Project 321 Office Campus

PRELIMINARY DRAINAGE REPORT
CITY OF LOUISVILLE, COLORAD

Martin/Martin, Inc. Project No.: 19.1391

January 31, 2020

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CERTIFICATION STATEMENT

"I hereby certify that this report for the preliminary drainage design of Project 321 was prepared by me (or under my direct supervision) in accordance with the provisions of City of Louisville Storm Drainage Design and Technical Criteria for the owners thereof."

Mark D. Thornbrough, PE
State of Colorado No. 33322

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I. GENERAL LOCATION AND DESCRIPTION

A. Location

The proposed development is part of the Redtail Ridge Filing 1 and is situated in the City of Louisville within Boulder County, Colorado. More specifically, the site is in the South ½ of Section 20 and the North ½ of Section 29, Township 1 South, Range 69 West of the 6th P.M. The site is bordered on the north by the proposed Campus Drive, by the proposed Street B to the east, by the future Tape Parkway on the south, and by the future Street A to the west. A Vicinity Map is included in the Appendix of this report for reference.

No major drainage facilities are found within the site. Refer to the Final Master Drainage Report prepared by Harris Kocher Smith (hereinafter referred to as the "Master Report") for additional information.

The nearest surrounding developments include the Monarch K-8 campus north of Campus Drive and the Parkway Circle development east of Northwest Parkway.

B. Project Description

The project includes construction of a medical office complex that includes three 5-story buildings with two building connections that join the office buildings. Associated parking areas, drives, sidewalks, landscape areas, and utilities are also included. A Full Spectrum Detention Basin will be located on the northeast corner of the site. The project is in coordination with the Master Development of Nawatny Ridge Filing 1 which will extend public access and utilities to the site. Estimated time for the construction of the site is as follows:

Construction Start: July 2020
Construction End: October 2022

C. Description of Property

The site is approximately 89.8 acres with ground cover consisting primarily of native grass landscaped areas, scattered coniferous trees, remnants of building foundations, private roadways and infrastructure from previous developments. Under the Hydrologic Soil Group classification, the soils on site are primarily classified as Type C with some Type D soils. Refer to the Appendix for more information.

There are no floodplains or major drainage channels on site. The Goodhue Ditch is located to the northeast of the site and Rock Creek is to the south. There are several minor swales and ditches that convey stormwater off the site.

A ridge currently runs along the alignment of Tape Drive, dividing the site such that the portion of the site to the north of Tape Drive generally slopes from southwest to northeast at 2-3%, and

the portion of the site to the south of Tape Drive generally slopes from northwest to southeast at 3-5%.

II. HISTORIC DRAINAGE

A. Major Basin Description

The site is located within the Rock Creek basin of the City of Louisville/Boulder County Outfall System Plan (hereinafter referred to as the "OSP"). According to the Master Report, the basin drains to Rock Creek, then northeast into Coal Creek, and eventually northeast into Boulder Creek. According to the OSP, the Rock Creek basin generally drains towards the northeast with a high point located just southwest of U.S. 36. The basin initially slopes down at 5-10% before leveling out at an average slope of 1.5% in the lower regions of the basin.

An irrigation ditch (Goodhue Ditch) located northeast of the site is owned by the Goodhue Ditch & Reservoir Company. All other irrigation swales and ditches are non-binding.

B. Sub-Basin Description

Historically, the existing Tape Drive divides the site into a northern and southern basin. The northern portion of the site drains northeast to an existing pond located just south of Goodhue Ditch. The southern portion of the site drains southeast to Rock Creek. The site currently receives offsite flows from the west. The master development will eliminate the offsite flows by constructing roads on all sides of the site that will capture offsite flows. Where the west and south roads are phased for a later date, the master development will construct swales to divert offsite flows from the site. The runoff summary for the existing sub-basins is provided below. Refer to the Appendix for the existing drainage plan and associated calculations.

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
E-N	E-N	70.04	5.2%	0.08	0.51	9.70	147.36
E-S	E-S	19.76	11.1%	0.13	0.53	5.04	49.56
SITE COMPOSITE						**14.74**	**196.92**

The proposed improvements have been subdivided into smaller basins for the purposes of determining peak flow rates and sizing storm sewer infrastructure, which includes the detention pond facility, inlet and conduit sizing, and determining peak flow rates at various points within the major basins. Refer to the Appendix for the proposed drainage plan and associated calculations.

Basin A1 primarily consists of asphalt parking lot with landscape islands. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet A1) and then conveyed within Storm Line A, outfalling to Pond B.

Basin A2 primarily consists of asphalt parking lot with landscape islands and landscaping. The basin drains to the northeast where it is captured by a Triple Type 16 Combination on-grade inlet (Inlet A2) and then conveyed within Storm Line A, outfalling to Pond B. Flow bypassing Inlet A2 continues north in the drive aisle to Inlet A1.

Basin A3 primarily consists of asphalt parking lot with landscape islands and landscaping. The basin drains to the northeast where it is captured by a Triple Type 16 Combination on-grade inlet inlet A3 and then conveyed within Storm Line A, outfalling to Pond B. Flow bypassing Inlet A3 continues north in the drive aisle to inlet A2.

Basin A4 primarily consists of asphalt parking lot with landscape islands and landscaping. The basin drains to the northeast where it is captured by a Single Type 16 Combination on-grade inlet (Inlet A4) and then conveyed within Storm Line A, outfalling to Pond B. Flow bypassing Inlet A4 continues north in the drive aisle to inlet A3.

Basin A5 consists of landscaping, concrete sidewalk, and asphalt drive. The basin drains to the southeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet A5) and then conveyed within Storm Line A, outfalling to Pond B.

Basin A6 consists of landscaping and asphalt drive. The basin drains to the northeast where it is captured by a Double Type 16 Combination sump inlet (Inlet A6) and then conveyed within Storm Line A, outfalling to Pond B.

Basin A7 consists of landscaping and asphalt parking lot with landscape islands. The basin drains to the southeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet A7) and then conveyed within Storm Line A, outfalling to Pond B.

Basin A8 consists of landscaping and asphalt parking lot with landscape islands. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet A8) and then conveyed within Storm Line A, outfalling to Pond B. Any flows bypassing inlets A10 and A9 are captured by inlet A8.

Basin A9 primarily consists of asphalt parking lot with landscape islands. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet A9) and then conveyed within Storm Line A, outfalling to Pond B.

Basin A10 primarily consists of asphalt parking lot with landscape islands. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet A10) and then conveyed within Storm Line A, outfalling to Pond B.

Basin A11 primarily consists of existing grade with native seeding. Runoff is conveyed via swale southeast to a Type C sump inlet (Inlet A11). Storm Line A conveys the flow outfalling to Pond B.

Basin B1 consists of asphalt parking, concrete sidewalk, and landscaping. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet B1) and then conveyed via Storm Line B to Storm Line A, outfalling to Pond B.

Basin B2 consists of asphalt parking, concrete sidewalk, and landscaping. The basin drains to the northeast where it is captured by a Single Type 16 Combination sump inlet (Inlet B2) and then conveyed via Storm Line B to Storm Line A, outfalling to Pond B.

Basin B3 consists of asphalt drive, concrete sidewalk, and landscaping. The basin drains to the northeast where it is captured by a Triple Type 16 Combination on-grade inlet (Inlet B3) and then conveyed via Storm Line B to Storm Line A, outfalling to Pond B. Flow bypassing Inlet B3 continues east in the drive aisle to Inlet A5.

Basin B4 consists of asphalt drive, concrete sidewalk, and landscaping. The basin drains to the southeast where it is captured by a Triple Type 16 Combination on-grade inlet (Inlet B4) and then conveyed via Storm Line B to Storm Line A, outfalling to Pond B. Flow bypassing Inlet B4 continues through the parking lot to Inlet A7.

Basin C1 consists of asphalt parking with landscape islands and landscaping. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet C1) and then conveyed via Storm Line C to Storm Line A, outfalling to Pond B.

Basin C2 consists of asphalt parking, concrete sidewalk, and landscaping. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet C2) and then conveyed via Storm Line C to Storm Line A, outfalling to Pond B.

Basin C3 consists of asphalt parking with landscape islands. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet C3) and then conveyed via Storm Line C to Storm Line A, outfalling to Pond B.

Basin D1 consists of asphalt parking, concrete sidewalk, and landscaping. The basin drains to the northeast where it is captured by a Single Type 16 Combination sump inlet (Inlet D1) and then conveyed via Storm Line D to Storm Line C to Storm Line A, outfalling to Pond B.

Basin E1 consists of asphalt drive and landscaping. The basin drains to the northeast where it passes through a curb cut and then conveyed via overland flow to Pond B.

Basin N consists of Pond B and native landscaped areas. Runoff is conveyed via overland flow to Pond B.

Basin P1 consists of landscaping. The basin drains to the east into the public right-of-way. The runoff associated with this basin has been coordinated with the Master Report.

Basin P2 consists of landscaping. The basin drains to the east into the public right-of-way. The runoff associated with this basin has been coordinated with the Master Report.

Basin P3 consists of landscaping. The basin drains to the east into the public right-of-way. The runoff associated with this basin has been coordinated with the Master Report.

Basin R1 consists of roof drainage. The roof is captured by roof inlets and then conveyed via Storm Line D to Storm Line C to Storm Line A, outfalling to Pond B.

Basin RA consists of roof drainage. The roof is captured by roof inlets and then conveyed via Storm Line B to Storm Line A, outfalling to Pond B.

Basin R2 consists of roof drainage. The roof is captured by roof inlets and then conveyed via Storm Line B to Storm Line A, outfalling to Pond B.

Basin RB consists of roof drainage. The roof is captured by roof inlets and then conveyed via Storm Line W to Storm Line Z, outfalling to Pond B.

Basin R3 consists of roof drainage. The roof is captured by roof inlets and then conveyed via Storm Line W to Storm Line Z, outfalling to Pond B.

Basin S1 is associated with the southern major basin and primarily consists of existing grade with native seeding. Runoff is conveyed to the southeast where it is captured by a Type D sump inlet (Inlet S1).

Basin S2 is associated with the southern major basin and primarily consists of asphalt drive and landscaping. Runoff is conveyed to the south via swale where it is captured by a Type D sump inlet (Inlet S1).

Basin W1 consists of asphalt parking, concrete sidewalk, and landscaping. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet W1) and then conveyed via Storm Line W to Storm Line Z, outfalling to Pond B.

Basin W2 consists of asphalt parking, concrete sidewalk, and landscaping. The basin drains to the northeast where it is captured by a Double Type 16 Combination sump inlet (Inlet W2) and then conveyed via Storm Line W to Storm Line Z, outfalling to Pond B.

Basin W3 consists of asphalt drive, concrete pads for mechanical equipment, and landscaping. The basin drains to the northeast where it is captured by a Single Type 16 Combination on-grade inlet (Inlet W3) and then conveyed via Storm Line W to Storm Line Z, outfalling to Pond B. Flow bypassing Inlet W3 continues to Inlet W2.

Basin X1 primarily consists of asphalt parking with landscaped islands. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet X1) and then conveyed via Storm Line X to Storm Line Z, outfalling to Pond B.

Basin X2 primarily consists of asphalt parking with landscaped islands. The basin drains to the northeast where it is captured by a Triple Type 16 Combination sump inlet (Inlet X2) and then conveyed via Storm Line X to Storm Line Z, outfalling to Pond B.

Basin Y1 primarily consists of asphalt drive. The basin drains to a low point in the north drive entrance where it is captured by a Double Type 16 Combination sump inlet (Inlet Y1) and then conveyed via Storm Line Y to Storm Line Z, outfalling to Pond B.

Basin Y2 primarily consists existing grade with native seed. The basin drains to the east to a low point adjacent to the north drive entrance where it is captured by a Type D sump inlet (Inlet Y2) and then conveyed via Storm Line Y to Storm Line Z, outfalling to Pond B.

Basin Y3 primarily consists existing grade with native seed and new landscaping. The basin drains to the northeast via swale where it is captured by a Type C sump inlet (Inlet Z03a) and then conveyed via Storm Line Y to Storm Line Z, outfalling to Pond B.

Basin Z01 primarily consists of asphalt parking with landscaped islands. The basin drains to the northeast where it is captured by a Double Type 16 Combination sump inlet (Inlet Z01) and then conveyed via Storm Line Z to Pond B.

Basin Z02 primarily consists of asphalt parking with landscaped islands. The basin drains to the northeast where it is captured by a Double Type 16 Combination sump inlet (Inlet Z02) and then conveyed via Storm Line Z to Pond B.

Basin Z03 primarily consists of concrete loading dock and landscaping. The basin drains to the northeast where the flow is split. Approximately half of the flow is conveyed via curb-cut to a Type C sump inlet (Inlet Z03a) and the other half is captured by a Double Type 16 Combination on-grade inlet (Inlet Z03b) and then conveyed via Storm Line Y to Storm Line Z to Pond B.

Basin Z04 primarily consists of landscaping, crusher fines, and concrete. The basin drains to a low point where it is captured by a Type D sump inlet (Inlet Z04) and then conveyed via Storm Line Z to Pond B.

Basin Z05 primarily consists of landscaping, crusher fines, and concrete. The basin drains to a low point where it is captured by a Type D sump inlet (Inlet Z05) and then conveyed via Storm Line Z to Pond B.

Basin Z06 primarily consists of landscaping, crusher fines, and concrete. The basin drains to a low point where it is captured by a Storm Manhole with a grated lid (Inlet Z06) and then conveyed via Storm Line Z to Pond B.

Basin Z07 primarily consists of landscaping, crusher fines, and concrete. The basin drains to a low point where it is captured by a Type C sump inlet (Inlet Z07) and then conveyed via Storm Line Z to Pond B.

Basin Z08 primarily consists of landscaping, crusher fines, and concrete. The basin drains to a low point where it is captured by a Type D sump inlet (Inlet Z08) and then conveyed via Storm Line Z to Pond B.

Basin Z09 primarily consists of landscaping and concrete sidewalk. The basin drains to a low point where it is captured by a Type D sump inlet (Inlet Z09) and then conveyed via Storm Line Z to Pond B.

Basin Z10 primarily consists of asphalt, concrete, and landscaping. The basin drains to a low point where it is captured by a Double Type 16 sump inlet (Inlet Z10) and then conveyed via Storm Line Z to Pond B.

Basin Z11 primarily consists of asphalt parking and landscaping. The basin drains to the northwest where it is captured by a Double Type 16 sump inlet (Inlet Z11) and then conveyed via Storm Line Z to Pond B.

Basin ZL consists of the concrete loading dock. The basin drains to a trench drain and then conveyed via Storm Line Z to Pond B.

III. DRAINAGE DESIGN CRITERIA

A. Regulations

The drainage design for the site complies with the criteria set forth in the latest editions of the City of Louisville Storm Drainage and Technical Criteria Manual (hereinafter referred to as the "Manual") and the Urban Drainage and Flood Control District/Mile High Flood District Manuals (hereinafter referred to as the "District Manual"). The general drainage patterns/requirements were set by the Master Report. Refer to the Master Report for subsequent compliance with the OSP.

B. Development Criteria Reference and Constraints

The Master Report primarily influenced the drainage design of this site. The Master Report isolated the site via proposed surrounding streets so that the site will not receive any offsite flows. Furthermore, the report provided general guidance for the major drainage patterns/requirements of the site. Specifically, the Master Report divided the site into north and south major basins (similar to the existing conditions). The requirements provided by the Master Report for the northern major basin are that it must drain to a proposed full spectrum detention pond at the northeast corner of the site. The design for the pond is included in this report. With regards to the southern major basin, the Master Report required that the basin drain to a proposed storm sewer outfall stub at the southeast corner of the site.

C. Hydrologic Criteria

Hydrologic calculations were performed in accordance with the Manual and District Manual. Onsite hydrology was performed using the Rational Method to estimate peak runoff discharges for the minor 5-year and major 100-year storm events. Composite runoff coefficients based on land uses were obtained from the District Manual. One-hour point rainfall values obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for Louisville, Colorado were used to determine rainfall intensities based on the time of concentration for overland and concentrated flow. Overland flow routing was performed to determine the peak flow at each storm inlet. Storm sewer routing was performed using Bentley StormCAD.

The full spectrum stormwater detention pond volume and release rates were determined using the MHFD-Detention v4.00 software which implements the Modified Puls reservoir routing method. Full spectrum detention is intended to control peak discharges over the full spectrum of runoff events from small, frequent storms up to the 100-year storm event. By designing the outlet structure to reflect the predevelopment discharge rates for each rainfall event, the full spectrum detention facility closely replicates the shape of the predevelopment hydrographs.

D. Hydraulic Criteria

IV. Drainage Facility Design

A. General Concept

Overall, the proposed drainage patterns will be similar to the existing. The site will be divided into two major basins, north and south. Following the historic drainage patterns, the north and south basins are divided by the ridge along the existing Tape Drive.

The north basin is approximately 70.57 acres and will convey runoff from southwest to northeast over fields, landscaping, and pavement into several inlets located throughout the proposed parking lot. Stormwater will then be conveyed through storm sewer and outfall into a proposed Full Spectrum detention pond at the northeast corner of the site, hereon referred to

as “Pond B.” Detained runoff will then be released at specified rates to offsite storm sewer that will be constructed as part the master development.

The south basin is approximately 19.23 acres and will convey runoff from northwest to southeast primarily over native landscaping and will discharge to offsite storm sewer provided by the master developer. Detention and water quality for the south basin will be provided in the downstream regional pond C-2, per the Master Drainage Report.

B. Specific Details

Pond B

Pond B will provide full spectrum detention and water quality treatment for the north major basin. The pond will match the existing grades to the west and match the proposed grades along the property line to the north and east and the landscaped area to the south. The pond has been designed for a total tributary area of approximately 70.04 acres with a composite imperviousness of 55%. This basin requires a Water Quality Capture Volume (WQCV) of 1.287 acre-feet and an Excess Urban Runoff Volume (EURV) of 3.672 acre-feet. The total required volume is the 100-year detention volume of 6.824 acre-feet. The total volume provided by the pond is 10.11 acre-feet, including 1.41 feet of freeboard storage between the 100-year water surface elevation (WSEL) and emergency overflow spillway crest.

An outlet control structure will control release rates from the pond. The WQCV volume will release through an orifice plate over 40 hours. The EURV will also be released through the orifice plate and will drain over 69 hours. Three CDOT Type D inlets will accept flows exceeding the EURV. An 36-inch RCP pipe with a rectangular restrictor plate will control the 100-year flows to release at less than 0.9 times the predevelopment peak flowrate. The 100-year detention volume will be released over 71 hours. The 36-inch RCP outlet pipe will convey flows east and outfalls into the Rock Creek Tributary I Channel (design by others), per the Nawatny Ridge Master Drainage Report.

An overflow spillway will be provided to discharge runoff volumes that exceed the pond’s capacity. Runoff conveyed through the spillway will discharge east into the adjacent right-of-way. The spillway is sized to convey the 100-year peak flow at a depth of 1.0’. The top of pond elevation will provide 1.0’ of freeboard above the water surface elevation at the overflow spillway.

V. Conclusions

A. Compliance with Standards

This report summarizes the final drainage design for the site improvements associated with the Project 321 Office Campus development. Graphics and supporting calculations associated with the design can be found in the attached appendices. The proposed drainage design has been completed in accordance with the City of Louisville Storm Drainage and Technical Criteria Manual (the "Manual") and the Urban Drainage and Flood Control District Manuals (the "District Manual").

B. Drainage Concept

Detention Pond B will provide full spectrum detention and water quality treatment for the north major basin. Runoff associated with the southern basin will be conveyed offsite to a regional detention pond as part of the Master Report by Harris Kocher Smith.

VI. References

1. Harris Kocher Smith. *Final Master Drainage Report and Filing 1 Final Drainage Report for Nawatny Ridge*. November 15, 2019.

2. City of Louisville *Storm Drainage and Technical Criteria Manual*. Prepared by WHPacific, Inc. August 2013.

3. Urban Drainage and Flood Control District Drainage Criteria Manual Vol. 1, 2, and 3, Latest Revision.

4. Web Soil Survey. Prepared by Natural Resources Conservation Service (NRCS). Downloaded November 2019.

VII. Appendices

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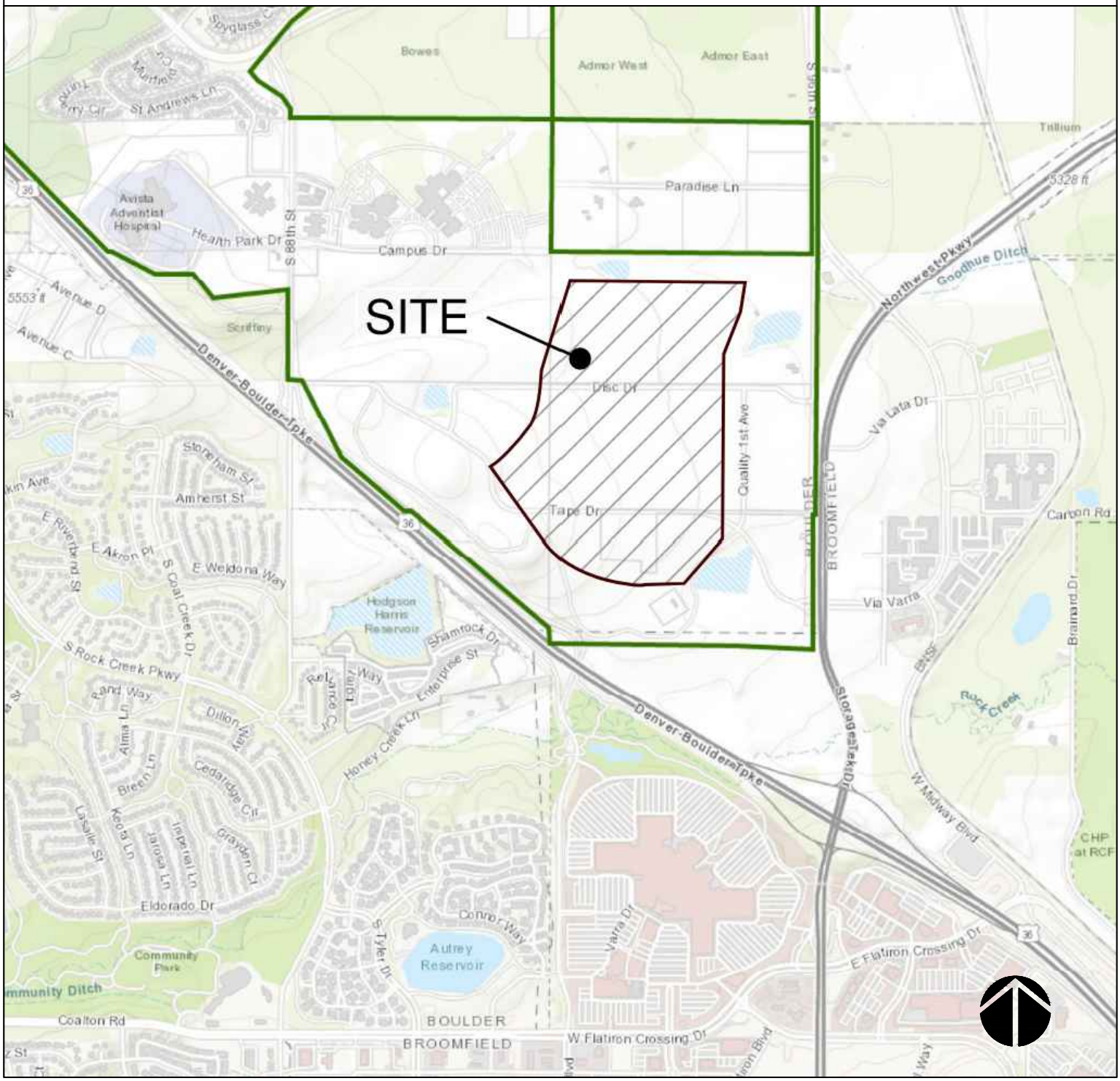
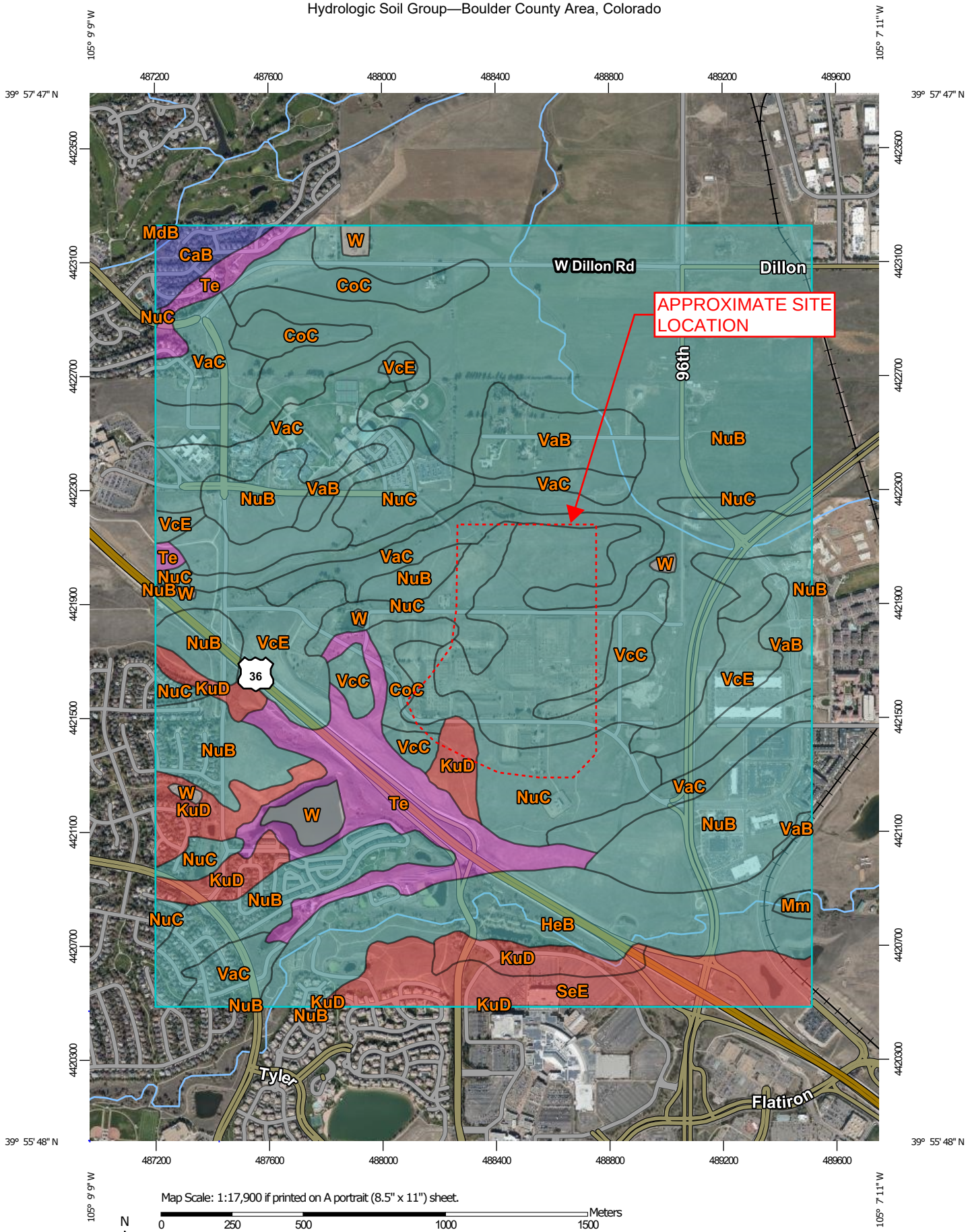
VICINITY MAP - SCALE: 1"=1000'



WEB SOIL SURVEY MAPS
HYDROLOGIC SOIL GROUP


105° 9' 9" W
105° 7' 11" W
39° 57' 47" N
39° 55' 48" N
487200
487600
488000
488400
488800
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489600
4423500
4423100
4422700
4422300
4421900
4421500
4421100
4420700
4420300
W Dillon Rd
Dillon
APPROXIMATE SITE LOCATION
96th
36
Tyler
Flatiron
MdB
CaB
Te
NuC
W
CoC
VaC
VcE
VaB
NuB
VcC
KuD
HeB
SeE
Mm
Map Scale: 1:17,900 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 250 500 1000 1500
Feet
0 500 1000 2000 3000
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 1:20,000.

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: Boulder County Area, Colorado
Survey Area Data: Version 16, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 25, 2018—Apr 9, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaB	Calkins sandy loam, 1 to 3 percent slopes	B	14.8	0.9%
CoC	Colby silty clay loam, 3 to 5 percent slopes	C	49.4	3.1%
HeB	Heldt clay, 0 to 3 percent slopes	C	117.1	7.4%
KuD	Kutch clay loam, 3 to 9 percent slopes	D	69.1	4.4%
MdB	Manter sandy loam, 1 to 3 percent slopes	A	0.5	0.0%
Mm	McClave clay loam	C	2.6	0.2%
NuB	Nunn clay loam, 1 to 3 percent slopes	C	662.1	42.1%
NuC	Nunn clay loam, 3 to 5 percent slopes	C	135.6	8.6%
SeE	Samsil-Shingle complex, 5 to 25 percent slopes	D	65.5	4.2%
Te	Terrace escarpments	A	93.2	5.9%
VaB	Valmont clay loam, 1 to 3 percent slopes	C	79.1	5.0%
VaC	Valmont clay loam, 3 to 5 percent slopes	C	175.9	11.2%
VcC	Valmont cobbly clay loam, 1 to 5 percent slopes	C	27.7	1.8%
VcE	Valmont cobbly clay loam, 5 to 25 percent slopes	C	66.4	4.2%
W	Water		15.2	1.0%
Totals for Area of Interest			**1,574.1**	**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

NOAA ATLAS 14 RAINFALL DEPTHS

NOAA Atlas 14, Volume 8, Version 2
Location name: Louisville, Colorado, USA*
Latitude: 39.9773°, Longitude: -105.1321°
Elevation: 5339.24 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	**0.215** (0.170-0.272)	**0.265** (0.209-0.336)	**0.359** (0.282-0.456)	**0.449** (0.351-0.573)	**0.590** (0.453-0.801)	**0.714** (0.531-0.974)	**0.849** (0.608-1.19)	**1.00** (0.684-1.43)	**1.22** (0.798-1.78)	**1.40** (0.884-2.05)
10-min	**0.315** (0.249-0.399)	**0.388** (0.306-0.492)	**0.525** (0.413-0.668)	**0.657** (0.514-0.839)	**0.864** (0.664-1.17)	**1.05** (0.777-1.43)	**1.24** (0.890-1.74)	**1.46** (1.00-2.09)	**1.78** (1.17-2.61)	**2.05** (1.30-3.00)
15-min	**0.384** (0.304-0.487)	**0.473** (0.374-0.599)	**0.640** (0.504-0.814)	**0.801** (0.627-1.02)	**1.05** (0.810-1.43)	**1.27** (0.948-1.74)	**1.52** (1.09-2.12)	**1.79** (1.22-2.55)	**2.17** (1.43-3.18)	**2.50** (1.58-3.66)
30-min	**0.531** (0.420-0.673)	**0.651** (0.514-0.826)	**0.879** (0.692-1.12)	**1.10** (0.859-1.40)	**1.44** (1.11-1.96)	**1.74** (1.30-2.38)	**2.08** (1.49-2.90)	**2.44** (1.67-3.49)	**2.97** (1.95-4.36)	**3.41** (2.16-5.01)
60-min	**0.653** (0.516-0.827)	**0.803** (0.634-1.02)	**1.09** (0.854-1.38)	**1.35** (1.06-1.73)	**1.78** (1.36-2.41)	**2.14** (1.59-2.92)	**2.54** (1.82-3.55)	**2.99** (2.04-4.27)	**3.63** (2.38-5.31)	**4.16** (2.63-6.10)
2-hr	**0.775** (0.619-0.970)	**0.954** (0.762-1.20)	**1.29** (1.03-1.62)	**1.61** (1.27-2.03)	**2.11** (1.63-2.82)	**2.54** (1.91-3.42)	**3.01** (2.18-4.14)	**3.53** (2.44-4.98)	**4.28** (2.84-6.19)	**4.90** (3.14-7.10)
3-hr	**0.845** (0.679-1.05)	**1.04** (0.836-1.30)	**1.40** (1.12-1.75)	**1.75** (1.39-2.19)	**2.28** (1.77-3.02)	**2.74** (2.07-3.66)	**3.24** (2.35-4.42)	**3.78** (2.63-5.30)	**4.58** (3.05-6.56)	**5.22** (3.36-7.52)
6-hr	**1.02** (0.832-1.26)	**1.25** (1.01-1.54)	**1.66** (1.34-2.05)	**2.05** (1.64-2.53)	**2.64** (2.08-3.45)	**3.15** (2.40-4.15)	**3.70** (2.72-4.99)	**4.31** (3.03-5.95)	**5.18** (3.49-7.33)	**5.89** (3.84-8.37)
12-hr	**1.30** (1.06-1.57)	**1.56** (1.28-1.89)	**2.03** (1.66-2.48)	**2.47** (2.01-3.03)	**3.15** (2.50-4.06)	**3.72** (2.87-4.84)	**4.34** (3.22-5.77)	**5.02** (3.56-6.84)	**5.99** (4.08-8.37)	**6.78** (4.47-9.52)
24-hr	**1.57** (1.30-1.88)	**1.91** (1.58-2.29)	**2.51** (2.07-3.02)	**3.04** (2.49-3.68)	**3.83** (3.05-4.84)	**4.48** (3.47-5.71)	**5.16** (3.86-6.74)	**5.89** (4.22-7.89)	**6.92** (4.75-9.50)	**7.74** (5.16-10.7)
2-day	**1.78** (1.49-2.10)	**2.23** (1.87-2.65)	**3.00** (2.50-3.56)	**3.64** (3.02-4.35)	**4.55** (3.64-5.62)	**5.26** (4.11-6.58)	**5.99** (4.51-7.67)	**6.74** (4.86-8.85)	**7.75** (5.36-10.5)	**8.53** (5.75-11.7)
3-day	**1.94** (1.63-2.28)	**2.40** (2.02-2.83)	**3.18** (2.67-3.75)	**3.84** (3.20-4.55)	**4.76** (3.83-5.84)	**5.49** (4.31-6.82)	**6.23** (4.72-7.92)	**7.00** (5.08-9.13)	**8.04** (5.60-10.8)	**8.84** (6.00-12.0)
4-day	**2.08** (1.76-2.43)	**2.53** (2.14-2.96)	**3.28** (2.76-3.85)	**3.93** (3.29-4.63)	**4.84** (3.92-5.92)	**5.57** (4.41-6.89)	**6.33** (4.82-8.01)	**7.11** (5.19-9.23)	**8.18** (5.74-10.9)	**9.01** (6.15-12.2)
7-day	**2.43** (2.07-2.81)	**2.83** (2.42-3.28)	**3.53** (3.00-4.10)	**4.14** (3.50-4.83)	**5.03** (4.13-6.10)	**5.76** (4.60-7.07)	**6.52** (5.03-8.19)	**7.33** (5.41-9.44)	**8.45** (5.99-11.2)	**9.33** (6.43-12.5)
10-day	**2.72** (2.34-3.13)	**3.12** (2.68-3.60)	**3.81** (3.26-4.40)	**4.42** (3.76-5.12)	**5.31** (4.38-6.39)	**6.03** (4.85-7.35)	**6.79** (5.27-8.47)	**7.60** (5.65-9.72)	**8.73** (6.23-11.5)	**9.62** (6.67-12.8)
20-day	**3.55** (3.08-4.03)	**4.03** (3.50-4.58)	**4.84** (4.18-5.51)	**5.52** (4.74-6.32)	**6.48** (5.38-7.65)	**7.24** (5.87-8.65)	**8.01** (6.27-9.80)	**8.80** (6.60-11.1)	**9.88** (7.12-12.7)	**10.7** (7.51-14.0)
30-day	**4.20** (3.67-4.73)	**4.79** (4.18-5.41)	**5.75** (5.01-6.51)	**6.54** (5.66-7.43)	**7.62** (6.35-8.88)	**8.44** (6.87-9.97)	**9.24** (7.27-11.2)	**10.1** (7.58-12.5)	**11.1** (8.05-14.2)	**11.9** (8.41-15.5)
45-day	**5.00** (4.40-5.60)	**5.74** (5.05-6.43)	**6.92** (6.06-7.77)	**7.86** (6.85-8.86)	**9.12** (7.63-10.5)	**10.0** (8.23-11.8)	**10.9** (8.66-13.1)	**11.8** (8.96-14.5)	**12.9** (9.42-16.3)	**13.7** (9.77-17.7)
60-day	**5.67** (5.01-6.31)	**6.54** (5.77-7.28)	**7.90** (6.95-8.82)	**8.99** (7.86-10.1)	**10.4** (8.76-11.9)	**11.5** (9.43-13.3)	**12.5** (9.91-14.8)	**13.4** (10.2-16.4)	**14.6** (10.7-18.4)	**15.5** (11.1-19.9)

[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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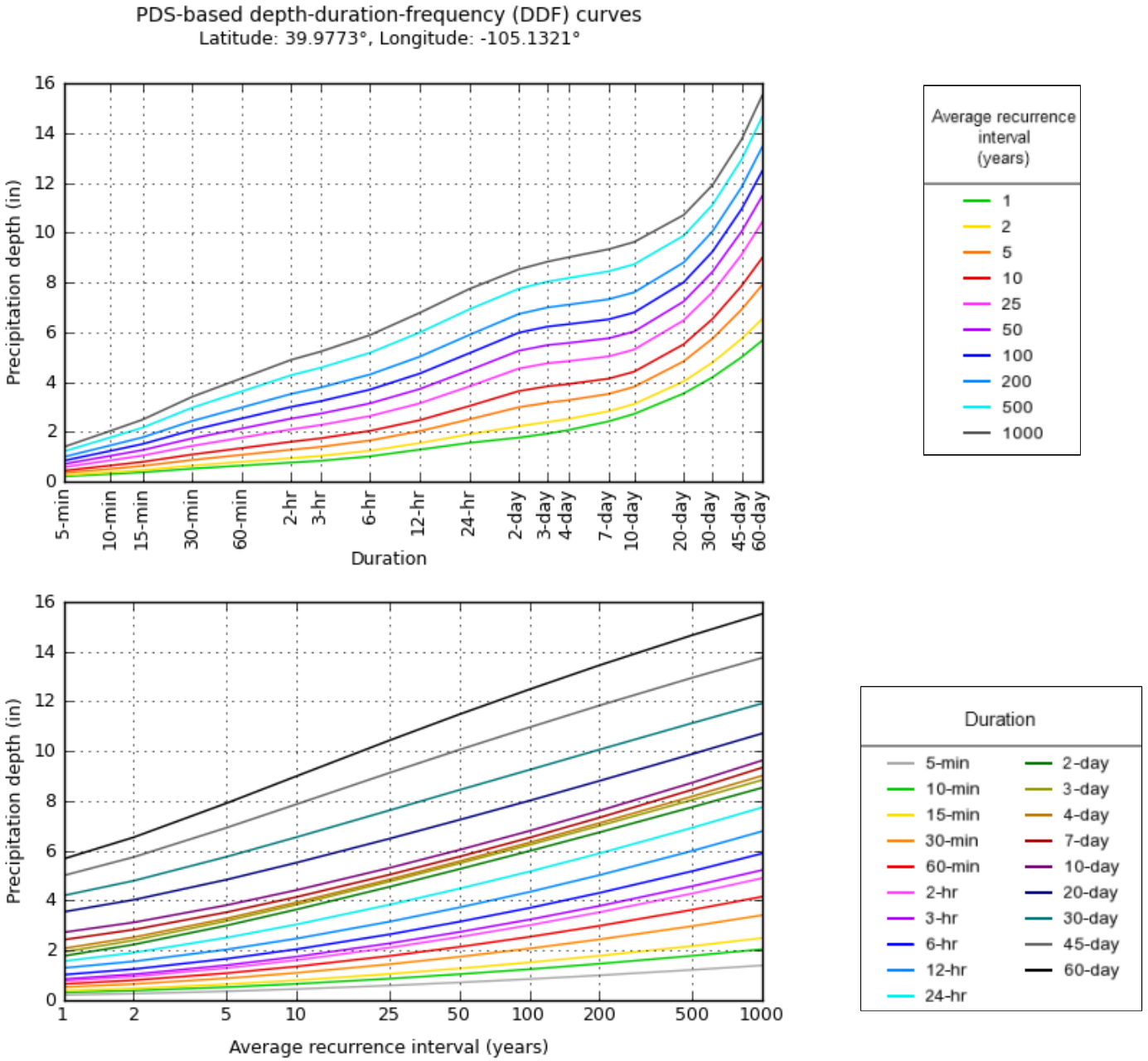
PF graphical



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Created (GMT): Thu Dec 19 21:09:20 2019

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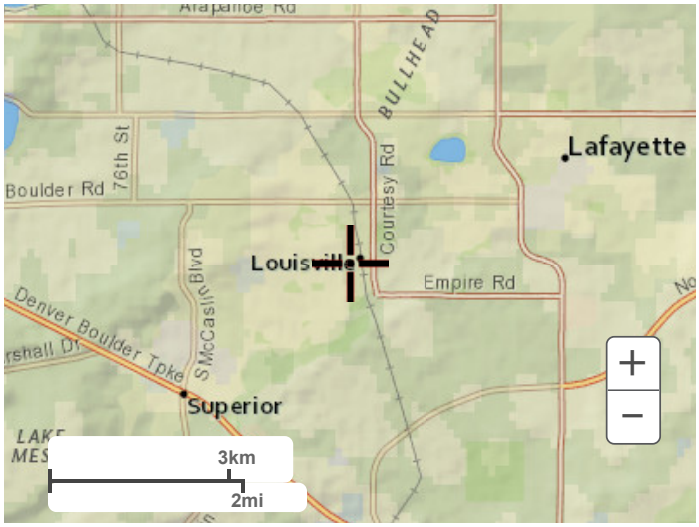
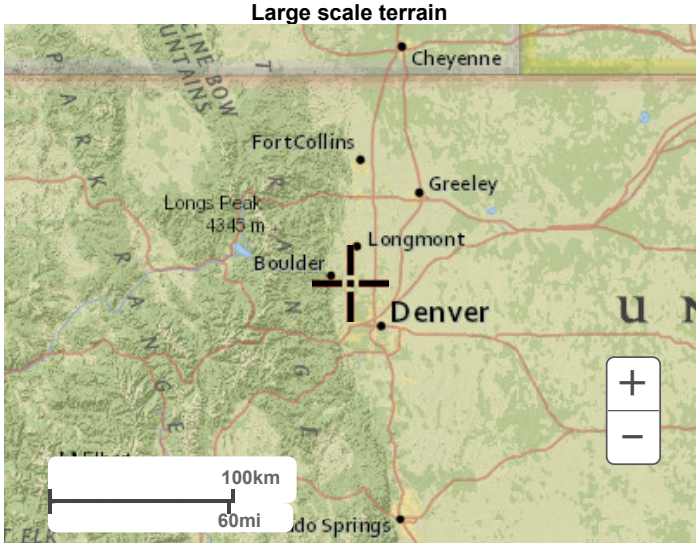
Maps & aerials

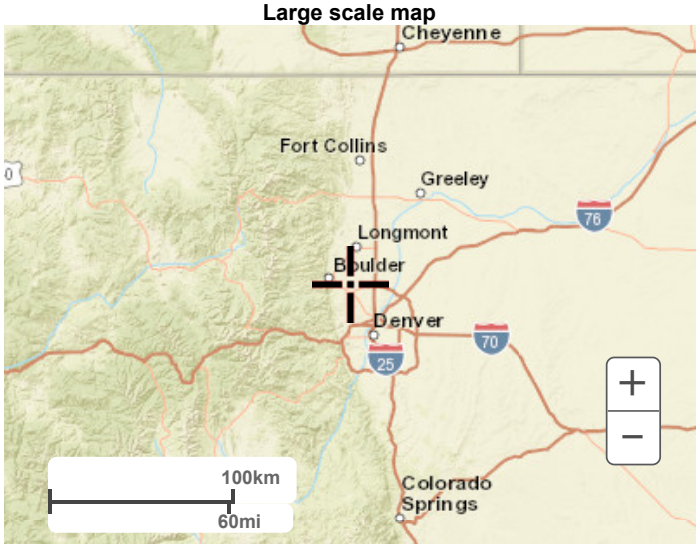
Small scale terrain



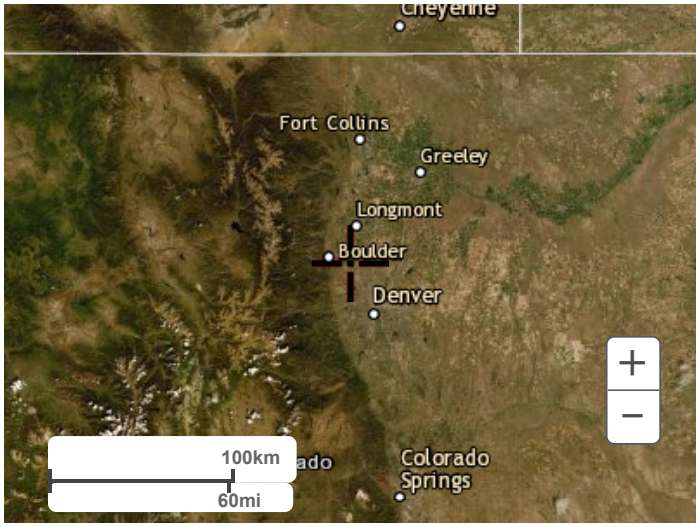
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
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

RATIONAL METHOD
EXISTING CONDITIONS RUNOFF

PROJECT INFORMATION

PROJECT NAME: 321
PROJECT NO: 19.1391
DESIGN BY: MB
REVIEWED BY: MS
JURISDICTION: Louisville
REPORT TYPE: EXISTING
DATE: 12/05/19

MARTIN/MARTIN
CONSULTING ENGINEERS

JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.01	0.05	0.15	0.49	2%
ROOF	0.74	0.77	0.79	0.85	90%
PAVED	0.83	0.85	0.87	0.89	100%
DRIVES AND WALKS	0.74	0.77	0.79	0.85	90%

TOTAL SITE COMPOSITE	89.80	0.04	0.09	0.18	0.51	6.5%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
E-N	PAVED	2.17	0.83	0.85	0.87	0.89	100%
	GRAVEL	0.34	0.30	0.36	0.43	0.65	40%
	LANDSCAPE	67.53	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		70.04	0.03	0.08	0.17	0.51	5.2%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
E-S	PAVED	1.78	0.83	0.85	0.87	0.89	100%
	GRAVEL	0.14	0.30	0.36	0.43	0.65	40%
	LANDSCAPE	17.84	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		19.76	0.07	0.13	0.21	0.53	11.1%

TOTAL SITE COMPOSITE	89.80	0.04	0.09	0.18	0.51	6.5%

CALCULATED BY: MB
CHECKED BY: MS
DATE: 12/05/19

STANDARD FORM SF-2
TIME OF CONCENTRATION SUMMARY
(RATIONAL METHOD PROCEDURE)

19.1391
321

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS) Is Project Urban? No						REMARKS
BASIN	DESIGN POINT	C_5	AREA ac	LENGTH ft	SLOPE ft/ft	t_i min	LENGTH ft	SLOPE ft/ft	C_v	VEL. fps	t_t min	COMP. t_c	TOT. LENGTH ft	SLOPE ft/ft	IMP %	tc First DP	tc min	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
E-N	E-N	0.08	70.04	50	0.0400	8.3	1300	0.0250	7	1.11	19.6	27.8	1350.0	0.03	5.2%	39.2	27.8	
E-S	E-S	0.13	19.76	50	0.0900	6.0	1350	0.0400	7	1.40	16.1	22.1	1400.0	0.04	11.1%	34.8	22.1	

*Velocity (V) = $C_v S_w 0.5$

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, Cv
Heavy Meadow	2.5
Tillage / Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

**Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5*

in which: Cv = Conveyance Coefficient (See Table Above)
Sw = Watercourse Slope (ft/ft)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 12/05/19

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 2-YEAR
ONE-HR PRECIP: 0.8

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
E-N	E-N	70.04	0.03	27.8	2.13	1.31	2.79					
E-S	E-S	19.76	0.07	22.1	1.40	1.49	2.09					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 12/05/19

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 5-YEAR
ONE-HR PRECIP: 1.09

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
E-N	E-N	70.04	0.08	27.8	5.43	1.79	9.70					
E-S	E-S	19.76	0.13	22.1	2.48	2.03	5.04					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 12/05/19

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 10-YEAR
ONE-HR PRECIP: 1.35

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
E-N	E-N	70.04	0.17	27.8	11.93	2.21	26.40					
E-S	E-S	19.76	0.21	22.1	4.22	2.52	10.63					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 12/05/19

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 100-YEAR
ONE-HR PRECIP: 2.54

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
E-N	E-N	70.04	0.51	27.8	35.39	4.16	147.36					
E-S	E-S	19.76	0.53	22.1	10.46	4.74	49.56					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

PROJECT: 321
JOB NO: 19.1391
DATE: 12/05/19

MARTIN/MARTIN CONSULTING ENGINEERS

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
E-N	E-N	70.04	5.2%	0.08	0.51	9.70	147.36
E-S	E-S	19.76	11.1%	0.13	0.53	5.04	49.56
SITE COMPOSITE		**89.80**	**6.5%**	**0.09**	**0.51**	**14.74**	**196.92**

RATIONAL METHOD
PROPOSED CONDITIONS RUNOFF
BASINS A, E, N, S

PROJECT INFORMATION

PROJECT NAME:	321
PROJECT NO:	19.1391
DESIGN BY:	MB
REVIEWED BY:	MS
JURISDICTION:	City of Louisville
REPORT TYPE:	Drainage
DATE:	01/16/20

MARTIN/MARTIN
CONSULTING ENGINEERS

JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.01	0.05	0.15	0.49	2%
ROOF	0.74	0.77	0.79	0.85	90%
PAVED	0.83	0.85	0.87	0.89	100%
DRIVES AND WALKS	0.74	0.77	0.79	0.85	90%

TOTAL SITE COMPOSITE	52.25	0.22	0.26	0.34	0.60	27.9%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
A1	PAVED	1.58	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.11	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		1.69	0.78	0.80	0.82	0.87	93.9%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
A2	PAVED	1.48	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.47	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		1.95	0.62	0.66	0.69	0.80	76.4%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
A3	PAVED	0.71	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.20	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.91	0.64	0.68	0.71	0.81	78.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
A4	PAVED	0.41	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.09	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.50	0.67	0.71	0.74	0.82	82.4%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
A5	PAVED	0.41	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.30	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.71	0.46	0.51	0.56	0.72	58.6%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
A6	PAVED	0.34	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.20	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.54	0.50	0.55	0.60	0.74	63.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
A7	PAVED	1.10	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.74	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**1.84**	0.48	0.53	0.58	0.73	**60.6%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
A8	PAVED	1.18	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	2.29	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**3.47**	0.26	0.32	0.39	0.63	**35.3%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
A9	PAVED	1.12	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.09	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**1.21**	0.77	0.79	0.81	0.86	**92.7%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
A10	PAVED	1.17	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.02	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**1.19**	0.82	0.84	0.85	0.89	**98.4%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
A11	PAVED	3.99	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	2.21	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**6.20**	0.51	0.57	0.61	0.75	**65.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
E1	PAVED	0.14	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.13	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.27**	0.41	0.47	0.52	0.70	**52.8%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
N	LANDSCAPE	11.03	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**11.03**	0.01	0.05	0.15	0.49	**2.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
P1	LANDSCAPE	0.46	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.46**	0.01	0.05	0.15	0.49	**2.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
P2	LANDSCAPE	0.44	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.44**	0.01	0.05	0.15	0.49	**2.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
P3	LANDSCAPE	0.61	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.61**	0.01	0.05	0.15	0.49	**2.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
S1	LANDSCAPE	18.79	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**18.79**	0.01	0.05	0.15	0.49	**2.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
S2	PAVED	0.18	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.26	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.44**	0.32	0.38	0.44	0.66	**42.1%**

TOTAL SITE COMPOSITE	**52.25**	**0.22**	**0.26**	**0.34**	**0.60**	**27.9%**

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-2
TIME OF CONCENTRATION SUMMARY
(RATIONAL METHOD PROCEDURE)

19.1391
321

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS) Is Project Urban? Yes						REMARKS
BASIN	DESIGN POINT	C_5	AREA ac	LENGTH ft	SLOPE ft/ft	t_i min	LENGTH ft	SLOPE ft/ft	C_v	VEL. fps	t_t min	COMP. t_c	TOT. LENGTH ft	SLOPE ft/ft	IMP %	tc First DP	tc min	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
A1	A1	0.80	1.69	100	0.0300	3.8	350	0.0100	20	2.00	2.9	6.7	450.0	0.01	93.9%	12.7	6.7	
A2	A2	0.66	1.95	100	0.0300	5.6	400	0.0100	20	2.00	3.3	8.9	500.0	0.01	76.4%	16.4	8.9	
A3	A3	0.68	0.91	100	0.0300	5.3	250	0.0100	20	2.00	2.1	7.4	350.0	0.02	78.7%	14.7	7.4	
A4	A4	0.71	0.50	100	0.0300	4.9	150	0.0100	20	2.00	1.3	6.2	250.0	0.02	82.4%	13.2	6.2	
A5	A5	0.51	0.71	50	0.0250	5.5	250	0.0300	20	3.46	1.2	6.7	300.0	0.03	58.6%	17.4	6.7	
A6	A6	0.55	0.54	50	0.0300	4.8	200	0.0300	20	3.46	1.0	5.8	250.0	0.03	63.7%	16.2	5.8	
A7	A7	0.53	1.84	100	0.0300	7.2	350	0.0150	20	2.45	2.4	9.6	450.0	0.02	60.6%	18.4	9.6	
A8	A8	0.32	3.47	100	0.0150	12.3	250	0.0200	20	2.83	1.5	13.7	350.0	0.02	35.3%	22.1	13.7	
A9	A9	0.79	1.21	100	0.0200	4.4	250	0.0100	20	2.00	2.1	6.5	350.0	0.01	92.7%	12.1	6.5	
A10	A10	0.84	1.19	100	0.0350	3.1	300	0.0500	20	4.47	1.1	4.3	400.0	0.05	98.4%	10.3	5.0	
A11	A11	0.57	6.20	50	0.0250	5.0	850	0.0400	20	4.00	3.5	8.6	900.0	0.04	65.0%	18.9	8.6	
E1	E1	0.47	0.27	50	0.6500	2.0	100	0.0200	20	2.83	0.6	2.6	150.0	0.23	52.8%	17.7	5.0	
N	N	0.05	11.03	50	0.0550	7.6	900	0.0300	20	3.46	4.3	12.0	950.0	0.03	2.0%	35.0	12.0	
P1	P1	0.05	0.46	35	0.0600	6.2				0.00	0.0	6.2	35.0	0.06	2.0%		6.2	
P2	P2	0.05	0.44	30	0.2200	3.7				0.00	0.0	3.7	30.0	0.22	2.0%		5.0	
P3	P3	0.05	0.61	25	0.1000	4.4				0.00	0.0	4.4	25.0	0.10	2.0%		5.0	
S1	S1	0.05	18.79	50	0.5500	3.6	1350	0.0400	5	1.00	22.5	26.1	1400.0	0.06	2.0%	37.8	26.1	
S2	S2	0.38	0.44	50	0.0200	7.3	150	0.0350	10	1.87	1.3	8.7	200.0	0.03	42.1%	19.7	8.7	

*Velocity (V) = $C_v S_w 0.5$

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, Cv
Heavy Meadow	2.5
Tillage / Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

**Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5*

in which: Cv = Conveyance Coefficient (See Table Above)
Sw = Watercourse Slope (ft/ft)

MARTIN/MARTIN
CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 2-YEAR
ONE-HR PRECIP: 0.8

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A1	A1	1.69	0.78	6.7	1.31	2.50	3.28					
A2	A2	1.95	0.62	8.9	1.20	2.26	2.72					
A3	A3	0.91	0.64	7.4	0.58	2.41	1.40					
A4	A4	0.50	0.67	6.2	0.34	2.55	0.86					
A5	A5	0.71	0.46	6.7	0.33	2.49	0.81					
A6	A6	0.54	0.50	5.8	0.27	2.60	0.71					
A7	A7	1.84	0.48	9.6	0.87	2.20	1.93					
A8	A8	3.47	0.26	13.7	0.90	1.89	1.70					
A9	A9	1.21	0.77	6.5	0.93	2.51	2.33					
A10	A10	1.19	0.82	5.0	0.97	2.71	2.64					
A11	A11	6.20	0.51	8.6	3.19	2.29	7.31					
E1	E1	0.27	0.41	5.0	0.11	2.71	0.30					
N	N	11.03	0.01	12.0	0.11	2.01	0.23					
P1	P1	0.46	0.01	6.2	0.00	2.55	0.01					
P2	P2	0.44	0.01	5.0	0.00	2.71	0.01					
P3	P3	0.61	0.01	5.0	0.01	2.71	0.02					
S1	S1	18.79	0.01	26.1	0.19	1.36	0.26					
S2	S2	0.44	0.32	8.7	0.14	2.28	0.32					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 5-YEAR
ONE-HR PRECIP: 1.09

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A1	A1	1.69	0.80	6.7	1.35	3.40	4.60					
A2	A2	1.95	0.66	8.9	1.28	3.08	3.95					
A3	A3	0.91	0.68	7.4	0.62	3.29	2.02					
A4	A4	0.50	0.71	6.2	0.35	3.48	1.23					
A5	A5	0.71	0.51	6.7	0.36	3.39	1.23					
A6	A6	0.54	0.55	5.8	0.30	3.55	1.06					
A7	A7	1.84	0.53	9.6	0.97	3.00	2.92					
A8	A8	3.47	0.32	13.7	1.12	2.58	2.89					
A9	A9	1.21	0.79	6.5	0.96	3.43	3.28					
A10	A10	1.19	0.84	5.0	1.00	3.70	3.68					
A11	A11	6.20	0.57	8.6	3.50	3.12	10.93					
E1	E1	0.27	0.47	5.0	0.13	3.70	0.46					
N	N	11.03	0.05	12.0	0.57	2.74	1.55					
P1	P1	0.46	0.05	6.2	0.02	3.48	0.08					
P2	P2	0.44	0.05	5.0	0.02	3.70	0.08					
P3	P3	0.61	0.05	5.0	0.03	3.70	0.12					
S1	S1	18.79	0.05	26.1	0.96	1.86	1.79					
S2	S2	0.44	0.38	8.7	0.17	3.11	0.52					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 10-YEAR
ONE-HR PRECIP: 1.35

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A1	A1	1.69	0.82	6.7	1.39	4.21	5.85					
A2	A2	1.95	0.69	8.9	1.35	3.82	5.16					
A3	A3	0.91	0.71	7.4	0.65	4.07	2.63					
A4	A4	0.50	0.74	6.2	0.37	4.31	1.59					
A5	A5	0.71	0.56	6.7	0.40	4.20	1.68					
A6	A6	0.54	0.60	5.8	0.32	4.39	1.42					
A7	A7	1.84	0.58	9.6	1.06	3.72	3.95					
A8	A8	3.47	0.39	13.7	1.36	3.19	4.34					
A9	A9	1.21	0.81	6.5	0.98	4.24	4.18					
A10	A10	1.19	0.85	5.0	1.02	4.58	4.66					
A11	A11	6.20	0.61	8.6	3.78	3.87	14.62					
E1	E1	0.27	0.52	5.0	0.14	4.58	0.64					
N	N	11.03	0.15	12.0	1.62	3.39	5.49					
P1	P1	0.46	0.15	6.2	0.07	4.31	0.29					
P2	P2	0.44	0.15	5.0	0.06	4.58	0.30					
P3	P3	0.61	0.15	5.0	0.09	4.58	0.41					
S1	S1	18.79	0.15	26.1	2.76	2.30	6.33					
S2	S2	0.44	0.44	8.7	0.19	3.86	0.75					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 100-YEAR
ONE-HR PRECIP: 2.54

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A1	A1	1.69	0.87	6.7	1.47	7.92	11.62					
A2	A2	1.95	0.80	8.9	1.55	7.19	11.16					
A3	A3	0.91	0.81	7.4	0.73	7.66	5.62					
A4	A4	0.50	0.82	6.2	0.41	8.11	3.33					
A5	A5	0.71	0.72	6.7	0.51	7.90	4.06					
A6	A6	0.54	0.74	5.8	0.40	8.27	3.32					
A7	A7	1.84	0.73	9.6	1.35	6.99	9.42					
A8	A8	3.47	0.63	13.7	2.18	6.00	13.09					
A9	A9	1.21	0.86	6.5	1.04	7.98	8.34					
A10	A10	1.19	0.89	5.0	1.05	8.62	9.09					
A11	A11	6.20	0.75	8.6	4.65	7.28	33.82					
E1	E1	0.27	0.70	5.0	0.19	8.62	1.63					
N	N	11.03	0.49	12.0	5.43	6.39	34.66					
P1	P1	0.46	0.49	6.2	0.23	8.11	1.84					
P2	P2	0.44	0.49	5.0	0.22	8.62	1.87					
P3	P3	0.61	0.49	5.0	0.30	8.62	2.59					
S1	S1	18.79	0.49	26.1	9.25	4.32	39.98					
S2	S2	0.44	0.66	8.7	0.29	7.25	2.09					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

PROJECT: 321
JOB NO: 19.1391
DATE: 01/16/20

MARTIN/MARTIN CONSULTING ENGINEERS

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
A1	A1	1.69	93.9%	0.80	0.87	4.60	11.62
A2	A2	1.95	76.4%	0.66	0.80	3.95	11.16
A3	A3	0.91	78.7%	0.68	0.81	2.02	5.62
A4	A4	0.50	82.4%	0.71	0.82	1.23	3.33
A5	A5	0.71	58.6%	0.51	0.72	1.23	4.06
A6	A6	0.54	63.7%	0.55	0.74	1.06	3.32
A7	A7	1.84	60.6%	0.53	0.73	2.92	9.42
A8	A8	3.47	35.3%	0.32	0.63	2.89	13.09
A9	A9	1.21	92.7%	0.79	0.86	3.28	8.34
A10	A10	1.19	98.4%	0.84	0.89	3.68	9.09
A11	A11	6.20	65.0%	0.57	0.75	10.93	33.82
E1	E1	0.27	52.8%	0.47	0.70	0.46	1.63
N	N	11.03	2.0%	0.05	0.49	1.55	34.66
P1	P1	0.46	2.0%	0.05	0.49	0.08	1.84
P2	P2	0.44	2.0%	0.05	0.49	0.08	1.87
P3	P3	0.61	2.0%	0.05	0.49	0.12	2.59
S1	S1	18.79	2.0%	0.05	0.49	1.79	39.98
S2	S2	0.44	42.1%	0.38	0.66	0.52	2.09
SITE COMPOSITE		**52.25**	**27.9%**	**0.26**	**0.60**	**42.40**	**197.52**

RATIONAL METHOD
PROPOSED CONDITIONS RUNOFF
BASINS B, C, R, D

PROJECT INFORMATION

PROJECT NAME: 321
PROJECT NO: 19.1391
DESIGN BY: MB
REVIEWED BY: MS
JURISDICTION: City of Louisville
REPORT TYPE: PROPOSED
DATE: 01/16/20

MARTIN/MARTIN CONSULTING ENGINEERS

JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.01	0.05	0.15	0.49	2%
ROOF	0.74	0.77	0.79	0.85	90%
PAVED	0.83	0.85	0.87	0.89	100%
DRIVES AND WALKS	0.74	0.77	0.79	0.85	90%

TOTAL SITE COMPOSITE	7.32	0.66	0.70	0.73	0.82	81.3%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
B1	PAVED	1.09	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.16	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		1.25	0.72	0.75	0.77	0.84	87.5%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
B2	PAVED	0.22	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.06	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.28	0.64	0.68	0.71	0.81	79.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
B3	PAVED	0.46	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.27	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.73	0.50	0.55	0.60	0.74	63.8%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
B4	PAVED	0.31	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.19	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.50	0.49	0.55	0.59	0.74	62.8%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
C1	PAVED	1.01	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.43	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		1.44	0.57	0.61	0.65	0.77	70.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
C2	PAVED	1.60	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.27	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		1.87	0.70	0.73	0.76	0.84	85.9%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
C3	PAVED	1.23	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.02	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**1.25**	0.82	0.84	0.86	0.89	**98.4%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
D1	PAVED	0.20	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.04	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.24**	0.68	0.72	0.75	0.83	**83.7%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
R1	ROOF	0.74	0.74	0.77	0.79	0.85	90%
SUB-BASIN COMPOSITE		**0.74**	0.74	0.77	0.79	0.85	**90.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
R2	ROOF	0.74	0.74	0.77	0.79	0.85	90%
SUB-BASIN COMPOSITE		**0.74**	0.74	0.77	0.79	0.85	**90.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
R3	ROOF	0.71	0.74	0.77	0.79	0.85	90%
SUB-BASIN COMPOSITE		**0.71**	0.74	0.77	0.79	0.85	**90.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
RA	ROOF	0.23	0.74	0.77	0.79	0.85	90%
SUB-BASIN COMPOSITE		**0.23**	0.74	0.77	0.79	0.85	**90.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
RB	ROOF	0.25	0.74	0.77	0.79	0.85	90%
SUB-BASIN COMPOSITE		**0.25**	0.74	0.77	0.79	0.85	**90.0%**

TOTAL SITE COMPOSITE	**10.23**	**0.66**	**0.70**	**0.73**	**0.82**	**81.3%**

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-2
TIME OF CONCENTRATION SUMMARY
(RATIONAL METHOD PROCEDURE)

19.1391
321

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS) Is Project Urban? Yes						REMARKS
BASIN	DESIGN POINT	C_5	AREA ac	LENGTH ft	SLOPE ft/ft	t_i min	LENGTH ft	SLOPE ft/ft	C_v	VEL. fps	t_t min	COMP. t_c	TOT. LENGTH ft	SLOPE ft/ft	IMP %	tc First DP	tc min	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
B1	B1	0.75	1.25	100	0.0300	4.4	250	0.0100	20	2.00	2.1	6.5	350.0	0.02	87.5%	13.1	6.5	
B2	B2	0.68	0.28	50	0.0200	4.3	100	0.0300	20	3.46	0.5	4.8	150.0	0.03	79.0%	13.0	5.0	
B3	B3	0.55	0.73	50	0.0300	4.8	250	0.0200	20	2.83	1.5	6.3	300.0	0.02	63.8%	16.8	6.3	
B4	B4	0.55	0.50	50	0.0250	5.2	300	0.0200	20	2.83	1.8	7.0	350.0	0.02	62.8%	17.3	7.0	
C1	C1	0.61	1.44	50	0.0200	5.0	250	0.0250	20	3.16	1.3	6.3	300.0	0.02	70.7%	15.4	6.3	
C2	C2	0.73	1.87	50	0.0200	3.7	350	0.0200	20	2.83	2.1	5.8	400.0	0.02	85.9%	13.4	5.8	
C3	C3	0.84	1.25	100	0.0450	2.9	250	0.0100	20	2.00	2.1	5.0	350.0	0.02	98.4%	11.1	5.0	
D1	D1	0.72	0.24	50	0.0300	3.4	150	0.0200	20	2.83	0.9	4.3	200.0	0.02	83.7%	12.6	5.0	
R1	R1	0.77	0.74	30	0.0250	2.4	95	0.0500	20	4.47	0.4	2.8	125.0	0.04	90.0%	11.0	5.0	
R2	R2	0.77	0.74	30	0.0350	2.2	95	0.0350	20	3.74	0.4	2.6	125.0	0.04	90.0%	11.1	5.0	
R3	R3	0.77	0.71	30	0.0150	2.9	95	0.0100	20	2.00	0.8	3.7	125.0	0.01	90.0%	11.4	5.0	
RA	RA	0.77	0.23	30	0.0100	3.3	70	0.0100	20	2.00	0.6	3.9	100.0	0.01	90.0%	11.2	5.0	
RB	RB	0.77	0.25	30	0.0100	3.3	70	0.0100	20	2.00	0.6	3.9	100.0	0.01	90.0%	11.2	5.0	

*Velocity (V) = $C_v S_w 0.5$

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, Cv
Heavy Meadow	2.5
Tillage / Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

**Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5*

in which: Cv = Conveyance Coefficient (See Table Above)
Sw = Watercourse Slope (ft/ft)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 2-YEAR
ONE-HR PRECIP: 0.8

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
B1	B1	1.25	0.72	6.5	0.90	2.52	2.26					
B2	B2	0.28	0.64	5.0	0.18	2.71	0.49					
B3	B3	0.73	0.50	6.3	0.37	2.54	0.93					
B4	B4	0.50	0.49	7.0	0.25	2.46	0.61					
C1	C1	1.44	0.57	6.3	0.81	2.54	2.07					
C2	C2	1.87	0.70	5.8	1.31	2.61	3.43					
C3	C3	1.25	0.82	5.0	1.02	2.71	2.78					
D1	D1	0.24	0.68	5.0	0.16	2.71	0.44					
R1	R1	0.74	0.74	5.0	0.55	2.71	1.49					
R2	R2	0.74	0.74	5.0	0.55	2.71	1.49					
R3	R3	0.71	0.74	5.0	0.53	2.71	1.43					
RA	RA	0.23	0.74	5.0	0.17	2.71	0.46					
RB	RB	0.25	0.74	5.0	0.19	2.71	0.50					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 5-YEAR
ONE-HR PRECIP: 1.09

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
B1	B1	1.25	0.75	6.5	0.93	3.43	3.20					
B2	B2	0.28	0.68	5.0	0.19	3.70	0.70					
B3	B3	0.73	0.55	6.3	0.40	3.46	1.40					
B4	B4	0.50	0.55	7.0	0.27	3.35	0.92					
C1	C1	1.44	0.61	6.3	0.88	3.47	3.05					
C2	C2	1.87	0.73	5.8	1.37	3.55	4.88					
C3	C3	1.25	0.84	5.0	1.05	3.70	3.87					
D1	D1	0.24	0.72	5.0	0.17	3.70	0.64					
R1	R1	0.74	0.77	5.0	0.57	3.70	2.10					
R2	R2	0.74	0.77	5.0	0.57	3.70	2.10					
R3	R3	0.71	0.77	5.0	0.55	3.70	2.02					
RA	RA	0.23	0.77	5.0	0.18	3.70	0.65					
RB	RB	0.25	0.77	5.0	0.19	3.70	0.71					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 10-YEAR
ONE-HR PRECIP: 1.35

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
B1	B1	1.25	0.77	6.5	0.97	4.25	4.11					
B2	B2	0.28	0.71	5.0	0.20	4.58	0.91					
B3	B3	0.73	0.60	6.3	0.44	4.29	1.88					
B4	B4	0.50	0.59	7.0	0.30	4.15	1.23					
C1	C1	1.44	0.65	6.3	0.94	4.29	4.03					
C2	C2	1.87	0.76	5.8	1.43	4.40	6.28					
C3	C3	1.25	0.86	5.0	1.07	4.58	4.90					
D1	D1	0.24	0.75	5.0	0.18	4.58	0.82					
R1	R1	0.74	0.79	5.0	0.59	4.58	2.69					
R2	R2	0.74	0.79	5.0	0.59	4.58	2.69					
R3	R3	0.71	0.79	5.0	0.56	4.58	2.58					
RA	RA	0.23	0.79	5.0	0.18	4.58	0.84					
RB	RB	0.25	0.79	5.0	0.20	4.58	0.91					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 100-YEAR
ONE-HR PRECIP: 2.54

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
B1	B1	1.25	0.84	6.5	1.05	7.99	8.41					
B2	B2	0.28	0.81	5.0	0.23	8.62	1.95					
B3	B3	0.73	0.74	6.3	0.54	8.06	4.38					
B4	B4	0.50	0.74	7.0	0.37	7.81	2.89					
C1	C1	1.44	0.77	6.3	1.11	8.08	9.00					
C2	C2	1.87	0.84	5.8	1.56	8.28	12.93					
C3	C3	1.25	0.89	5.0	1.11	8.62	9.55					
D1	D1	0.24	0.83	5.0	0.20	8.62	1.71					
R1	R1	0.74	0.85	5.0	0.63	8.62	5.43					
R2	R2	0.74	0.85	5.0	0.63	8.62	5.43					
R3	R3	0.71	0.85	5.0	0.60	8.62	5.21					
RA	RA	0.23	0.85	5.0	0.20	8.62	1.69					
RB	RB	0.25	0.85	5.0	0.21	8.62	1.84					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

PROJECT: 321
JOB NO: 19.1391
DATE: 01/16/20

MARTIN/MARTIN
CONSULTING ENGINEERS

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
B1	B1	1.25	87.5%	0.75	0.84	3.20	8.41
B2	B2	0.28	79.0%	0.68	0.81	0.70	1.95
B3	B3	0.73	63.8%	0.55	0.74	1.40	4.38
B4	B4	0.50	62.8%	0.55	0.74	0.92	2.89
C1	C1	1.44	70.7%	0.61	0.77	3.05	9.00
C2	C2	1.87	85.9%	0.73	0.84	4.88	12.93
C3	C3	1.25	98.4%	0.84	0.89	3.87	9.55
D1	D1	0.24	83.7%	0.72	0.83	0.64	1.71
R1	R1	0.74	90.0%	0.77	0.85	2.10	5.43
R2	R2	0.74	90.0%	0.77	0.85	2.10	5.43
R3	R3	0.71	90.0%	0.77	0.85	2.02	5.21
RA	RA	0.23	90.0%	0.77	0.85	0.65	1.69
RB	RB	0.25	90.0%	0.77	0.85	0.71	1.84
SITE COMPOSITE		**10.23**	**81.3%**	**0.70**	**0.82**	**26.25**	**70.42**

RATIONAL METHOD
PROPOSED CONDITIONS RUNOFF
BASINS W, X, Y

PROJECT INFORMATION

PROJECT NAME:	321
PROJECT NO:	19.1391
DESIGN BY:	MB
REVIEWED BY:	MS
JURISDICTION:	City of Louisville
REPORT TYPE:	PROPOSED
DATE:	01/16/20

MARTIN/MARTIN
CONSULTING ENGINEERS

JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.01	0.05	0.15	0.49	2%
ROOF	0.74	0.77	0.79	0.85	90%
PAVED	0.83	0.85	0.87	0.89	100%
DRIVES AND WALKS	0.74	0.77	0.79	0.85	90%

TOTAL SITE COMPOSITE	7.62	0.41	0.44	0.50	0.69	49.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
W1	PAVED	0.91	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.13	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		1.04	0.72	0.75	0.78	0.84	87.8%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
W2	PAVED	0.52	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.11	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.63	0.68	0.71	0.74	0.82	82.9%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
W3	PAVED	0.13	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.07	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.20	0.52	0.57	0.61	0.75	65.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
X1	PAVED	0.87	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.09	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.96	0.75	0.78	0.80	0.86	90.9%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
X2	PAVED	0.88	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.09	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.97	0.75	0.78	0.80	0.86	91.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
Y1	PAVED	0.40	0.83	0.85	0.87	0.89	100%
SUB-BASIN COMPOSITE		0.40	0.83	0.85	0.87	0.89	100.0%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
Y2	LANDSCAPE	3.42	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**3.42**	0.01	0.05	0.15	0.49	**2.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
Y3	PAVED	0.02	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	4.37	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**4.39**	0.01	0.05	0.15	0.49	**2.4%**

TOTAL SITE COMPOSITE	**12.01**	**0.41**	**0.44**	**0.50**	**0.69**	**49.7%**

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-2
TIME OF CONCENTRATION SUMMARY
(RATIONAL METHOD PROCEDURE)

19.1391
321

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS) Is Project Urban? Yes						REMARKS
BASIN	DESIGN POINT	C_5	AREA ac	LENGTH ft	SLOPE ft/ft	t_i min	LENGTH ft	SLOPE ft/ft	C_v	VEL. fps	t_t min	COMP. t_c	TOT. LENGTH ft	SLOPE ft/ft	IMP %	tc First DP	tc min	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
W1	W1	0.75	1.04	50	0.0100	4.5	300	0.0250	20	3.16	1.6	6.0	350.0	0.02	87.8%	12.6	6.0	
W2	W2	0.71	0.63	50	0.0300	3.5	200	0.0100	20	2.00	1.7	5.1	250.0	0.01	82.9%	13.5	5.1	
W3	W3	0.57	0.20	75	0.0100	8.3				0.00	0.0	8.3	75.0	0.01	65.7%		8.3	
X1	X1	0.78	0.96	100	0.0350	3.9	200	0.0100	20	2.00	1.7	5.5	300.0	0.02	90.9%	12.1	5.5	
X2	X2	0.78	0.97	100	0.0350	3.9	200	0.0100	20	2.00	1.7	5.5	300.0	0.02	91.0%	12.1	5.5	
Y1	Y1	0.85	0.40	50	0.0200	2.5	200	0.0200	20	2.83	1.2	3.7	250.0	0.02	100.0%	10.0	5.0	
Y2	Y2	0.05	3.42	50	0.0400	8.5	550	0.0100	5	0.50	18.3	26.8	600.0	0.01	2.0%	35.5	26.8	
Y3	Y3	0.05	4.39	50	0.0250	9.9	600	0.0200	5	0.71	14.1	24.0	650.0	0.02	2.4%	33.2	24.0	

*Velocity (V) = $C_v S_w 0.5$

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, Cv
Heavy Meadow	2.5
Tillage / Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

**Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5*

in which: Cv = Conveyance Coefficient (See Table Above)
Sw = Watercourse Slope (ft/ft)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 2-YEAR
ONE-HR PRECIP: 0.8

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
W1	W1	1.04	0.72	6.0	0.75	2.57	1.93					
W2	W2	0.63	0.68	5.1	0.43	2.70	1.15					
W3	W3	0.20	0.52	8.3	0.10	2.32	0.24					
X1	X1	0.96	0.75	5.5	0.72	2.64	1.90					
X2	X2	0.97	0.75	5.5	0.73	2.64	1.92					
Y1	Y1	0.40	0.83	5.0	0.33	2.71	0.91					
Y2	Y2	3.42	0.01	26.8	0.04	1.34	0.05					
Y3	Y3	4.39	0.01	24.0	0.06	1.43	0.08					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 5-YEAR
ONE-HR PRECIP: 1.09

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
W1	W1	1.04	0.75	6.0	0.78	3.51	2.74					
W2	W2	0.63	0.71	5.1	0.45	3.67	1.64					
W3	W3	0.20	0.57	8.3	0.11	3.16	0.36					
X1	X1	0.96	0.78	5.5	0.74	3.60	2.68					
X2	X2	0.97	0.78	5.5	0.75	3.60	2.71					
Y1	Y1	0.40	0.85	5.0	0.34	3.70	1.26					
Y2	Y2	3.42	0.05	26.8	0.18	1.83	0.32					
Y3	Y3	4.39	0.05	24.0	0.24	1.94	0.47					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 10-YEAR
ONE-HR PRECIP: 1.35

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
W1	W1	1.04	0.78	6.0	0.81	4.34	3.51					
W2	W2	0.63	0.74	5.1	0.47	4.55	2.12					
W3	W3	0.20	0.61	8.3	0.12	3.92	0.48					
X1	X1	0.96	0.80	5.5	0.77	4.45	3.42					
X2	X2	0.97	0.80	5.5	0.78	4.46	3.46					
Y1	Y1	0.40	0.87	5.0	0.35	4.58	1.59					
Y2	Y2	3.42	0.15	26.8	0.50	2.26	1.13					
Y3	Y3	4.39	0.15	24.0	0.66	2.41	1.58					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 100-YEAR
ONE-HR PRECIP: 2.54

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
W1	W1	1.04	0.84	6.0	0.88	8.17	7.16					
W2	W2	0.63	0.82	5.1	0.52	8.56	4.44					
W3	W3	0.20	0.75	8.3	0.15	7.38	1.11					
X1	X1	0.96	0.86	5.5	0.82	8.38	6.89					
X2	X2	0.97	0.86	5.5	0.83	8.38	6.96					
Y1	Y1	0.40	0.89	5.0	0.36	8.62	3.08					
Y2	Y2	3.42	0.49	26.8	1.68	4.25	7.16					
Y3	Y3	4.39	0.49	24.0	2.17	4.53	9.82					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

PROJECT: 321
JOB NO: 19.1391
DATE: 01/16/20

MARTIN/MARTIN CONSULTING ENGINEERS

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
W1	W1	1.04	87.8%	0.75	0.84	2.74	7.16
W2	W2	0.63	82.9%	0.71	0.82	1.64	4.44
W3	W3	0.20	65.7%	0.57	0.75	0.36	1.11
X1	X1	0.96	90.9%	0.78	0.86	2.68	6.89
X2	X2	0.97	91.0%	0.78	0.86	2.71	6.96
Y1	Y1	0.40	100.0%	0.85	0.89	1.26	3.08
Y2	Y2	3.42	2.0%	0.05	0.49	0.32	7.16
Y3	Y3	4.39	2.4%	0.05	0.49	0.47	9.82
SITE COMPOSITE		**12.01**	**49.7%**	**0.44**	**0.69**	**12.18**	**46.62**

RATIONAL METHOD
PROPOSED CONDITIONS RUNOFF
BASIN Z

PROJECT INFORMATION

PROJECT NAME: 321
PROJECT NO: 19.1391
DESIGN BY: MB
REVIEWED BY: MS
JURISDICTION: City of Louisville
REPORT TYPE: Drainage
DATE: 01/16/20

MARTIN/MARTIN
CONSULTING ENGINEERS

JURISDICTIONAL STANDARD	C2	C5	C10	C100	% IMPERV
LANDSCAPE	0.01	0.05	0.15	0.49	2%
ROOF	0.74	0.77	0.79	0.85	90%
PAVED	0.83	0.85	0.87	0.89	100%
DRIVES AND WALKS	0.74	0.77	0.79	0.85	90%

TOTAL SITE COMPOSITE	15.27	0.28	0.33	0.40	0.63	35.8%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
Z01	PAVED	0.58	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.07	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.65	0.74	0.76	0.79	0.85	89.4%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
Z02	PAVED	0.66	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.12	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.78	0.69	0.73	0.76	0.83	84.9%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
Z03	PAVED	0.44	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.07	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		0.51	0.71	0.74	0.77	0.84	86.5%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
Z04	PAVED	0.25	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	1.38	0.01	0.05	0.15	0.49	2%
	GRAVEL	0.05	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		1.68	0.12	0.18	0.26	0.56	17.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
Z05	PAVED	0.10	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	2.07	0.01	0.05	0.15	0.49	2%
	GRAVEL	0.01	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		2.18	0.04	0.09	0.18	0.51	6.7%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA (ACRES)	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	PERCENT IMPERVIOUSNESS
Z06	PAVED	0.17	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	2.84	0.01	0.05	0.15	0.49	2%
	GRAVEL	0.12	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		3.13	0.05	0.11	0.20	0.52	8.8%

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
Z07	PAVED	0.04	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.28	0.01	0.05	0.15	0.49	2%
	GRAVEL	0.04	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		**0.36**	0.12	0.17	0.26	0.55	**17.1%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
Z08	PAVED	0.11	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	1.26	0.01	0.05	0.15	0.49	2%
	GRAVEL	0.10	0.30	0.36	0.43	0.65	40%
SUB-BASIN COMPOSITE		**1.47**	0.08	0.13	0.22	0.53	**11.9%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
Z09	PAVED	1.64	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.91	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**2.54**	0.51	0.57	0.61	0.75	**65.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
Z10	PAVED	0.63	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.35	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.98**	0.51	0.56	0.61	0.75	**65.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
Z11	PAVED	0.62	0.83	0.85	0.87	0.89	100%
	LANDSCAPE	0.34	0.01	0.05	0.15	0.49	2%
SUB-BASIN COMPOSITE		**0.96**	0.51	0.56	0.61	0.75	**65.0%**

SUB-BASIN	SURFACE CHARACTERISTICS	AREA	COMPOSITE RUNOFF COEFFICIENTS				PERCENT IMPERVIOUSNESS
		(ACRES)	C2	C5	C10	C100	
ZL	PAVED	0.03	0.83	0.85	0.87	0.89	100%
SUB-BASIN COMPOSITE		**0.03**	0.83	0.85	0.87	0.89	**100.0%**

TOTAL SITE COMPOSITE	**15.27**	**0.28**	**0.33**	**0.40**	**0.63**	**35.8%**

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-2
TIME OF CONCENTRATION SUMMARY
(RATIONAL METHOD PROCEDURE)

19.1391
321

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS) Is Project Urban? Yes						REMARKS
BASIN	DESIGN POINT	C_5	AREA ac	LENGTH ft	SLOPE ft/ft	t_i min	LENGTH ft	SLOPE ft/ft	C_v	VEL. fps	t_t min	COMP. t_c	TOT. LENGTH ft	SLOPE ft/ft	IMP %	tc First DP	tc min	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
Z01	Z01	0.76	0.65	100	0.0300	4.2	150	0.0100	20	2.00	1.3	5.5	250.0	0.02	89.4%	12.0	5.5	
Z02	Z02	0.73	0.78	25	0.0900	1.6	275	0.0250	20	3.16	1.4	3.1	300.0	0.03	84.9%	13.0	5.0	
Z03	Z03	0.74	0.51	100	0.0200	5.2	100	0.0200	20	2.83	0.6	5.8	200.0	0.02	86.5%	11.8	5.8	
Z04	Z04	0.18	1.68	50	0.0300	8.2	350	0.0300	5	0.87	6.7	14.9	400.0	0.03	17.7%	25.9	14.9	
Z05	Z05	0.09	2.18	50	0.0200	10.3	400	0.0800	5	1.41	4.7	15.0	450.0	0.07	6.7%	27.2	15.0	
Z06	Z06	0.11	3.13	50	0.0700	6.7	500	0.0400	5	1.00	8.3	15.0	550.0	0.04	8.8%	28.6	15.0	
Z07	Z07	0.17	0.36	50	0.0400	7.5	125	0.0400	7	1.40	1.5	9.0	175.0	0.04	17.1%	24.0	9.0	
Z08	Z08	0.13	1.47	50	0.0350	8.2	300	0.0600	7	1.71	2.9	11.1	350.0	0.06	11.9%	25.9	11.1	
Z09	Z09	0.57	2.54	50	0.0100	6.8	300	0.0600	7	1.71	2.9	9.7	350.0	0.05	65.0%	16.1	9.7	
Z10	Z10	0.56	0.98	50	0.0150	6.0	450	0.0500	10	2.24	3.4	9.3	500.0	0.05	65.0%	16.8	9.3	
Z11	Z11	0.56	0.96	50	0.0100	6.8	500	0.0600	10	2.45	3.4	10.2	550.0	0.06	65.0%	16.8	10.2	
ZL	ZL	0.85	0.03	50	0.0900	1.5				0.00	0.0	1.5	50.0	0.09	100.0%		5.0	

*Velocity (V) = $C_v S_w 0.5$

TABLE 6-2

Type of Land Surface	Conveyance Coefficient, Cv
Heavy Meadow	2.5
Tillage / Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

**Table 6-2, UDFCD (V.1), Chapter 6, Page 6-5*

in which: Cv = Conveyance Coefficient (See Table Above)
Sw = Watercourse Slope (ft/ft)

MARTIN/MARTIN
CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 2-YEAR
ONE-HR PRECIP: 0.8

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Z01	Z01	0.65	0.74	5.5	0.48	2.65	1.27					
Z02	Z02	0.78	0.69	5.0	0.54	2.71	1.47					
Z03	Z03	0.51	0.71	5.8	0.36	2.61	0.94					
Z04	Z04	1.68	0.12	14.9	0.20	1.82	0.37					
Z05	Z05	2.18	0.04	15.0	0.09	1.82	0.16					
Z06	Z06	3.13	0.05	15.0	0.17	1.82	0.31					
Z07	Z07	0.36	0.12	9.0	0.04	2.26	0.09					
Z08	Z08	1.47	0.08	11.1	0.11	2.08	0.23					
Z09	Z09	2.54	0.51	9.7	1.31	2.19	2.86					
Z10	Z10	0.98	0.51	9.3	0.50	2.22	1.12					
Z11	Z11	0.96	0.51	10.2	0.50	2.14	1.06					
ZL	ZL	0.03	0.83	5.0	0.03	2.71	0.07					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 5-YEAR
ONE-HR PRECIP: 1.09

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Z01	Z01	0.65	0.76	5.5	0.50	3.61	1.79					
Z02	Z02	0.78	0.73	5.0	0.57	3.70	2.10					
Z03	Z03	0.51	0.74	5.8	0.38	3.56	1.34					
Z04	Z04	1.68	0.18	14.9	0.30	2.48	0.75					
Z05	Z05	2.18	0.09	15.0	0.19	2.48	0.48					
Z06	Z06	3.13	0.11	15.0	0.33	2.47	0.83					
Z07	Z07	0.36	0.17	9.0	0.06	3.07	0.19					
Z08	Z08	1.47	0.13	11.1	0.19	2.83	0.55					
Z09	Z09	2.54	0.57	9.7	1.44	2.98	4.28					
Z10	Z10	0.98	0.56	9.3	0.55	3.03	1.68					
Z11	Z11	0.96	0.56	10.2	0.54	2.92	1.59					
ZL	ZL	0.03	0.85	5.0	0.03	3.70	0.09					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 10-YEAR
ONE-HR PRECIP: 1.35

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Z01	Z01	0.65	0.79	5.5	0.51	4.47	2.29					
Z02	Z02	0.78	0.76	5.0	0.59	4.58	2.70					
Z03	Z03	0.51	0.77	5.8	0.39	4.41	1.73					
Z04	Z04	1.68	0.26	14.9	0.44	3.07	1.35					
Z05	Z05	2.18	0.18	15.0	0.39	3.07	1.21					
Z06	Z06	3.13	0.20	15.0	0.62	3.06	1.88					
Z07	Z07	0.36	0.26	9.0	0.09	3.81	0.35					
Z08	Z08	1.47	0.22	11.1	0.32	3.50	1.13					
Z09	Z09	2.54	0.61	9.7	1.55	3.69	5.72					
Z10	Z10	0.98	0.61	9.3	0.60	3.75	2.24					
Z11	Z11	0.96	0.61	10.2	0.59	3.62	2.13					
ZL	ZL	0.03	0.87	5.0	0.03	4.58	0.12					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

CALCULATED BY: MB
CHECKED BY: MS
DATE: 01/16/20

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: 19.1391
PROJECT: 321
DESIGN STORM: 100-YEAR
ONE-HR PRECIP: 2.54

BASIN	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				REMARKS
		AREA (AC)	RUNOFF COEFF	t_c (MIN)	CxA (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S(CxA) (AC)	I (IN/HR)	Q (CFS)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Z01	Z01	0.65	0.85	5.5	0.55	8.41	4.64					
Z02	Z02	0.78	0.83	5.0	0.65	8.62	5.59					
Z03	Z03	0.51	0.84	5.8	0.43	8.29	3.54					
Z04	Z04	1.68	0.56	14.9	0.93	5.78	5.41					
Z05	Z05	2.18	0.51	15.0	1.11	5.77	6.43					
Z06	Z06	3.13	0.52	15.0	1.63	5.77	9.38					
Z07	Z07	0.36	0.55	9.0	0.20	7.16	1.43					
Z08	Z08	1.47	0.53	11.1	0.78	6.59	5.16					
Z09	Z09	2.54	0.75	9.7	1.91	6.94	13.23					
Z10	Z10	0.98	0.75	9.3	0.73	7.06	5.19					
Z11	Z11	0.96	0.75	10.2	0.72	6.81	4.92					
ZL	ZL	0.03	0.89	5.0	0.03	8.62	0.23					

I. One-Hr Precipitation Values from NOAA Atlas 14 PFDS

Return Period:	2-YEAR	5-YEAR	10-YEAR	100-YEAR
Depth In Inches:	0.80	1.09	1.35	2.54

**Equation 5-1, UDFCD (V.1), Chapter 5, Page 5-9*

*Rainfall Intensity: $$I = \frac{(28.5 \times P1)}{(10 + t_c)^{0.786}}$$

In Which:
I = Rainfall Intensity (Inches Per Hour)
P1 = 1-Hour Point Rainfall Depth (Inches)
tc = Time Of Concentration (Minutes)

MARTIN/MARTIN CONSULTING ENGINEERS

PROJECT: 321
JOB NO: 19.1391
DATE: 01/16/20

MARTIN/MARTIN CONSULTING ENGINEERS

RUNOFF SUMMARY							
BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
Z01	Z01	0.65	89.4%	0.76	0.85	1.79	4.64
Z02	Z02	0.78	84.9%	0.73	0.83	2.10	5.59
Z03	Z03	0.51	86.5%	0.74	0.84	1.34	3.54
Z04	Z04	1.68	17.7%	0.18	0.56	0.75	5.41
Z05	Z05	2.18	6.7%	0.09	0.51	0.48	6.43
Z06	Z06	3.13	8.8%	0.11	0.52	0.83	9.38
Z07	Z07	0.36	17.1%	0.17	0.55	0.19	1.43
Z08	Z08	1.47	11.9%	0.13	0.53	0.55	5.16
Z09	Z09	2.54	65.0%	0.57	0.75	4.28	13.23
Z10	Z10	0.98	65.0%	0.56	0.75	1.68	5.19
Z11	Z11	0.96	65.0%	0.56	0.75	1.59	4.92
ZL	ZL	0.03	100.0%	0.85	0.89	0.09	0.23
SITE COMPOSITE		**15.27**	**35.8%**	**0.33**	**0.63**	**15.67**	**65.16**

OVERALL IMPERVIOUSNESS ANALYSIS
BASINS TRIBUTARY TO POND B

CONTRIBUTING BASINS FOR NORTH DETENTION POND	AREA (AC)	%
A1	1.69	93.9%
A2	1.95	76.4%
A3	0.91	78.7%
A4	0.50	82.4%
A5	0.71	58.6%
A6	0.54	63.7%
A7	1.84	60.6%
A8	3.47	35.3%
A9	1.21	92.7%
A10	1.19	98.4%
A11	6.20	65.0%
E1	0.27	52.8%
N	11.03	2.0%
B1	1.25	87.5%
B2	0.28	79.0%
B3	0.73	63.8%
B4	0.50	62.8%
C1	1.44	70.7%
C2	1.87	85.9%
C3	1.25	98.4%
D1	0.24	83.7%
R1	0.74	90.0%
R2	0.74	90.0%
R3	0.71	90.0%
RA	0.23	90.0%
RB	0.25	90.0%
W1	1.04	87.8%
W2	0.63	82.9%
W3	0.20	65.7%
X1	0.96	90.9%
X2	0.97	91.0%
Y1	0.40	100.0%
Y2	3.42	2.0%
Y3	4.39	2.4%
Z01	0.65	89.4%
Z02	0.78	84.9%
Z03	0.51	86.5%
Z04	1.68	17.7%
Z05	2.18	6.7%
Z06	3.13	8.8%
Z07	0.36	17.1%
Z08	1.47	11.9%
Z09	2.54	65.0%
Z10	0.98	65.0%
Z11	0.96	65.0%
ZL	0.03	100.0%
SITE COMPOSITE	69.01	46.4%

UD-INLET SPREADSHEETS

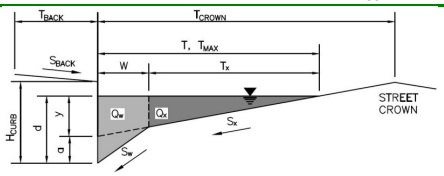
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A11



Gutter Geometry (Enter data in the blue cells)

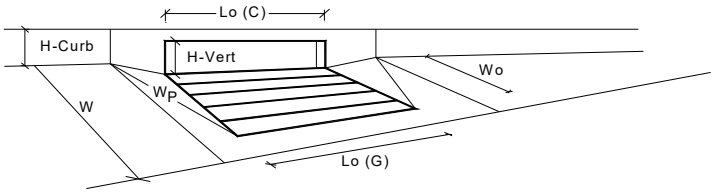
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	20.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.190	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	10.00	ft
Street Transverse Slope	S_X =	0.170	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.030	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	50.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	48.0	58.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type C Grate		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	44.4	58.0	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92	feet
Width of a Unit Grate		W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	3.656	4.790	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	1.00	1.00	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**30.7**	**35.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	10.9	33.8	cfs

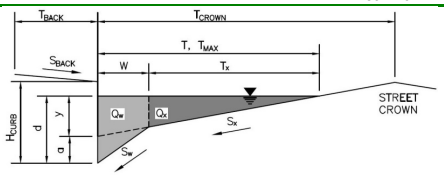
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A10



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} =	0.010	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.035	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

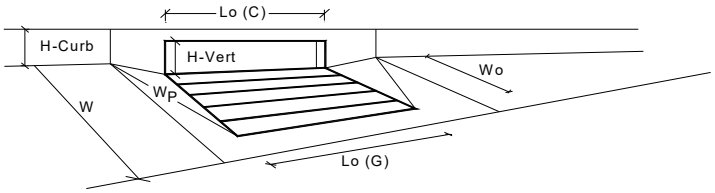
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.564	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.61	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.61	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**9.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.7	9.1	cfs

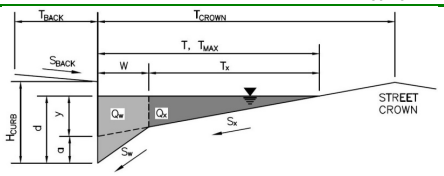
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A9



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} =	0.010	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

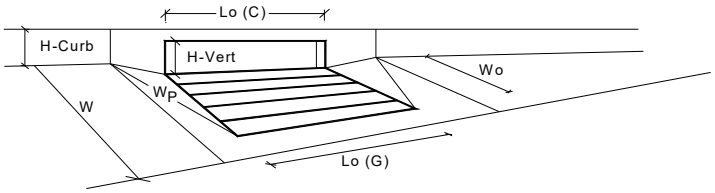
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.564	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.61	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.61	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**9.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.3	8.3	cfs

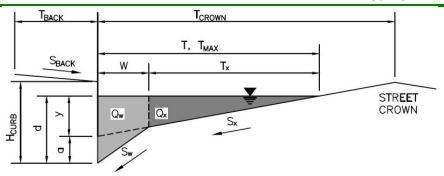
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A8



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	50.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.035	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

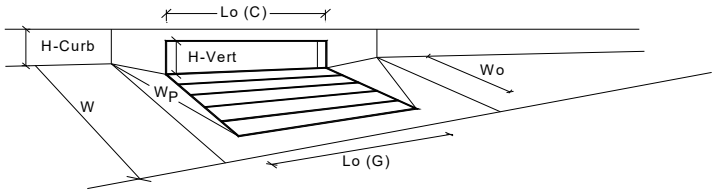
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.5	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.648	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.46	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.71	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**13.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.9	13.1	cfs

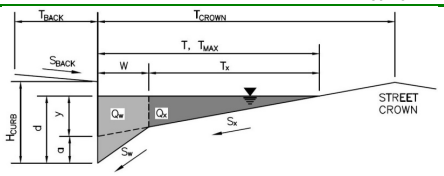
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.080	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.015	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

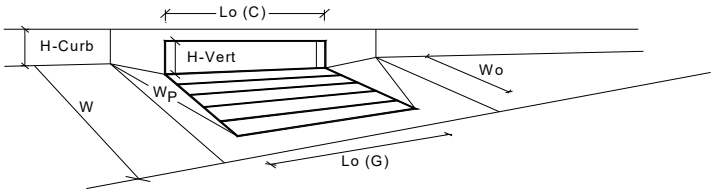
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**3.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.1	3.3	cfs

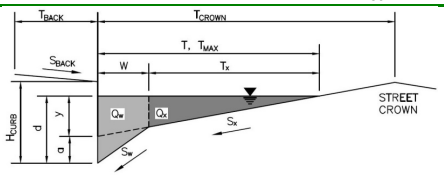
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A4



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.025	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

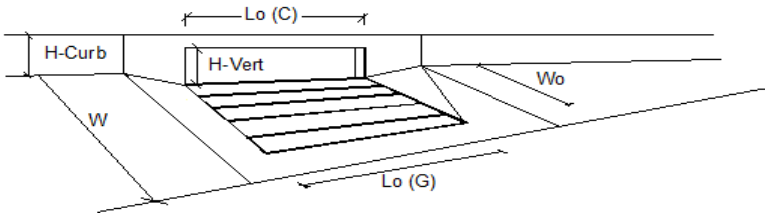
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.9**	**11.9**	**cfs**

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 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
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 =**	**1.4**	**3.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**98**	**%**

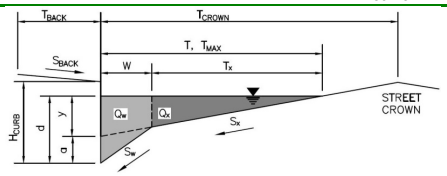
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.025	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

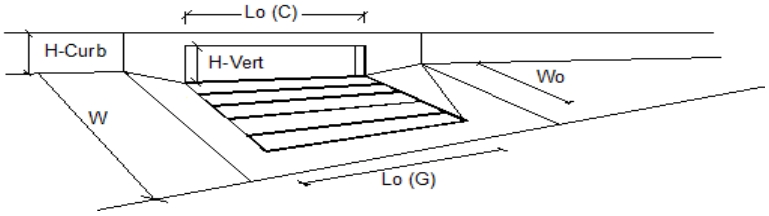
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.9**	**11.9**	**cfs**

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 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
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 =**	**2.1**	**5.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**89**	**%**

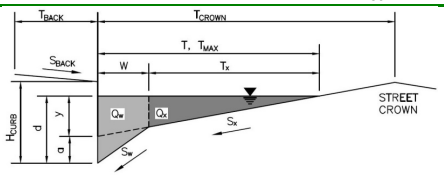
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.025	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

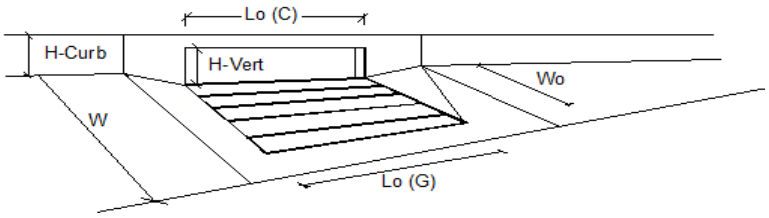
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.9**	**11.9**	**cfs**

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 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
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 =**	**3.8**	**9.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**2.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**95**	**76**	**%**

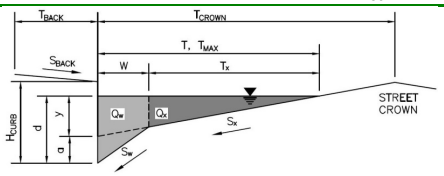
Version 4.05 Released March 2017

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

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

Project: Project 321 Office Campus

Inlet ID: Inlet A1



Gutter Geometry (Enter data in the blue cells)

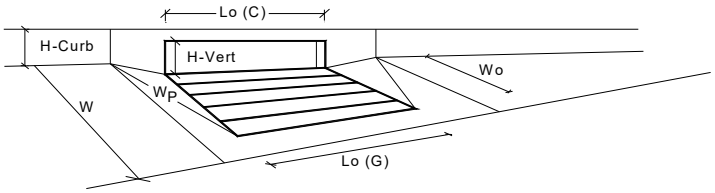
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.689	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.75	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**16.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.8	14.4	cfs

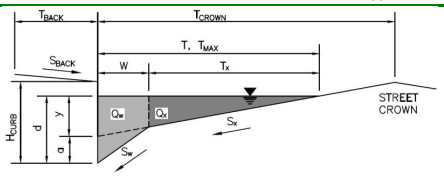
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet B4



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

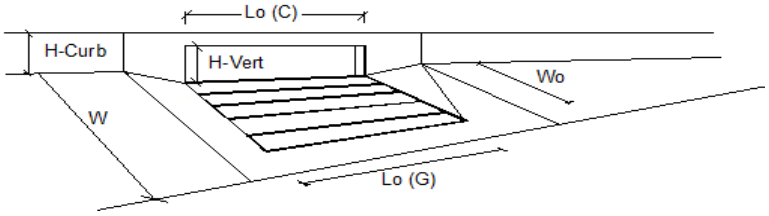
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.2**	**13.2**	**cfs**

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 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
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**	**2.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**91**	**%**

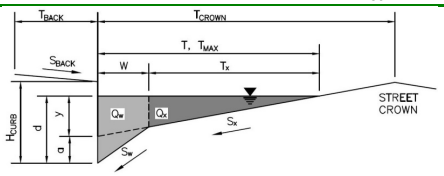
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet A7



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.035	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

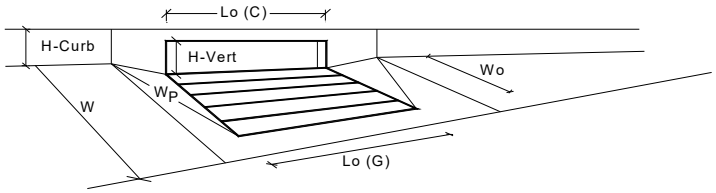
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	50.0	50.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.606	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.66	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**11.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.9	9.7	cfs

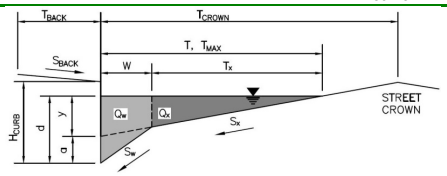
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet B3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

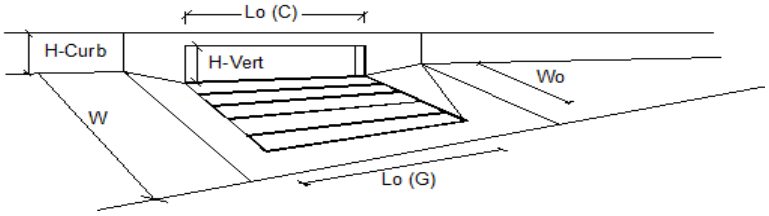
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**11.5**	**11.5**	**cfs**

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 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
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 =**	**1.5**	**3.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**86**	**%**

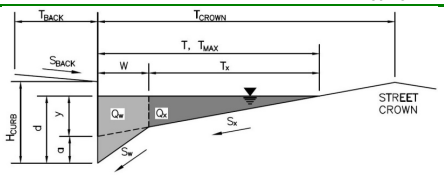
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet A5



Gutter Geometry (Enter data in the blue cells)

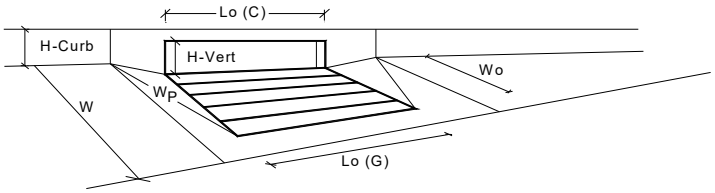
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	0.97	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.57	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**7.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.2	4.7	cfs

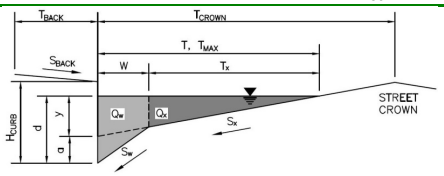
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet B2



Gutter Geometry (Enter data in the blue cells)

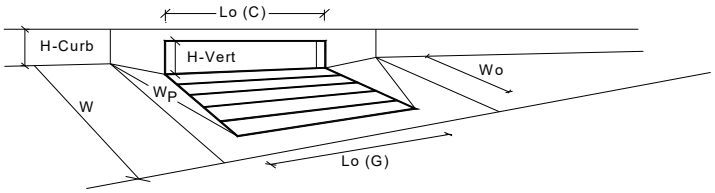
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	60.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	60.0	60.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**3.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.7	2.0	cfs

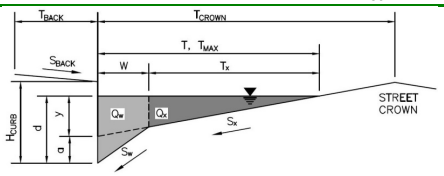
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet B1



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} =	0.010	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.050	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

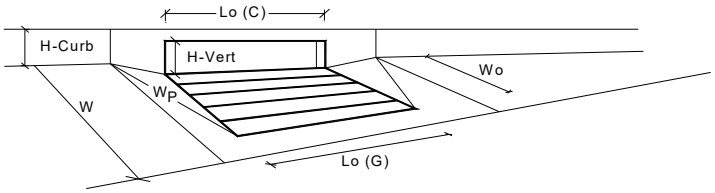
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.564	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.61	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.61	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**9.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.2	8.4	cfs

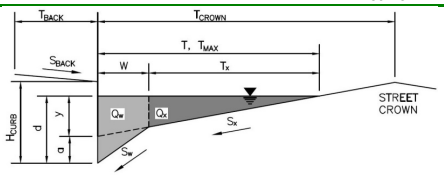
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet C3



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} =	0.010	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.035	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

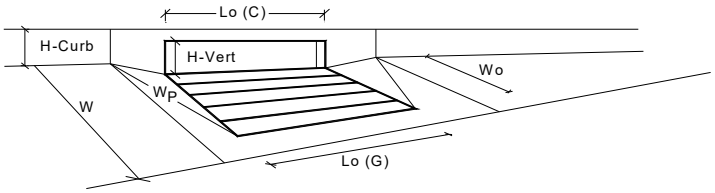
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.606	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.66	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**11.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.9	9.6	cfs

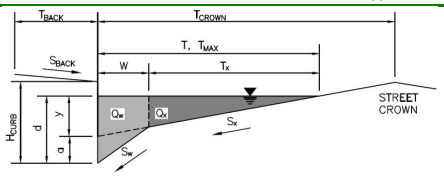
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet C2



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} =	0.050	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

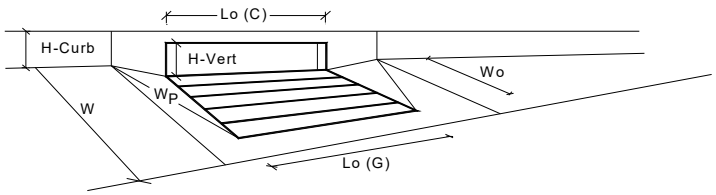
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.5	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.648	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.46	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.71	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**13.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.9	12.9	cfs

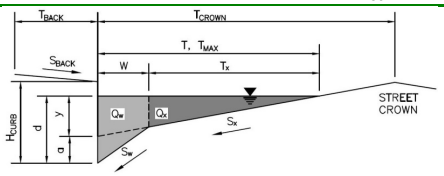
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet C1



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} =	0.050	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	240.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

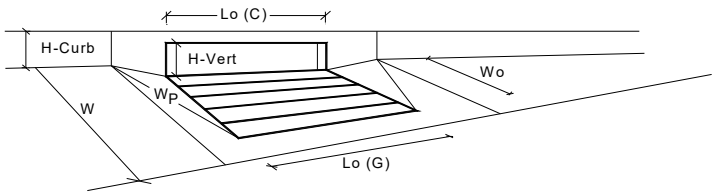
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	240.0	240.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.564	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.61	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.61	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**9.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.1	9.0	cfs

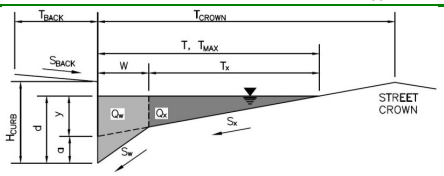
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet D1



Gutter Geometry (Enter data in the blue cells)

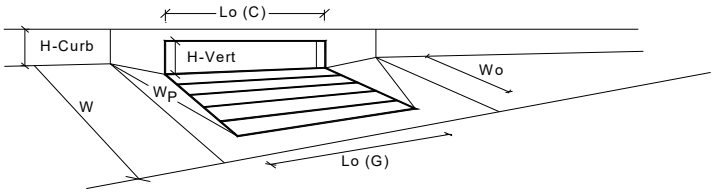
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	60.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.015	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 =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	60.0	60.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.558	0.558	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.6**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.7	cfs

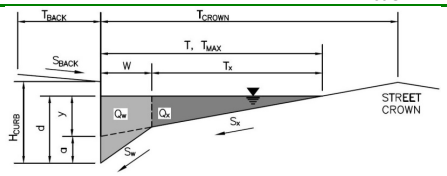
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet S1



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	20.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.120	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.120	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

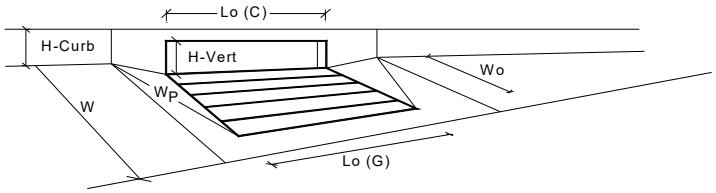
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	18.0	25.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type C Grate		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	18.0	25.0	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92	feet
Width of a Unit Grate		W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	1.379	1.962	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	1.00	1.00	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**23.9**	**40.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.8	40.0	cfs

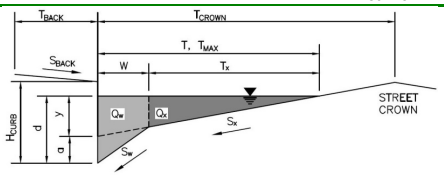
Version 4.05 Released March 2017

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

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

Project: PROJECT 321

Inlet ID: Inlet W3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

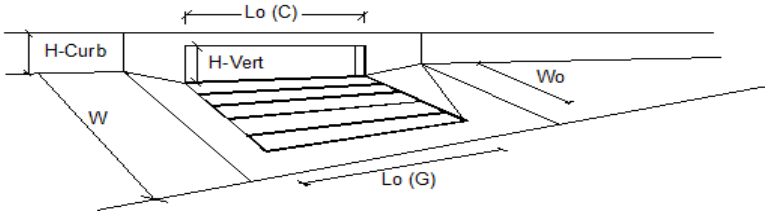
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**18.8**	**18.8**	**cfs**

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 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	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 =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
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 =**	**0.3**	**0.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**91**	**82**	**%**

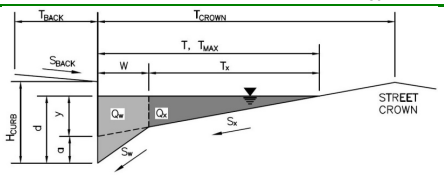
Version 4.05 Released March 2017

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

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

Project: PROJECT 321

Inlet ID: Inlet W2



Gutter Geometry (Enter data in the blue cells)

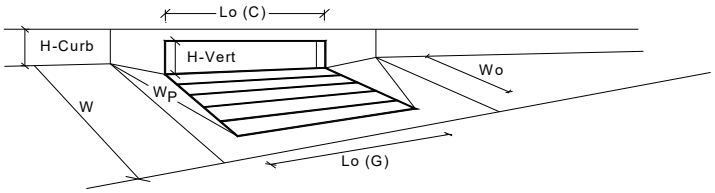
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	44.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	44.0	44.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**6.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	4.6	cfs

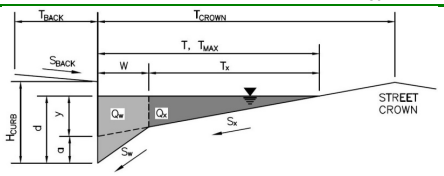
Version 4.05 Released March 2017

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

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

Project: PROJECT 321

Inlet ID: Inlet W1



Gutter Geometry (Enter data in the blue cells)

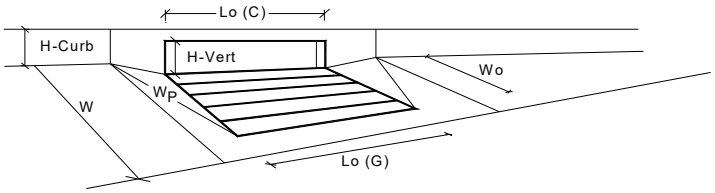
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	0.97	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.57	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**7.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.7	7.2	cfs

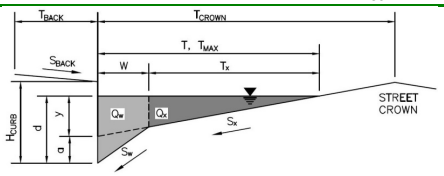
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet X2



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} =	0.005	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

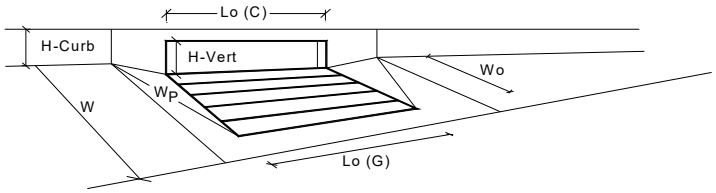
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.564	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.76	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.76	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**7.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.7	7.0	cfs

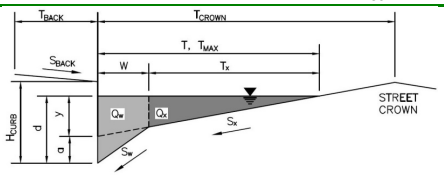
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet X1



Gutter Geometry (Enter data in the blue cells)

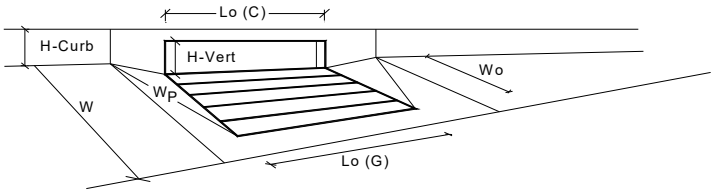
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	180.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	180.0	180.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.97	0.97	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.57	0.57	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.6**	**7.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.7	6.9	cfs

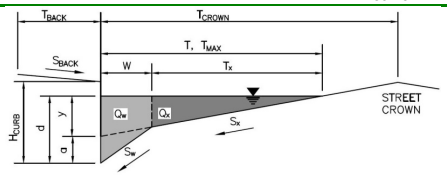
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Y3



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	50.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.060	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.200	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

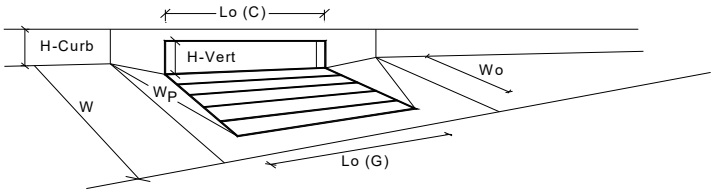
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	18.0	18.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type C Grate	Type =	CDOT Type C Grate	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1
Water Depth at Flowline (outside of local depression)		Ponding Depth =	18.0	18.0 inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92 feet
Width of a Unit Grate		W_o =	2.92	2.92 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	1.379	1.379 ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	1.00	1.00
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**14.4**	**14.4 cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.5	11.0 cfs

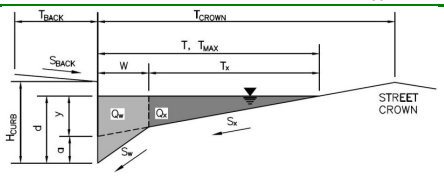
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Y2



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	40.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.025	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.100	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

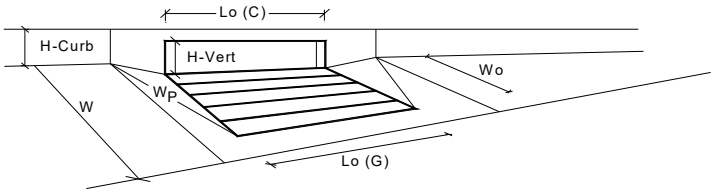
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type C Grate	Type =	CDOT Type C Grate	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2
Water Depth at Flowline (outside of local depression)		Ponding Depth =	11.4	11.4 inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92 feet
Width of a Unit Grate		W_o =	2.92	2.92 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.829	0.829 ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	1.00	1.00
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**11.2**	**11.2 cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.3	7.2 cfs

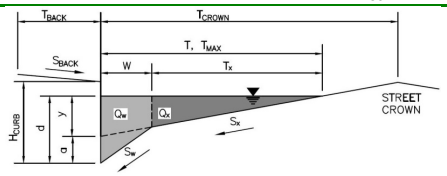
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z11



Gutter Geometry (Enter data in the blue cells)

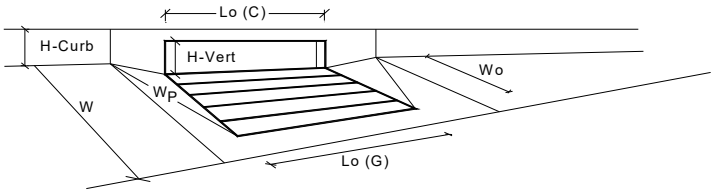
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	60.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.012	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	60.0	60.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**6.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.6	4.9	cfs

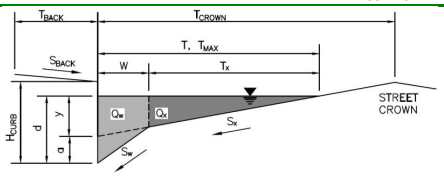
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z10



Gutter Geometry (Enter data in the blue cells)

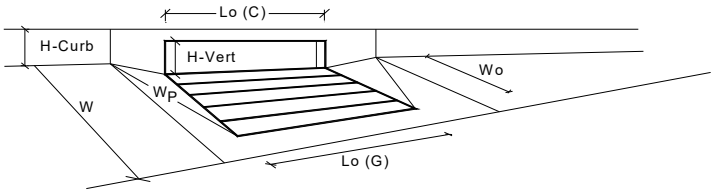
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	48.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.018	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	48.0	48.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**6.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	5.2	cfs

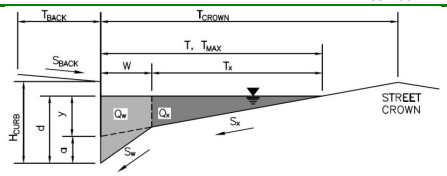
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z09



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	25.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.090	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	25.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.090	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

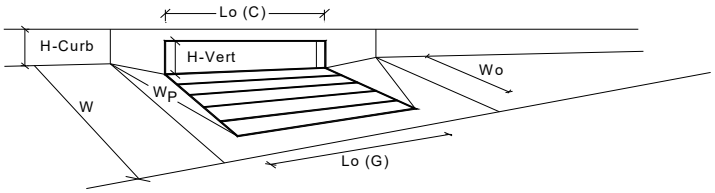
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	25.0	25.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	18.0	18.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	0.00	0.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	18.0	18.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	1.379	1.379	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	1.00	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**23.9**	**23.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.3	13.2	cfs

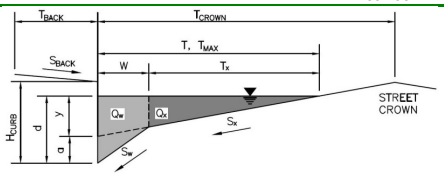
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z08



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.070	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.090	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

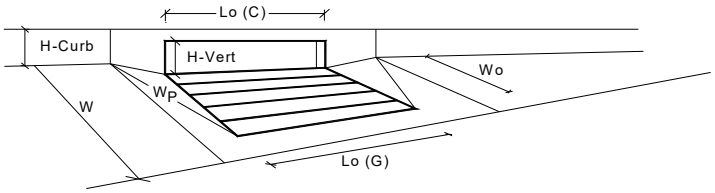
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	18.0	18.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type C Grate	Type =	CDOT Type C Grate	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2
Water Depth at Flowline (outside of local depression)		Ponding Depth =	10.6	10.6 inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92 feet
Width of a Unit Grate		W_o =	2.92	2.92 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.758	0.758 ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	1.00	1.00
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**9.8**	**9.8 cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.6	5.2 cfs

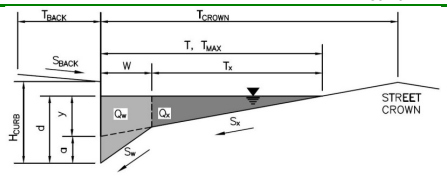
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z07



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.030	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.030	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

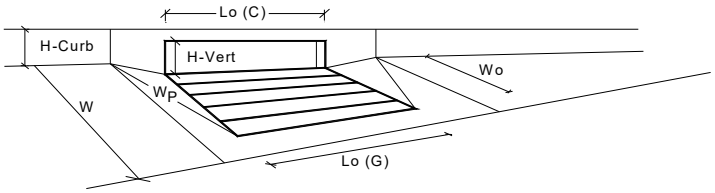
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type C Grate	Type =	CDOT Type C Grate	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	5.5 inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92 feet
Width of a Unit Grate		W_o =	2.92	2.92 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.334	0.334 ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	0.86	0.86
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**1.5**	**1.5 cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.2	1.4 cfs

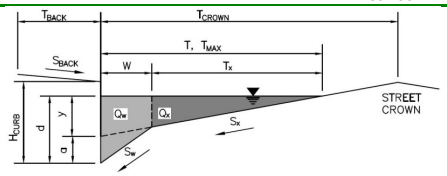
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z06



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.060	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	ft
	Gutter Width	W =	2.92	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 =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

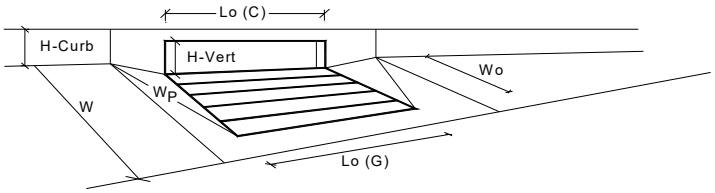
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =			
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =			inches
Number of Unit Inlets (Grate or Curb Opening)	No =			
Water Depth at Flowline (outside of local depression)	Ponding Depth =			inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =			feet
Width of a Unit Grate	W_o =			feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =			
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =			
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =			
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =			
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =			feet
Height of Vertical Curb Opening in Inches	H_{vert} =			inches
Height of Curb Orifice Throat in Inches	H_{throat} =			inches
Angle of Throat (see USDCM Figure ST-5)	Theta =			degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =			feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =			
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =			
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =			

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**			**cfs**
	$Q_{PEAK\ REQUIRED}$ =			cfs

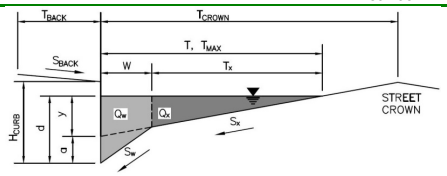
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z05



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	30.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.050	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.100	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

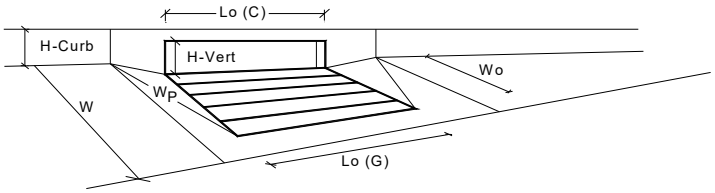
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type C Grate	Type =	CDOT Type C Grate	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2
Water Depth at Flowline (outside of local depression)		Ponding Depth =	11.4	11.4 inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92 feet
Width of a Unit Grate		W_o =	2.92	2.92 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.829	0.829 ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	1.00	1.00
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**11.2**	**11.2 cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.5	6.4 cfs

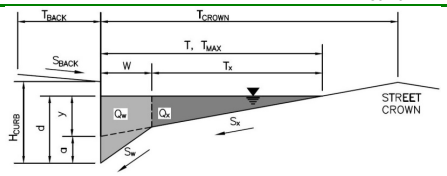
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z04



Gutter Geometry (Enter data in the blue cells)

	Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	30.0	ft
	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.030	ft/ft
Warning 01	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
	Height of Curb at Gutter Flow Line	H_{CURB} =	0.00	inches
	Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	ft
	Gutter Width	W =	2.92	ft
	Street Transverse Slope	S_X =	0.300	ft/ft
	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
	Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Warning 01	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.035	

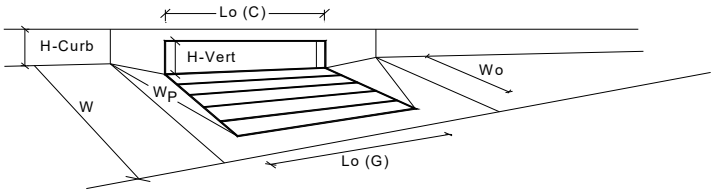
			Minor Storm	Major Storm	
	Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Warning 02	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
	Check boxes are not applicable in SUMP conditions		☐	☐	

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

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type C Grate	Type =	CDOT Type C Grate	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	0.00	0.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2
Water Depth at Flowline (outside of local depression)		Ponding Depth =	12.0	12.0 inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92 feet
Width of a Unit Grate		W_o =	2.92	2.92 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.879	0.879 ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	1.00	1.00
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**12.2**	**12.2 cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.8	5.4 cfs

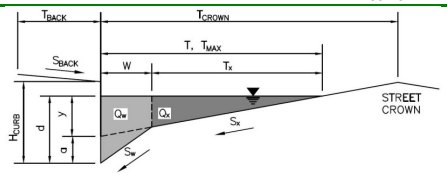
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z02



Gutter Geometry (Enter data in the blue cells)

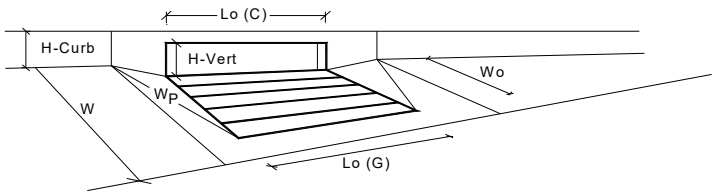
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	120.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	120.0	120.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**6.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.1	5.6	cfs

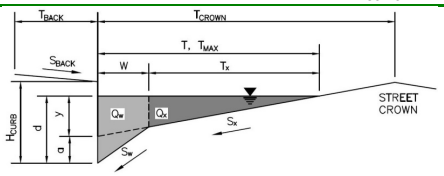
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z01



Gutter Geometry (Enter data in the blue cells)

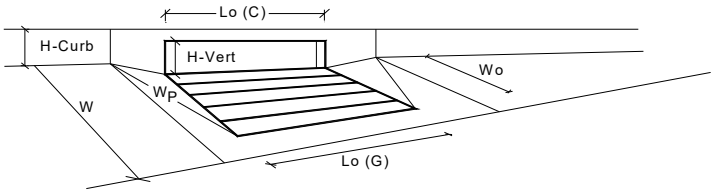
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	120.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	120.0	120.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**6.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.8	4.6	cfs

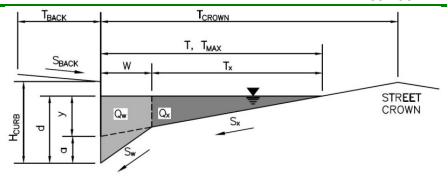
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Z03



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

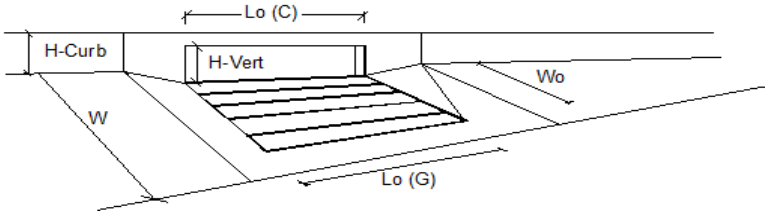
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**21.5**	**21.5**	**cfs**

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 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
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 =**	**1.2**	**2.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**1.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**89**	**62**	**%**

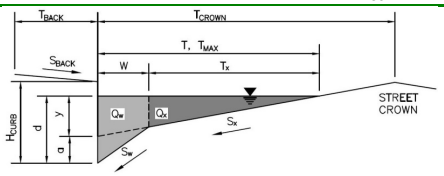
Version 4.05 Released March 2017

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

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

Project: Project 321

Inlet ID: Inlet Y1



Gutter Geometry (Enter data in the blue cells)

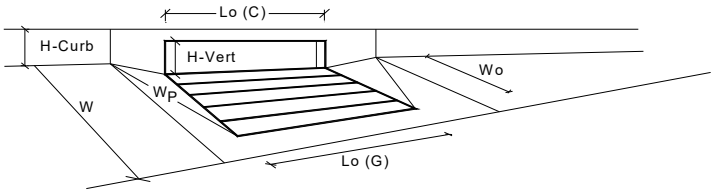
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.523	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**6.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.4	4.4	cfs

HYDRAULIC CALCULATIONS SUMMARY

5YR

Conduit FlexTable: Combined Pipe/Node Report

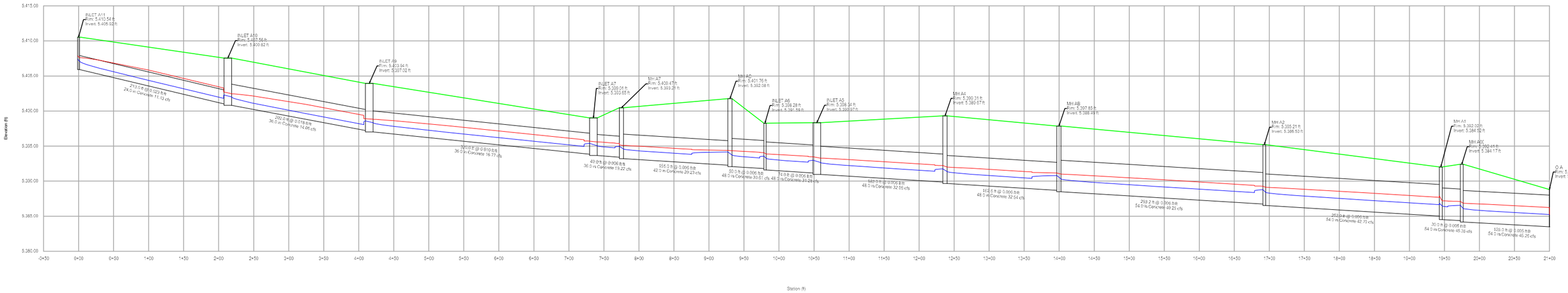
Diameter (in)	Material	Start Node	Stop Node	Length (Unified) (ft)	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
12.0	PVC	INLET R2b	INLET R2a	95.0	1.69	4.63	5.44	5,405.78	5,404.83	0.010	5,406.33	5,405.53
12.0	PVC	INLET R2a	MH B1	230.0	2.69	7.32	8.61	5,404.63	5,398.88	0.025	5,405.33	5,399.30
8.0	PVC	INLET RA	INLET R2b	100.0	0.66	1.57	4.31	5,406.98	5,405.98	0.010	5,407.36	5,406.47
8.0	PVC	INLET RB	INLET WR1	56.0	0.72	2.11	5.46	5,407.31	5,406.30	0.018	5,407.71	5,406.75
18.0	Concrete	INLET W2	INLET W1	202.0	4.07	14.02	6.87	5,403.30	5,399.70	0.018	5,404.07	5,400.56
18.0	Concrete	INLET Z02	MH WZ	24.1	2.12	14.18	5.77	5,398.50	5,398.06	0.018	5,399.05	5,398.46
24.0	Concrete	INLET W1	MH WZ	115.9	6.37	31.94	7.93	5,399.50	5,397.19	0.020	5,400.39	5,397.80
48.0	Concrete	INLET A6	INLET A5	74.0	31.28	108.21	7.45	5,391.59	5,391.17	0.006	5,393.25	5,392.97
48.0	Concrete	INLET A5	MH A4	183.0	32.05	111.36	7.66	5,390.97	5,389.87	0.006	5,392.65	5,391.75
48.0	Concrete	MH A4	MH AB	162.6	32.54	111.50	7.70	5,389.67	5,388.69	0.006	5,391.37	5,390.80
54.0	Concrete	MH AB	MH A2	293.2	40.25	152.34	8.09	5,388.49	5,386.73	0.006	5,390.32	5,388.77
54.0	Concrete	MH A2	MH A1	252.0	42.70	152.21	8.21	5,386.53	5,385.02	0.006	5,388.41	5,386.65
54.0	Concrete	MH A1	MH A00	30.0	45.35	139.04	7.82	5,384.52	5,384.37	0.005	5,386.46	5,386.55
54.0	Concrete	MH A00	O A	125.0	45.26	143.94	8.01	5,384.17	5,383.50	0.005	5,386.11	5,385.23
18.0	Concrete	INLET A1	MH A1	12.0	4.64	14.85	7.43	5,387.26	5,387.02	0.020	5,388.09	5,387.67
18.0	Concrete	INLET A3	MH AB	12.0	2.05	13.56	5.54	5,392.85	5,392.65	0.017	5,393.39	5,393.07
18.0	Concrete	INLET W3	MH W2	112.5	2.72	10.48	4.98	5,405.50	5,404.38	0.010	5,406.13	5,404.90
36.0	Concrete	MH WZ	MH XZ	219.0	12.73	72.39	7.71	5,393.00	5,390.42	0.012	5,394.13	5,391.84
18.0	Concrete	INLET X1	MH XZ	116.0	5.29	12.87	6.92	5,394.39	5,392.65	0.015	5,395.28	5,393.32
24.0	Concrete	MH B1	MH AB	260.1	8.18	35.76	9.23	5,398.00	5,391.50	0.025	5,399.02	5,392.15
18.0	Concrete	INLET X2	INLET X1	202.0	2.75	10.43	4.98	5,396.40	5,394.41	0.010	5,397.03	5,395.46
18.0	Concrete	INLET B1	MH B1	27.4	3.24	14.34	6.56	5,399.00	5,398.49	0.019	5,399.69	5,399.26
30.0	Concrete	MH CD	MH C1	207.1	11.01	50.19	8.19	5,399.82	5,396.72	0.015	5,400.93	5,398.16
18.0	Concrete	INLET C3	INLET C2	202.0	3.91	12.84	6.38	5,404.03	5,401.01	0.015	5,404.79	5,402.11
24.0	Concrete	INLET C2	MH CD	52.6	8.66	27.73	7.80	5,400.81	5,400.02	0.015	5,401.86	5,401.19
12.0	PVC	INLET D1b	MH D1	125.0	2.06	5.48	6.49	5,404.18	5,402.43	0.014	5,404.79	5,402.85
18.0	Concrete	MH D1	MH CD	150.2	2.65	12.36	5.57	5,402.23	5,400.15	0.014	5,402.85	5,401.19
18.0	Concrete	INLET Z10	INLET Z09	108.1	3.18	12.86	6.03	5,406.40	5,404.78	0.015	5,407.08	5,405.29
30.0	Concrete	INLET Z09	INLET Z08	140.0	7.33	29.00	4.93	5,402.43	5,401.73	0.005	5,403.33	5,402.59
30.0	Concrete	INLET Z08	MH Z06	280.0	7.74	29.00	5.00	5,401.53	5,400.13	0.005	5,402.45	5,401.06
36.0	Concrete	INLET Z05	INLET Z04	109.6	8.15	47.24	5.00	5,398.85	5,398.30	0.005	5,399.75	5,399.31
36.0	Concrete	MH Z06	INLET Z05	175.9	7.81	47.17	4.94	5,399.93	5,399.05	0.005	5,400.81	5,399.88
36.0	Concrete	INLET Z04	MH Z04	232.2	8.79	47.14	5.10	5,398.10	5,396.94	0.005	5,399.04	5,397.93
36.0	Concrete	MH Z04	MH Z03	120.0	8.59	47.16	5.07	5,396.74	5,396.14	0.005	5,397.67	5,397.13
36.0	Concrete	MH Z03	MH YZ	104.4	8.55	47.52	5.09	5,395.94	5,395.41	0.005	5,396.86	5,396.27
12.0	PVC	INLET D1a	MH D1	27.4	0.64	6.56	5.31	5,404.00	5,403.45	0.020	5,404.33	5,403.67
36.0	Concrete	INLET A9	INLET A7	320.0	16.77	66.39	7.83	5,397.02	5,393.85	0.010	5,398.33	5,395.38
36.0	Concrete	INLET A7	MH A7	40.0	19.22	51.66	6.77	5,393.65	5,393.41	0.006	5,395.06	5,394.95
48.0	Concrete	MH AC	INLET A6	50.0	30.61	109.40	7.47	5,392.08	5,391.79	0.006	5,393.72	5,393.56
30.0	Concrete	MH C1	MH AC	260.0	13.79	41.01	7.53	5,396.52	5,393.92	0.010	5,397.77	5,394.92
12.0	PVC	INLET B4	INLET B3	42.0	0.93	4.41	4.44	5,401.80	5,401.42	0.009	5,402.20	5,401.92
18.0	Concrete	INLET B3	INLET B2	119.2	2.27	10.41	4.71	5,401.22	5,400.05	0.010	5,401.79	5,400.64
18.0	Concrete	INLET B2	MH B1	172.7	2.85	10.48	5.05	5,399.85	5,398.13	0.010	5,400.49	5,399.26
18.0	Concrete	INLET A2	MH A2	12.0	4.00	13.56	6.68	5,390.21	5,390.01	0.017	5,390.98	5,390.62
36.0	Concrete	MH YZ	MH WZ	175.0	8.28	47.03	5.01	5,394.07	5,393.20	0.005	5,394.98	5,394.43
18.0	Concrete	INLET Y1	INLET Y2	43.9	1.27	7.09	3.03	5,397.40	5,397.20	0.005	5,397.83	5,397.62
24.0	Concrete	INLET Y2	MH Y1	187.3	0.94	15.94	2.78	5,397.00	5,396.07	0.005	5,397.33	5,396.40
18.0	Concrete	INLET Z11	INLET Z10	46.5	1.58	12.88	4.95	5,407.30	5,406.60	0.015	5,407.77	5,407.29
24.0	Concrete	INLET A11	INLET A10	213.0	11.13	34.31	9.75	5,405.92	5,401.02	0.023	5,407.12	5,402.28

Conduit FlexTable: Combined Pipe/Node Report

Diameter (in)	Material	Start Node	Stop Node	Length (Unified) (ft)	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
18.0	Concrete	INLET A4	MH A4	12.0	1.25	13.56	4.79	5,394.31	5,394.11	0.017	5,394.73	5,394.43
12.0	PVC	INLET R3b	INLET R3a	95.0	1.02	3.26	3.67	5,407.31	5,406.84	0.005	5,407.73	5,407.37
12.0	PVC	INLET WR2	INLET WR1	60.0	1.99	3.28	4.37	5,406.39	5,406.09	0.005	5,406.99	5,406.75
10.0	PVC	INLET R1b	INLET R1a	94.0	1.06	3.04	5.07	5,406.75	5,405.68	0.011	5,407.21	5,406.25
12.0	PVC	INLET R1a	INLET D1b	96.4	2.09	4.95	6.04	5,405.48	5,404.38	0.011	5,406.10	5,404.83
36.0	Concrete	INLET A10	INLET A9	202.0	14.06	89.04	9.20	5,400.82	5,397.22	0.018	5,402.01	5,398.58
12.0	PVC	INLET R3a	INLET WR2	9.1	1.99	3.43	4.53	5,406.64	5,406.59	0.005	5,407.24	5,407.15
6.0	PVC	INLET ZL	MH Z03	80.7	0.10	0.90	2.99	5,409.42	5,408.18	0.015	5,409.57	5,408.29
18.0	Concrete	INLET C1	MH C1	27.0	3.07	13.25	6.10	5,397.83	5,397.40	0.016	5,398.50	5,398.16
12.0	PVC	INLET A8	MH A8	50.5	2.99	5.37	7.02	5,395.30	5,394.62	0.013	5,396.04	5,395.37
24.0	Concrete	MH Y1	MH YZ1	230.9	0.92	15.96	2.76	5,395.87	5,394.72	0.005	5,396.20	5,395.29
36.0	Concrete	MH YZ1	MH YZ	50.0	1.94	47.16	3.28	5,394.52	5,394.27	0.005	5,395.27	5,395.27
42.0	Concrete	MH A7	MH AC	155.0	20.23	77.93	6.80	5,393.21	5,392.28	0.006	5,394.59	5,394.15
18.0	Concrete	INLET Z01	MH XZ	24.3	1.80	14.28	5.53	5,393.50	5,393.05	0.018	5,394.00	5,393.42
15.0	Concrete	INLET Z07	MH Z06	61.5	0.19	8.56	2.85	5,402.75	5,401.67	0.018	5,402.92	5,401.80
36.0	Concrete	MH XZ	O Z	360.5	16.02	91.06	9.70	5,390.22	5,383.50	0.019	5,391.50	5,384.35
12.0	PVC	MH A8	MH A7	35.0	2.97	5.65	7.28	5,394.42	5,393.90	0.015	5,395.16	5,394.95
12.0	PVC	INLET WR1	INLET W3	38.0	2.66	3.27	4.65	5,405.89	5,405.70	0.005	5,406.59	5,406.38
18.0	Concrete	MH W2	INLET W2	38.0	2.68	14.05	6.12	5,404.18	5,403.50	0.018	5,404.80	5,404.26
18.0	Concrete	INLET Y3	INLET Z03	76.8	0.43	12.91	3.38	5,399.80	5,398.64	0.015	5,400.04	5,398.91
18.0	Concrete	INLET Z03	MH YZ1	19.6	1.16	12.79	4.50	5,398.44	5,398.15	0.015	5,398.84	5,398.46

STORM PROFILES
5YR

Profile Report
Engineering Profile - Storm Line A (StormCAD Model.stsw)

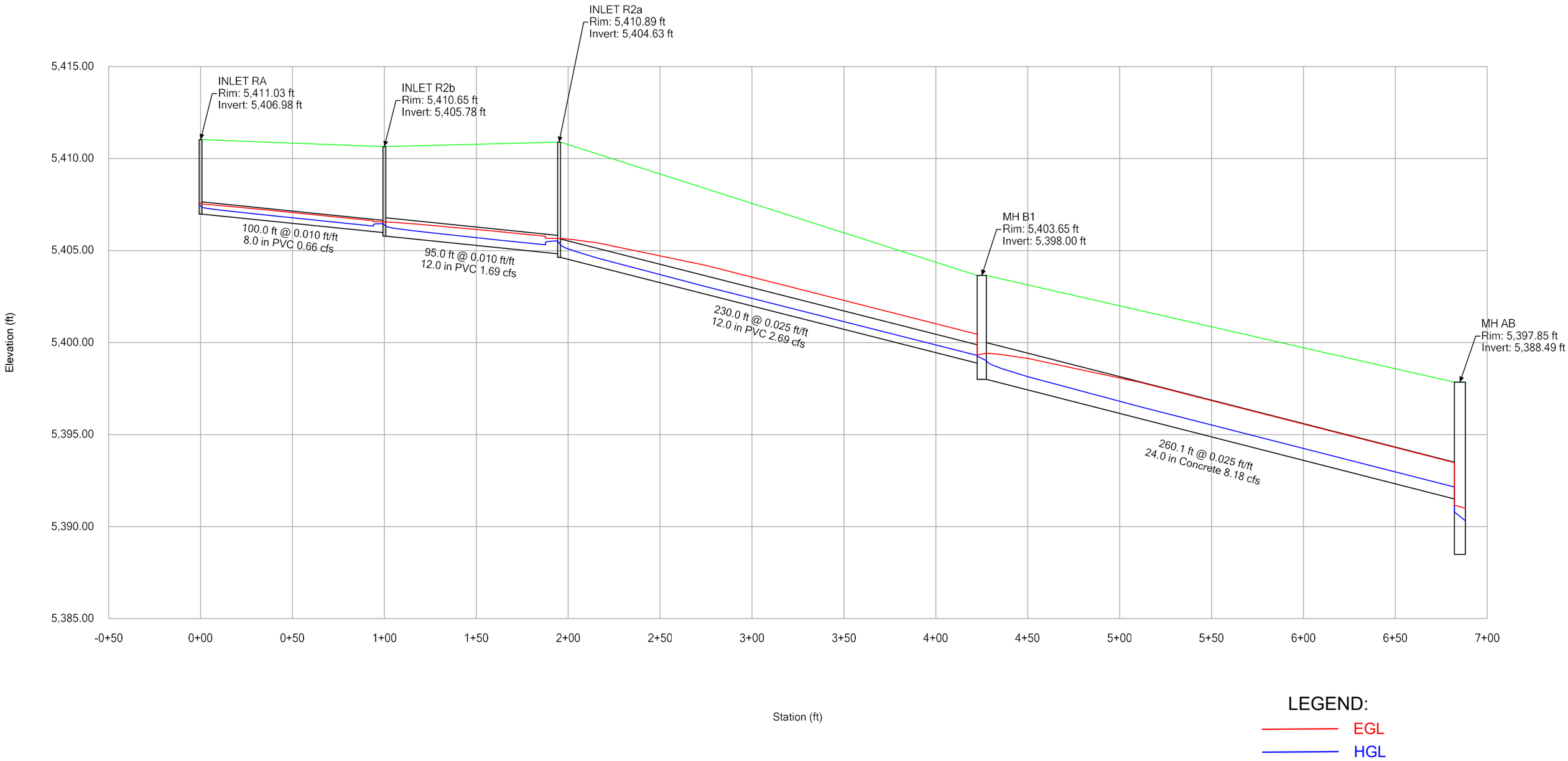


LEGEND:

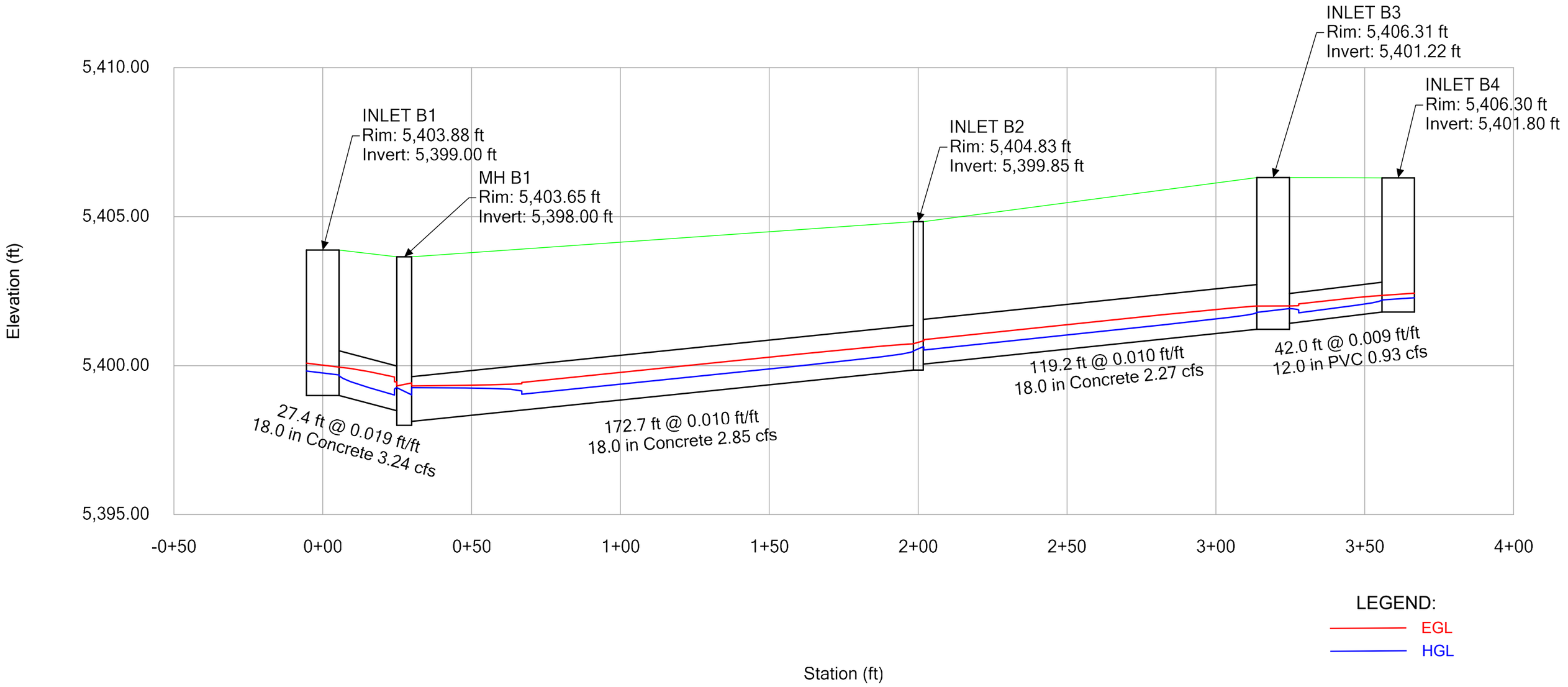
EGL

HGL

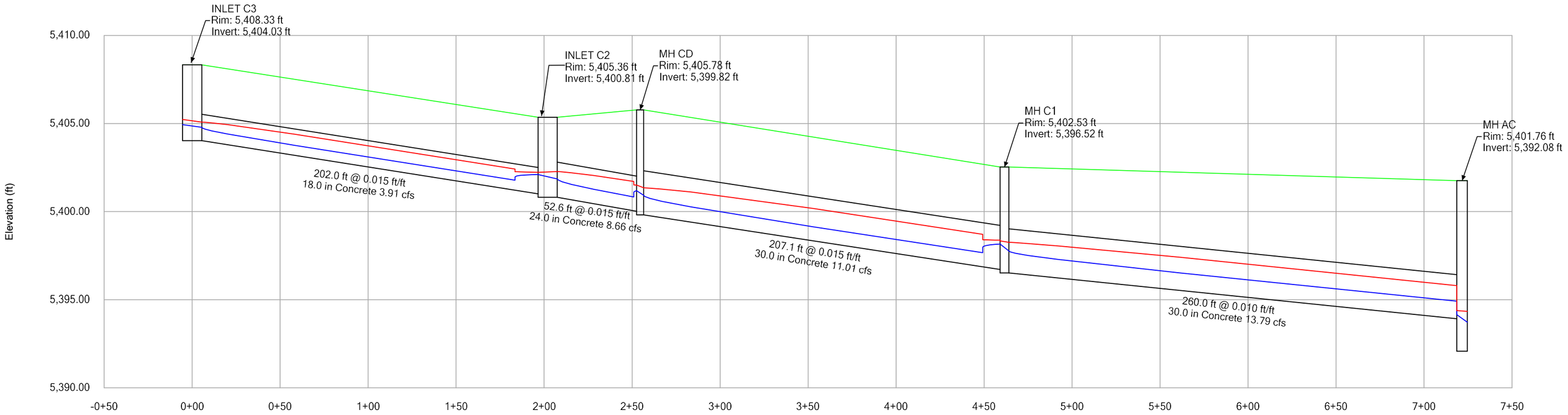
Profile Report
Engineering Profile - Strom Line B (StormCAD Model.stsw)



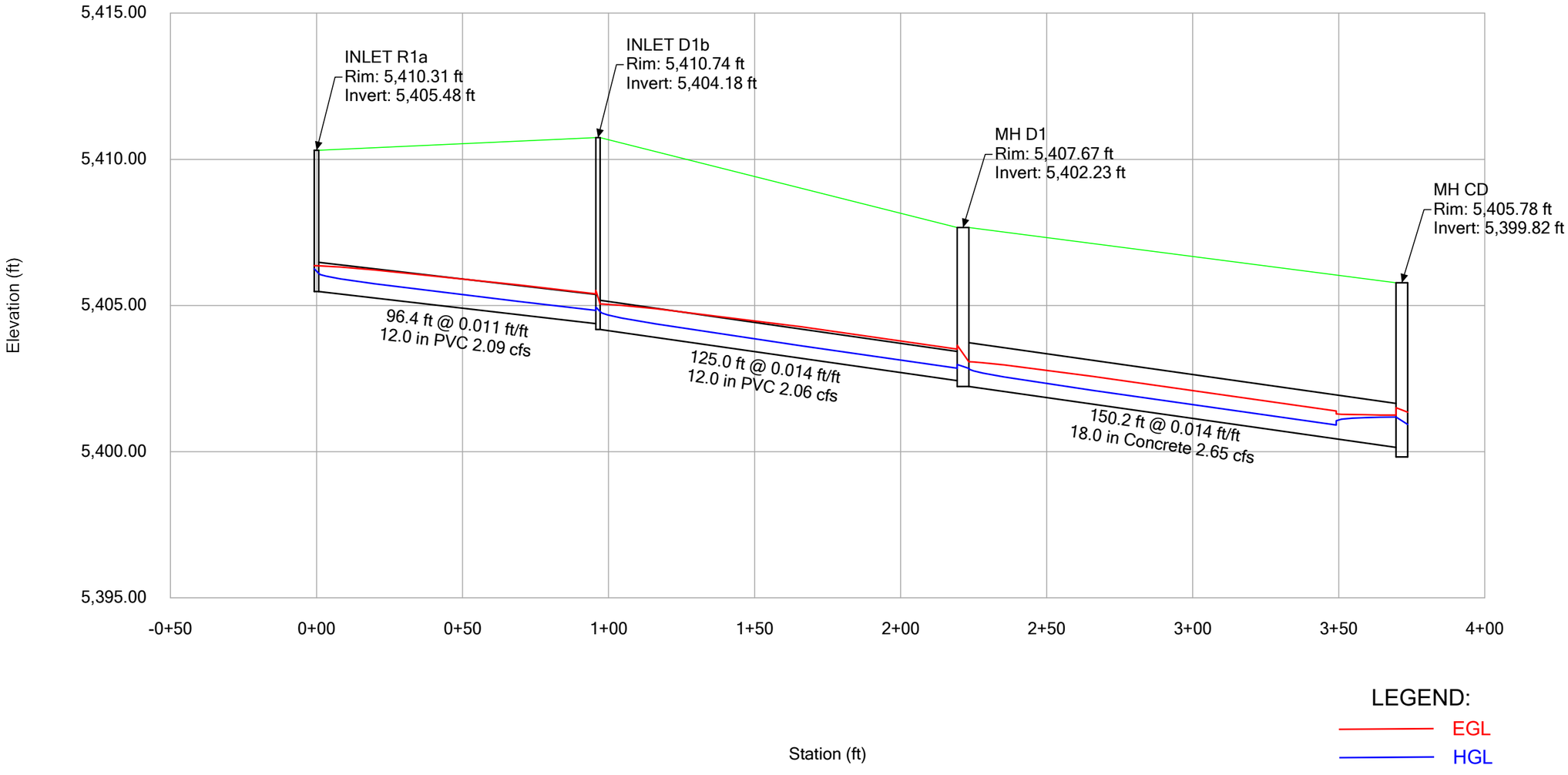
Profile Report
Engineering Profile - Strom Line B1 (StormCAD Model.stsw)



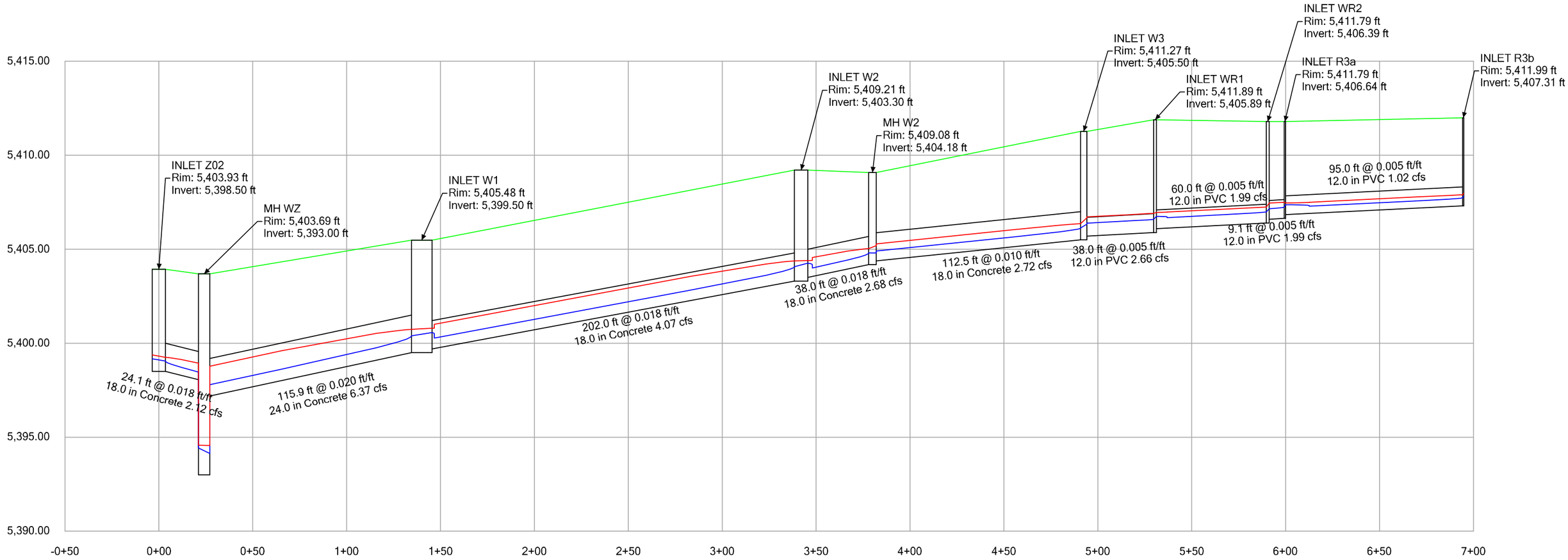
Profile Report
Engineering Profile - Storm Line C (StormCAD Model.stsw)



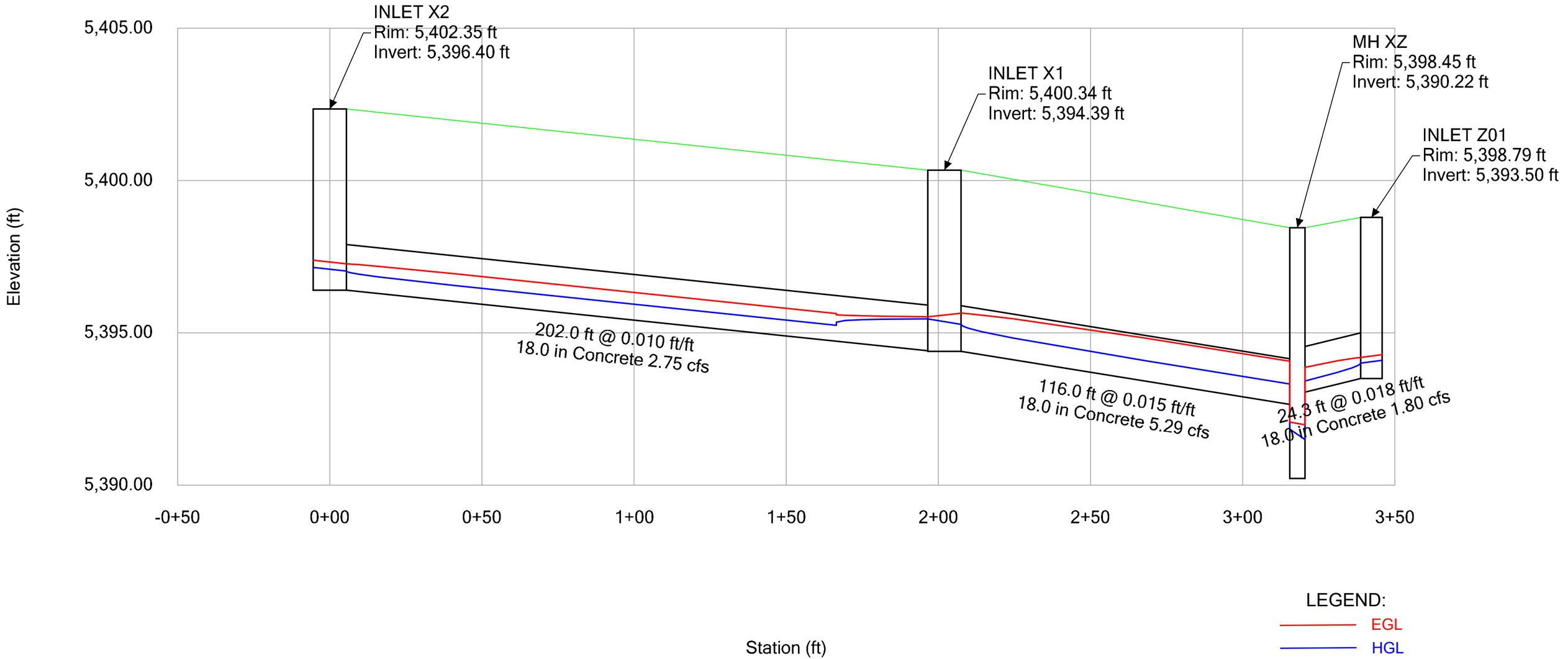
Profile Report
Engineering Profile - Storm Line D (StormCAD Model.stsw)



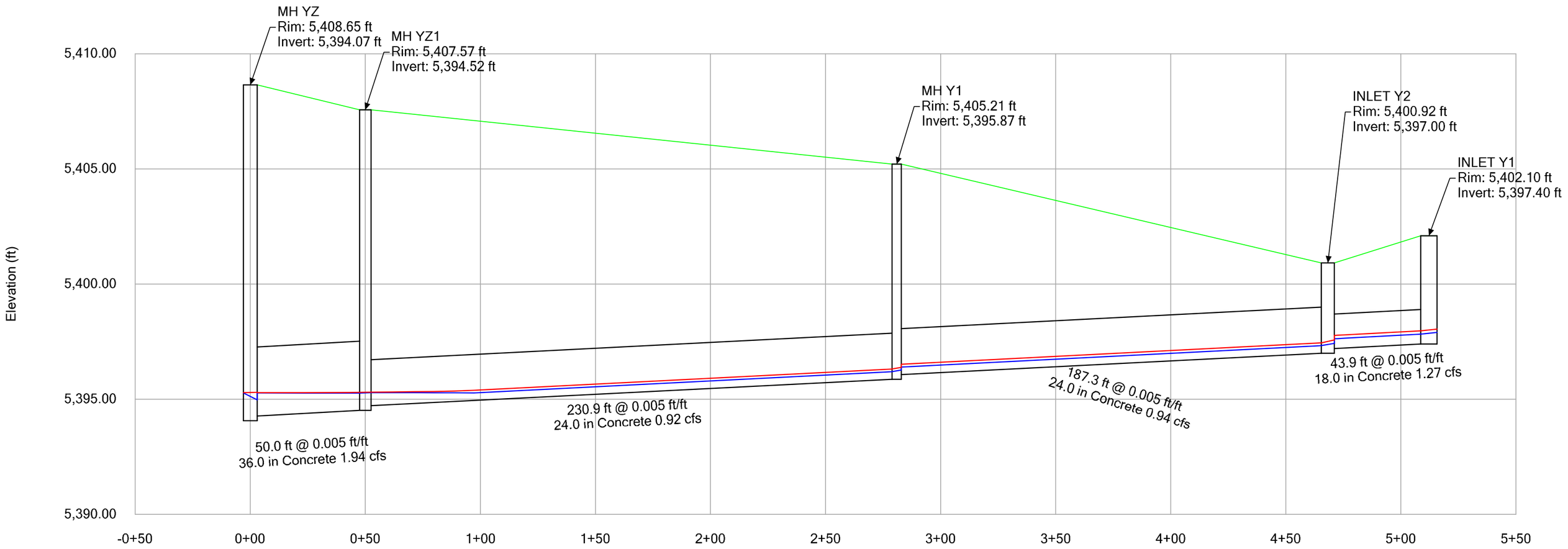
Profile Report
Engineering Profile - Storm Line W (StormCAD Model.stsw)



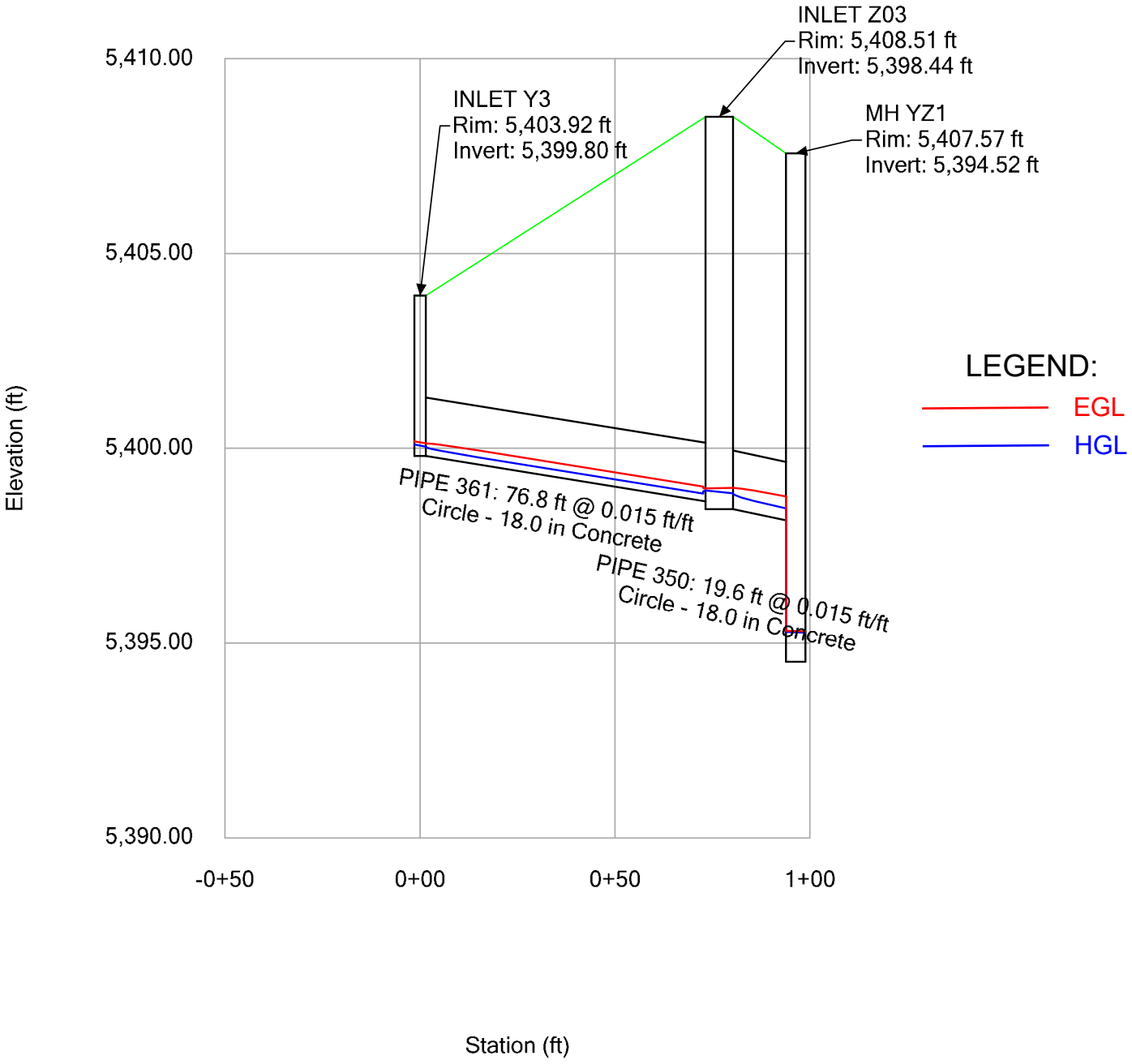
Profile Report
Engineering Profile - Storm Line X (StormCAD Model.stsw)



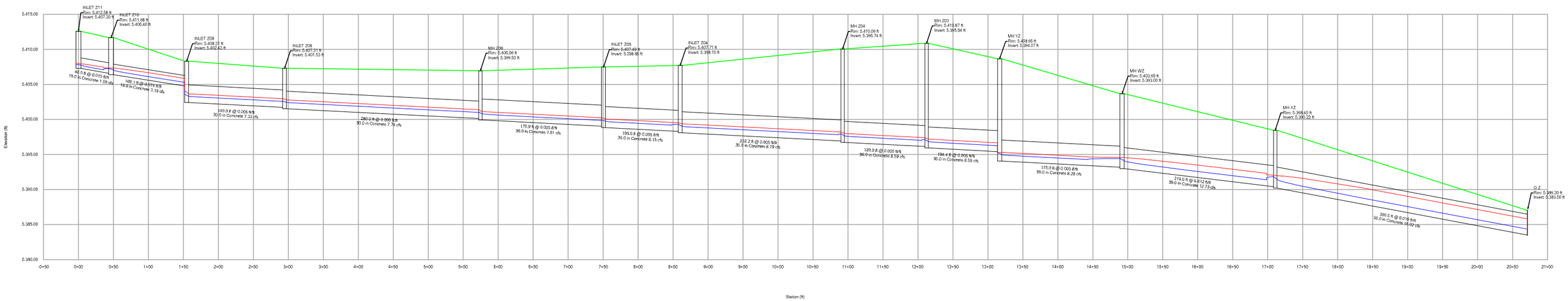
Profile Report
Engineering Profile - Storm Line Y (StormCAD Model.stsw)



Profile Report
Engineering Profile - Storm Line Y1 (StormCAD Model.stsw)



Profile Report
Engineering Profile - Storm Line Z (StormCAD Model.stsw)



LEGEND:

EGL

HGL

HYDRAULIC CALCULATIONS SUMMARY

100YR

Conduit FlexTable: Combined Pipe/Node Report

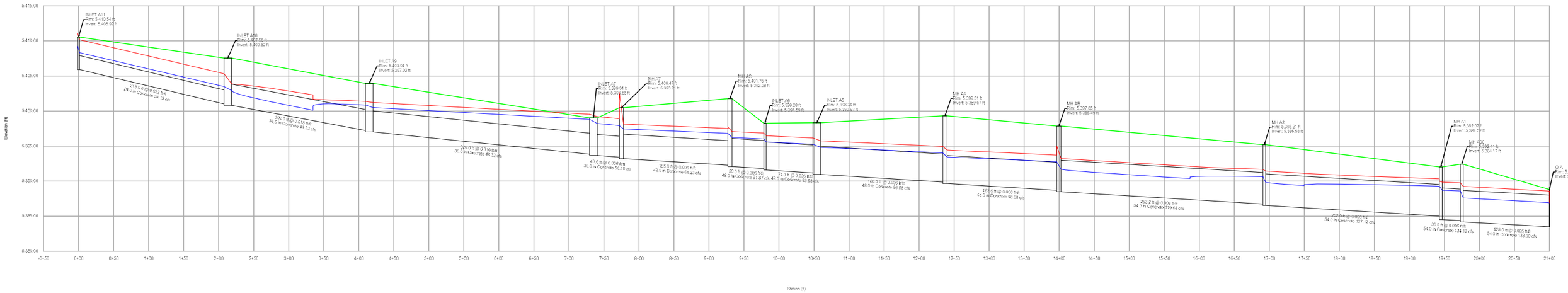
Diameter (in)	Material	Start Node	Stop Node	Length (Unified) (ft)	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
12.0	PVC	INLET R2b	INLET R2a	95.0	4.36	4.63	5.55	5,405.78	5,404.83	0.010	5,407.18	5,406.34
12.0	PVC	INLET R2a	MH B1	230.0	6.94	7.32	10.61	5,404.63	5,398.88	0.025	5,405.60	5,400.29
8.0	PVC	INLET RA	INLET R2b	100.0	1.70	1.57	4.86	5,406.98	5,405.98	0.010	5,408.64	5,407.47
8.0	PVC	INLET RB	INLET WR1	56.0	1.85	2.11	5.29	5,407.31	5,406.30	0.018	5,409.16	5,408.39
18.0	Concrete	INLET W2	INLET W1	202.0	10.85	14.02	8.76	5,403.30	5,399.70	0.018	5,404.56	5,401.34
18.0	Concrete	INLET Z02	MH WZ	24.1	5.62	14.18	7.56	5,398.50	5,398.06	0.018	5,399.42	5,398.76
24.0	Concrete	INLET W1	MH WZ	115.9	16.97	31.94	10.32	5,399.50	5,397.19	0.020	5,400.98	5,398.23
48.0	Concrete	INLET A6	INLET A5	74.0	93.98	108.21	7.48	5,391.59	5,391.17	0.006	5,395.60	5,395.28
48.0	Concrete	INLET A5	MH A4	183.0	96.58	111.36	9.98	5,390.97	5,389.87	0.006	5,394.81	5,394.03
48.0	Concrete	MH A4	MH AB	162.6	98.08	111.50	10.01	5,389.67	5,388.69	0.006	5,393.43	5,392.76
54.0	Concrete	MH AB	MH A2	293.2	119.68	152.34	10.61	5,388.49	5,386.73	0.006	5,391.71	5,390.64
54.0	Concrete	MH A2	MH A1	252.0	127.12	152.21	10.71	5,386.53	5,385.02	0.006	5,389.85	5,389.29
54.0	Concrete	MH A1	MH A00	30.0	134.12	139.04	9.96	5,384.52	5,384.37	0.005	5,388.70	5,388.59
54.0	Concrete	MH A00	O A	125.0	133.90	143.94	10.28	5,384.17	5,383.50	0.005	5,387.60	5,386.90
18.0	Concrete	INLET A1	MH A1	12.0	11.76	14.85	6.65	5,387.26	5,387.02	0.020	5,389.44	5,389.29
18.0	Concrete	INLET A3	MH AB	12.0	5.70	13.56	7.34	5,392.85	5,392.65	0.017	5,393.77	5,393.40
18.0	Concrete	INLET W3	MH W2	112.5	7.18	10.48	6.39	5,405.50	5,404.38	0.010	5,406.54	5,405.29
36.0	Concrete	MH WZ	MH XZ	219.0	62.80	72.39	8.88	5,393.00	5,390.42	0.012	5,396.08	5,394.14
18.0	Concrete	INLET X1	MH XZ	116.0	13.68	12.87	8.20	5,394.39	5,392.65	0.015	5,396.09	5,394.14
24.0	Concrete	MH B1	MH AB	260.1	22.63	35.76	12.04	5,398.00	5,391.50	0.025	5,399.70	5,392.65
18.0	Concrete	INLET X2	INLET X1	202.0	7.06	10.43	6.34	5,396.40	5,394.41	0.010	5,397.43	5,396.56
18.0	Concrete	INLET B1	MH B1	27.4	8.47	14.34	8.45	5,399.00	5,398.49	0.019	5,400.46	5,400.29
30.0	Concrete	MH CD	MH C1	207.1	28.79	50.19	10.57	5,399.82	5,396.72	0.015	5,401.65	5,399.67
18.0	Concrete	INLET C3	INLET C2	202.0	9.66	12.84	7.98	5,404.03	5,401.01	0.015	5,405.23	5,403.08
24.0	Concrete	INLET C2	MH CD	52.6	22.41	27.73	9.82	5,400.81	5,400.02	0.015	5,402.50	5,402.17
12.0	PVC	INLET D1b	MH D1	125.0	5.32	5.48	7.95	5,404.18	5,402.43	0.014	5,405.11	5,403.52
18.0	Concrete	MH D1	MH CD	150.2	6.91	12.36	7.19	5,402.23	5,400.15	0.014	5,403.25	5,402.17
18.0	Concrete	INLET Z10	INLET Z09	108.1	9.93	12.86	8.03	5,406.40	5,404.78	0.015	5,407.62	5,405.77
30.0	Concrete	INLET Z09	INLET Z08	140.0	22.74	29.00	4.63	5,402.43	5,401.73	0.005	5,405.61	5,405.18
30.0	Concrete	INLET Z08	MH Z06	280.0	27.49	29.00	5.60	5,401.53	5,400.13	0.005	5,404.94	5,403.68
36.0	Concrete	INLET Z05	INLET Z04	109.6	40.37	47.24	5.71	5,398.85	5,398.30	0.005	5,402.65	5,402.25
36.0	Concrete	MH Z06	INLET Z05	175.9	34.67	47.17	4.90	5,399.93	5,399.05	0.005	5,403.38	5,402.91
36.0	Concrete	INLET Z04	MH Z04	232.2	45.30	47.14	6.41	5,398.10	5,396.94	0.005	5,401.74	5,400.67
36.0	Concrete	MH Z04	MH Z03	120.0	44.49	47.16	6.29	5,396.74	5,396.14	0.005	5,400.18	5,399.64
36.0	Concrete	MH Z03	MH YZ	104.4	44.22	47.52	6.26	5,395.94	5,395.41	0.005	5,399.16	5,398.70
12.0	PVC	INLET D1a	MH D1	27.4	1.73	6.56	7.05	5,404.00	5,403.45	0.020	5,404.56	5,403.82
36.0	Concrete	INLET A9	INLET A7	320.0	48.32	66.39	6.84	5,397.02	5,393.85	0.010	5,400.49	5,398.81
36.0	Concrete	INLET A7	MH A7	40.0	56.15	51.66	7.94	5,393.65	5,393.41	0.006	5,398.22	5,397.94
48.0	Concrete	MH AC	INLET A6	50.0	91.87	109.40	7.31	5,392.08	5,391.79	0.006	5,396.24	5,396.03
30.0	Concrete	MH C1	MH AC	260.0	37.29	41.01	9.47	5,396.52	5,393.92	0.010	5,398.93	5,396.82
12.0	PVC	INLET B4	INLET B3	42.0	2.91	4.41	5.99	5,401.80	5,401.42	0.009	5,402.64	5,402.53
18.0	Concrete	INLET B3	INLET B2	119.2	7.12	10.41	6.34	5,401.22	5,400.05	0.010	5,402.25	5,401.72
18.0	Concrete	INLET B2	MH B1	172.7	8.77	10.48	4.96	5,399.85	5,398.13	0.010	5,401.49	5,400.29
18.0	Concrete	INLET A2	MH A2	12.0	11.31	13.56	8.58	5,390.21	5,390.01	0.017	5,391.49	5,391.15
36.0	Concrete	MH YZ	MH WZ	175.0	51.16	47.03	7.24	5,394.07	5,393.20	0.005	5,397.97	5,396.94
18.0	Concrete	INLET Y1	INLET Y2	43.9	3.09	7.09	1.75	5,397.40	5,397.20	0.005	5,399.61	5,399.57
24.0	Concrete	INLET Y2	MH Y1	187.3	8.71	15.94	2.77	5,397.00	5,396.07	0.005	5,399.48	5,399.20
18.0	Concrete	INLET Z11	INLET Z10	46.5	4.94	12.88	6.81	5,407.30	5,406.60	0.015	5,408.15	5,408.14
24.0	Concrete	INLET A11	INLET A10	213.0	34.13	34.31	10.86	5,405.92	5,401.02	0.023	5,408.34	5,403.49

Conduit FlexTable: Combined Pipe/Node Report

Diameter (in)	Material	Start Node	Stop Node	Length (Unified) (ft)	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
18.0	Concrete	INLET A4	MH A4	12.0	3.35	13.56	6.36	5,394.31	5,394.11	0.017	5,395.01	5,394.66
12.0	PVC	INLET R3b	INLET R3a	95.0	2.62	3.26	3.34	5,407.31	5,406.84	0.005	5,410.26	5,409.96
12.0	PVC	INLET WR2	INLET WR1	60.0	5.11	3.28	6.51	5,406.39	5,406.09	0.005	5,409.12	5,408.39
10.0	PVC	INLET R1b	INLET R1a	94.0	2.73	3.04	5.01	5,406.75	5,405.68	0.011	5,408.17	5,407.30
12.0	PVC	INLET R1a	INLET D1b	96.4	5.38	4.95	6.85	5,405.48	5,404.38	0.011	5,406.87	5,405.57
36.0	Concrete	INLET A10	INLET A9	202.0	41.33	89.04	12.36	5,400.82	5,397.22	0.018	5,402.91	5,400.85
12.0	PVC	INLET R3a	INLET WR2	9.1	5.12	3.43	6.52	5,406.64	5,406.59	0.005	5,409.63	5,409.51
6.0	PVC	INLET ZL	MH Z03	80.7	0.23	0.90	3.86	5,409.42	5,408.18	0.015	5,409.66	5,408.35
18.0	Concrete	INLET C1	MH C1	27.0	9.02	13.25	5.10	5,397.83	5,397.40	0.016	5,399.86	5,399.67
12.0	PVC	INLET A8	MH A8	50.5	13.70	5.37	17.44	5,395.30	5,394.62	0.013	5,405.13	5,400.71
24.0	Concrete	MH Y1	MH YZ1	230.9	8.51	15.96	2.71	5,395.87	5,394.72	0.005	5,399.13	5,398.80
36.0	Concrete	MH YZ1	MH YZ	50.0	18.76	47.16	2.65	5,394.52	5,394.27	0.005	5,398.74	5,398.70
42.0	Concrete	MH A7	MH AC	155.0	64.23	77.93	6.68	5,393.21	5,392.28	0.006	5,397.45	5,396.82
18.0	Concrete	INLET Z01	MH XZ	24.3	4.69	14.28	7.24	5,393.50	5,393.05	0.018	5,394.33	5,394.14
15.0	Concrete	INLET Z07	MH Z06	61.5	1.43	8.56	5.17	5,402.75	5,401.67	0.018	5,403.70	5,403.68
36.0	Concrete	MH XZ	O Z	360.5	71.10	91.06	14.25	5,390.22	5,383.50	0.019	5,392.89	5,385.49
12.0	PVC	MH A8	MH A7	35.0	13.68	5.65	17.41	5,394.42	5,393.90	0.015	5,400.99	5,397.94
12.0	PVC	INLET WR1	INLET W3	38.0	6.86	3.27	8.73	5,405.89	5,405.70	0.005	5,407.80	5,406.96
18.0	Concrete	MH W2	INLET W2	38.0	7.09	14.05	7.97	5,404.18	5,403.50	0.018	5,405.21	5,405.00
18.0	Concrete	INLET Y3	INLET Z03	76.8	9.82	12.91	8.04	5,399.80	5,398.64	0.015	5,401.01	5,400.15
18.0	Concrete	INLET Z03	MH YZ1	19.6	11.73	12.79	8.21	5,398.44	5,398.15	0.015	5,399.74	5,399.32

STORM PROFILES
100YR

Profile Report
Engineering Profile - Storm Line A (StormCAD Model.stsw)

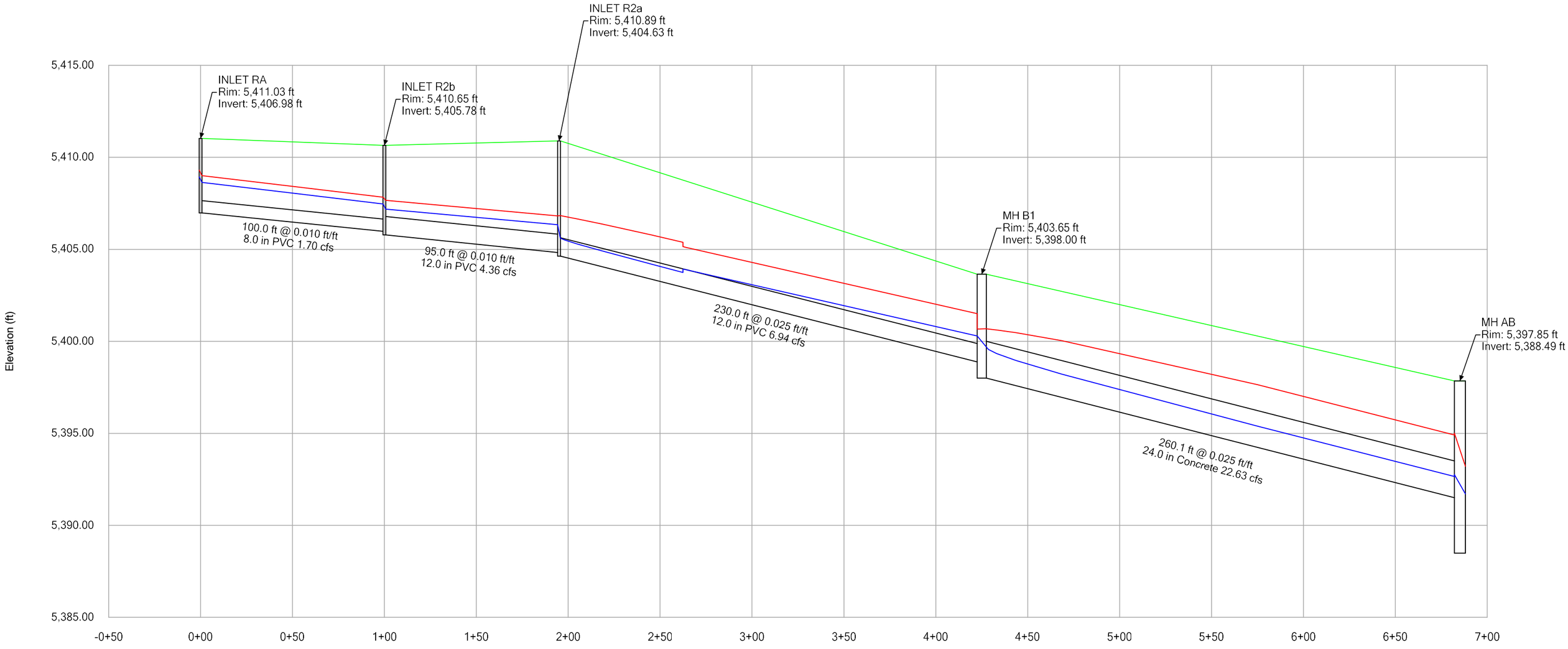


LEGEND:

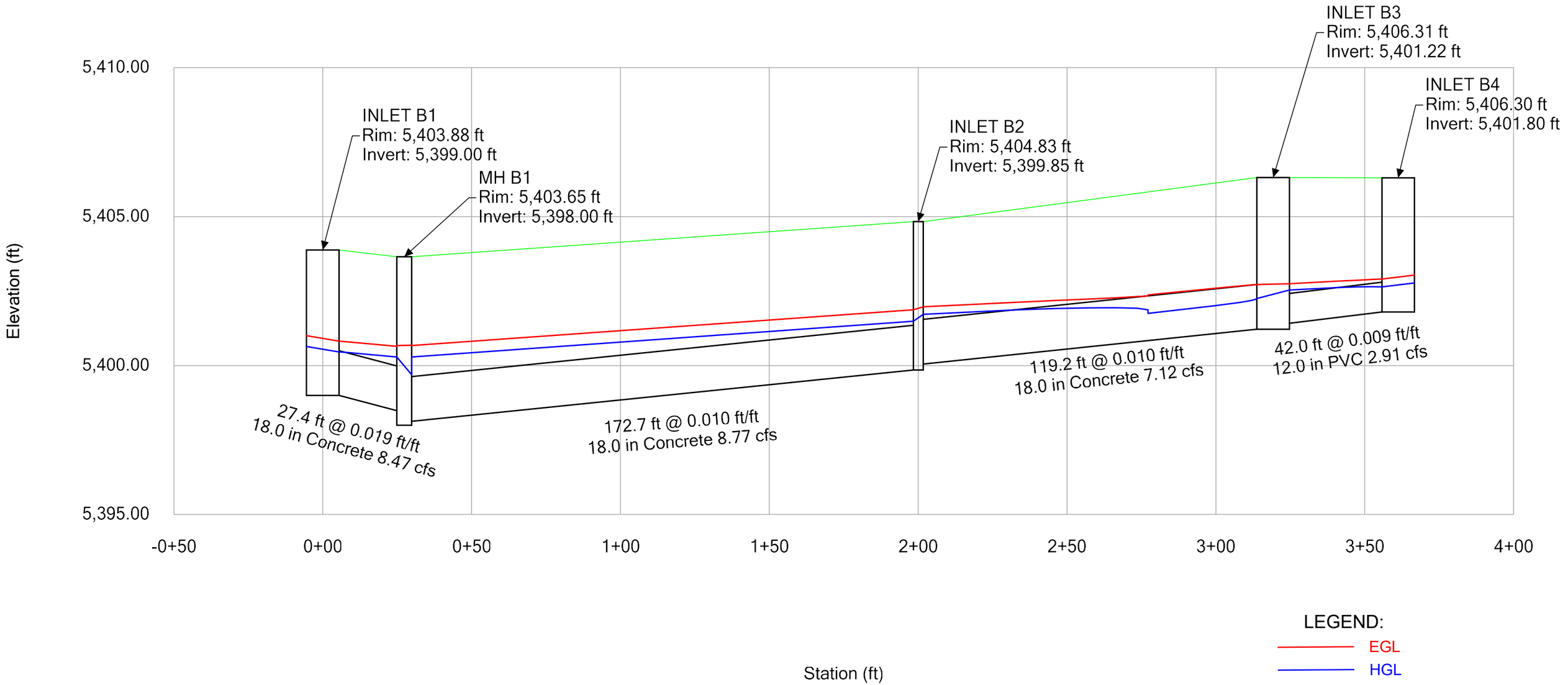
EGL

HGL

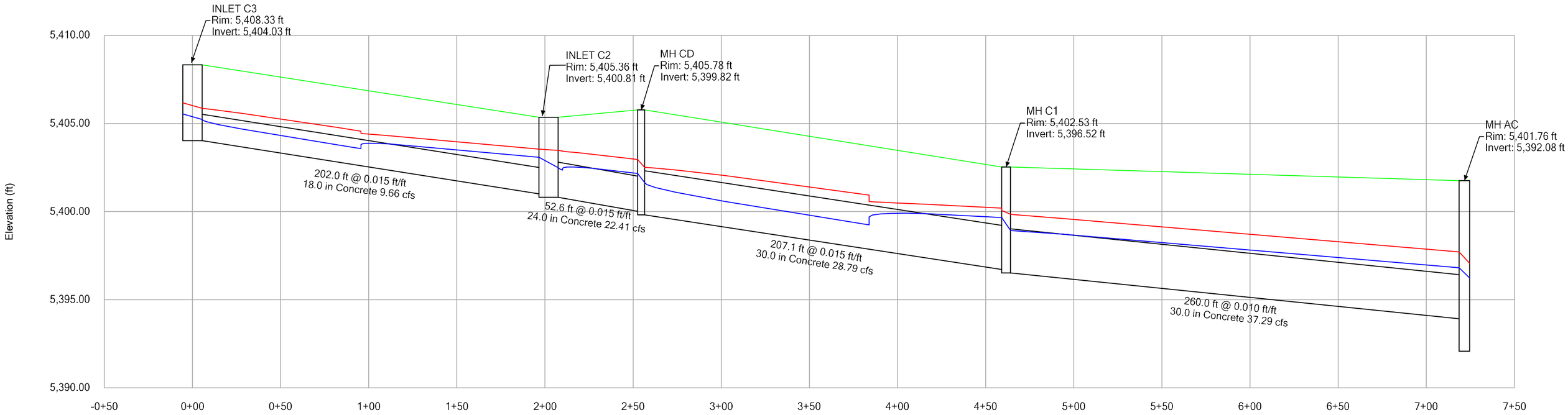
Profile Report
Engineering Profile - Strom Line B (StormCAD Model.stsw)



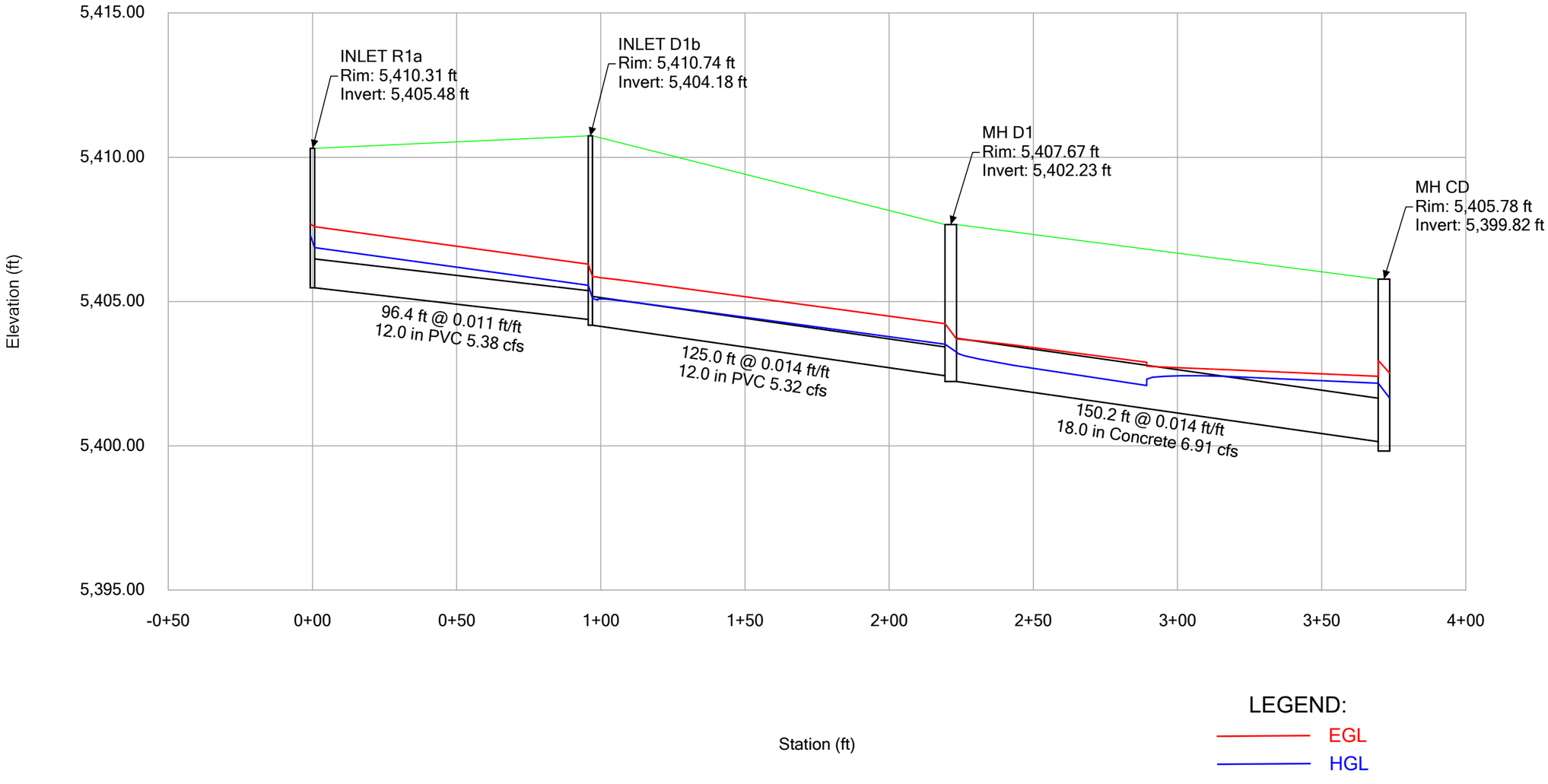
Profile Report
Engineering Profile - Strom Line B1 (StormCAD Model.stsw)



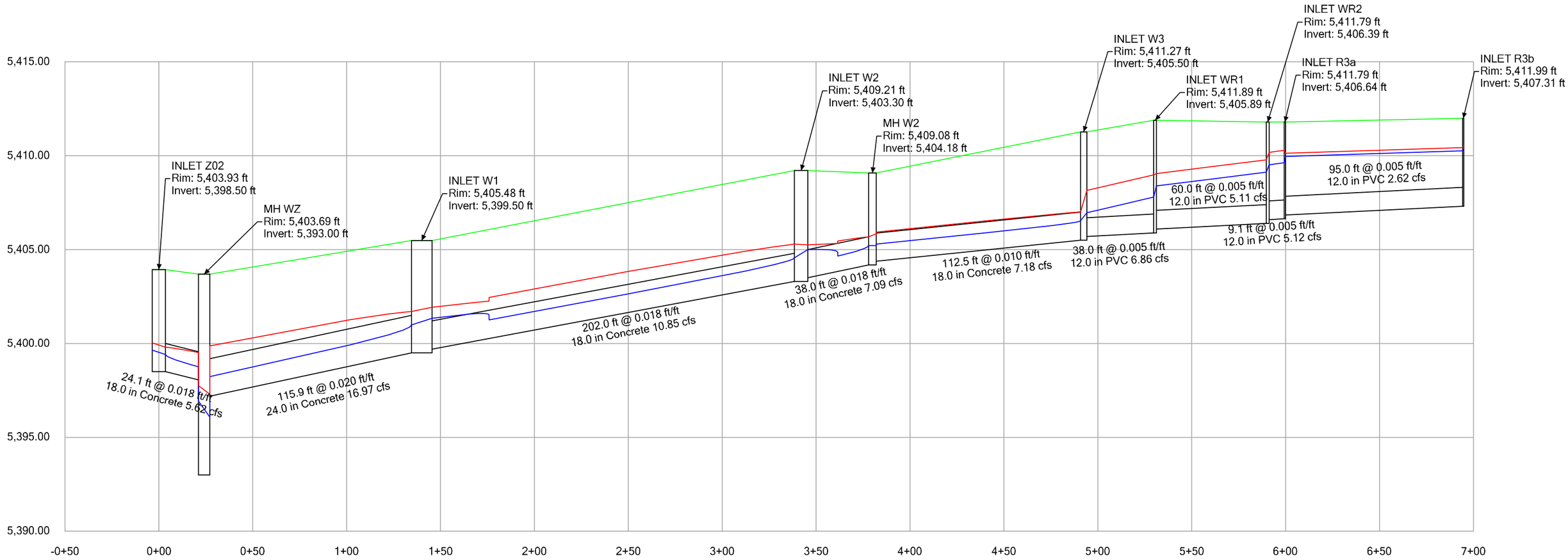
Profile Report
Engineering Profile - Storm Line C (StormCAD Model.stsw)



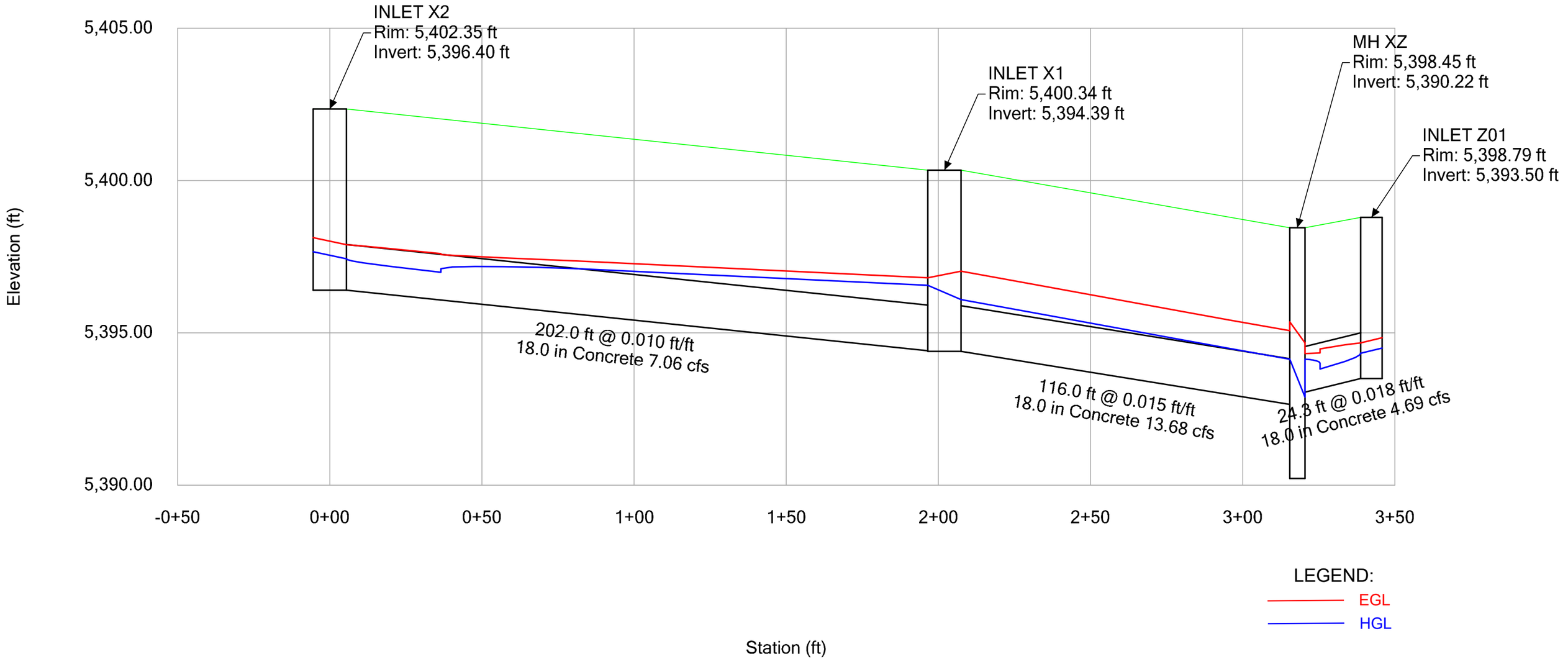
Profile Report
Engineering Profile - Storm Line D (StormCAD Model.stsw)



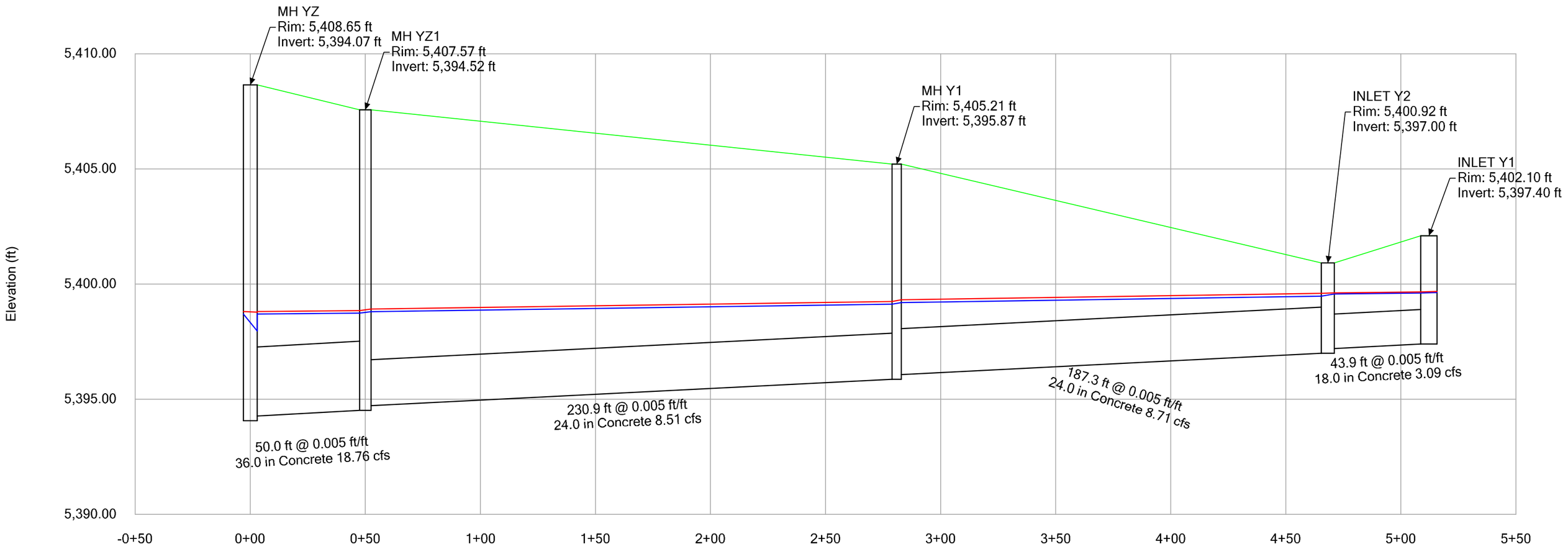
Profile Report
Engineering Profile - Storm Line W (StormCAD Model.stsw)



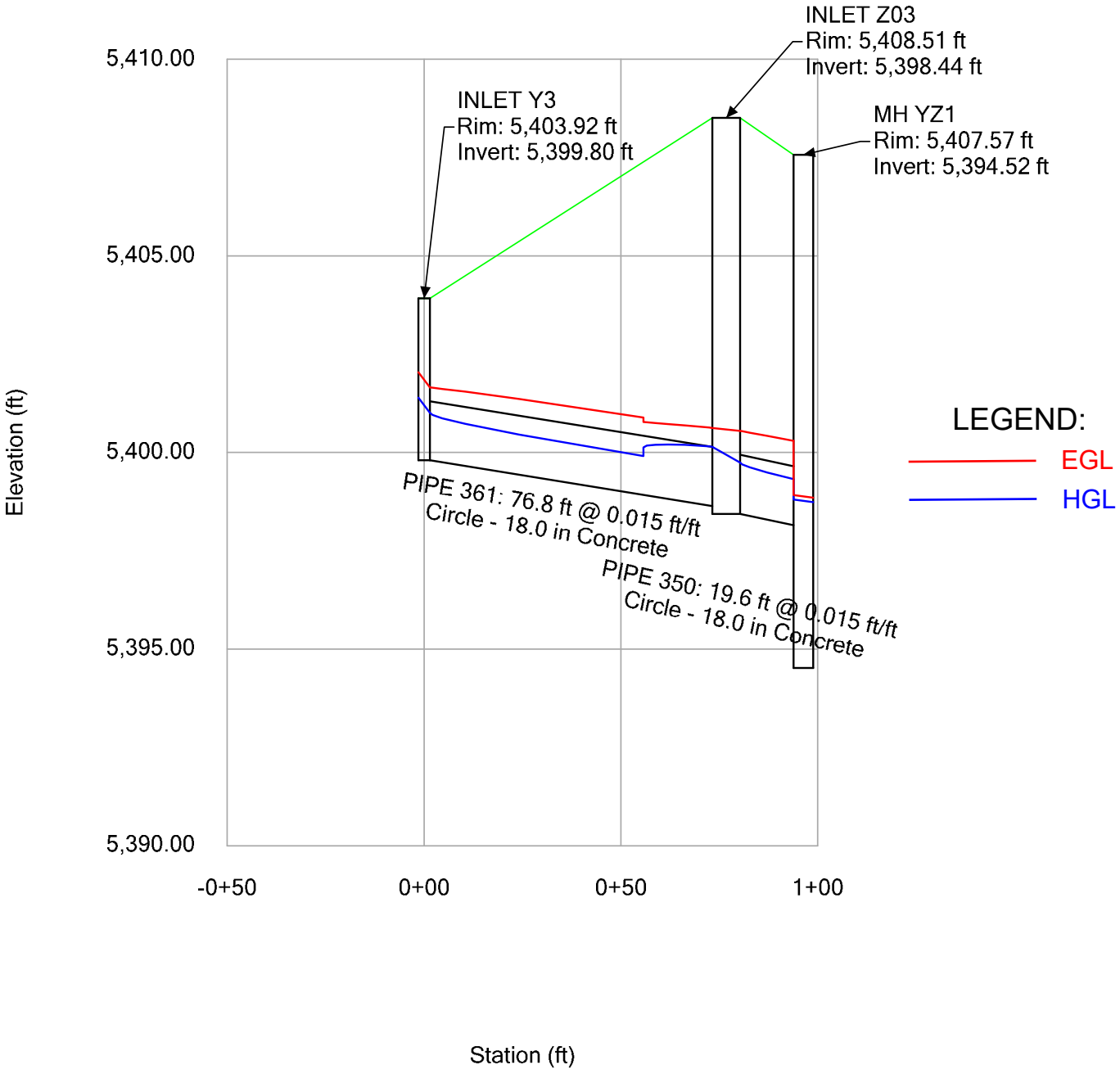
Profile Report
Engineering Profile - Storm Line X (StormCAD Model.stsw)



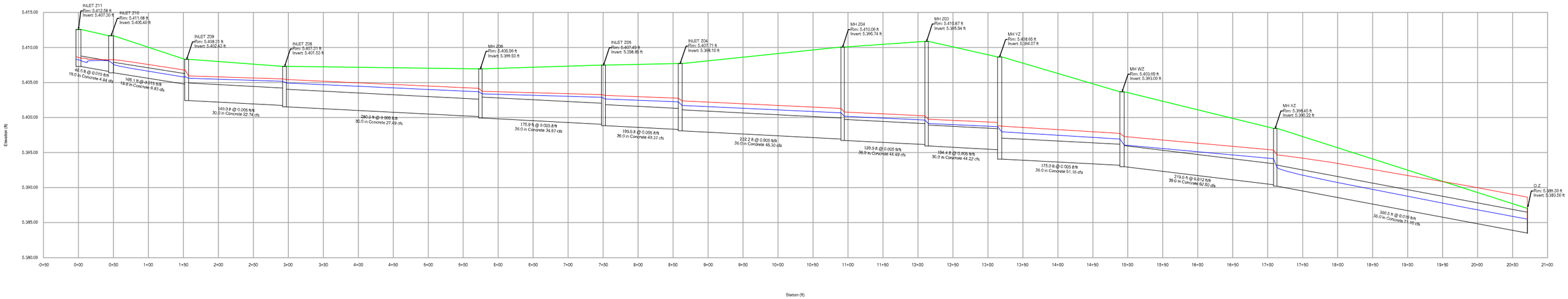
Profile Report
Engineering Profile - Storm Line Y (StormCAD Model.stsw)



Profile Report
Engineering Profile - Storm Line Y1 (StormCAD Model.stsw)



Profile Report
Engineering Profile - Storm Line Z (StormCAD Model.stsw)



LEGEND:

EGL

HGL

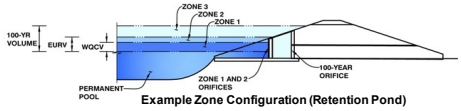
POND B
MHFD-DETENTION

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.00 (December 2019)

Project: _____

Basin ID: _____



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	70.04	acres
Watershed Length =	3,000	ft
Watershed Length to Centroid =	1,500	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Louisville - City Hall	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.287	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	3.672	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.8 in.) =	2.332	acre-feet	inches
5-yr Runoff Volume (P1 = 1.09 in.) =	3.564	acre-feet	inches
10-yr Runoff Volume (P1 = 1.35 in.) =	4.947	acre-feet	inches
25-yr Runoff Volume (P1 = 1.78 in.) =	7.707	acre-feet	inches
50-yr Runoff Volume (P1 = 2.14 in.) =	9.885	acre-feet	inches
100-yr Runoff Volume (P1 = 2.54 in.) =	12.519	acre-feet	inches
500-yr Runoff Volume (P1 = 3.63 in.) =	19.296	acre-feet	inches
Approximate 2-yr Detention Volume =	2.198	acre-feet	
Approximate 5-yr Detention Volume =	3.460	acre-feet	
Approximate 10-yr Detention Volume =	4.189	acre-feet	
Approximate 25-yr Detention Volume =	5.199	acre-feet	
Approximate 50-yr Detention Volume =	5.743	acre-feet	
Approximate 100-yr Detention Volume =	6.824	acre-feet	

Define Zones and Basin Geometry

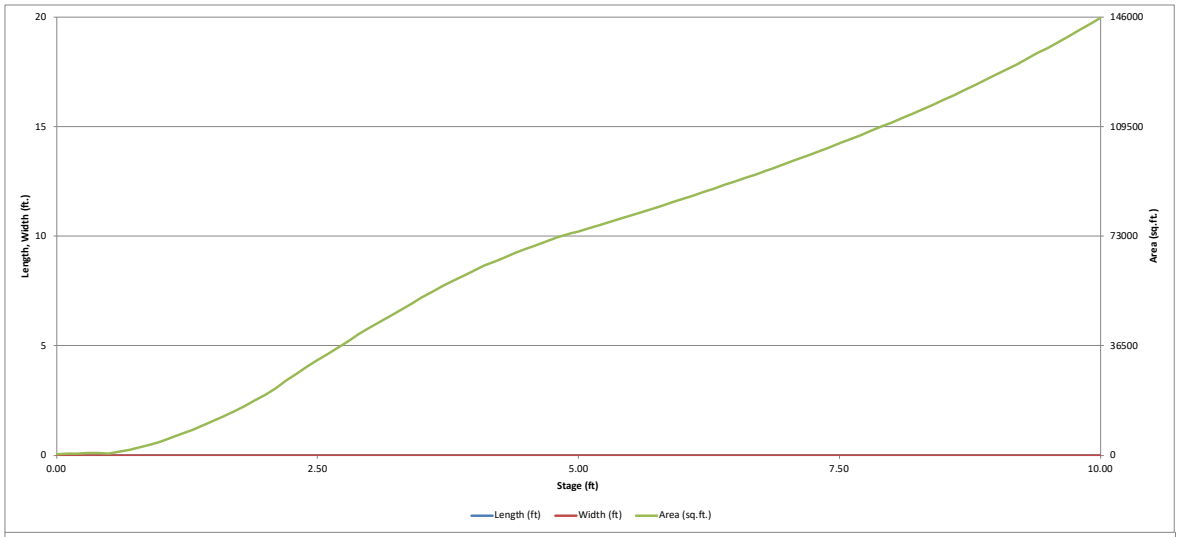
Zone 1 Volume (WQCV) =	1.287	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.386	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.152	acre-feet
Total Detention Basin Volume =	6.824	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

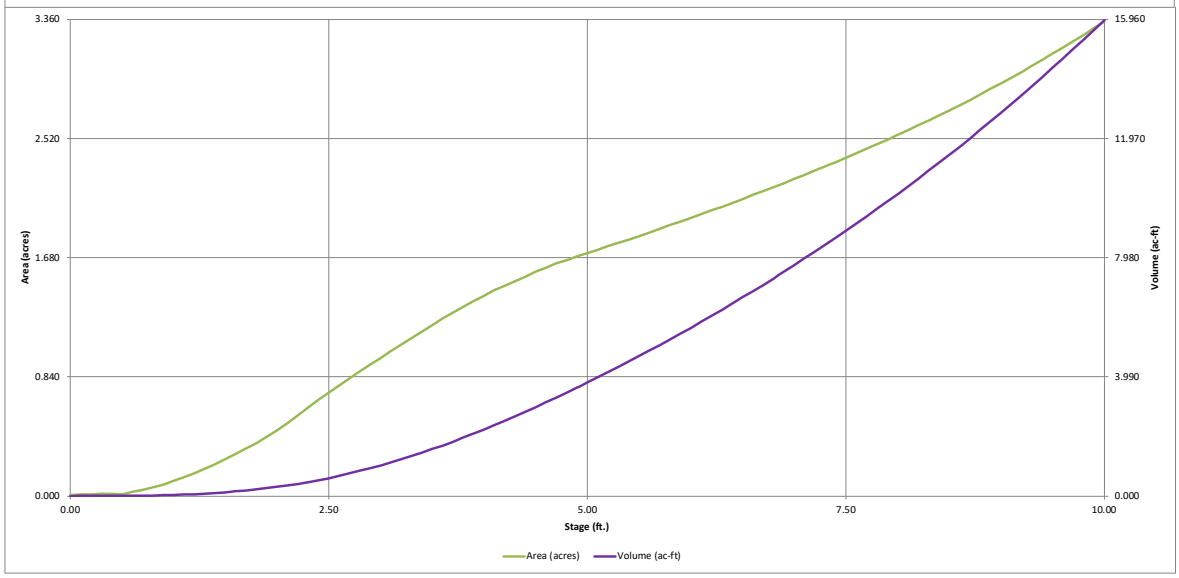
Depth Increment = _____ ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	384	0.009		
	--	0.10	--	--	--	459	0.011	42	0.001
	--	0.20	--	--	--	538	0.012	92	0.002
	--	0.30	--	--	--	620	0.014	150	0.003
	--	0.40	--	--	--	705	0.016	216	0.005
	--	0.50	--	--	--	412	0.009	272	0.006
	--	0.60	--	--	--	1,200	0.028	353	0.008
	--	0.70	--	--	--	1,777	0.041	501	0.012
	--	0.80	--	--	--	2,545	0.058	718	0.016
	--	0.90	--	--	--	3,486	0.080	1,019	0.023
	--	1.00	--	--	--	4,576	0.105	1,422	0.033
	--	1.10	--	--	--	5,768	0.132	1,939	0.045
	--	1.20	--	--	--	7,036	0.162	2,580	0.059
	--	1.30	--	--	--	8,373	0.192	3,350	0.077
	--	1.40	--	--	--	9,790	0.225	4,258	0.098
	--	1.50	--	--	--	11,292	0.259	5,312	0.122
	--	1.60	--	--	--	12,877	0.296	6,521	0.150
	--	1.70	--	--	--	14,542	0.334	7,892	0.181
	--	1.80	--	--	--	16,291	0.374	9,433	0.217
	--	1.90	--	--	--	18,129	0.416	11,154	0.256
	--	2.00	--	--	--	20,054	0.460	13,063	0.300
	--	2.10	--	--	--	22,286	0.512	15,180	0.348
	--	2.20	--	--	--	24,704	0.567	17,530	0.402
	--	2.30	--	--	--	27,220	0.625	20,126	0.462
	--	2.40	--	--	--	29,552	0.678	22,965	0.527
	--	2.50	--	--	--	31,697	0.728	26,027	0.597
	--	2.60	--	--	--	33,823	0.776	29,303	0.673
	--	2.70	--	--	--	35,952	0.825	32,792	0.753
	--	2.80	--	--	--	38,109	0.875	36,495	0.838
	--	2.90	--	--	--	40,296	0.925	40,415	0.928
	--	3.00	--	--	--	42,406	0.974	44,550	1.023
	--	3.10	--	--	--	44,451	1.020	48,893	1.122
	--	3.20	--	--	--	46,433	1.066	53,437	1.227
	--	3.40	--	--	--	50,398	1.157	63,120	1.449
	--	3.50	--	--	--	52,443	1.204	68,262	1.567
	--	3.60	--	--	--	54,484	1.251	73,609	1.690
	--	3.70	--	--	--	56,351	1.294	79,151	1.817
	--	3.80	--	--	--	58,134	1.335	84,875	1.948
	--	3.90	--	--	--	59,838	1.374	90,773	2.084
	--	4.00	--	--	--	61,485	1.412	96,840	2.223
	--	4.10	--	--	--	63,118	1.449	103,070	2.366
	--	4.20	--	--	--	64,582	1.483	109,455	2.513
	--	4.30	--	--	--	65,982	1.515	115,983	2.663
	--	4.40	--	--	--	67,382	1.547	122,651	2.816
	--	4.50	--	--	--	68,771	1.579	129,459	2.972
	--	4.60	--	--	--	70,106	1.609	136,403	3.131
	--	4.70	--	--	--	71,346	1.638	143,475	3.294
	--	4.80	--	--	--	72,498	1.664	150,668	3.459
	--	4.90	--	--	--	73,564	1.689	157,971	3.627
	--	4.92	--	--	--	73,770	1.694	159,444	3.660
	--	5.00	--	--	--	74,590	1.712	165,378	3.797
	--	5.10	--	--	--	75,620	1.736	172,889	3.969
	--	5.20	--	--	--	76,656	1.760	180,503	4.144
	--	5.30	--	--	--	77,703	1.784	188,221	4.321
	--	5.40	--	--	--	78,763	1.808	196,044	4.501
	--	5.60	--	--	--	80,919	1.858	212,012	4.867
	--	5.70	--	--	--	82,014	1.883	220,159	5.054
	--	5.80	--	--	--	83,119	1.908	228,416	5.244
	--	5.90	--	--	--	84,232	1.934	236,783	5.436
	--	6.00	--	--	--	85,357	1.960	245,263	5.630
	--	6.10	--	--	--	86,493	1.986	253,855	5.828
	--	6.20	--	--	--	87,642	2.012	262,562	6.028
	--	6.30	--	--	--	88,804	2.039	271,384	6.230
	--	6.40	--	--	--	89,980	2.066	280,323	6.435
	--	6.50	--	--	--	91,168	2.093	289,381	6.643
	--	6.60	--	--	--	92,370	2.121	298,558	6.854
	--	6.70	--	--	--	93,585	2.148	307,855	7.067
	--	6.80	--	--	--	94,816	2.177	317,275	7.284
	--	6.85	--	--	--	95,436	2.191	322,032	7.393
	--	6.90	--	--	--	96,060	2.205	326,819	7.503
	--	7.00	--	--	--	97,320	2.234	336,488	7.725
	--	7.10	--	--	--	98,593	2.263	346,284	7.950
	--	7.20	--	--	--	99,882	2.293	356,208	8.177
	--	7.40	--	--	--	102,513	2.353	376,447	8.642
	--	7.50	--	--	--	103,852	2.384	386,765	8.879
	--	7.60	--	--	--	105,211	2.415	397,218	9.119
	--	7.70	--	--	--	106,593	2.447	407,809	9.362
	--	7.80	--	--	--	107,994	2.479	418,538	9.608
	--	7.90	--	--	--	109,411	2.512	429,408	9.858
	--	8.00	--	--	--	110,850	2.545	440,421	10.111
	--	8.10	--	--	--	112,313	2.578	451,579	10.367
	--	8.20	--	--	--	113,799	2.612	462,885	10.626
	--	8.30	--	--	--	115,307	2.647	474,340	10.889
	--	8.40	--	--	--	116,844	2.682	485,948	11.156
	--	8.50	--	--	--	118,412	2.718	497,711	11.426
	--	8.60	--	--	--	120,005	2.755	509,632	11.700
	--	8.70	--	--	--	121,627	2.792	521,713	11.977
	--	8.80	--	--	--	123,285	2.830	533,959	12.258
	--	8.90	--	--	--	124,997	2.870	546,373	12.543
	--	9.00	--	--	--	126,742	2.910	558,960	12.832
	--	9.20	--	--	--	130,279	2.991	584,662	13.422
	--	9.30	--	--	--	132,089	3.032	597,780	13.723
	--	9.40	--	--	--	133,926	3.075	611,081	14.028
	--	9.50	--	--	--	135,800	3.118	624,567	14.338
	--	9.60	--	--	--	137,700	3.161	638,242	14.652
	--	9.70	--	--	--	139,640	3.206	652,109	14.970
	--	9.80	--	--	--	141,617	3.251	666,172	15.293
	--	9.90	--	--	--	143,667	3.298	680,436	15.621
	--	10.00	--	--	--	145,870	3.349	694,913	15.953

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.00 (December 2019)



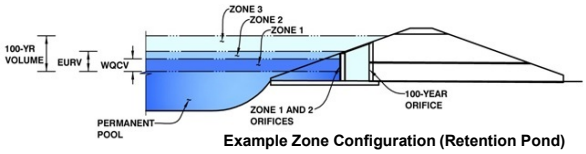


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)

Project:

Basin ID:



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.26	1.287	Orifice Plate
Zone 2 (EURV)	4.93	2.386	Orifice Plate
Zone 3 (100-year)	6.59	3.152	Weir&Pipe (Restrict)
Total (all zones)		6.824	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	5.18	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	20.70	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.73	3.45					
Orifice Area (sq. inches)	5.50	5.50	14.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.18	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.18	N/A	feet
Overflow Weir Front Edge Length =	17.00	N/A	feet	Overflow Weir Slope Length =	2.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.31	N/A	
Horiz. Length of Weir Sides =	2.92	N/A	feet	Overflow Grate Open Area w/o Debris =	39.71	N/A	ft^2
Overflow Grate Open Area % =	80%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	19.86	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	6.29	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.35	N/A	feet
Restrictor Plate Height Above Pipe Invert =	30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.99	feet
Spillway Crest Length =	60.00	feet	Stage at Top of Freeboard =	9.99	feet
Spillway End Slopes =	2.50	H:V	Basin Area at Top of Freeboard =	3.34	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	15.92	acre-ft

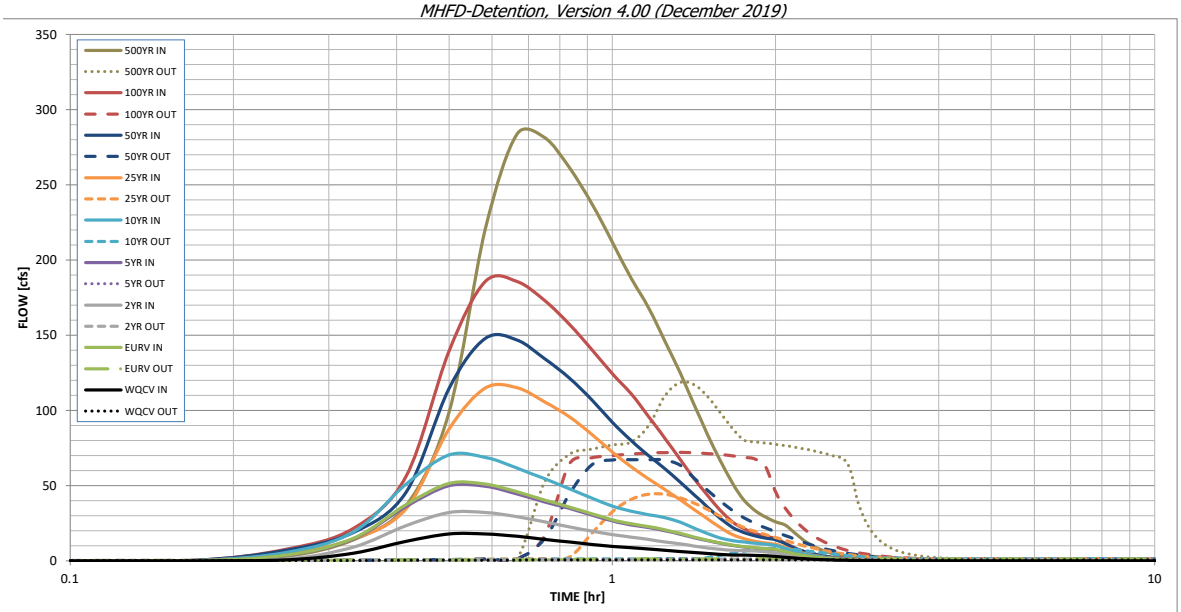
Routed Hydrograph Results

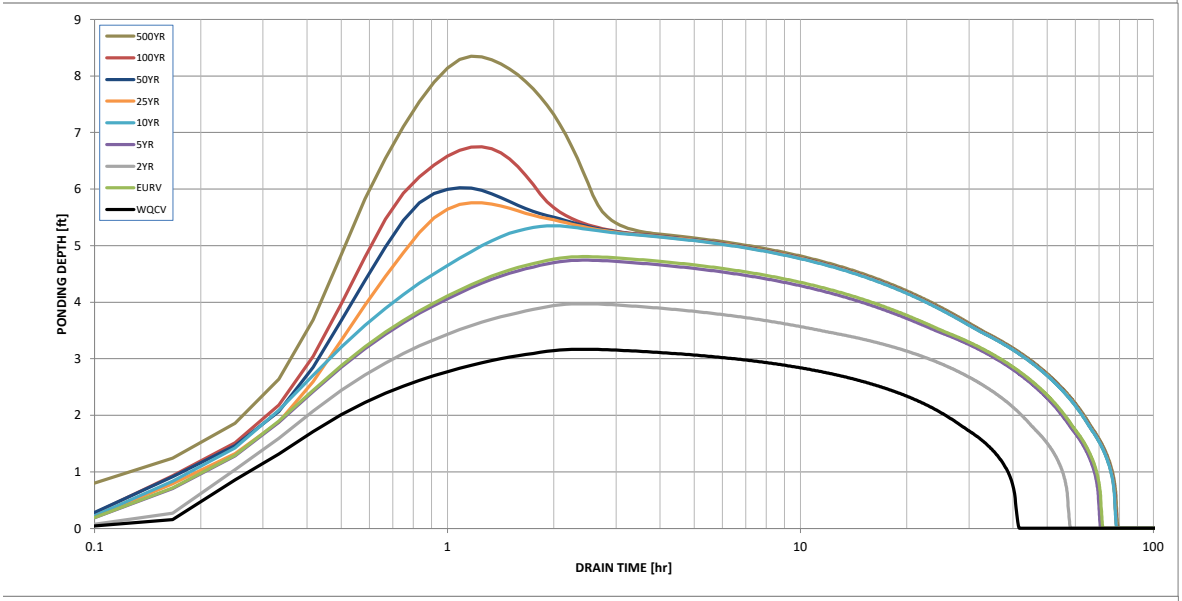
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

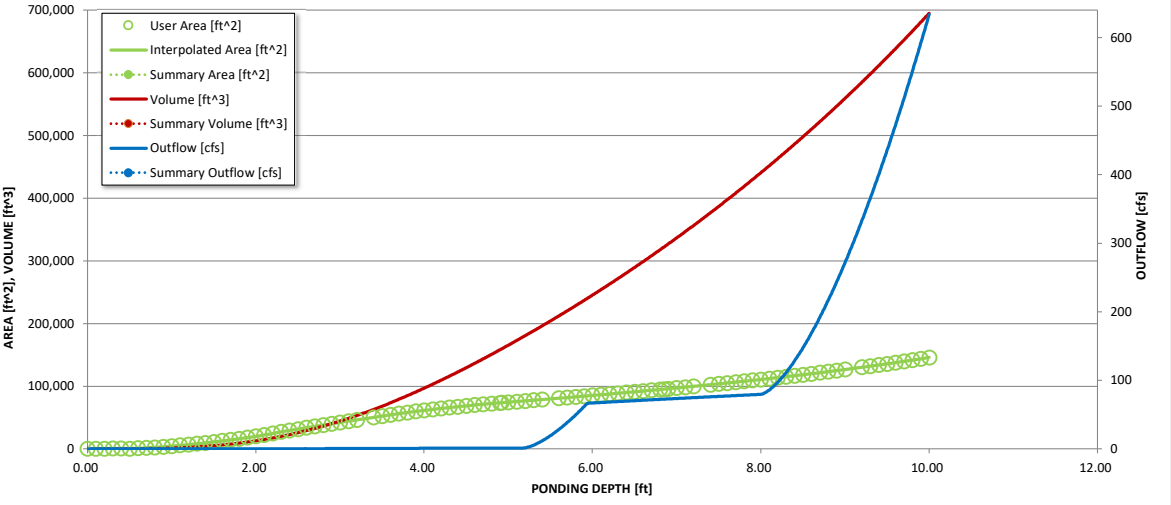
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.80	1.09	1.35	1.78	2.14	2.54	3.63
CUHP Runoff Volume (acre-ft) =	1.287	3.672	2.332	3.564	4.947	7.707	9.885	12.519	19.296
Inflow Hydrograph Volume (acre-ft) =	1.287	3.672	2.332	3.564	4.947	7.707	9.885	12.519	19.296
CUHP Predevelopment Peak Q (cfs) =	0.0	0.0	0.6	5.4	16.7	46.2	65.4	90.4	149.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	0.0	0.0							
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.08	0.24	0.66	0.93	1.29	2.14
Peak Inflow Q (cfs) =	17.7	51.3	32.1	49.8	70.2	115.1	147.8	185.7	283.7
Peak Outflow Q (cfs) =	0.5	1.3	1.0	1.3	8.2	44.2	67.2	72.0	118.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.5	1.0	1.0	0.8	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	1.1	1.7	1.8	2.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	65	53	64	69	65	63	61	55
Time to Drain 99% of Inflow Volume (hours) =	**40**	69	56	68	75	73	72	71	68
Maximum Ponding Depth (ft) =	3.17	4.80	3.97	4.74	5.35	5.75	6.02	6.74	8.35
Area at Maximum Ponding Depth (acres) =	1.05	1.66	1.40	1.65	1.79	1.90	1.96	2.16	2.66
Maximum Volume Stored (acre-ft) =	1.184	3.459	2.167	3.343	4.393	5.149	5.650	7.154	10.996

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.10	2.87
	0:15:00	0.53	3.66	0.97	3.55	5.49	4.69	6.96	7.52	13.99
	0:20:00	5.02	15.05	9.09	14.60	19.18	14.50	18.93	21.67	36.65
	0:25:00	12.82	37.28	23.24	36.18	50.90	34.65	45.63	56.26	98.79
	0:30:00	17.71	51.34	32.09	49.83	70.24	87.65	114.66	139.56	220.53
	0:35:00	17.72	50.93	32.12	49.44	68.75	114.74	147.76	185.74	283.70
	0:40:00	16.20	45.77	29.36	44.42	61.53	115.11	146.77	185.74	281.44
	0:45:00	14.24	40.35	25.80	39.16	54.52	105.65	134.33	173.06	261.40
	0:50:00	12.41	35.76	22.49	34.71	47.72	95.66	121.49	157.27	237.52
	0:55:00	10.84	31.25	19.64	30.33	41.54	84.03	106.88	140.35	211.89
	1:00:00	9.53	27.22	17.27	26.42	36.28	72.31	92.11	124.39	187.81
	1:05:00	8.65	24.54	15.67	23.82	32.95	62.54	79.88	111.02	168.29
	1:10:00	7.76	22.67	14.06	22.01	30.65	54.40	69.87	95.82	146.03
	1:15:00	6.90	20.54	12.50	19.93	28.54	47.38	61.19	81.50	124.98
	1:20:00	6.14	18.11	11.12	17.58	25.56	40.53	52.29	67.45	103.55
	1:25:00	5.41	15.74	9.80	15.28	21.69	33.99	43.71	54.47	83.57
	1:30:00	4.70	13.61	8.52	13.21	18.03	27.73	35.55	43.27	66.36
	1:35:00	4.13	11.90	7.49	11.55	15.10	21.93	28.01	33.39	51.39
	1:40:00	3.80	10.43	6.89	10.13	13.37	17.28	22.09	25.68	40.07
	1:45:00	3.65	9.36	6.61	9.09	12.36	14.63	18.70	21.20	33.39
	1:50:00	3.56	8.63	6.45	8.37	11.65	12.92	16.50	18.26	28.96
	1:55:00	3.24	8.08	5.86	7.84	10.99	11.81	15.06	16.23	25.89
	2:00:00	2.87	7.51	5.20	7.29	10.11	11.02	14.01	14.76	23.65
	2:05:00	2.32	6.10	4.20	5.92	8.16	8.94	11.35	11.67	18.74
	2:10:00	1.78	4.64	3.22	4.50	6.19	6.71	8.50	8.54	13.73
	2:15:00	1.36	3.54	2.47	3.43	4.68	5.04	6.37	6.31	10.15
	2:20:00	1.04	2.67	1.88	2.59	3.50	3.79	4.76	4.73	7.59
	2:25:00	0.78	2.00	1.42	1.94	2.59	2.82	3.54	3.53	5.67
	2:30:00	0.58	1.46	1.06	1.42	1.91	2.07	2.59	2.62	4.20
	2:35:00	0.43	1.05	0.78	1.02	1.40	1.50	1.88	1.92	3.07
	2:40:00	0.31	0.76	0.56	0.74	1.03	1.12	1.41	1.43	2.29
	2:45:00	0.21	0.53	0.38	0.51	0.72	0.80	1.00	1.01	1.62
	2:50:00	0.13	0.35	0.24	0.34	0.47	0.53	0.66	0.67	1.06
	2:55:00	0.07	0.21	0.13	0.20	0.27	0.31	0.39	0.39	0.62
	3:00:00	0.03	0.10	0.06	0.10	0.12	0.15	0.19	0.19	0.30
	3:05:00	0.01	0.03	0.02	0.03	0.04	0.05	0.06	0.06	0.09
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

POND B
FOREBAY CALCULATIONS

FOREBAY CALCULATIONS

PROJECT: PROJECT 321
JURISDICTION: CITY OF LOUISVILLE
DATE: 1/23/2020

EDB VALUES	WATER QUALITY CAPTURE VOLUME =	1.483	ACRE-FT
		64599	CU. FT.
	100-YEAR PEAK DISCHARGE =	185.70	CFS
FOREBAY CALCULATIONS	FOREBAY VOLUME = 3% WQCV =	0.044	ACRE-FT
		1938	CU. FT.
	FOREBAY DEPTH =	18	IN
	FOREBAY DISCHARGE = 2% 100-YEAR FLOW =	3.71	CFS
	FOREBAY NOTCH WIDTH =	10.9	IN

Urban Storm Drainage Criteria Manual, Volume 3, EDB-1, Table EDB-4 "EDB Component Criteria" (November 2015)
Mile High Flood District (Previously Urban Drainage and Flood Control District)

	On-Site EDBs for Watersheds up to 1 Impervious Acre[1]	EDBs with Watersheds between 1 and 2 Impervious Acres[1]	EDBs with Watersheds up to 5 Impervious Acres	EDBs with Watersheds over 5 Impervious Acres	EDBs with Watersheds over 20 Impervious Acres
Forebay Release and Configuration	EDBs should not be used for watersheds with less than 1 impervious acre.	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch configuration	Release 2% of the undetained 100-year peak discharge by way of a wall/notch or berm/pipe[2] configuration
Minimum Forebay Volume		1% of the WQCV	2% of the WQCV	3% of the WQCV	3% of the WQCV
Maximum Forebay Depth		12 inches	18 inches	18 inches	30 inches
Trickle Channel Capacity		≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity	≥ the maximum possible forebay outlet capacity
Micropool		Area ≥ 10 ft^2	Area ≥ 10 ft^2	Area ≥ 10 ft^2	Area ≥ 10 ft^2
Initial Surcharge Volume		Depth ≥ 4 inches	Depth ≥ 4 inches	Depth ≥ 4 in. Volume ≥ 0.3% WQCV	Depth ≥ 4 in. Volume ≥ 0.3% WQCV

[1] EDBs are not recommended for sites with less than 2 impervious acres. Consider a sand filter or rain garden.

[2] Round up to the first standard pipe size (minimum 8 inches).

POND B

TRICKLE CHANNEL CAPACITY CALCULATIONS

Worksheet for Trickle Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00600	ft/ft
Discharge	4.21	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.51	0.00
0+02.50	-0.17
0+04.50	0.00
0+04.51	0.50
0+05.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+05.00, 0.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.37	ft
Elevation Range	-0.17 to 0.50 ft	
Flow Area	1.16	ft²
Wetted Perimeter	4.42	ft
Hydraulic Radius	0.26	ft
Top Width	4.00	ft

Worksheet for Trickle Channel

Results

Normal Depth		0.37	ft
Critical Depth		0.41	ft
Critical Slope		0.00418	ft/ft
Velocity		3.63	ft/s
Velocity Head		0.20	ft
Specific Energy		0.58	ft
Froude Number		1.19	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.37	ft
Critical Depth	0.41	ft
Channel Slope	0.00600	ft/ft
Critical Slope	0.00418	ft/ft

Cross Section for Irregular Section - 1

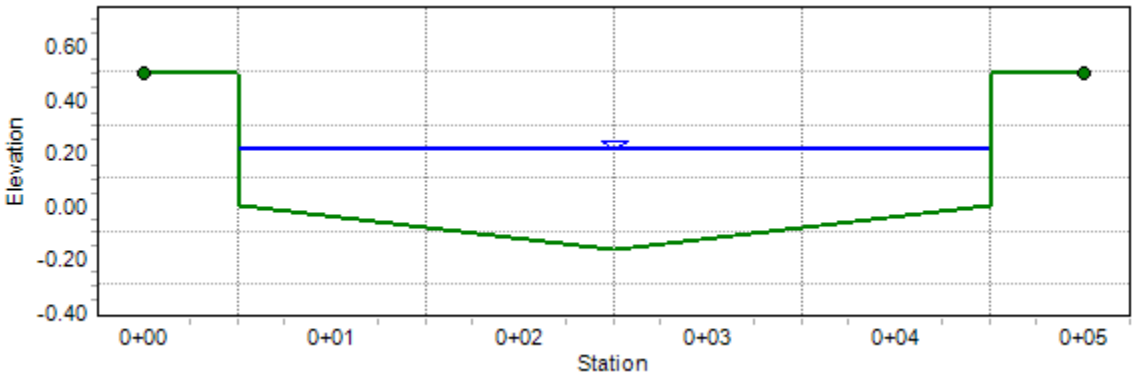
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00600	ft/ft
Normal Depth	0.37	ft
Discharge	4.21	ft³/s

Cross Section Image



POND B
OUTLET PIPE CALCULATIONS

Worksheet for Pond Outlet Pipe

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Diameter	3.00	ft
Discharge	72.00	ft³/s

Peak Outflow from MHFD Spreadsheet

Results

Normal Depth	1.96	ft
Flow Area	4.90	ft²
Wetted Perimeter	5.65	ft
Hydraulic Radius	0.87	ft
Top Width	2.85	ft
Critical Depth	2.68	ft
Percent Full	65.4	%
Critical Slope	0.01031	ft/ft
Velocity	14.69	ft/s
Velocity Head	3.36	ft
Specific Energy	5.32	ft
Froude Number	1.98	
Maximum Discharge	101.46	ft³/s
Discharge Full	94.32	ft³/s
Slope Full	0.01165	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	65.42	%
Downstream Velocity	Infinity	ft/s

Worksheet for Pond Outlet Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.96	ft
Critical Depth	2.68	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.01031	ft/ft

POND B
SPILLWAY DESIGN CALCULATIONS

Worksheet for Pond Spillway

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.069	
Channel Slope	0.02000	ft/ft
Left Side Slope	2.50	ft/ft (H:V)
Right Side Slope	2.50	ft/ft (H:V)
Bottom Width	60.00	ft
Discharge	185.70	ft³/s

Results

Normal Depth	1.00	ft
Flow Area	62.70	ft²
Wetted Perimeter	65.40	ft
Hydraulic Radius	0.96	ft
Top Width	65.02	ft
Critical Depth	0.66	ft
Critical Slope	0.08076	ft/ft
Velocity	2.96	ft/s
Velocity Head	0.14	ft
Specific Energy	1.14	ft
Froude Number	0.53	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.66	ft
Channel Slope	0.02000	ft/ft

PROJECT INFORMATION

PROJECT NAME:	Project 321
PROJECT #:	19.1391
DATE:	01/14/19
DESIGN POINT:	Spillway

MARTIN/MARTIN CONSULTING ENGINEERS

Riprap Channel with Mild Slope:

$$d_{50} \geq \left[\frac{VS^{0.17}}{4.5(G_s - 1)^{0.66}}\right]^2$$

**Equation 8-11, UDFCD (V.1), Chapter 8, Page 8-71*

Where:

d_{50} = Mean Rock Size (ft)
V = Mean Channel Velocity (ft/sec)
S = Longitudinal Channel Slope (ft/ft)
G_s = Specific Gravity of Riprap (2.65)

V =	3.0	(ft/sec)
S =	0.020	(ft/ft)
G_s =	2.65	

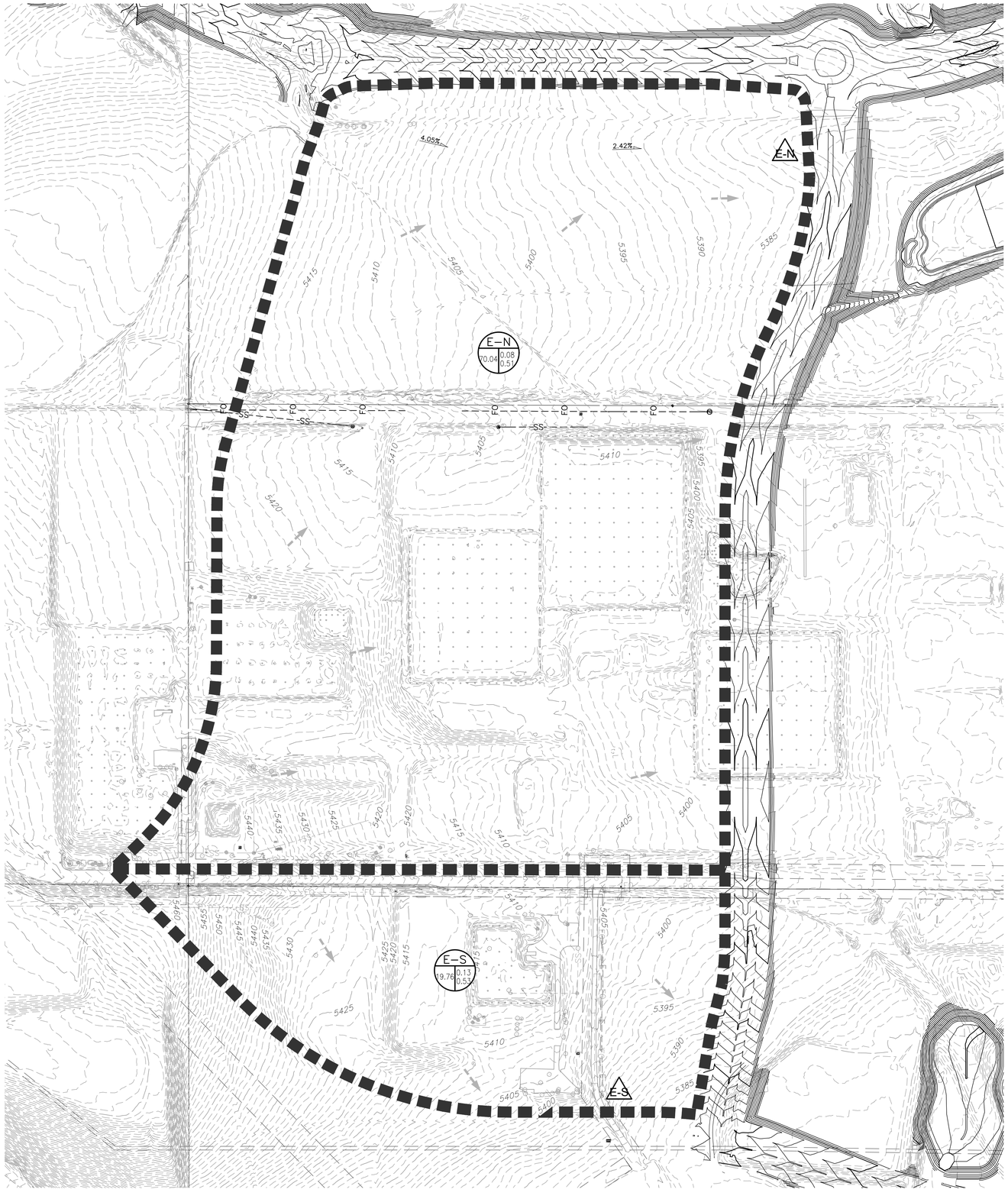
d_{50} =	**0.1**	**(ft)**	
	1	**(in)**	**TYPE-VL**

Note that Equation 8-11 is applicable for sizing riprap for channel lining with a longitudinal slope of no more than 2%. This equation is not intended for use in sizing riprap for steep slopes (typically in excess of 2 percent), rundowns, or protection downstream of culverts. Information on rundowns is provided in Section 7.0 of the *Hydraulic Structures* chapter of the USDCM, and protection downstream of culverts is discussed in the *Culverts and Bridges* chapter. For channel slopes greater than 2% use one of the methods presented in 8.1.2.

Rock size does not need to be increased for steeper channel side slopes, provided the side slopes are no steeper than 2.5H:1V (UDFCD 1982). Channel side slopes steeper than 2.5H:1V are not recommended because of stability, safety, and maintenance considerations. See Figure 8-34 for riprap placement specifications. At the upstream and downstream termination of a riprap lining, the thickness should be increased 50% for at least 3 feet to prevent undercutting.

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D_{50}* (INCHES)
TYPE VL	70 – 100 50 – 70 35 – 50 2 – 10	12 9 6 2	6
TYPE L	70 – 100 50 – 70 35 – 50 2 – 10	15 12 9 3	9
TYPE M	70 – 100 50 – 70 35 – 50 2 – 10	21 18 12 4	12
TYPE H	70 – 100 50 – 70 35 – 50 2 – 10	30 24 18 6	18
*D_{50} = MEAN ROCK SIZE			

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)



LEGEND

BASIN BOUNDARY

SUB-BASIN BOUNDARY

DIRECTION OF FLOW

DESIGN POINT 1

BASIN — B — C5

AREA IN ACRES — 1.25 — .88 .93 — C100

RUNOFF SUMMARY

BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
E-N	E-N	70.04	5.2%	0.08	0.51	9.70	147.36
E-S	E-S	19.76	11.1%	0.13	0.53	5.04	49.56
SITE COMPOSITE		**89.80**	**6.5%**	**0.09**	**0.51**	**14.74**	**196.92**

N

50 25 0 50 100

SCALE: 1"=50'

ALL LINEAL DIMENSIONS ARE IN U.S. SURVEY FEET

MARTIN/MARTIN
CONSULTING ENGINEERS
12499 WEST COLFAX AVENUE
LAKEWOOD, COLORADO 80215
303.431.6100
MARTINMARTIN.COM

RYAN

NOT FOR CONSTRUCTION

PROJECT 321 OFFICE CAMPUS
NAWATNY RIDGE - LOUISVILLE, CO

EXISTING DRAINAGE PLAN

No.	Issue / Revision	Date	Name
1	CIVIL CDs FOR REVIEW	01/31/20	REF

Job Number 19.1391
Project Manager R. FRANKENBERGER
Design By M. SUNDSTROM
Drawn By D. BEHM
Principal In Charge M. THORNBROUGH

Sheet Number:

D1

PLOT DATE: Wednesday, January 29, 2020 11:50 AM LAST SAVED BY: MBONILLA
DRAWING LOCATION: G:\Thornbrough\19.1391-Project 321\ENG\DRAINAGE\Drainage Basins (Existing).dwg

LEGEND

BASIN BOUNDARY

SUB-BASIN BOUNDARY

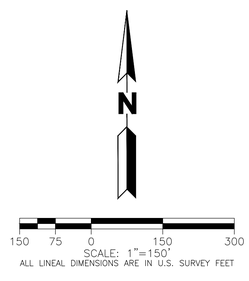
DIRECTION OF FLOW

DESIGN POINT 1

BASIN B | C5 | 1.25 | .88 / .93 | C100 | AREA IN ACRES

RUNOFF SUMMARY

BASIN	DESIGN POINT	AREA (ACRES)	% IMP.	C_5	C_{100}	Q_5 (CFS)	Q_{100} (CFS)
A1	A1	1.69	93.9%	0.80	0.87	4.60	11.62
A2	A2	1.95	76.4%	0.66	0.80	3.95	11.16
A3	A3	0.91	78.7%	0.68	0.81	2.02	5.62
A4	A4	0.50	82.4%	0.71	0.82	1.23	3.33
A5	A5	0.71	58.6%	0.51	0.72	1.23	4.06
A6	A6	0.54	63.7%	0.55	0.74	1.06	3.32
A7	A7	1.84	60.6%	0.53	0.73	2.92	9.42
A8	A8	3.47	35.3%	0.32	0.63	2.89	13.09
A9	A9	1.21	92.7%	0.79	0.86	3.28	8.34
A10	A10	1.19	98.4%	0.84	0.89	3.68	9.09
A11	A11	6.20	65.0%	0.57	0.75	10.93	33.82
B1	B1	1.25	87.5%	0.75	0.84	3.20	8.41
B2	B2	0.28	79.0%	0.68	0.81	0.70	1.95
B3	B3	0.73	63.8%	0.55	0.74	1.40	4.38
B4	B4	0.50	62.8%	0.55	0.74	0.92	2.89
C1	C1	1.44	70.7%	0.61	0.77	3.05	9.00
C2	C2	1.87	85.9%	0.73	0.84	4.88	12.93
C3	C3	1.25	98.4%	0.84	0.89	3.87	9.55
D1	D1	0.24	83.7%	0.72	0.83	0.64	1.71
E1	E1	0.27	52.8%	0.47	0.70	0.46	1.63
N	N	11.03	2.0%	0.05	0.49	1.55	34.66
P1	P1	0.46	2.0%	0.05	0.49	0.08	1.84
P2	P2	0.44	2.0%	0.05	0.49	0.08	1.87
P3	P3	0.61	2.0%	0.05	0.49	0.12	2.59
R1	R1	0.74	90.0%	0.77	0.85	2.10	5.43
R2	R2	0.74	90.0%	0.77	0.85	2.10	5.43
R3	R3	0.71	90.0%	0.77	0.85	2.02	5.21
RA	RA	0.23	90.0%	0.77	0.85	0.65	1.69
RB	RB	0.25	90.0%	0.77	0.85	0.71	1.84
S1	S1	18.79	2.0%	0.05	0.49	1.79	39.98
S2	S2	0.44	42.1%	0.38	0.66	0.52	2.09
W1	W1	1.04	87.8%	0.75	0.84	2.74	7.16
W2	W2	0.63	82.9%	0.71	0.82	1.64	4.44
W3	W3	0.20	65.7%	0.57	0.75	0.36	1.11
X1	X1	0.96	90.9%	0.78	0.86	2.68	6.89
X2	X2	0.97	91.0%	0.78	0.86	2.71	6.96
Y1	Y1	0.40	100.0%	0.85	0.89	1.26	3.08
Y2	Y2	3.42	2.0%	0.05	0.49	0.32	7.16
Y3	Y3	4.39	2.4%	0.05	0.49	0.47	9.82
Z01	Z01	0.65	89.4%	0.76	0.85	1.79	4.64
Z02	Z02	0.78	84.9%	0.73	0.83	2.10	5.59
Z03	Z03	0.51	86.5%	0.74	0.84	1.34	3.54
Z04	Z04	1.68	17.7%	0.18	0.56	0.75	5.41
Z05	Z05	2.18	6.7%	0.09	0.51	0.48	6.43
Z06	Z06	3.13	8.8%	0.11	0.52	0.83	9.38
Z07	Z07	0.36	17.1%	0.17	0.55	0.19	1.43
Z08	Z08	1.47	11.9%	0.13	0.53	0.55	5.16
Z09	Z09	2.54	65.0%	0.57	0.75	4.28	13.23
Z10	Z10	0.98	65.0%	0.56	0.75	1.68	5.19
Z11	Z11	0.96	65.0%	0.56	0.75	1.59	4.92
ZL	ZL	0.03	100.0%	0.85	0.89	0.09	0.23
SITE COMPOSITE		89.76	36.3%	0.33	0.63	96.50	379.71



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12499 WEST COLFAX AVENUE
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303.431.6100
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PROJECT 321 OFFICE CAMPUS
NAWATNY RIDGE - LOUISVILLE, CO

PROPOSED DRAINAGE PLAN

No.	Issue / Revision	Date	Name
1	CIVIL CDs FOR REVIEW	01/31/20	REF

Job Number 19.1391
Project Manager R. FRANKENBERGER
Design By M. SUNDSTROM
Drawn By D. BEHM
Principal In Charge M. THORNBROUGH

Sheet Number:

D2

PLOT DATE: Wednesday, January 29, 2020 11:49 AM LAST SAVED BY: MBONILLA
DRAWING LOCATION: G:\Thornbrough\19.1391-Project 321\ENG\DRAINAGE\Drainage Basins.dwg