

**PRELIMINARY DRAINAGE REPORT
FOR
AMERICAN FURNITURE WAREHOUSE
COLORADO SPRINGS, COLORADO**

Project Number: 050985-01-001

Developer/Owner:
American Furniture Warehouse
8820 American Way
Englewood, CO 80112

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Engineer's Statement

This report and plan for the preliminary drainage design of American Furniture Warehouse Colorado Springs was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Colorado Springs Drainage Criteria Manual for the owners thereof. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others.

Signature: _____

Zane Ross, P.E.
Registered Professional Engineer
State of Colorado No. 45432

Developer's Statement

American Furniture Warehouse hereby certifies that the drainage facilities for American Furniture Warehouse Colorado Springs 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 the City of Colorado Springs reviews drainage plans pursuant to section 7.7.906 of the City Code; but cannot, on behalf of American Furniture Warehouse, guarantee that final drainage design review will absolve American Furniture Warehouse 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.

Name of Developer

Authorized Signature

General Location and Description

1.1 Site Location

The location of American Furniture Warehouse Colorado Springs (Site) is north of Dublin Boulevard, east of North Powers Boulevard and west of Tutt Boulevard in the City of Colorado Springs. The site boundaries are shown on the Vicinity Map, Figure 1. The site is in the north half of Section 7, Township 13 South, Range 65 West of the Sixth Principal Meridian, City of Colorado Springs, El Paso County, Colorado.

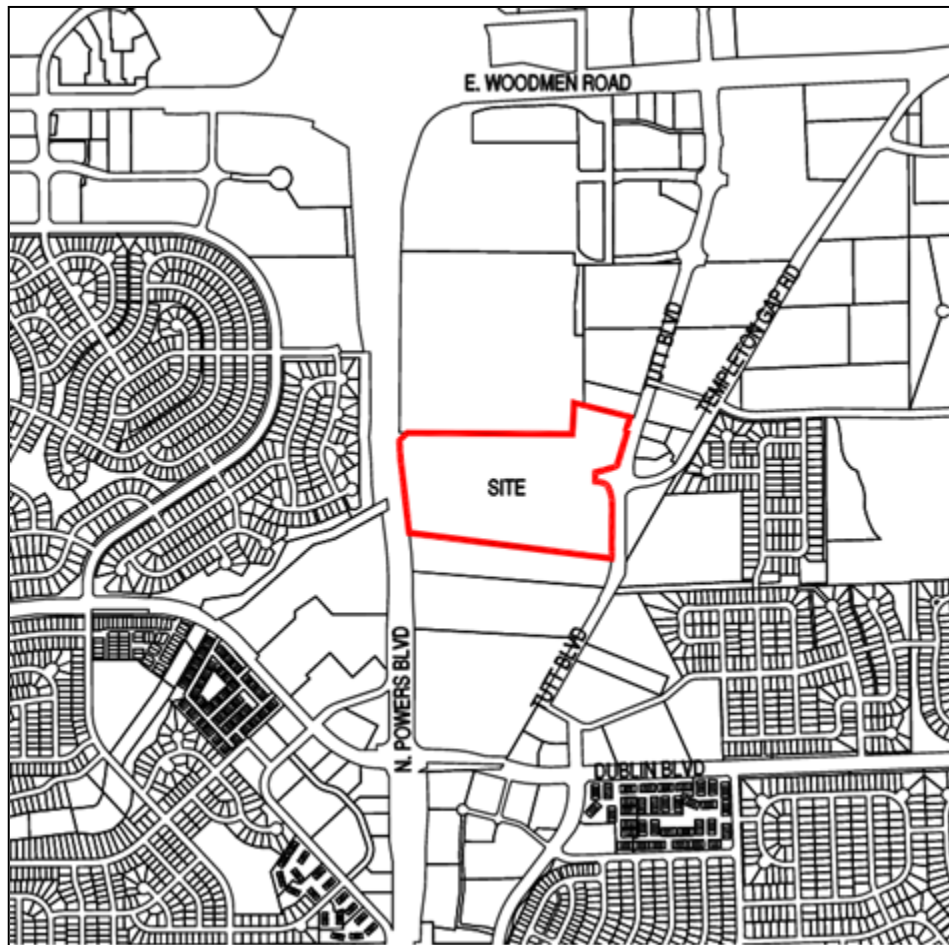


Figure 1

1.2 Description of Property

The existing site includes parts of the Tuscany Plaza Subdivision and consists of 34.07 acres. The site was zoned PBC AO as part of the Tuscany Plaza Subdivision and allows for retail. The land to the north is an existing closed landfill and the land to the south is vacant land covered by natural grass.

The site is currently undeveloped land covered with natural grasses and vegetation. There is also an existing sedimentation pond on the west side of the site. The site's topography generally slopes from east to southwest to the existing regional detention facility. Slopes range from 1% to 9%.

The NRCS Soil Classification Map classifies the site as Blakeland Sandy Loam – Hydrologic Soil Group A. A Soils Map can be found in Appendix D. Blakeland Sandy Loam is characterized by slow surface runoff and high permeability.

2 Drainage Basins and Sub-Basins

The site is part of a larger basin that drains to the onsite existing sedimentation pond which ultimately drains through an existing twin 66" RCP culver under Powers Boulevard. The sedimentation pond collects flows from the existing landfill, Tutt Boulevard (which collects flows from the Greenbriar II Development to the north), as well as the remainder of the Tuscany Plaza Subdivision.

According to FEMA Flood Insurance Rate Map (FIRM 08041C0537G, effective December 7, 2018, the entire site is outside of the 0.2% annual chance flood hazard. This FEMA map can be found in Appendix D.

Existing offsite flow paths and patterns will be maintained and remain unaffected by this development. The existing regional detention facility located on the site will remain but will be modified to comply with current drainage standards.

2.1 Major Drainage Basins

This project site is part of the Master Development Drainage Plan designed by Associated Design Professionals, Inc (ADP) for the Tuscany Plaza Subdivision. The previous design separated the existing site into approximately 16 basins as part of plans for a larger commercial development with parking lots and associated private roads. The ADP report had a composite 5-year C coefficient of 0.68 and a composite 100-year C coefficient of 0.74 which corresponds to an overall imperviousness of approximately 80.4%. This project will have an imperviousness of approximately 68.4%, which is less than the ADP report assumed and therefore the site will be in conformance with the MDDP.

Of the 43.1 acres on site defined in the ADP report, the proposed site accounts for 48.88 acres which includes Basin OS3B (Lot 2 Tutt Blvd Industrial Park Fil 1) as well as OS5A and OS5B which are part of Wolf Ridge Road and drain to Tutt Blvd. The proposed full spectrum detention pond will provide detention and water quality for all onsite basins A, B, C, D, R and EX-E, EX-F, OS-EXD, OS3B, OS5A, OS5B, OS-A5A, OS-A5B and OS-A5C. Offsite basins north and west of the property are not included in the detention and water quality volume of the site as those basins either have provided detention, are not being disturbed as part of the project or are not historically tributary to the proposed site.

2.2 Minor Drainage Basins

There are several minor drainage basins, both onsite and offsite, that drain into and across this project site. The following is a brief description of each basin.

Basin A1 (0.31 Ac., $C_5=0.43$, $C_{100}=0.56$)

Basin A1 is located in the southeast area of the site and is composed of a proposed drive aisle, associated curb and gutter, and landscaping area that is part of a future pad site. Runoff from this basin will be collected in a proposed Type-R inlet on the west side of the drive aisle near a southeast parking lot entrance. Flows are ultimately conveyed to the west towards the existing regional detention pond.

Basin A2 (0.16 Ac., $C_5=0.82$, $C_{100}=0.86$)

Basin A2 is located in the southeast area of the site and is composed of a proposed drive aisle, associated curb and gutter, a small landscaping area north of the proposed retaining wall. Runoff from this basin will be collected in a proposed Type-R inlet on the north side of the drive aisle and conveyed to the north and west towards the existing regional detention pond.

Basin A3 (0.62 Ac., $C_5=0.38$, $C_{100}=0.52$)

Basin A3 is located in the southeast area of the site and is composed of a proposed drive aisle, a parking lot, associated curb and gutter, and landscaping area south of the parking lot. Runoff from this basin will be collected in a proposed area inlet on the south side of the proposed parking area and conveyed to the west towards the existing regional detention pond.

Basin A4 (0.48 Ac., $C_5=0.56$, $C_{100}=0.66$)

Basin A4 is located in the southeast area of the site and is composed of a proposed drive aisle, a parking lot, associated curb and gutter, landscaping area south of the parking lot. Runoff from this basin will be collected in a proposed area inlet on the south side of the parking lot and conveyed to the west towards the existing regional detention pond.

Basin A5 (0.22 Ac., $C_5=0.72$, $C_{100}=0.79$)

Basin A5 is located in the south area of the site and is composed of a proposed drive aisle, associated curb and gutter, a small landscaping area north of the proposed retaining wall. Runoff from this basin will be collected in a proposed Type-R inlet on the northwest side of the drive aisle and conveyed to the north and west towards the existing regional detention pond.

Basin A6 (1.04 Ac., $C_5=0.61$, $C_{100}=0.70$)

Basin A6 is located in the southeast area of the site, south of the proposed truck dock, and is composed of proposed drive aisles, a parking lot, associated curb and gutter, landscaping area south of the parking lot. Runoff from this basin will be collected in a proposed area inlet in the center of the drive aisle for the parking lot and conveyed to the west towards the existing regional detention pond.

Basin A7 (0.72 Ac., $C_5=0.78$, $C_{100}=0.83$)

Basin A7 is located in the center of the site, south of the proposed building, and is composed of proposed drive aisles, a parking lot, associated curb and gutter, and parking lot islands. Runoff from this basin will be collected in a proposed Type-R inlet on the west side of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin A8 (0.44 Ac., $C_5=0.64$, $C_{100}=0.73$)

Basin A8 is located in the southwest area of the site, on the southeast side of the customer parking lot and is composed of proposed drive aisles, associated curb and gutter, and landscaping. Runoff from this basin will be collected in a proposed area inlet in the southeast corner of the proposed parking lot, north of the proposed landscaping area and then conveyed to the west towards the existing regional detention pond.

Basin A9 (0.43 Ac., $C_5=0.74$, $C_{100}=0.80$)

Basin A9 is located in the southwest area of the site, on the southeast side of the customer parking lot and is composed of proposed drive aisles, associated curb and gutter, and landscaping. Runoff from this basin will be collected in a proposed area inlet in the southwest corner of the proposed parking lot and then conveyed to the west towards the existing regional detention pond.

Basin A10 (0.27 Ac., $C_5=0.73$, $C_{100}=0.79$)

Basin A10 is located in the southwest area of the site, on the southwest side of the customer parking lot and is composed of proposed drive aisles, associated curb and gutter, and landscaping. Runoff from this basin will be collected in a proposed area inlet in the southeast corner of the proposed parking lot and then conveyed to the west towards the existing regional detention pond.

Basin A11 (0.43 Ac., $C_5=0.78$, $C_{100}=0.83$)

Basin A11 is located in the southwest area of the site, on the southwest side of the customer parking lot and is composed of proposed drive aisles, associated curb and gutter, and landscaping. Runoff from this basin will be collected in a proposed area inlet in the southwest corner of the proposed parking lot and then conveyed to the south and west towards the existing regional detention pond.

Basin B1 (0.40 Ac., $C_5=0.45$, $C_{100}=0.58$)

Basin B1 is located on the east side of the proposed building, near the main site entryway and is composed of a proposed drive aisle, parking, associated curb and gutter, and landscaping. Runoff from this basin will be collected in a proposed area inlet in the drive aisle on the west side of the parking island and then conveyed to the north and west towards the existing regional detention pond.

Basin B2 (0.07 Ac., $C_5=0.57$, $C_{100}=0.67$)

Basin B2 is located on the northeast corner of the proposed building and is composed of a proposed drive aisle, parking, associated curb and gutter, and landscaping. Runoff from this basin will be collected in a proposed area inlet on the east side of the drive aisle and then conveyed to the north and west towards the existing regional detention pond.

Basin B3 (0.79 Ac., $C_5=0.15$, $C_{100}=0.30$)

Basin B3 is located on the north side of the site and is composed of a proposed drive aisle, parking, associated curb and gutter, landscaping, and existing open space. Runoff from this basin will be collected in a proposed Type-R inlet on the north side of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin B4 (0.45 Ac., $C_5=0.23$, $C_{100}=0.38$)

Basin B4 is located on the north side of the site and is composed of a proposed drive aisle, parking, associated curb and gutter, landscaping, and existing open space. Runoff from this basin will be collected in a proposed Type-R inlet on the north side of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin B5 (0.43 Ac., $C_5=0.25$, $C_{100}=0.41$)

Basin B5 is located on the north side of the site and is composed of a proposed drive aisle, associated curb and gutter, and open space. Runoff from this basin will be collected in a proposed Type-R inlet on the north side of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin B6 (0.14 Ac., $C_5=0.86$, $C_{100}=0.89$)

Basin B6 is located on the north side of the site and is composed of a proposed drive aisle, parking, and associated curb and gutter. Runoff from this basin will be collected in a proposed Type-R inlet on the north side of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin B7 (1.43 Ac., $C_5=0.01$, $C_{100}=0.13$)

Basin B7 is located at the north side of the site and is composed of the undeveloped open space north of the site and south of the landfill. Runoff from the basin will flow into a proposed swale and combine with flows from the existing offsite basin OS2B where it will then enter the existing roadside swale on the west side of the site along Powers Boulevard.

Basin B8 (0.05 Ac., $C_5=0.80$, $C_{100}=0.84$)

Basin B8 is located on the north side of the site and is composed of a proposed drive aisle, parking, and associated curb and gutter. Runoff from this basin will be collected in a proposed Type-R inlet on the north side of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin B9 (0.23 Ac., $C_5=0.75$, $C_{100}=0.81$)

Basin B9 is located on the west side of the site, west of the proposed building, and is composed of a proposed drive aisle, parking, and associated curb and gutter. Runoff from this basin will be collected in a proposed Type-R inlet on the west side of the drive aisle and then conveyed to the north towards then existing regional detention pond.

Basin B10 (0.26 Ac., $C_5=0.73$, $C_{100}=0.79$)

Basin B10 is located on the west side of the site, west of the proposed building, and is composed of a proposed drive aisle, parking, and associated curb and gutter. Runoff from this basin will be collected in a proposed Type-R inlet on the west side of the drive aisle and then conveyed to the north towards the existing regional detention pond.

Basin C1 (2.79 Ac., $C_5=0.68$, $C_{100}=0.75$)

Basin C1 is located at the center of the site and is composed of the proposed truck dock and warehouse, proposed drive aisle, parking, landscape islands, and associated curb and gutter. Runoff from this basin will be collected in a proposed area inlet at the center of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin C2 (2.89 Ac., $C_5=0.77$, $C_{100}=0.82$)

Basin C2 is located at the center of the site and is composed of the proposed truck dock and warehouse, proposed drive aisle, parking, landscape area, and associated curb and gutter. Runoff from this basin will be collected in a proposed area inlet at the center of the drive aisle and then conveyed to the west towards the existing regional detention pond.

Basin C3 (0.32 Ac., $C_5=0.79$, $C_{100}=0.84$)

Basin C3 is located at the center of the site and is composed of the front building sidewalk, proposed drive aisle, parking, landscape islands, and associated curb and gutter. Runoff from this basin will be collected in a proposed area inlet at the southeast side of the proposed parking lot and then conveyed to the west towards the existing regional detention pond.

Basin C4 (0.37 Ac., $C_5=0.79$, $C_{100}=0.84$)

Basin C4 is located at the center of the site and is composed of the front building sidewalk, proposed drive aisle, parking, landscape islands, and associated curb and gutter. Runoff from this basin will be collected in a proposed area inlet at the southwest side of the proposed parking lot and then conveyed to the west towards the existing regional detention pond.

Basin C5 (0.22 Ac., $C_5=0.70$, $C_{100}=0.78$)

Basin C5 is located at the center of the site and is composed of the front building sidewalk, proposed drive aisle, parking, landscape islands, and associated curb and gutter. Runoff from this basin will be collected in a proposed area inlet at the southwest side of the proposed parking lot and then conveyed to the west towards the existing regional detention pond.

Basin D1 (3.27 Ac., $C_5=0.55$, $C_{100}=0.66$)

Basin D1 is located at the northeast side of the site and is composed of future pad sites, landscape islands, open space, a proposed parking lot, drive aisles, and associated curb and gutter. Runoff from this basin will be collected in proposed inlets which are conveyed to a manhole within the proposed drive aisle at the end of the overall site

entryway and then conveyed to the south and west to the existing regional detention pond.

Basin D2 (0.93 Ac., $C_5=0.42$, $C_{100}=0.55$)

Basin D2 is located at the east side of the site and is composed a proposed site entryway, drive aisle, landscaping, and associated curb and gutter. Runoff from this basin will be collected in a proposed Type-R inlet at the west end of the entryway and then conveyed to the south and west to the existing regional detention pond.

Basin D3 (2.53 Ac., $C_5=0.60$, $C_{100}=0.70$)

Basin D3 is located at the east side of the site and is composed of future pad sites, landscape islands, open space, a proposed parking lot, drive aisles, and associated curb and gutter. Runoff from this basin will be collected in proposed inlets which are conveyed to a Type-R inlet on the west side of the proposed drive aisle and then conveyed to the south and west to the existing regional detention pond.

Basin D4 (0.60 Ac., $C_5=0.42$, $C_{100}=0.56$)

Basin D4 is located at the east side of the site and is composed of a proposed drive aisle, associated curb and gutter, and landscaped area on the west side of the proposed pad sites. Runoff from this basin will be collected in a proposed Type-R inlet on the west side of the drive aisle near the truck dock entrance and then conveyed to the south and west to the existing regional detention pond.

Basin D5 (0.73 Ac., $C_5=0.47$, $C_{100}=0.60$)

Basin D5 is located at the southeast side of the site and is composed of a future pad site, landscape area, proposed parking lot, drive aisle, and associated curb and gutter. Runoff from this basin will be collected in a future proposed inlet which will convey the flow to the proposed storm sewer south of the pad site and then conveyed to the west to the existing regional detention pond.

Basin D6 (0.20 Ac., $C_5=0.01$, $C_{100}=0.13$)

Basin D6 is located along the side of the site and is composed of existing open space south of the proposed retaining wall. Runoff from this basin will flow off site to the south.

Basin D7 (3.94 Ac., $C_5=0.01$, $C_{100}=0.13$)

Basin D7 is located at the west side of the site and is composed of the existing regional detention pond and the surrounding open space. Runoff from the basin will flow into the pond and ultimately to the outflow and to the west under Powers Boulevard.

Offsite Minor Basins

Runoff from the following offsite basins currently drain toward and through the project site, eventually draining into the existing regional detention pond. With the proposed development, runoff from these basins will continue to flow into the regional detention

pond. For simplicity, the names of the offsite basins are mostly consistent with the naming convention used in the Master Development Drainage Plan for Tuscany Plaza Subdivision. The following is a description of each of these offsite basins:

Basin OS-A1A (1.01 Ac., $C_5=0.89$, $C_{100}=0.95$)

Basin OS-A1A consists of the eastern half of Tutt Boulevard north of the existing roundabout as well as the west half of Wolf Ridge Road adjacent to Tuscany Plaza Subdivision Filing No. 1. Flows in the basin flow to the south and southwest towards and existing inlet northeast of the existing roundabout. From there, flows are conveyed to the west through the site towards the existing regional detention pond.

Basin OS-A1B (3.14 Ac., $C_5=0.71$, $C_{100}=0.80$)

Basin OS-A1B consists of the existing Tuscany Plaza Subdivision Filing No. 1 and includes a commercial and office area northeast of the existing roundabout. The basin consists of existing buildings, associated parking, and landscaped areas. Flows from this basin are conveyed to the southwest towards an existing area inlet within the basin. From there, the flows are conveyed to the west towards the existing detention basin.

Basin OS-A3 (0.99 Ac., $C_5=0.71$, $C_{100}=0.80$)

Basin OS-A3 consists of the west half of Tutt Boulevard north of the roundabout. Runoff from this basin combines with the runoff from the existing detention pond north of the site and then is conveyed to an existing inlet northwest of the roundabout. The flows are then conveyed to the west through the site to the existing detention pond.

Basin OS-A5A (2.56 Ac., $C_5=0.61$, $C_{100}=0.71$)

Basin OS-A5A is located on the east side of Tutt boulevard, southeast of the existing roundabout. The basin is currently being developed and will have parking, landscaping, and a building. Runoff from this basin flows to the southeast towards an existing area inlet. The flows are then conveyed to the west towards the site along the south property line for the site where they are ultimately routed to the existing regional detention pond.

Basin OS-A5B (0.74 Ac., $C_5=0.90$, $C_{100}=0.96$)

Basin OS-A5B is located on the east half of Tutt Boulevard south of the roundabout, east of the site. Runoff from this basin flows to the south where it is collected in an existing inlet on the east side of Tutt Boulevard. The flows are then conveyed to the west along the south property line of the site where they are ultimately routed to the regional detention pond.

Basin OS-A5C (0.68 Ac., $C_5=0.90$, $C_{100}=0.96$)

Basin OS-A5C is located on the west half of Tutt Boulevard south of the roundabout, east of the site. Runoff from this basin flows to the south where it is collected in an existing inlet on the west side of Tutt Boulevard and conveyed to the west along the south property line of the site where it ultimately is routed to the regional detention pond.

Basin OS-EX-D (0.64 Ac., $C_5=0.74$, $C_{100}=0.80$)

Basin OS-A5C is located on the west half of Tutt Boulevard north of the roundabout, east of the site. Runoff from this basin flows to the south where it is collected in an existing inlet on the west side of Tutt Boulevard within the roundabout and conveyed to the west within the proposed 48" RCP where it ultimately is routed to the regional detention pond.

Basin OS1A (30.81 Ac., $C_5=0.18$, $C_{100}=0.26$)

Basin OS1A is located to the north of the project site and represents that outfall from a 3.7 ac-ft detention facility used by the hospital site located at the corner of Powers Boulevard and Woodman Road. The flows from this detention basin are conveyed south adjacent to Powers Boulevard in a roadside swale to the twin 66" culvert on the west side of the site. (Tuscany Plaza Subdivision Final Drainage Report, February 2020)

Basin OS1B (17.4 Ac., $C_5=0.25$, $C_{100}=0.35$)

Basin OS1B is located north of the site, south of basin OS1A and is composed of open space above in the western portion of the landfill site. Flows are conveyed via sheet flow to the west and then are conveyed to the south by the Powers Boulevard roadside swale where they combine with the flows from Basin OS1A and flow to the south towards the twin 66" culvert.

Basin OS2A (13.63 Ac., $C_5=0.08$, $C_{100}=0.35$)

Basin OS2A is located on the north side of the closed landfill site and consists of open space. Runoff is conveyed via overland flow to an existing inlet on the west side of the basin where it then is conveyed by a 24" RVP to the west to the Powers Boulevard roadside swale.

Basin OS2B (14.04 Ac., $C_5=0.08$, $C_{100}=0.35$)

Basin OS2B is located on the south side of the landfill site and consists of open space. Runoff is conveyed to the south via overland flow to the south to an existing ditch on the north side of the site. The ditch ends and flows are conveyed into Basin B7 where they are ultimately conveyed via a proposed swale to the regional detention pond.

Basin OS3A (56.65 Ac., $C_5=0.17$, $C_{100}=0.21$)

Basin OS3A consists of the entire existing Greenbriar development north of the proposed site as well as the existing 7.3 ac-ft detention pond. Flows from this basin are detained in the existing detention basin which is designed for the 100-year event. The pond outlets back into Tutt Boulevard into an existing 36" RCP storm sewer which ultimately outlets into the existing regional detention pond.

Basin OS3B (2.82 Ac., $C_5=0.34$, $C_{100}=0.52$)

Basin OS3B consists of the existing Tutt Boulevard Industrial Park Filing No. 1, Lot 2 which is a developed auto collision center including an existing building, parking lot, and landscaped areas. Runoff from this basin is collected in a curb inlet in the southwest corner of the existing parking lot and in a sump inlet in the landscaped areas. Per the MDDP, this basin was intended to provide onsite detention when the lot developed, but after investigation of the approved drainage report for Lot 2, Tutt Blvd Industrial Park Fil No 1, by JR Engineering, the site was developed without detention or water quality

capture volumes and routed to the proposed detention pond which increased the required pond volume by 2.2% or 5,510 cf. This basin has been included as part of the proposed full spectrum detention pond as it flows undetained and treated, and must be detained and treated to meet the City and State MS4 Permit regulations. Flows from this basin are conveyed to the existing storm sewer in Tutt Boulevard where they are ultimately routed to the proposed detention pond on site.

Basin OS4 (1.76 Ac., $C_5=0.25$, $C_{100}=0.47$)

Basin OS4 consists of the roadside swale on the east side of Powers Boulevard. The flows from this basin combine with the flows from the north and the outfall from the existing detention basin and outlets into the twin 55" RCP culvert to the west.

Basin OS5A (1.24 Ac., $C_5=0.39$, $C_{100}=0.55$)

Basin OS5A consists of the western half of Templeton Gap Road to the northeast of the site. The flows from the road are conveyed via roadside ditch parallel to the road to an existing Type R inlet where they are then conveyed to the existing detention pond to the west through the site to the existing detention basin.

Basin OS5B (1.58 Ac., $C_5=0.37$, $C_{100}=0.54$)

Basin OS5B consists of the eastern half of Templeton Gap Road to the northeast of the site. The flows from the road are conveyed via a roadside ditch parallel to the road to an existing Type R inlet where they are then conveyed to the west through the site and into the existing detention basin.

3 Existing Stormwater Conveyance and Storage Facilities

3.1 Existing Stormwater Conveyance Facilities

The site currently has existing stormwater conveyance facilities running through it. These conveyance facilities include storm sewer infrastructure as well as graded drainage channels and swales.

The existing storm sewer infrastructure consists of an existing 42" public RCP storm sewer and manholes that convey runoff from Tutt Boulevard as well as the developments within the original Tuscany Plaza Subdivision, and the Greenbriar II development through the center of the site to the west towards the existing detention pond. There is also an existing 24" private RCP storm sewer that conveys runoff from parts of Tutt Boulevard and the existing development to the southeast of the roundabout to the west towards the existing detention pond. The existing infrastructure within the site will need to be relocated with the proposed development to avoid placing the sewer under the foundation of the proposed building.

3.2 Existing Stormwater Quality and Storage Facilities

The existing regional detention pond located on the site was originally designed to act as a sediment basin for the entire Tuscany Plaza Subdivision before releasing the water into the Powers Boulevard twin 66" RCP culvert. In order to comply with current stormwater standards, the pond will be improved to include forebay structures, trickle channels, a full spectrum detention outlet structure, emergency spillway, and an outlet pipe.

The existing detention basin within basin OS3A provides 100-year detention for the Greenbriar II development which includes Basin OS3A. This project is not providing water quality capture volume for Basins tributary to Basin OS3A as it is expected that when the undeveloped lots north of the existing OS3A are developed, that the OS3A detention pond will require improvements to meet current standards for water quality and general pond design.

4 Drainage Design Criteria

4.1 Regulations

This Preliminary Drainage Report was compiled in accordance with the May 2014 City of Colorado Springs Drainage Criteria Manual and the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM). The following versions of the USDCM were used; Volume 1 – Revised through August 2018, Volume 2 – Revised through September 2017, Volume 3 – Revised through October 2019.

4.2 Drainage Studies, Master Plans, Site Constraints

There have been several drainage studies performed which include this project site as well as the surrounding properties. The Final Drainage Report for Tuscany Plaza Subdivision as prepared by Kiowa Engineering corporation examined the entire drainage basin tributary to the existing regional detention facility and provided updated calculations and design for the detention pond from the previous Master Development Drainage Plan by Associated Design Professionals, Inc. This new report was referenced for the historic drainage patterns and flows from the adjacent.

4.3 Hydrology

The City of Colorado Springs Drainage Criteria Manual specifies specific one-hour rainfall depths for varying design storms. These rainfall depths are found in Table 6-2 of that manual and are as follows:

2-yr	5-yr	10-yr	50-yr	100-yr
1.19 inches	1.50 inches	1.75 inches	2.25 inches	2.52 inches

The Rational Method was used for determining peak runoff discharges for the development. Runoff coefficients were calculated for each basin using values from the UDFCD's Table 6-4.

Times of concentration (t_c) were calculated using Equations 6-7, 6-8, and 6-9 from the DCM using 100 feet as the maximum length for overland flow. Rainfall intensity (i) was calculated using the IDF curves in Figure 6-5. Figures and equations used are included in Appendix B. Flows will ultimately be routed to the proposed Extended Detention Pond (EDB). The EDB will provide detention of both the EURV and the runoff produced by the 100-yr storm event.

4.4 Hydraulics

All proposed storm sewer systems have been preliminarily designed using Flowmaster. These systems will be designed using StormCAD with the preparation of the Final Drainage Report for this project. Inlets have been conceptually laid out on the site. Detailed analysis will be performed, and specific sizing calculations will be provided with the final design.

5 Proposed Stormwater Conveyance and Storage Facilities

5.1 Proposed Stormwater Conveyance Facilities

The proposed storm sewer infrastructure will consist of a series of inlets and pipes which will convey runoff to the proposed detention pond. Pipes and inlets have been sized conceptually for this report and will be fully designed with the Final Drainage Report.

Most offsite flows will be intercepted and conveyed by storm sewer running through the site. Other offsite runoff will be collected in swales or enter the pond directly. Preliminary hydraulic calculations are included in Appendix C. Inlet, pipe, and street capacity calculations will be provided in the Final Drainage Report.

Swale D8 collects flow from Basin B7 and Basin OS2B along the north property line and conveys the flow to the existing roadside swale along Powers Boulevard as proposed by the previous Kiowa drainage report. It has been sized to convey the flow with 1' of freeboard above the proposed 100-year flow. Capacity calculations have been provided in the appendix for the 5-year and 100-year flows.

5.2 Proposed Storage Facilities

The existing regional detention pond will be modified as a part of this development. The modified regional detention pond will provide water quality as well as detention of the EURV and 100-yr storm events.

The existing outlet structure was originally designed as part of the Master Drainage Development Plan by Associated Design Professionals. Kiowa Engineering Corporation then updated the design to meet current standards in the Final Drainage Report. This

report defines the detention improvements to replace existing outlet structures, new forebays, trickle channels, emergency overflow spillway and pond maintenance access. The emergency spillway is designed to pass 2x 100 year peak storm for the 48.88 ac tributary basin. Final design details will be provided with the Construction Documents.

Required pond volumes were calculated by using UDFCD's UD-Detention Spreadsheet (v. 4.03). The required Water Quality Capture Volume for the pond is 1.092 acre-feet. The required EURV detention volume is 4.209 acre-feet and the required 100-yr detention volume is 6.20 acre-feet. Per the City of Colorado Springs standards, a full-spectrum detention pond must provide volume for the 100-year detention volume plus the Water Quality Capture Volume. The proposed pond provides sufficient volume and freeboard for all 3 required volume zones.

Revised regional pond sizing and outlet structure design calculations are included in Appendix B.

6 Water Quality Enhancement Best Management Practices

The City of Colorado Springs requires a Four Step Process to achieve stormwater permit requirements. The Four Step Process is summarized for this site below.

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

This development will disconnect impervious areas to the greatest extent possible. Landscaped areas will provide infiltration and reduce storm runoff. Additionally, the full spectrum detention will provide infiltration and runoff reduction for the site as well.

Step 2 – Treat and slowly release the WQCV.

To implement step 2 of the process, this development will include WQCV within the detention basin for the entire site. The facility provides water quality by slowly releasing the WQCV over a 40-hour period.

Step 3 – Stabilize stream channels.

To implement step 3 of the process, this development will provide riprap outlet protection for the detention outfall and extend to the culvert crossing of Powers Boulevard. The existing drainageway parallel to Powers Boulevard that collects runoff from northern offsite basins and the road is currently stable with healthy vegetation and existing rip rap. The outfall of the detention pond will reduce flows to historic rates and will not have adverse impacts on the drainageway on the west side of the site or under Powers Boulevard.

Step 4 – Implement source controls.

To implement step 4 of the process, the process will provide targeted source control BMPs. This site may have potential pollution sources such as parked vehicles, deicing chemicals, waste disposal practices, and landscape maintenance. No vehicle maintenance

will be allowed on site and the property owners for this site and other associated future lots will be responsible for trash collection, landscape maintenance, and private storm maintenance.

7 Floodplain Modifications

There are no anticipated floodplain modifications at this time.

8 Potential Permitting Requirements

No other permitting requirements are anticipated with this development.

9 Conclusions

The overall concept of the drainage design presented in this report is consistent with historic drainage patterns and designs in that stormwater will be conveyed to a regional detention and water quality pond and then discharged to the existing twin 66" RCP culvert under Powers Boulevard. This drainage design is in compliance with both the City of Colorado Springs Drainage Criteria and the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM). There are no variance requests at this time. Downstream properties are not anticipated to be negatively impacted by this drainage design nor the development of this property.

10 References

1. Urban Storm Drainage Criteria Manual Volumes 1, 2, & 3; Urban Drainage and Flood Control District, Volume 1 – Revised through August 2018, Volume 2 – Revised through September 2017; Volume 3 – Revised through October 2019
2. City of Colorado Springs "Drainage Criteria Manual, Vol 1 & 2", May 2014
3. "Final Drainage Report Tuscany Plaza Subdivision" prepared by Kiowa Engineering Corporation, Revised February 3, 2020
4. "Master Development Drainage Plan for Tuscany Plaza Subdivision" prepared by Associated Design Professionals, Inc, April 20, 2009

**APPENDIX A
HYDROLOGIC COMPUTATIONS**

POST-DEVELOPMENT C VALUES

Designer: JAB/ZMR
 Company: Bowman Consulting
 Date: 3/5/2021
 Project: AFW TUTT BLVD - Colorado Springs
 Location: Tutt Blvd & Wolf Ridge Rd

Global Parameters ¹	
Land Use	% Imp.
Open Space/Landscaping	2
Hardscape	100
Roof	90

Summary	
Total Area Detained (ac)	48.88
Composite Impervious	68.4%



Cells of this color are for required user-input

Cells of this color are for optional user-input

¹ From Table 6-3 in UDFCD Volume 1

² From Table 6-4 in UDFCD Volume 1

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Open Space/Landscaping		Hardscape		Roof		% Check	Percent Imperviousness	Runoff Coefficient, C ²							
			Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	
A1	0.31	A	0.13	43.1%	0.18	56.9%	0.00	0.0%	100.00%	57.7%	0.41	0.43	0.44	0.48	0.52	0.56	0.63	
A2	0.16	A	0.01	4.1%	0.15	95.9%	0.00	0.0%	100.00%	96.0%	0.80	0.82	0.83	0.84	0.84	0.86	0.87	
A3	0.62	A	0.30	48.1%	0.32	51.9%	0.00	0.0%	100.00%	52.9%	0.37	0.38	0.40	0.43	0.48	0.52	0.59	
A4	0.48	A	0.14	29.6%	0.34	70.4%	0.00	0.0%	100.00%	71.0%	0.54	0.56	0.57	0.60	0.63	0.66	0.71	
A5	0.22	A	0.03	13.5%	0.19	86.5%	0.00	0.0%	100.00%	86.8%	0.70	0.72	0.73	0.75	0.77	0.79	0.81	
A6	1.04	A	0.26	24.6%	0.78	75.4%	0.00	0.0%	100.00%	75.9%	0.59	0.61	0.62	0.65	0.67	0.70	0.74	
A7	0.72	A	0.05	7.1%	0.67	92.9%	0.00	0.0%	100.00%	93.0%	0.76	0.78	0.80	0.81	0.82	0.83	0.85	
A8	0.44	A	0.09	21.5%	0.34	78.5%	0.00	0.0%	100.00%	79.0%	0.62	0.64	0.65	0.68	0.70	0.73	0.76	
A9	0.43	A	0.05	11.5%	0.38	88.5%	0.00	0.0%	100.00%	88.7%	0.72	0.74	0.75	0.77	0.78	0.80	0.83	
A10	0.27	A	0.03	12.8%	0.24	87.2%	0.00	0.0%	100.00%	87.4%	0.71	0.73	0.74	0.76	0.77	0.79	0.82	
A11	0.43	A	0.03	7.4%	0.40	92.6%	0.00	0.0%	100.00%	92.7%	0.76	0.78	0.80	0.81	0.82	0.83	0.85	
B1	0.40	A	0.16	40.8%	0.24	59.2%	0.00	0.0%	100.00%	60.1%	0.43	0.45	0.47	0.50	0.54	0.58	0.64	
B2	0.07	A	0.02	28.5%	0.05	71.5%	0.00	0.0%	100.00%	72.0%	0.55	0.57	0.58	0.61	0.64	0.67	0.72	
B3	0.89	A	0.71	80.1%	0.18	19.9%	0.00	0.0%	100.00%	21.5%	0.11	0.12	0.13	0.16	0.21	0.28	0.39	
B4	0.50	A	0.36	70.5%	0.15	29.5%	0.00	0.0%	100.00%	30.9%	0.18	0.19	0.21	0.24	0.29	0.35	0.45	
B5	0.49	A	0.33	66.7%	0.16	33.3%	0.00	0.0%	100.00%	34.6%	0.21	0.22	0.24	0.27	0.32	0.38	0.48	
B6	0.14	A	0.00	0.0%	0.14	100.0%	0.00	0.0%	100.00%	100.0%	0.84	0.86	0.87	0.88	0.88	0.89	0.90	
B7	1.43	A	1.43	100.0%	0.00	0.0%	0.00	0.0%	100.00%	2.0%	0.01	0.01	0.01	0.01	0.04	0.13	0.27	
B8	0.05	A	0.00	6.1%	0.05	93.9%	0.00	0.0%	100.00%	94.0%	0.78	0.80	0.81	0.83	0.83	0.84	0.86	
B9	0.23	A	0.03	10.9%	0.20	89.1%	0.00	0.0%	100.00%	89.3%	0.73	0.75	0.76	0.78	0.79	0.81	0.83	
B10	0.26	A	0.03	12.8%	0.23	87.2%	0.00	0.0%	100.00%	87.5%	0.71	0.73	0.74	0.76	0.77	0.79	0.82	
C1	2.79	A	0.38	13.8%	1.33	47.5%	1.08	38.7%	100.00%	82.7%	0.66	0.68	0.69	0.71	0.73	0.75	0.79	
C2	2.89	A	0.07	2.5%	1.13	39.0%	1.69	58.4%	100.00%	91.7%	0.75	0.77	0.78	0.80	0.81	0.82	0.85	
C3	0.32	A	0.02	6.3%	0.30	93.7%	0.00	0.0%	100.00%	93.8%	0.77	0.79	0.81	0.82	0.83	0.84	0.86	
C4	0.37	A	0.04	9.7%	0.33	90.3%	0.00	0.0%	100.00%	90.5%	0.74	0.76	0.77	0.79	0.80	0.82	0.84	
C5	0.22	A	0.03	14.9%	0.19	85.1%	0.00	0.0%	100.00%	85.4%	0.68	0.70	0.72	0.74	0.75	0.78	0.80	
C6	0.43	A	0.03	7.6%	0.40	92.4%	0.00	0.0%	100.00%	92.5%	0.76	0.78	0.79	0.81	0.82	0.83	0.85	
D1	3.27	A	0.94	28.7%	1.81	55.4%	0.52	16.0%	100.00%	70.3%	0.53	0.55	0.57	0.59	0.63	0.66	0.71	
D2	0.93	A	0.41	44.3%	0.52	55.7%	0.00	0.0%	100.00%	56.6%	0.40	0.42	0.43	0.47	0.51	0.55	0.62	
D3	2.53	A	0.60	23.7%	1.56	61.6%	0.37	14.7%	100.00%	75.3%	0.58	0.60	0.62	0.64	0.67	0.70	0.74	
D4	0.60	A	0.26	43.6%	0.34	56.4%	0.00	0.0%	100.00%	57.3%	0.41	0.42	0.44	0.47	0.51	0.56	0.62	
D5	0.73	A	0.26	36.2%	0.32	44.2%	0.14	19.6%	100.00%	62.6%	0.46	0.47	0.49	0.52	0.56	0.60	0.66	
D6	0.20	A	0.20	100.0%	0.00	0.0%	0.00	0.0%	100.00%	2.0%	0.01	0.01	0.01	0.01	0.04	0.13	0.27	
D7	3.94	A	3.94	100.0%	0.00	0.0%	0.00	0.0%	100.00%	2.0%	0.01	0.01	0.01	0.01	0.04	0.13	0.27	
R1	0.35	A	0.00	0.0%	0.00	0.0%	0.35	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R2	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R3	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R4	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R5	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R6	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R7	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R8	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R9	0.34	A	0.00	0.0%	0.00	0.0%	0.34	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R10	0.18	A	0.00	0.0%	0.00	0.0%	0.18	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R11	0.46	A	0.00	0.0%	0.00	0.0%	0.46	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R12	0.46	A	0.00	0.0%	0.00	0.0%	0.46	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R13	0.46	A	0.00	0.0%	0.00	0.0%	0.46	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R14	0.46	A	0.00	0.0%	0.00	0.0%	0.46	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
R15	0.46	A	0.00	0.0%	0.00	0.0%	0.46	100.0%	100.00%	90.0%	0.73	0.75	0.77	0.79	0.79	0.81	0.83	
OS-ASA	2.56	A	0.43	16.8%	1.67	65.2%	0.46	18.0%	100.00%	81.2%	0.64	0.66	0.68	0.70	0.72	0.74	0.78	
OS-ASB	0.74	A	0.00	0.0%	0.74	100.0%	0.00	0.0%	100.00%	100.0%	0.84	0.86	0.87	0.88	0.88	0.89	0.90	
OS-ASC	0.68	A	0.00	0.0%	0.68	100.0%	0.00	0.0%	100.00%	100.0%	0.84	0.86	0.87	0.88	0.88	0.89	0.90	
OS-EX-D	0.64	A	0.00	0.0%	0.64	100.0%	0.00	0.0%	100.00%	89.1%	0.72	0.74	0.76	0.78	0.79	0.80	0.83	
EX-E	1.01	A	0.00	0.0%	1.01	100.0%	0.00	0.0%	100.00%	99.5%	0.83	0.86	0.87	0.88	0.87	0.89	0.90	
EX-F	3.14	A	0.28	8.9%	2.15	68.5%	0.71	22.6%	100.00%	89.0%	0.72	0.74	0.76	0.78	0.79	0.80	0.83	
OSSA	1.24	A	0.53	42.7%	0.71	57.3%	0.00	0.0%	100.00%	57.4%	0.41	0.42	0.44	0.47	0.52	0.56	0.62	
OSSB	1.70	A	0.85	50.0%	0.85	50.0%	0.00	0.0%	100.00%	54.1%	0.38	0.39	0.41	0.44	0.49	0.53	0.60	
OSSB	2.82	A	1.19	42.2%	1.33	47.2%	0.00	0.0%	89.36%	47.8%	0.32	0.34	0.35	0.39	0.43	0.48	0.56	
TOTAL DETAINED	48.88	A	14.67	30.0%	23.38	47.8%	10.83	22.2%	100.00%	68.4%	0.51	0.53	0.55	0.58	0.61	0.64	0.70	
PREVIOUSLY DETAINED BASINS																		
OS3A	56.65	A																
OS1A	30.81	A																
UNDEVELOPED LANDFILL (NOT DETAINED)																		
OS1B	14.04	A	14.04	100.0%	0.00	0.0%	0.00	0.0%	100.00%	2.0%	0.01	0.01	0.01	0.01	0.04	0.13	0.27	
OS1B	17.40	A	17.40	100.0%	0.00	0.0%	0.00	0.0%	100.00%	2.0%	0.01	0.01	0.01	0.01	0.04	0.13	0.27	

TIME OF CONCENTRATION



Designer: JAB/ZMR
Company: Bowman Consulting
Date: 3/5/2021
Project: AFW TUTT BLVD - Colorado Springs
Location: Tutt Blvd & Wolf Ridge Rd

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_i^{0.33}}$$

Computed $t_c = t_i + t_r$

$t_{\text{minimum}} = 5$ (urban)
 $t_{\text{minimum}} = 10$ (non-urban)

Cells of this color are for required user-input

$$t_r = \frac{L_r}{60K\sqrt{S_r}} = \frac{L_r}{60V_r}$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_r}{60(14i + 9)\sqrt{S_r}}$$

Selected $t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			
Sub-Basin	Area	% Impervious	C5	Overland Flow Length L_i (ft)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_i (ft)	Channelized Flow Slope S_i (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_i (ft/sec)	Channelized Flow Time t_i (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	
A1	0.31	57.7%	0.43	184.58	0.036	10.82	65.21	0.049	20	4.43	0.25	11.06	16.47	11.06	
A2	0.16	96.0%	0.82	61.94	0.025	2.97	163.94	0.025	20	3.16	0.86	3.83	10.45	5.00	
A3	0.62	52.9%	0.38	165.00	0.025	12.31	37.93	0.025	20	3.16	0.20	12.51	17.26	12.51	
A4	0.48	71.0%	0.56	130.00	0.026	8.17	104.00	0.025	20	3.16	0.55	8.72	14.51	8.72	
A5	0.22	86.8%	0.72	39.00	0.025	3.18	234.00	0.025	20	3.16	1.23	4.41	12.41	5.00	
A6	1.04	75.9%	0.61	227.00	0.029	9.47	0.00	0.025	20	3.16	0.00	9.47	13.10	9.47	
A7	0.72	93.0%	0.78	110.00	0.028	4.25	208.00	0.029	20	3.41	1.02	5.26	11.11	5.26	
A8	0.44	79.0%	0.64	122.00	0.035	6.11	387.00	0.024	20	3.10	2.08	8.19	14.65	8.19	
A9	0.43	88.7%	0.74	32.70	0.019	3.02	165.00	0.025	20	3.16	0.87	3.89	11.74	5.00	
A10	0.27	87.4%	0.73	130.52	0.040	4.89	12.00	0.025	20	3.16	0.06	4.96	11.20	5.00	
A11	0.43	92.7%	0.78	124.00	0.024	4.79	22.00	0.025	20	3.16	0.12	4.91	10.34	5.00	
B1	0.40	60.1%	0.45	189.00	0.010	16.15	0.00	0.025	20	3.16	0.00	16.15	15.79	15.79	
B2	0.07	72.0%	0.57	63.00	0.042	4.76	0.00	0.025	20	3.16	0.00	4.76	13.75	5.00	
B3	0.89	21.5%	0.12	25.00	0.015	7.73	216.00	0.005	20	1.41	2.55	10.28	26.59	10.28	
B4	0.50	30.9%	0.19	25.00	0.030	5.70	103.00	0.005	20	1.41	1.21	6.92	22.57	6.92	
B5	0.49	34.6%	0.22	25.00	0.025	5.86	111.00	0.005	20	1.41	1.31	7.16	22.01	7.16	
B6	0.14	100.0%	0.86	25.00	0.044	1.32	76.70	0.005	20	1.41	0.90	2.23	9.79	5.00	
B7	1.43	2.0%	0.01	137.00	0.250	7.99	620.00	0.022	15	2.22	4.64	12.64	33.17	12.64	
B8	0.05	94.0%	0.80	25.00	0.044	1.68	63.00	0.005	20	1.41	0.74	2.43	10.68	5.00	
B9	0.23	89.3%	0.75	51.00	0.035	3.02	52.00	0.005	20	1.41	0.61	3.64	11.39	5.00	
B10	0.26	87.5%	0.73	48.00	0.020	3.73	80.00	0.005	20	1.41	0.94	4.67	12.02	5.00	
C1	2.79	82.7%	0.68	300.00	0.032	9.05	0.00	0.025	20	3.16	0.00	9.05	11.95	9.05	
C2	2.89	91.7%	0.77	219.00	0.020	7.00	0.00	0.025	20	3.16	0.00	7.00	10.41	7.00	
C3	0.32	93.8%	0.79	200.00	0.025	5.78	0.00	0.025	20	3.16	0.00	5.78	10.05	5.78	
C4	0.37	90.5%	0.76	143.00	0.014	6.61	74.00	0.019	20	2.76	0.45	7.05	11.03	7.05	
C5	0.22	85.4%	0.70	150.00	0.017	7.35	0.00	0.025	20	3.16	0.00	7.35	11.49	7.35	
C6	0.43	92.5%	0.78	150.00	0.030	4.93	6.00	0.020	20	2.83	0.04	4.96	10.30	5.00	
D1	3.27	70.3%	0.55	121.00	0.250	3.78	512.00	0.020	20	2.83	3.02	6.80	17.25	6.80	
D2	0.93	56.6%	0.42	132.00	0.050	8.34	0.00	0.020	20	2.83	0.00	8.34	16.38	8.34	
D3	2.53	75.3%	0.60	38.00	0.050	3.28	417.00	0.020	20	2.83	2.46	5.73	15.72	5.73	
D4	0.60	57.3%	0.42	0.00	0.050	0.00	224.00	0.051	20	4.52	0.83	0.83	17.23	5.00	
D5	0.73	62.6%	0.47	20.00	0.030	3.52	150.00	0.030	20	3.46	0.72	4.24	16.17	5.00	
D6	0.20	2.0%	0.01	5.00	0.080	2.22	100.00	0.030	20	3.46	0.48	2.71	26.70	10.00	
D7	3.94	2.0%	0.01	150.00	0.250	8.36	0.00	0.030	20	3.46	0.00	8.36	25.66	10.00	

R1	0.35	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R2	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R3	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R4	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R5	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R6	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R7	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R8	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R9	0.34	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R10	0.18	90.0%	0.75	61.00	0.025	3.62	115.00	0.300	20	10.95	0.17	3.79	10.86	5.00	
R11	0.46	90.0%	0.75	61.00	0.025	3.62	168.00	0.210	20	9.17	0.31	3.93	10.98	5.00	
R12	0.46	90.0%	0.75	61.00	0.025	3.62	168.00	0.210	20	9.17	0.31	3.93	10.98	5.00	
R13	0.46	90.0%	0.75	61.00	0.025	3.62	168.00	0.210	20	9.17	0.31	3.93	10.98	5.00	
R14	0.46	90.0%	0.75	61.00	0.025	3.62	168.00	0.210	20	9.17	0.31	3.93	10.98	5.00	
R15	0.46	90.0%	0.75	61.00	0.025	3.62	168.00	0.210	20	9.17	0.31	3.93	10.98	5.00	
EX-E	1.01	99.5%	0.86	30.00	0.020	1.92	850.00	0.030	20	3.46	4.09	6.01	12.65	6.01	
EX-F	3.14	89.0%	0.74	100.00	0.020	5.14	500.00	0.030	20	3.46	2.41	7.55	13.11	7.55	
OS-A5A	2.56	81.2%	0.66	100.00	0.020	6.32	650.00	0.030	20	3.46	3.13	9.45	15.27	9.45	
OS-A5B	0.74	100.0%	0.86	30.00	0.020	1.88	650.00	0.030	20	3.46	3.13	5.01	11.72	5.01	
OS-A5C	0.68	100.0%	0.86	30.00	0.020	1.88	650.00	0.030	20	3.46	3.13	5.01	11.72	5.01	
OS3B	2.82	47.8%	0.34	500.00	0.010	30.86	350.00	0.035	15	2.81	2.08	32.94	19.86	19.86	

STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM

Designer: JAB/ZMR
 Company: Bowman Consulting
 Date: 3/5/2021
 Project: AFW TUTT BLVD - Colorado Springs
 Location: Tutt Blvd & Wolf Ridge Rd



Cells of this color are for required user-input
 Cells of this color are for optional user-input

DESIGN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET		PIPE			TRAVEL TIME					Remarks
		Area Design	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ca)	Sum C*A (ac)	I in/hr	Q cfs	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l		
1	OFFSITE BASINS								14.4	64.6	15.6	3.47	57.6			57.6	2.0%	42"	288	6.0	0.8			
		D1	3.27	0.55	6.8	1.80	4.65	8.4								8.4								
2	D1								6.8	3.3	1.8	4.65	8.4			8.4								
3	DP1, DP2								15.2	67.9	17.4	3.38	59.0			59.0	2.0%	42"	29.71	6.1	0.1			
		D2	0.92661	0.42	8.3	0.39	4.34	1.7								1.7								
4	DP3, D2								15.3	68.8	17.8	3.38	60.2			60.2	5.4%	42"	212	6.3	0.6			
		D3	2.53022	0.60	5.7	1.52	4.90	7.4								7.4								
5	D3								5.7	2.5	1.5	4.90	7.4			7.4	2.0%	42"	71	0.8	1.5			
		D4	0.59745	0.42	5.0	0.25	5.09	1.3								1.3								
6	DP4, DP5, D4								15.8	71.9	19.6	3.32	65.0			65.0	2.0%	42"	164	6.8	0.4			
7	OFFSITE BASINS								10.7	4.0	3.5	3.95	13.9			13.9	2.0%	24"	396	1.4	4.6			
		D5	0.73	0.47	5.0	0.35	5.09	1.8								1.8								
8	DP7, D5								15.3	4.7	3.8	3.38	15.7			15.7	3.0%	24"	962	1.6	9.9			
		A1	0.31	0.43	11.1	0.13	3.90	0.5								0.5								
10	A1								11.1	0.3	0.1	3.90	0.5			0.5	2.0%	12"	191	2.6	1.2			
		A2	0.16	0.82	5.0	0.13	5.09	0.7								0.7								
11	A2								0.8	0.2	0.1	6.58	0.9			0.9	2.0%	12"	62	3.1	0.3			
		A3	0.62	0.38	12.5	0.24	3.70	0.9								0.9								
12	DP10, DP11, A3								12.5	1.1	0.5	3.70	1.8			1.8	2.1%	12"	126	3.8	0.6			
		A4	0.48	0.56	8.7	0.27	4.27	1.1								1.1								
13	DP12, A4								13.1	2.2	0.8	3.63	2.8			2.8	2.0%	12"	144	4.4	0.5			
		A5	0.22	0.72	5.0	0.16	5.09	0.8								0.8								
14	A5								5.0	0.2	0.2	5.09	0.8			0.8	2.0%	12"	57	3.0	0.3			
		A6	1.04	0.61	9.5	0.63	4.14	2.6								2.6								
15	DP13, DP14, A6								13.6	2.8	1.6	3.56	5.5			5.5	2.0%	18"	206	4.7	0.7			
		A7	0.72	0.78	5.3	0.57	5.02	2.8								2.8								
16	A7, DP15								14.3	3.6	2.1	3.48	7.4			7.4	2.0%	18"	37	5.3	0.1			
		A8	0.43884	0.64	8.2	0.28	4.37	1.2								1.2								
17	DP16, A8								14.5	4.0	2.4	3.46	8.3			8.3	2.0%	18"	152	5.6	0.5			
		A9	0.42551	0.74	5.0	0.31	5.09	1.6								1.6								
18	DP17, A9								14.9	4.4	2.7	3.41	9.3			9.3	2.0%	18"	23	5.9	0.1			
		A10	0.27	0.73	5.0	0.20	5.09	1.0								1.0								
19	DP18, A10								15.0	4.7	2.9	3.41	9.9			9.9	2.0%	24"	135	6.1	0.4			
		A11	0.43	0.78	5.0	0.34	5.09	1.7								1.7								
20	DP19, A11								15.3	5.1	3.2	3.37	10.9			10.9	2.0%	24"	98	6.5	0.3			
9	DP20, DP8								25.1	9.8	7.0	2.61	18.4			18.4	2.0%	24"	108	6.5	0.3			
		B1	0.4	0.45	15.8	0.18	3.32	0.6								0.6								
21	B1								15.8	0.4	0.2	3.32	0.6			0.6	1.0%	12"	98	0.8	2.2			
		B2	0.07	0.57	5.0	0.04	5.09	0.2								0.2								
22	DP21, B2								17.9	0.5	0.2	3.12	0.7			0.7	1.0%	12"	63	0.9	1.2			
		B3	0.88752	0.12	10.3	0.11	4.01	0.4								0.4								
23	DP22, B3								19.2	1.4	0.3	3.02	1.0			1.0	1.0%	12"	40	1.2	0.5			
		R1	0.35	0.75	5.0	0.26	5.09	1.3								1.3								
24	DP23, R1								19.7	1.9	0.6	2.97	1.8			1.8	1.0%	15"	105	2.2	0.8			
		R2	0.34	0.75	5.0	0.26	5.09	1.3								1.3								
25	DP24, R2								20.5	2.0	0.8	2.91	2.5			2.5	1.0%	15"	106	3.1	0.6			
		R3	0.34	0.75	5.0	0.26	5.09	1.3								1.3								
26	DP25, R3								21.0	2.4	1.1	2.87	3.2			3.2	1.0%	15"	89	4.0	0.4			
		R4	0.34	0.75	5.0	0.26	5.09	1.3								1.3								
		B4	0.50373	0.19	6.9	0.10	4.63	0.4								0.4								
27	DP26, R4, B4								21.4	3.2	1.5	2.85	4.1			4.1	1.0%	15"	109	5.2	0.3			
		R5	0.34	0.75	5.0	0.26	5.09	1.3								1.3								
28	DP27, R5								21.8	3.6	1.7	2.82	4.8			4.8	1.0%	15"	122	6.1	0.3			
		R6	0.34	0.75	5.0	0.26	5.09	1.3								1.3								

[illegible]

STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer: JAB/ZMR
 Company: Bowman Consulting
 Date: 3/6/2021
 Project: AFW TUTT BLVD - Colorado Springs
 Location: Tutt Blvd & Wolf Ridge Rd

Bowman
CONSULTING

Cells of this color are for required user-input
Cells of this color are for optional user-input

DESIGN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF						TOTAL RUNOFF						STREET		PIPE		TRAVEL TIME						Remarks
		Area Design	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ca)	Sum C*A (ac)	I in/hr	Q cfs	Slope %	Street Q cfs	Design Q cfs	PIPE Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add1		
1	OFFSITE BASINS							14.4	66.2	19.4	5.83	114.9				114.9	2.0%	42"	288	11.9	0.4			
2	D1	D1	3.3	0.66	6.8	2.2	7.82	16.8	6.8	3.3	2.2	7.82	16.8			16.8								
3	DP1, DP2							14.8	69.5	21.5	5.76	123.9				123.9	2.0%	42"	29.71	12.9	0.0			
4	DP3, D2	D2	0.9	0.55	8.3	0.5	7.30	3.7	14.8	70.4	22.0	5.75	126.7			126.7	5.4%	42"	212	15.7	0.2			
5	D3	D3	2.5	0.70	5.7	1.8	8.23	14.5	5.7	2.5	1.8	8.23	14.5			14.5	2.0%	42"	71	1.5	0.8			
6	DP4, DP5, D4	D4	0.6	0.56	5.0	0.3	8.55	2.8	15.1	73.5	24.1	5.71	137.8			137.8	2.0%	42"	164	14.3	0.2			
7	OFFSITE BASINS							10.7	4.0	4.0	6.64	27.4				27.4	2.0%	24"	396	9.1	0.7			
8	DP7, D5	D5	0.7	0.60	5.0	0.4	8.55	3.7	11.4	4.7	4.5	6.46	31.1			31.1	3.0%	24"	1060	10.2	1.7			
10	A1	A1	0.3	0.56	11.1	0.2	6.55	1.1	11.1	0.3	0.2	6.55	1.1			1.1	2.0%	12"	191	3.3	1.0			
11	A2	A2	0.2	0.86	5.0	0.1	8.55	1.2	0.9	0.2	0.1	11.02	1.5			1.5	2.0%	12"	62	2.1	0.5			
12	DP10, DP11, A3	A3	0.6	0.52	12.5	0.3	6.21	2.0	12.5	1.1	0.6	6.21	3.9			3.9	2.1%	12"	126	4.9	0.4			
13	DP12, A4	A4	0.5	0.66	8.7	0.3	7.18	2.3	12.9	2.6	1.0	6.12	5.8			5.8	2.0%	12"	144	7.2	0.3			
14	A5	A5	0.2	0.79	5.0	0.2	8.55	1.5	5.0	0.2	0.2	8.55	1.5			1.5	2.0%	12"	57	1.9	0.5			
15	DP13, DP14, A6	A6	1.0	0.70	9.5	0.7	6.96	5.1	13.3	2.8	1.9	6.05	11.2			11.2	2.0%	12"	206	6.2	0.6			
16	A7, DP15	A7	0.7	0.83	5.3	0.6	8.43	5.1	13.8	3.6	2.5	5.94	14.6			14.6	2.0%	12"	37	8.1	0.1			
17	DP16, A8	A8	0.4	0.73	8.2	0.3	7.35	2.3	13.9	4.0	2.8	5.93	16.4			16.4	2.0%	12"	152	9.2	0.3			
18	DP17, A9	A9	0.4	0.80	5.0	0.3	8.55	2.9	14.2	4.4	3.1	5.87	18.3			18.3	2.0%	12"	23	10.3	0.0			
19	DP18, A10	A10	0.3	0.79	5.0	0.2	8.55	1.8	14.2	4.7	3.3	5.87	19.5			19.5	2.0%	12"	135	11.0	0.2			
20	DP19, A11	A11	0.4	0.83	5.0	0.4	8.55	3.1	14.4	5.1	3.7	5.83	21.5			21.5	2.0%	12"	98	12.1	0.1			
9	DP20, DP8							14.6	9.8	8.2	5.80	47.3				47.3	2.0%	24"	108	6.5	0.3			
21	B1	B1	0.4	0.58	15.8	0.2	5.58	1.3	15.8	0.4	0.2	5.58	1.3			1.3	1.0%	12"	98	1.6	1.0			
22	DP21, B2	B2	0.1	0.67	5.0	0.0	8.55	0.4	16.8	0.5	0.3	5.42	1.5			0.4	1.0%	12"	63	1.9	0.5			
23	DP22, B3	B3	0.9	0.28	10.3	0.2	6.74	1.7	17.3	1.4	0.5	5.33	2.8			1.7	1.0%	12"	40	3.6	0.2			

[illegible]

		D7	4.0	0.00	10.0	0.0	6.82	0.0								0.0								
51	D7, DP50, DP37, DP49, DP9, DP6, DP8								20.0	32.9	20.4	4.96	101.2			101.2								
		D8	1.4	0.13	10.3	0.2	6.73	1.2								1.2								

Rainfall Data
AFW Colorado Springs
Tutt Blvd & Wolf Ridge Rd

Recurrence Interval (yrs)	1-hr Rainfall Depth (in)
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52
500	

APPENDIX B
DETENTION/WATER QUALITY ENHANCEMENT BMPS

APPENDIX C
HYDRAULIC COMPUTATIONS

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Feb 15 2021

Swale B7 5 YEAR

Triangular

Side Slopes (z:1) = 5.00, 5.00
Total Depth (ft) = 1.20

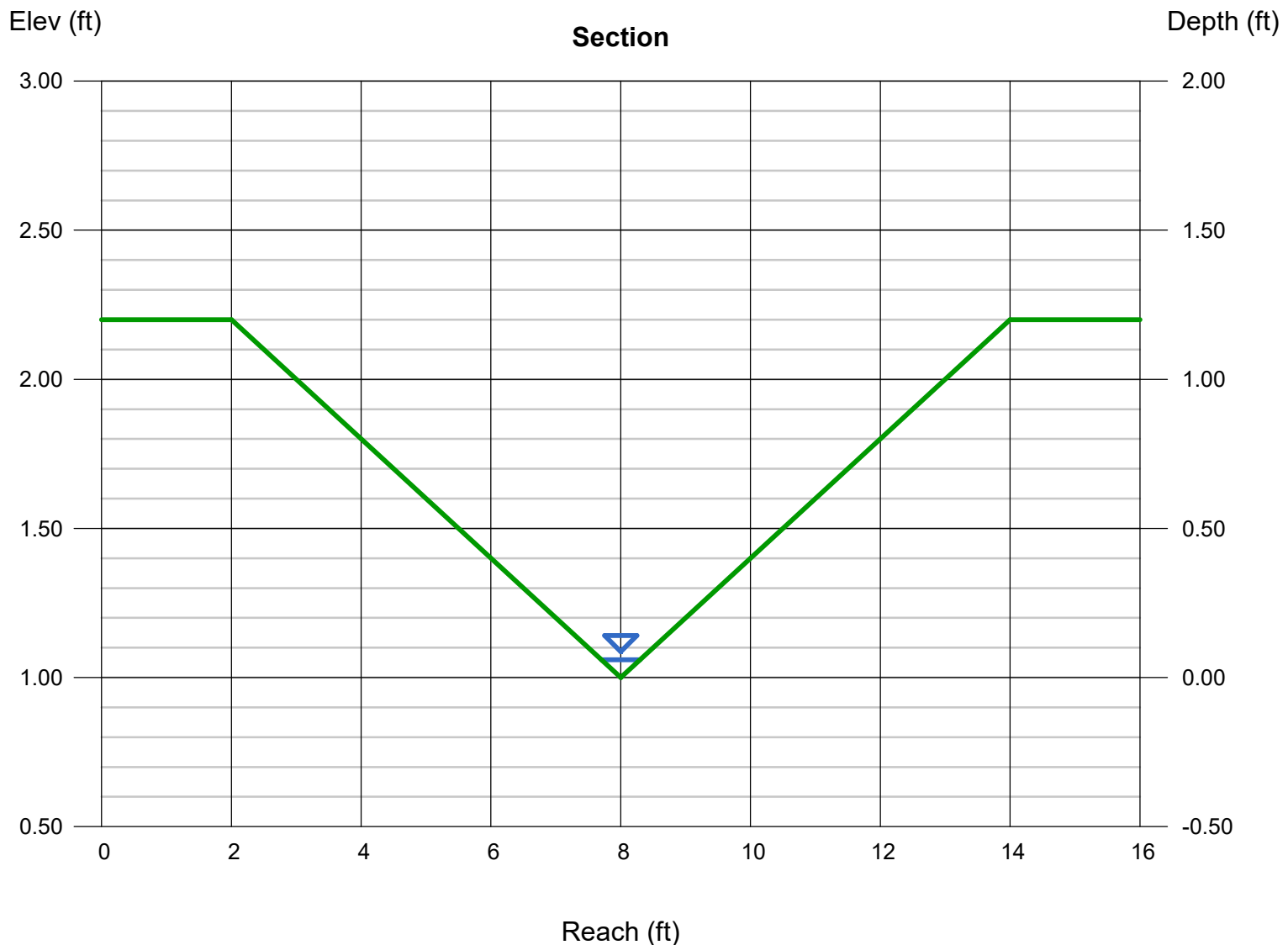
Invert Elev (ft) = 1.00
Slope (%) = 2.10
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 0.01

Highlighted

Depth (ft) = 0.06
Q (cfs) = 0.010
Area (sqft) = 0.02
Velocity (ft/s) = 0.56
Wetted Perim (ft) = 0.61
Crit Depth, Yc (ft) = 0.05
Top Width (ft) = 0.60
EGL (ft) = 0.06



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Feb 15 2021

Swale B7 100 YEAR

Triangular

Side Slopes (z:1) = 5.00, 5.00
Total Depth (ft) = 1.20

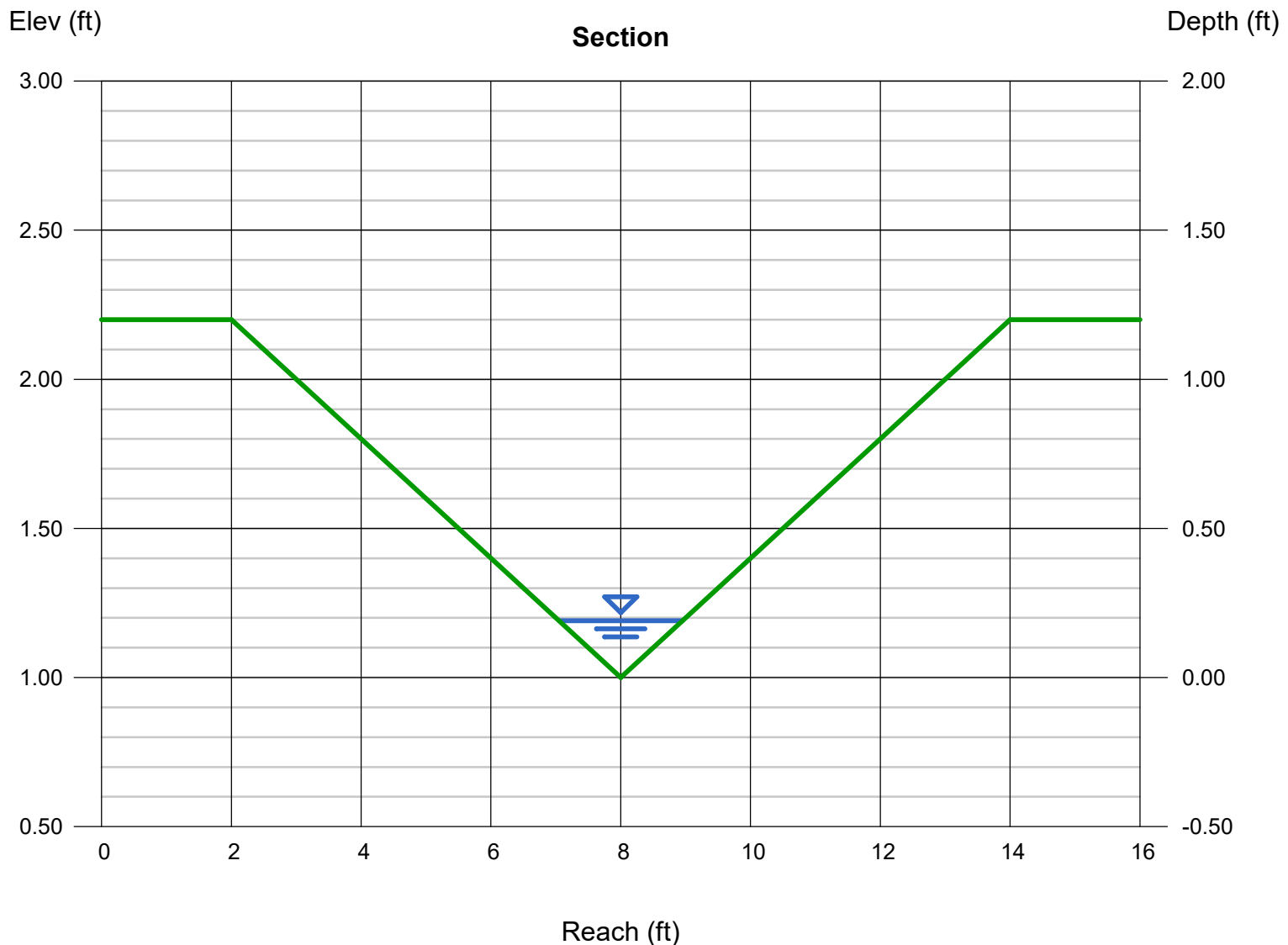
Invert Elev (ft) = 1.00
Slope (%) = 2.10
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 0.25

Highlighted

Depth (ft) = 0.19
Q (cfs) = 0.250
Area (sqft) = 0.18
Velocity (ft/s) = 1.39
Wetted Perim (ft) = 1.94
Crit Depth, Yc (ft) = 0.18
Top Width (ft) = 1.90
EGL (ft) = 0.22



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Feb 15 2021

Swale D8 5 YEAR

Trapezoidal

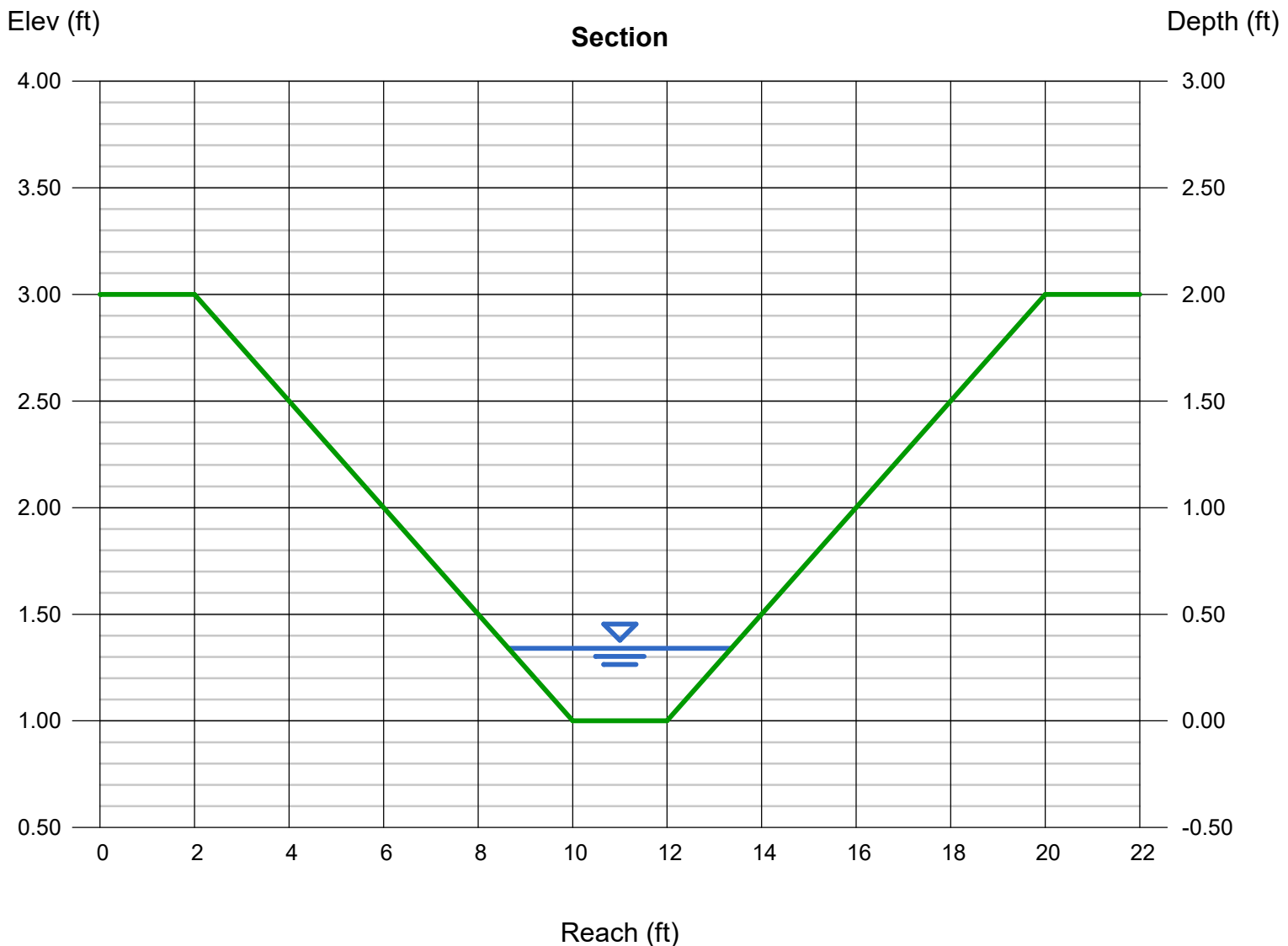
Bottom Width (ft) = 2.00
Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 1.00
Slope (%) = 2.50
N-Value = 0.030

Highlighted

Depth (ft) = 0.34
Q (cfs) = 3.330
Area (sqft) = 1.14
Velocity (ft/s) = 2.91
Wetted Perim (ft) = 4.80
Crit Depth, Yc (ft) = 0.35
Top Width (ft) = 4.72
EGL (ft) = 0.47

Calculations

Compute by: Known Q
Known Q (cfs) = 3.33



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Feb 15 2021

Swale D8 100 YEAR

Trapezoidal

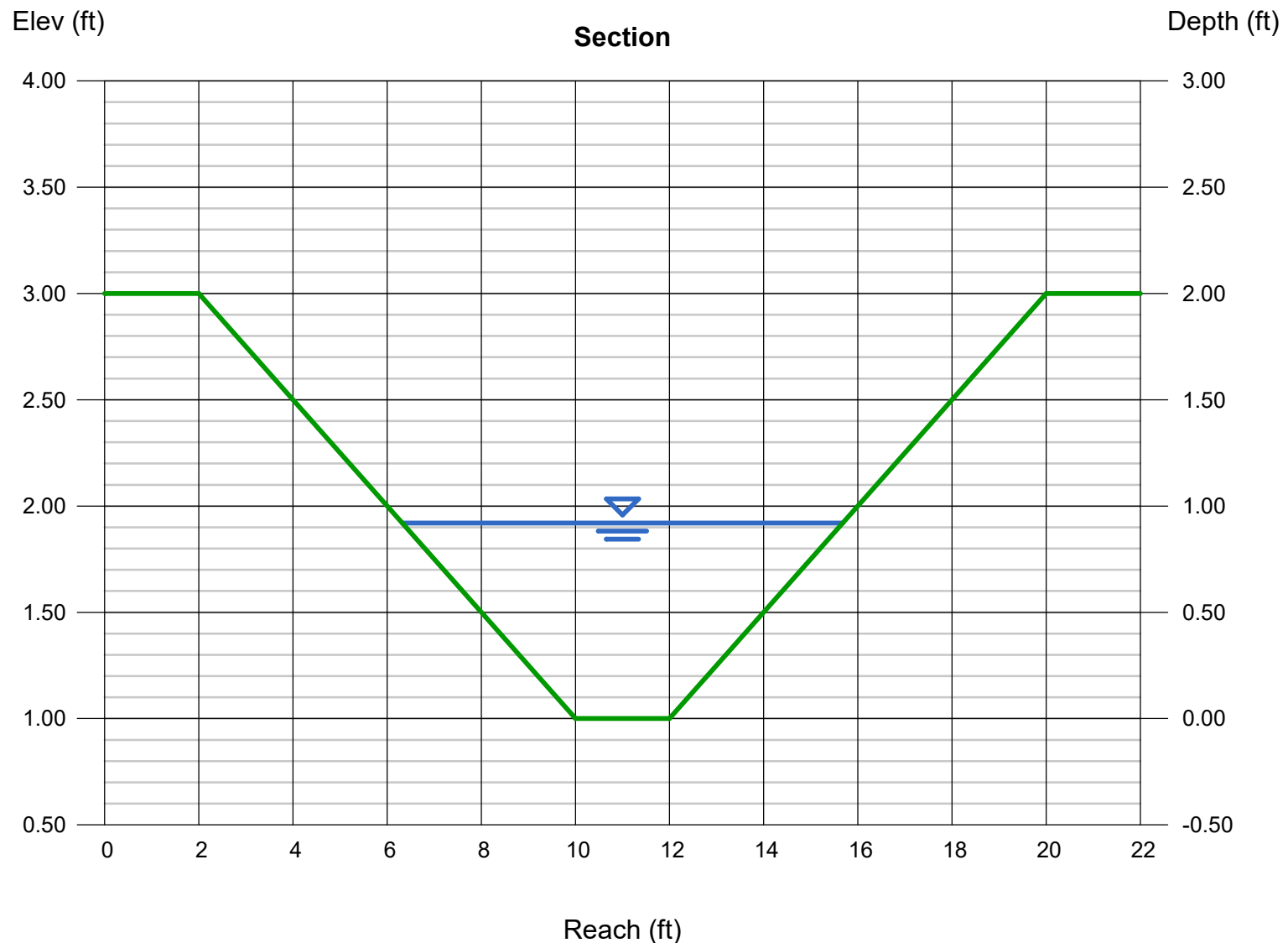
Bottom Width (ft) = 2.00
Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 1.00
Slope (%) = 2.50
N-Value = 0.030

Highlighted

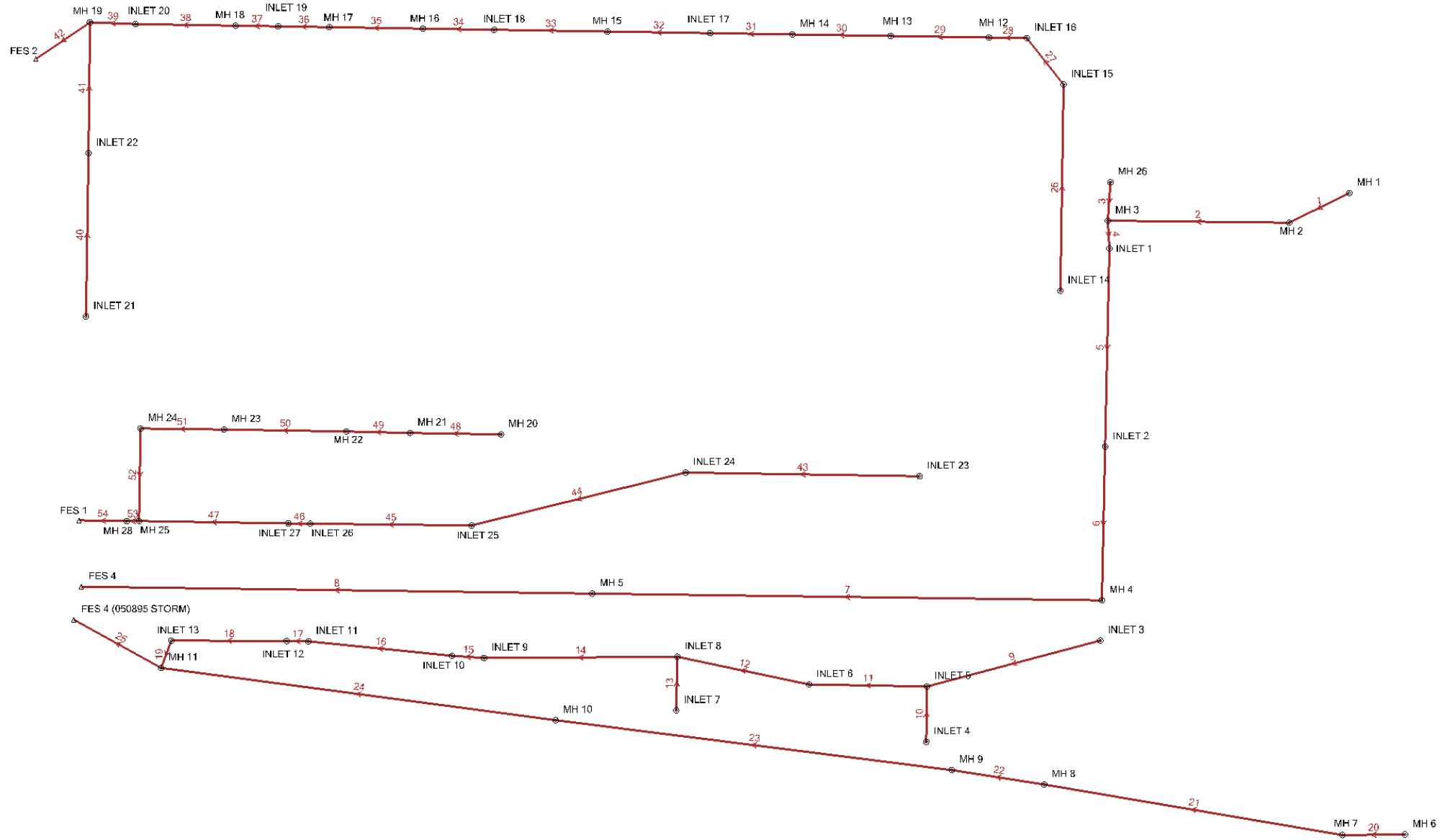
Depth (ft) = 0.92
Q (cfs) = 26.70
Area (sqft) = 5.23
Velocity (ft/s) = 5.11
Wetted Perim (ft) = 9.59
Crit Depth, Yc (ft) = 1.01
Top Width (ft) = 9.36
EGL (ft) = 1.33

Calculations

Compute by: Known Q
Known Q (cfs) = 26.70



STORMCAD LAYOUT



5 Year **FlexTable: Manhole Table**

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (Out) (ft/s)	Notes
MH 26	6,855.29	6,868.22	7.82	0.99	6,856.29	6,856.29	5.01	5'-DIA. STMMH
MH 3	6,843.24	6,866.46	55.22	2.33	6,845.57	6,845.57	8.13	8'-DIA. STMMH
MH 6	6,859.57	6,865.56	13.90	1.34	6,860.91	6,860.91	6.20	4'-DIA. STMMH
INLET 1	6,842.15	6,864.83	56.25	2.35	6,844.50	6,844.50	8.20	5' TYPE-R INLET <SIDE>
MH 7	6,854.87	6,861.76	15.70	1.43	6,856.30	6,856.30	6.54	4'-DIA. STMMH
MH 8	6,851.44	6,861.70	15.70	1.43	6,852.87	6,852.87	6.54	4'-DIA. STMMH
MH 9	6,849.24	6,859.74	15.70	1.43	6,850.67	6,850.67	6.54	4'-DIA. STMMH
INLET 4	6,847.14	6,859.48	0.80	1.00	6,848.13	6,848.13	2.99	5' TYPE-R INLET <FRONT>
INLET 3	6,849.88	6,858.94	0.52	0.30	6,850.18	6,850.18	2.64	5' TYPE-R INLET <FRONT>
MH 4	6,837.79	6,856.28	61.20	2.36	6,840.15	6,840.15	7.94	8'-DIA. STMMH
MH 14	6,843.47	6,855.01	3.11	0.71	6,844.18	6,844.18	4.32	4'-DIA. STMMH
INLET 20	6,831.15	6,854.83	8.69	1.14	6,832.29	6,832.29	6.02	5' TYPE-R INLET <SIDE>
INLET 17	6,842.59	6,854.73	4.13	0.83	6,843.42	6,843.42	4.82	5' TYPE-R INLET <SIDE>
INLET 7	6,841.41	6,854.40	0.80	0.37	6,841.78	6,841.78	2.99	5' TYPE-R INLET <FRONT>
MH 13	6,844.52	6,854.26	2.41	0.62	6,845.14	6,845.14	3.96	4'-DIA. STMMH
INLET 16	6,845.97	6,854.25	0.93	0.41	6,846.38	6,846.38	3.12	5' TYPE-R INLET <SIDE>
MH 15	6,841.50	6,853.96	4.81	0.89	6,842.39	6,842.39	5.15	4'-DIA. STMMH
MH 12	6,845.31	6,853.91	1.70	0.52	6,845.83	6,845.83	3.54	4'-DIA. STMMH
MH 21	6,846.57	6,853.83	3.39	0.79	6,847.36	6,847.36	5.11	4'-DIA. STMMH
MH 20	6,849.10	6,853.81	1.76	0.56	6,849.67	6,849.67	3.85	4'-DIA. STMMH
MH 16	6,838.51	6,853.79	6.56	0.99	6,839.50	6,839.50	5.30	4'-DIA. STMMH
MH 23	6,838.47	6,853.71	6.59	1.03	6,839.50	6,839.50	6.07	4'-DIA. STMMH
MH 24	6,833.90	6,853.69	8.17	1.12	6,835.02	6,835.02	7.03	4'-DIA. STMMH
MH 17	6,836.18	6,853.67	7.24	1.04	6,837.23	6,837.23	5.52	4'-DIA. STMMH
MH 22	6,844.77	6,853.66	5.03	0.92	6,845.69	6,845.69	6.66	4'-DIA. STMMH
MH 18	6,833.85	6,853.61	8.24	1.11	6,834.96	6,834.96	5.87	4'-DIA. STMMH

5 Year **FlexTable: Manhole Table**

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (Out) (ft/s)	Notes
INLET 2	6,839.93	6,853.32	61.20	2.45	6,842.38	6,842.38	8.50	5' TYPE-R INLET <SIDE>
INLET 21	6,846.12	6,852.94	0.87	0.39	6,846.51	6,846.51	3.06	5' TYPE-R INLET <SIDE>
INLET 22	6,837.20	6,852.94	1.61	0.54	6,837.74	6,837.74	3.73	5' TYPE-R INLET <SIDE>
INLET 18	6,840.28	6,852.91	5.87	0.94	6,841.22	6,841.22	5.06	5' TYPE-R INLET <SIDE>
INLET 15	6,846.60	6,852.89	0.68	0.34	6,846.95	6,846.95	2.85	TYPE-13 VALLEY INLET
INLET 19	6,834.90	6,852.88	7.55	1.06	6,835.97	6,835.97	5.63	5' TYPE-R INLET <SIDE>
INLET 27	6,834.66	6,852.25	19.67	1.59	6,836.25	6,836.25	7.33	TYPE-13 VALLEY INLET
INLET 5	6,845.94	6,861.75	1.85	0.59	6,846.53	6,846.53	3.92	TYPE-13 VALLEY INLET
INLET 14	6,848.64	6,851.80	0.60	0.49	6,849.13	6,849.13	2.75	TYPE-13 VALLEY INLET
MH 10	6,840.62	6,851.69	15.70	1.43	6,842.05	6,842.05	6.54	4'-DIA. STMMH
INLET 25	6,839.07	6,851.32	17.99	1.53	6,840.60	6,840.60	6.98	TYPE-13 VALLEY INLET
INLET 26	6,835.59	6,851.19	19.04	1.57	6,837.16	6,837.16	7.20	TYPE-13 VALLEY INLET
MH 25	6,828.28	6,851.13	26.64	1.81	6,830.09	6,830.09	8.94	4'-DIA. STMMH
MH 28	6,827.76	6,850.87	28.00	1.83	6,829.59	6,829.59	9.30	TYPE-13 VALLEY INLET
INLET 9	6,835.74	6,850.26	7.37	1.05	6,836.79	6,836.79	5.57	5' TYPE-R INLET <FRONT>
INLET 6	6,843.14	6,849.41	2.78	0.72	6,843.85	6,843.85	4.63	TYPE-13 VALLEY INLET
INLET 23	6,845.29	6,848.85	7.95	1.00	6,846.29	6,846.29	5.04	TYPE-13 VALLEY INLET
INLET 24	6,842.78	6,848.85	17.06	1.49	6,844.27	6,844.27	6.80	TYPE-13 VALLEY INLET
MH 5	6,832.24	6,848.42	61.20	2.37	6,834.61	6,834.61	7.94	6'-DIA. STMMH

5 Year FlexTable: Manhole Table

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (Out) (ft/s)	Notes
INLET 10	6,834.80	6,848.18	8.31	1.12	6,835.92	6,835.92	5.89	TYPE-13 VALLEY INLET
INLET 11	6,831.61	6,848.05	9.26	1.09	6,832.70	6,832.70	5.31	TYPE-13 VALLEY INLET
INLET 12	6,830.90	6,847.96	9.91	1.13	6,832.02	6,832.02	5.44	TYPE-13 VALLEY INLET
MH 11	6,827.63	6,847.72	15.70	1.43	6,829.06	6,829.06	6.54	4'-DIA. STMMH
INLET 13	6,828.65	6,847.50	10.93	1.19	6,829.84	6,829.84	5.63	TYPE-13 VALLEY INLET
INLET 8	6,840.06	6,846.74	5.53	0.91	6,840.97	6,840.97	4.95	TYPE-13 VALLEY INLET
MH 19	6,830.02	6,838.34	9.68	1.12	6,831.14	6,831.14	5.39	5'-DIA. STMMH
MH 2	6,860.21	6,874.26	52.30	2.26	6,862.47	6,862.47	7.95	
MH 1	6,868.56	6,874.16	52.30	2.26	6,870.82	6,870.82	7.95	

100 Year **FlexTable: Manhole Table**

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (Out) (ft/s)	Notes
MH 26	6,855.29	6,868.22	16.84	1.48	6,856.77	6,856.77	6.76	5'-DIA. STMMH
MH 3	6,843.24	6,866.46	117.49	4.69	6,847.93	6,847.93	12.21	8'-DIA. STMMH
MH 6	6,859.57	6,865.56	27.40	1.82	6,861.39	6,861.39	9.14	4'-DIA. STMMH
INLET 1	6,842.15	6,864.83	120.04	5.38	6,847.53	6,847.53	12.48	5' TYPE-R INLET <SIDE>
MH 7	6,854.87	6,861.76	31.13	4.83	6,859.70	6,859.70	9.91	4'-DIA. STMMH
MH 8	6,851.44	6,861.70	31.13	1.88	6,853.32	6,853.32	10.16	4'-DIA. STMMH
MH 9	6,849.24	6,859.74	31.13	1.88	6,851.12	6,851.12	10.16	4'-DIA. STMMH
INLET 4	6,847.14	6,859.48	1.51	1.14	6,848.28	6,848.28	3.65	5' TYPE-R INLET <FRONT>
INLET 3	6,849.88	6,858.94	1.14	0.45	6,850.33	6,850.33	3.33	5' TYPE-R INLET <FRONT>
MH 4	6,837.79	6,856.28	131.40	3.43	6,841.22	6,841.22	11.47	8'-DIA. STMMH
MH 14	6,843.47	6,855.01	7.04	4.80	6,848.27	6,848.27	5.74	4'-DIA. STMMH
INLET 20	6,831.15	6,854.83	18.05	2.28	6,833.43	6,833.43	10.21	5' TYPE-R INLET <SIDE>
INLET 17	6,842.59	6,854.73	9.22	4.63	6,847.22	6,847.22	7.51	5' TYPE-R INLET <SIDE>
INLET 7	6,841.41	6,854.40	1.48	0.52	6,841.92	6,841.92	3.63	5' TYPE-R INLET <FRONT>
MH 13	6,844.52	6,854.26	5.67	4.56	6,849.08	6,849.08	4.62	4'-DIA. STMMH
INLET 16	6,845.97	6,854.25	2.80	3.82	6,849.79	6,849.79	3.57	5' TYPE-R INLET <SIDE>
MH 15	6,841.50	6,853.96	10.57	3.49	6,844.99	6,844.99	8.61	4'-DIA. STMMH
MH 12	6,845.31	6,853.91	4.29	4.23	6,849.54	6,849.54	3.50	4'-DIA. STMMH
MH 21	6,846.57	6,853.83	6.33	4.41	6,850.98	6,850.98	8.06	4'-DIA. STMMH
MH 20	6,849.10	6,853.81	3.19	2.66	6,851.76	6,851.76	4.06	4'-DIA. STMMH
MH 16	6,838.51	6,853.79	13.96	1.74	6,840.25	6,840.25	7.90	4'-DIA. STMMH
MH 23	6,838.47	6,853.71	12.40	1.22	6,839.69	6,839.69	10.17	4'-DIA. STMMH
MH 24	6,833.90	6,853.69	15.38	1.97	6,835.87	6,835.87	12.53	4'-DIA. STMMH
MH 17	6,836.18	6,853.67	15.27	2.30	6,838.49	6,838.49	8.64	4'-DIA. STMMH
MH 22	6,844.77	6,853.66	9.42	4.06	6,848.83	6,848.83	11.99	4'-DIA. STMMH
MH 18	6,833.85	6,853.61	17.20	2.45	6,836.30	6,836.30	9.73	4'-DIA. STMMH

100 Year **FlexTable: Manhole Table**

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (Out) (ft/s)	Notes
INLET 2	6,839.93	6,853.32	131.40	4.58	6,844.51	6,844.51	13.66	5' TYPE-R INLET <SIDE>
INLET 21	6,846.12	6,852.94	1.58	0.53	6,846.66	6,846.66	3.71	5' TYPE-R INLET <SIDE>
INLET 22	6,837.20	6,852.94	3.21	0.77	6,837.97	6,837.97	4.96	5' TYPE-R INLET <SIDE>
INLET 18	6,840.28	6,852.91	12.62	1.34	6,841.62	6,841.62	7.58	5' TYPE-R INLET <SIDE>
INLET 15	6,846.60	6,852.89	1.51	3.30	6,849.90	6,849.90	1.92	TYPE-13 VALLEY INLET
INLET 19	6,834.90	6,852.88	15.85	2.43	6,837.33	6,837.33	8.97	5' TYPE-R INLET <SIDE>
INLET 27	6,834.66	6,852.25	34.49	1.92	6,836.58	6,836.58	11.14	TYPE-13 VALLEY INLET
INLET 5	6,845.94	6,861.75	3.94	0.86	6,846.80	6,846.80	5.58	TYPE-13 VALLEY INLET
INLET 14	6,848.64	6,851.80	1.29	1.56	6,850.19	6,850.19	1.64	TYPE-13 VALLEY INLET
MH 10	6,840.62	6,851.69	31.13	1.88	6,842.50	6,842.50	10.16	4'-DIA. STMMH
INLET 25	6,839.07	6,851.32	31.96	1.89	6,840.96	6,840.96	10.40	TYPE-13 VALLEY INLET
INLET 26	6,835.59	6,851.19	33.43	1.91	6,837.50	6,837.50	10.83	TYPE-13 VALLEY INLET
MH 25	6,828.28	6,851.13	46.15	1.98	6,830.26	6,830.26	14.73	4'-DIA. STMMH
MH 28	6,827.76	6,850.87	48.45	1.83	6,829.59	6,829.59	16.10	TYPE-13 VALLEY INLET
INLET 9	6,835.74	6,850.26	14.59	1.97	6,837.71	6,837.71	8.26	5' TYPE-R INLET <FRONT>
INLET 6	6,843.14	6,849.41	5.83	2.05	6,845.19	6,845.19	7.42	TYPE-13 VALLEY INLET
INLET 23	6,845.29	6,848.85	14.92	2.15	6,847.44	6,847.44	4.75	TYPE-13 VALLEY INLET
INLET 24	6,842.78	6,848.85	30.70	3.57	6,846.35	6,846.35	9.77	TYPE-13 VALLEY INLET
MH 5	6,832.24	6,848.42	131.40	3.44	6,835.68	6,835.68	11.47	6'-DIA. STMMH

100 Year FlexTable: Manhole Table

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (Out) (ft/s)	Notes
INLET 10	6,834.80	6,848.18	16.44	2.24	6,837.04	6,837.04	9.30	TYPE-13 VALLEY INLET
INLET 11	6,831.61	6,848.05	18.29	1.54	6,833.15	6,833.15	7.04	TYPE-13 VALLEY INLET
INLET 12	6,830.90	6,847.96	19.52	2.09	6,832.99	6,832.99	6.21	TYPE-13 VALLEY INLET
MH 11	6,827.63	6,847.72	47.29	4.12	6,831.75	6,831.75	15.05	4'-DIA. STMMH
INLET 13	6,828.65	6,847.50	21.48	3.33	6,831.98	6,831.98	6.84	TYPE-13 VALLEY INLET
INLET 8	6,840.06	6,846.74	11.22	1.28	6,841.34	6,841.34	6.98	TYPE-13 VALLEY INLET
MH 19	6,830.02	6,838.34	20.00	1.61	6,831.63	6,831.63	7.40	5'-DIA. STMMH
MH 2	6,860.21	6,874.26	104.40	3.12	6,863.33	6,863.33	11.54	
MH 1	6,868.56	6,874.16	104.40	3.12	6,871.68	6,871.68	11.54	

APPENDIX D
REFERENCED INFORMATION

**Proposed Conditions
Runoff Calculation**

Design Storm: **5 Year**

Street	Design Point	Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			Remarks
		Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q	Slope	Q	Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	
	OS1A	OS1A	30.81 ac	0.18	25.0min	5.51	2.8	15.2 cfs										1400'	2.9	8.0min	To DP1
	OS1B	OS1B	17.40 ac	0.12	16.7min	2.01	3.4	6.8 cfs													
	DP1	OS1A+OS1B	48.21 ac						33.0min	7.52	2.3	17.6 cfs									
	OS2A	OS2A	13.63 ac	0.08	16.7min	1.02	3.4	3.4 cfs													
	DP2	DP1+OS2A	61.84 ac						33.0min	8.55	2.3	20.0 cfs						500'	4.5	1.9min	To DP3
	OS2B	OS2B	14.04 ac	0.08	20.0min	1.05	3.1	3.3 cfs													
	DP3	DP2+OS2B	75.88 ac						34.9min	9.60	2.3	21.6 cfs									
	OS4	OS4	1.76 ac	0.25	12.8min	0.44	3.8	1.6 cfs							22.6 cfs	0.7%	120-in	155'	10	0.3min	To DP21
	DP4	DP3+OS4	77.64 ac						34.9min	10.04	2.3	22.6 cfs									
	OS3A	OS3A	56.65 ac	0.17	13.3min	9.43	3.7	34.9 cfs													
	OS3B	OS3B	2.82 ac	0.34	13.1min	0.95	3.7	3.5 cfs													
	OS5A		1.24 ac	0.33	12.2min	0.41	3.8	1.6 cfs													To DP7
	OS5B		1.58 ac	0.39	18.6min	0.62	3.2	2.0 cfs													To DP13
	DP5	OS3A+OS3B	59.47 ac						13.3min	10.38	3.7	38.4 cfs			38.4 cfs	3.0%	36-in	397'	10	0.7min	To DP8
	A1A	A1A	1.01 ac	0.89	5.8min	0.90	5.0	4.5 cfs													
	A1B	A1B	3.14 ac	0.71	8.1min	2.23	4.5	9.9 cfs													
	DP7	EX-E + EX-F + OS5A	4.15 ac						8.1min	3.54	4.5	15.8 cfs									
	DP8	DP5+DP7	63.63 ac						14.0min	13.93	3.6	50.5 cfs			50.5 cfs	1.5%	42-in	272'	10	0.5min	To DP9
	A3	A3	0.99 ac	0.71	5.4min	0.71	5.0	3.6 cfs							3.6 cfs	1.5%	18-in	62'	10	0.1min	To DP9
	DP9	DP8+A3	64.62 ac						14.4min	14.63	3.6	52.3 cfs			52.3 cfs	1.5%	42-in	133'	10	0.2min	To DP10
	A2	A2	3.37 ac	0.75	6.1min	2.53	4.9	12.3 cfs							12.3 cfs	1.0%	24-in	171'	7.22	0.4min	To DP10
	DP10	DP9+A2	67.99 ac						14.8min	17.16	3.5	60.7 cfs			60.7 cfs	2.4%	42-in	961'	16	1.0min	To DP11
	A4A	A4A	3.75 ac	0.61	12.0min	2.29	3.9	8.8 cfs													
	DP11	DP10+A4A	71.74 ac						15.8min	19.45	3.4	66.9 cfs			66.9 cfs	2.8%	42-in	312'	17.9	0.3min	To DP12
	A4B	A4B	4.18 ac	0.60	12.1min	2.52	3.8	9.7 cfs							9.7 cfs	2.8%	24-in	277'	12.1	0.4min	To DP17
	DP12	DP11+A9	74.60 ac						16.1min	21.41	3.4	73.1 cfs			73.1 cfs	0.6%	48-in	85'	10	0.1min	To DP20
	A5A	A5A	2.56 ac	0.61	10.3min	1.56	4.1	6.4 cfs							6.4 cfs	1.7%	18-in	132'	10	0.2min	To DP13
	A5B	A5B	0.74 ac	0.90	5.0min	0.66	5.2	3.4 cfs													
	DP13	A5A+A5B	3.30 ac						10.5min	2.84	4.1	11.5 cfs			11.5 cfs	1.0%	24-in	112'	10	0.2min	To DP14
	A5C	A5C	0.68 ac	0.90	5.0min	0.61	5.2	3.2 cfs													
	DP14	DP13+A5C	3.98 ac						10.7min	3.45	4.0	13.9 cfs			13.9 cfs	2.3%	24-in	542'	10.9	0.8min	To DP15
	A6	A6	5.98 ac	0.68	10.1min	4.08	4.1	16.8 cfs													
	DP15	DP14+A6	9.95 ac						11.5min	7.53	3.9	29.5 cfs			29.5 cfs	2.3%	30-in	411'	12.7	0.5min	To DP16
	A7	A7	2.53 ac	0.73	6.7min	1.85	4.7	8.8 cfs													
	DP16	DP15+A7	12.48 ac						12.0min	9.38	3.8	36.1 cfs									
	DP17	DP16+A4B	16.67 ac						12.4min	11.90	3.8	45.2 cfs			45.2 cfs	2.3%	36-in	335'	14.3	0.4min	To DP18
	A8	A8	2.65 ac	0.69	5.5min	1.82	5.0	9.1 cfs													
	DP18	DP17+A8	19.32 ac						12.8min	13.71	3.8	51.5 cfs			51.5 cfs	2.3%	36-in	82'	14.3	0.1min	To DP20
	A9	A9	2.87 ac	0.69	5.5min	1.97	5.0	9.9 cfs													
	A10	A10	3.65 ac	0.73	12.9min	2.66	3.7	10.0 cfs							10.0 cfs	2.0%	24-in	404'	10.2	0.7min	To DP19
	A11	A11	2.83 ac	0.62	11.7min	1.75	3.9	6.8 cfs													
	DP19	A10+A11	6.48 ac						13.6min	4.41	3.7	16.2 cfs			16.2 cfs	2.0%	24-in	54'	10.2	0.1min	To DP20
	A12	A12	2.20 ac	0.08	12.2min	0.17	3.8	0.6 cfs													
	DP20	DP12+DP18+DP19+A12	102.60 ac						16.2min	39.70	3.4	135.1 cfs									
	DP21*	DP20 detained	102.60 ac									7.0 cfs			7.0 cfs	0.7%	120-in	155'	10	0.3min	To DP21
	DP22	DP21+DP4	105.48 ac						35.2min	10.04	2.2	29.5 cfs									

*Detention outflow per HEC-HMS Proposed Model

**Existing Conditions
Runoff Calculation**

Design Storm: **5 Year**

		Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			
Street	Design Point	Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q			Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	Remarks
	OS1A		30.81 ac	0.18	25.0min	5.51	2.8	15.2 cfs			---	---						1400'	2.9	8.0min	To DP1
	OS1B		17.40 ac	0.12	16.7min	2.01	3.4	6.8 cfs			---	---									
	DP1	OS1A+OS1B	48.21 ac						33.0min	7.52	2.3	17.6 cfs									
	OS2A		13.63 ac	0.08	16.7min	1.02	3.4	3.4 cfs			---	---									
	DP2	DP1+OS2A	61.84 ac						33.0min	8.55	2.3	20.0 cfs						500'	4.5	1.9min	TO DP12
	OS2B		14.04 ac	0.08	20.0min	1.05	3.1	3.3 cfs			---	---						700'	3.4	3.5min	To PD6
	DP3	DP2+OS2B	75.88 ac						34.9min	9.60	2.3	21.6 cfs									TO DP4
	OS4		1.76 ac	0.25	12.8min	0.44	3.8	1.6 cfs			---	---									
	DP4	DP3+OS4	77.64 ac						34.9min	10.04	2.3	22.6 cfs									
	OS3A		56.65 ac	0.17	13.3min	9.43	3.7	34.9 cfs			---	---									
	OS3B		2.82 ac	0.33	12.2min	0.93	3.8	3.6 cfs			---	---									
	DP5	OS3A+OS3B	59.47 ac						13.3min	10.36	3.7	38.3 cfs						400'	10	0.7min	To DP8
	OS5A		1.24 ac	0.39	18.6min	0.49	3.2	1.6 cfs										670'	10	1.1min	To DP7
	OS5B		1.58 ac	0.37	20.4min	0.59	3.1	1.8 cfs										980'	10	1.6min	To DP 13
	EX-A		4.57 ac	0.08	14.3min	0.34	3.6	1.2 cfs			---	---									To DP 12
	DP6	OS2B + EX-A	18.61 ac						23.5min	1.40	2.8	4.0 cfs									
	EX-B		5.48 ac	0.08	16.3min	0.41	3.4	1.4 cfs			---	---									To DP 11
	DP11	DP10+EX-B	74.64 ac						16.5min	15.35	3.4	51.9 cfs						84'	10	0.1min	To DP12
	EX-C		4.89 ac	0.08	14.0min	0.37	3.6	1.3 cfs			---	---									To DP 10
	DP10	DP9 + EX-C	69.16 ac						14.5min	14.94	3.6	53.4 cfs						930'	7.75	2.0min	To DP11
	EX-D		0.64 ac	0.90	5.0min	0.58	5.2	3.0 cfs			---	---									To DP 9
	DP9	DP8+EX-D	64.27 ac						14.2min	14.57	3.6	52.4 cfs						140'	10	0.2min	To DP10
	EX-E		1.01 ac	0.90	5.3min	0.91	5.1	4.6 cfs			---	---									TO DP 7
	EX-F		3.14 ac	0.71	8.1min	2.23	4.5	9.9 cfs			---	---									To DP7
	DP7	EX-E + EX-F + OS5A	4.15 ac						8.1min	3.63	4.5	16.2 cfs									TO DP8
	DP8	DP5+DP7	63.63 ac						14.0min	13.99	3.6	50.7 cfs						140'	10	0.2min	To DP9
	EX-G		2.56 ac	0.08	14.1min	0.19	3.6	0.7 cfs			---	---						175'	10	0.3min	To DP13
	EX-H		0.74 ac	0.90	6.1min	0.66	4.9	3.2 cfs			---	---									TO DP13
	DP13	EX-G + EX-H + OS5B	3.30 ac						14.1min	1.44	3.6	5.2 cfs						90'	10	0.2min	TO DP14
	EX-I		0.68 ac	0.90	5.0min	0.61	5.2	3.2 cfs			---	---									TO DP14
	DP14	DP13 + EX-I	6.40 ac						14.2min	1.67	3.6	6.0 cfs						395'	10	0.7min	TO DP15
	EX-J		3.11 ac	0.08	13.3min	0.23	3.7	0.9 cfs			---	---									TO DP15
	DP15	EX-j + DP14	9.51 ac						14.9min	1.91	3.5	6.7 cfs						800'	3.97	3.4min	TO DP16
EX-K		14.10 ac	0.09	17.7min	1.26	3.3	4.1 cfs			---	---									TO DP16	
DP16	DP15 + EX-K	23.60 ac						18.2min	3.17	3.2	10.2 cfs									TO DP12	
EX-L		2.20 ac	0.08	8.7min	0.17	4.3	0.7 cfs			---	---									TO DP12	
DP12	DP16+DP11+DP6+EX-L	119.05 ac						18.2min	20.96	3.2	67.7 cfs									TO DP17	
DP 17*	DP12 (Calibrated for Detention)	77.64 ac					70.1 cfs													TO DP18	
DP18	DP17 + DP4	105.48 ac					92.7 cfs														

* Calibrated to 100yr Design Outflow of Tuscany Detention

**Proposed Conditions
Runoff Calculation**

Design Storm: 100 Year

Street	Design Point	Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			Remarks
		Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q	Slope	Q	Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	
	OS1A	OS1A	30.81 ac	0.26	25.0min	8.04	4.6	37.2 cfs			---	---						1400'	2.9	8.0min	To DP1
	OS1B	OS1B	17.40 ac	0.39	16.7min	6.77	5.6	38.2 cfs			---	---								---	
	DP1	OS1A+OS1B	48.21 ac						33.0min	14.82	3.9	58.1 cfs								---	
	OS2A	OS2A	13.63 ac	0.35	16.7min	4.77	5.6	26.9 cfs			---	---								---	
	DP2	DP1+OS2A	61.84 ac						33.0min	19.59	3.9	76.8 cfs						500'	4.5	1.9min	To DP3
	OS2B	OS2B	14.04 ac	0.35	20.0min	4.91	5.2	25.5 cfs			---	---								---	
	DP3	DP2+OS2B	75.88 ac						34.9min	24.50	3.8	92.7 cfs								---	
	OS4	OS4	1.76 ac	0.47	12.8min	0.83	6.3	5.2 cfs			---	---								---	
	DP4	DP3+OS4	77.64 ac						34.9min	25.33	3.8	95.8 cfs			95.8 cfs	0.7%	120-in	155'	10	0.3min	To DP21
	OS3A	OS3A	56.65 ac	0.21	13.3min	11.79	6.2	73.2 cfs			---	---								---	
	OS3B	OS3B	2.82 ac	0.52	13.1min	1.46	6.3	9.1 cfs			---	---								---	
	OS5A		1.24 ac	0.55	12.2min	0.68	6.4	4.4 cfs			---	---								---	
	OS5B		1.58 ac	0.54	18.6min	0.85	5.4	4.6 cfs			---	---								---	
	DP5	OS3A+OS3B	59.47 ac						13.3min	13.25	6.2	82.2 cfs			82.2 cfs	3.0%	36-in	397'	10	0.7min	To DP8
	A1A	A1A	1.01 ac	0.95	5.8min	0.96	8.3	8.0 cfs			---	---								---	
	A1B	A1B	3.14 ac	0.80	8.1min	2.50	7.5	18.7 cfs			---	---								---	
	DP7	EX-E + EX-F + OS5A	4.15 ac						8.1min	4.15	7.5	31.0 cfs								---	
	DP8	DP5+DP7	63.63 ac						14.0min	17.40	6.1	105.9 cfs			105.9 cfs	1.5%	42-in	272'	10	0.5min	To DP9
	A3	A3	0.99 ac	0.80	5.4min	0.79	8.5	6.7 cfs			---	---			6.7 cfs	1.5%	18-in	62'	10	0.1min	To DP9
	DP9	DP8+A3	64.62 ac						14.4min	18.19	6.0	109.2 cfs			109.2 cfs	1.5%	42-in	133'	10	0.2min	To DP10
	A2	A2	3.37 ac	0.83	6.1min	2.80	8.2	22.9 cfs			---	---			22.9 cfs	1.0%	24-in	171'	7.22	0.4min	To DP10
	DP10	DP9+A2	67.99 ac						14.8min	20.98	5.9	124.6 cfs			124.6 cfs	2.4%	42-in	961'	16	1.0min	To DP11
	A4A	A4A	3.75 ac	0.71	12.0min	2.67	6.5	17.3 cfs			---	---								---	
	DP11	DP10+A4A	71.74 ac						15.8min	23.66	5.8	136.6 cfs			136.6 cfs	2.8%	42-in	312'	17.9	0.3min	To DP12
	A4B	A4B	4.18 ac	0.71	12.1min	2.95	6.5	19.1 cfs			---	---			19.1 cfs	2.8%	24-in	277'	12.1	0.4min	To DP17
	DP12	DP11+A9	74.60 ac						16.1min	25.88	5.7	148.2 cfs			148.2 cfs	0.6%	48-in	85'	10	0.1min	To DP20
	A5A	A5A	2.56 ac	0.71	10.3min	1.82	6.9	12.5 cfs			---	---			12.5 cfs	1.7%	18-in	132'	10	0.2min	To DP13
	A5B	A5B	0.74 ac	0.96	5.0min	0.70	8.7	6.1 cfs			---	---								---	
	DP13	A5A+A5B	3.30 ac						10.5min	3.37	6.8	23.0 cfs			23.0 cfs	1.0%	24-in	112'	10	0.2min	To DP14
	A5C	A5C	0.68 ac	0.96	5.0min	0.65	8.7	5.7 cfs			---	---								---	
	DP14	DP13+A5C	3.98 ac						10.7min	4.03	6.8	27.2 cfs			27.2 cfs	2.3%	24-in	542'	10.9	0.8min	To DP15
	A6	A6	5.98 ac	0.77	10.1min	4.62	6.9	32.0 cfs			---	---								---	
	DP15	DP14+A6	9.95 ac						11.5min	8.65	6.6	56.9 cfs			56.9 cfs	2.3%	30-in	411'	12.7	0.5min	To DP16
	A7	A7	2.53 ac	0.81	6.7min	2.06	8.0	16.4 cfs			---	---								---	
	DP16	DP15+A7	12.48 ac						12.0min	10.70	6.5	69.2 cfs								---	
	DP17	DP16+A4B	16.67 ac						12.4min	13.66	6.4	87.2 cfs			87.2 cfs	2.3%	36-in	335'	14.3	0.4min	To DP18
	A8	A8	2.65 ac	0.78	5.5min	2.06	8.4	17.4 cfs			---	---								---	
	DP18	DP17+A8	19.32 ac						12.8min	15.71	6.3	99.1 cfs			99.1 cfs	2.3%	36-in	82'	14.3	0.1min	To DP20
	A9	A9	2.87 ac	0.78	5.5min	2.22	8.4	18.8 cfs			---	---								---	
	A10	A10	3.65 ac	0.81	12.9min	2.96	6.3	18.6 cfs			---	---			18.6 cfs	2.0%	24-in	404'	10.2	0.7min	To DP19
	A11	A11	2.83 ac	0.72	11.7min	2.04	6.5	13.3 cfs			---	---								---	
	DP19	A10+A11	6.48 ac						13.6min	5.00	6.2	30.8 cfs			30.8 cfs	2.0%	24-in	54'	10.2	0.1min	To DP20
	A12	A12	2.20 ac	0.35	12.2min	0.77	6.4	5.0 cfs			---	---								---	
	DP20	DP12+DP18+DP19+A12	102.60 ac						16.2min	47.36	5.7	270.6 cfs								---	
	DP21*	DP20 detained	102.60 ac									65.1 cfs			65.1 cfs	0.7%	120-in	155'	10	0.3min	To DP21
	DP22	DP20 detained HMS	105.48 ac						35.2min	25.33	3.8	160.4 cfs								---	

*Detention outflow per HEC-HMS Proposed Model

**Existing Conditions
Runoff Calculation**

Design Storm: **100 Year**

Street	Design Point	Direct Runoff							Total Runoff				Street/Chan		Pipe			Travel Time			Remarks
		Area Designation	Area	C	T _c	C*A (acre)	i (in/hr)	Q	T _c	Sum C*A	i (in/hr)	Q	Slope	Q	Q	Slope	Pipe Size	L (ft)	Vel (ft/s)	T _t	
	OS1A	OS1A	30.81 ac	0.26	25.0min	8.04	4.6	37.2 cfs			---	---						1400'	2.9	8.0min	To DP1
	OS1B	OS1B	17.40 ac	0.39	16.7min	6.77	5.6	38.2 cfs			---	---									
	DP1	OS1A+OS1B	48.21 ac						33.0min	14.82	3.9	58.1 cfs									
	OS2A	OS2A	13.63 ac	0.35	16.7min	4.77	5.6	26.9 cfs			---	---									
	DP2	DP1+OS2A	61.84 ac						33.0min	19.59	3.9	76.8 cfs						500'	4.5	1.9min	To DP12
	OS2B	OS2B	14.04 ac	0.35	20.0min	4.91	5.2	25.5 cfs			---	---						700'	3.4	3.5min	To PD6
	DP3	DP2+OS2B	75.88 ac						34.9min	24.50	3.8	92.7 cfs									To DP4
	OS4	OS4	1.76 ac	0.47	12.8min	0.83	6.3	5.2 cfs			---	---									
	DP4	DP3+OS4	77.64 ac						34.9min	25.33	3.8	95.8 cfs									
	OS3A	OS3A	56.65 ac	0.21	13.3min	11.79	6.2	73.2 cfs			---	---									
	OS3B	OS3B	2.82 ac	0.35	12.2min	0.99	6.4	6.4 cfs			---	---									
	DP5	OS3A+OS3B	59.47 ac						13.3min	12.78	6.2	79.3 cfs						400'	10	0.7min	To DP8
	OS5A		1.24 ac	0.55	18.6min	0.68	5.4	3.7 cfs										670'	10	1.1min	To DP7
	OS5B		1.58 ac	0.54	20.4min	0.85	5.1	4.4 cfs										980'	10	1.6min	To DP13
	EX-A		4.57 ac	0.35	14.3min	1.60	6.0	9.6 cfs			---	---									To DP12
	DP6	OS2B + EX-A	18.61 ac						23.5min	6.51	4.8	31.1 cfs									
	EX-B		5.48 ac	0.35	16.3min	1.92	5.7	10.9 cfs			---	---									To DP11
	DP11	DP10+EX-B	74.64 ac						16.5min	20.91	5.7	118.7 cfs						84'	10	0.1min	To DP12
	EX-C		4.89 ac	0.35	14.0min	1.71	6.1	10.4 cfs			---	---									To DP10
	DP10	DP9 + EX-C	69.16 ac						14.5min	18.99	6.0	114.0 cfs						930'	7.75	2.0min	To DP11
	EX-D		0.64 ac	0.96	5.0min	0.61	8.7	5.3 cfs			---	---									To DP9
	DP9	DP8+EX-D	64.27 ac						14.2min	17.28	6.0	104.4 cfs						140'	10	0.2min	To DP10
	EX-E		1.01 ac	0.96	5.3min	0.97	8.5	8.3 cfs			---	---									To DP7
	EX-F		3.14 ac	0.71	8.1min	2.23	7.5	16.7 cfs			---	---									To DP7
	DP7	EX-E + EX-F + OS5A	4.15 ac						8.1min	3.89	7.5	29.1 cfs									To DP8
	DP8	DP5+DP7	63.63 ac						14.0min	16.66	6.1	101.4 cfs						140'	10	0.2min	To DP9
	EX-G		2.56 ac	0.35	14.1min	0.90	6.1	5.4 cfs			---	---						175'	10	0.3min	To DP13
	EX-H		0.74 ac	0.96	6.1min	0.70	8.2	5.7 cfs			---	---									To DP13
	DP13	EX-G + EX-H + OS5B	3.30 ac						14.1min	2.45	6.1	14.9 cfs						90'	10	0.2min	To DP14
	EX-I		0.68 ac	0.96	5.0min	0.65	8.7	5.7 cfs			---	---									To DP14
	DP14	DP13 + EX-I	6.40 ac						14.2min	3.54	6.0	21.4 cfs						395'	10	0.7min	To DP15
	EX-J		3.11 ac	0.35	13.3min	1.09	6.2	6.7 cfs			---	---									To DP15
	DP15	EX-J + DP14	9.51 ac						14.9min	4.62	5.9	27.4 cfs						800'	3.97	3.4min	To DP16
	EX-K		14.10 ac	0.37	17.7min	5.23	5.5	28.7 cfs			---	---									To DP16
	DP16	DP15 + EX-K	23.60 ac						18.2min	9.86	5.4	53.4 cfs									To DP12
	EX-L		2.20 ac	0.35	8.7min	0.77	7.3	5.6 cfs			---	---									To DP12
	DP12	DP16+DP11+DP6+EX-L	119.05 ac						18.2min	42.19	5.4	228.7 cfs									To DP17
	DP17*	DP12 (Calibrated for Detention)	77.64 ac					104.8 cfs													To DP18
	DP18	DP17 + DP4	105.48 ac					182.4 cfs													

* Calibrated to 100yr Design Outflow of Tuscany Detention

Equations (taken from Fig 6-5, City of Colorado Springs DCM):

$$i_2 = -1.19 \ln(T_c) + 6.035$$

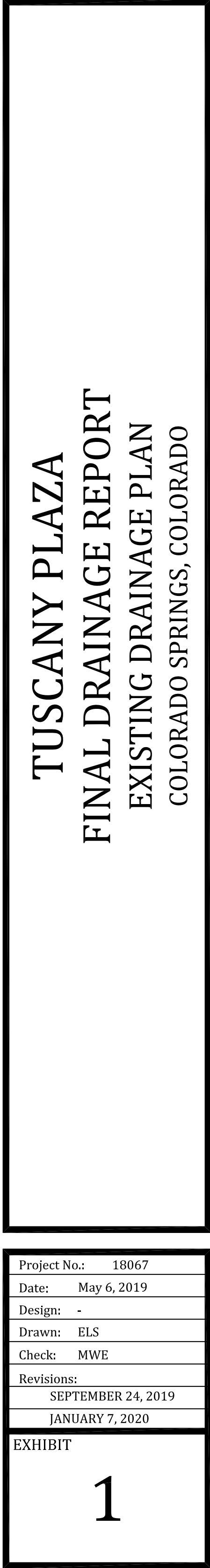
$$i_5 = -1.50 \ln(T_c) + 7.583$$

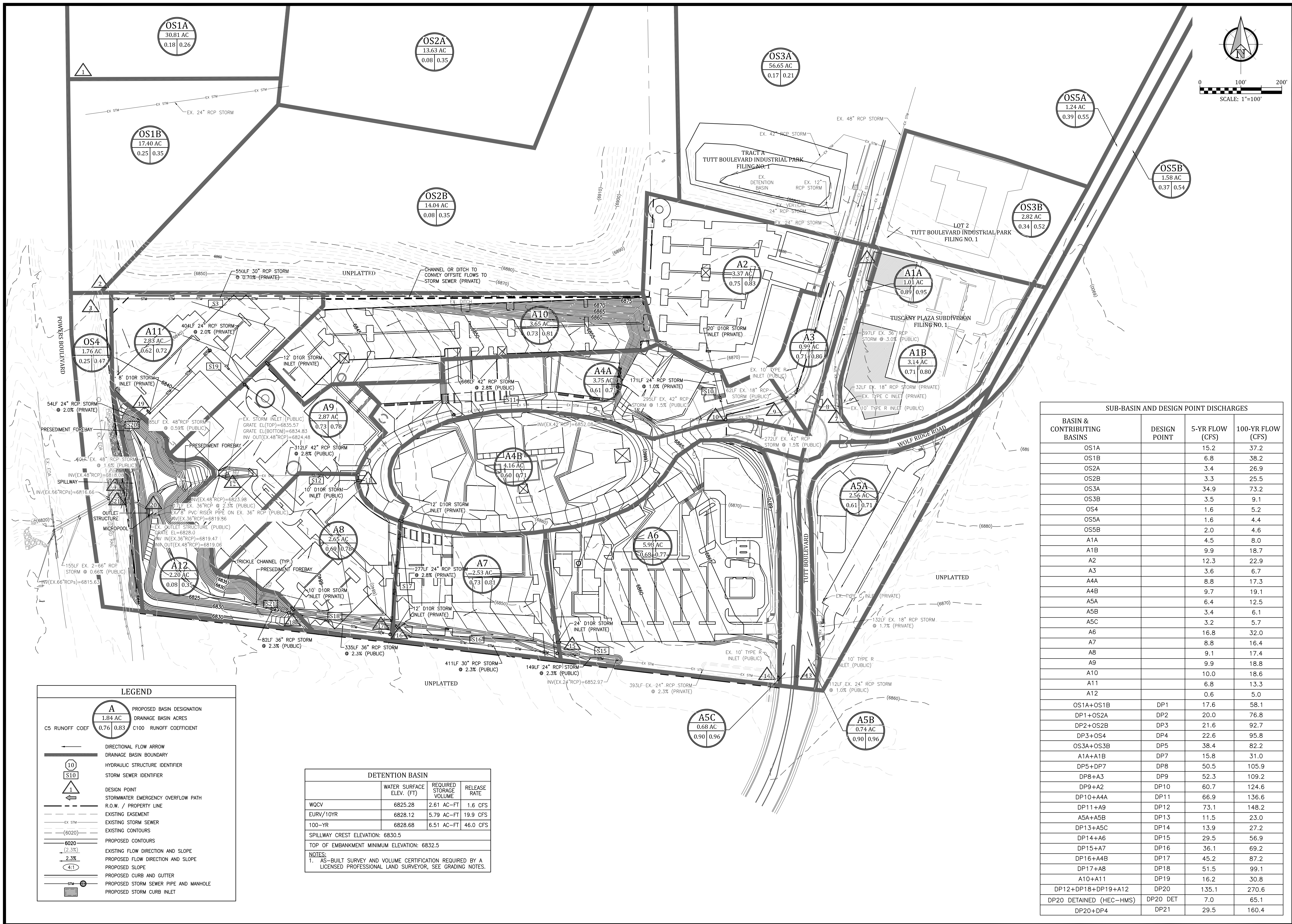
$$i_{10} = -1.75 \ln(T_c) + 8.847$$

$$Q = C i A$$

Q = Peak Runoff Rate (cubic feet/second)

C = Runoff coef representing a ration of peak runoff rate to ave rainfall intensity for a duration equal to the runoff time of concentration.





LEGEND

A PROPOSED BASIN DESIGNATION
1.84 AC DRAINAGE BASIN ACRES
0.76 0.83 C100 RUNOFF COEFFICIENT

CS RUNOFF COEF

10 S10

DESIGN POINT

STORMWATER EMERGENCY OVERFLOW PATH

R.O.W. / PROPERTY LINE

EXISTING EASEMENT

EXISTING STORM SEWER

EXISTING CONTOURS

PROPOSED CONTOURS

EXISTING FLOW DIRECTION AND SLOPE

PROPOSED FLOW DIRECTION AND SLOPE

PROPOSED SLOPE

PROPOSED CURB AND GUTTER

PROPOSED STORM SEWER PIPE AND MANHOLE

PROPOSED STORM CURB INLET

DETENTION BASIN			
	WATER SURFACE ELEV. (FT)	REQUIRED STORAGE VOLUME	RELEASE RATE
WQCV	6825.28	2.61 AC-FT	1.6 CFS
EURV/10YR	6828.12	5.79 AC-FT	19.9 CFS
100-YR	6828.68	6.51 AC-FT	46.0 CFS
SPILLWAY CREST ELEVATION: 6830.5			
TOP OF EMBANKMENT MINIMUM ELEVATION: 6832.5			
NOTES:			
1. AS-BUILT SURVEY AND VOLUME CERTIFICATION REQUIRED BY A LICENSED PROFESSIONAL LAND SURVEYOR, SEE GRADING NOTES.			

SUB-BASIN AND DESIGN POINT DISCHARGES			
BASIN & CONTRIBUTING BASINS	DESIGN POINT	5-YR FLOW (CFS)	100-YR FLOW (CFS)
OS1A		15.2	37.2
OS1B		6.8	38.2
OS2A		3.4	26.9
OS2B		3.3	25.5
OS3A		34.9	73.2
OS3B		3.5	9.1
OS4		1.6	5.2
OS5A		1.6	4.4
OS5B		2.0	4.6
A1A		4.5	8.0
A1B		9.9	18.7
A2		12.3	22.9
A3		3.6	6.7
A4A		8.8	17.3
A4B		9.7	19.1
A5A		6.4	12.5
A5B		3.4	6.1
A5C		3.2	5.7
A6		16.8	32.0
A7		8.8	16.4
A8		9.1	17.4
A9		9.9	18.8
A10		10.0	18.6
A11		6.8	13.3
A12		0.6	5.0
OS1A+OS1B	DP1	17.6	58.1
DP1+OS2A	DP2	20.0	76.8
DP2+OS2B	DP3	21.6	92.7
DP3+OS4	DP4	22.6	95.8
OS3A+OS3B	DP5	38.4	82.2
A1A+A1B	DP7	15.8	31.0
DP5+DP7	DP8	50.5	105.9
DP8+A3	DP9	52.3	109.2
DP9+A2	DP10	60.7	124.6
DP10+A4A	DP11	66.9	136.6
DP11+A9	DP12	73.1	148.2
A5A+A5B	DP13	11.5	23.0
DP13+A5C	DP14	13.9	27.2
DP14+A6	DP15	29.5	56.9
DP15+A7	DP16	36.1	69.2
DP16+A4B	DP17	45.2	87.2
DP17+A8	DP18	51.5	99.1
A10+A11	DP19	16.2	30.8
DP12+DP18+DP19+A12	DP20	135.1	270.6
DP20 DETAINED (HEC-HMS)	DP20 DET	7.0	65.1
DP20+DP4	DP21	29.5	160.4

Kiowa
Celebrating 30 years
Engineering Corporation
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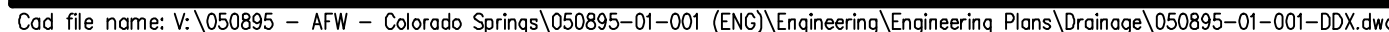
TUSCANY PLAZA
FINAL DRAINAGE REPORT
PROPOSED DRAINAGE PLAN
COLORADO SPRINGS, COLORADO

Project No.: 18067
Date: MAY 6, 2019
Design: -
Drawn: ELS
Check: MWE
Revisions:
SEPTEMBER 24, 2019
JANUARY 23, 2019

EXHIBIT

2

**APPENDIX E
DRAINAGE PLANS**



EXISTING DRAINAGE PLAN

AMERICAN FURNITURE WAREHOUSE

CITY OF COLORADO SPRINGS

COLORADO