step 2: Treat and slowly release the WQCV.

- Each pond meets the DCM standards for the release rates of Full Spectrum Detention Ponds for Water Quality Capture Volumes.

Step 3: Stabilize stream channels.

- The detention of increased flows, and decrease in some cases, will allow the site to be developed without requiring any stream modifications. Channel improvements for Sand Creek are planned to be completed by the development adjacent to the creek and drainage fees will be paid for at the time of platting. These fees will help fund the channel improvements.

Step 4: Implement source controls.

- During construction, the contractor will have designated concrete washout areas and will implement sediment control logs and inlet protection in order to control pollutants at their source.

C. PERMITTING REQUIREMENTS

No additional permitting requirements are expected at this time.

VI. Alternatives Evaluation

Analysis of the site in both the existing and developed conditions is in accordance with the most recent Drainage Basin Planning Study ***(DBPS-1996)*** as well as the drainage revisions outlined in the successive Master Development Drainage Plans ***(MDDP-Classic, MDDP-ESI, MDDP-MATRIX, MDDP-F1).*** As such, no alternatives have been evaluated.

VII. Selected Plan (Implementation of DBPS)

A. PLAN HYDROLOGY

The hydrology for the site has been provided above and is in compliance with the latest study (DPBS-1996).

B. SYSTEM IMPROVEMENTS

No improvements to the existing system are anticipated.

C. SYSTEM PRIORITIES/PHASING

No phasing of the development has been provided at this time. Once development of any portion of the site begins, the owner will be responsible for providing detention and water quality in accordance with this MDDP, before releasing downstream.

D. GOVERNMENTAL AGENCY REQUIREMENTS

There are no governmental agency requirements for this development.

E. MAINTENANCE REQUIREMENTS

Maintenance requirements for all stormwater quality and erosion control procedures will be outlined in each filing's individual Erosion Control and Storm Water Management Plans.

F. RECOMMENDATION FOR IMPLEMENTATION

It is recommended that any development of the site initiates the implementation of the detention and water quality procedures that have been detailed in this report. In doing so, the developed conditions will produce runoff comparable to that of the existing conditions, which will allow the site to continue to adhere to the DPBS and protect downstream owners and facilities.

VIII. Fee Development

A. UNDEVELOPED PLATTABLE LAND

Shiloh Mesa Filing No. 5 is currently going through the platting process. Shiloh Mesa Commercial Filing No. 1 has not been previously platted, but is currently zoned as PUD and undergoing the platting process. The site is to remain PUD and will incorporate multiple uses. The site was annexed into the City of Colorado Springs in August of 2004 as part of the Woodmen Heights Metropolitan District.

B. REIMBURSABLE COSTS AND FEES

The site is located entirely within the Sand Creek Drainage Fee Basin. The fees are based upon the platted acreage and have been calculated as follows.

Shiloh Mesa Commercial Filing No. 1*

Master Development Drainage Plan

2018 Drainage and Bridge Fees

	Area (ac.)	Fee/Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Drainage Fee	36.22	$11,851.00	$429,243.22	$0.00	$429,243.22	$0.00
Bridge Fee	36.22	$713.00	$25,824.86	$0.00	$25,824.86	$0.00
Pond Fee	36.22	$1,070.00	$38,755.40	$0.00	$38,755.40	$0.00
Pond Facility	36.22	$3,445.00	$124,777.90	$0.00	$124,777.90	$0.00
Surcharge	36.22	$0.00	$0.00	$0.00	$0.00	$0.00
				$0.00	***$618,601.38***	

*The Drainage and Bridge Fees for Shiloh Mesa Filing No. 5 have not been included in this estimate as they were accounted for in the approved Shiloh Mesa Filing No. 5 Final Drainage Report completed by Matrix Design Group, July 2017

C. Construction Cost Opinion

An engineer's estimate of probable construction costs has been provided for the proposed improvements of Shiloh Mesa Filing No. 5 and Shiloh Mesa Commercial Filing No. 1. According to the approved MDDP for Shiloh Mesa at Woodmen Heights (MDDP-Matrix), the only reimbursable improvements are located north of Kenosha Drive, therefore all the improvements in this report are non-reimbursable.

Construction Cost Opinion

SHILOH MESA FILING NO. 5 - Public Non-Reimbursable Expenses				
Storm MH	EA	2	$3,800.00	$7,600.00
24" RCP	LF	334	$58.00	$19,372.00
30" RCP	LF	73	$70.00	$5,110.00
36" RCP	LF	408	$80.00	$32,640.00
42" RCP	LF	25	$100.00	$2,500.00
34"X53" RCP	LF	96	$160.00	$15,360.00
38"X60" RCP	LF	99	$205.00	$20,295.00
6' D-10 R Inlet	EA	1	$5,750.00	$5,750.00
8' D-10R Inlet	EA	1	$7,600.00	$7,600.00
12' D-10R Inlet	EA	1	$9,000.00	$9,000.00
38"X60" FES	EA	1	$5,000.00	$5,000.00
34"X53" FES	EA	1	$5,000.00	$5,000.00
42" Headwall	EA	1	$5,000.00	$5,000.00
18" Dia. Riprap	CY	0.5	$125.00	$62.50
Detention/WQ Pond	EA	1	$25,000.00	$25,000.00
			Sub Total	$165,289.50
		10% Contingency		$16,528.95
			TOTAL:	**$181,818.45**
(All storm infrastructure in Filing No. 5 is PUBLIC)				
SHILOH MESA COMMERCIAL FILING NO. 1 - Public Non-Reimbursable Expenses				
Storm MH	EA	7	$3,800.00	$26,600.00
18" RCP	LF	32	$45.00	$1,440.00
30" RCP	LF	32	$70.00	$2,240.00
36" RCP	LF	351	$80.00	$28,080.00
42" RCP	LF	613	$100.00	$61,300.00
48" RCP	LF	752	$120.00	$90,240.00
6' D-10 R Inlet	EA	5	$5,750.00	$28,750.00
8' D-10R Inlet	EA	2	$7,600.00	$15,200.00
12' D-10R Inlet	EA	1	$9,000.00	$9,000.00
16' D-10R Inlet	EA	0	$12,500.00	$0.00
42" FES	EA	0	$5,000.00	$0.00
48" FES	EA	1	$5,000.00	$5,000.00
18" Dia. Riprap	CY	10	$125.00	$1,250.00
Detention/WQ Pond	EA	0	$25,000.00	$0.00
			Sub Total	$269,100.00
		10% Contingency		$26,910.00
			TOTAL:	**$296,010.00**
			GRAND TOTAL:	**$477,828.45**

Construction Cost Opinion					
SHILOH MESA COMMERCIAL FILING NO. 1 - Private Non-Reimbursable Expense					
Storm MH	EA	1	$3,800.00	$3,800.00	
18" RCP	LF	30	$45.00	$1,350.00	
30" RCP	LF	338	$70.00	$23,660.00	
36" RCP	LF	0	$80.00	$0.00	
42" RCP	LF	189	$100.00	$18,900.00	
48" RCP	LF	0	$120.00	$0.00	
6' D-10 R Inlet	EA	0	$5,750.00	$0.00	
8' D-10R Inlet	EA	1	$7,600.00	$7,600.00	
12' D-10R Inlet	EA	2	$9,000.00	$18,000.00	
16' D-10R Inlet	EA	1	$12,500.00	$12,500.00	
42" FES	EA	1	$5,000.00	$5,000.00	
48" FES	EA	1	$5,000.00	$5,000.00	
18" Dia. Riprap	CY	20	$125.00	$2,500.00	
Detention/WQ Pond	EA	2	$25,000.00	$50,000.00	
			Sub Total	$148,310.00	
		10% Contingency		$14,831.00	
			TOTAL:	**$163,141.00**	

IX. References

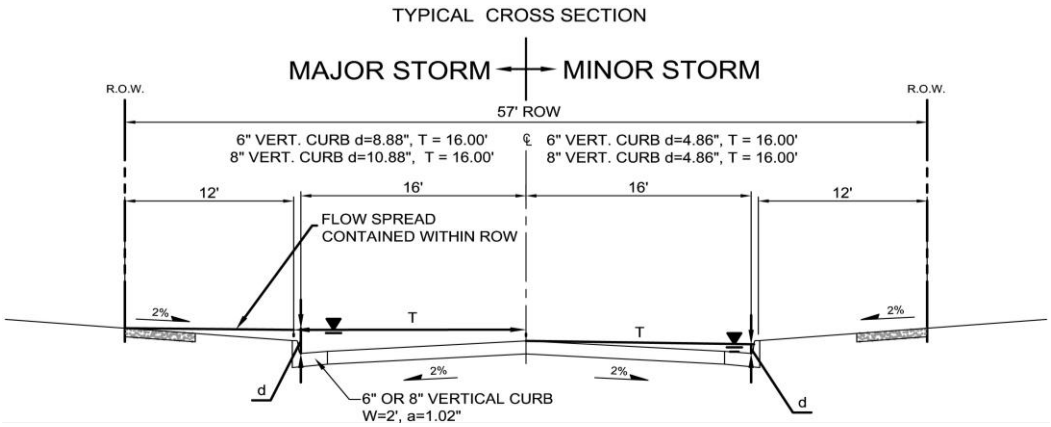
1. ***City of Colorado Springs Drainage Criteria Manual***, City of Colorado Springs, May 2014
2. ***Web Soil Survey of El Paso County Area, Colorado. Unites States Department of Agriculture Soil Conservation Service***, November 2015.
3. ***Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas, Panel 760 of 1300, Federal Emergency Management Agency***, Effective Date March 17, 1997.
4. ***Urban Storm Drainage Criteria Manual, Vol. 1-3*** by Urban Drainage and Flood Control District (UDFCD), January 2016
5. ***Preliminary Design of Selected Alternative, Sand Creek Drainage Basin Planning Study*** by Kiowa Engineering, revised March 1996
6. ***Master Development Drainage Plan for Woodmen Heights Master Plan,*** by Classic Consulting Engineers and Surveyors, June 2004
7. ***Master Development Drainage Plan for Woodmen Heights Master Plan Update for Woodmen Heights and Final Drainage Report for Forrest Meadows Filing No.1 and No. 4,*** by Engineer and Surveying, Inc., February 2006
8. ***Master Development Drainage Plan for Shiloh Mesa at Woodmen Heights,*** by Matrix Design Group Inc., November 2009
9. ***Master Development Drainage Plan and Final Drainage Report for Shiloh Mesa and Shiloh Mesa Filing No. 1,*** by M&S Civil Consultants, Inc., December 2015
10. ***Preliminary/Final Drainage Report for Shiloh Mesa Filing No. 5***, by Matrix Design Group Inc., November 2016

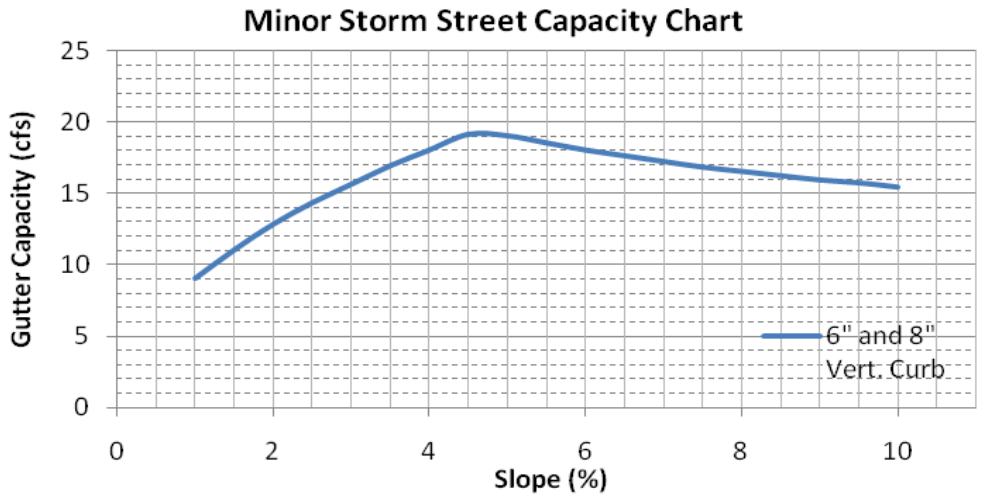
X. Appendices

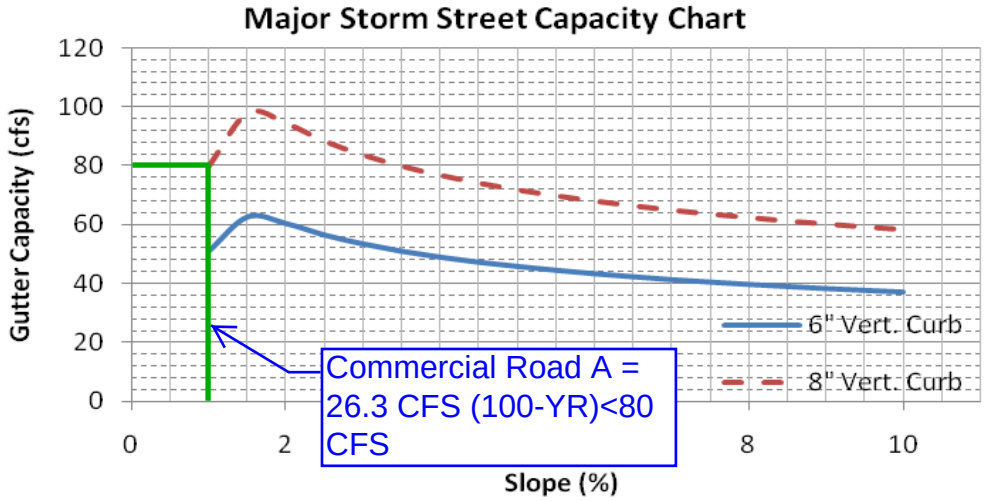
APPENDIX A

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Figure 7-6. Street Capacity Charts Collector (without Parking)

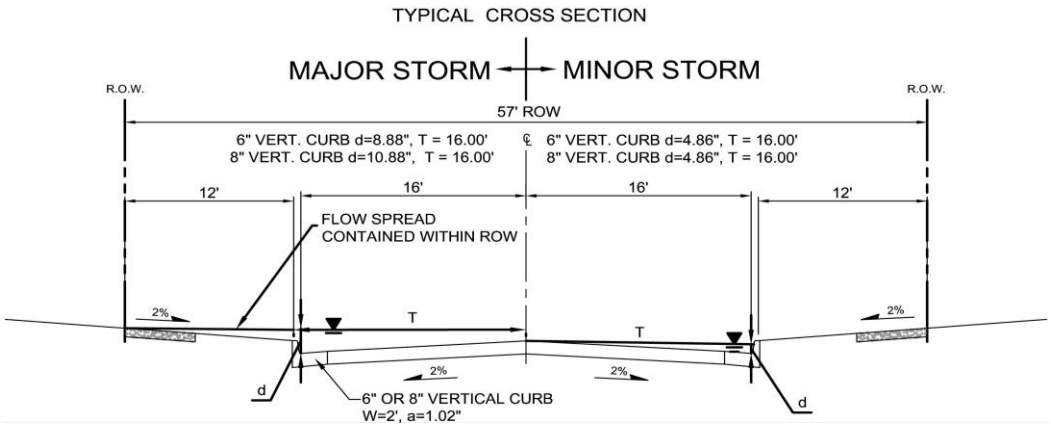


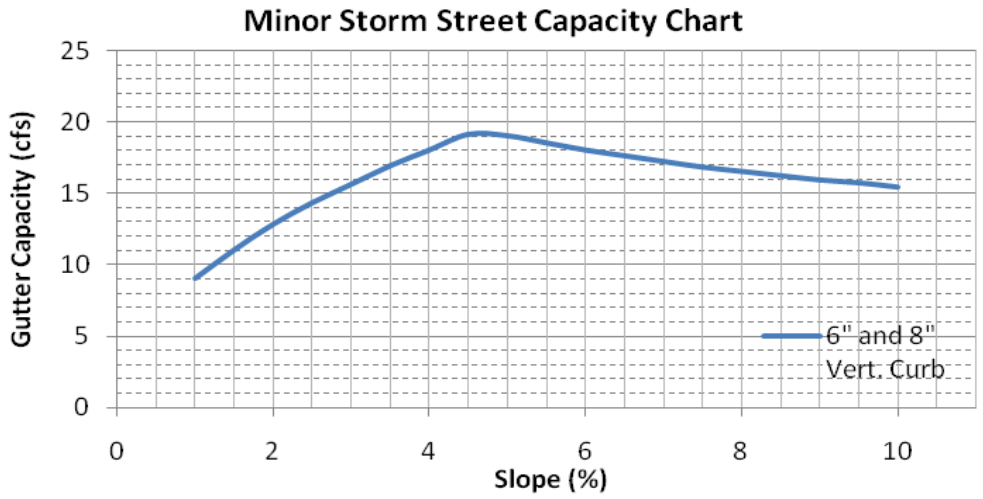




These charts shall only be used for the standard street sections as shown. The capacity shown is based on ½ the street section as calculated by the UD-Inlet spreadsheets. Minor storm capacities are based on no crown overtopping, curb height or maximum allowable spread widths. Major storm capacities are based on flow being containing within the public right-of-way, including conveyance capacity behind the curb. The UDFCD Safety Reduction Factor was applied. An 'n_{STREET}' of 0.016 and 'n_{BACK}' of 0.020 was used. Calculations were done using UD-Inlet 3.00.xls, March, 2011.

Figure 7-6. Street Capacity Charts Collector (without Parking)





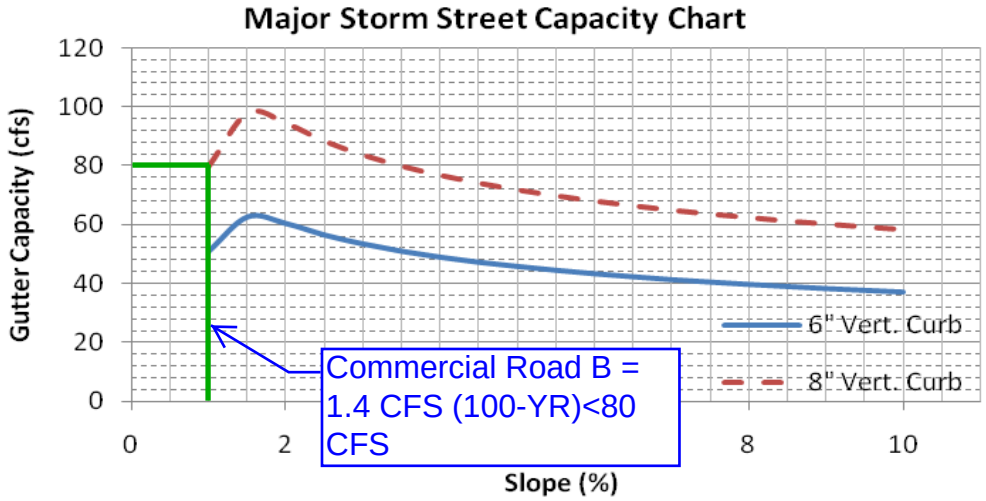


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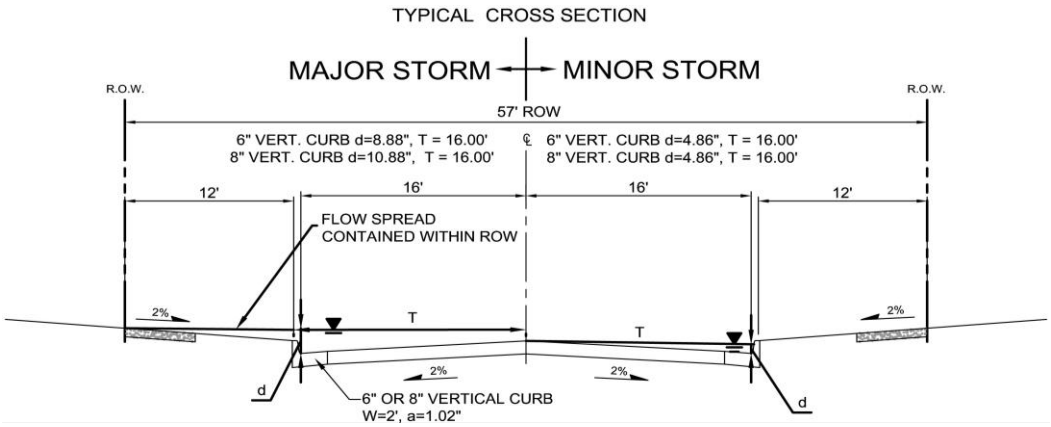
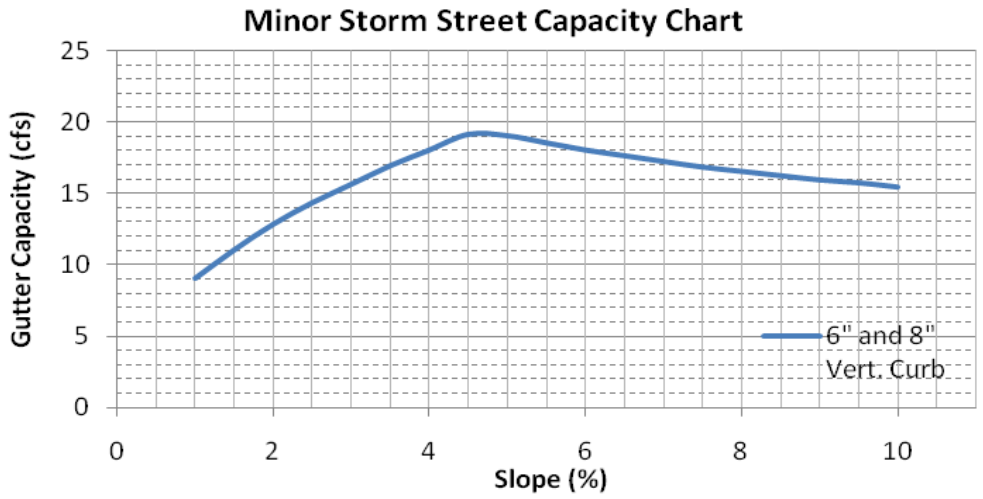
Figure 7-6. Street Capacity Charts Collector (without Parking)





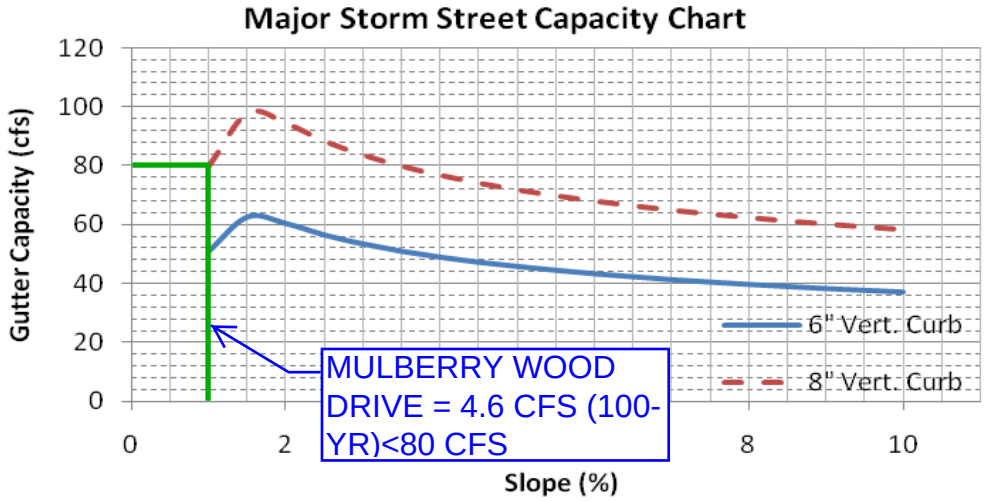


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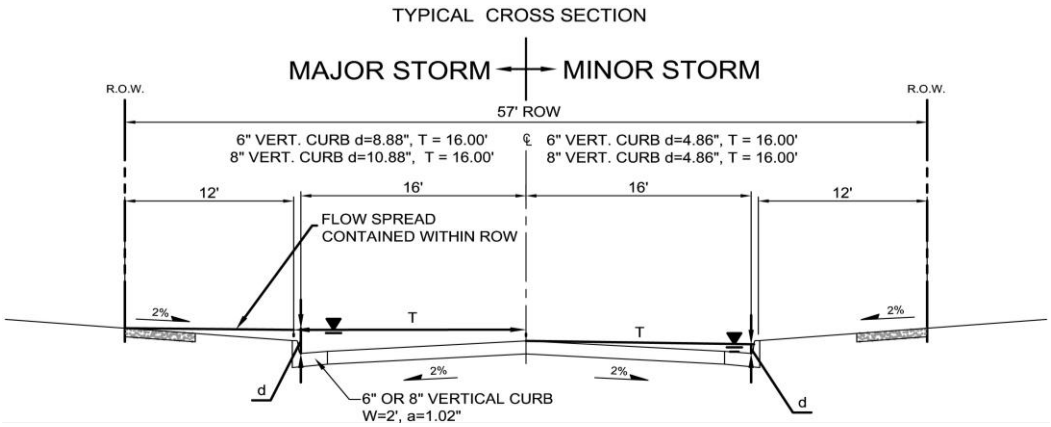
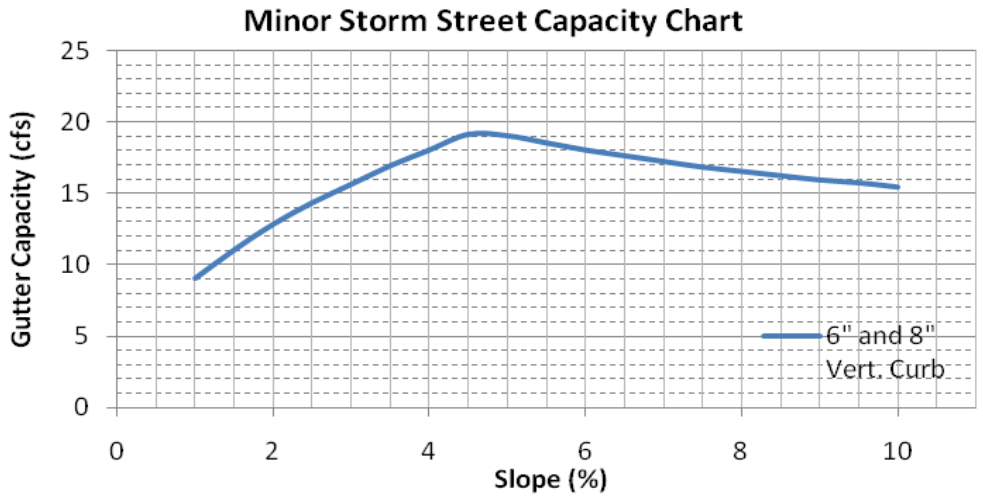
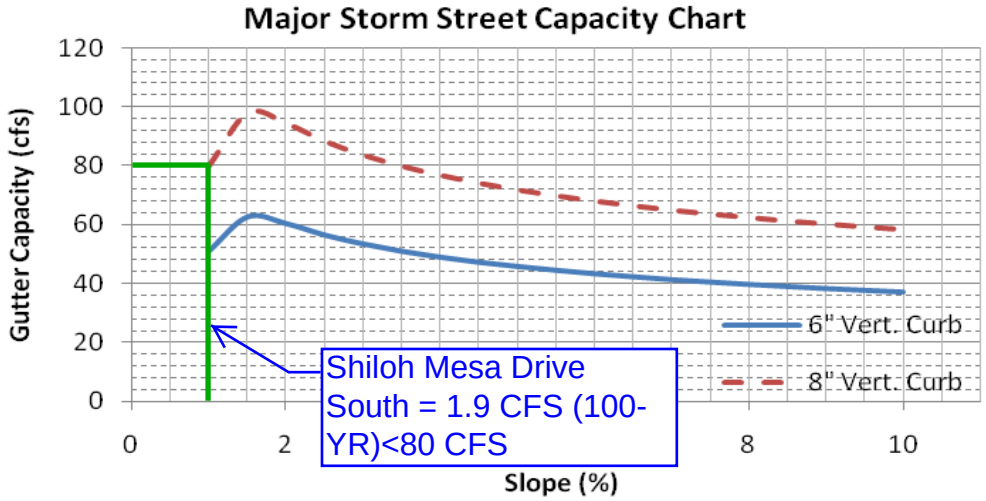
Figure 7-6. Street Capacity Charts Collector (without Parking)

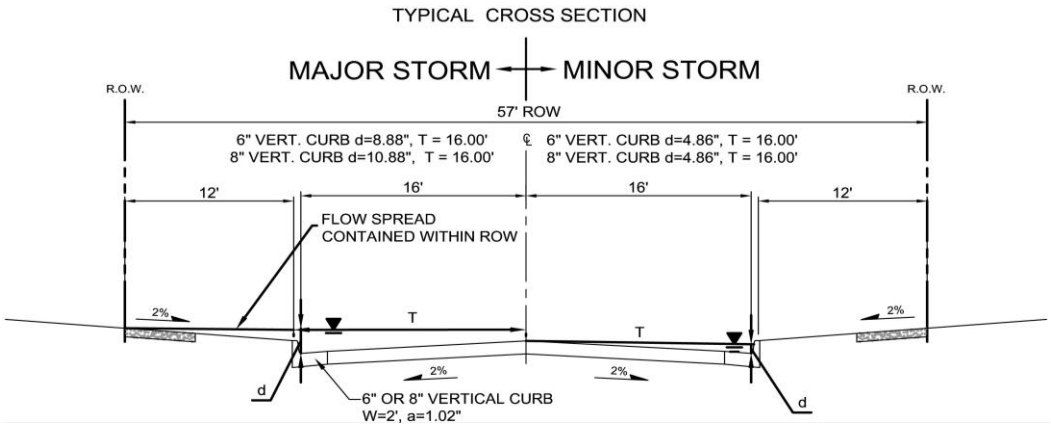


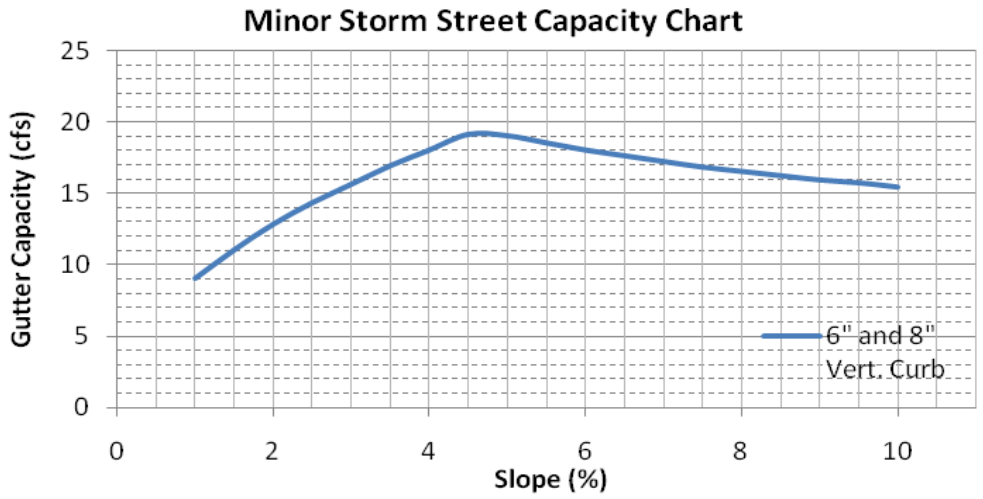




These charts shall only be used for the standard street sections as shown. The capacity shown is based on ½ the street section as calculated by the UD-Inlet spreadsheets. Minor storm capacities are based on no crown overtopping, curb height or maximum allowable spread widths. Major storm capacities are based on flow being containing within the public right-of-way, including conveyance capacity behind the curb. The UDFCD Safety Reduction Factor was applied. An 'n_{STREET}' of 0.016 and 'n_{BACK}' of 0.020 was used. Calculations were done using UD-Inlet 3.00.xls, March, 2011.

Figure 7-6. Street Capacity Charts Collector (without Parking)





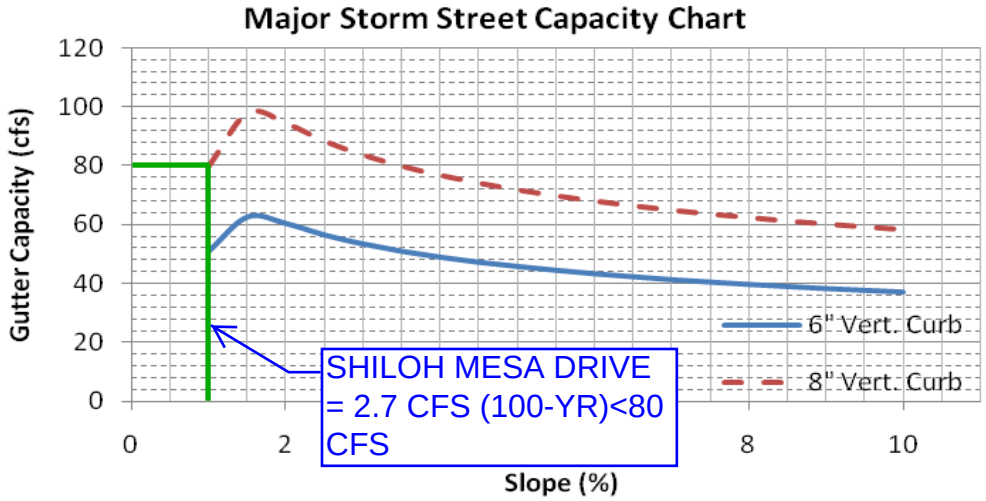


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Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet

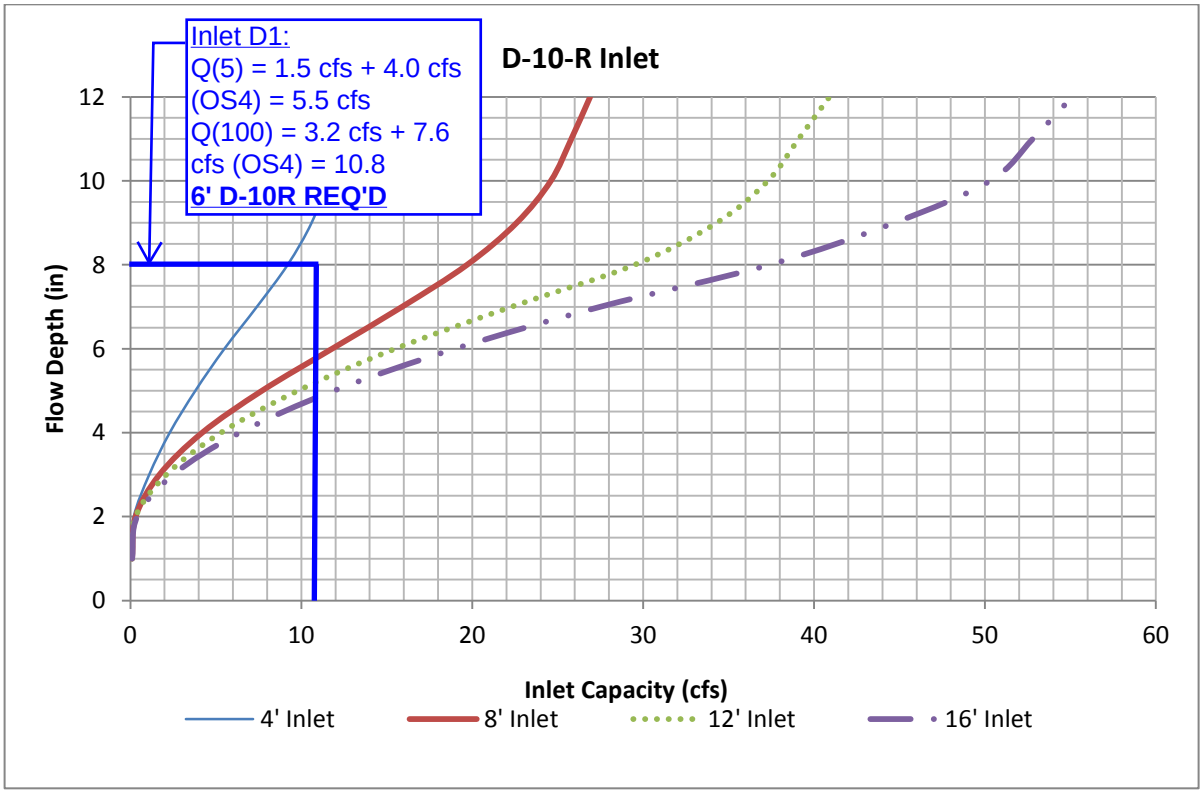
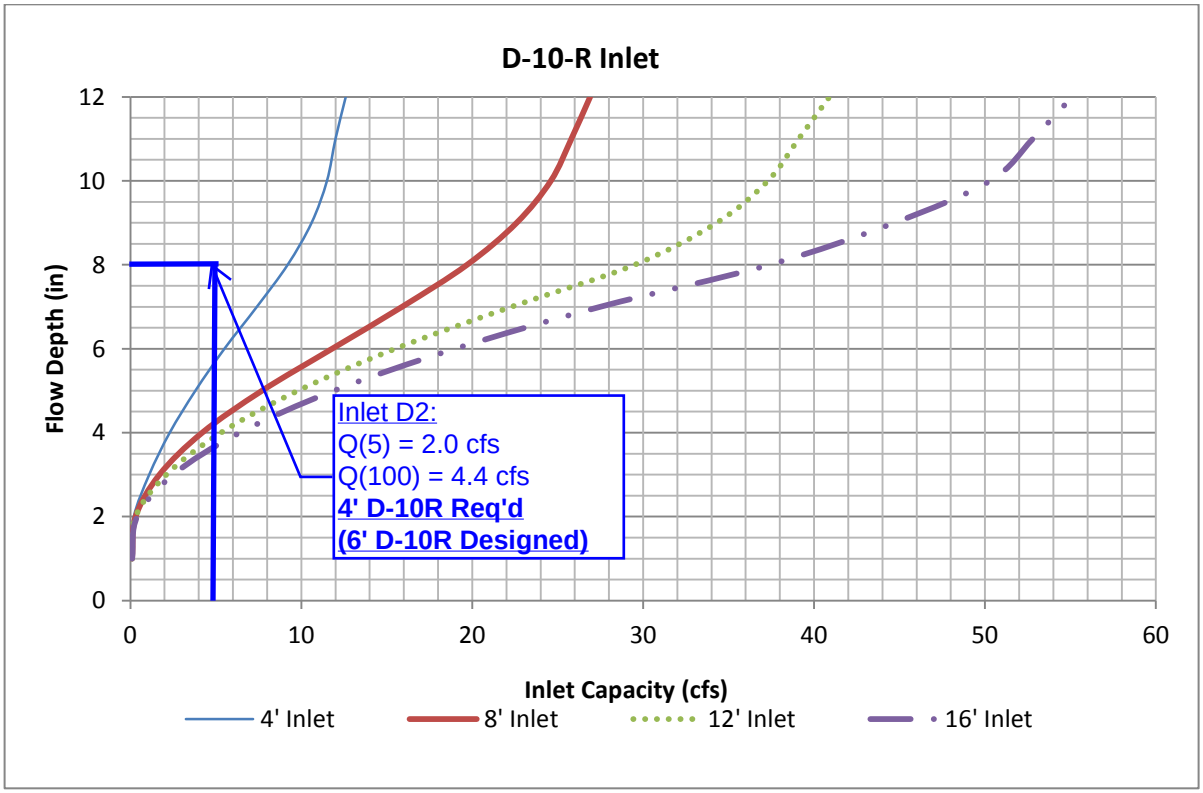


Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet



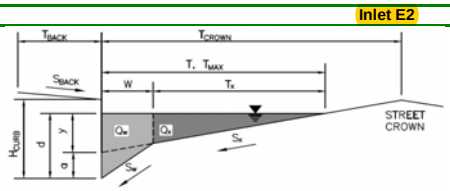
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet E2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.033	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.40	3.60	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.5	1.5	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.78	0.78	inches
Water Depth at Gutter Flowline	d =	3.18	4.38	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	7.0	12.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.683	0.497	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	2.1	8.7	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	4.5	8.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**6.5**	**17.3**	**cfs**
Flow Velocity within the Gutter Section	V =	16.5	21.3	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	4.4	7.8	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	21.7	30.1	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	18.7	27.1	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.357	0.262	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	28.6	76.2	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	26.7	60.2	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	15.8	27.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	42.6	87.3	cfs
Average Flow Velocity Within the Gutter Section	V =	27.2	33.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	13.6	22.4	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	0.69	0.56	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**29.4**	**48.8**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	5.25	6.33	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.86	1.94	inches

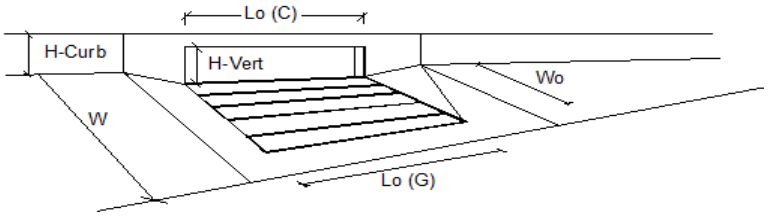
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.5**	**17.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.04 Released November 2016



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	4.00	4.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.7**	**1.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.1**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**90**	**67**	**%**

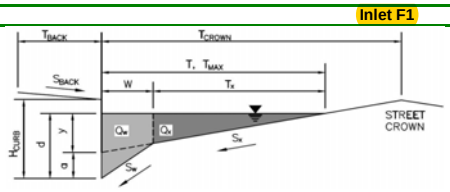
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet F1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.033	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

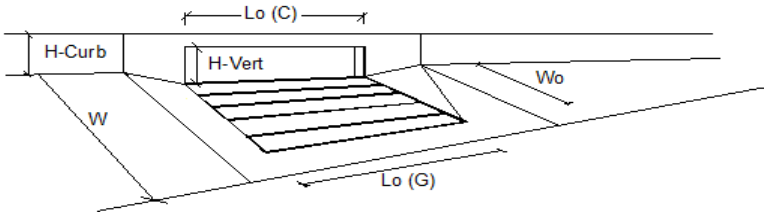
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.5**	**17.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

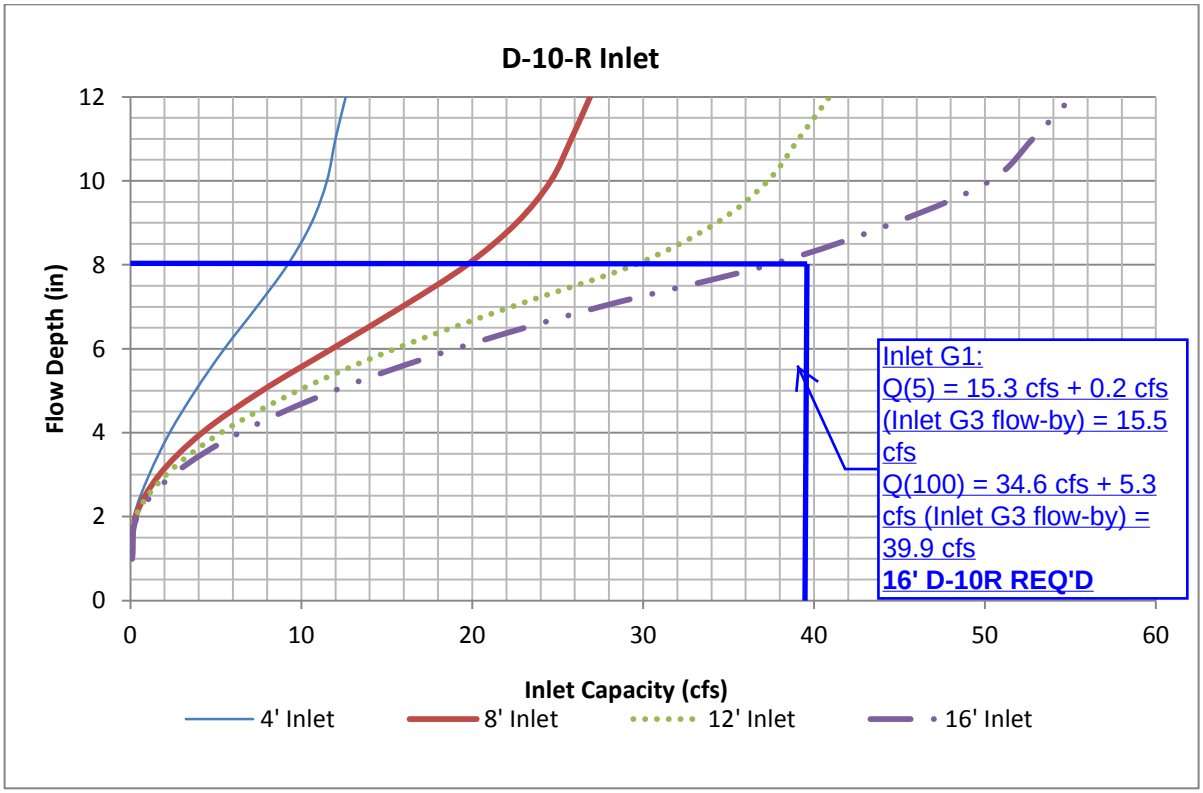
INLET ON A CONTINUOUS GRADE

Version 4.04 Released November 2016



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	4.00	4.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.8**	**1.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.1**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**87**	**66**	**%**

Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet



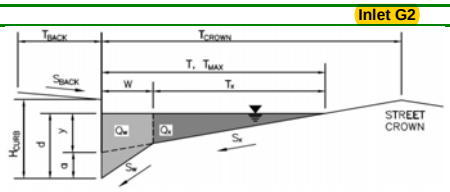
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet G2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	1.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

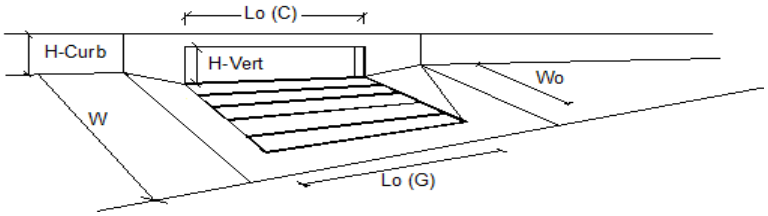
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.7**	**18.1**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.04 Released November 2016



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	12.00	12.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.0**	**8.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.6**	**4.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**90**	**65**	**%**

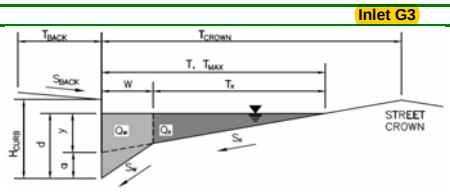
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet G3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

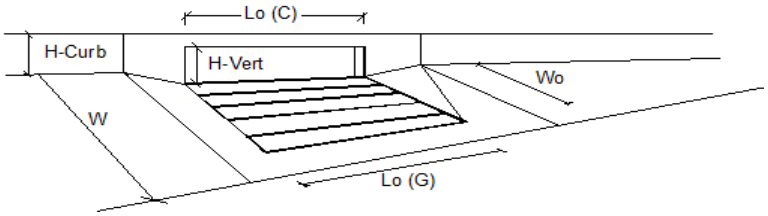
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**5.5**	**9.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

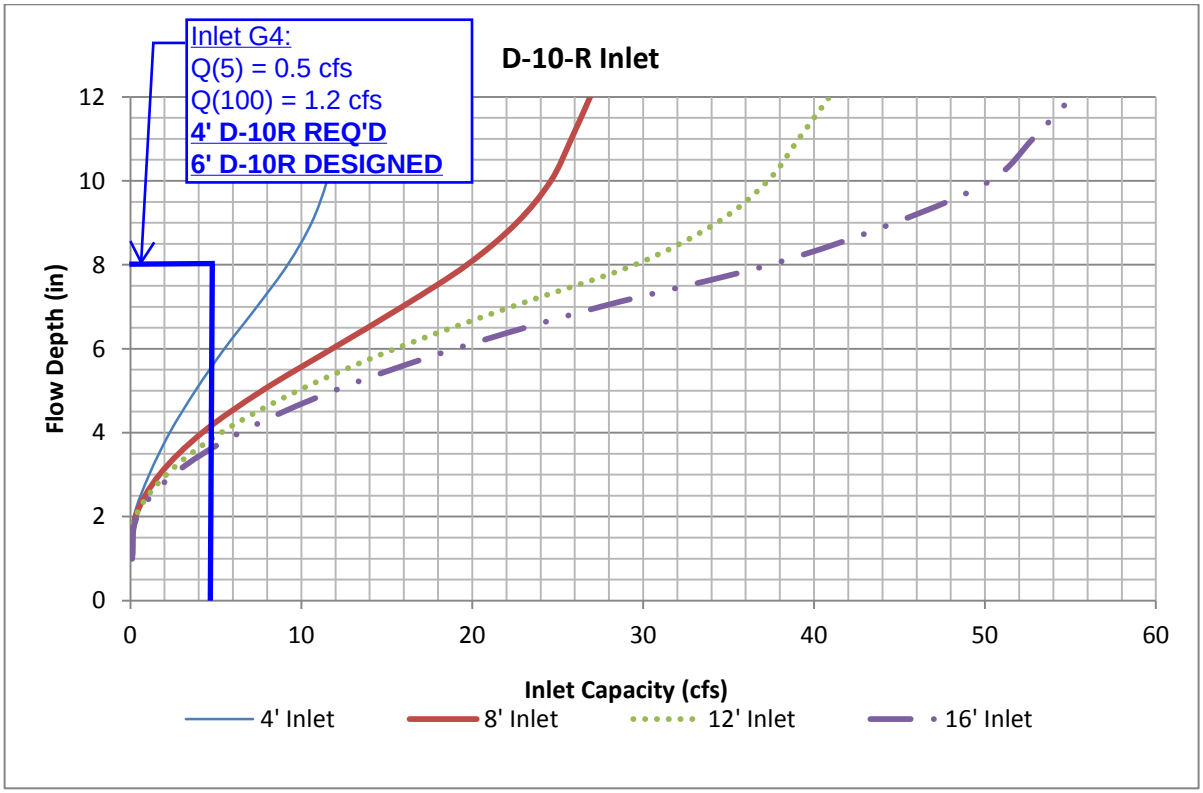
Version 4.04 Released November 2016



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	12.00	12.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.8**	**9.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**5.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**96**	**63**	**%**

Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet



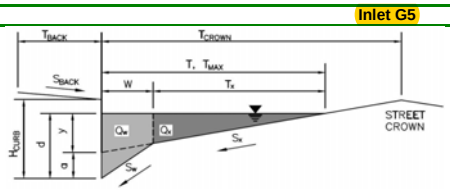
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet G5



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

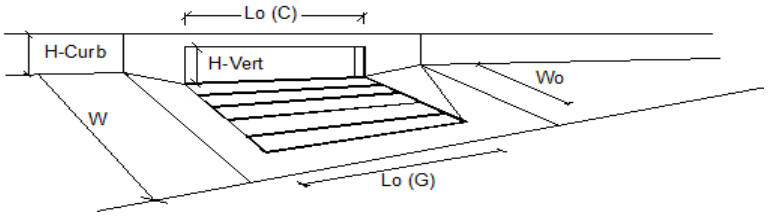
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**5.5**	**9.5**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

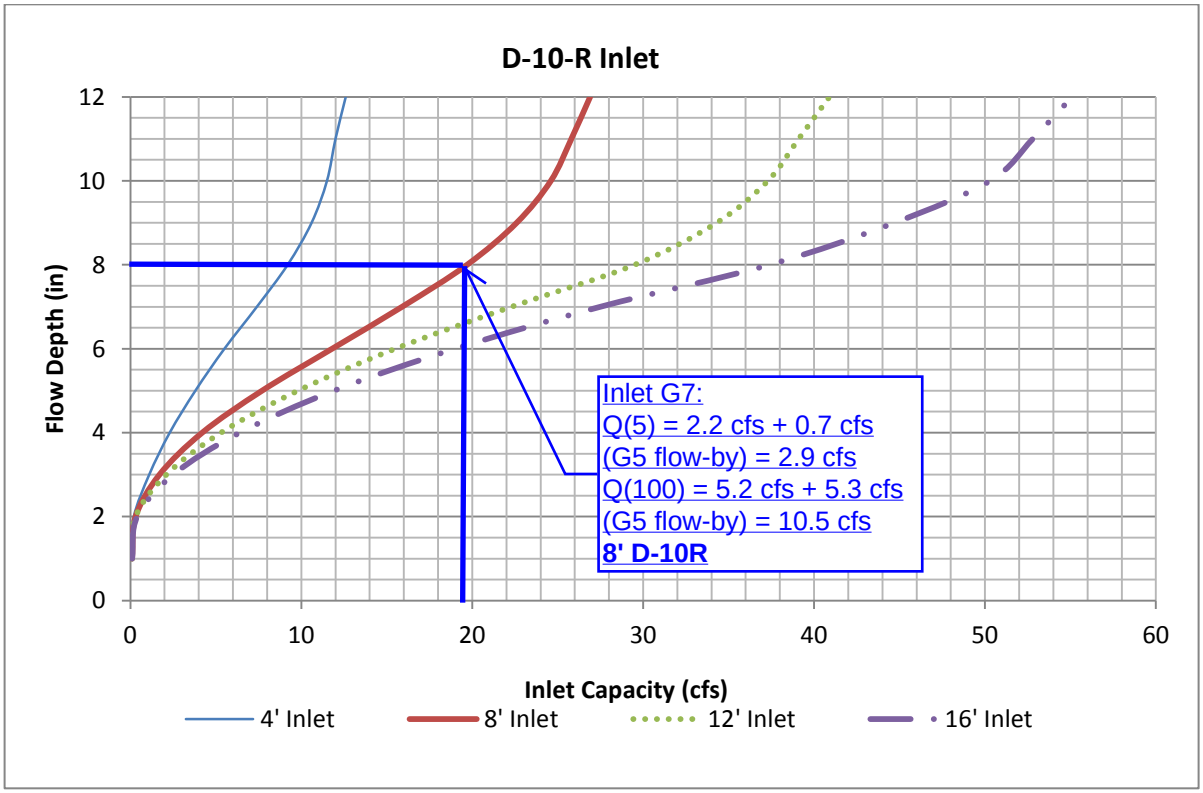
INLET ON A CONTINUOUS GRADE

Version 4.04 Released November 2016



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	12.00	12.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**5.7**	**9.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.7**	**5.3**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**89**	**63**	**%**

Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet



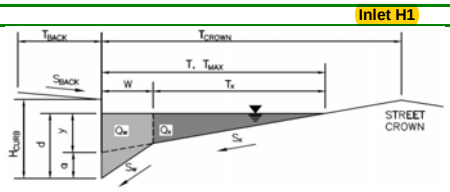
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet H1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

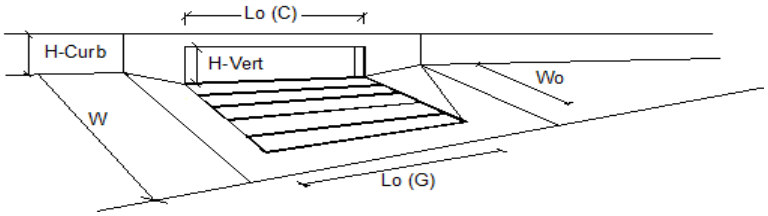
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**5.5**	**11.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.04 Released November 2016



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	8.00	8.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.5**	**4.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**2.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**95**	**64**	**%**

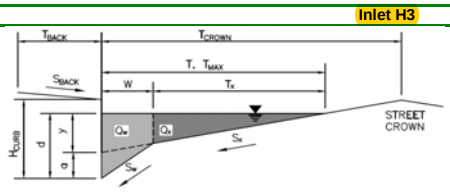
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet H3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.017	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

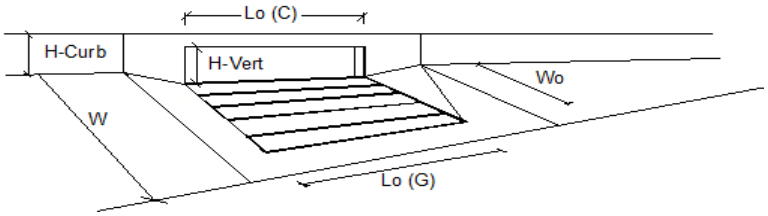
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**7.2**	**14.6**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.04 Released November 2016



Design Information (Input)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	6.00	6.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**1.1**	**2.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.4**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**83**	**%**

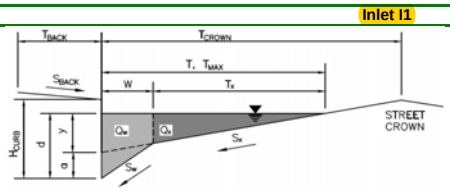
Version 4.04 Released November 2016

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Shiloh Mesa MDDP

Inlet ID: Inlet I1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.042	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.017	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

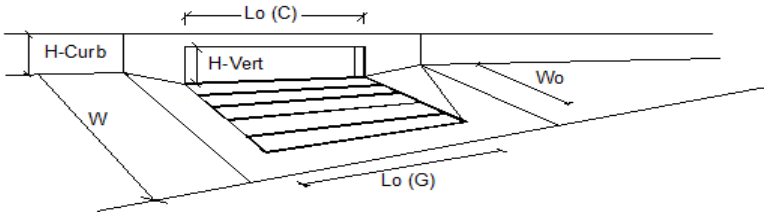
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**7.2**	**14.6**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

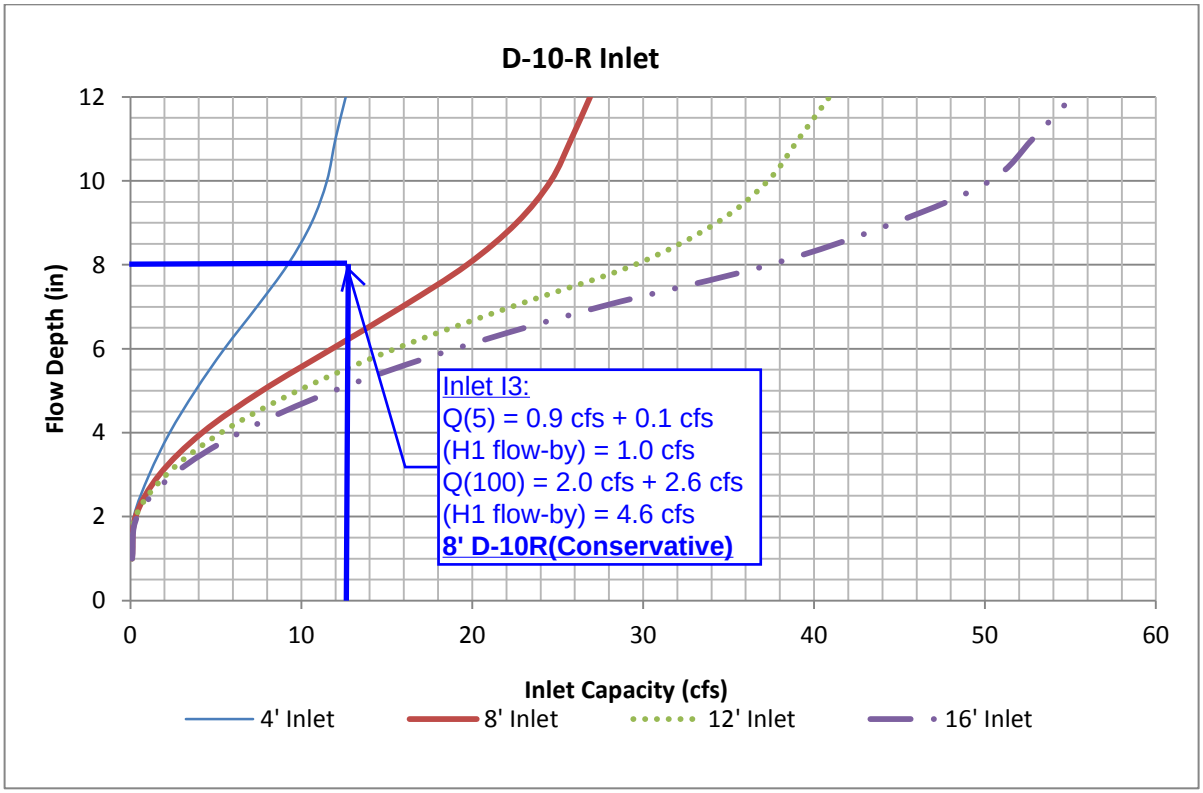
INLET ON A CONTINUOUS GRADE

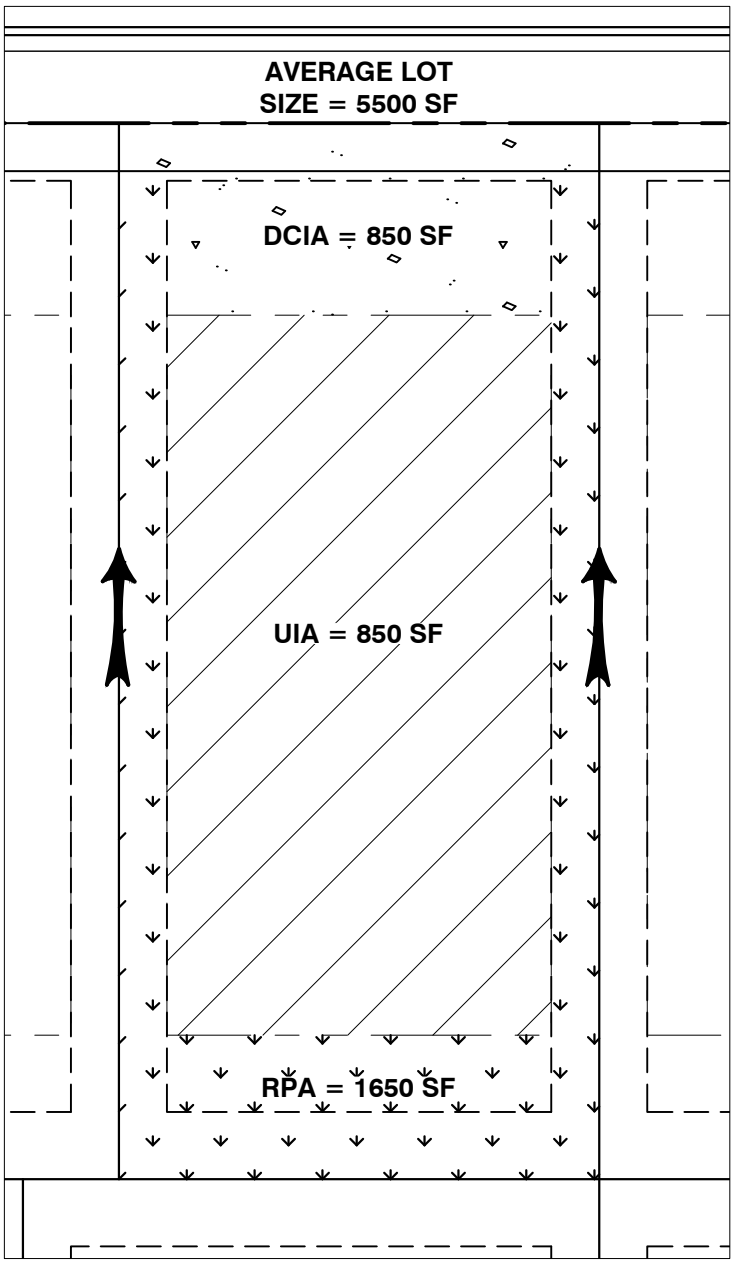
Version 4.04 Released November 2016



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (Colorado Springs D-10-R)	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	6.00	6.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**1.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**84**	**%**

Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet





AVG LOT			TOTAL LOTS	CUMULATIVE AREAS
TOTAL AREA:	5500	X	43	236500
DCIA:	860	X	43	36980
UIA:	850	X	43	36550
RPA:	1650	X	43	70950
SPA:	0	X	43	0

PREPARED BY:

Matrix DESIGN GROUP
AN EMPLOYEE-OWNED COMPANY

SHILOH MESA FILING 5
LOT IMPERVIOUSNESS EXHIBIT

DESIGNED BY:	NMS	SCALE		DATE ISSUED:	DRAWING No.
DRAWN BY:	NMS	HORIZ.	N/A		
CHECKED BY:	NMS	VERT.	N/A	SHEET 1 OF 1	1

Worksheet Protected

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches	**Designer:**	**Nicole Schanel**
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	**Company:**	**Matrix Design Group**
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	**Date:**	**November 17, 2017**
Optional User Defined Storm	CUHP			**Project:**	**Shiloh Mesa Commercial Filing No. 1**
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52		**Location:**	**Colorado Springs, CO**

Max Intensity for Optional User Defined Storm: 2.51496

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	A	B	C1	C2	D1	D2	E1	E2	F1	F2	H1	H2	H3
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	5.550	11.210	5.380	0.350	0.300	0.410	1.660	0.160	0.170	2.940	0.690	5.160	0.220
Directly Connected Impervious Area (DCIA, acres)	0.000	7.182	5.111	0.350	0.300	0.410	1.577	0.160	0.170	2.793	0.690	4.902	0.220
Unconnected Impervious Area (UIA, acres)	0.000	0.839	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Receiving Pervious Area (RPA, acres)	0.000	1.629	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Separate Pervious Area (SPA, acres)	5.550	1.560	0.269	0.000	0.000	0.000	0.083	0.000	0.000	0.147	0.000	0.258	0.000
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	5.550	11.210	5.380	0.350	0.300	0.410	1.660	0.160	0.170	2.940	0.690	5.160	0.220
Directly Connected Impervious Area (DCIA, %)	0.0%	64.1%	95.0%	100.0%	100.0%	100.0%	95.0%	100.0%	100.0%	95.0%	100.0%	95.0%	100.0%
Unconnected Impervious Area (UIA, %)	0.0%	7.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Receiving Pervious Area (RPA, %)	0.0%	14.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Separate Pervious Area (SPA, %)	100.0%	13.9%	5.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	5.0%	0.0%	5.0%	0.0%
A_R (RPA / UIA)	0.000	1.942	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
I_a Check	1.000	0.340	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
f / I for Optional User Defined Storm CUHP:	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
IRF for WQCV Event:	1.00	0.59	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 5-Year Event:	1.00	0.87	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 100-Year Event:	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for Optional User Defined Storm CUHP:	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Site Imperviousness: I_{total}	0.0%	71.6%	95.0%	100.0%	100.0%	100.0%	95.0%	100.0%	100.0%	95.0%	100.0%	95.0%	100.0%
Effective Imperviousness for WQCV Event:	0.0%	68.5%	95.0%	100.0%	100.0%	100.0%	95.0%	100.0%	100.0%	95.0%	100.0%	95.0%	100.0%
Effective Imperviousness for 5-Year Event:	0.0%	70.6%	95.0%	100.0%	100.0%	100.0%	95.0%	100.0%	100.0%	95.0%	100.0%	95.0%	100.0%
Effective Imperviousness for 100-Year Event:	0.0%	70.9%	95.0%	100.0%	100.0%	100.0%	95.0%	100.0%	100.0%	95.0%	100.0%	95.0%	100.0%
Effective Imperviousness for Optional User Defined Storm CUHP:	0.0%	70.9%	95.0%	100.0%	100.0%	100.0%	95.0%	100.0%	100.0%	95.0%	100.0%	95.0%	100.0%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	N/A	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	N/A	0.9%	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	N/A
User Defined CUHP CREDIT: Reduce Detention By:	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Total Site Imperviousness:	**72.2%**
Total Site Effective Imperviousness for WQCV Event:	**71.2%**
Total Site Effective Imperviousness for 5-Year Event:	**71.9%**
Total Site Effective Imperviousness for 100-Year Event:	**72.0%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**72.0%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

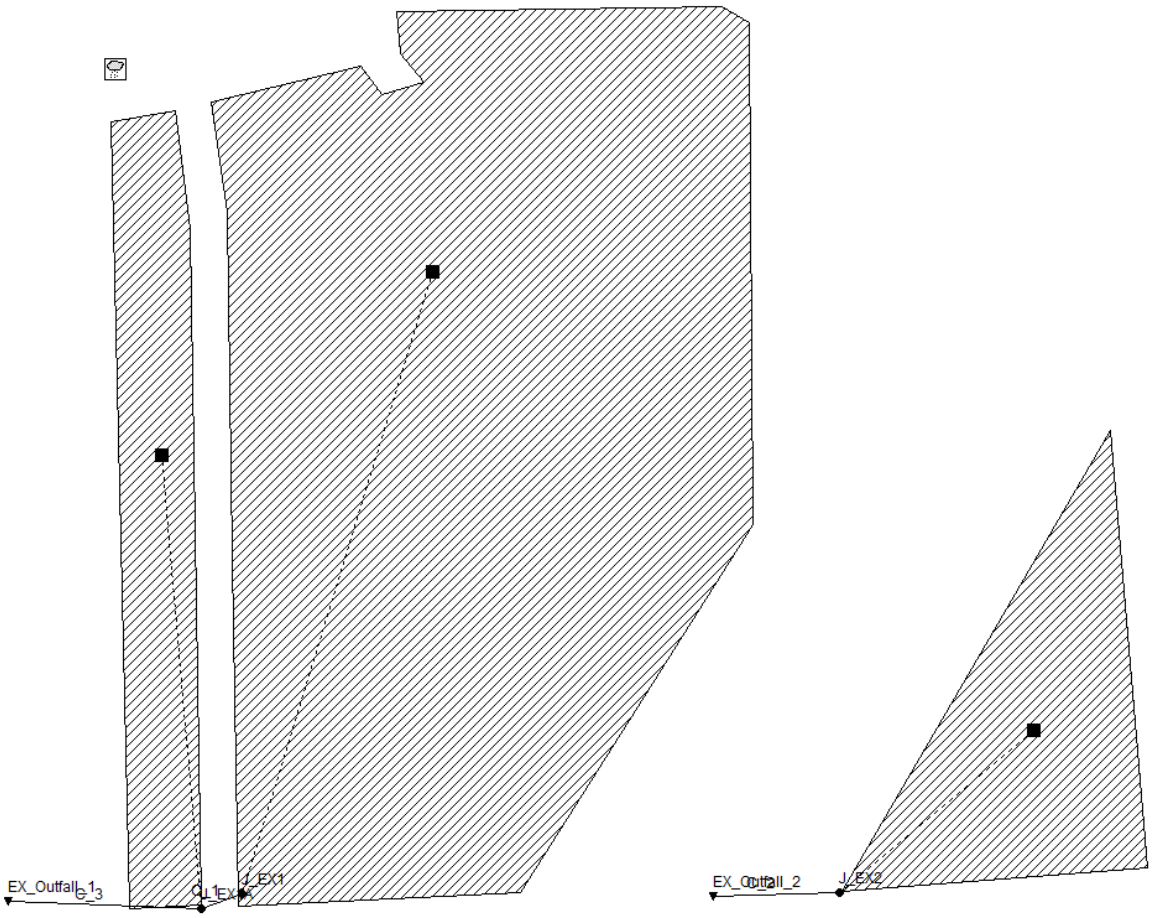
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

SWMM MODEL 2-HOUR STORM INPUT

		2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500
		1.15	1.5	1.78	2.27	2.69	2.52	3.52
0	0	0	0	0	0	0	0	0
0:05	0.014	0.0161	0.021	0.02492	0.03178	0.03766	0.03528	0.04928
0:10	0.046	0.0529	0.069	0.08188	0.10442	0.12374	0.11592	0.16192
0:15	0.079	0.09085	0.1185	0.14062	0.17933	0.21251	0.19908	0.27808
0:20	0.12	0.138	0.18	0.2136	0.2724	0.3228	0.3024	0.4224
0:25	0.179	0.20585	0.2685	0.31862	0.40633	0.48151	0.45108	0.63008
0:30	0.258	0.2967	0.387	0.45924	0.58566	0.69402	0.65016	0.90816
0:35	0.421	0.48415	0.6315	0.74938	0.95567	1.13249	1.06092	1.48192
0:40	0.712	0.8188	1.068	1.26736	1.61624	1.91528	1.79424	2.50624
0:45	0.824	0.9476	1.236	1.46672	1.87048	2.21656	2.07648	2.90048
0:50	0.892	1.0258	1.338	1.58776	2.02484	2.39948	2.24784	3.13984
0:55	0.935	1.07525	1.4025	1.6643	2.12245	2.51515	2.3562	3.2912
1:00	0.972	1.1178	1.458	1.73016	2.20644	2.61468	2.44944	3.42144
1:05	1.004	1.1546	1.506	1.78712	2.27908	2.70076	2.53008	3.53408
1:10	1.018	1.1707	1.527	1.81204	2.31086	2.73842	2.56536	3.58336
1:15	1.03	1.1845	1.545	1.8334	2.3381	2.7707	2.5956	3.6256
1:20	1.041	1.19715	1.5615	1.85298	2.36307	2.80029	2.62332	3.66432
1:25	1.052	1.2098	1.578	1.87256	2.38804	2.82988	2.65104	3.70304
1:30	1.063	1.22245	1.5945	1.89214	2.41301	2.85947	2.67876	3.74176
1:35	1.072	1.2328	1.608	1.90816	2.43344	2.88368	2.70144	3.77344
1:40	1.082	1.2443	1.623	1.92596	2.45614	2.91058	2.72664	3.80864
1:45	1.091	1.25465	1.6365	1.94198	2.47657	2.93479	2.74932	3.84032
1:50	1.1	1.265	1.65	1.958	2.497	2.959	2.772	3.872
1:55	1.109	1.27535	1.6635	1.97402	2.51743	2.98321	2.79468	3.90368
2:00	1.119	1.28685	1.6785	1.99182	2.54013	3.01011	2.81988	3.93888

EPA SWMM 5.1
EXISTING MODEL



Subcatchment EX1

Property	Value
Name	EX1
X-Coordinate	4783.036
Y-Coordinate	7819.464
Description	
Tag	
Rain Gage	RG_SM
Outlet	J_EX1
Area	34.02
Width	950
% Slope	1
% Imperv	2
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	0
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	MODIFIED_GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Subcatchment EX2

Property	Value
Name	EX2
X-Coordinate	8023.649
Y-Coordinate	5315.315
Description	
Tag	
Rain Gage	RG_SM
Outlet	J_EX2
Area	34.02
Width	633
% Slope	1
% Imperv	2
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	0
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	MODIFIED_GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Subcatchment MS_East

Property	Value
Name	MS_East
X-Coordinate	2652.027
Y-Coordinate	7004.505
Description	
Tag	
Rain Gage	RG_SM
Outlet	J_EX1A
Area	2.35
Width	75
% Slope	1
% Imperv	100
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	MODIFIED_GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Percent of runoff routed between sub-areas

Junction J_EX1A

Property	Value
Name	J_EX1A
X-Coordinate	2899.775
Y-Coordinate	4211.712
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	6891.05
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0

Junction J_EX2

Property	Value
Name	J_EX2
X-Coordinate	6829.955
Y-Coordinate	4313.063
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0

Conduit C_1

Property	Value
Name	C_1
Inlet Node	J_EX1
Outlet Node	J_EX1A
Description	
Tag	
Shape	CIRCULAR
Max. Depth	4
Length	16
Roughness	.013
Inlet Offset	0
Outlet Offset	0
Initial Flow	0
Maximum Flow	0
Entry Loss Coeff.	0
Exit Loss Coeff.	0
Avg. Loss Coeff.	0
Seepage Loss Rate	0
Flap Gate	NO
Culvert Code	

Conduit C_2

Property	Value
Name	C_2
Inlet Node	J_EX2
Outlet Node	EX_Outfall_2
Description	
Tag	
Shape	CIRCULAR
Max. Depth	3
Length	400
Roughness	0.01
Inlet Offset	0
Outlet Offset	0
Initial Flow	0
Maximum Flow	0
Entry Loss Coeff.	0
Exit Loss Coeff.	0
Avg. Loss Coeff.	0
Seepage Loss Rate	0
Flap Gate	NO
Culvert Code	

Conduit C_3

Property	Value
Name	C_3
Inlet Node	J_EX1A
Outlet Node	EX_Outfall_1
Description	
Tag	
Shape	HORIZ_ELLIPSE
Max. Depth	3.167
Length	159
Roughness	0.01
Inlet Offset	0
Outlet Offset	0
Initial Flow	0
Maximum Flow	0
Entry Loss Coeff.	0
Exit Loss Coeff.	0
Avg. Loss Coeff.	0
Seepage Loss Rate	0
Flap Gate	NO
Culvert Code	

Rain Gage RG_SM

Property	Value
Name	RG_SM
X-Coordinate	2375.847
Y-Coordinate	9367.946
Description	
Tag	
Rain Format	CUMULATIVE
Time Interval	0:05
Snow Catch Factor	1.0
Data Source	TIMESERIES

2 YR STORM

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
EX2	1.29	0.00	0.00	1.25	0.04	0.03	3.88	0.028
MS_East	1.29	0.00	0.00	0.00	1.25	0.08	5.67	0.969
EX1	1.29	0.00	0.00	1.24	0.04	0.04	4.44	0.032

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J_EX1	JUNCTION	4.44	4.44	0	00:45	0.0384	0.0384	-0.004
J_EX2	JUNCTION	3.88	3.88	0	00:45	0.0336	0.0336	-0.023
J_EX1A	JUNCTION	5.67	10.09	0	00:45	0.0796	0.118	-0.002
EX_Outfall_1	OUTFALL	0.00	10.10	0	00:45	0	0.118	0.000
EX_Outfall_2	OUTFALL	0.00	3.69	0	00:45	0	0.0336	0.000

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Day of Maximum Depth	Hour of Maximum Depth	Maximum Reported Depth Feet
J_EX1	JUNCTION	0.03	0.58	6891.79	0	00:45	0.58
J_EX2	JUNCTION	0.09	0.96	0.96	0	00:45	0.96
J_EX1A	JUNCTION	0.06	0.69	6891.74	0	00:45	0.68
EX_Outfall_1	OUTFALL	0.05	0.65	6891.06	0	00:45	0.64
EX_Outfall_2	OUTFALL	0.03	0.50	0.50	0	00:45	0.49

Link Flow Summary

Link	Type	Maximum |Flow| CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum |Velocity| ft/sec	Max / Full Flow	Max / Full Depth
C_1	CONDUIT	4.43	0	00:45	3.49	0.03	0.16
C_2	CONDUIT	3.69	0	00:45	2.82	0.06	0.24
C_3	CONDUIT	10.10	0	00:45	5.71	0.08	0.21

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
EX_Outfall_1	92.27	0.40	10.10	0.118
EX_Outfall_2	29.31	0.35	3.69	0.034

5 YR STORM

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
EX2	1.66	0.00	0.00	1.57	0.09	0.08	6.57	0.051
MS_East	1.66	0.00	0.00	0.00	1.62	0.10	7.88	0.976
EX1	1.66	0.00	0.00	1.55	0.11	0.10	8.05	0.064

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J_EX1	JUNCTION	8.05	8.05	0	00:45	0.0985	0.0985	-0.002
J_EX2	JUNCTION	6.57	6.57	0	00:45	0.0788	0.0788	-0.016
J_EX1A	JUNCTION	7.88	15.92	0	00:45	0.103	0.202	-0.002
EX_Outfall_1	OUTFALL	0.00	15.97	0	00:45	0	0.202	0.000
EX_Outfall_2	OUTFALL	0.00	6.34	0	00:45	0	0.0788	0.000

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Day of Maximum Depth	Hour of Maximum Depth	Maximum Reported Depth Feet
J_EX1	JUNCTION	0.05	0.77	6891.98	0	00:45	0.77
J_EX2	JUNCTION	0.11	1.18	1.18	0	00:45	1.18
J_EX1A	JUNCTION	0.08	0.86	6891.91	0	00:45	0.85
EX_Outfall_1	OUTFALL	0.06	0.81	6891.22	0	00:45	0.80
EX_Outfall_2	OUTFALL	0.04	0.65	0.65	0	00:45	0.65

Link Flow Summary

Link	Type	Maximum |Flow| CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum |Velocity| ft/sec	Max / Full Flow	Max / Full Depth
C_1	CONDUIT	8.05	0	00:45	4.48	0.06	0.20
C_2	CONDUIT	6.34	0	00:45	3.57	0.10	0.30
C_3	CONDUIT	15.97	0	00:45	6.72	0.12	0.26

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
EX_Outfall_1	92.95	0.67	15.97	0.202
EX_Outfall_2	29.68	0.82	6.34	0.079

10 YR STORM

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
EX2	1.99	0.00	0.00	1.83	0.16	0.15	9.58	0.082
MS_East	1.99	0.00	0.00	0.00	1.95	0.12	9.97	0.980
EX1	1.99	0.00	0.00	1.79	0.21	0.19	12.16	0.103

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J_EX1	JUNCTION	12.16	12.16	0	00:45	0.19	0.19	-0.001
J_EX2	JUNCTION	9.58	9.58	0	00:45	0.15	0.15	-0.012
J_EX1A	JUNCTION	9.97	22.13	0	00:45	0.125	0.315	-0.002
EX_Outfall_1	OUTFALL	0.00	22.24	0	00:45	0	0.315	0.000
EX_Outfall_2	OUTFALL	0.00	9.38	0	00:45	0	0.15	0.000

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Day of Maximum Depth	Hour of Maximum Depth	Maximum Reported Depth Feet
J_EX1	JUNCTION	0.06	0.93	6892.14	0	00:45	0.93
J_EX2	JUNCTION	0.14	1.38	1.38	0	00:45	1.37
J_EX1A	JUNCTION	0.09	1.00	6892.05	0	00:45	1.00
EX_Outfall_1	OUTFALL	0.08	0.95	6891.36	0	00:45	0.94
EX_Outfall_2	OUTFALL	0.06	0.79	0.79	0	00:45	0.79

Link Flow Summary

Link	Type	Maximum |Flow| CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum |Velocity| ft/sec	Max / Full Flow	Max / Full Depth
C_1	CONDUIT	12.18	0	00:45	5.78	0.08	0.24
C_2	CONDUIT	9.38	0	00:45	4.21	0.15	0.36
C_3	CONDUIT	22.24	0	00:45	7.46	0.17	0.31

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
EX_Outfall_1	93.41	1.04	22.24	0.315
EX_Outfall_2	29.92	1.55	9.38	0.150

25 YR STORM

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
EX2	2.54	0.00	0.00	2.17	0.37	0.34	16.06	0.144
MS_East	2.54	0.00	0.00	0.00	2.50	0.16	13.49	0.984
EX1	2.54	0.00	0.00	2.09	0.45	0.42	21.56	0.179

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J_EX1	JUNCTION	21.56	21.56	0	00:50	0.419	0.419	-0.000
J_EX2	JUNCTION	16.06	16.06	0	00:45	0.339	0.339	-0.007
J_EX1A	JUNCTION	13.49	34.63	0	00:45	0.16	0.579	-0.002
EX_Outfall_1	OUTFALL	0.00	34.91	0	00:45	0	0.579	0.000
EX_Outfall_2	OUTFALL	0.00	15.95	0	00:45	0	0.339	0.000

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Day of Maximum Depth	Hour of Maximum Depth	Maximum Reported Depth Feet
J_EX1	JUNCTION	0.10	1.17	6892.38	0	00:45	1.17
J_EX2	JUNCTION	0.20	1.73	1.73	0	00:45	1.71
J_EX1A	JUNCTION	0.12	1.23	6892.28	0	00:45	1.23
EX_Outfall_1	OUTFALL	0.11	1.17	6891.58	0	00:45	1.15
EX_Outfall_2	OUTFALL	0.10	1.04	1.04	0	00:45	1.04

Link Flow Summary

Link	Type	Maximum |Flow| CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum |Velocity| ft/sec	Max / Full Flow	Max / Full Depth
C_1	CONDUIT	21.57	0	00:50	7.68	0.15	0.30
C_2	CONDUIT	15.95	0	00:45	5.21	0.26	0.46
C_3	CONDUIT	34.91	0	00:45	8.56	0.26	0.38

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
EX_Outfall_1	94.01	1.93	34.91	0.579
EX_Outfall_2	31.04	3.42	15.95	0.339

50 YR STORM

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
EX2	3.01	0.00	0.00	2.41	0.60	0.56	23.24	0.201
MS_East	3.01	0.00	0.00	0.00	2.97	0.19	16.59	0.987
EX1	3.01	0.00	0.00	2.28	0.73	0.67	32.19	0.243

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J_EX1	JUNCTION	32.19	32.19	0	00:50	0.675	0.675	0.003
J_EX2	JUNCTION	23.24	23.24	0	00:55	0.558	0.558	-0.005
J_EX1A	JUNCTION	16.59	47.35	0	00:45	0.19	0.864	-0.004
EX_Outfall_1	OUTFALL	0.00	47.77	0	00:45	0	0.864	0.000
EX_Outfall_2	OUTFALL	0.00	23.38	0	00:50	0	0.558	0.000

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Day of Maximum Depth	Hour of Maximum Depth	Maximum Reported Depth Feet
J_EX1	JUNCTION	0.13	1.38	6892.59	0	00:45	1.37
J_EX2	JUNCTION	0.26	2.06	2.06	0	00:45	2.04
J_EX1A	JUNCTION	0.16	1.42	6892.47	0	00:45	1.41
EX_Outfall_1	OUTFALL	0.14	1.34	6891.75	0	00:45	1.33
EX_Outfall_2	OUTFALL	0.14	1.28	1.28	0	00:50	1.28

Link Flow Summary

Link	Type	Maximum |Flow| CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum |Velocity| ft/sec	Max / Full Flow	Max / Full Depth
C_1	CONDUIT	32.21	0	00:50	9.14	0.22	0.35
C_2	CONDUIT	23.38	0	00:50	5.92	0.38	0.55
C_3	CONDUIT	47.77	0	00:45	9.33	0.36	0.44

Outfall Loading Summary

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
EX_Outfall_1	94.43	3.10	47.77	0.864
EX_Outfall_2	33.16	5.66	23.38	0.558

100 YR STORM

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
EX2	3.51	0.00	0.00	2.61	0.91	0.84	32.97	0.258
MS_East	3.51	0.00	0.00	0.00	3.47	0.22	19.97	0.989
EX1	3.51	0.00	0.00	2.44	1.07	0.99	45.30	0.305

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J_EX1	JUNCTION	45.30	45.30	0	00:50	0.988	0.988	0.003
J_EX2	JUNCTION	32.97	32.97	0	00:55	0.837	0.837	-0.002
J_EX1A	JUNCTION	19.97	62.70	0	00:45	0.222	1.21	-0.004
EX_Outfall_1	OUTFALL	0.00	63.22	0	00:45	0	1.21	0.000
EX_Outfall_2	OUTFALL	0.00	32.92	0	00:55	0	0.837	0.000

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Day of Maximum Depth	Hour of Maximum Depth	Maximum Reported Depth Feet
J_EX1	JUNCTION	0.18	1.60	6892.81	0	00:45	1.60
J_EX2	JUNCTION	0.34	2.50	2.50	0	00:50	2.49
J_EX1A	JUNCTION	0.19	1.63	6892.68	0	00:45	1.63
EX_Outfall_1	OUTFALL	0.17	1.53	6891.94	0	00:45	1.51
EX_Outfall_2	OUTFALL	0.19	1.57	1.57	0	00:55	1.56

Link Flow Summary

Link	Type	Maximum |Flow| CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum |Velocity| ft/sec	Max / Full Flow	Max / Full Depth
C_1	CONDUIT	45.32	0	00:50	10.37	0.32	0.40
C_2	CONDUIT	32.92	0	00:55	6.50	0.54	0.68
C_3	CONDUIT	63.22	0	00:45	9.99	0.48	0.50

Outfall Loading Summary

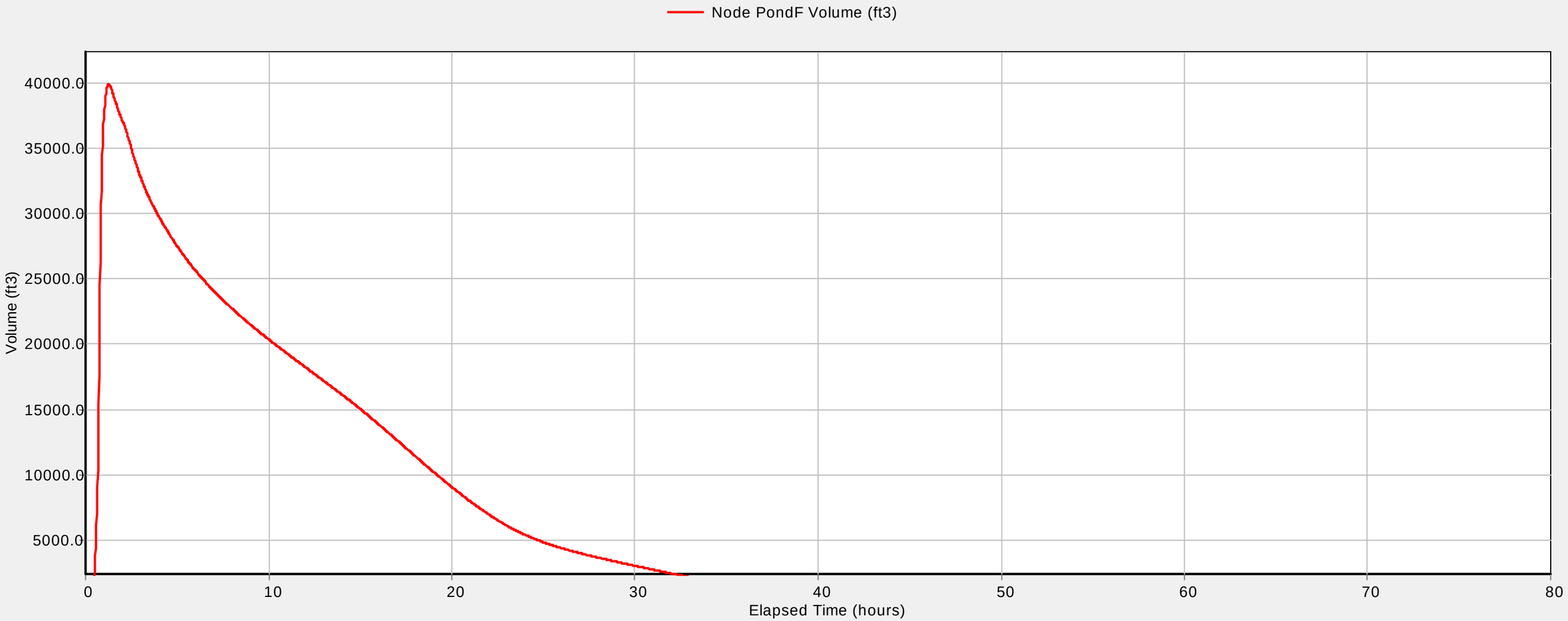
Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
EX_Outfall_1	94.81	4.66	63.22	1.210
EX_Outfall_2	35.40	8.51	32.92	0.837

Pond Release

5-Year; 97%; 72 Hours

Table - Node PondF Max Volume(CF)= 39929.08

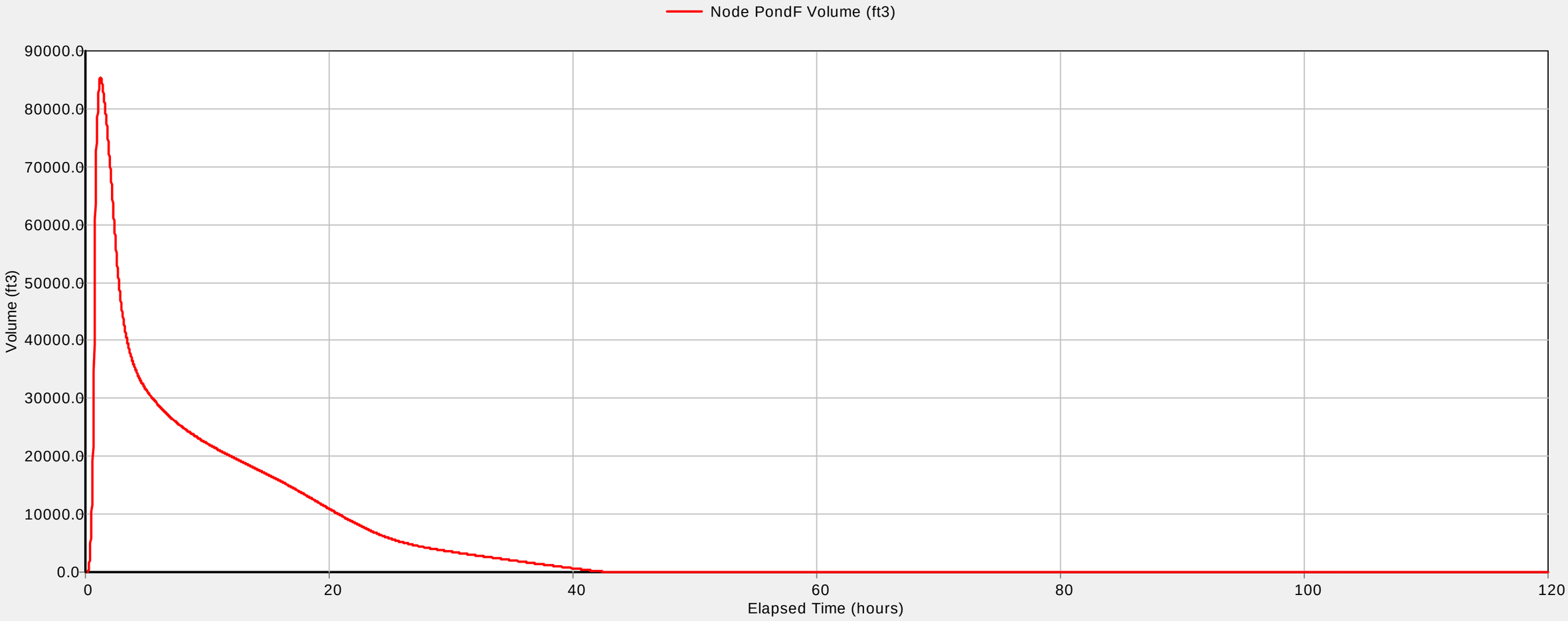
Days	Hours	Volume (ft3)	Total Hours	% Remaining
0	0:01:00	0	0	0.0
0	1:00:00	37274.21	1	93.4
0	2:00:00	37144.19	2	93.0
0	3:00:00	32802.08	3	82.2
0	4:00:00	29777.78	4	74.6
0	5:00:00	27513.93	5	68.9
0	6:00:00	25645.11	6	64.2
0	7:00:00	24079.99	7	60.3
0	8:00:00	22721.38	8	56.9
0	9:00:00	21500.61	9	53.8
0	10:00:00	20368.86	10	51.0
0	11:00:00	19290.8	11	48.3
0	12:00:00	18239.73	12	45.7
0	13:00:00	17194.74	13	43.1
0	14:00:00	16137.54	14	40.4
0	15:00:00	15039.77	15	37.7
0	16:00:00	13866.1	16	34.7
0	18:00:00	11424.55	18	28.6
0	19:00:00	10213.91	19	25.6
0	20:00:00	9054.61	20	22.7
0	21:00:00	7968.73	21	20.0
0	22:00:00	6976.82	22	17.5
0	23:00:00	6104.87	23	15.3
1	0:00:00	5400.48	24	13.5
1	1:00:00	4837.43	25	12.1
1	2:00:00	4377.28	26	11.0
1	3:00:00	3990.51	27	10.0
1	4:00:00	3652.34	28	9.1
1	5:00:00	3335.76	29	8.4
1	6:00:00	3028.61	30	7.6
1	7:00:00	2730.27	31	6.8
1	8:00:00	2439.43	32	6.1
1	9:00:00	2152.94	33	5.4
1	10:00:00	1868.67	34	4.7
1	11:00:00	1587.34	35	4.0
1	12:00:00	1309.83	36	3.3
1	13:00:00	1037.12	37	2.6
1	14:00:00	770.47	38	1.9
1	15:00:00	511.78	39	1.3
1	16:00:00	264.75	40	0.7
1	17:00:00	80.44	41	0.2
1	18:00:00	26.65	42	0.1
1	19:00:00	6.09	43	0.0
1	20:00:00	4.31	44	0.0
1	21:00:00	3.98	45	0.0
1	22:00:00	3.77	46	0.0
1	23:00:00	3.58	47	0.0
2	0:00:00	3.41	48	0.0
2	1:00:00	3.25	49	0.0
2	2:00:00	3.1	50	0.0
2	3:00:00	2.96	51	0.0
2	4:00:00	2.83	52	0.0
2	5:00:00	2.71	53	0.0
2	6:00:00	2.6	54	0.0
2	7:00:00	2.49	55	0.0
2	8:00:00	2.39	56	0.0
2	9:00:00	2.3	57	0.0
2	10:00:00	2.21	58	0.0
2	11:00:00	2.13	59	0.0
2	12:00:00	2.05	60	0.0
2	13:00:00	1.97	61	0.0
2	14:00:00	1.9	62	0.0
2	15:00:00	1.84	63	0.0
2	16:00:00	1.77	64	0.0
2	17:00:00	1.71	65	0.0
2	18:00:00	1.66	66	0.0
2	19:00:00	1.6	67	0.0
2	20:00:00	1.55	68	0.0
2	21:00:00	1.5	69	0.0
2	22:00:00	1.45	70	0.0
2	23:00:00	1.41	71	0.0
3	0:00:00	1.37	72	0.0


Node PondF Volume (ft3)
Volume (ft3)
40000.0
35000.0
30000.0
25000.0
20000.0
15000.0
10000.0
5000.0
0
10
20
30
40
50
60
70
80
Elapsed Time (hours)

100-Year; 99%; 120 Hours

Table - Node PondF — Max Volume(CF)= 85451.41

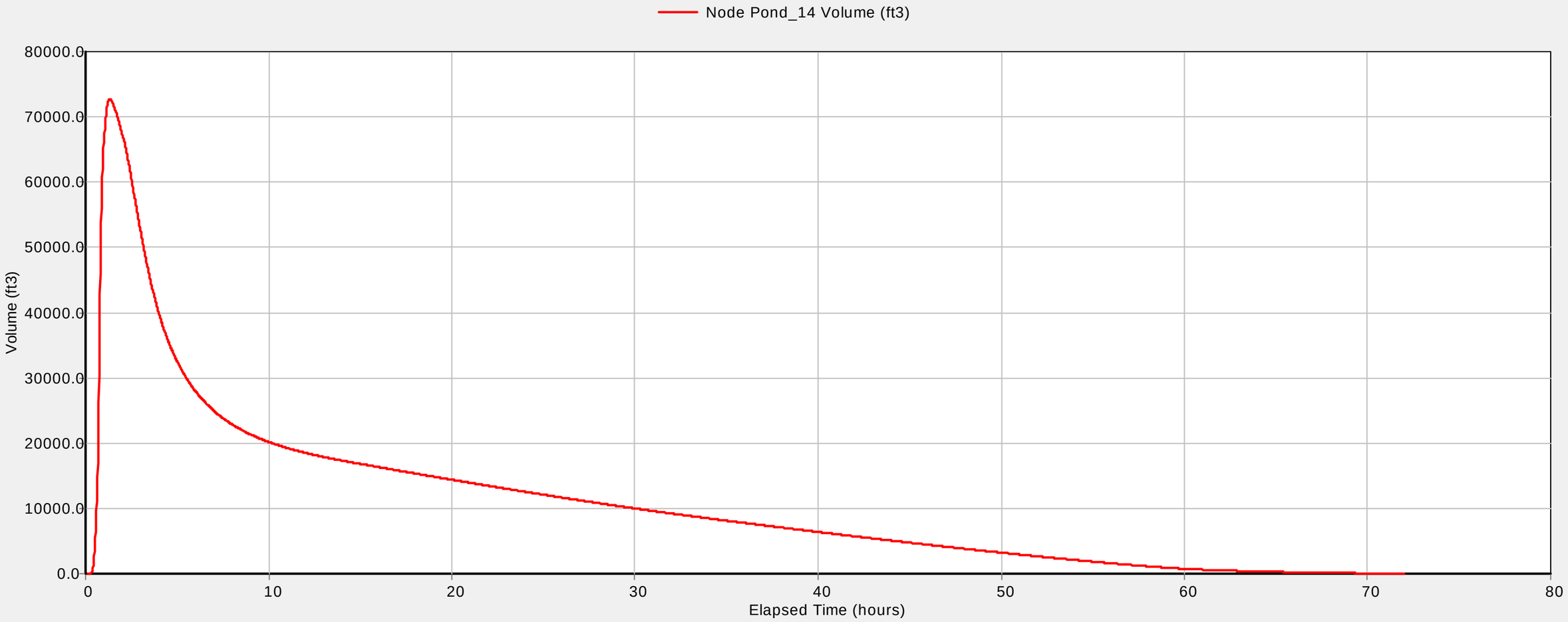
Days	Hours	Volume (ft3)	Total Hours	% Remaining
0	0:01:00	0	0	0.0
0	1:00:00	79393.27	1	92.9
0	2:00:00	70905.95	2	83.0
0	3:00:00	45238.14	3	52.9
0	4:00:00	35625.32	4	41.7
0	5:00:00	31427.47	5	36.8
0	6:00:00	28827.29	6	33.7
0	7:00:00	26703.63	7	31.3
0	8:00:00	24969.4	8	29.2
0	9:00:00	23499.63	9	27.5
0	10:00:00	22206.6	10	26.0
0	11:00:00	21029.58	11	24.6
0	12:00:00	19925.56	12	23.3
0	13:00:00	18863.21	13	22.1
0	14:00:00	17818.48	14	20.9
0	15:00:00	16771.91	15	19.6
0	16:00:00	15705.72	16	18.4
0	18:00:00	13386.57	18	15.7
0	19:00:00	12162.88	19	14.2
0	20:00:00	10935.16	20	12.8
0	21:00:00	9741.87	21	11.4
0	22:00:00	8609.49	22	10.1
0	23:00:00	7558.43	23	8.8
1	0:00:00	6610.57	24	7.7
1	1:00:00	5802.26	25	6.8
1	2:00:00	5159.81	26	6.0
1	3:00:00	4642	27	5.4
1	4:00:00	4214.4	28	4.9
1	5:00:00	3849.98	29	4.5
1	6:00:00	3523.7	30	4.1
1	7:00:00	3210.9	31	3.8
1	8:00:00	2907.32	32	3.4
1	9:00:00	2612.14	33	3.1
1	10:00:00	2323.54	34	2.7
1	11:00:00	2037.83	35	2.4
1	12:00:00	1754.6	36	2.1
1	13:00:00	1474.65	37	1.7
1	14:00:00	1198.9	38	1.4
1	15:00:00	928.42	39	1.1
1	16:00:00	664.67	40	0.8
1	17:00:00	410.01	41	0.5
1	18:00:00	170.35	42	0.2
1	19:00:00	55.58	43	0.1
1	20:00:00	13.47	44	0.0
1	21:00:00	4.88	45	0.0
1	22:00:00	4.13	46	0.0
1	23:00:00	3.88	47	0.0
2	0:00:00	3.68	48	0.0
2	1:00:00	3.5	49	0.0
2	2:00:00	3.33	50	0.0
2	3:00:00	3.18	51	0.0
2	4:00:00	3.04	52	0.0
2	5:00:00	2.9	53	0.0
2	6:00:00	2.78	54	0.0
2	7:00:00	2.66	55	0.0
2	8:00:00	2.55	56	0.0
2	9:00:00	2.44	57	0.0
2	10:00:00	2.35	58	0.0
2	11:00:00	2.26	59	0.0
2	12:00:00	2.17	60	0.0
2	13:00:00	2.09	61	0.0
2	14:00:00	2.01	62	0.0
2	15:00:00	1.94	63	0.0
2	16:00:00	1.87	64	0.0
2	17:00:00	1.81	65	0.0
2	18:00:00	1.74	66	0.0
2	19:00:00	1.69	67	0.0
2	20:00:00	1.63	68	0.0
2	21:00:00	1.58	69	0.0
2	22:00:00	1.53	70	0.0
2	23:00:00	1.48	71	0.0
3	0:00:00	1.43	72	0.0
3	1:00:00	1.39	73	0.0
3	2:00:00	1.35	74	0.0
3	3:00:00	1.31	75	0.0
3	4:00:00	1.27	76	0.0
3	5:00:00	1.23	77	0.0
3	6:00:00	1.2	78	0.0
3	7:00:00	1.16	79	0.0
3	8:00:00	1.13	80	0.0
3	9:00:00	1.1	81	0.0
3	10:00:00	1.07	82	0.0
3	11:00:00	1.04	83	0.0
3	12:00:00	1.02	84	0.0
3	13:00:00	0.99	85	0.0
3	14:00:00	0.97	86	0.0
3	15:00:00	0.94	87	0.0
3	16:00:00	0.92	88	0.0
3	17:00:00	0.9	89	0.0
3	18:00:00	0.88	90	0.0
3	19:00:00	0.85	91	0.0
3	20:00:00	0.83	92	0.0
3	21:00:00	0.81	93	0.0
3	22:00:00	0.8	94	0.0
3	23:00:00	0.78	95	0.0
4	0:00:00	0.76	96	0.0
4	1:00:00	0.74	97	0.0
4	2:00:00	0.73	98	0.0
4	3:00:00	0.71	99	0.0
4	4:00:00	0.7	100	0.0
4	5:00:00	0.68	101	0.0
4	6:00:00	0.67	102	0.0
4	7:00:00	0.65	103	0.0
4	8:00:00	0.64	104	0.0
4	9:00:00	0.63	105	0.0
4	10:00:00	0.61	106	0.0
4	11:00:00	0.6	107	0.0
4	12:00:00	0.59	108	0.0
4	13:00:00	0.58	109	0.0
4	14:00:00	0.57	110	0.0
4	15:00:00	0.56	111	0.0
4	16:00:00	0.55	112	0.0
4	17:00:00	0.54	113	0.0
4	18:00:00	0.53	114	0.0
4	19:00:00	0.52	115	0.0
4	20:00:00	0.51	116	0.0
4	21:00:00	0.5	117	0.0
4	22:00:00	0.49	118	0.0
4	23:00:00	0.48	119	0.0
5	0:00:00	0.47	120	0.0


Node PondF Volume (ft3)
90000.0
80000.0
70000.0
60000.0
50000.0
40000.0
30000.0
20000.0
10000.0
0.0
Volume (ft3)
0
20
40
60
80
100
120
Elapsed Time (hours)

5-Year: 97%; 72 Hours

Table - Node Pond_14 Max Volume(CF)= 72766.52

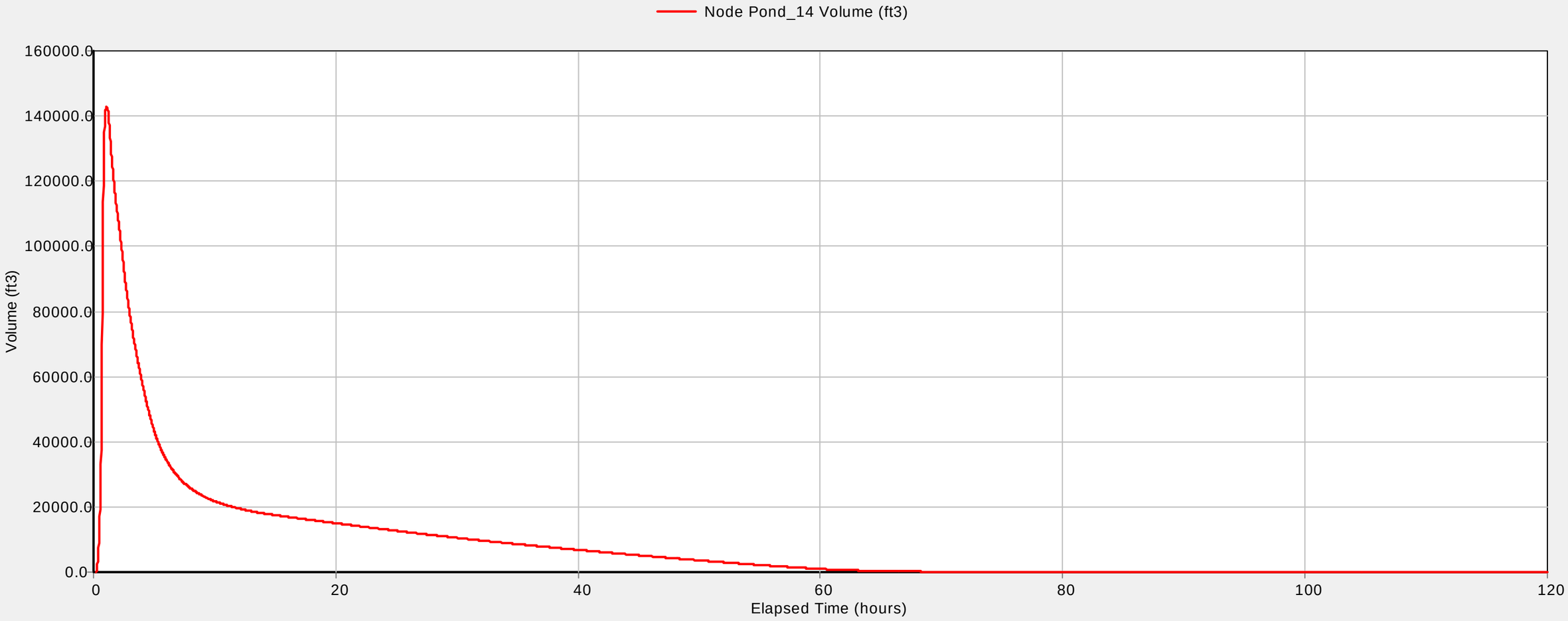
Days	Hours	Volume (ft3)	Total Hours	% Remaining
0	0:01:00	0	0	0.0
0	1:00:00	66063.81	1	90.8
0	2:00:00	67401.89	2	92.6
0	3:00:00	52550.58	3	72.2
0	4:00:00	39947.61	4	54.9
0	5:00:00	32538.69	5	44.7
0	6:00:00	27979.09	6	38.5
0	7:00:00	24974.85	7	34.3
0	8:00:00	22881.47	8	31.4
0	9:00:00	21352.63	9	29.3
0	10:00:00	20189.77	10	27.7
0	11:00:00	19272.43	11	26.5
0	12:00:00	18523.65	12	25.5
0	13:00:00	17891.52	13	24.6
0	14:00:00	17338.3	14	23.8
0	15:00:00	16831.01	15	23.1
0	16:00:00	16335.08	16	22.4
0	18:00:00	15358.2	18	21.1
0	19:00:00	14877.54	19	20.4
0	20:00:00	14402.24	20	19.8
0	21:00:00	13932.41	21	19.1
0	22:00:00	13468.18	22	18.5
0	23:00:00	13009.81	23	17.9
1	0:00:00	12557.77	24	17.3
1	1:00:00	12112.35	25	16.6
1	2:00:00	11673.88	26	16.0
1	3:00:00	11242.74	27	15.5
1	4:00:00	10819.42	28	14.9
1	5:00:00	10404.62	29	14.3
1	6:00:00	10000.7	30	13.7
1	7:00:00	9607.9	31	13.2
1	8:00:00	9225.37	32	12.7
1	9:00:00	8852.17	33	12.2
1	10:00:00	8487.27	34	11.7
1	11:00:00	8129.34	35	11.2
1	12:00:00	7776.21	36	10.7
1	13:00:00	7426.34	37	10.2
1	14:00:00	7079.8	38	9.7
1	15:00:00	6736.68	39	9.3
1	16:00:00	6397.08	40	8.8
1	17:00:00	6061.14	41	8.3
1	18:00:00	5728.97	42	7.9
1	19:00:00	5400.73	43	7.4
1	20:00:00	5076.55	44	7.0
1	21:00:00	4756.62	45	6.5
1	22:00:00	4441.13	46	6.1
1	23:00:00	4130.29	47	5.7
2	0:00:00	3824.33	48	5.3
2	1:00:00	3523.54	49	4.8
2	2:00:00	3228.23	50	4.4
2	3:00:00	2938.79	51	4.0
2	4:00:00	2655.65	52	3.6
2	5:00:00	2379.38	53	3.3
2	6:00:00	2110.65	54	2.9
2	7:00:00	1850.33	55	2.5
2	8:00:00	1599.61	56	2.2
2	9:00:00	1360.17	57	1.9
2	10:00:00	1134.66	58	1.6
2	11:00:00	927.81	59	1.3
2	12:00:00	751.05	60	1.0
2	13:00:00	621.98	61	0.9
2	14:00:00	519.13	62	0.7
2	15:00:00	435.74	63	0.6
2	16:00:00	360.24	64	0.5
2	17:00:00	291.5	65	0.4
2	18:00:00	230.08	66	0.3
2	19:00:00	176.66	67	0.2
2	20:00:00	132.21	68	0.2
2	21:00:00	98.07	69	0.1
2	22:00:00	73.43	70	0.1
2	23:00:00	51.41	71	0.1
3	0:00:00	32.56	72	0.0


Node Pond_14 Volume (ft3)
Volume (ft3)
80000.0
70000.0
60000.0
50000.0
40000.0
30000.0
20000.0
10000.0
0.0
0
10
20
30
40
50
60
70
80
Elapsed Time (hours)

100-Year; 99%; 120 Hours

Table - Node Pond_14 (100_YR) Max Volume(CF)= 142811

Days	Hours	Volume (ft3)	Total Hours	% Remaining
0	0:01:00	0	0	0.0
0	1:00:00	141852.2	1	99.3
0	2:00:00	109287.1	2	76.5
0	3:00:00	79082.11	3	55.4
0	4:00:00	58433.24	4	40.9
0	5:00:00	43454.69	5	30.4
0	6:00:00	34509.98	6	24.2
0	7:00:00	29195.47	7	20.4
0	8:00:00	25780.05	8	18.1
0	9:00:00	23445.24	9	16.4
0	10:00:00	21766.27	10	15.2
0	11:00:00	20505.83	11	14.4
0	12:00:00	19522.96	12	13.7
0	13:00:00	18729.26	13	13.1
0	14:00:00	18066.26	14	12.7
0	15:00:00	17492.65	15	12.2
0	16:00:00	16975.29	16	11.9
0	18:00:00	15984.67	18	11.2
0	19:00:00	15497.01	19	10.9
0	20:00:00	15014.6	20	10.5
0	21:00:00	14537.56	21	10.2
0	22:00:00	14065.99	22	9.8
0	23:00:00	13600.02	23	9.5
1	0:00:00	13139.81	24	9.2
1	1:00:00	12685.84	25	8.9
1	2:00:00	12238.43	26	8.6
1	3:00:00	11797.88	27	8.3
1	4:00:00	11364.55	28	8.0
1	5:00:00	10938.89	29	7.7
1	6:00:00	10521.5	30	7.4
1	7:00:00	10114.24	31	7.1
1	8:00:00	9718.33	32	6.8
1	9:00:00	9332.94	33	6.5
1	10:00:00	8957.17	34	6.3
1	11:00:00	8590.01	35	6.0
1	12:00:00	8230.24	36	5.8
1	13:00:00	7876	37	5.5
1	14:00:00	7525.19	38	5.3
1	15:00:00	7177.68	39	5.0
1	16:00:00	6833.56	40	4.8
1	17:00:00	6492.94	41	4.5
1	18:00:00	6155.94	42	4.3
1	19:00:00	5822.68	43	4.1
1	20:00:00	5493.3	44	3.8
1	21:00:00	5167.94	45	3.6
1	22:00:00	4846.79	46	3.4
1	23:00:00	4530.01	47	3.2
2	0:00:00	4217.82	48	3.0
2	1:00:00	3910.44	49	2.7
2	2:00:00	3608.15	50	2.5
2	3:00:00	3311.25	51	2.3
2	4:00:00	3020.1	52	2.1
2	5:00:00	2735.12	53	1.9
2	6:00:00	2456.84	54	1.7
2	7:00:00	2185.89	55	1.5
2	8:00:00	1923.08	56	1.3
2	9:00:00	1669.5	57	1.2
2	10:00:00	1426.65	58	1.0
2	11:00:00	1196.84	59	0.8
2	12:00:00	984.01	60	0.7
2	13:00:00	796.62	61	0.6
2	14:00:00	655.78	62	0.5
2	15:00:00	545.66	63	0.4
2	16:00:00	458.26	64	0.3
2	17:00:00	380.93	65	0.3
2	18:00:00	310.23	66	0.2
2	19:00:00	246.68	67	0.2
2	20:00:00	190.91	68	0.1
2	21:00:00	143.8	69	0.1
2	22:00:00	106.57	70	0.1
2	23:00:00	80.07	71	0.1
3	0:00:00	57.37	72	0.0
3	1:00:00	37.51	73	0.0
3	2:00:00	22.47	74	0.0
3	3:00:00	13.72	75	0.0
3	4:00:00	8.58	76	0.0
3	5:00:00	5.55	77	0.0
3	6:00:00	3.74	78	0.0
3	7:00:00	2.63	79	0.0
3	8:00:00	1.93	80	0.0
3	9:00:00	1.47	81	0.0
3	10:00:00	1.16	82	0.0
3	11:00:00	0.94	83	0.0
3	12:00:00	0.79	84	0.0
3	13:00:00	0.67	85	0.0
3	14:00:00	0.58	86	0.0
3	15:00:00	0.52	87	0.0
3	16:00:00	0.46	88	0.0
3	17:00:00	0.42	89	0.0
3	18:00:00	0.39	90	0.0
3	19:00:00	0.36	91	0.0
3	20:00:00	0.33	92	0.0
3	21:00:00	0.31	93	0.0
3	22:00:00	0.3	94	0.0
3	23:00:00	0.29	95	0.0
4	0:00:00	0.28	96	0.0
4	1:00:00	0.27	97	0.0
4	2:00:00	0.26	98	0.0
4	3:00:00	0.25	99	0.0
4	4:00:00	0.24	100	0.0
4	5:00:00	0.24	101	0.0
4	6:00:00	0.23	102	0.0
4	7:00:00	0.23	103	0.0
4	8:00:00	0.22	104	0.0
4	9:00:00	0.22	105	0.0
4	10:00:00	0.22	106	0.0
4	11:00:00	0.21	107	0.0
4	12:00:00	0.21	108	0.0
4	13:00:00	0.21	109	0.0
4	14:00:00	0.2	110	0.0
4	15:00:00	0.2	111	0.0
4	16:00:00	0.2	112	0.0
4	17:00:00	0.2	113	0.0
4	18:00:00	0.19	114	0.0
4	19:00:00	0.19	115	0.0
4	20:00:00	0.19	116	0.0
4	21:00:00	0.19	117	0.0
4	22:00:00	0.19	118	0.0
4	23:00:00	0.19	119	0.0
5	0:00:00	0.18	120	0.0


Node Pond_14 Volume (ft3)
160000.0
140000.0
120000.0
100000.0
80000.0
60000.0
40000.0
20000.0
0.0
Volume (ft3)
0
20
40
60
80
100
120
Elapsed Time (hours)

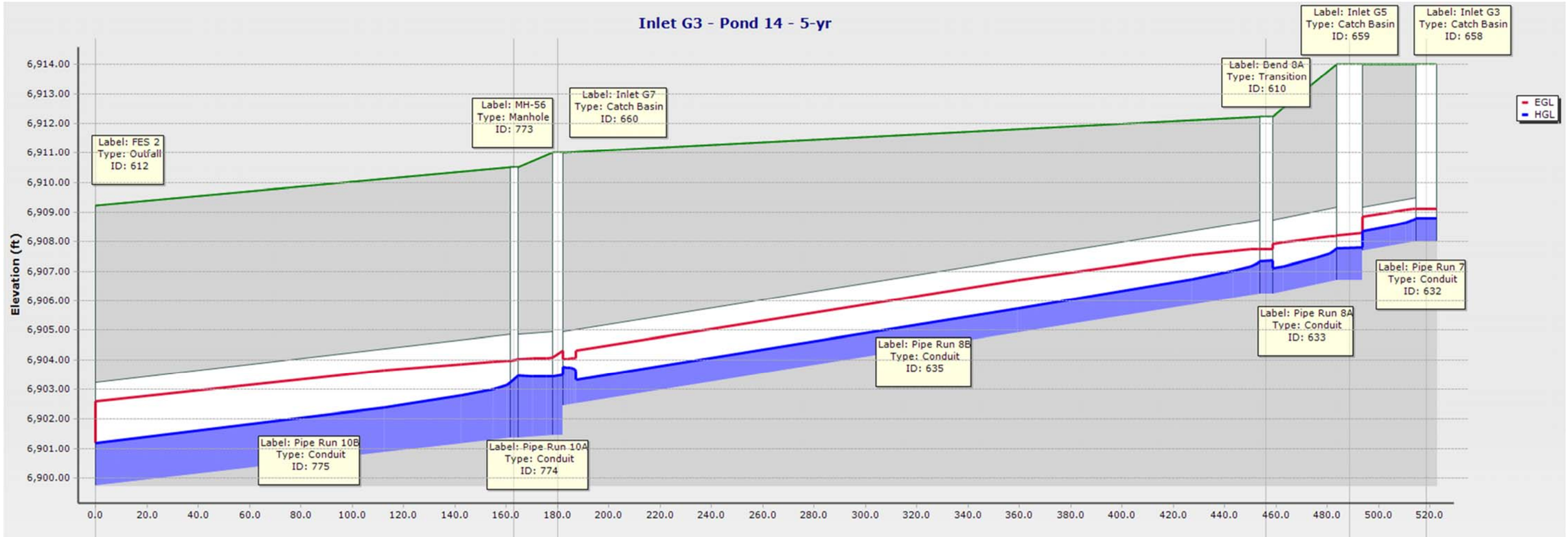
StormCAD

100 YR

Inlet G1 - Pond 14 - 5-yr

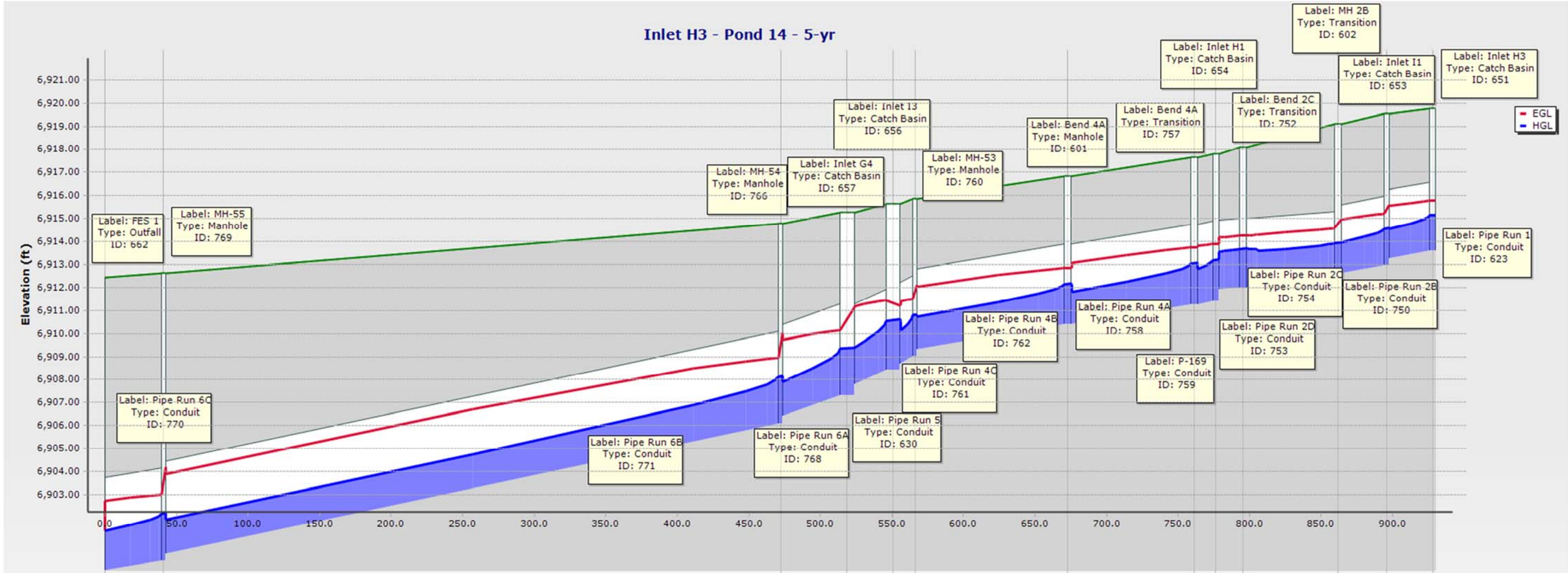
ID\Label	775 \ Pipe Run 10B	774 \ Pipe Run 10A	634 \ Pipe Run 9
Link Length (ft)	163.2	17.0	30.0
Rise (in)\Material	42.0 \ Concrete	42.0 \ Concrete	30.0 \ Concrete
Flow (ft³/s)	35.8	35.8	15.3
Slope (ft/ft)	0.010	0.005	-0.010

ID\Label	612 \ FES 2	773 \ MH-56	660 \ Inlet G7	661 \ Inlet G1
Ground (ft)	6909.24	6910.51	6911.01	6911.01
Invert (ft)	6899.74	6901.38	6901.46	6902.76
Station (ft)	0.0	163.2	180.2	210.2

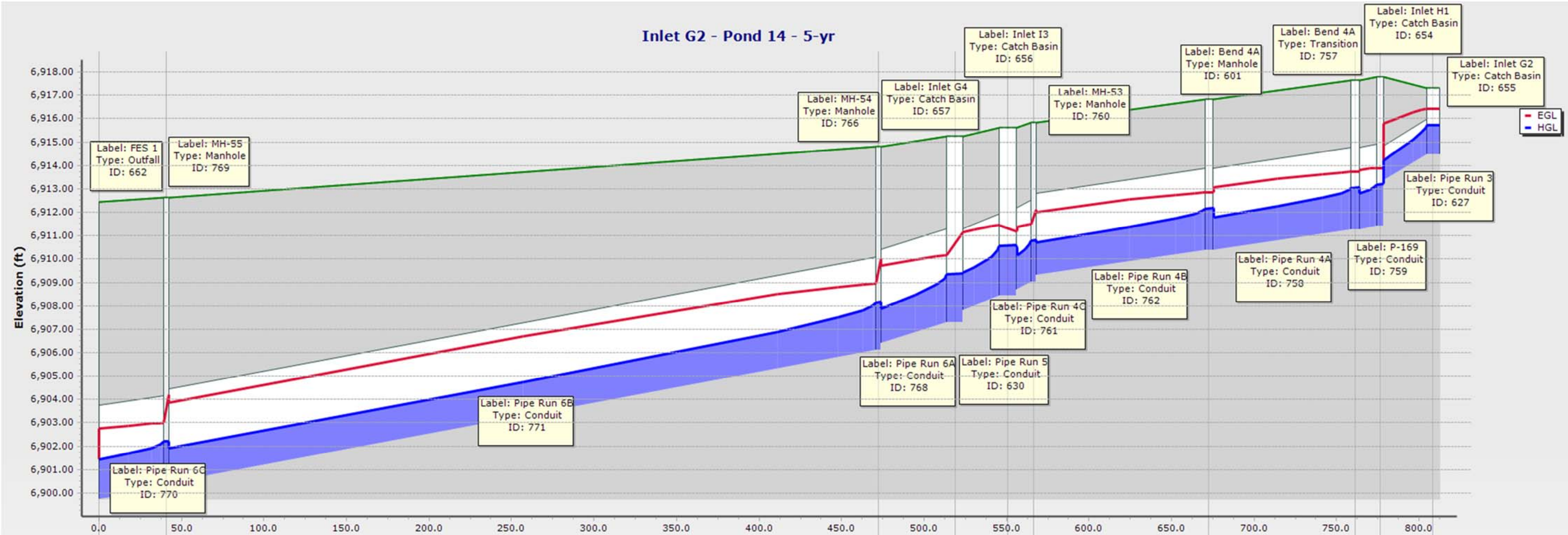


ID\Label	775 \ Pipe Run 10B	774 \ Pipe Run 10A	635 \ Pipe Run 8B	633 \ Pipe Run 8A	632 \ Pipe Run 7
Link Length (ft)	163.2	17.0	276.0	32.5	30.0
Rise (in)\Material	42.0 \ Concrete	42.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	18.0 \ Concrete
Flow (ft³/s)	35.8	35.8	10.8	10.8	4.4
Slope (ft/ft)	0.010	0.005	-0.014	-0.014	-0.010

ID\Label	612 \ FES 2	773 \ MH-56	660 \ Inlet G7	610 \ Bend 8A	659 \ Inlet G5	658 \ Inlet G3
Ground (ft)	6909.24	6910.51	6911.01	6912.24	6914.01	6914.01
Invert (ft)	6899.74	6901.38	6901.46	6906.24	6906.69	6908.00
Station (ft)	0.0	163.2	180.2	456.2	488.6	518.6



ID\Label	770 \ Pipe Run 6C	771 \ Pipe Run 6B	768 \ Pipe Run 6A	630 \ Pipe Run 5	761 \ Pipe Run 4C	762 \ Pipe Run 4B	758 \ Pipe Run 4A	759 \ P-169	753 \ Pipe Run 2D	754 \ Pipe Run 2C	750 \ Pipe Run 2B	623 \ Pipe Run 1
Link Length (ft)	40.9	431.2	46.6	32.0	15.5	106.4	88.6	15.1	19.1	66.3	34.0	32.1
Rise (in)\Material	48.0 \ Concrete	48.0 \ Concrete	48.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete
Flow (ft³/s)	46.6	46.6	46.6	46.0	33.1	33.1	33.1	33.1	25.0	25.0	25.0	23.9
Slope (ft/ft)	-0.010	-0.013	-0.019	-0.020	-0.020	-0.010	-0.010	-0.010	0.004	-0.005	-0.010	-0.010
ID\Label	662 \ FES 1	769 \ MH-55	766 \ MH-54	657 \ Inlet G4	656 \ Inlet I3	760 \ MH-53	601 \ Bend 4A	757 \ Bend 4A	654 \ Inlet H1	752 \ Bend 2C	602 \ MH 2B	653 \ Inlet I1	651 \ Inlet H3
Ground (ft)	6912.43	6912.63	6914.80	6915.26	6915.62	6915.84	6916.83	6917.65	6917.76	6918.08	6919.10	6919.56	6919.77
Invert (ft)	6899.74	6900.15	6906.10	6907.30	6908.64	6909.01	6910.38	6911.45	6911.48	6911.99	6912.32	6912.96	6913.58
Station (ft)	0.0	40.9	472.1	518.7	550.7	566.2	672.7	761.3	776.4	795.5	861.8	895.8	927.9



ID\Label	Link Length (ft)	Rise (in)\Material	Flow (ft³/s)	Slope (ft/ft)
770 \ Pipe Run 6C	40.9	48.0 \ Concrete	46.6	-0.010
771 \ Pipe Run 6B	431.2	48.0 \ Concrete	46.6	-0.013
768 \ Pipe Run 6A	46.6	48.0 \ Concrete	46.6	-0.019
630 \ Pipe Run 5	32.0	42.0 \ Concrete	46.0	-0.020
761 \ Pipe Run 4C	15.5	42.0 \ Concrete	33.1	-0.020
762 \ Pipe Run 4B	106.4	42.0 \ Concrete	33.1	-0.010
758 \ Pipe Run 4A	88.6	42.0 \ Concrete	33.1	-0.010
759 \ P-169	15.1	42.0 \ Concrete	33.1	-0.010
627 \ Pipe Run 3	32.0	18.0 \ Concrete	10.6	-0.035

ID\Label	Ground (ft)	Invert (ft)	Station (ft)
662 \ FES 1	6912.43	6899.74	0.0
769 \ MH-55	6912.63	6900.15	40.9
766 \ MH-54	6914.80	6906.10	472.1
657 \ Inlet G4	6915.26	6907.30	518.7
656 \ Inlet I3	6915.6[illegible]	6908.4[illegible]	550.7
760 \ MH-53	6915.84	6909.01	566.2
601 \ Bend 4A	6916.83	6910.38	672.7
757 \ Bend 4A	6917.6[illegible]	6911.2[illegible]	761.3
654 \ Inlet H1	6917.79	6911.41	776.4
655 \ Inlet G2	6917.32	6914.47	808.5

Analysis Results
Scenario: 5-yr

Title	S:\16.900.001 Shiloh Mesa Commercial Filing\Dwg\Dref\D-900-PR-STORM-PROF_COMM.dwg
Engineer	
Company	
Date	2/6/2013
Notes	

Scenario Summary

ID	289
Label	5-yr
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrologic
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	Base Rainfall Runoff
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
SCADA	Base SCADA
Energy Cost	Base Energy Cost
Solver Calculation Options	Base Calculation Options

Network Inventory

Conduits	41	Manholes	12
-Circle	37	Property Connections	0
-Box	0	Taps	0
-Ellipse	4	Transitions	5
-Virtual	0	Cross Sections	0
-Irregular Channel	0	Outfalls	7
-Trapezoidal Channel	0	Catchments	0
-Triangular Channel	0	Low Impact Development Controls	0
-Rectangular Channel	0	Ponds	0
-Pipe-Arch	0	Pond Outlet Structures	0
Laterals	0	Headwalls	0
Channels	0	Pumps	0
Gutters	8	Wet Wells	0
Pressure Pipes	0	Pressure Junctions	0
Catch Basins	24	SCADA Elements	0
-Maximum Capacity	0	Pump Stations	0
-Full Capture	3	Variable Speed Pump Batteries	0
-Catalog Inlet	20	Air Valves	0

Network Inventory	
--Curb Colo. Sprgs. D-10-R Inlet (Curb)	20

Transition elements for network with outlet: FES 1

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH 2B	6,913.97	6,913.93	0.04	HEC-22 Energy (Second Edition)	0.0	24.9	0.0	8.000	0.13	0.00
Bend 2C	6,913.69	6,913.65	0.04	HEC-22 Energy (Second Edition)	0.0	24.9	0.0	8.000	0.29	0.00
Bend 4A	6,913.07	6,913.04	0.03	HEC-22 Energy (Second Edition)	0.0	33.0	0.0	8.000	0.37	0.00

Transition elements for network with outlet: FES 2

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
Bend 8A	6,907.37	6,907.34	0.03	HEC-22 Energy (Second Edition)	0.0	10.8	0.0	8.000	0.16	0.00

Transition elements for network with outlet: OF-28

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
Manhole 13B	6,897.54	6,897.33	0.20	HEC-22 Energy (Second Edition)	0.0	14.9	0.0	8.000	0.53	0.00

Outfall elements for network with outlet: <None>

Label	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)

Outfall elements for network with outlet: <None>

Label	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
FES 2	0.0	35.8	0.0	11.972	1.06	0.00
FES 1	0.0	46.6	0.0	11.972	1.54	0.00
MH EX2	0.0	10.1	0.0	11.972	1.28	0.00
OF-28	0.0	14.9	0.0	11.972	1.79	0.00
OF-29	0.0	31.0	0.0	11.972	0.82	0.00

Conduit elements for network with outlet: MH EX2

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run Ex1	Circle	Circle - 48.0 in	22.0	1	-0.010	6.8	5.9	6,891.21	6,891.43	6,892.19	6,891.83
Pipe Run 12B	Circle	Circle - 48.0 in	197.6	1	-0.010	6.8	5.9	6,891.73	6,893.71	6,894.46	6,892.32
Pipe Run Ex2	Ellipse	Ellipse - 5.0 x 3.2 in	159.8	1	-0.005	10.1	4.8	6,889.96	6,890.75	6,891.53	6,890.67
Pipe Run Ex4	Circle	Circle - 36.0 in	32.2	1	-0.005	10.1	5.3	6,889.50	6,889.66	6,890.67	6,890.44
Pipe Run Ex3	Circle	Circle - 24.0 in	22.5	1	-0.020	0.0	0.0	6,889.96	6,890.41	6,890.67	6,890.67

Conduit elements for network with outlet: FES 1

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 1	Circle	Circle - 36.0 in	32.1	1	-0.010	23.9	8.6	6,913.26	6,913.58	6,915.15	6,914.58
Pipe Run 3	Circle	Circle - 18.0 in	32.0	1	-0.035	10.6	11.3	6,913.36	6,914.47	6,915.72	6,914.22
Pipe Run 5	Circle	Circle - 42.0 in	32.0	1	-0.020	46.0	13.2	6,907.80	6,908.44	6,910.56	6,909.41
Pipe Run 2B	Circle	Circle - 36.0 in	34.0	1	-0.010	24.9	8.7	6,912.62	6,912.96	6,914.56	6,913.97
Pipe Run 2D	Circle	Circle - 36.0 in	19.1	1	-0.004	24.9	6.2	6,911.91	6,911.99	6,913.65	6,913.52
Pipe Run 2C	Circle	Circle - 36.0 in	66.3	1	-0.005	24.9	6.8	6,911.99	6,912.32	6,913.93	6,913.69
Pipe Run 4A	Circle	Circle - 42.0 in	88.6	1	-0.010	33.0	9.4	6,910.38	6,911.26	6,913.04	6,912.20
P-169	Circle	Circle - 42.0 in	15.1	1	-0.010	33.0	9.4	6,911.26	6,911.41	6,913.19	6,913.07
Pipe Run 4C	Circle	Circle - 42.0 in	15.5	1	-0.020	33.0	12.0	6,908.70	6,909.01	6,910.79	6,910.61
Pipe Run 4B	Circle	Circle - 42.0 in	106.4	1	-0.010	33.0	9.4	6,909.31	6,910.38	6,912.15	6,910.72
Pipe Run 6A	Circle	Circle - 48.0 in	46.6	1	-0.019	46.6	12.9	6,906.40	6,907.30	6,909.34	6,907.90
Pipe Run 6C	Circle	Circle - 48.0 in	40.9	1	-0.010	46.6	10.2	6,899.74	6,900.15	6,902.20	6,901.44
Pipe Run 6B	Circle	Circle - 48.0 in	431.2	1	-0.013	46.6	11.3	6,900.45	6,906.10	6,908.15	6,901.91

Conduit elements for network with outlet: FES 2

Conduit elements for network with outlet: FES 2

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 7	Circle	Circle - 18.0 in	30.0	1	-0.010	4.4	5.8	6,907.69	6,908.00	6,908.80	6,908.36
Pipe Run 8A	Circle	Circle - 30.0 in	32.5	1	-0.014	10.8	7.9	6,906.24	6,906.69	6,907.79	6,907.37
Pipe Run 9	Circle	Circle - 30.0 in	30.0	1	-0.010	15.3	7.7	6,902.46	6,902.76	6,904.08	6,903.57
Pipe Run 8B	Circle	Circle - 30.0 in	276.0	1	-0.014	10.8	7.9	6,902.46	6,906.24	6,907.34	6,903.76
Pipe Run 10A	Circle	Circle - 42.0 in	17.0	1	0.005	35.8	7.4	6,901.46	6,901.38	6,903.43	6,903.46
Pipe Run 10B	Circle	Circle - 42.0 in	163.2	1	0.010	35.8	9.6	6,901.38	6,899.74	6,903.23	6,901.19

Conduit elements for network with outlet: OF-28

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 13A	Circle	Circle - 36.0 in	240.2	1	0.010	14.9	7.6	6,898.80	6,896.40	6,900.03	6,897.37
Pipe Run 13B	Circle	Circle - 36.0 in	43.2	1	0.010	14.9	7.5	6,896.10	6,895.69	6,897.33	6,896.70
Pipe Run 13C	Circle	Circle - 42.0 in	471.2	1	0.007	14.9	6.8	6,895.19	6,891.66	6,896.37	6,892.64

Conduit elements for network with outlet: OF-29

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 11	Circle	Circle - 42.0 in	28.0	1	-0.008	30.4	8.4	6,896.56	6,896.78	6,898.48	6,898.05
Pipe Run C	Circle	Circle - 42.0 in	41.5	1	-0.010	22.5	8.4	6,904.45	6,904.86	6,906.32	6,905.63
Pipe Run B	Ellipse	Ellipse - 4.4 x 2.8 in	42.0	1	-0.010	20.6	7.8	6,906.03	6,906.45	6,907.62	6,906.96
Pipe Run A	Circle	Circle - 42.0 in	29.1	1	-0.036	19.2	12.7	6,906.00	6,907.05	6,908.39	6,907.64
Pipe Run C (2)	Circle	Circle - 42.0 in	331.0	1	0.021	22.5	11.1	6,904.15	6,897.08	6,905.60	6,898.80
P-184	Circle	Circle - 48.0 in	28.0	1	0.007	31.0	7.9	6,896.26	6,896.07	6,897.91	6,897.54

Catch Basin elements for network with outlet: MH EX2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet EX1	Catalog Inlet	0.0	0.0	100.0	6,891.54	6,891.53	0.01	HEC-22 Energy (Second Edition)
Inlet EX2	Full Capture	0.0	0.0	100.0	6,890.67	6,890.67	0.00	Standard

Catch Basin elements for network with outlet: MH EX2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
MH-F	Full Capture	0.0	0.0	100.0	6,894.46	6,894.46	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: FES 1

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet H3	Catalog Inlet	0.0	0.0	100.0	6,915.15	6,915.15	0.00	HEC-22 Energy (Second Edition)
Inlet I1	Catalog Inlet	0.0	0.0	100.0	6,914.61	6,914.56	0.04	HEC-22 Energy (Second Edition)
Inlet H1	Catalog Inlet	0.0	0.0	100.0	6,913.23	6,913.19	0.04	HEC-22 Energy (Second Edition)
Inlet G2	Catalog Inlet	0.0	0.0	100.0	6,915.72	6,915.72	0.00	HEC-22 Energy (Second Edition)
Inlet I3	Catalog Inlet	0.0	0.0	100.0	6,910.61	6,910.56	0.05	HEC-22 Energy (Second Edition)
Inlet G4	Catalog Inlet	0.0	0.0	100.0	6,909.38	6,909.34	0.04	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: FES 2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet G3	Catalog Inlet	0.0	0.0	100.0	6,908.80	6,908.80	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: FES 2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet G5	Catalog Inlet	0.0	0.0	100.0	6,907.81	6,907.79	0.03	HEC-22 Energy (Second Edition)
Inlet G7	Catalog Inlet	0.0	0.0	100.0	6,903.49	6,903.43	0.07	HEC-22 Energy (Second Edition)
Inlet G1	Catalog Inlet	0.0	0.0	100.0	6,904.08	6,904.08	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: OF-28

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP15	Full Capture	0.0	0.0	100.0	6,900.03	6,900.03	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: OF-29

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet E2	Catalog Inlet	0.0	0.0	100.0	6,898.80	6,898.48	0.32	HEC-22 Energy (Second Edition)
Inlet F1	Catalog Inlet	0.0	0.0	100.0	6,897.94	6,897.91	0.03	HEC-22 Energy (Second Edition)
Headwall 1	Percent Capture	0.0	0.0	100.0	6,908.39	6,908.39	0.00	HEC-22 Energy (Second Edition)
Inlet D1	Catalog Inlet	0.0	0.0	100.0	6,907.64	6,907.62	0.02	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: OF-29

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet D2	Catalog Inlet	0.0	0.0	100.0	6,906.34	6,906.32	0.03	HEC-22 Energy (Second Edition)

Manhole elements for network with outlet: MH EX2

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH1	6,892.19	6,892.19	0.01	HEC-22 Energy (Second Edition)	0.0	6.8	0.0	8.000	0.56	0.00
MH EX1	6,890.67	6,890.67	0.00	Standard	0.0	10.1	0.0	8.000	1.18	0.00

Manhole elements for network with outlet: FES 1

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
Bend 4A	6,912.20	6,912.15	0.04	HEC-22 Energy (Second Edition)	0.0	33.0	0.0	8.000	0.53	0.00
MH-53	6,910.81	6,910.79	0.02	HEC-22 Energy (Second Edition)	0.0	33.0	0.0	8.000	0.72	0.00
MH-54	6,908.17	6,908.15	0.02	HEC-22 Energy (Second Edition)	0.0	46.6	0.0	8.000	0.84	0.00
MH-55	6,902.22	6,902.20	0.02	HEC-22 Energy (Second Edition)	0.0	46.6	0.0	8.000	1.48	0.00

Manhole elements for network with outlet: FES 2

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)

Manhole elements for network with outlet: FES 2

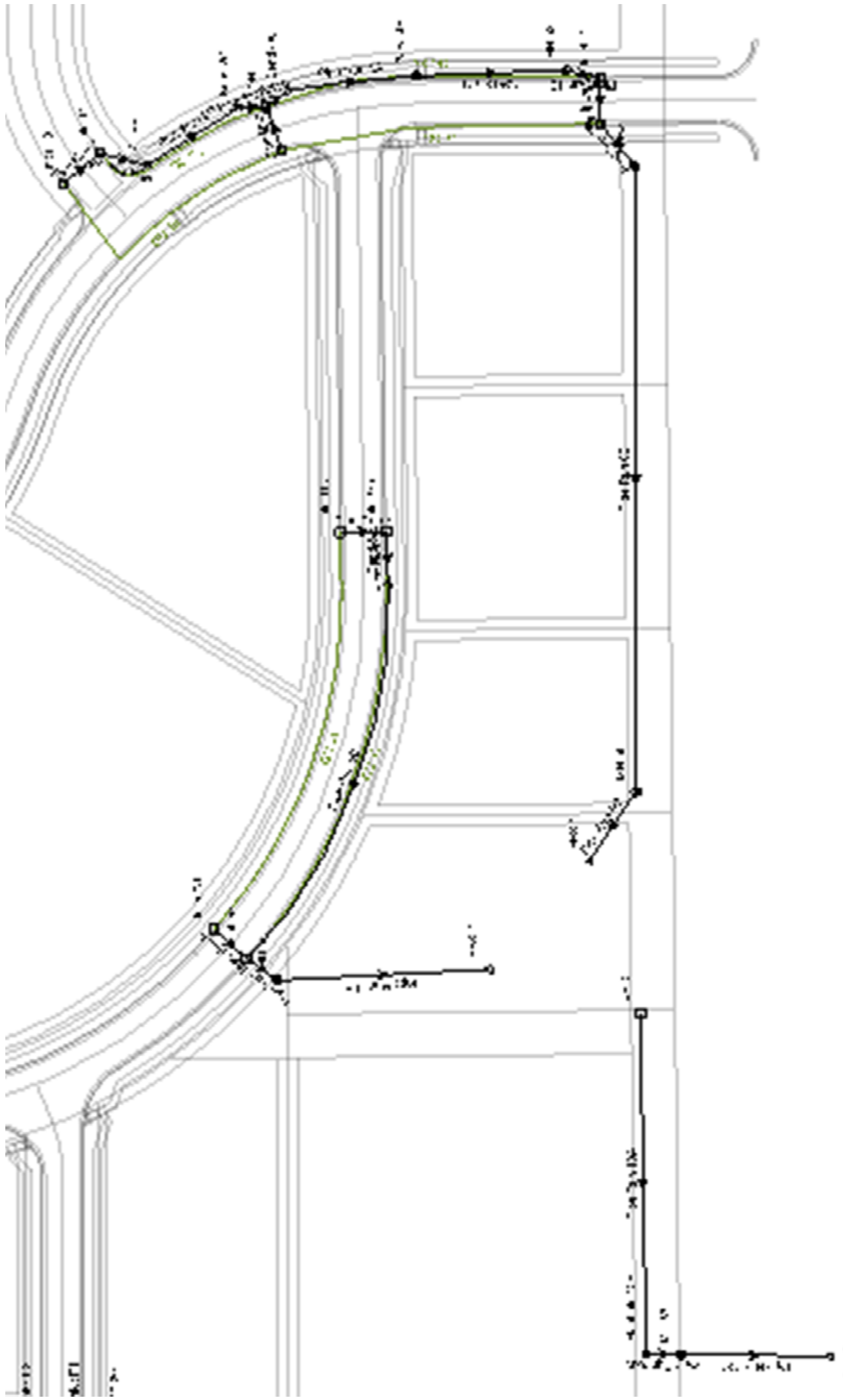
Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft^3/s)	System Known Flow (ft^3/s)	System Rational Flow (ft^3/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH-56	6,903.46	6,903.23	0.22	HEC-22 Energy (Second Edition)	0.0	35.8	0.0	8.000	0.78	0.00

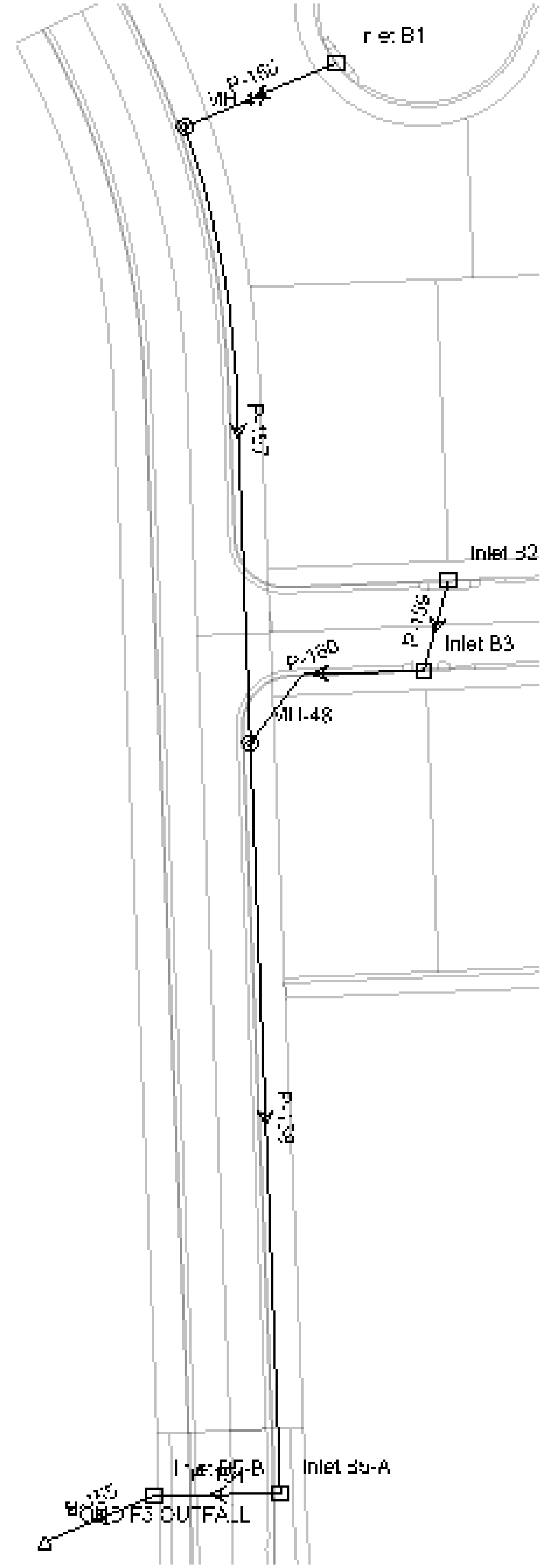
Manhole elements for network with outlet: OF-29

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft^3/s)	System Known Flow (ft^3/s)	System Rational Flow (ft^3/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH-58	6,905.60	6,905.60	0.00	Absolute	0.0	22.5	0.0	8.000	0.21	0.00

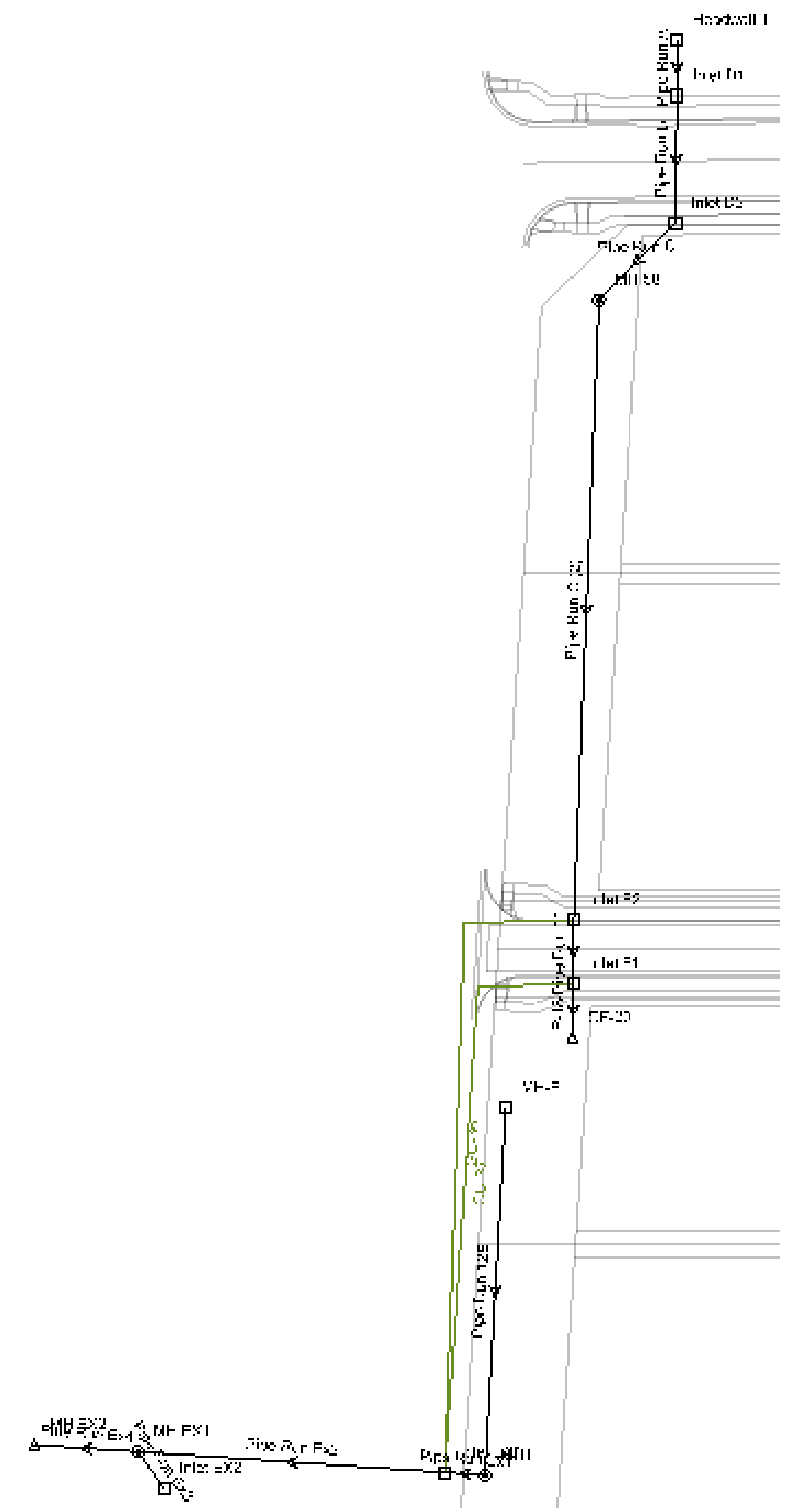
Manhole elements for network with outlet: OF-28

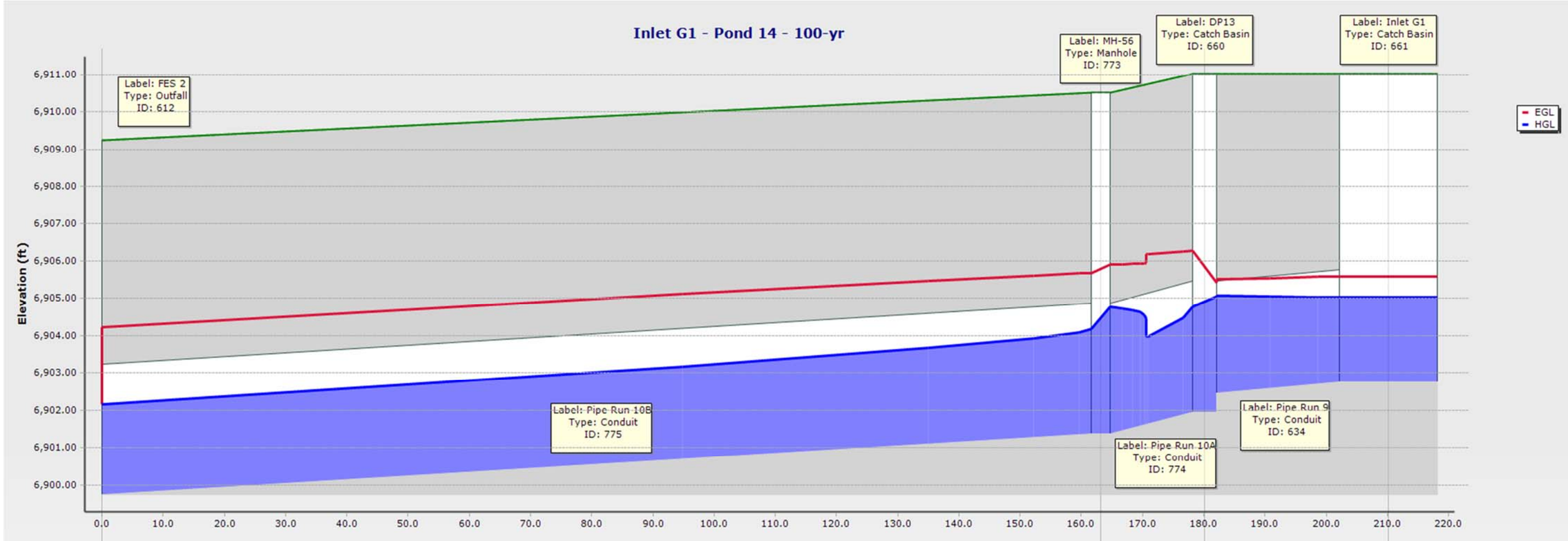
Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft^3/s)	System Known Flow (ft^3/s)	System Rational Flow (ft^3/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH-57	6,896.39	6,896.37	0.03	HEC-22 Energy (Second Edition)	0.0	14.9	0.0	8.000	0.62	0.00





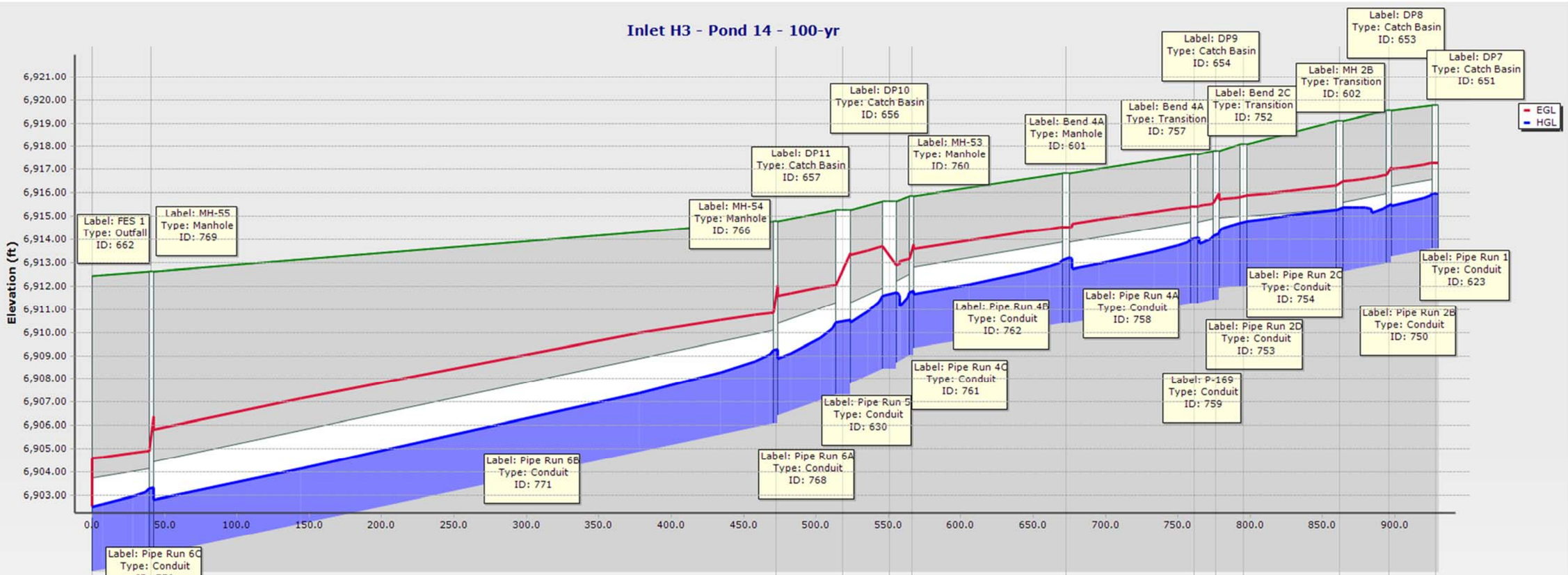
Inlet B3
MH-48
OUTFALL



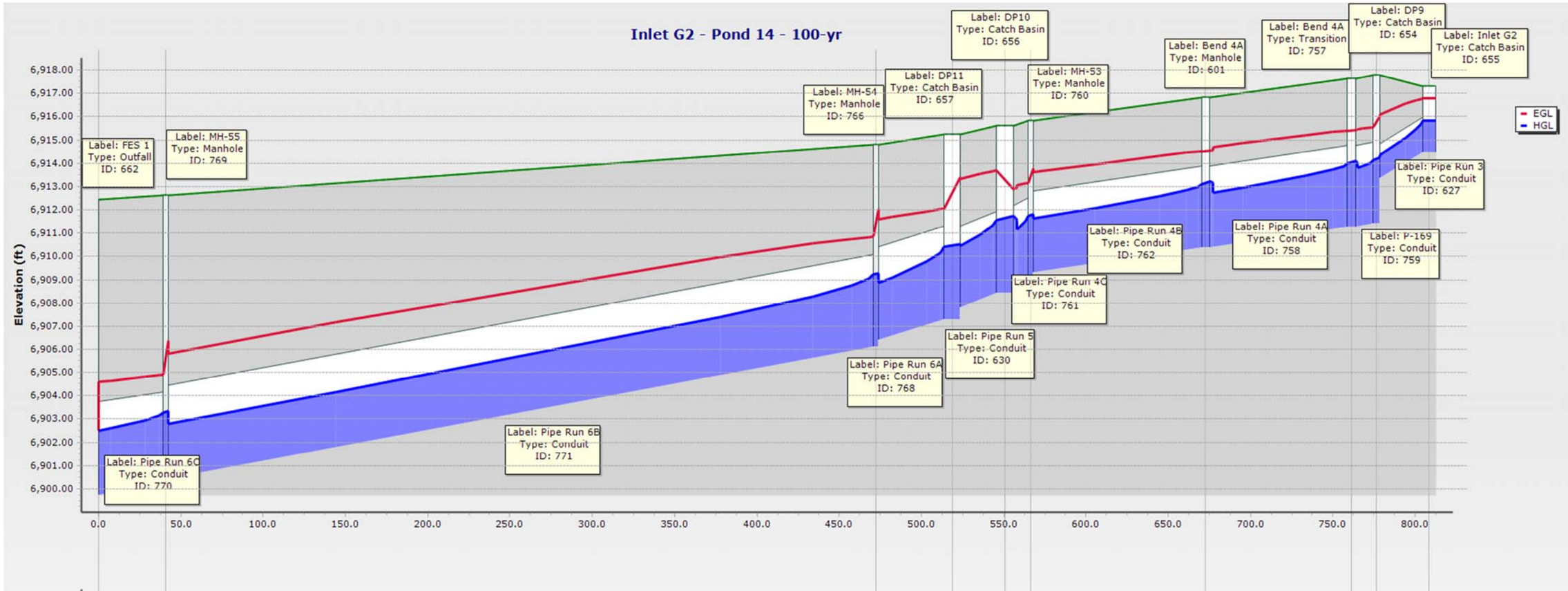


ID\Label	775 \ Pipe Run 10B	774 \ Pipe Run 10A	634 \ Pipe Run 9	
Link Length (ft)	163.2	17.0	30.0	
Rise (in)\Material	42.0 \ Concrete	42.0 \ Concrete	36.0 \ Concrete	
Flow (ft³/s)	81.3	81.3	34.6	
Slope (ft/ft)	0.010	0.034	-0.010	
ID\Label	612 \ FES 2	773 \ MH-56	660 \ DP13	661 \ Inlet G1
Ground (ft)	6909.24	6910.51	6911.01	6911.01
Invert (ft)	6899.74	6901.38	6901.96	6902.76
Station (ft)	0.0	163.2	180.2	210.2

Inlet H3 - Pond 14 - 100-yr



ID\Label	770 \ Pipe Run 6C	771 \ Pipe Run 6B	768 \ Pipe Run 6A	630 \ Pipe Run 5	761 \ Pipe Run 4C	762 \ Pipe Run 4B	758 \ Pipe Run 4A	759 \ P-169	753 \ Pipe Run 2D	754 \ Pipe Run 2C	750 \ Pipe Run 2B	623 \ Pipe Run 1
Link Length (ft)	40.9	431.2	46.6	32.0	15.5	106.4	88.6	15.1	19.1	66.3	34.0	32.1
Rise (in)\Material	48.0 \ Concrete	48.0 \ Concrete	48.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete
Flow (ft³/s)	107.5	107.5	107.5	106.2	76.8	76.8	76.8	76.8	57.5	57.5	57.5	55.3
Slope (ft/ft)	-0.010	-0.013	-0.019	-0.020	-0.020	-0.010	-0.010	-0.010	-0.004	-0.005	-0.010	-0.010
ID\Label	662 \ FES 1	769 \ MH-55	766 \ MH-54	657 \ DP11	656 \ DP10	760 \ MH-53	601 \ Bend 4A	757 \ Bend 4A	654 \ DP9	752 \ Bend 2C	602 \ MH 2B	653 \ DP8	651 \ DP7
Ground (ft)	6912.43	6912.63	6914.80	6915.26	6915.62	6915.84	6916.83	6917.65	6917.76	6918.08	6919.10	6919.56	6919.77
Invert (ft)	6899.74	6900.15	6906.10	6907.30	6908.88	6909.01	6910.38	6911.42	6911.46	6911.99	6912.32	6912.96	6913.58
Station (ft)	0.0	40.9	472.1	518.7	550.7	566.2	672.7	761.3	776.4	795.5	861.8	895.8	927.9



ID\Label	770 \ Pipe Run 6C	771 \ Pipe Run 6B	768 \ Pipe Run 6A	630 \ Pipe Run 5	761 \ Pipe Run 4C	762 \ Pipe Run 4B	758 \ Pipe Run 4A	759 \ P-169	627 \ Pipe Run 3
Link Length (ft)	40.9	431.2	46.6	32.0	15.5	106.4	88.6	15.1	32.0
Rise (in)\Material	48.0 \ Concrete	48.0 \ Concrete	48.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	42.0 \ Concrete	18.0 \ Concrete
Flow (ft³/s)	107.5	107.5	107.5	106.2	76.8	76.8	76.8	76.8	13.2
Slope (ft/ft)	-0.010	-0.013	-0.019	-0.020	-0.020	-0.010	-0.010	-0.010	-0.035
ID\Label	662 \ FES 1	769 \ MH-55	766 \ MH-54	657 \ DP11	656 \ DP10	760 \ MH-53	601 \ Bend 4A	757 \ Bend 4A	654 \ DP9	655 \ Inlet G2
Ground (ft)	6912.43	6912.63	6914.80	6915.26	6915.65	6915.84	6916.83	6917.65	6917.79	6917.32
Invert (ft)	6899.74	6900.15	6906.10	6907.30	6908.46	6909.01	6910.38	6911.26	6911.41	6914.47
Station (ft)	0.0	40.9	472.1	518.7	550.7	566.2	672.7	761.3	776.4	808.5

ID\Label	775 \ Pipe Run 10B	774 \ Pipe Run 10A	635 \ Pipe Run 8B	633 \ Pipe Run 8A	632 \ Pipe Run 7
Link Length (ft)	163.2	17.0	276.0	32.5	30.0
Rise (in)\Material	42.0 \ Concrete	42.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	18.0 \ Concrete
Flow (ft³/s)	81.3	81.3	24.1	24.1	9.7
Slope (ft/ft)	0.010	0.034	-0.014	-0.014	-0.010

ID\Label	612 \ FES 2	773 \ MH-56	660 \ DP13	610 \ Bend 8A	659 \ DP12	658 \ Inlet G3
Ground (ft)	6909.24	6910.51	6911.01	6912.24	6914.01	6914.01
Invert (ft)	6899.74	6901.38	6901.96	6906.24	6906.69	6908.00
Station (ft)	0.0	163.2	180.2	456.2	488.6	518.6

Analysis Results
Scenario: 100-yr

Title	S:\16.900.001 Shiloh Mesa Commercial Filing\Dwg\Dref\D-900-PR-STORM-PROF_COMM.dwg
Engineer	
Company	
Date	2/6/2013
Notes	

Scenario Summary

ID	289
Label	100-yr
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrologic
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	Base Rainfall Runoff
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
SCADA	Base SCADA
Energy Cost	Base Energy Cost
Solver Calculation Options	Base Calculation Options

Network Inventory

Conduits	40	Manholes	11
-Circle	36	Property Connections	0
-Box	0	Taps	0
-Ellipse	4	Transitions	5
-Virtual	0	Cross Sections	0
-Irregular Channel	0	Outfalls	6
-Trapezoidal Channel	0	Catchments	0
-Triangular Channel	0	Low Impact Development Controls	0
-Rectangular Channel	0	Ponds	0
-Pipe-Arch	0	Pond Outlet Structures	0
Laterals	0	Headwalls	0
Channels	0	Pumps	0
Gutters	8	Wet Wells	0
Pressure Pipes	0	Pressure Junctions	0
Catch Basins	24	SCADA Elements	0
-Maximum Capacity	0	Pump Stations	0
-Full Capture	3	Variable Speed Pump Batteries	0
-Catalog Inlet	20	Air Valves	0

Network Inventory	
--Curb Colo. Sprgs. D-10-R Inlet (Curb)	20

Transition elements for network with outlet: FES 1

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH 2B	6,915.37	6,915.28	0.09	HEC-22 Energy (Second Edition)	0.0	57.5	0.0	8.000	0.10	0.00
Bend 2C	6,914.80	6,914.70	0.09	HEC-22 Energy (Second Edition)	0.0	57.5	0.0	8.000	0.24	0.00
Bend 4A	6,914.09	6,914.00	0.09	HEC-22 Energy (Second Edition)	0.0	76.8	0.0	8.000	0.30	0.00

Transition elements for network with outlet: FES 2

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
Bend 8A	6,907.97	6,907.91	0.06	HEC-22 Energy (Second Edition)	0.0	24.1	0.0	8.000	0.13	0.00

Transition elements for network with outlet: OF-28

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
DP15	6,898.42	6,897.97	0.45	HEC-22 Energy (Second Edition)	0.0	33.0	0.0	8.000	0.43	0.00

Outfall elements for network with outlet: <None>

Label	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)

Outfall elements for network with outlet: <None>

Label	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
FES 2	0.0	81.3	0.0	11.972	0.85	0.00
FES 1	0.0	107.5	0.0	11.972	1.25	0.00
MH EX2	0.0	31.5	0.0	11.972	0.89	0.00
OF-28	0.0	33.0	0.0	11.972	1.44	0.00
OF-29	0.0	70.2	0.0	11.972	0.66	0.00

Conduit elements for network with outlet: MH EX2

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run Ex1	Circle	Circle - 48.0 in	22.0	1	-0.010	25.3	8.6	6,891.21	6,891.43	6,892.92	6,892.46
Pipe Run 12B	Circle	Circle - 48.0 in	197.6	1	-0.010	25.3	8.6	6,891.73	6,893.71	6,895.19	6,892.87
Pipe Run Ex2	Ellipse	Ellipse - 5.0 x 3.2 in	159.8	1	-0.005	31.5	6.8	6,889.96	6,890.75	6,892.16	6,891.48
Pipe Run Ex4	Circle	Circle - 36.0 in	32.2	1	-0.005	31.5	7.1	6,889.50	6,889.66	6,891.48	6,891.30
Pipe Run Ex3	Circle	Circle - 24.0 in	22.5	1	-0.020	0.0	0.0	6,889.96	6,890.41	6,891.48	6,891.48

Conduit elements for network with outlet: FES 1

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 1	Circle	Circle - 36.0 in	32.1	1	-0.010	55.3	10.5	6,913.26	6,913.58	6,915.99	6,915.44
Pipe Run 3	Circle	Circle - 18.0 in	32.0	1	-0.035	13.2	11.9	6,913.36	6,914.47	6,915.83	6,914.35
Pipe Run 5	Circle	Circle - 42.0 in	32.0	1	-0.020	106.2	16.2	6,907.80	6,908.44	6,911.57	6,910.45
Pipe Run 2B	Circle	Circle - 36.0 in	34.0	1	-0.010	57.5	10.5	6,912.62	6,912.96	6,915.41	6,915.37
Pipe Run 2D	Circle	Circle - 36.0 in	19.1	1	-0.004	57.5	8.1	6,911.91	6,911.99	6,914.70	6,914.37
Pipe Run 2C	Circle	Circle - 36.0 in	66.3	1	-0.005	57.5	8.1	6,911.99	6,912.32	6,915.28	6,914.80
Pipe Run 4A	Circle	Circle - 42.0 in	88.6	1	-0.010	76.8	11.5	6,910.38	6,911.26	6,914.00	6,913.23
P-169	Circle	Circle - 42.0 in	15.1	1	-0.010	76.8	11.5	6,911.26	6,911.41	6,914.16	6,914.09
Pipe Run 4C	Circle	Circle - 42.0 in	15.5	1	-0.020	76.8	15.1	6,908.70	6,909.01	6,911.75	6,911.73
Pipe Run 4B	Circle	Circle - 42.0 in	106.4	1	-0.010	76.8	11.5	6,909.31	6,910.38	6,913.12	6,911.65
Pipe Run 6A	Circle	Circle - 48.0 in	46.6	1	-0.019	107.5	16.2	6,906.40	6,907.30	6,910.44	6,908.86
Pipe Run 6C	Circle	Circle - 48.0 in	40.9	1	-0.010	107.5	12.6	6,899.74	6,900.15	6,903.29	6,902.51
Pipe Run 6B	Circle	Circle - 48.0 in	431.2	1	-0.013	107.5	13.9	6,900.45	6,906.10	6,909.24	6,902.81

Conduit elements for network with outlet: FES 2

Conduit elements for network with outlet: FES 2

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 7	Circle	Circle - 18.0 in	30.0	1	-0.010	9.7	6.9	6,907.69	6,908.00	6,909.20	6,908.81
Pipe Run 8A	Circle	Circle - 30.0 in	32.5	1	-0.014	24.1	9.8	6,906.24	6,906.69	6,908.36	6,907.97
Pipe Run 9	Circle	Circle - 36.0 in	30.0	1	-0.010	34.6	9.5	6,902.46	6,902.76	6,905.02	6,905.07
Pipe Run 8B	Circle	Circle - 30.0 in	276.0	1	-0.014	24.1	9.8	6,902.46	6,906.24	6,907.91	6,905.05
Pipe Run 10A	Circle	Circle - 42.0 in	17.0	1	0.034	81.3	18.7	6,901.96	6,901.38	6,904.78	6,904.77
Pipe Run 10B	Circle	Circle - 42.0 in	163.2	1	0.010	81.3	11.6	6,901.38	6,899.74	6,904.19	6,902.15

Conduit elements for network with outlet: OF-28

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 13A	Circle	Circle - 36.0 in	240.2	1	0.010	33.0	9.4	6,898.80	6,896.40	6,900.66	6,898.42
Pipe Run 13B	Circle	Circle - 36.0 in	43.2	1	0.010	33.0	9.3	6,896.10	6,895.69	6,897.97	6,897.27
Pipe Run 13C	Circle	Circle - 42.0 in	471.2	1	0.007	33.0	8.4	6,895.19	6,891.66	6,896.97	6,893.15

Conduit elements for network with outlet: OF-29

Label	Section Type	Conduit Description	Length (Unified) (ft)	Number of Barrels	Slope (Calculated) (ft/ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Pipe Run 11	Circle	Circle - 42.0 in	28.0	1	-0.008	68.8	10.2	6,896.56	6,896.78	6,899.38	6,898.96
Pipe Run C	Circle	Circle - 42.0 in	41.5	1	-0.010	51.0	10.5	6,904.45	6,904.86	6,907.10	6,906.73
Pipe Run B	Ellipse	Ellipse - 4.4 x 2.8 in	42.0	1	-0.010	46.6	10.0	6,906.03	6,906.45	6,908.25	6,907.50
Pipe Run A	Circle	Circle - 42.0 in	29.1	1	-0.036	43.4	16.1	6,906.00	6,907.05	6,909.10	6,908.29
Pipe Run C (2)	Circle	Circle - 42.0 in	331.0	1	0.021	51.0	13.9	6,904.15	6,897.08	6,906.38	6,900.16
P-184	Circle	Circle - 48.0 in	28.0	1	0.007	70.2	9.8	6,896.26	6,896.07	6,898.79	6,898.39

Catch Basin elements for network with outlet: MH EX2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP6B	Catalog Inlet	0.0	0.0	100.0	6,892.18	6,892.16	0.02	HEC-22 Energy (Second Edition)
Inlet EX2	Full Capture	0.0	0.0	100.0	6,891.48	6,891.48	0.00	Standard

Catch Basin elements for network with outlet: MH EX2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP6A	Full Capture	0.0	0.0	100.0	6,895.19	6,895.19	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: FES 1

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP7	Catalog Inlet	0.0	0.0	100.0	6,915.99	6,915.99	0.00	HEC-22 Energy (Second Edition)
DP8	Catalog Inlet	0.0	0.0	100.0	6,915.52	6,915.41	0.11	HEC-22 Energy (Second Edition)
DP9	Catalog Inlet	0.0	0.0	100.0	6,914.25	6,914.16	0.10	HEC-22 Energy (Second Edition)
Inlet G2	Catalog Inlet	0.0	0.0	100.0	6,915.83	6,915.83	0.00	HEC-22 Energy (Second Edition)
DP10	Catalog Inlet	0.0	0.0	100.0	6,911.73	6,911.57	0.16	HEC-22 Energy (Second Edition)
DP11	Catalog Inlet	0.0	0.0	100.0	6,910.54	6,910.44	0.10	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: FES 2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
Inlet G3	Catalog Inlet	0.0	0.0	100.0	6,909.20	6,909.20	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: FES 2

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP12	Catalog Inlet	0.0	0.0	100.0	6,908.42	6,908.36	0.07	HEC-22 Energy (Second Edition)
DP13	Catalog Inlet	0.0	0.0	100.0	6,905.05	6,904.78	0.27	HEC-22 Energy (Second Edition)
Inlet G1	Catalog Inlet	0.0	0.0	100.0	6,905.02	6,905.02	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: OF-28

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP15	Full Capture	0.0	0.0	100.0	6,900.66	6,900.66	0.00	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: OF-29

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP5	Catalog Inlet	0.0	0.0	100.0	6,900.16	6,899.38	0.79	HEC-22 Energy (Second Edition)
DP6	Catalog Inlet	0.0	0.0	100.0	6,898.87	6,898.79	0.07	HEC-22 Energy (Second Edition)
DP2	Percent Capture	0.0	0.0	100.0	6,909.10	6,909.10	0.00	HEC-22 Energy (Second Edition)
DP3	Catalog Inlet	0.0	0.0	100.0	6,908.29	6,908.25	0.05	HEC-22 Energy (Second Edition)

Catch Basin elements for network with outlet: OF-29

Label	Inlet Type	Flow (Captured) (ft³/s)	Flow (Total Bypassed) (ft³/s)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method
DP4	Catalog Inlet	0.0	0.0	100.0	6,907.15	6,907.10	0.06	HEC-22 Energy (Second Edition)

Manhole elements for network with outlet: MH EX2

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH1	6,892.94	6,892.92	0.02	HEC-22 Energy (Second Edition)	0.0	25.3	0.0	8.000	0.38	0.00
MH EX1	6,891.48	6,891.48	0.00	Standard	0.0	31.5	0.0	8.000	0.82	0.00

Manhole elements for network with outlet: FES 1

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
Bend 4A	6,913.23	6,913.12	0.11	HEC-22 Energy (Second Edition)	0.0	76.8	0.0	8.000	0.43	0.00
MH-53	6,911.81	6,911.75	0.05	HEC-22 Energy (Second Edition)	0.0	76.8	0.0	8.000	0.58	0.00
MH-54	6,909.29	6,909.24	0.05	HEC-22 Energy (Second Edition)	0.0	107.5	0.0	8.000	0.68	0.00
MH-55	6,903.34	6,903.29	0.05	HEC-22 Energy (Second Edition)	0.0	107.5	0.0	8.000	1.20	0.00

Manhole elements for network with outlet: FES 2

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft³/s)	System Known Flow (ft³/s)	System Rational Flow (ft³/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)

Manhole elements for network with outlet: FES 2

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft^3/s)	System Known Flow (ft^3/s)	System Rational Flow (ft^3/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH-56	6,904.77	6,904.19	0.58	HEC-22 Energy (Second Edition)	0.0	81.3	0.0	8.000	0.61	0.00

Manhole elements for network with outlet: OF-29

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft^3/s)	System Known Flow (ft^3/s)	System Rational Flow (ft^3/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH-58	6,906.73	6,906.38	0.35	HEC-22 Energy (Second Edition)	0.0	51.0	0.0	8.000	0.17	0.00

Manhole elements for network with outlet: OF-28

Label	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Headloss Method	System Additional Flow (ft^3/s)	System Known Flow (ft^3/s)	System Rational Flow (ft^3/s)	System Intensity (in/h)	System Flow Time (min)	System CA (acres)
MH-57	6,897.03	6,896.97	0.06	HEC-22 Energy (Second Edition)	0.0	33.0	0.0	8.000	0.50	0.00

APPENDIX B

STANDARD DESIGN CHARTS AND TABLES

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 38.9431°, Longitude: -104.676°
Elevation: 6923.41 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.237 (0.195-0.291)	0.289 (0.237-0.355)	0.379 (0.310-0.467)	0.458 (0.372-0.567)	0.575 (0.453-0.744)	0.671 (0.514-0.878)	0.772 (0.570-1.03)	0.879 (0.621-1.21)	1.03 (0.697-1.46)	1.15 (0.755-1.64)
10-min	0.347 (0.285-0.426)	0.423 (0.347-0.519)	0.555 (0.453-0.683)	0.671 (0.545-0.830)	0.842 (0.664-1.09)	0.982 (0.753-1.28)	1.13 (0.835-1.51)	1.29 (0.910-1.77)	1.51 (1.02-2.13)	1.68 (1.10-2.40)
15-min	0.423 (0.347-0.519)	0.516 (0.423-0.633)	0.676 (0.553-0.833)	0.818 (0.665-1.01)	1.03 (0.809-1.33)	1.20 (0.919-1.57)	1.38 (1.02-1.85)	1.57 (1.11-2.16)	1.84 (1.25-2.60)	2.05 (1.35-2.93)
30-min	0.615 (0.505-0.754)	0.748 (0.614-0.919)	0.980 (0.801-1.21)	1.19 (0.963-1.47)	1.49 (1.17-1.92)	1.73 (1.33-2.27)	1.99 (1.47-2.67)	2.27 (1.60-3.12)	2.65 (1.80-3.75)	2.96 (1.95-4.23)
60-min	0.798 (0.655-0.979)	0.951 (0.780-1.17)	1.23 (1.00-1.51)	1.49 (1.21-1.84)	1.88 (1.49-2.45)	2.21 (1.70-2.91)	2.57 (1.90-3.46)	2.96 (2.10-4.09)	3.52 (2.39-4.99)	3.97 (2.61-5.67)
2-hr	0.980 (0.811-1.19)	1.15 (0.953-1.41)	1.48 (1.22-1.81)	1.78 (1.46-2.19)	2.27 (1.82-2.95)	2.69 (2.09-3.52)	3.14 (2.35-4.22)	3.65 (2.61-5.02)	4.38 (3.00-6.19)	4.98 (3.30-7.07)
3-hr	1.08 (0.898-1.31)	1.25 (1.04-1.52)	1.59 (1.31-1.93)	1.92 (1.58-2.35)	2.45 (1.98-3.19)	2.92 (2.29-3.83)	3.45 (2.60-4.63)	4.04 (2.91-5.56)	4.90 (3.38-6.92)	5.62 (3.74-7.95)
6-hr	1.26 (1.05-1.51)	1.44 (1.20-1.73)	1.81 (1.51-2.19)	2.19 (1.81-2.65)	2.81 (2.29-3.64)	3.36 (2.66-4.39)	3.99 (3.04-5.34)	4.70 (3.42-6.45)	5.76 (4.01-8.09)	6.64 (4.45-9.32)
12-hr	1.45 (1.22-1.73)	1.67 (1.41-2.00)	2.11 (1.77-2.53)	2.55 (2.12-3.07)	3.25 (2.67-4.18)	3.88 (3.08-5.01)	4.58 (3.50-6.06)	5.36 (3.92-7.28)	6.51 (4.57-9.07)	7.47 (5.05-10.4)
24-hr	1.67 (1.42-1.98)	1.95 (1.66-2.32)	2.49 (2.10-2.96)	2.99 (2.52-3.58)	3.78 (3.11-4.78)	4.45 (3.56-5.68)	5.19 (3.99-6.79)	6.00 (4.42-8.07)	7.18 (5.06-9.90)	8.14 (5.55-11.3)
2-day	1.93 (1.65-2.27)	2.29 (1.96-2.69)	2.92 (2.49-3.45)	3.49 (2.96-4.14)	4.35 (3.59-5.42)	5.07 (4.06-6.38)	5.83 (4.50-7.53)	6.66 (4.92-8.84)	7.82 (5.54-10.7)	8.76 (6.02-12.1)
3-day	2.13 (1.83-2.49)	2.51 (2.16-2.94)	3.19 (2.73-3.75)	3.79 (3.23-4.48)	4.70 (3.89-5.81)	5.45 (4.38-6.82)	6.24 (4.84-8.02)	7.09 (5.26-9.37)	8.29 (5.91-11.3)	9.26 (6.39-12.7)
4-day	2.29 (1.98-2.68)	2.69 (2.32-3.15)	3.39 (2.91-3.98)	4.02 (3.43-4.73)	4.95 (4.11-6.11)	5.73 (4.62-7.15)	6.55 (5.09-8.38)	7.43 (5.53-9.78)	8.67 (6.19-11.7)	9.66 (6.69-13.2)
7-day	2.71 (2.36-3.15)	3.14 (2.72-3.65)	3.88 (3.36-4.53)	4.55 (3.91-5.33)	5.55 (4.63-6.79)	6.37 (5.18-7.90)	7.25 (5.68-9.22)	8.19 (6.14-10.7)	9.51 (6.84-12.8)	10.6 (7.37-14.4)
10-day	3.08 (2.69-3.56)	3.54 (3.09-4.10)	4.35 (3.77-5.04)	5.06 (4.37-5.90)	6.12 (5.13-7.45)	6.99 (5.70-8.62)	7.91 (6.22-10.0)	8.89 (6.69-11.6)	10.3 (7.41-13.8)	11.4 (7.95-15.4)
20-day	4.14 (3.64-4.75)	4.75 (4.17-5.45)	5.78 (5.06-6.66)	6.67 (5.80-7.71)	7.93 (6.67-9.52)	8.93 (7.33-10.9)	9.97 (7.88-12.5)	11.0 (8.36-14.2)	12.5 (9.09-16.6)	13.7 (9.65-18.4)
30-day	5.00 (4.42-5.71)	5.75 (5.07-6.57)	6.98 (6.14-8.00)	8.01 (7.00-9.22)	9.44 (7.95-11.2)	10.5 (8.67-12.7)	11.7 (9.25-14.5)	12.8 (9.71-16.4)	14.3 (10.4-18.9)	15.5 (11.0-20.8)
45-day	6.08 (5.39-6.91)	6.99 (6.20-7.95)	8.46 (7.47-9.65)	9.66 (8.48-11.1)	11.3 (9.53-13.3)	12.5 (10.3-15.0)	13.7 (10.9-16.9)	14.9 (11.3-18.9)	16.4 (12.0-21.5)	17.6 (12.5-23.5)
60-day	6.98 (6.21-7.90)	8.03 (7.14-9.10)	9.70 (8.59-11.0)	11.0 (9.71-12.6)	12.8 (10.8-15.0)	14.1 (11.7-16.8)	15.4 (12.2-18.8)	16.6 (12.7-20.9)	18.1 (13.3-23.6)	19.2 (13.7-25.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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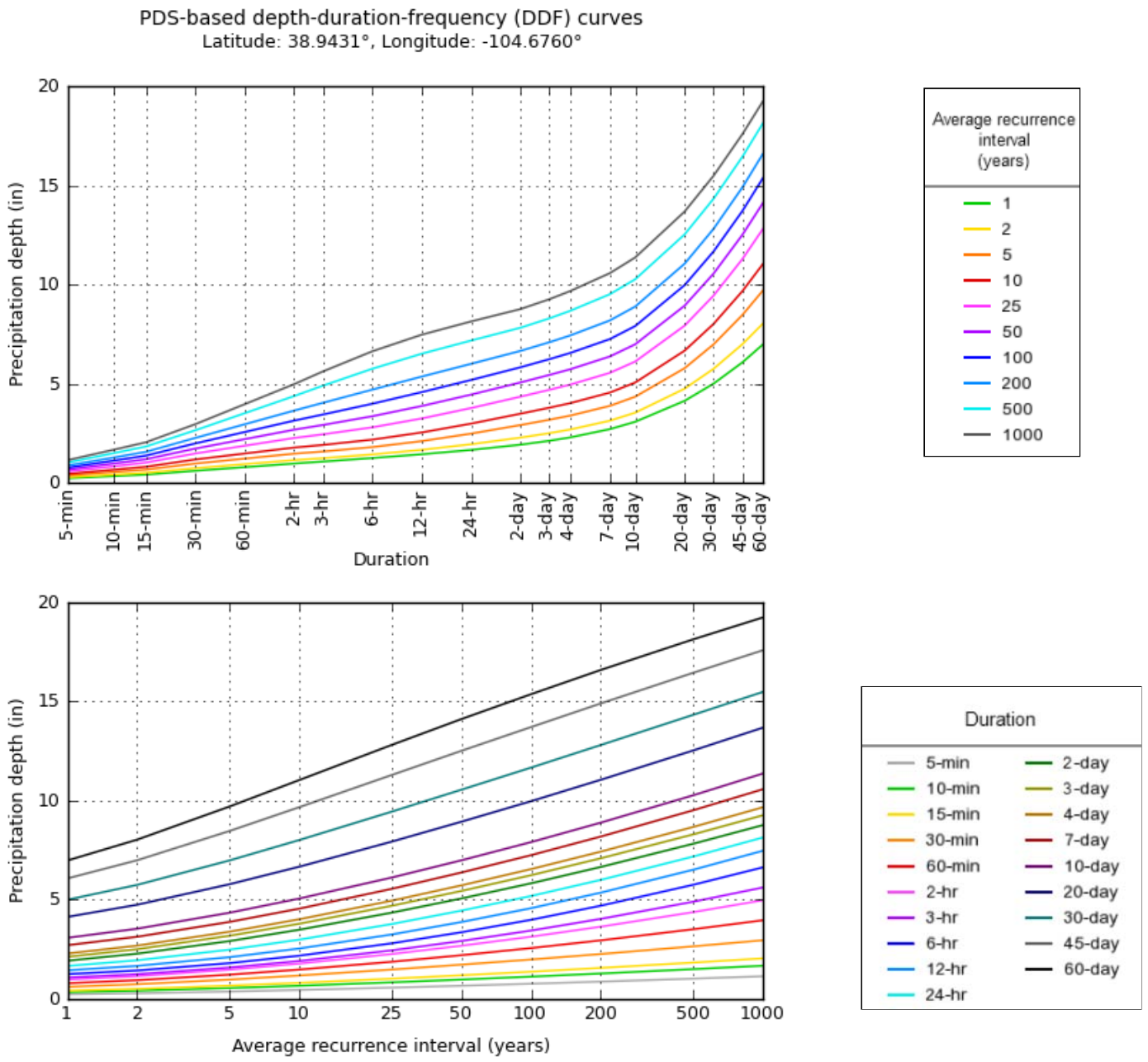
PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Fri Feb 10 15:58:52 2017

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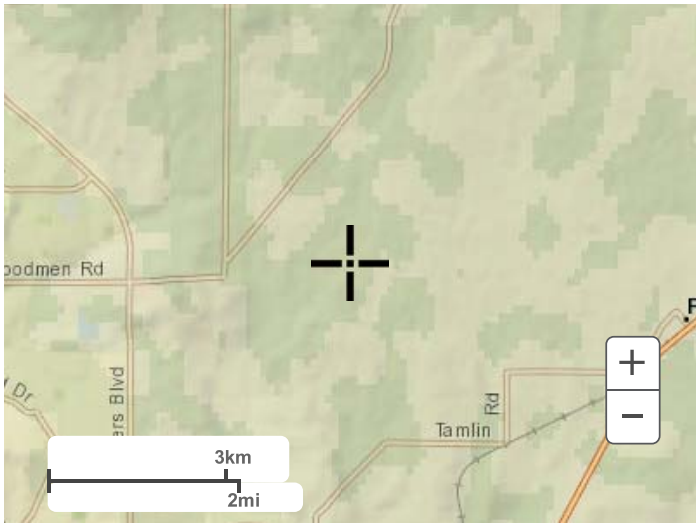
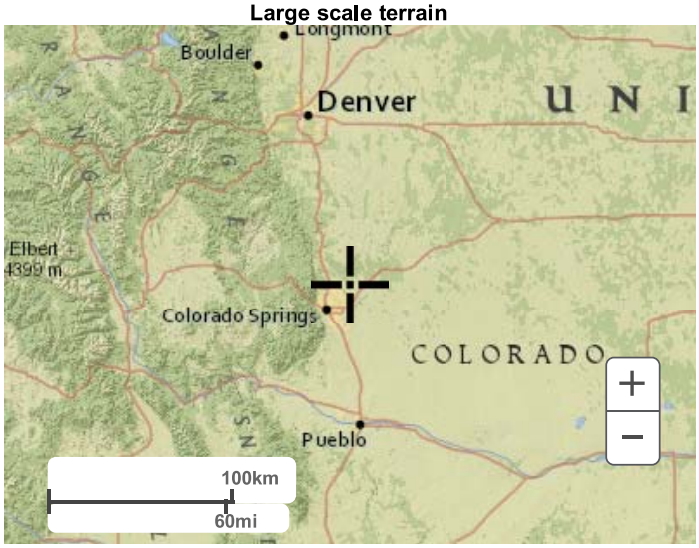
Maps & aerials

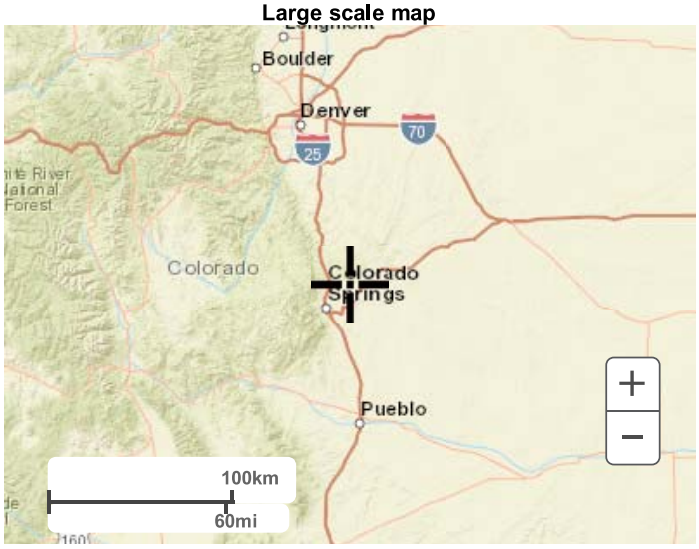
Small scale terrain



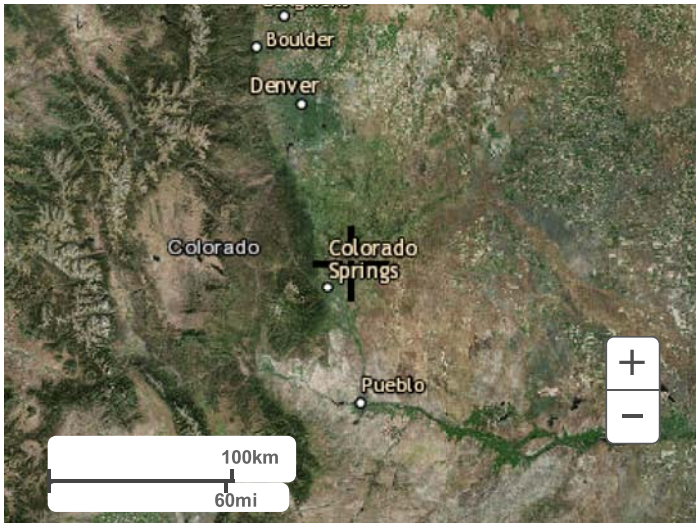
Large scale terrain



Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

2017 DRAINAGE, BRIDGE AND POND FEES
CITY OF COLORADO SPRINGS
Approved February 28, 2017

Basin Name	DBPS Year	Drainage Fee/Acre	Bridge Fee/Acre	Pond Land Fee/Acre	Pond Facility Fee/Acre	Surcharge/ Acre
19th Street	1964	$3,573				
21st Street	1977	$5,454				
Bear Creek	1980	$3,510	$331			
Big Johnson, Crews	1991	$13,580	$1,116	$241		
Black Squirrel Creek	1989	$12,442	$1,421	$789		
Camp Creek	1964	$2,012				
Cottonwood Creek[1]	2000	$12,692	$1,002			$641
Douglas Creek	1981	$11,286	$253			
Dry Creek[2]	1966	$0.00				
Elkhorn Basin[3]	n/a	$0.00				
Fishers Canyon[4]	1991	$0.00				
Fountain Creek[5]	n/a	VAR				
Jimmy Camp Creek	2015	$7,071			$2,305	
Kettle Creek[6] Old Ranch Trib.	2001	$0.00				
Little Johnson	1988	$11,852		$1,227		
Mesa	1986	$9,486				
Middle Tributary	1987	$6,202		$1,121		
Miscellaneous[7]	n/a	$10,555				
Monument Branch[11]	1987	$0				
North Rockrimmon	1973	$5,455				
Park Vista (MDDP)	2004	$15,193				
Peterson Field	1984	$11,460	$528			
Pine Creek[8]	1988	$0.00				
Pope's Bluff	1976	$3,632	$622			
Pulpit Rock	1968	$6,015				
Sand Creek[9]	1996	$11,154	$675	$1,070	$3,259	$1,182
Shooks Run[10]	1994	$0.00				
Smith Creek[11]	2002	$0.00				
South Rockrimmon	1976	$4,265				
Southwest Area	1984	$11,940				
Spring Creek	1968	$9,407				
Templeton Gap	1977	$6,204	$68			
Windmill Gulch	1992	$12,490	$254	$3,055		

All Drainage, Bridge and Detention Pond Facilities Fees adjusted by 3.5% over 2016 by City Council Resolution No. 25-17 on February 28, 2017.
Land Fees are based on the Park Land Dedication Fee which is currently $76,602/acre (0% change for inflation in 2016 thus far).

[1] The 2017 Cottonwood Creek drainage fee consists of a capital improvement fee of $9,623 per acre and land fee of $3,069 per acre for a total of $12,692 per acre. These fees are adjusted annually using different procedures but are combined for collection purposes. **The surcharge fee of $641/ac is due in cash; credits for prior facility construction cannot be used to offset this fee,** which is deposited into a separate City fund known as the "Cottonwood Creek Surcharge" fund.
[2] Dry Creek is a closed basin per City Council Resolution No. 118-08 on June 24, 2008
[3] Elkhorn Basin is a closed basin per the Annexation Agreements for the area.
[4] Fishers Canyon is a closed basin per City Council Resolution No. 74-08 on April 22, 2008.
[5] Pursuant to the recommendation of the Subdivision Storm Drainage Board adopted at its meeting of September 15, 1977, there are exempted and excluded from the provisions of this part construction of the main Fountain Creek Channel from the confluence of Fountain Creek with Monument Creek northwest to the City limits. Land developments taking place adjacent to Fountain Creek shall remain responsible for dedicating rights of way necessary for the channelization of Fountain Creek, and the developers shall continue to pay to the City as a condition of subdivision plat approval the applicable drainage fees. Drainage fees are required in accordance with the appropriate basin study.
[6] Kettle Creek Old Ranch Tributary is a closed basin per City Council Resolution 139-02 on August 27, 2002.
[7] Miscellaneous fee is assessed on unstudied areas and the Roswell and Westside Basins.
[8] Pine Creek is a closed basin per City Council Resolution No.236-88 on December 13, 1988.
[9] Sand Creek Detention Pond #2 Surcharge (Ridgeview and Indigo Ranch) = $1,182/ac. for 2017. Sand Creek Pond fees include two components, one for facility construction costs ($3,259) and one for land dedication costs ($1,070), the total Pond fee within Sand Creek is $4,329/ac.
[10] Shooks Run is a closed basin pursuant to the recommendation of the Drainage Board, adopted at its meeting on October 15, 1963.
[11] Smith Creek is a closed basin per City Council Resolution 140-02 on August 27, 2002
[11] Monument Branch Basin is a closed basin per City Council Res. 177-10 on October 12, 2010

depths over the duration of the storm as a fraction of the 1-hour depth and is also shown in Figure 6-19. By applying the 1-hour depths shown in Table 6-2 to the values shown in Table 6-3, a short-duration project design storm can be developed for any return period storm from a 2-year up to 100-year frequency. By applying the appropriate 1-hour depth for other project locations, a project design storm can be created for any location.

Table 6-3. 2-Hour Design Storm Distribution, ≤ 1 mi^2

Time (minutes)	Fraction of 1-Hour Rainfall Depth	Time (minutes)	Fraction of 1-Hour Rainfall Depth
5	0.014	65	1.004
10	0.046	70	1.018
15	0.079	75	1.030
20	0.120	80	1.041
25	0.179	85	1.052
30	0.258	90	1.063
35	0.421	95	1.072
40	0.712	100	1.082
45	0.824	105	1.091
50	0.892	110	1.100
55	0.935	115	1.109
60	0.972	120	1.119

- **Frontal Storms**: The characteristics of longer-duration "frontal storms" (general) is less well understood than the shorter duration thunderstorms and should be studied further. However, some events of this nature have been observed, such as the April 1999 storm which produced flooding on Fountain Creek, showing that these types of events do occur and tend to produce hazardous flood flows. In addition, modeling of the Jimmy Camp Creek drainage basin using the 24-hour, Type II distribution shows that it produces results reasonably comparably to recorded flow data. Therefore, the NRCS 24-hour Type II distribution has replaced the Type IIa distribution as the standard, long-duration design storm. This distribution can be applied to drainage basins up to 10 square miles without a DARF correction and is shown in Table 6-4. This distribution is included as a standard storm option in the HEC-HMS program.

APPENDIX C

REPORT REFERENCES

PROPOSED REGIONAL DETENTION POND #3

WOODMEN HEIGHTS
COMMERCIAL CENTER
(PROPOSED)

EXISTING
RESIDENCE

100-YR
FLOODPLAIN

EXISTING UTILITY
EASEMENT

VACANT LAND
SCHEDULE NO. 5300000568

SAND CREEK CHANNEL

100-YR
FLOODPLAIN

EXISTING
LOW POINT

WOODMEN ROAD

EXISTING SWALE

EX.
COMMUNITY
CENTER

Woodmen
Valley
Chapel

TEMP. MODULAR
CLASSROOM
UNITS

(2) EX. 42" CMP
CULVERTS

MUSTANG ROAD

EXISTING BAR J-B ACRES
SUBDIVISION

EXISTING PAWNEE
RANCHEROS FILING NO. 1

SUMMARY HISTORIC BASIN RUNOFF TABLE

Sub-Basin Designation	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
A	2.1	2.3	6.6
B	3.5	2.4	6.1
C	19.6	7.1	17.7
D	6.6	3.6	9.1
E	18.1	9.0	22.5
F	7.0	4.0	9.9
G	3.8	2.2	5.4
H	7.7	4.2	10.4
K	6.5	3.8	9.4
L	3.2	6.1	12.6
OS-1	4.3	2.7	6.6
OS-5	323.0	201.7	404.0

SUMMARY HISTORIC DESIGN POINT TABLE

Design Point	Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
1	OS-1, A	6.3	4.0	9.8
1-A	DP1, E	24.5	11.5	28.6
2	OS-5	323.0	201.7	404.0
3	DP2, D	329.6	144.5	347.4
4	1-A, DP3, C,	373.6	145.0	350.5
5	DP4, G	377.4	146.8	354.9
6	DP5, F	384.3	150.0	363.0
7	H, I	15.8	7.4	21.2
8	DP6, DP7, J, K, L	423.9	170.7	416.6

GRAPHIC SCALE
100 0 50 100 200
(IN FEET)
1 inch = 100 ft.

LEGEND

- DRAINAGE BASIN BOUNDARY
- 6520 EXISTING CONTOUR
- E EXISTING ELECTRIC
- FO EXISTING FIBER OPTIC
- EXISTING STORM
- EXISTING FENCE
- EXISTING FLOW DIRECTION ARROW
- 10 DESIGN POINT
- A 1.9 AC 0.38 BASIN DESIGNATION, "C" COEFFICIENT (100 YR), BASIN AREA (ACRES)

Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

SHILOH MESA AT
WOODMEN HEIGHTS

MASTER DEVELOPEMNT DRAINAGE PLAN

DRAINAGE PLAN
EXISTING CONDITIONS

DESIGNED BY: BAS	SCALE	DATE ISSUED: FEBRUARY, 2009	DR01
DRAWN BY: BAS	HORZ: 1" = 100'		
CHECKED BY: REP	VERT: N/A	MDG PROJECT NO: 08.346.005	

NOTE:
SCHEMATIC LOCATION & DEPICTION OF CHANNEL IMPROVEMENTS ARE BASED ON RECOMMENDATIONS FROM THE SAND CREEK DRAINAGE BASIN PLANNING STUDY.

THE BANK LINING AND EXACT LOCATION OF DROP STRUCTURES TO BE DETERMINED WITH SUBSEQUENT CHANNEL IMPROVEMENT REPORT.

SUMMARY RUNOFF TABLE

Design Point	Contributing Area	Total Peak Discharge Q(5)	Total Peak Discharge Q(100)	Pipe Diameter	Contributing Basins
		cfs	cfs	inch	
1	4.3	5.13	8.12	36	OS-1
2	7.0	8.15	14.56	36	DP-1, A
3	12.9	22.69	40.66	36	DP-2, D
4	4.7	14.97	26.67	36	B,C
5	17.7	33.61	60.34	36	DP-3, DP-4
6	20.8	40.28	72.43	42	E, F, DP-5
7	31.2	59.61	107.36	42	G, H, DP-6, DP-9
8	7.1	5.69	10.13	30	I
9	11.0	15.30	27.53	36	DP-8, J
10	31.7	59.70	107.53	42	DP-7, K
11	31.7	59.70	107.53	42	DP-10
12	6.5	30.69	54.63	36	L
13	7.4	34.50	61.44	42	DP-12, M
14	12.2	54.35	96.87	42	DP-13, N
15	15.2	65.23	116.52	54	DP-14, O
16	324.5	205.38	410.56	72	DP-32, P
17	328.6	215.39	428.44	72	DP-16, DP-33
18	4.9	18.03	32.10	54	S
19	9.8	35.07	62.66	42	DP-18, T
20	27.1	94.44	169.01	54	DP-19, U, V
21	29.8	102.78	184.26	54	DP-20, OS-4, OS-9
22	3.3	15.37	27.37	30	W
23	6.6	21.40	38.09	42	X, Y
24	10.9	38.40	67.03	42	DP-22, DP-23, DP-25
25	1.0	4.40	7.83	18	Z
26	12.3	44.50	75.69	48	DP-24, AA
27	3.1	5.03	8.56	18	BB
28	21.2	80.95	138.95	48	DP-26, CC
29	24.3	84.67	144.53	48	DP-28, DP-27
30	27.0	92.17	157.90	60	DP-29, OS-2, OS-3
31	348.4	344.82	588.12	84	DP-17, DP-15, EE
32	323.0	201.70	404.00	72	OS-5
33	4.1	15.22	27.39	30	OS-7, Q

PROPOSED REGIONAL DETENTION POND #3

WOODMEN HEIGHTS COMMERCIAL CENTER (PROPOSED)

100-YR FLOODPLAIN

PROPOSED MARKSHEFFEL ROAD ALIGNMENT

VACANT LAND
SCHEDULE NO. 5300000568

EXISTING 24" WATERLINE

APPROXIMATE DROP STRUCTURE LOCATION

RIPRAP LINING

SAND CREEK

PROPERTY BOUNDARY

APPROXIMATE DROP STRUCTURE LOCATION

CHANNEL

RIPRAP LINING

WOODMEN ROAD

MAIN STREET

KENOSHA DR.

PUBLIC COMMERCIAL ROAD

MICMASH STREET

SYCAMORE WOOD

TAMARISK WOOD

OLIVE WOOD

HOLLY WOOD PUBLIC

POPLAR WOOD PUBLIC

MULBERRY WOOD PUBLIC

ALMOND WOOD

EXISTING PAWNEE RANCHEROS FILING NO. 2

PROPOSED SWALE

18" CULVERT

MUSTANG ROAD

EXISTING BAR J-B ACRES SUBDIVISION

GRAPHIC SCALE
(IN FEET)
1 inch = 100 ft.

LEGEND

- EXISTING ELECTRIC
- EXISTING FIBER OPTIC
- EXISTING CONTOUR
- EXISTING STORM
- DRAINAGE BASIN BOUNDARY
- PROPOSED CONTOUR
- PROPOSED STORM
- PROPOSED D10R INLET
- PROPOSED FLOW DIRECTION ARROW
- DESIGN POINT
- BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)

Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
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Phone 719-575-0100
Fax 719-575-0208

SHILOH MESA AT WOODMEN HEIGHTS

MASTER DEVELOPMENT DRAINAGE PLAN

DRAINAGE PLAN
PROPOSED CONDITIONS

DESIGNED BY:	BAS	SCALE	
DRAWN BY:	BAS	HORIZ:	1" = 100'
CHECKED BY:	RED	VERT:	N/A

DATE ISSUED: FEBRUARY, 2009
MDG PROJECT NO: 08.346.005

DR02

III. EXISTING FACILITIES

A. Previous Analysis of Existing Facilities

The SCDBPS outlines the drainage improvements required by the City, prior to development in this area. The SCDBPS proposed numerous regional detention ponds throughout the development area of Woodmen Heights Metropolitan District. Other studies of the Shiloh Mesa development area include ***The Master Development Drainage Plan for Woodmen Heights*** (Classic MDDP), by Classic Consulting Engineers and Surveyors, dated June 2004, and more recently ***The Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4*** (ESI MDDP), by Engineering and Surveying Inc (ESI), dated February of 2006. The Classic MDDP proposed eliminating Detention Facilities No. 4 and 5, as outlined in the SCDBPS, and enlarging Facilities No. 3 and 6 to compensate for the loss of detention area.

Detention Facility No. 3 (Pond #3), is located inline with the main reach of the Sand Creek Channel just west of the proposed Marksheffel Road alignment and north of Woodmen Road. This detention pond was sized to accommodate the developed stormwater runoff from the eastern portion of the Woodmen Heights Metropolitan District. According to the Classic MDDP, Pond #3 is a 224 acre-foot facility with a total developed inflow of Q_{100}=2883 cubic feet per second (cfs) and a release rate of **Q_{100}=2242 cfs**. It was anticipated that this facility would be combined with a neighborhood park area. In addition to Pond #3, the Woodmen Heights Metropolitan District is responsible to complete the construction of Regional Pond #2, located adjacent to Security Service Field, approximately 3 miles downstream. Construction is underway to complete the interim condition of Pond #2.

The ESI MDDP was approved by the City in February of 2006, and functions as an amendment/update to the Classic MDDP. The ESI MDDP evaluated the previous analysis performed in the Classic MDDP and resized Pond #3 to a 209 acre-foot facility. The reason for the decrease in size of Pond #3 can be attributed to the rerouting of runoff from 18.7 acres, known as Parcel 11 in the Classic MDDP, to Detention Facility No. 6. Minor changes were also made with respect to drainage analysis, such as an increased inflow of Q_{100}=3207 cfs to Pond #3 and a release rate of **Q_{100}=2240 cfs**. Both the Classic MDDP and the ESI MDDP, assumed that Pond #3 would accept developed flows from the Shiloh Mesa development and would treat the runoff for water quality.

B. Offsite Analysis of Existing Facilities

The Classic MDDP and the ESI MDDP utilized the SCS method for computing the hydrologic analysis. The impervious area of each basin was analyzed to compare the results from the ESI MDDP to those calculated using the Rational Method in this report (which will yield more conservative results). It was assumed that the time of concentration would remain the same for each analysis, and therefore the impervious area is the controlling factor for evaluating the peak runoff rates. For the proposed site, the ESI MDDP employed a curve number of 92. According to **Table 5-5** of the Drainage Criteria Manual, *Runoff Curve Numbers for Hydrologic Soil*, a commercial area with a curve number of 92 corresponded to an 85 percent impervious area. Conversely, **Table 5-1** of the Drainage Criteria Manual, *Recommended Average Runoff*

SHILOH MESA
POST DEVELOPMENT DRAINAGE PLAN
DECEMBER 2015

NORTH
1" = 100'

LEGEND

DESIGN POINT
FLOW DIRECTION
EMERGENCY OVERFLOW
BASIN DESIGNATION (A / 25 / 5.0 / 30 / C100 / ACRES / C5)
PROPOSED MINOR CONTOUR
PROPOSED MAJOR CONTOUR
EXISTING MINOR CONTOUR
EXISTING MAJOR CONTOUR
BASIN BOUNDARY
EMERGENCY OVERFLOW PATH
SAND FILTRATION BASIN
PIPE RUN IDENTIFIER
SELECTIVE LINING
GRADE CONTROL

DRAINAGE NOTES

1. PROPOSED TYPE D-10-R DROP INLET, SUMP & AT-GRADE COND'N
2. PROPOSED STORM SEWER PIPE
3. PROPOSED FABRICATED END SECTION
5. PROPOSED STORM DRAIN HEADWALL
6. PROPOSED WATER QUALITY FEATURE – SAND FILTRATION BASIN
7. PROPOSED POND OUTLET, DESIGNED TO BYPASS Q100
8. PROPOSED RIPRAP APRON
9. PROPOSED TRAPEZOIDAL DIVERSION CHANNEL

BASIN SUMMARY TABLE			
BASIN ID	BASIN AREA (Acres)	FLOW Q5 (CFS)	FLOW Q100 EST. (CFS)
OS1*	4.3	3.8	9.0
OS5*	323	72.0	340.0
A1	3.78	7.1	15.1
A2	6.20	9.4	20.1
A3	2.30	4.7	9.9
A4	1.20	1.6	5.3
B1	1.20	3.2	6.7
B2	4.10	7.6	16.3
C1	1.70	3.3	7.1
C2	4.64	10.8	22.4
D1	4.53	8.4	18.0
D2	6.18	11.1	23.8
D3	1.72	3.5	7.4
D5	0.40	1.8	3.5
D6	1.65	3.0	6.3
F1	2.38	4.6	9.9
F2	2.16	4.0	8.6
G1	1.75	3.3	7.1
G2	2.58	5.3	11.2
OS7**	1.8	6.7	12.5
OS10**	1.9	7.0	13.2

*Q5 & Q100 REFERENCED FROM "MASTER DEVELOPMENT DRAINAGE PLAN FOR SHILOH MESA AT WOODMEN HEIGHTS", PREPARED BY MATRIX
**Q5 & Q100 REVISED AREAS AND FLOWS FOR "MASTER DEVELOPMENT DRAINAGE PLAN FOR SHILOH MESA AT WOODMEN HEIGHTS", PREPARED BY MATRIX

PIPE TABLE			
PIPE #	DIA.(IN.) & MTL	FLOW Q5 (CFS)	FLOW Q100 (CFS)
1	*2 - 42" RCP	72.0	340.0
2	72" RCP	72.0	340.0
3	24" RCP	7.1	15.1
4	18" RCP	3.2	6.7
5	24" RCP	7.6	16.3
6	24" RCP	10.3	21.9
7	18" RCP	3.3	7.1
8	30" RCP	10.8	22.4
9	30" RCP	14.1	29.5
10	36" RCP	23.9	50.2
11	18" RCP	4.7	9.9
12	24" RCP	8.3	20.8
13	30" RCP	12.9	27.5
14	42" RCP	32.3	68.4
15	18" RCP	3.3	7.1
16	18" RCP	5.3	11.2
17	24" RCP	8.2	17.6
18	18" RCP	4.0	8.6
19	18" RCP	4.6	9.9
20	24" RCP	8.5	18.1
21	30" RCP	16.5	35.3
22	24" RCP	8.4	18.0
23	18" RCP	1.8	3.5
24	42" RCP	31.9	70.6
25	18" RCP	3.5	7.4
26	42" RCP	35.0	77.2
27	24" RCP	6.4	16.6
28	36" RCP	22.4	50.7

* PROPOSED DUEL - 42" RCP TO BE USED IN CONJUNCTION WITH EXISTING DUAL - 42" CMP. TO BE INSTALLED WITH UPSTREAM DEVELOPMENT. (CULVERTS TO PROVIDE EQUIVALENT FLOW AREA OF 2 - 60" RCP CULVERTS)

DESIGN POINT SUMMARY TABLE			
DESIGN PT.	PEAK Q5 (CFS)	PEAK Q100 (CFS)	COMMENTS
NORTH WQ POND TRIBUTARY			
A1	7.1	15.1	6-FT SUMP D-10-R
			RELEASE INTO N. WQ POND
CENTRAL WQ POND TRIBUTARY			
A2	9.4	20.1	8-FT SUMP D-10-R
A3	4.7	9.9	4-FT SUMP D-10-R
B1	3.2	6.7	4-FT SUMP D-10-R
B2	7.6	16.3	6-FT SUMP D-10-R
C1	3.3	7.1	4-FT SUMP D-10-R
C2	10.8	22.4	10-FT SUMP D-10-R
A4	33.4	72.0	RELEASE INTO C. WQ POND
SOUTHERN WQ POND TRIBUTARY			
D1	8.4	18.0	8-FT SUMP D-10-R
D2	11.1	23.8	12-FT AT-GRADED-10-R
D3	3.5	7.4	4-FT SUMP D-10-R
F1	4.6	9.9	4-FT SUMP D-10-R
F2	4.0	8.6	4-FT SUMP D-10-R
G1	3.3	7.1	4-FT SUMP D-10-R
G2	5.3	11.2	4-FT SUMP D-10-R
D5	1.8	3.5	4-FT SUMP D-10-R
D4	35.0	77.2	RELEASE INTO S. WQ POND
OS7 OFFSITE TRIBUTARY			
OS7,OS10	11.4	21.5	TBD
D2	4.7	7.2	FLOW-BY
D6	3.0	6.3	SHEET FLOW

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OWNER: BARHAM TED R LOCATION: 8245 MUSTANG RD
OWNER: ERNST GORDON W / ERNST WANDA R LOCATION: 8185 MUSTANG RD
OWNER: HOFER ROBERT P & CAROLYN S LOCATION: 8035 MUSTANG RD
OWNER: HOFER ROBERT P & CAROLYN S LOCATION: 8035 MUSTANG RD
OWNER: CLEARWATER WILLIAM F & MELINDA E LOCATION: 7950 MAVERICK RD
OWNER: PETERSON PAUL K & PETERSON LAURIE A LOCATION: 7898 MUSTANG RD
OWNER: BRACE-HALL FAMILY TRUST LOCATION: 8315 MUSTANG RD
OWNER: LEONARD & EDNA LOCATION: 8255 MUSTANG PL
OWNER: WOLF-HOLCOMB, AUSTIN LOCATION: 8175 MUSTANG RD
OWNER: CENTER FOR STRATEGIC MINISTRY LOCATION: 0 4-13-65
OWNER: MARK SHEFFEL-WOODMEN INVESTMENTS LLC LOCATION: 0 4-13-65

SEE APPROVED GRADING PLAN FOR SHILOH MESA FILING NO.1 (IN REPORT) FOR MORE DETAIL OF OVERFLOW SWALE AND ADJACENT LOT GRADING. OVERFLOW TO 72" DIRECTED SOUTH ALONG MUSTANG ROAD

SEE SHEET 3 OF 3 FOR MARKSHEFFEL ROAD DRAINAGE BASIN INFORMATION.

MUSTANG ROAD
MARK SHEFFELL ROAD
FILING NO. 1 BOUNDARY
OUTER STREAMSIDE BOUNDARY
INNER STREAMSIDE BOUNDARY
100-YR FLOODPLAIN ZONE "AE"
SAND CREEK
GRADE CONTROL
SELECTIVE LINING
NORTH WQ POND SAND FILTRATION BASIN WQCV= 3,200 CF
CENTRAL WQ POND SAND FILTRATION BASIN WQCV = 17,800 CF
SOUTH WQ POND SAND FILTRATION BASIN WQCV = 19,000 CF

AR PUD 14-00692

CIVIL CONSULTANTS, INC.
102 E. PIKES PEAK AVE., STE 306
COLORADO SPRINGS, COLORADO 80903
v 719.955.5485
f 719.444.8427

SHILOH-MESA
POST DEVELOPMENT DRAINAGE PLAN

PROJECT NO. 08-026	FILE: O:\08026\Documents\Reports\Drainage\DP		
DESIGNED BY: VAS	SCALE	DATE: 6/08/2015	
DRAWN BY: ET	HORIZ: 1"=100'	SHEET 2 OF 3	DP-1
CHECKED BY: VAS	VERT: N/A		

SHILOH MESA
POST DEVELOPMENT DRAINAGE PLAN-MARKSHEFFEL ROAD
DECEMBER 2015

LEGEND

DESIGN POINT
FLOW DIRECTION
EMERGENCY OVERFLOW
BASIN DESIGNATION (A, 5.0 ACRES, .25/.35 Cs, C100)
PROPOSED MINOR CONTOUR
PROPOSED MAJOR CONTOUR
EXISTING MINOR CONTOUR
EXISTING MAJOR CONTOUR
BASIN BOUNDARY
EMERGENCY OVERFLOW PATH
SAND FILTRATION BASIN
PIPE RUN IDENTIFIER
SELECTIVE LINING
GRADE CONTROL

DRAINAGE NOTES

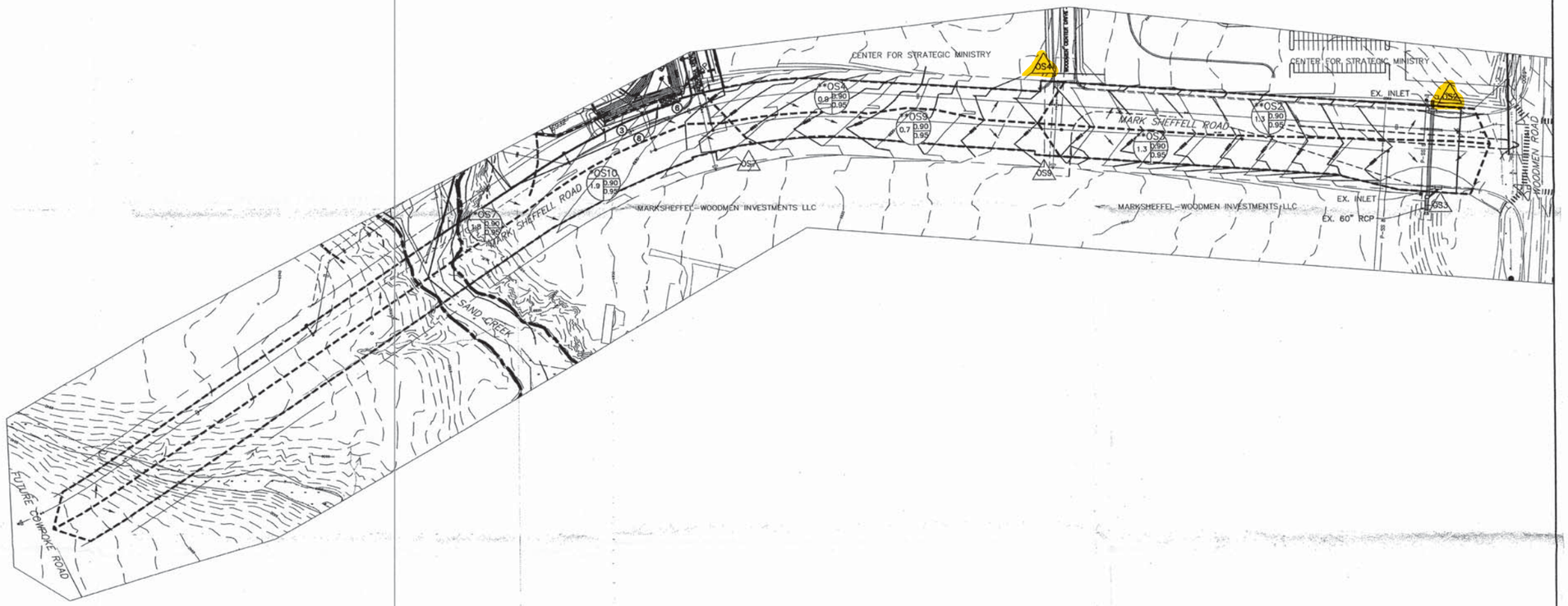
1. PROPOSED TYPE D-10-R DROP INLET, SUMP & AT-GRADE COND'N
2. PROPOSED STORM SEWER PIPE
3. PROPOSED FABRICATED END SECTION
4. REMOVE & REPLACE EX. CMP PIPES W/ PROPOSED RCBC CROSSING
5. PROPOSED STORM DRAIN HEADWALL
6. PROPOSED WATER QUALITY FEATURE – SAND FILTRATION BASIN
7. PROPOSED POND OUTLET, DESIGNED TO BYPASS Q100
8. PROPOSED RIPRAP APRON
9. PROPOSED TRAPEZOIDAL DIVERSION CHANNEL

BASIN SUMMARY TABLE			
BASIN ID	BASIN AREA (Acres)	FLOW Qs (CFS)	FLOW Q100 EST. (CFS)
OS7**	1.8	6.7	12.5
OS10**	1.9	7.0	13.2
OS4**	0.9	4.0	7.6
OS9**	0.7	3.2	6.0
OS2**	1.3	5.6	10.5
OS3**	1.3	5.7	10.7

**25 & Q100 REVISED AREAS AND FLOWS FOR "MASTER DEVELOPMENT DRAINAGE PLAN FOR SHILOH MESA AT WOODMEN HEIGHTS" PREPARED B MATRIX APPROVED NOVEMBER 2009

DESIGN POINT SUMMARY TABLE			
DESIGN PT.	PEAK Qs (CFS)	PEAK Q100 (CFS)	COMMENTS
OFFSITE TRIBUTARY			
OS7	13.7	25.7	TBD
OS4	4.0	7.6	PER MDDP MATRIX
OS9	3.2	6.0	PER MDDP MATRIX
OS2	5.6	10.5	PER MDDP MATRIX
OS3	5.7	10.7	PER MDDP MATRIX

NORTH
1" = 100'



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AR PUD 14-00692

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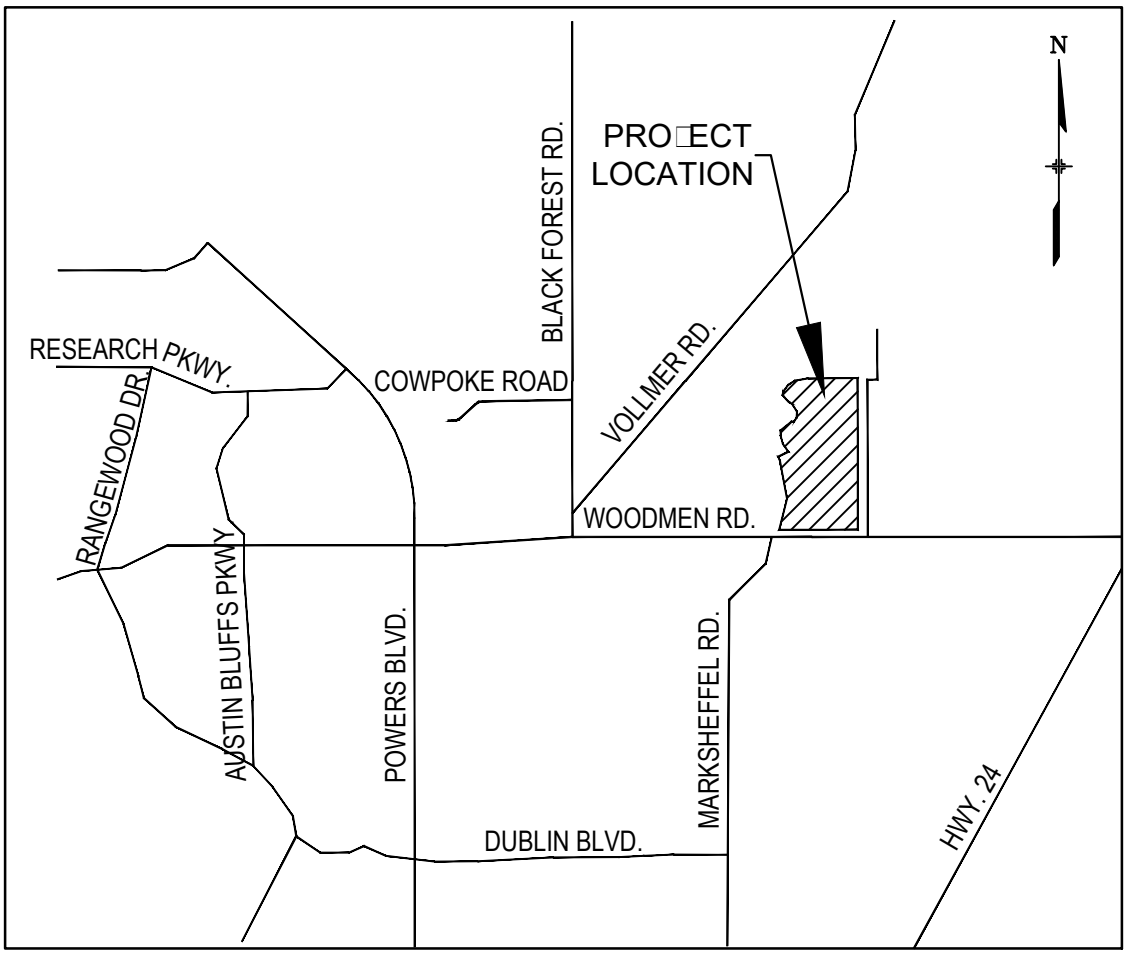
COLORADO 80903
v 719.955.5485
f 719.444.8427
CIVIL CONSULTANTS, INC.

SHILOH-MESA
POST DEVELOPMENT DRAINAGE PLAN-MARKSHEFFEL

PROJECT NO. 08-026		FILE: O:\08026\DWG\DEV PLAN\Drainage\DP2	
DESIGNED BY:	VAS	SCALE	DATE: 6/08/2015
DRAWN BY:	ET	HORIZ: 1"=100'	SHEET 3 OF 3 DP2
CHECKED BY:	VAS	VERT: N/A	

APPENDIX D

MAPS



NORTH
N.T.S.

PREPARED BY:

Matrix DESIGN GROUP
AN EMPLOYEE-OWNED COMPANY

SHILOH MESA FILING NO. 5 & SHILOH MESA COMMERCIAL FILING NO. 1

DESIGNED BY:	NMS	SCALE		DATE ISSUED: 03.02.17	DRAWING No.
DRAWN BY:	NMS	HORIZ.	N/A		1
CHECKED BY:	GGS	VERT.	N.A	SHEET 1 OF 1	

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

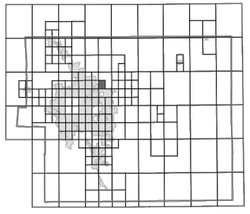
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

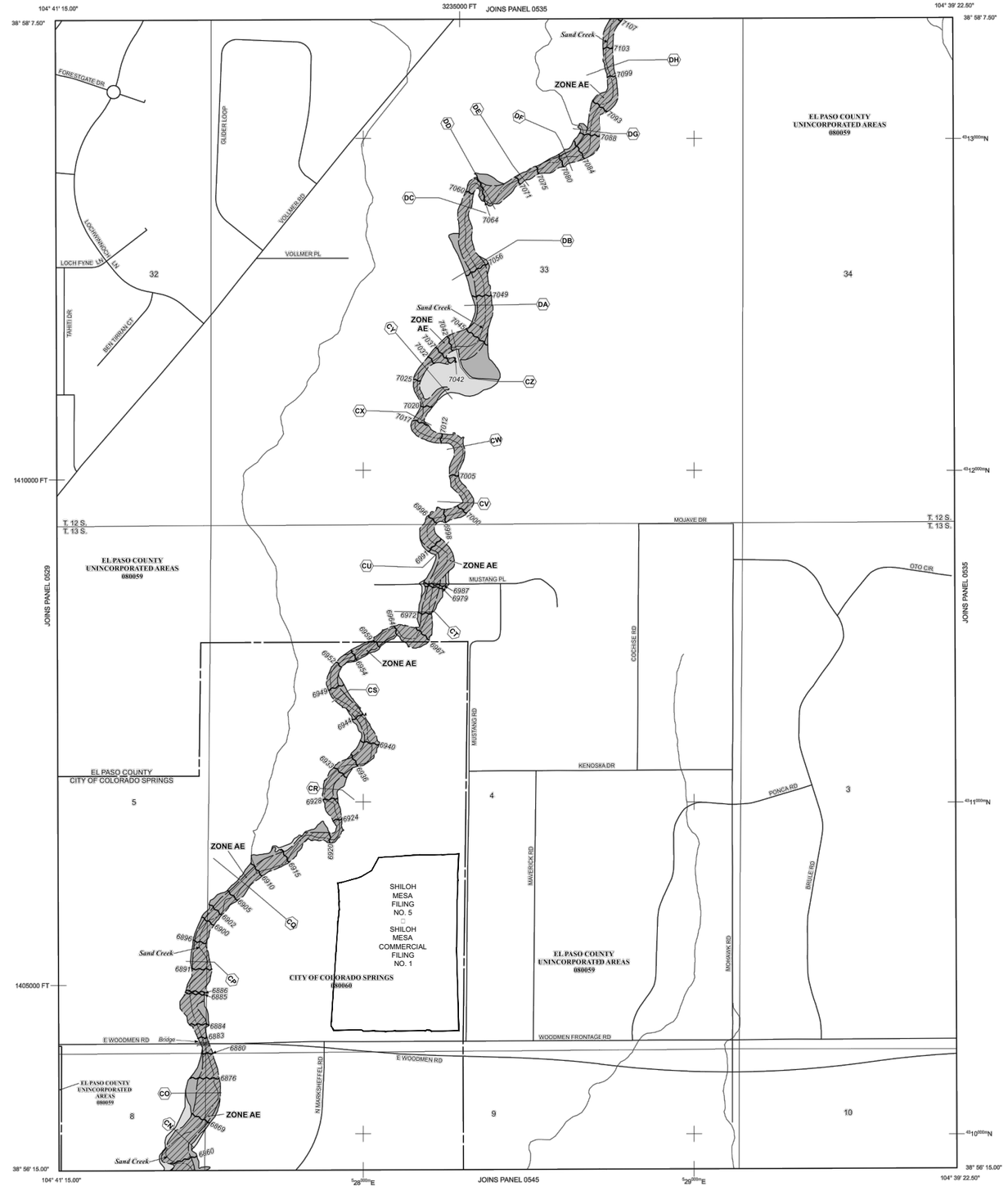
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 (EL 987) Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A–A Cross section line
23–23 Transect line
97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4375000mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
[MAP REVISED DATE] - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0533G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 533 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0533	G
EL PASO COUNTY	080059	0533	G

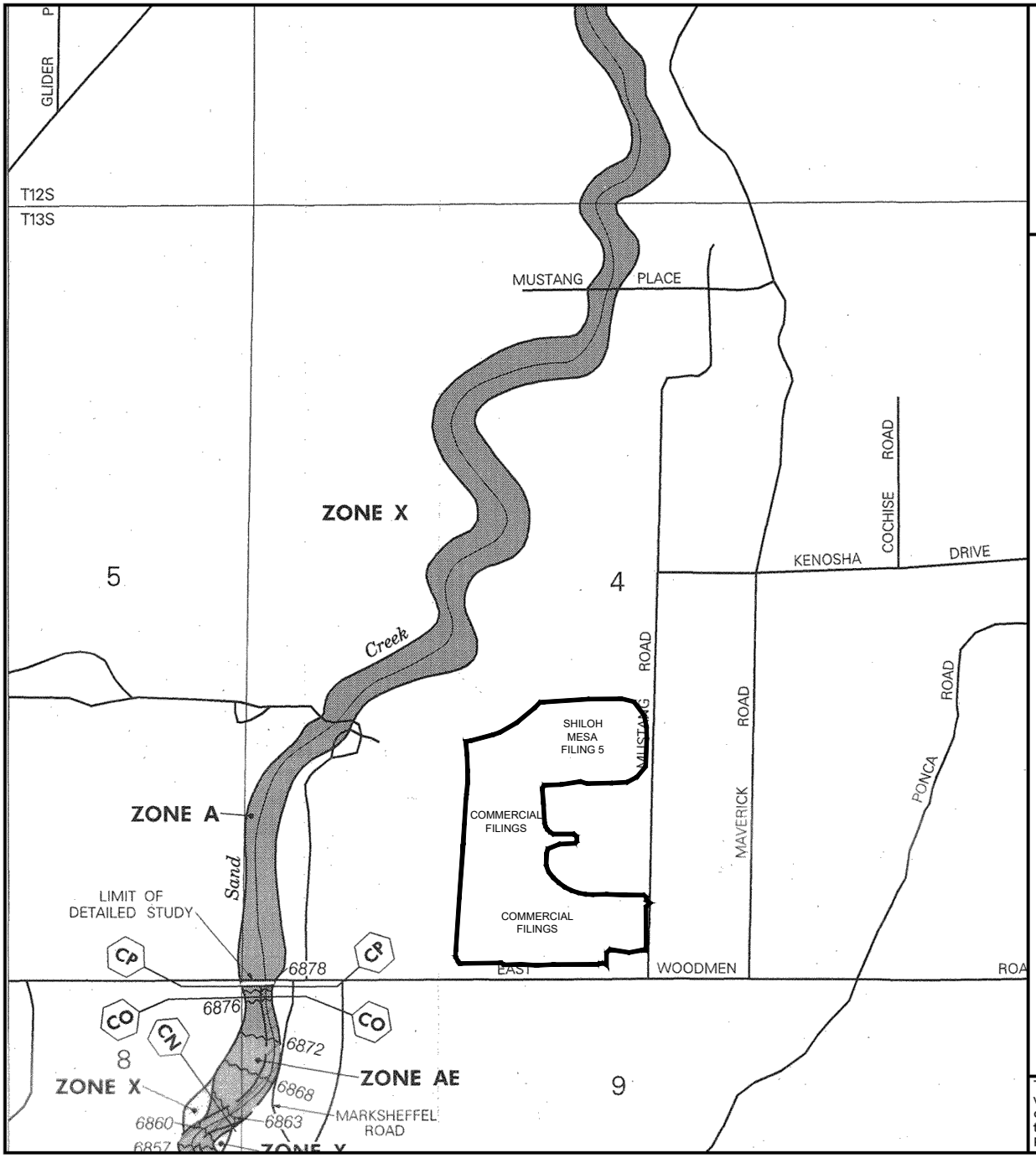
PRELIMINARY
JULY 29, 2015

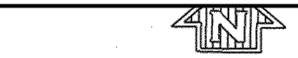
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0533G

MAP REVISED

Federal Emergency Management Agency





APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

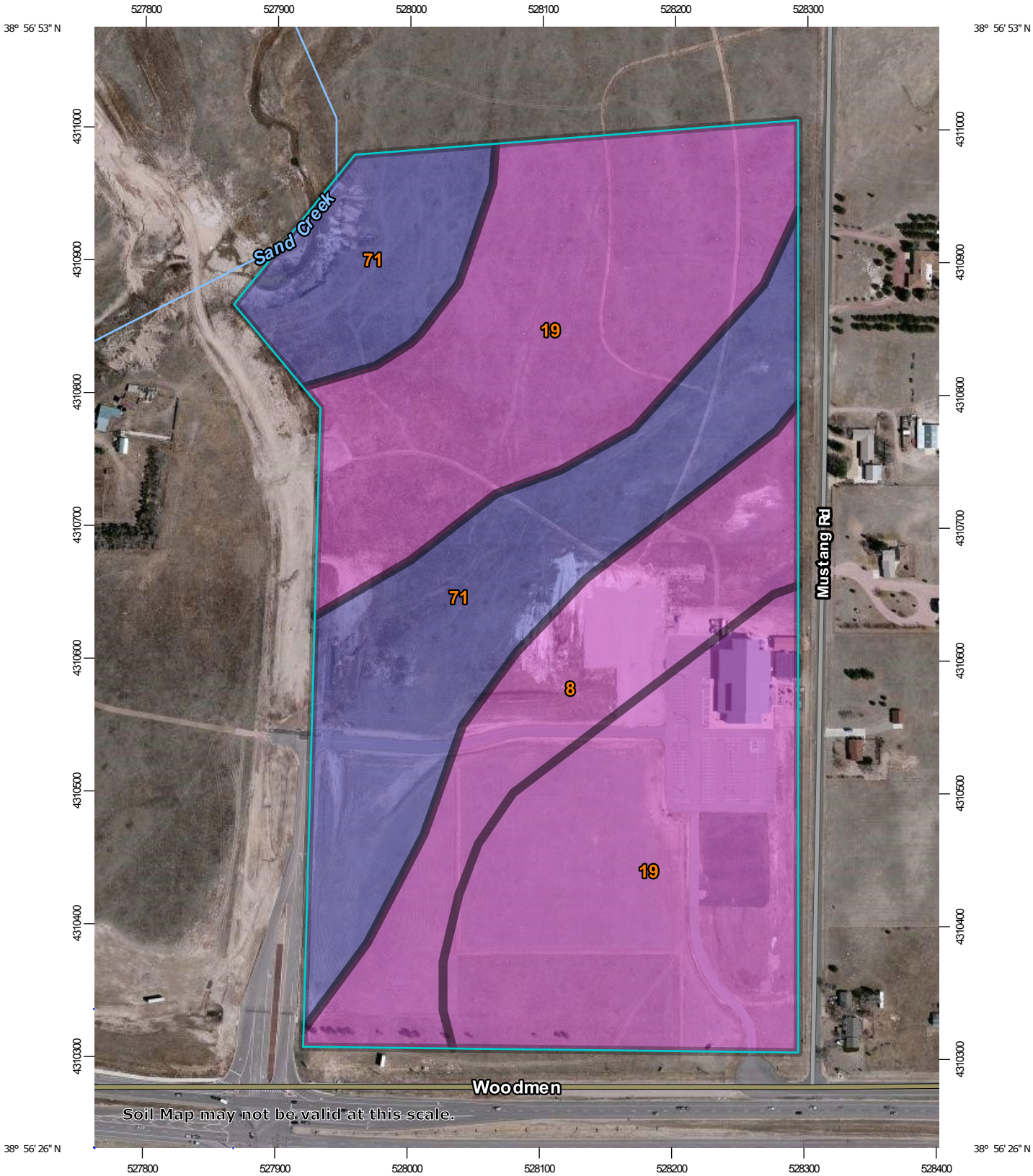
CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0535	F

MAP NUMBER
08041C0535 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

Hydrologic Soil Group—El Paso County Area, Colorado
(Shiloh Mesa Filing No. 5 & Shiloh Mesa Commercial Filing No. 1)



Map Scale: 1:4,110 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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: El Paso County Area, Colorado
Survey Area Data: Version 14, Sep 23, 2016

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

Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
8	Blakeland loamy sand, 1 to 9 percent slopes	A	10.3	16.3%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	33.7	53.1%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	19.4	30.6%
Totals for Area of Interest			**63.4**	**100.0%**

Description

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

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

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

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

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

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

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

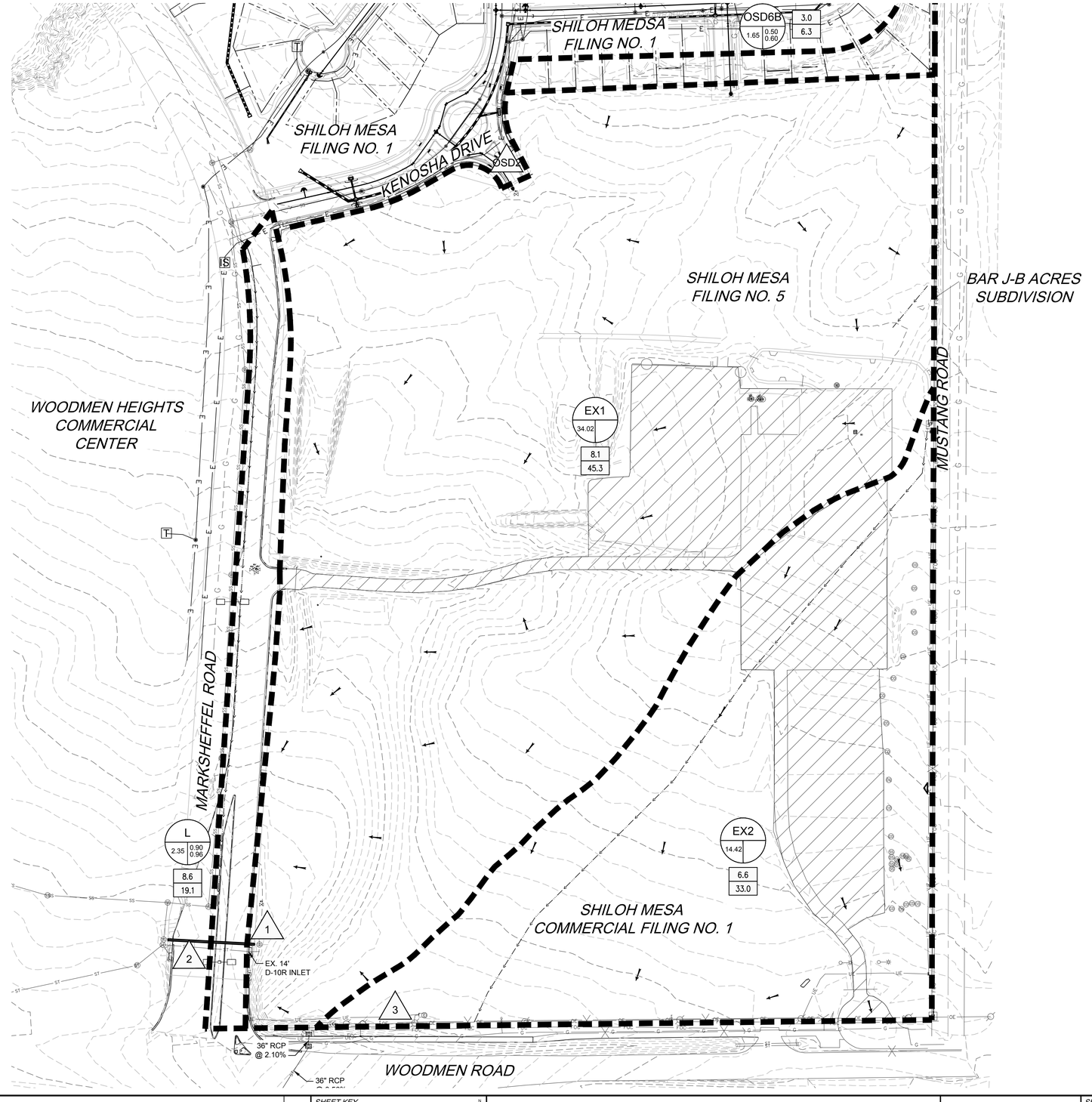
Rating Options

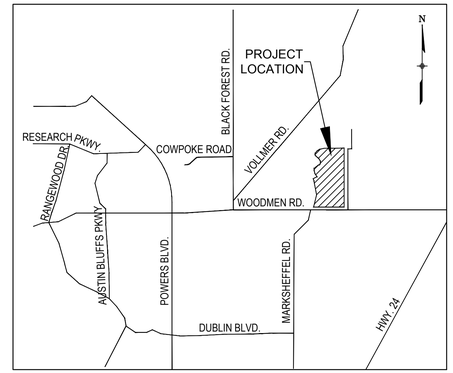
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Know what's **below.** **Call** before you dig.





VICINITY MAP

NORTH
N.T.S.

LEGEND

- SUB–BASIN BOUNDARY
- 4900 — EXISTING CONTOUR
- FLOW DIRECTION
- FLOWLINE
- LOT LINE
- DESIGN POINT
- X — SUB BASIN DESIGNATION
- X.XX — SUB BASIN 100 YEAR RUNOFF COEFFICIENT
- SUB BASIN AREA (AC.)
- 0.0 — 5–YEAR STORM EVENT PEAK FLOW (CFS)
- 0.0 — 100–YEAR STORM EVENT PEAK FLOW (CFS)

REFERENCE DRAWINGS

X-Ex Feat
X-MSBASE-RES
X-Util
DR02
DR01
X-886-PR-ROAD_ROUNDABOUT
X-Base-FS
X-900-PR-UTIL_COMM
X-900-EX-UTIL
X-900-EX-BASE

No.	DATE	DESCRIPTION	BY

REVISIONS

COMPUTER FILE MANAGEMENT

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CTB FILE: ----
PLOT DATE: December 21, 2017 10:34:13 AM
THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE.

SHEET KEY

PREPARED BY: Matrix DESIGN GROUP — AN EMPLOYEE-OWNED COMPANY

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FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No. 16.900.001

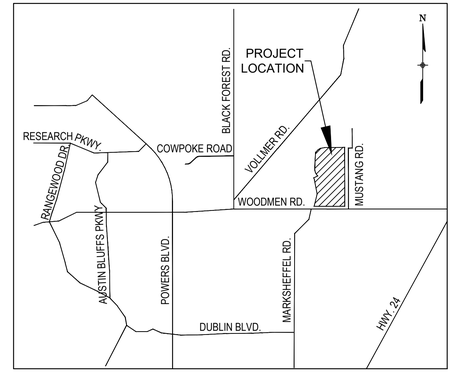
SHILOH MESA AT WOODMEN HEIGHTS

FILING NO. 5 & COMMERCIAL FILING NO. 1
MASTER DEVELOPMENT DRAINAGE PLAN

EXISTING CONDITIONS DRAINAGE MAP

		SCALE		DATE ISSUED:	OCTOBER 2017	DRAWING No.
DESIGNED BY:	NMS	HORIZ.	1" = 100'	SHEET	01 OF 03	DR01
DRAWN BY:	NMS	VERT.	N/A			
CHECKED BY:	GGS					

Know what's **below.** **Call** before you dig.



VICINITY MAP

NORTH
N.T.S.

LEGEND

- SUB–BASIN BOUNDARY
- 4900 — EXISTING CONTOUR
- FLOW DIRECTION
- FLOWLINE
- LOT LINE
- x — DESIGN POINT
- X / x.xx / x.xx — SUB BASIN DESIGNATION; SUB BASIN 100 YEAR RUNOFF COEFFICIENT; SUB BASIN AREA (AC.)
- 0.0 — 5–YEAR STORM EVENT PEAK FLOW (CFS)
- 0.0 — 100–YEAR STORM EVENT PEAK FLOW (CFS)

Sub-Basin Summary Table

Sub-Basin	Area (AC)	Runoff (CFS) Q5	Runoff (CFS) Q100
A	5.55	18.2	**40.9**
B	11.21	32.0	**57.0**
C1	5.38	21.6	**52.0**
C2	0.35	1.5	**3.4**
D1	0.30	1.5	**3.2**
D2	0.41	2.0	**4.4**
E1	1.66	7.3	**16.5**
E2	0.16	0.8	**1.8**
F1	0.17	0.9	**1.9**
F2	2.94	12.2	**28.1**
G1	3.30	15.3	**34.6**
G2	1.34	5.6	**13.2**
G3	0.91	4.4	**9.7**
G4	0.14	0.7	**1.5**
G5	1.34	6.4	**14.4**
G6	1.64	7.7	**17.5**
G7	0.54	2.2	**5.2**
H1	0.69	2.6	**6.3**
H2	5.16	22.9	**52.9**
H3	0.22	1.1	**2.4**
I1	0.21	1.0	**2.3**
I2	2.65	12.4	**27.9**
I3	0.18	0.9	**2.0**

Design Point Summary Table

Design Point	Contributing Basins	Runoff (CFS) Q5	Runoff (CFS) Q100
1	Pond F5 Release	1.9	**16.8**
2	DP1 + A	18.2	**42.5**
3	DP2 + DP-OS4 + DP-D1	19.7	**45.7**
4	DP3 + DP-D2	21.7	**50.1**
5	DP4+E1+E2	29.5	**64.9**
6	DP5+F1+F2	30.2	**67.9**
6A	Pond F Release	5.6	**25.0**
6B	DP6A+OS2	10.1	**31.2**
7	H2+H3	23.9	**55.3**
8	DP7 + I1	25.0	**57.5**
9	DP8 + G2 + H1	33.1	**76.8**
10	DP9 + I3	46.0	**106.2**
11	DP10 + G4	46.6	**107.5**
12	G3 + G5	10.8	**24.1**
13	DP12 + G1 + G7	35.8	**81.1**
14	DP11 + DP13 + G6	81.7	**186.6**
15	Pond 14 Release	6.5	**29.3**

Pond Summary Table

Pond ID	Contributing Basins	EX 2-YR PR 2-YR (CFS)	(CFS)	EX 5-YR PR 5-YR (CFS)	(CFS)	EX 10-YR PR 10-YR (CFS)	(CFS)	EX 25-YR PR 25-YR (CFS)	(CFS)	EX 50-YR PR 50-YR (CFS)	(CFS)	EX 100-YR PR 100-YR (CFS)	(CFS)
Pond F5	B, C1, C2												16.2
Pond F	A, D1, D2, E1, E2, F1, F2		0.9		**1.9**		3.4		6.6		11.5		**16.8**
F5 & F		4.44	2.7	8.1	**5.6**	12.2	8.8	21.6	14.2	32.2	18.3	45.3	**25.0**
Pond 14	G1-G7, H1-H3, I1-I3	3.88	4.94	6.6	**6.5**	9.6	9.2	16.1	14.5	23.2	21.3	33.0	**29.3**

REFERENCE DRAWINGS

X-Ex Feat
X-Ex Util
X-MSBASE-RES
X-Util
DR02
DR01
X-886-PR-ROAD_ROUNDABOUT
X-Base-FS
X-900-PR-ROAD_COMM
X-900-PR-UTIL_COMM

No.	DATE	DESCRIPTION	BY

REVISIONS

COMPUTER FILE MANAGEMENT

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THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE.

SHEET KEY

PREPARED BY: Matrix DESIGN GROUP AN EMPLOYEE-OWNED COMPANY

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FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No. 16.900.001

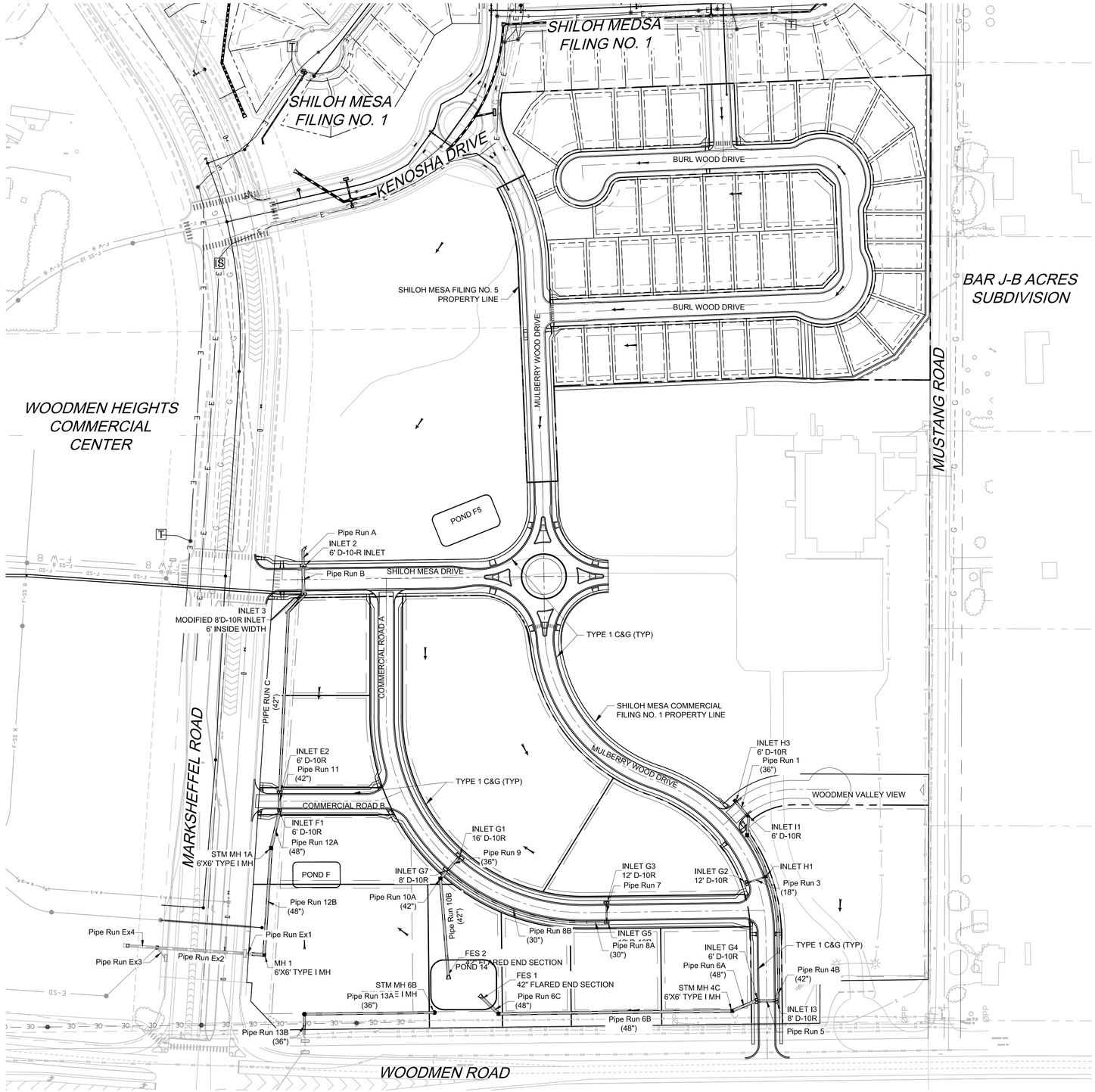
SHILOH MESA AT WOODMEN HEIGHTS

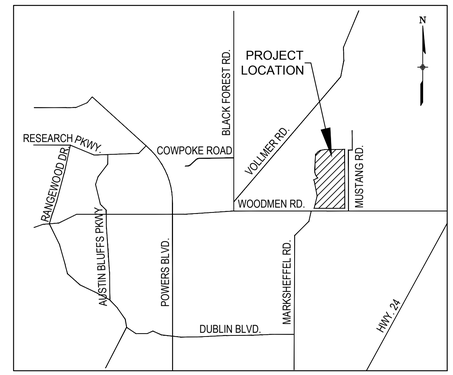
FILING NO. 5 & COMMERCIAL FILING NO. 1
MASTER DEVELOPMENT DRAINAGE PLAN

DEVELOPED CONDITIONS DRAINAGE MAP

		SCALE		DATE ISSUED:	OCTOBER 2017	DRAWING No.
DESIGNED BY:	NMS	HORIZ.	1" = 100'	SHEET	02 OF 03	DR02
DRAWN BY:	NMS	VERT.	N/A			
CHECKED BY:	GGS					

Know what's **below.** **Call** before you dig.





VICINITY MAP

NORTH
N.T.S.

LEGEND

- SUB–BASIN BOUNDARY
- 4900 — EXISTING CONTOUR
- FLOW DIRECTION
- FLOWLINE
- LOT LINE
- DESIGN POINT
- SUB BASIN DESIGNATION
- SUB BASIN 100 YEAR RUNOFF COEFFICIENT
- SUB BASIN AREA (AC.)
- 0.0 — 5–YEAR STORM EVENT PEAK FLOW (CFS)
- 0.0 — 100–YEAR STORM EVENT PEAK FLOW (CFS)

N

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.

NOTE:
ALL STORM INFRASTRUCTURE IS TO BE PUBLIC

REFERENCE DRAWINGS

X-Ex Feat
X-Ex Util
X-MSBASE-RES
X-Util
DR02
DR01
X-686-PR-ROAD_ROUNDABOUT
X-Base-FS
X-900-PR-ROAD_COMM
X-900-PR-UTIL_COMM
X-900-PR-MAP_COMM

No.	DATE	DESCRIPTION	BY

REVISIONS

COMPUTER FILE MANAGEMENT

FILE NAME: S:\16.900.001 Shiloh Mesa Commercial Filing\Drainage\MDDP\Dwg\DR03.dwg
CTB FILE: ----
PLOT DATE: December 21, 2017 10:39:45 AM
THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE.

SHEET KEY

PREPARED BY: Matrix DESIGN GROUP AN EMPLOYEE-OWNED COMPANY

SEAL

PRELIMINARY
THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No. 16.900.001

SHILOH MESA AT WOODMEN HEIGHTS

FILING NO. 5 & COMMERCIAL FILING NO. 1
MASTER DEVELOPMENT DRAINAGE PLAN

DEVELOPED CONDITIONS SITE MAP

DESIGNED BY:	NMS	SCALE		DATE ISSUED:	OCTOBER 2017
DRAWN BY:	NMS	HORIZ.	1"=100'	SHEET	03 OF 03
CHECKED BY:	GGS	VERT.	N/A		

DRAWING No. DR03