INNOVATIVE DESIGN. **CLASSIC RESULTS.**

FINAL DRAINAGE REPORT
FOR
MIDTOWN AT WOLF RANCH
FILING NO'S. 1 & 2

December 2019

Prepared for:
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Job no. 2555.00

FINAL DRAINAGE REPORT FOR MIDTOWN AT WOLF RANCH FILING NO'S. 1 & 2

Engineer's Statement

This report and plan for the drainage design of **Midtown at Wolf Ranch Filing No's 1 & 2** was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

SIGNATURE (Affix Seal):_____

David L. Gibson Colorado P.E. No. 46477 Date

Developer's Statement

Remington at Wolf Ranch LLC. hereby certifies that the drainage facilities for **Midtown at Wolf Ranch Filing No.'s 1 & 2** shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of **Midtown at Wolf Ranch Filing No's 1 & 2**, guarantee that final drainage design review will absolve **Remington at Wolf Ranch LLC.** and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Remington at Wolf Ranch LLC

Name of Developer

_____

Signature

_____

Printed Name

_____

Title

111 S. Tejon Suite 222

Colorado Springs, CO 80903

Address:

City of Colorado Springs Statement:

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

_____ _____

For City Engineer Date

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FINAL DRAINAGE REPORT FOR MIDTOWN AT WOLF RANCH FILING NO'S. 1 & 2

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APPENDICES

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FINAL DRAINAGE REPORT FOR MIDTOWN AT WOLF RANCH FILING NO'S. 1 & 2

PURPOSE

This document is the Final Drainage Report for Midtown at Wolf Ranch Filing No's 1 & 2. The purpose of this report is to identify onsite and offsite drainage patterns, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities.

GENERAL DESCRIPTION

Please consider this the Final Drainage Report for Midtown at Wolf Ranch Filing No's 1 & 2. This report is being written to accompany the Midtown at Wolf Ranch Development Plan and Plats. Midtown at Wolf Ranch Filing No. 1 is 9.58 acres and Filing 2 is 4.09 acres of proposed residential development in a portion of section 31, township 12 south, range 65 west of the sixth principal meridian, City of Colorado Springs, County of El Paso. The site is bound to the south by unplatted future park land to the west is a Cottonwood Creek Tributary 4, To the north by Research Parkway and to the east by Wolf Valley Drive. This Development Plan proposes to develop approximately 13.67 acres into 119 residential single-family lots and tracts. This site is not within the streamside overlay portion of the Cottonwood Creek Tributary 4.

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the soils underlying the site consist of Soil Type "71" Pring Coarse Sandy Loam Classification Group "B" and Type "85" Stapleton Bernal Sandy Loam classification group "B". (See Appendix).

EXISTING DRAINAGE CONDITIONS/PREVIOUS STUDIES

Reference previous reports drainage maps in appendix.

This site is located within the Cottonwood Creek Drainage Basin. The site has existing slopes ranging from 1% to 33% and ground cover being predominantly native grasses. This site has been previously studied as a part of the Cottonwood Creek (DBPS), and the Wolf Ranch Master Development Drainage Plan (MDDP). This site is adjacent to the existing Wolf Ranch Tributary Four within the Cottonwood Creek drainage basin. This section of the Wolf Ranch Tributary Four is within the prudent line setback as determined with the MDDP. Tributary Four does not lie within a designated streamside overlay zone. The master developer for Wolf Ranch has already installed improvements in conformance with the approved MDDP to this existing channel with the development of adjacent properties.

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Existing flows travel southwesterly direction towards existing Wolf Ranch Tributary Four and eventually to Cottonwood Creek. This site was previously studied in the Wolf Ranch MDDP by Kiowa Engineering and lies with in Basins G-3 and F-17 of the MDDP existing conditions map.

Currently there is an existing 24" RCP storm sewer crossing the north portion of the site and outfalling to the existing Wolf Ranch Tributary Four from the existing FSD pond located on the north side of existing Research Parkway. This pond was installed with development of Wolf Ranch north of Research Parkway. This storm sewer will be relocated within Midtown at Wolf Ranch maintaining the same outfall location.. Midtown at Wolf Ranch will not contribute flows to this existing storm sewer.

Basin EX-1 (Q_5= 3 cfs, Q_{100}= 24 cfs) is 13.67 acres of undeveloped acreage that represents Midtown at Wolf Ranch Filing no. 1 and 2. Flows drain south and then east towards the future park site.

Basin EX-2(Q_5= 2 cfs, Q_{100}= 15 cfs) is 8.50 acres of undeveloped acreage that represents the future park site south of the proposed Midtown at Wolf Ranch Filing No. 1 & 2. This basin is not part of this development by analyzed as tributary to a future sub-regional Full Spectrum Detention Facility.

Basin CE-1 (Q_5= 29.3 cfs, Q_{100}= 246.7 cfs) is 83.30 acres of future school site for the District 20 middle school and high school. This site was previously studied with the Preliminary Drainage Repot for Academy District 20 School Sites Final Drainage Report for Elementary School #20 at Wolf Ranch by Matrix Design Group approved August 2017.

PROPOSED DRAINAGE CONDITIONS

See Appendix for Drainage Map.

Design Point 1 (Q_5= 2 cfs, Q_{100}= 4 cfs) consists of flows from Basin B. Basin A consists of 0.71 acres of proposed residential development with associated streets, landscaping, open space landscape common space and homes. Flows will travel in the curb line of Vaunt Court to a proposed public 4' D-10-R sump inlet located at Design Point 1 where flows will be completely intercepted (see appendix for inlet capacity information). Street capacity at this design point is Q_5= 4.1 cfs, Q_{100}= 28.4 cfs. Flows will be intercepted and convey in a proposed public 18" RCP storm sewer (see appendix for capacity Pipe 1). The overflow route for this inlet is to overtop the proposed curb and travel to Design Point 2.

Design Point 2 (Q_5= 2 cfs, Q_{100}= 5 cfs) consists of flows from Basin C. Basin C consists of 1.27 acres of proposed residential development with associated streets, landscaping, open space landscape common space and homes. Flows will travel in the westerly curb line of Hoopla Drive to a proposed 10' D-10-R at-grade inlet at Design Point 2. This at-grade inlet will intercept (Q_5= 2 cfs, Q_{100}= 4.8 cfs) with a flow-by of (Q_5= 0 cfs, Q_{100}= 0.20 cfs) (see appendix for inlet capacity) that will travel in the westerly curb line of Hoopla Drive then to Design Point 6. Street Capacity for a residential street with Type 1 curb and gutter at 2.0% is Q_5= 11.9 cfs, Q_{100}= 59.8 cfs (to ROW) at this design point. Intercepted flows will be conveyed by a proposed public 18" RCP storm sewer (see appendix for capacity Pipe 2).

Design Point 3 (Q_5= 11 cfs, Q_{100}= 23 cfs) consists of flows from Basin E. Basin E consists of 5.30 acres of proposed residential development with associated streets, landscaping, open space landscape common space and homes. Flows will travel in the curb line of Rollick Drive to a proposed public 14' D-10-R sump inlet located at Design Point 3 where flows will be completely intercepted (see appendix for inlet capacity information). Street capacity at this design point is Q_5= 13.4 cfs, Q_{100}= 55.9 cfs. Flows will be intercepted and convey in a proposed public 24" RCP storm sewer (see appendix for capacity Pipe 4). The overflow route for this inlet is to overtop the crown in the road to Design Point 4.

Design Point 4 (Q_5= 1 cfs, Q_{100}= 2 cfs) consists of flows from Basin G. Basin G is 0.52 acres of proposed residential development with associated streets, landscaping, open space landscape common space and homes. Developed flows will travel to Design Point 4 where a proposed public 4' D-10-R sump inlet will completely intercept flows (see appendix for capacity). Street Capacity at this design point is Q_5= 13.4 cfs, Q_{100}= 55.9 cfs. Flows will be intercepted and conveyed along with flows from Pipe 5 in a proposed public 18" RCP storm sewer (see appendix for capacity). The emergency overflow route for this inlet will be in the intersection of Rollick Drive and Swagger Drive then south to Design Point 6.

Design Point 5 (Q_5= 3 cfs, Q_{100}= 6 cfs) consists of flows from Basin F and Basin OS-1. Basin F consists of 0.78 acres of proposed residential development with landscaping, open space landscape common space and homes. Basin OS-1 is a portion of existing Wolf Valley Drive. Flows will travel in the westerly curb line of Wolf Valley Drive to a proposed 10' D-10-R at-grade inlet at Design Point 5. This at-grade inlet will intercept (Q_5= 3 cfs, Q_{100}= 5.5 cfs) with a flow-by of (Q_5= 0 cfs, Q_{100}= 0.50 cfs) (see appendix for inlet capacity) that will travel in the westerly curb line of Wolf Valley Drive to an existing 6' D-10-R at grade inlet installed with the construction of Wolf Valley Drive. Street Capacity for a residential street with Type 1 curb and gutter at 2.5% is Q_5= 15.4 cfs,

Q_{100}= 57.5cfs (to ROW) at this design point. Intercepted flows will be conveyed by a proposed public 18" RCP storm sewer (see appendix for capacity Pipe 7).

Design Point 6 (Q_5= 5 cfs, Q_{100}= 12 cfs) consists of flows from Basin I and flow-by from Design Point 2. Basin I consist of 2.47 acres of proposed residential development with associated streets, landscaping, open space landscape common space and homes. Flows will travel in the curb line of Jovial Place to a proposed public 8' D-10-R sump inlet located at Design Point 6 where flows will be completely intercepted (see appendix for inlet capacity information). Street capacity at this design point is Q_5= 5 cfs, Q_{100}= 25.2 cfs. Flows will be intercepted and convey in a proposed public 24" RCP storm sewer (see appendix for capacity Pipe 9). The overflow route for this inlet is to overtop the proposed curb and travel to Wolf Valley Drive.

Basin A (Q_5= 1 cfs, Q_{100}= 2 cfs) is 0.63 acres. This basin consists of front yard landscaping, roof, and sidewalk within the single-family lots and undisturbed vegetated slope. Of that 0.63 acres of basin, 0.14 acres is the assumed impervious area (sidewalk, roof) of the residential development. This basin will drain as unconcentrated sheet flow across the undisturbed vegetated slope along its historic path to the adjacent Cottonwood Creek Trihutary 4. Due to the slope constraints of the existing grading the disturbance along this corridor are limited. The physical constraints of the elevations along Cottonwood Creek make collection of stormwater difficult to capture and treat, and is impractical to access for maintenance. This 0.14 acres of impervious area will sheet flow over approximately 300' feet of natural grass buffer prior to discharge into Cottonwood Creek. Any roof drains will be routed north to the proposed roadway in an attempt to route as much impervious area to the proposed Full Spectrum Detention Facility.

Basin D (Q_5= 0.40 cfs, Q_{100}= 1 cfs) is 0.17 acres. This basin consists of landscaping and a portion of Hoopla Drive at its intersection with Research Parkway. A highpoint in Hoopla Drive is proposed to keep flows from existing Research Parkway (an arterial roadway) from entering the site. Flows will continue in the curb line of Research Parkway.

Basin H (Q_5= 1 cfs, Q_{100}= 3 cfs) is 0.93 acres. This basin consists of front yard landscaping, roof, and sidewalk within the single-family lots. Of that 0.93 acres of basin, 0.16 acres is the assumed impervious area (sidewalk, roof) of the residential development. This basin will drain to a proposed vegetated swale to the future park site south of Midtown at Wolf Ranch Filing No. 2 (Basin OS-2). These flows will need to be taken into account with development of the future park. All flows from this site, as well as the future park site will be treated in a proposed Full Spectrum Detention Facility. See Storm Water Quality section of this report.

Basin J (Q_5= 0.30 cfs, Q_{100}= 1 cfs) is 0.23 acres. This basin consists of front yard landscaping, roof, and sidewalk within the single-family lots. This basin will drain as unconcentrated sheet flow to existing Wolf Valley Drive. Flows will travel in the west curb line and will need to be taken into account with development of the future park site south of Filing 2. All flows from this site, as well as the future park site will be treated in a proposed Full Spectrum Detention Facility. See Storm Water Quality section of this report.

Basin K (Q_5= 1 cfs, Q_{100}= 2 cfs) is 0.60 acres. This basin consists of front yard landscaping, roof, and sidewalk within the single-family lots and undisturbed vegetated slope. Of that 0.60 acres of basin, 0.12 acres is the assumed impervious area (sidewalk, roof) of the residential development. This basin will drain as unconcentrated sheet flow across the undisturbed vegetated slope along its historic path to the future park site south of Midtown at Wolf Ranch Filing No. 2 (Basin OS-2). These flows will need to be taken into account with development of the future park. All flows from this site as well as the future park site will be treated in a proposed Full Spectrum Detention Facility. See Storm Water Quality section of this report.

Basin OS-2 (Q_5= 10 cfs, Q_{100}= 25 cfs) is 8.50 acres. Basin OS-2 per the Wolf Ranch Master Plan is designated as a future park site. This park site is not part of this development proposal, but is analyzed and tributary to the proposed Full Spectrum Detention Facility that will be used to treat flows from Midtown at Wolf Ranch Filing No. 1 and 2. A proposed 30" RCP Storm sewer stub will be provided to the park (see appendix for capacity Pipe 11).

Basin OS-3 (Q_5= 97 cfs, Q_{100}= 227 cfs) is 64.90 acres. Basin OS-3 is per the Wolf Ranch Master Plan is designated as a future school campus expansion of the existing Academy School District 20 elementary school site. This site is currently planned for a future middle school and high school. See Basin CP 21 in the Preliminary Drainage Report for Academy District 20 School Sites Final Drainage Report for Elementary School #20 at Wolf Ranch by Matrix Design Group approved August 2017. This portion of the school site is not part of this development proposal, but is analyzed and tributary to the proposed Full Spectrum Detention Facility that will be used to treat flows from Midtown at Wolf Ranch Filing No. 1 and 2.

STORM WATER QUALITY/DETENTION

Development of Midtown at Wolf Ranch Filing No. 1 & 2 will require a public Full Spectrum Detention Extended Detention Basin (EDB) to treat the water quality event and the EURV restricting release into the existing Cottonwood Creek to allowable flows per the UD-Detention spreadsheet. A sub-regional public facility is

proposed located adjacent to the confluence of the Wolf Ranch Tributary 4 and Cottonwood Creek. This facility will serve not only the Midtown at Wolf Ranch Filing No.1 and 2 project, but also the future park site and the future District 20 Middle School and High School site. Total allowable discharge into Cottonwood Creek per the UD-Detention spreadsheet is Q_5= 2.22 cfs, Q_{100}= 129.4 cfs. The UD-BMP spreadsheet along with the UD-Detention spreadsheet were used to calculate the required volume for the WQVC and 100-year release. The UD-BMP IRF spreadsheet (see appendix) was used to calculate the overall total site imperviousness from Basins B, C, E, F, G, H, I, J, K, OS-1, OS- and OS-3 basins to the EDB. These basins included anticipated developed flows from the park site and the schools ite. This total area is 87.01 acres. Per the spread sheet a 51.4% 100-year effective imperviousness will be used for the proposed site. Per UD-Detention and UD-BMP spreadsheets a 3.268ac-ft EURV is required, and a 3.512c-ft. 100-year flow volume is required. With a total Basin Volume of 8.304 ac-ft. The outlet structure will have a 5-rectangular hole configuration with areas of 3.0 sqin, 5.0 sqin, 6.50sqin, 20 sqin, 20sqin spaced 19.5 inches apart. The inlet box will be an 14'x4' grated inlet box 6.50' tall with a 30" RCP storm sewer outlet and a restrictor plate 26" from the invert. A 89' wide 2.0' deep emergency overflow weir will be installed in the pond berm with Type M rip rap (see appendix for calculation). Planned release per the UD-Detention spreadsheet from the EDB will be Q_5= 1.81 cfs, Q_{100}= 68.9 cfs with is within acceptable limits established by the UD-Detention spreadsheet. Construction documents for this Full Spectrum facility will be provided and approved by City Water Resources Division along with the Inspection and Maintenance Plan. Due to the acceptance of offsite flows from the public street as well as future properties, this facility will be a public facility that will be owned and maintained by the City of Colorado Springs with surface maintenance of the landscaping by Wolf Ranch HOA.

The City of Colorado Springs has required the Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls. The Four Step Process pertains to management of smaller, frequently occurring storm events, as opposed to larger storms for which drainage and flood control infrastructure are sized. Implementation of these four steps helps to achieve storm water permit requirements. This site adheres to this Four Step Process as follows:

1. Minimize impacts: The development of this site will consist of residential homes that will utilize the existing natural features, natural vegetation, and minimize disturbance for the home building pad thus allowing developed flows from rooftops and patios to sheet flow over natural ground prior to entering a storm sewer system. This initial treatment provides the following: 1. Minimizes directly connected impervious areas. 2. Provides initial pollutant and sediment removal before entering the storm system. on-

Stormwater Quality Treatment and detention will be required and will be provided in a public sub-regional facility.

2. BMP's are being implemented in the form of a permanent sub-regional Full Spectrum Detention Facility including Water Quality.

3. Stabilize Drainage ways: This site is adjacent to the existing Wolf Ranch Tributary Four within the Cottonwood Creek drainage basin. This section of the Wolf Ranch Tributary Four is within the prudent line setback as determined with the MDDP. Tributary Four does not lie within a designated streamside overlay zone. The master developer for Wolf Ranch has already installed improvements in conformance with the approved MDDP to this existing channel with the development of adjacent properties in anticipation of future development.

4. A site specific stormwater quality and erosion control plan and narrative will be submitted and approved by City Engineering prior to any disturbance within the project area. Details such as site-specific source control construction BMP's as well as permanent BMP's will be detailed in this plan and narrative to protect receiving waters.

EROSION CONTROL PLAN

The City of Colorado Springs Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate be submitted with the Final Drainage Report. We respectfully request that the Erosion Control Plan and Cost Estimate be submitted in conjunction with the grading plan and construction assurances posted prior to obtaining a grading permit.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in May 2014. Stormwater quality analysis and calculations were performed using the Drainage Criteria Manual, Volume 2 and Urban Drainage Flood Control District. The Rational Method was used to estimate stormwater runoff anticipated from design storms for the 5-year, and 100-year recurrence interval.

All stormwater flows are within street capacity at per the current Engineering Criteria Manual. All basins/design points have been evaluated to ensure that the gutter capacity has not been exceeded for this development. In the event of clogging or inlet failure, emergency overflow routing for each inlet will either be provided by overtopping

the nearby high point in the roadway to the next downstream inlet, or will be provided in an emergency overflow swale between lots in a defined drainage easement.

In addition, where adjacent uphill lots are proposed to drain through a lower adjacent lot (upstream rear yard to downstream rear yard), only one lot is allowed to be conveyed through a downstream lot. Side yard swales are required on the lower lots to convey the combined rear yard drainage to the street.

Storm Sewer plans have not been completed at this time. An addendum to this report at the time of Storm Sewer construction drawing submittal will be required that includes any changes to the initial storm sewer design detailing in this report and additional calculations for the required 5 and 100 year HGL lines.

FLOODPLAIN STATEMENT

No portion of this site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C 0529G effective date, December 7, 2018 (See Appendix).

DRAINAGE AND BRIDGE FEES FILING NO. 1

This lot lies within the Wolf Ranch portion of Cottonwood Creek Drainage Basin as was approved as a "No fee" Basin as to Drainage Fees only by City Council on August 28, 2018 by Resolution No. 96-18.

COTTONWOOD CREEK FEE CALCULATIONS:

$723/acre x 9.58 acres (Surcharge 2019)	$	6,926.34
$1,130/acre x 9.58 acres (Bridge 2019)	$	10,825.40
Cottonwood Creek Fees Filing No. 1		**$ 17,751.74**

DRAINAGE AND BRIDGE FEES FILING NO. 2

This lot lies within the Wolf Ranch portion of Cottonwood Creek Drainage Basin as was approved as a "No fee" Basin as to Drainage Fees only by City Council on August 28, 2018 by Resolution No. 96-18.

COTTONWOOD CREEK FEE CALCULATIONS:

$723/acre x 4.09 acres (Surcharge 2019)	$	2,957.07
$1,130/acre x 4.09 acres (Bridge 2019)	$	4,621.70
Cottonwood Creek Fees Filing No. 2		**$ 7,578.77**

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CONSTRUCTION COST OPINION FILING NO. 1

Public Drainage Facilities Non-reimbursable

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	4' D-10-R Inlet	2 EACH	$4,300/EA	$ 8,600.00
2.	10'D-10-R Inlet	2 EACH	$5,300/EA	$ 10,600.00
3.	14'D-10-R Inlet	1 EACH	$6,600/EA	$ 6,600.00
4.	18" RCP Storm Drain	615 LF	$50/LF	$ 30,750.00
5.	24" RCP Storm Drain	50 LF	$65/LF	$ 3,250.00
6.	30" RCP Storm Drain	330 LF	$75/LF	$ 24,750.00
7.	36" RCP Storm Drain	1000 LF	$100/LF	$ 100,000.00
8.	Type II Storm MH	2 EACH	$3,000/EA	$ 6,000.00
9.	Type I Storm MH	5 EACH	$7,000/EA	$ 35,000.00

SUB-TOTAL	$ 106,895.00
10% ENGINEERING	$ 10,689.50
5% CONTINGENCIES	$ 5,344.75
TOTAL	**$ 122,929.25**

CONSTRUCTION COST OPINION FILING NO. 2

Public Drainage Facilities Non-reimbursable

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	8' D-10-R Inlet	1 EACH	$4,900/EA	$ 4,900.00
2.	24" RCP Storm Drain	50 LF	$65/LF	$ 3,250.00

SUB-TOTAL	$ 8,150.00
10% ENGINEERING	$ 815.00
5% CONTINGENCIES	$ 407.50
TOTAL	**$ 9,372.50**

Classic Consulting Engineers & Surveyors cannot and does not guarantee that the construction cost will not vary from these opinions of probable construction costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular.

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SUMMARY

Flows for the Midtown at Wolf Ranch Filing No's 1 & 2 site are proposed to outfall into a proposed public Sub-Regional Full Spectrum Detention Facility and then to Cottonwood Creek. This is in general conformance with previously referenced reports. All drainage facilities were sized using the current City of Colorado Springs Drainage Criteria and will safely discharge storm water runoff to adequate outfalls and will not adversely affect the downstream and surrounding developments.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

David L Gibson P.E.
Project Manager

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REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual Vol 1 and 2 dated May 2014.

2. "Wolf Ranch Master Development Drainage Plan Update" Kiowa Engineering Corporation, dated September 2013.

3. "Cottonwood Creek Drainage Basin Planning Study" by URS, Inc. dated 1994

4. "Cottonwood Creek Drainage Basin Planning Study" by Ayers Associates dated June 2000

APPENDIX

VICINITY MAP

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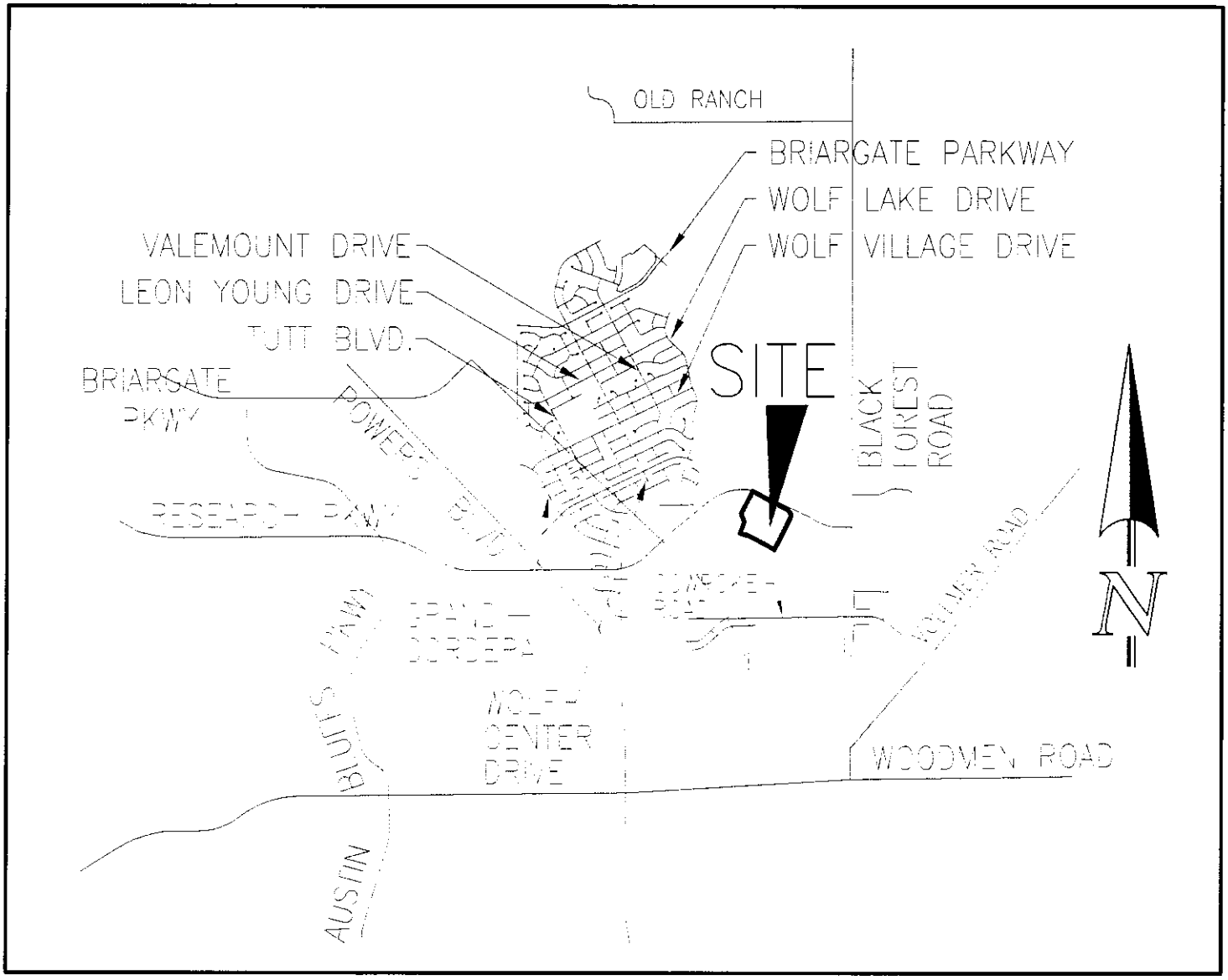

VICINITY MAP

N.T.S.

SOILS MAP (S.C.S SURVEY)

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Map Scale: 1:2,440 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, 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: Aug 19, 2018—Sep 23, 2018

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
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	3.7	19.1%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	B	15.5	80.9%
Totals for Area of Interest			**19.2**	**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

F.E.M.A. MAP

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National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **12/2/2019 at 6:21:11 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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National Flood Hazard Layer FIRMette

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

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The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **12/2/2019 at 6:21:11 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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CALCULATIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

JOB NAME: *MIDTOWN AT WOLF RANCH FIL NO. 1 & 2*
JOB NUMBER: *2555.00*
DATE: *12/19/19*
CALCULATED BY: *DLG*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS				LANDSCAPE/UNDEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
		AREA (AC)	C(2)	C(5)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	CA(2)	CA(5)	CA(100)
A	0.63	0.14	0.89	0.90	0.96	0.49	0.02	0.08	0.35	0.21	0.26	0.49	**0.13**	**0.17**	**0.31**
B	0.71	0.42	0.89	0.90	0.96	0.29	0.02	0.08	0.35	0.53	0.57	0.71	**0.38**	**0.40**	**0.50**
C	1.27	0.62	0.89	0.90	0.96	0.65	0.02	0.08	0.35	0.44	0.48	0.65	**0.56**	**0.61**	**0.82**
D	0.17	0.10	0.89	0.90	0.96	0.07	0.02	0.08	0.35	0.53	0.56	0.71	**0.09**	**0.10**	**0.12**
E	5.30	2.95	0.89	0.90	0.96	2.35	0.02	0.08	0.35	0.50	0.54	0.69	**2.67**	**2.84**	**3.65**
F	0.78	0.20	0.89	0.90	0.96	0.58	0.02	0.08	0.35	0.24	0.29	0.51	**0.19**	**0.23**	**0.40**
G	0.52	0.25	0.89	0.90	0.96	0.27	0.02	0.08	0.35	0.44	0.47	0.64	**0.23**	**0.25**	**0.33**
H	0.93	0.16	0.89	0.90	0.96	0.77	0.02	0.08	0.35	0.17	0.22	0.45	**0.16**	**0.21**	**0.42**
I	2.47	1.35	0.89	0.90	0.96	1.12	0.02	0.08	0.35	0.50	0.53	0.68	**1.22**	**1.30**	**1.69**
J	0.28	0.06	0.89	0.90	0.96	0.22	0.02	0.08	0.35	0.21	0.26	0.48	**0.06**	**0.07**	**0.13**
K	0.60	0.16	0.89	0.90	0.96	0.44	0.02	0.08	0.35	0.25	0.30	0.51	**0.15**	**0.18**	**0.31**
OS-1	0.41	0.41	0.89	0.90	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	**0.36**	**0.37**	**0.39**
OS-2	8.50	3.00	0.89	0.90	0.96	5.50	0.02	0.08	0.35	0.33	0.37	0.57	**2.78**	**3.14**	**4.81**
OS-3	64.90	29.00	0.89	0.90	0.96	35.90	0.02	0.08	0.35	0.41	0.45	0.62	**26.53**	**28.97**	**40.41**
EX-1	13.67	0.00	0.89	0.90	0.96	13.67	0.02	0.08	0.35	0.02	0.08	0.35	**0.27**	**1.09**	**4.78**
EX-2	8.50	0.00	0.89	0.90	0.96	8.50	0.02	0.08	0.35	0.02	0.08	0.35	**0.17**	**0.68**	**2.98**

JOB NAME:	*MIDTOWN AT WOLF RANCH FIL NO. 1 & 2*
JOB NUMBER:	*2555.00*
DATE:	*12/19/19*
CALC'D BY:	*DLG*

$$t_t = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)* $t_c = \frac{L}{180} + 10$	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

*For buried riprap, select C_v value based on type of vegetative cover.

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	CA(2)	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
A	0.13	0.17	0.31	0.08	40	1	8.6	570	2.0%	2.8	3.4	12.0	3.08	3.86	6.48	0	**1**	**2**
B	0.38	0.40	0.50	0.08	30	1	6.8	100	2.0%	2.8	0.6	7.4	3.66	4.59	7.70	1	**2**	**4**
C	0.56	0.61	0.82	0.08	70	2	10.9	100	2.0%	2.8	0.6	11.5	3.13	3.92	6.58	2	**2**	**5**
D	0.09	0.10	0.12	0.08	100	4	11.7	100	2.0%	2.8	0.6	12.2	3.05	3.83	6.42	0.3	**0.4**	**1**
E	2.67	2.84	3.65	0.08	100	4	11.7	100	2.0%	2.8	0.6	12.2	3.05	3.83	6.42	8	**11**	**23**
F	0.19	0.23	0.40	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	0.7	**1.0**	**3**
G	0.23	0.25	0.33	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	1	**1**	**2**
H	0.16	0.21	0.42	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	1	**1**	**3**
I	1.22	1.30	1.69	0.08	70	2	10.9	100	2.0%	2.8	0.6	11.5	3.13	3.92	6.58	3.8	**5.1**	**11**
J	0.06	0.07	0.13	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	0.2	**0.3**	**1.0**
K	0.15	0.18	0.31	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	1	**1**	**2**
OS-1	0.36	0.37	0.39	0.08	10	1	2.7	100	2.0%	2.8	0.0	5.0	4.12	5.17	8.68	2	**2**	**3**
OS-2	2.78	3.14	4.81	0.08	300	14	19.2	100	2.0%	2.8	0.6	19.8	2.48	3.11	5.21	7	**10**	**25**
OS-3	26.53	28.97	40.41	0.08	0	0	0.0	0	0.0%	0.0	0.0	16.9	2.67	3.34	5.61	71	**97**	**227**
EX-1	0.27	1.09	4.78	0.08	300	10	21.4	0	0.0%	0.0	0.0	21.4	2.39	2.99	5.01	1	**3**	**24**
EX-2	0.17	0.68	2.98	0.08	300	10	21.4	0	0.0%	0.0	0.0	21.4	2.39	2.99	5.01	0	**2**	**15**

JOB NAME:	*MIDTOWN AT WOLF RANCH FIL NO. 1 & 2*
JOB NUMBER:	*2555.00*
DATE:	*12/19/19*
CALCULATED BY:	*DLG*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Inlet Size
1	BASIN B	0.40	0.50	7.4	4.59	7.70	2	4	4' D-10-R
2	BASIN C	0.61	0.82	11.5	3.92	6.58	2	5	10 D-10-R
3	BASIN E	2.84	3.65	12.2	3.83	6.42	11	23	14 D-10-R
4	BASIN G	0.25	0.33	8.6	4.35	7.31	1	2	4 D-10-R
5	BASIN F & BASIN OS-1	0.60	0.79	8.6	4.35	7.31	3	6	10 D-10-R
6	BASIN I FLOW-BY 2	1.30	1.82	11.5	3.92	6.58	5	12	8 D-10-R

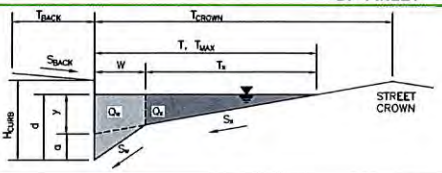
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 1 INLET



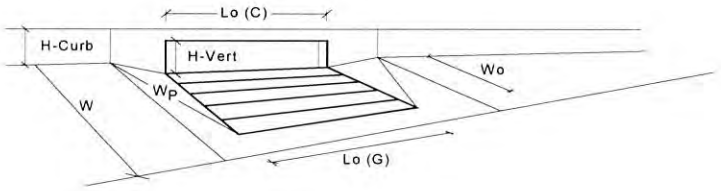
Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	3.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	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 =	0.065	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} =	10.0	10.0	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)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	8.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00	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) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
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} =	0.37	0.54	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
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 =**	**5.4**	**9.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	2.0	4.0	cfs

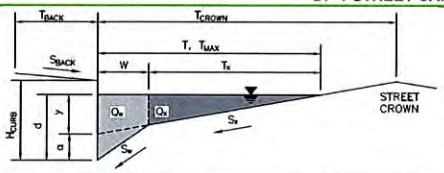
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 1 STREET CAP



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	3.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.0	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 =	0.065	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} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

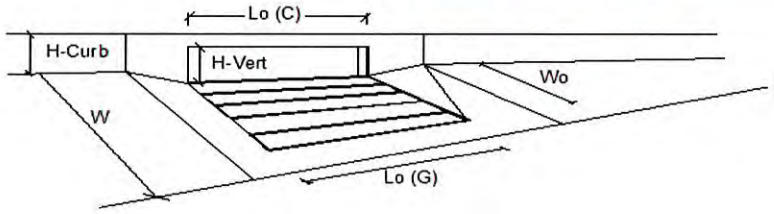
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	4.1	28.4	cfs

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 =			
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =			inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =			
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =			ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =			ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =			
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =			

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

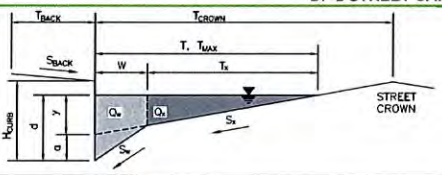
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 2 STREET CAP



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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 =	0.065	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} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

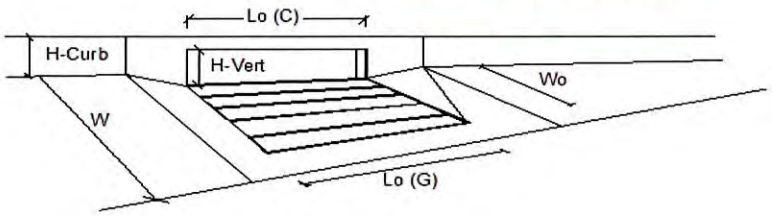
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	11.9	59.8	cfs

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 =			
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =			inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =			
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =			ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =			ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =			
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =			

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

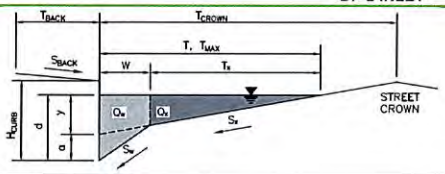
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 2 INLET



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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 =	0.065	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} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

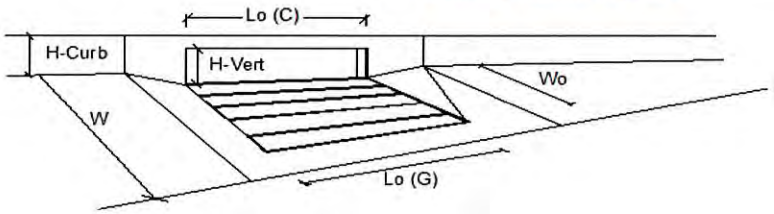
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	11.9	59.8	cfs

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)	Colorado Springs D-10-R		MINOR	MAJOR	
Type of Inlet		Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**2.0**	**4.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**97**	**%**

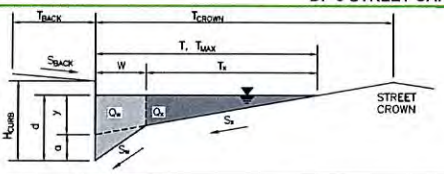
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 3 STREET CAP



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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 =	0.065	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} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

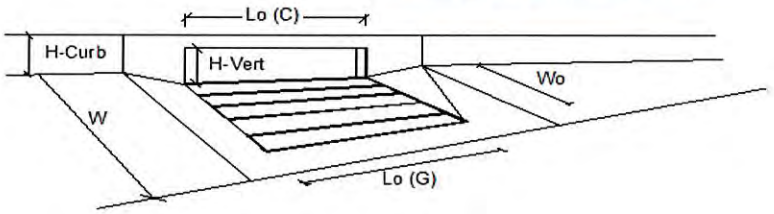
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	13.4	55.9	cfs

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 =			
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =			inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =			
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =			ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =			ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =			
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =			

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

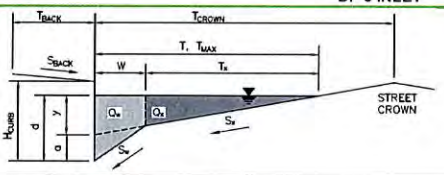
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 3 INLET



Gutter Geometry (Enter data in the blue cells)

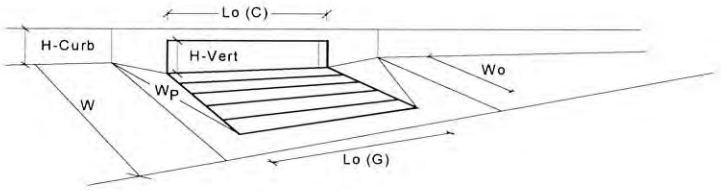
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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 =	0.065	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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	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)	Colorado Springs D-10-R			
		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	14.00	14.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	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) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
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} =	0.37	0.69	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.92	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.81	0.99	
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 =**	**11.1**	**34.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	11.0	23.0	cfs

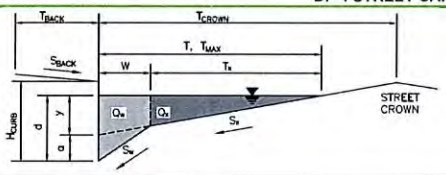
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 4 STREET CAP



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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 =	0.065	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} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

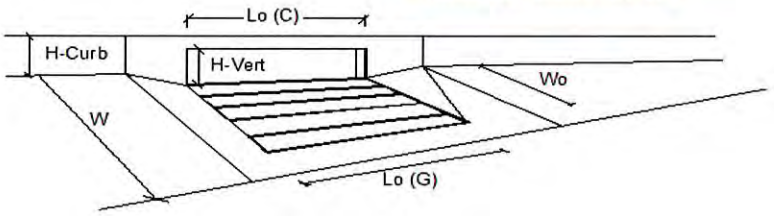
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	13.4	55.9	cfs

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 =			
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =			inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =			
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =			ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =			ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =			
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =			

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

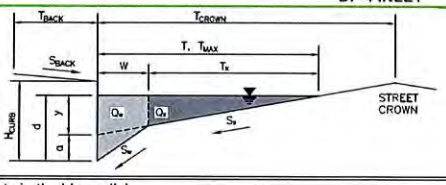
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 4 INLET



Gutter Geometry (Enter data in the blue cells)

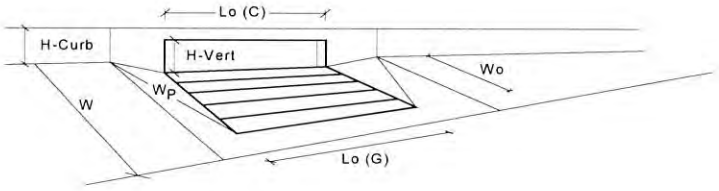
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	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 =	0.065	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} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	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)	Colorado Springs D-10-R	MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	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) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
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} =	0.37	0.69	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
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 =	5.4	11.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

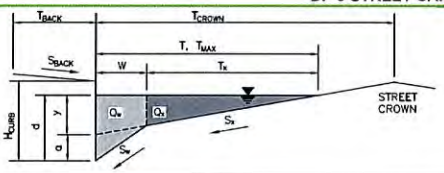
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 5 STREET CAP



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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 =	0.065	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} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

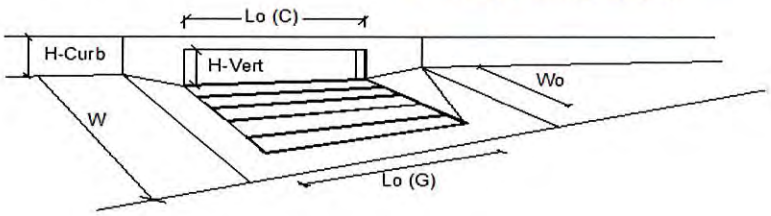
	Minor Storm	Major Storm	
Q_{allow} =	15.4	57.5	cfs

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 =			
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =			inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =			
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =			ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =			ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =			
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =			

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

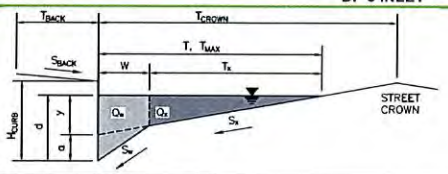
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 5 INLET



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	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 =	0.065	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} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

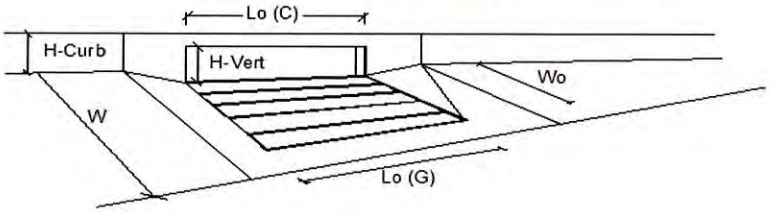
	Minor Storm	Major Storm	
Q_{allow} =	15.4	57.5	cfs

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 =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.0**	**5.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**92**	**%**

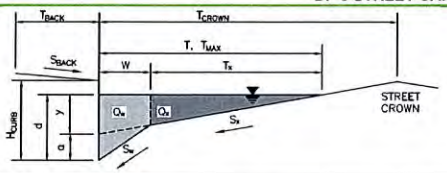
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 6 STREET CAP



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	3.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.0	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 =	0.065	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.030	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} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

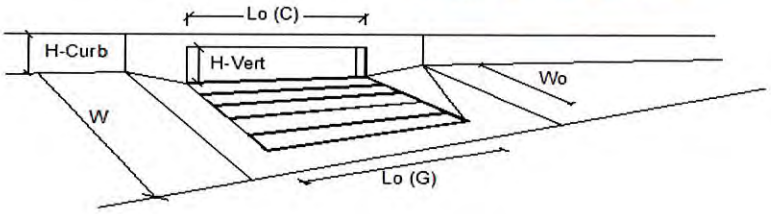
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	5.0	25.2	cfs

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 =			
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =			inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =			
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =			ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =			ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =			
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =			

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

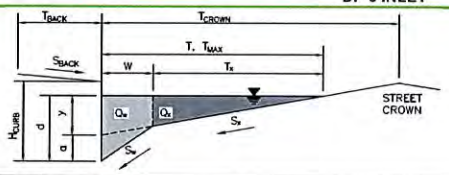
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: DP 6 INLET



Gutter Geometry (Enter data in the blue cells)

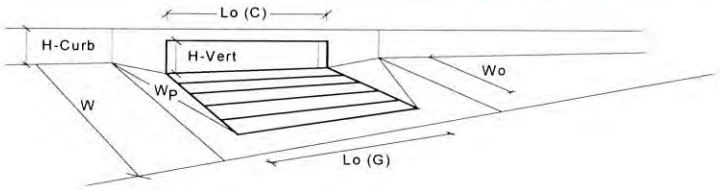
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.0	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 =	0.065	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} =	11.0	11.0	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 =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	8.00	8.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	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) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
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} =	0.37	0.54	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.61	0.81	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
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 =	**8.8**	**15.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	12.0	cfs

JOB NAME:	*MIDTOWN AT WOLF RANCH FIL NO. 1 & 2*
JOB NUMBER:	*2555.00*
DATE:	*12/19/19*
CALCULATED BY:	*DLG*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE. REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
1	DP1	0.40	0.50	7.37	4.59	7.70	2	4	18" RCP STORM
2	DP2 INTERCEPTED	0.61	0.69	11.49	3.92	6.58	2	5	18" RCP STORM
3	PIPE 1 & PIPE 2	1.01	1.19	11.49	3.92	6.58	4	8	18" RCP STORM
4	DP 3	2.84	3.65	12.2	3.83	6.42	11	23	24" RCP STORM
5	DP 4	0.25	0.33	8.6	4.35	7.31	1	2	18" RCP STORM
6	PIPE 3, 4, 5	4.10	5.18	12.2	3.83	6.42	16	33	30" RCP STORM
7	DP 5 INTERCEPTED	0.60	0.79	8.6	4.35	7.31	3	6	18" RCP STORM
8	PIPE 6 & PIPE 7	4.70	5.97	12.2	3.83	6.42	18	38	30" RCP STORM
9	DP 6	1.30	1.82	11.5	3.92	6.58	5	12	24" RCP STORM
10	PIPE 8 & PIPE 9	6.00	7.79	12.2	3.83	6.42	23	50	36" RCP STORM
11	BASIN OS-2	3.14	4.81	19.8	3.11	5.21	10	25	30" RCP STORM
12	PIPE 10 & 11	9.14	12.60	19.8	3.11	5.21	28	66	36" RCP STORM

Worksheet for PIPE RUN 1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	4.00 cfs

Results	
Normal Depth	7.7 in
Flow Area	0.7 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	4.0 in
Top Width	1.48 ft
Critical Depth	9.2 in
Percent Full	42.8 %
Critical Slope	0.005 ft/ft
Velocity	5.54 ft/s
Velocity Head	0.48 ft
Specific Energy	1.12 ft
Froude Number	1.401
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.001 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	42.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	7.7 in
Critical Depth	9.2 in
Channel Slope	0.010 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for PIPE RUN 2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	5.00 cfs

Results	
Normal Depth	8.7 in
Flow Area	0.9 ft²
Wetted Perimeter	2.3 ft
Hydraulic Radius	4.4 in
Top Width	1.50 ft
Critical Depth	10.3 in
Percent Full	48.6 %
Critical Slope	0.006 ft/ft
Velocity	5.87 ft/s
Velocity Head	0.54 ft
Specific Energy	1.26 ft
Froude Number	1.374
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.002 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	48.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.7 in
Critical Depth	10.3 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for PIPE RUN 3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	8.00 cfs

Results	
Normal Depth	11.8 in
Flow Area	1.2 ft²
Wetted Perimeter	2.8 ft
Hydraulic Radius	5.2 in
Top Width	1.43 ft
Critical Depth	13.2 in
Percent Full	65.3 %
Critical Slope	0.007 ft/ft
Velocity	6.54 ft/s
Velocity Head	0.67 ft
Specific Energy	1.64 ft
Froude Number	1.246
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.006 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	65.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.8 in
Critical Depth	13.2 in
Channel Slope	0.010 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for PIPE RUN 4

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	24.0 in
Discharge	23.00 cfs

Results	
Normal Depth	20.1 in
Flow Area	2.8 ft²
Wetted Perimeter	4.6 ft
Hydraulic Radius	7.3 in
Top Width	1.48 ft
Critical Depth	20.5 in
Percent Full	83.6 %
Critical Slope	0.010 ft/ft
Velocity	8.20 ft/s
Velocity Head	1.05 ft
Specific Energy	2.72 ft
Froude Number	1.051
Maximum Discharge	24.33 cfs
Discharge Full	22.62 cfs
Slope Full	0.010 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	83.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	20.1 in
Critical Depth	20.5 in
Channel Slope	0.010 ft/ft
Critical Slope	0.010 ft/ft

Worksheet for PIPE RUN 5

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	2.00 cfs

Results	
Normal Depth	5.3 in
Flow Area	0.4 ft^2
Wetted Perimeter	1.7 ft
Hydraulic Radius	3.0 in
Top Width	1.37 ft
Critical Depth	6.4 in
Percent Full	29.6 %
Critical Slope	0.005 ft/ft
Velocity	4.58 ft/s
Velocity Head	0.33 ft
Specific Energy	0.77 ft
Froude Number	1.428
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.000 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	29.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.3 in
Critical Depth	6.4 in
Channel Slope	0.010 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for PIPE RUN 6

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	30.0 in
Discharge	33.00 cfs

Results	
Normal Depth	20.4 in
Flow Area	3.6 ft^2
Wetted Perimeter	4.8 ft
Hydraulic Radius	8.8 in
Top Width	2.33 ft
Critical Depth	23.5 in
Percent Full	67.9 %
Critical Slope	0.007 ft/ft
Velocity	9.29 ft/s
Velocity Head	1.34 ft
Specific Energy	3.04 ft
Froude Number	1.328
Maximum Discharge	44.12 cfs
Discharge Full	41.01 cfs
Slope Full	0.006 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	67.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	20.4 in
Critical Depth	23.5 in
Channel Slope	0.010 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for PIPE RUN 7

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	18.0 in
Discharge	6.00 cfs

Results	
Normal Depth	9.7 in
Flow Area	1.0 ft²
Wetted Perimeter	2.5 ft
Hydraulic Radius	4.7 in
Top Width	1.49 ft
Critical Depth	11.4 in
Percent Full	54.2 %
Critical Slope	0.006 ft/ft
Velocity	6.14 ft/s
Velocity Head	0.59 ft
Specific Energy	1.40 ft
Froude Number	1.339
Maximum Discharge	11.30 cfs
Discharge Full	10.50 cfs
Slope Full	0.003 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	54.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.7 in
Critical Depth	11.4 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for PIPE RUN 8

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	30.0 in
Discharge	38.00 cfs

Results	
Normal Depth	22.8 in
Flow Area	4.0 ft^2
Wetted Perimeter	5.3 ft
Hydraulic Radius	9.1 in
Top Width	2.13 ft
Critical Depth	25.0 in
Percent Full	76.0 %
Critical Slope	0.008 ft/ft
Velocity	9.49 ft/s
Velocity Head	1.40 ft
Specific Energy	3.30 ft
Froude Number	1.221
Maximum Discharge	44.12 cfs
Discharge Full	41.01 cfs
Slope Full	0.009 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	76.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	22.8 in
Critical Depth	25.0 in
Channel Slope	0.010 ft/ft
Critical Slope	0.008 ft/ft

Worksheet for PIPE RUN 9

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	24.0 in
Discharge	12.00 cfs

Results	
Normal Depth	12.4 in
Flow Area	1.6 ft²
Wetted Perimeter	3.2 ft
Hydraulic Radius	6.1 in
Top Width	2.00 ft
Critical Depth	14.9 in
Percent Full	51.8 %
Critical Slope	0.006 ft/ft
Velocity	7.31 ft/s
Velocity Head	0.83 ft
Specific Energy	1.87 ft
Froude Number	1.421
Maximum Discharge	24.33 cfs
Discharge Full	22.62 cfs
Slope Full	0.003 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	51.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.4 in
Critical Depth	14.9 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for PIPE RUN 10

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	36.0 in
Discharge	50.00 cfs

Results	
Normal Depth	23.3 in
Flow Area	4.8 ft²
Wetted Perimeter	5.6 ft
Hydraulic Radius	10.3 in
Top Width	2.87 ft
Critical Depth	27.6 in
Percent Full	64.6 %
Critical Slope	0.006 ft/ft
Velocity	10.35 ft/s
Velocity Head	1.67 ft
Specific Energy	3.60 ft
Froude Number	1.407
Maximum Discharge	71.74 cfs
Discharge Full	66.69 cfs
Slope Full	0.006 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	64.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	23.3 in
Critical Depth	27.6 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for PIPE RUN 11

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	30.0 in
Discharge	25.00 cfs

Results	
Normal Depth	16.9 in
Flow Area	2.9 ft^2
Wetted Perimeter	4.2 ft
Hydraulic Radius	8.1 in
Top Width	2.48 ft
Critical Depth	20.4 in
Percent Full	56.4 %
Critical Slope	0.006 ft/ft
Velocity	8.77 ft/s
Velocity Head	1.19 ft
Specific Energy	2.60 ft
Froude Number	1.441
Maximum Discharge	44.12 cfs
Discharge Full	41.01 cfs
Slope Full	0.004 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	56.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	16.9 in
Critical Depth	20.4 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for PIPE RUN 12

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	36.0 in
Discharge	66.00 cfs

Results	
Normal Depth	29.2 in
Flow Area	6.1 ft²
Wetted Perimeter	6.7 ft
Hydraulic Radius	11.0 in
Top Width	2.35 ft
Critical Depth	31.2 in
Percent Full	81.0 %
Critical Slope	0.009 ft/ft
Velocity	10.76 ft/s
Velocity Head	1.80 ft
Specific Energy	4.23 ft
Froude Number	1.174
Maximum Discharge	71.74 cfs
Discharge Full	66.69 cfs
Slope Full	0.010 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	81.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	29.2 in
Critical Depth	31.2 in
Channel Slope	0.010 ft/ft
Critical Slope	0.009 ft/ft

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.53	inches	
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches	
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches	
Optional User Defined Storm	CUHP			
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52		
Max Intensity for Optional User Defined Storm	2.51496			

Designer: dlg
Company: Classic Consulting
Date: December 13, 2019
Project: Midtown at Wolf Ranch Filing No. 1 & 2
Location:

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	B	C	E	F&OS1	G	H	I	J & K	OS-2	OS-3				
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand				
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.710	1.270	5.300	1.530	0.520	0.930	2.470	0.880	8.500	64.900				
Directly Connected Impervious Area (DCIA, acres)	0.220	0.410	1.310	0.410	0.130	0.000	0.830	0.000	0.500	29.000				
Unconnected Impervious Area (UIA, acres)	0.200	0.210	1.630	0.200	0.100	0.160	0.550	0.220	0.000	10.000				
Receiving Pervious Area (RPA, acres)	0.290	0.520	1.970	0.920	0.290	0.500	1.090	0.660	0.000	14.000				
Separate Pervious Area (SPA, acres)	0.000	0.130	0.390	0.000	0.000	0.270	0.000	0.000	8.000	11.900				
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C				

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.710	1.270	5.300	1.530	0.520	0.930	2.470	0.880	8.500	64.900				
Directly Connected Impervious Area (DCIA, %)	31.0%	32.3%	24.7%	26.8%	25.0%	0.0%	33.6%	0.0%	5.9%	44.7%				
Unconnected Impervious Area (UIA, %)	28.2%	16.5%	30.8%	13.1%	19.2%	17.2%	22.3%	25.0%	0.0%	15.4%				
Receiving Pervious Area (RPA, %)	40.8%	40.9%	37.2%	60.1%	55.8%	53.8%	44.1%	75.0%	0.0%	21.6%				
Separate Pervious Area (SPA, %)	0.0%	10.2%	7.4%	0.0%	0.0%	29.0%	0.0%	0.0%	94.1%	18.3%				
A_R (RPA / UIA)	1.450	2.476	1.209	4.600	2.900	3.125	1.982	3.000	0.000	1.400				
I_a Check	0.410	0.290	0.450	0.180	0.260	0.240	0.340	0.250	1.000	0.420				
f / i for WQCV Event:	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6				
f / i for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5				
f / i for 100-Year Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4				
f / i for Optional User Defined Storm CUHP:	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39				
IRF for WQCV Event:	0.55	0.49	0.58	0.39	0.47	0.46	0.51	0.46	1.00	0.56				
IRF for 5-Year Event:	0.87	0.85	0.88	0.75	0.85	0.84	0.86	0.85	1.00	0.88				
IRF for 100-Year Event:	0.90	0.88	0.90	0.78	0.88	0.87	0.89	0.87	1.00	0.90				
IRF for Optional User Defined Storm CUHP:	0.90	0.88	0.90	0.78	0.88	0.87	0.89	0.87	1.00	0.90				
Total Site Imperviousness: I_{ota}	59.2%	48.8%	55.5%	39.9%	44.2%	17.2%	55.9%	25.0%	5.9%	60.1%				
Effective Imperviousness for WQCV Event:	46.6%	40.3%	42.5%	31.9%	34.0%	7.9%	45.1%	11.6%	5.9%	53.3%				
Effective Imperviousness for 5-Year Event:	55.6%	46.4%	51.8%	36.7%	41.3%	14.5%	52.8%	21.2%	5.9%	58.2%				
Effective Imperviousness for 100-Year Event:	56.3%	46.8%	52.5%	37.0%	41.8%	15.0%	53.4%	21.8%	5.9%	58.5%				
Effective Imperviousness for Optional User Defined Storm CUHP:	56.3%	46.8%	52.5%	37.0%	41.8%	15.0%	53.4%	21.8%	5.9%	58.5%				

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	15.5%	11.0%	16.0%	12.4%	14.4%	47.4%	13.4%	43.8%	0.0%	8.9%	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	4.7%	4.1%	5.2%	7.4%	5.5%	14.4%	4.4%	13.6%	0.1%	2.5%	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:	5.2%	3.7%	5.3%	5.7%	4.6%	8.4%	4.5%	8.8%	0.0%	2.8%				

Total Site Imperviousness:	**53.0%**
Total Site Effective Imperviousness for WQCV Event:	**46.1%**
Total Site Effective Imperviousness for 5-Year Event:	**51.0%**
Total Site Effective Imperviousness for 100-Year Event:	**51.4%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**51.4%**

Notes:

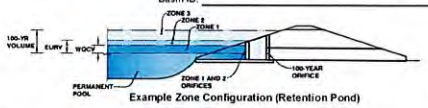
* Use Green-Ampt average infiltration rate values from Table 3-3.
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: MIDTOWN AT WOLF RANCH FILING NO. 1 & 2

Basin ID:



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	87.01	acres
Watershed Length =	2,500	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	51.40%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	1.523	acre-feet
Excess Urban Runoff Volume (EURV) =	4.792	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.874	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	5.279	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	7.101	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	9.812	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	11.699	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	14.174	acre-feet
500-yr Runoff Volume (P1 = 3 in.) =	18.404	acre-feet
Approximate 2-yr Detention Volume =	3.626	acre-feet
Approximate 5-yr Detention Volume =	4.958	acre-feet
Approximate 10-yr Detention Volume =	6.539	acre-feet
Approximate 25-yr Detention Volume =	7.143	acre-feet
Approximate 50-yr Detention Volume =	7.464	acre-feet
Approximate 100-yr Detention Volume =	8.304	acre-feet

Optional User Override 1-hr Precipitation	
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.00	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	1.523	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.268	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.512	acre-feet
Total Detention Basin Volume =	8.304	acre-feet
Initial Surcharge Volume (ISV) =	199	ft^3
Initial Surcharge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H_{TOTAL}) =	8.00	ft
Depth of Trickle Channel (H_{TC}) =	0.67	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{MAIN}) =	3	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

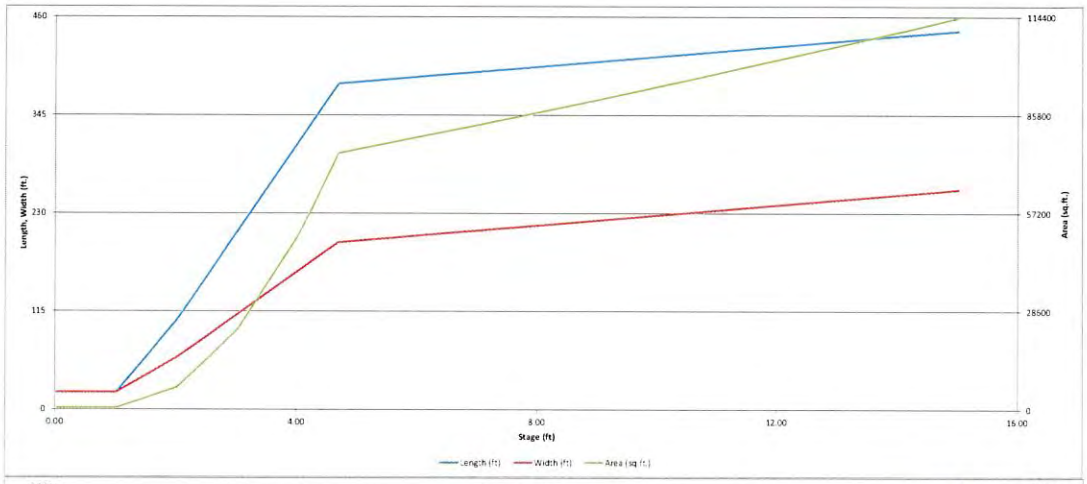
Initial Surcharge Area (A_{ISV}) =	398	ft^2
Surcharge Volume Length (L_{SV}) =	20.0	ft
Surcharge Volume Width (W_{SV}) =	20.0	ft
Depth of Basin Floor (H_{FLOOR}) =	3.51	ft
Length of Basin Floor (L_{FLOOR}) =	381.6	ft
Width of Basin Floor (W_{FLOOR}) =	195.5	ft
Area of Basin Floor (A_{FLOOR}) =	74,602	ft^2
Volume of Basin Floor (V_{FLOOR}) =	94,153	ft^3
Depth of Main Basin (H_{MAIN}) =	3.32	ft
Length of Main Basin (L_{MAIN}) =	401.5	ft
Width of Main Basin (W_{MAIN}) =	215.4	ft
Area of Main Basin (A_{MAIN}) =	86,490	ft^2
Volume of Main Basin (V_{MAIN}) =	267,090	ft^3
Calculated Total Basin Volume (V_{TOTAL}) =	8.304	acre-feet

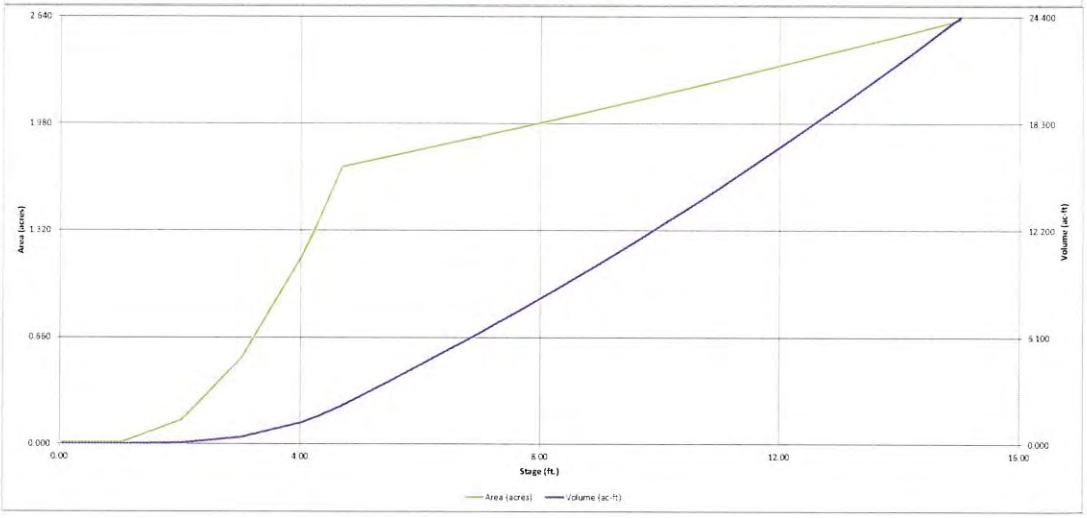
Depth Increment = 1 ft

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		20.0	20.0	398		0.009		
ISV	0.50		20.0	20.0	398		0.009	195	0.004
	1.00		20.0	20.0	398		0.009	394	0.009
	2.00		104.4	61.0	6,364		0.146	2,765	0.063
	3.00		208.4	111.5	23,232		0.533	16,827	0.386
	4.00		311.4	161.5	50,284		1.154	52,727	1.210
Zone 1 (WQCV)	4.26		338.2	174.5	59,004		1.355	66,919	1.536
Floor	4.68		381.5	195.5	74,563		1.712	94,904	2.179
	5.00		383.5	197.4	75,710		1.738	118,953	2.731
	6.00		389.5	203.4	79,231		1.819	196,418	4.509
Zone 2 (EURV)	6.16		390.5	204.4	79,802		1.832	209,141	4.801
	7.00		395.5	209.4	82,825		1.901	277,440	6.369
Zone 3 (100-year)	8.00		401.5	215.4	86,490		1.986	362,092	8.312
	9.00		407.5	221.4	90,228		2.071	450,445	10.341
	10.00		413.5	227.4	94,038		2.159	542,572	12.456
	11.00		419.5	233.4	97,919		2.248	638,544	14.659
	12.00		425.5	239.4	101,873		2.339	738,434	16.952
	13.00		431.5	245.4	105,898		2.431	842,314	19.337
	14.00		437.5	251.4	109,996		2.525	950,254	21.815
	15.00		443.5	257.4	114,165		2.621	1,062,329	24.388

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



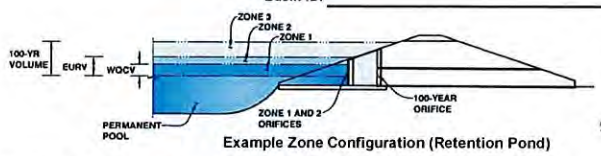


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: MIDTOWN AT WOLF RANCH FILING NO. 1 & 2

Basin ID:



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.26	1.523	Orifice Plate
Zone 2 (EURV)	6.16	3.268	Orifice Plate
Zone 3 (100-year)	8.00	3.512	Weir&Pipe (Restrict)
		8.304	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	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)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.50	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	19.50	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
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	1.60	3.20	4.80	6.40			
Orifice Area (sq. inches)	3.00	5.00	6.50	20.00	20.00			

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	14.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.50	N/A	feet
Over Flow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.67	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	39.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	19.60	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	26.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	4.52	N/A	ft^2
Outlet Orifice Centroid =	1.16	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.39	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	89.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

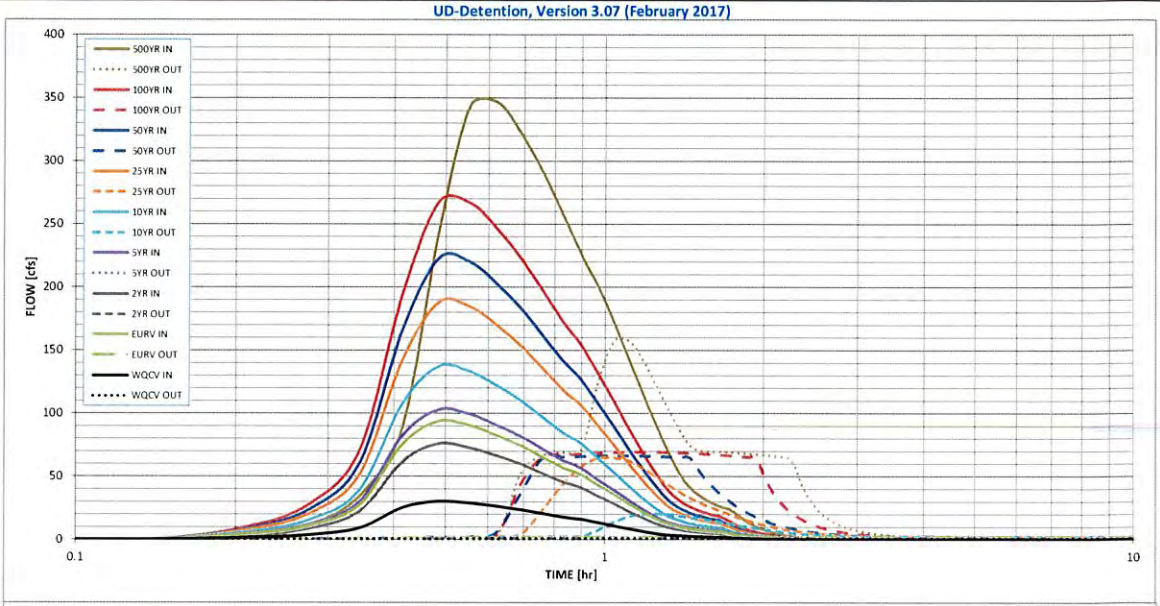
Spillway Design Flow Depth=	0.97	feet
Stage at Top of Freeboard =	10.97	feet
Basin Area at Top of Freeboard =	2.25	acres

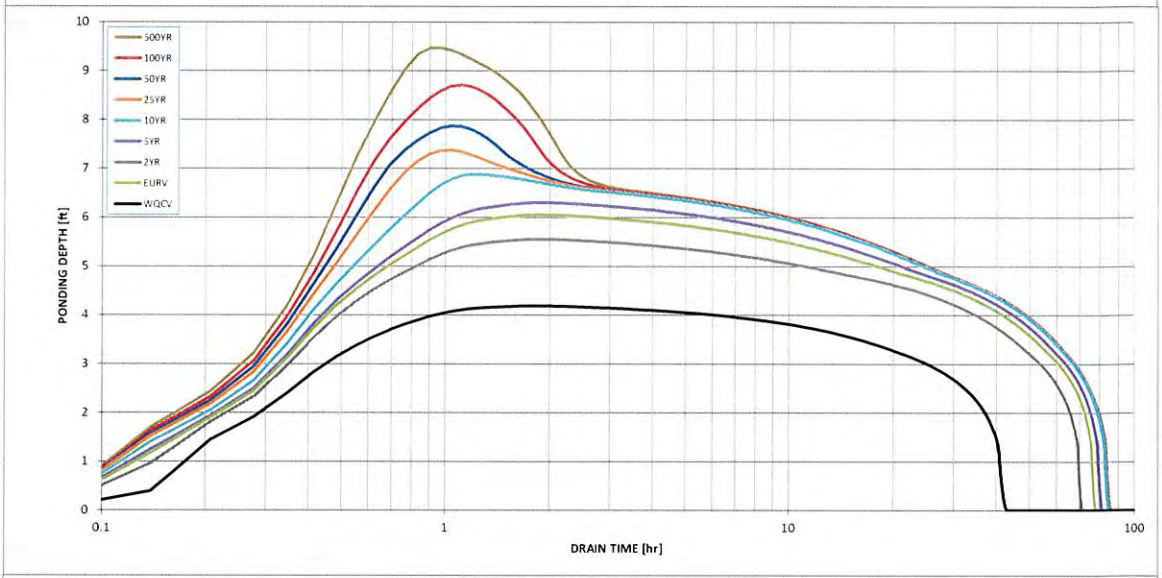
Routed Hydrograph Results

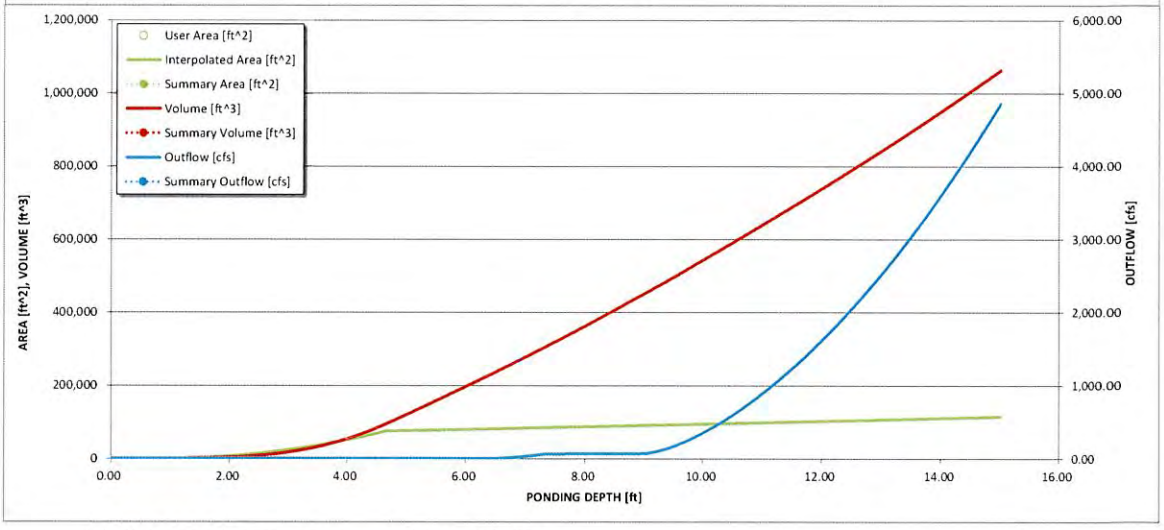
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.00
Calculated Runoff Volume (acre-ft) =	1.523	4.792	3.874	5.279	7.101	9.812	11.699	14.174	18.404
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.523	4.793	3.876	5.274	7.095	9.816	11.703	14.178	18.413
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.03	0.25	0.81	1.11	1.49	2.09
Predevelopment Peak Q (cfs) =	0.0	0.0	1.3	2.223	22.0	70.2	96.9	129.4	182.0
Peak Inflow Q (cfs) =	30.2	93.3	75.8	102.4	136.8	187.5	222.2	267.2	346.2
Peak Outflow Q (cfs) =	0.7	1.7	1.5	1.814	20.2	64.2	66.0	68.9	157.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.9	0.9	0.7	0.5	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.4	1.6	1.6	1.7	1.7
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	69	63	72	73	70	68	66	63
Time to Drain 99% of Inflow Volume (hours) =	40	73	67	76	79	78	77	76	75
Maximum Ponding Depth (ft) =	4.18	6.04	5.55	6.30	6.87	7.36	7.86	8.70	9.46
Area at Maximum Ponding Depth (acres) =	1.29	1.82	1.78	1.84	1.89	1.93	1.97	2.04	2.11
Maximum Volume Stored (acre-ft) =	1.430	4.582	3.699	5.040	6.123	7.059	8.035	9.703	11.303

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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: _____

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	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]
4.15 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph Constant	0:08:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:12:27	1.31	3.82	3.16	4.15	5.34	6.91	7.90	9.09	10.89
1.205	0:16:36	3.56	10.69	8.76	11.67	15.27	20.34	23.68	27.85	34.57
	0:20:45	9.14	27.44	22.50	29.96	39.22	52.26	60.85	71.62	89.03
	0:24:54	25.09	75.20	61.69	82.10	107.36	142.83	166.15	195.31	242.32
	0:29:03	30.17	93.29	75.76	102.43	136.80	187.48	222.24	267.24	343.04
	0:33:12	28.87	89.97	72.83	98.96	133.07	184.18	219.74	266.33	346.20
	0:37:21	26.28	82.03	66.30	90.30	121.76	169.12	202.21	245.72	320.74
	0:41:30	23.56	73.92	59.72	81.38	109.80	152.62	182.54	221.90	289.77
	0:45:39	20.45	64.73	52.21	71.31	96.43	134.37	160.94	195.95	256.41
	0:49:48	17.77	56.54	45.57	62.32	84.37	117.67	141.00	171.73	224.82
	0:53:57	16.12	50.99	41.15	56.16	75.83	105.44	126.12	153.29	200.06
	0:58:06	13.41	42.80	34.47	47.20	64.00	89.47	107.35	130.96	171.80
	1:02:15	11.03	35.49	28.55	39.16	53.17	74.43	89.38	109.11	143.30
	1:06:24	8.62	28.19	22.60	31.14	42.48	59.78	71.97	88.15	116.28
	1:10:33	6.53	21.82	17.44	24.13	33.05	46.67	56.30	69.10	91.41
	1:14:42	4.77	16.34	13.01	18.10	24.91	35.34	42.73	52.66	70.02
	1:18:51	3.64	12.22	9.76	13.52	18.51	26.13	31.50	38.94	52.00
	1:23:00	2.97	9.81	7.86	10.83	14.76	20.73	24.91	30.62	40.57
	1:27:09	2.51	8.25	6.62	9.11	12.39	17.36	20.85	25.54	33.68
	1:31:18	2.20	7.17	5.76	7.91	10.74	15.02	18.01	22.01	28.95
	1:35:27	1.97	6.41	5.15	7.07	9.58	13.37	16.02	19.56	25.67
	1:39:36	1.82	5.86	4.72	6.47	8.76	12.20	14.61	17.81	23.32
	1:43:45	1.34	4.39	3.51	4.85	6.64	9.37	11.31	13.92	18.50
	1:47:54	0.98	3.17	2.54	3.51	4.79	6.75	8.14	10.03	13.35
	1:52:03	0.72	2.35	1.88	2.60	3.55	5.01	6.05	7.44	9.88
	1:56:12	0.53	1.75	1.40	1.93	2.64	3.72	4.49	5.52	7.32
	2:00:21	0.38	1.28	1.02	1.42	1.94	2.75	3.32	4.09	5.43
	2:04:30	0.27	0.92	0.73	1.02	1.40	1.99	2.41	2.97	3.95
	2:08:39	0.20	0.67	0.53	0.74	1.02	1.44	1.74	2.14	2.85
	2:12:48	0.13	0.47	0.37	0.52	0.72	1.02	1.24	1.54	2.06
	2:16:57	0.08	0.30	0.24	0.34	0.47	0.68	0.83	1.03	1.40
	2:21:06	0.04	0.17	0.14	0.20	0.28	0.40	0.50	0.63	0.86
	2:25:15	0.02	0.08	0.06	0.09	0.13	0.20	0.25	0.32	0.45
	2:29:24	0.00	0.02	0.02	0.03	0.04	0.06	0.08	0.11	0.17
	2:33:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02
	2:37:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:41:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:46:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:54:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:58:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:02:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:06:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:19:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:23:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:31:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:39:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:44:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:48:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:52:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:56:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:04:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:09:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:13:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:17:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:21:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:29:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:33:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:38:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:42:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:46:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:54:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:58:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DRAINAGE MAP

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

Know what's below. Call before you dig.

HYDROLOGY SUMMARY				
School District 20 Campus Site				
Design Point	Sub-Basins	Total Area (s.c.)	Q(5) (cfs)	Q(100) (cfs)
DP11	CP-21	64.9	85.2	227.2

RESEARCH PARKWAY

WOLF VALLEY DRIVE

BLACK FOREST ROAD

FOUR

TRIBUTARY

RANCH

WOLF

DP1

DP2

DP3

DP4

DP5

DP6

DP7

DP8

DP9

DP10

DP11

DETENTION FACILITY DF-1

DETENTION FACILITY DF-2

DISTRICT 20 SCHOOL SITE

CP-21
64.9
0.39
85.2
227.2

STREAMSIDE OUTER BUFFER (80')

STREAMSIDE INNER BUFFER (40')

100-YR FLOODPLAIN

COTTONWOOD CREEK
(MAJOR NATURAL PERENNIAL CHANNEL)

N

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

REFERENCE DRAWINGS
X:\923-DRAINAGE\BENCH
X:\923-EX ROW_RESEARCH
X:\Te\Drainage\
X:\923-PR BASE.CP

NO	DATE	DESCRIPTION	BY
REVISIONS			

NAME: S:\17.923.001 Wolf Ranch School Site\Drainage\Dwg\DR02.dwg
PCP: Matrix.ctb
PLOT DATE: Wed Aug 09, 2017, 10:53am

BENCHMARK DATA(ELEV.) _____
(DATUM) _____
(DESCRIPTION/LOCATION) _____

VERTICAL BENCHMARK:
ELEVATIONS ARE BASED ON FACILITIES INFORMATION MANAGEMENT SYSTEM (FIMS) MONUMENT #"L 68" BEING A FOUND 3.25-INCH DIAMETER ALUMINUM CAP IN RANGE BOX, LOCATED ON THE WEST SIDE OF BLACK FOREST ROAD, ABOUT 1.95 MILES SOUTH OF OLD RANCH ROAD, JUST SOUTH OF THE SCHMUCK CONSTRUCTION CO. DRIVEWAY. A FENCE CORNER IS 28.1 FEET TO THE SOUTH-WEST, AND THE MOST SOUTHERLY GUARDRAIL POST IS 25.7 FEET TO THE NORTH. THE PUBLISHED ELEVATION, 6,975.82 U.S. SURVEY FEET BASED ON NGVD 29 AND THE 1960 SUPPLEMENTARY ADJUSTMENT.

BASIS OF BEARING:
THE BASIS OF BEARINGS FOR THIS MAP IS THE WITH BEARINGS REFERENCED TO THE SOUTH LINE OF THE SAID SOUTHEAST ONE-QUARTER OF SECTION 33 BEING MONUMENTED ON THE WEST END BY A FOUND 3-1/4" INCH ALUMINUM STAMPED WITH THE END BY A FOUND 3-1/4 INCH ALUMINUM CAP STAMPED WITH THE APPROPRIATE SYMBOLOGY FOR A 30-FOOT WITNESS CORNER TO THE SOUTHEAST SECTION CORNER OF SAID SECTION 33 AND "S 1.5 1937" BEARING SOUTH 89°16'06" WEST A DISTANCE OF 2589.65 FEET BETWEEN SAID MONUMENTS.

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite
300 Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

ELEMENTARY #20 AT WOLF RANCH

PRELIMINARY DRAINAGE REPORT

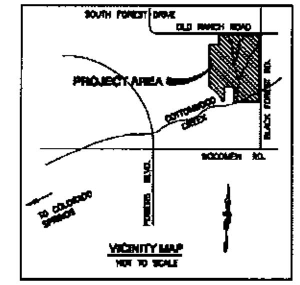
PROPOSED CONDITIONS DRAINAGE MAP

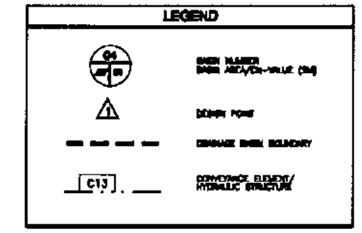
DESIGNED BY	SAS	SCALE		DATE ISSUED	JUNE 2017
DRAWN BY	SAS	HOR.	1"=100'	SHEET NO. 2 OF 4 SHEETS	DP02
CHECKED BY	GDS	VERT.	N/A		

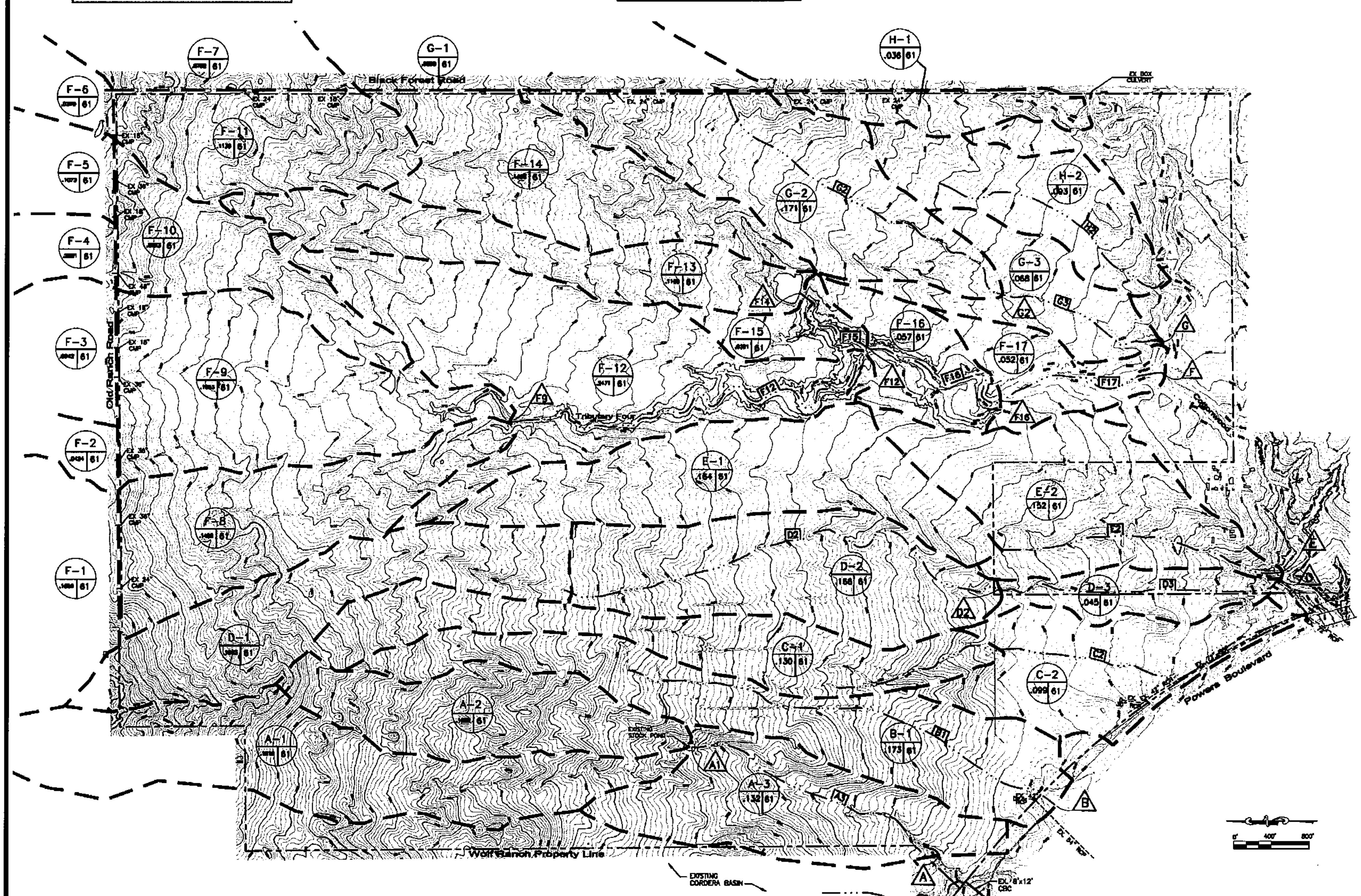
SUB-BASIN DISCHARGES SUMMARY			
SUB-BASIN	AREA	Q_5 (cfs)	Q_{100} (cfs)
A-1	0.1819	7	85
A-2	0.1098	5	59
A-3	0.1318	12	142
B-1	0.1505	5	55
C-1	0.1300	5	58
C-2	0.0990	4	41
D-1	0.1503	5	60
D-2	0.1580	7	75
D-3	0.0450	4	38
E-1	0.1840	6	66
E-2	0.1520	6	61
F-1	0.1858	10	110
F-2	0.0424	3	29
F-3	0.0942	5	59
F-4	0.2681	13	147
F-5	0.1073	5	52
F-6	0.0310	2	21
F-7	0.0782	5	54

SUB-BASIN DISCHARGES SUMMARY (Con't)			
SUB-BASIN	AREA	Q_5 (cfs)	Q_{100} (cfs)
F-8	0.1499	9	93
F-9	0.1953	10	111
F-10	0.0883	4	49
F-11	0.1138	6	66
F-12	0.2471	11	123
F-13	0.1189	4	47
F-14	0.1493	7	77
F-15	0.0321	3	27
F-16	0.0570	5	53
F-17	0.0520	41	24
G-1	0.0808	5	50
G-2	0.1710	8	87
G-3	0.0680	2	27
H-1	0.0370	5	41
H-2	0.0930	3	36

DESIGN POINT DISCHARGES SUMMARY			
BASIN	AREA	Q_5 (cfs)	Q_{100} (cfs)
A	0.4235	11	157
A1 INFLOW	0.2917	12	142
A1 OUTFLOW	0.2917	8	116
B	0.1505	5	55
C	0.2310	8	94
D	0.3610	10	107
D2	0.3216	10	103
E	0.3300	11	124
F	1.9900	49	661
F9	1.1100	48	570
F12	1.5800	65	684
F14	0.4900	20	244
F15	0.5300	3	31
F16	1.8400	49	650
G	0.3200	13	135
G2	0.2500	11	130
H	0.0356	28	39







Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado
80904 - 4208
(719) 630-7342

WOLF RANCH
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE
EXISTING CONDITION HYDROLOGIC SUB-BASIN MAP
COLORADO SPRINGS, COLORADO

Project No.: 12055
Date: 05/01/2013
Design: RHW
Drawn: EAK
Check: RHW
Revisions:

Fig. 4

EXISTING
EDB DETENTION
POND RESIDENTIAL

EXISTING RESEARCH PARKWAY

EXISTING 24"
RCP STORM

EX-1
13.67

COTTONWOOD CREEK TRIBUTARY 4

EXISTING
CHANNEL
IMPROVEMENTS

UNPLATTED

EXISTING 6'
PUBLIC D-10-R
INLETS

EXISTING WOLF VALLEY DRIVE

LOT 1 ACADEMY
SCHOOL
DISTRICT NO. 20
AT WOLF RANCH
SUBDIVISION
FILING NO. 1

EXISTING
EDB DETENTION
POND FOR D20
ELEMENTARY
SCHOOL

EXISTING 18"
RCP STORM
SEWER POND
OUTFALL

UNPLATTED

EX-2
8.50

CE-01
83.3

SEE PRELIMINARY DRAINAGE
REPORT
ACADEMY DISTRICT 20 SCHOOL
SITES FINAL DRAINAGE REPORT
FOR ELEMENTARY SCHOOL #20
AT WOLF RANCH

EXISTING
CHANNEL
IMPROVEMENTS

EXISTING RIP
RAP CHANNEL

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
EX-1	0.27	1.09	4.78	0.08	300	10	21.4	0	0.0%	0.0	0.0	21.4	2.39	2.99	5.01	1	**3**	**24**
EX-2	0.17	0.68	2.98	0.08	300	10	21.4	0	0.0%	0.0	0.0	21.4	2.39	2.99	5.01	0	**2**	**15**

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS AREA (AC)	IMPERVIOUS AREA / STREETS C(2)	IMPERVIOUS AREA / STREETS C(5)	IMPERVIOUS AREA / STREETS C(100)	LANDSCAPE/UNDEVELOPED AREAS AREA (AC)	LANDSCAPE/UNDEVELOPED AREAS C(2)	LANDSCAPE/UNDEVELOPED AREAS C(5)	LANDSCAPE/UNDEVELOPED AREAS C(100)	WEIGHTED C(2)	WEIGHTED C(5)	WEIGHTED C(100)	WEIGHTED CA CA(2)	WEIGHTED CA CA(5)	WEIGHTED CA CA(100)
EX-1	13.67	0.00	0.89	0.90	0.96	13.67	0.02	0.08	0.35	0.02	0.08	0.35	**0.27**	**1.09**	**4.78**
EX-2	8.50	0.00	0.89	0.90	0.96	8.50	0.02	0.08	0.35	0.02	0.08	0.35	**0.17**	**0.68**	**2.98**

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
DESIGN POINT	3
BASIN IDENTIFIER / AREA IN ACRES	BB / 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
PIPE RUN	4
STORM SEWER	
CROSS PAN	

N

80' 40' 0 80' 160'

SCALE: 1" = 80'

EXISTING CONDITIONS
MIDTOWN AT WOLF RANCH
2555.00
DECEMBER 2019
SHEET 1 OF 1

CLASSIC CONSULTING SM
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799 (Fax)

EX. TYPE 1 C&G

EXISTING RESEARCH PARKWAY

PROP. 6' CONCRETE PAN

TRACT A

TRACT E

TRACT F

TRACT G

TRACT B

TRACT C

TRACT A

A 0.63

B 0.71

C 1.27

D 0.17

E 5.30

F 0.78

G 0.52

H 0.93

I 2.47

J 0.28

K 0.60

OS-1 0.41

OS-2 8.50

PROPOSED BOUNDARY

5' WALK

6' ATTACHED WALK

TYPE 1 C&G

TYPE 5 C&G

MAT

PROP. 24" CHASE SECTION

PROP. 18" STORM SEWER

PROP. 4' SUMP INLET

PROP. 3' CONCRETE PAN

PROP. 10' AT-GRADE INLET

PROP. 14' SUMP INLET

PROP. 24" STORM SEWER

PROP. 4' SUMP INLET

PROP. 30" STORM SEWER

PROP. 6' CONCRETE PAN

PROP. 10' AT GRADE INLET

PROP. 18" STORM SEWER

PROP. 8' SUMP INLET

PROP. 24" STORM SEWER

PROP. 36" STORM SEWER OUTFALL

EXISTING WOLF VALLEY DRIVE

EX. TYPE 1 C&G

LOT 1 ACADEMY SCHOOL DISTRICT NO. 20 AT WOLF RANCH SUBDIVISION FILING NO. 1

EXISTING ELEMENTARY SCHOOL

EXISTING PRIVATE EDB

UNPLATTED

UNPLATTED FUTURE PARK SITE

COTTONWOOD CREEK TRIBUTARY 4

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
DESIGN POINT	3
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
PIPE RUN	4
STORM SEWER	
CROSS PAN	

60' 30' 0 60' 120'

SCALE: 1" = 60'

SEE SHEET 2

SEE SHEET 2

MIDTOWN AT WOLF RANCH
DRAINAGE MAP
JOB NO. 2555.00
DECEMBER 2019
SHEET 1 OF 2

CLASSIC CONSULTING
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(719)785-0790
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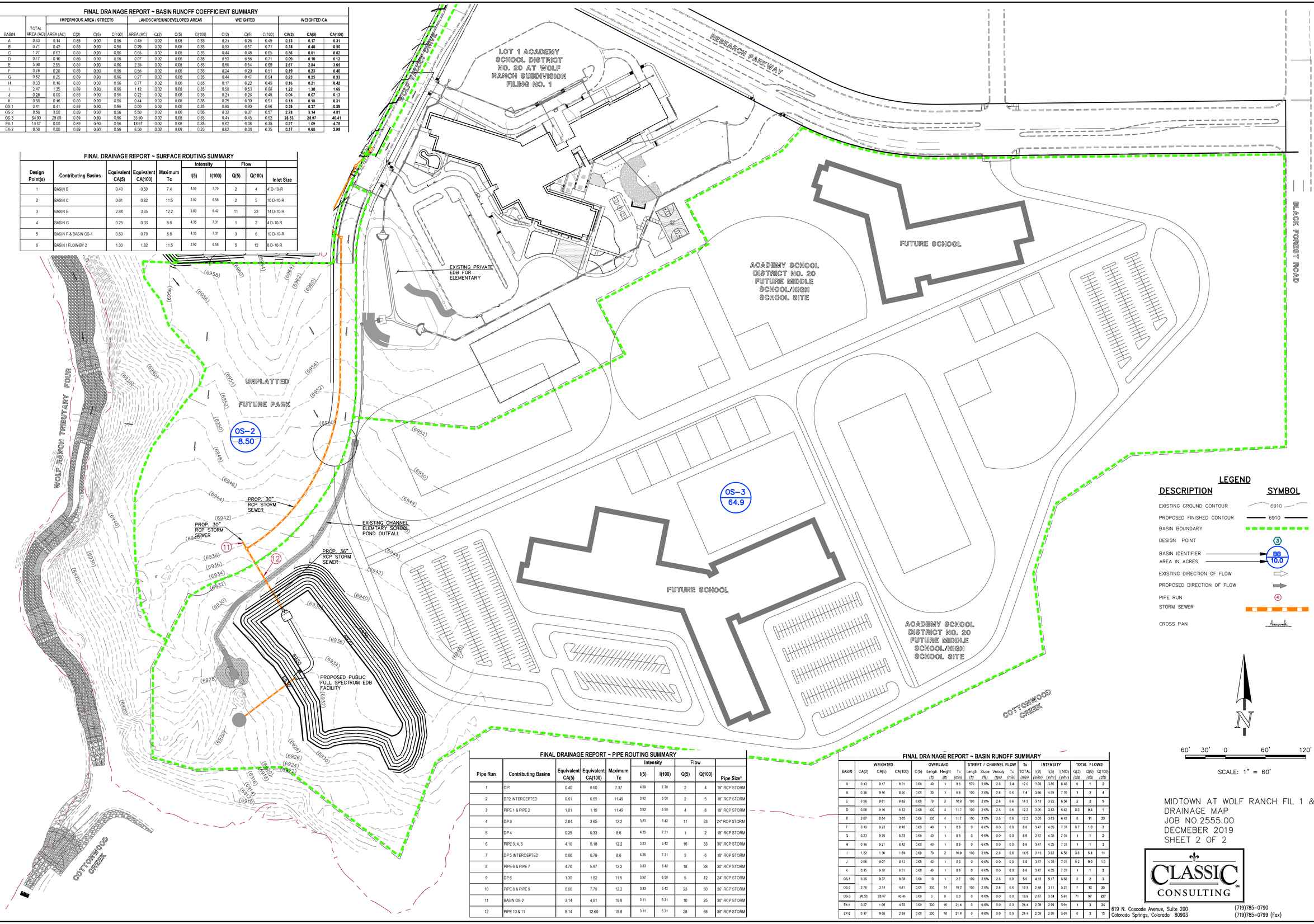
FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA / STREETS AREA (AC)	C(2)	C(5)	C(100)	LANDSCAPE/UNDEVELOPED AREAS AREA (AC)	C(2)	C(5)	C(100)	WEIGHTED C(2)	C(5)	C(100)	WEIGHTED CA CA(2)	CA(5)	CA(100)
A	0.63	0.14	0.89	0.90	0.96	0.49	0.02	0.08	0.35	0.23	0.26	0.49	**0.13**	**0.17**	**0.31**
B	0.71	0.42	0.89	0.90	0.96	0.29	0.02	0.08	0.35	0.53	0.57	0.71	**0.38**	**0.40**	**0.50**
C	1.27	0.62	0.89	0.90	0.96	0.65	0.02	0.08	0.35	0.44	0.48	0.65	**0.56**	**0.61**	**0.82**
D	0.17	0.10	0.89	0.90	0.96	0.07	0.02	0.08	0.35	0.53	0.56	0.71	**0.09**	**0.10**	**0.12**
E	5.36	2.95	0.89	0.90	0.96	2.35	0.02	0.08	0.35	0.50	0.54	0.69	**2.67**	**2.84**	**3.65**
F	0.78	0.20	0.89	0.90	0.96	0.58	0.02	0.08	0.35	0.24	0.29	0.51	**0.19**	**0.23**	**0.40**
G	0.52	0.25	0.89	0.90	0.96	0.27	0.02	0.08	0.35	0.44	0.47	0.64	**0.23**	**0.25**	**0.33**
H	0.93	0.16	0.89	0.90	0.96	0.77	0.02	0.08	0.35	0.17	0.22	0.45	**0.16**	**0.21**	**0.42**
I	2.47	1.35	0.89	0.90	0.96	1.12	0.02	0.08	0.35	0.50	0.53	0.68	**1.22**	**1.30**	**1.65**
J	0.28	0.05	0.89	0.90	0.96	0.22	0.02	0.08	0.35	0.21	0.26	0.48	**0.06**	**0.07**	**0.13**
K	0.60	0.16	0.89	0.90	0.96	0.44	0.02	0.08	0.35	0.25	0.30	0.51	**0.15**	**0.18**	**0.31**
OS-1	0.41	0.41	0.89	0.90	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	**0.36**	**0.37**	**0.39**
OS-2	8.50	3.00	0.89	0.90	0.96	5.50	0.02	0.08	0.35	0.33	0.37	0.57	**2.78**	**3.14**	**4.81**
OS-3	64.90	29.00	0.89	0.90	0.96	35.90	0.02	0.08	0.35	0.41	0.45	0.62	**26.53**	**28.97**	**40.41**
EX-1	13.67	0.00	0.89	0.90	0.96	13.67	0.02	0.08	0.35	0.02	0.08	0.35	**0.27**	**1.09**	**4.78**
EX-2	8.50	0.00	0.89	0.90	0.96	8.50	0.02	0.08	0.35	0.02	0.08	0.35	**0.17**	**0.66**	**2.98**

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	BASIN B	0.40	0.50	7.4	4.59	7.70	2	4	4'D-10-R
2	BASIN C	0.61	0.82	11.5	3.92	6.58	2	5	10 D-10-R
3	BASIN E	2.84	3.65	12.2	3.83	6.42	11	23	14 D-10-R
4	BASIN G	0.25	0.33	8.6	4.35	7.31	1	2	4 D-10-R
5	BASIN F & BASIN OS-1	0.60	0.79	8.6	4.35	7.31	3	6	10 D-10-R
6	BASIN I FLOW-BY 2	1.30	1.82	11.5	3.92	6.58	5	12	8 D-10-R



LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
DESIGN POINT	3
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
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PIPE RUN	4
STORM SEWER	
CROSS PAN	

N

60' 30' 0 60' 120'

SCALE: 1" = 60'

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP1	0.40	0.50	7.37	4.59	7.70	2	4	18" RCP STORM
2	DP2 INTERCEPTED	0.61	0.69	11.49	3.92	6.58	2	5	18" RCP STORM
3	PIPE 1 & PIPE 2	1.01	1.19	11.49	3.92	6.58	4	8	18" RCP STORM
4	DP 3	2.84	3.65	12.2	3.83	6.42	11	23	24" RCP STORM
5	DP 4	0.25	0.33	8.6	4.35	7.31	1	2	18" RCP STORM
6	PIPE 3, 4, 5	4.10	5.18	12.2	3.83	6.42	16	33	30" RCP STORM
7	DP 5 INTERCEPTED	0.60	0.79	8.6	4.35	7.31	3	6	18" RCP STORM
8	PIPE 6 & PIPE 7	4.70	5.97	12.2	3.83	6.42	18	38	30" RCP STORM
9	DP 6	1.30	1.82	11.5	3.92	6.58	5	12	24" RCP STORM
10	PIPE 8 & PIPE 9	6.00	7.79	12.2	3.83	6.42	23	50	36" RCP STORM
11	BASIN OS-2	3.14	4.81	19.8	3.11	5.21	10	25	30" RCP STORM
12	PIPE 10 & 11	9.14	12.60	19.8	3.11	5.21	28	66	36" RCP STORM

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	CA(5)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
A	0.13	0.17	0.31	0.08	40	1	8.6	570	2.0%	2.5	3.4	12.0	3.06	3.86	6.48	0	1	2
B	0.38	0.40	0.50	0.08	30	1	6.8	100	2.0%	2.8	0.6	7.4	3.66	4.59	7.70	1	2	4
C	0.56	0.61	0.82	0.08	70	2	10.9	100	2.0%	2.8	0.6	11.5	3.13	3.92	6.58	2	2	5
D	0.09	0.10	0.12	0.08	100	4	11.7	100	2.0%	2.5	0.6	12.2	3.06	3.83	6.42	0.3	0.4	1
E	2.67	2.84	3.65	0.08	100	4	11.7	100	2.0%	2.5	0.6	12.2	3.06	3.83	6.42	8	11	23
F	0.19	0.23	0.40	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	1	1	3
G	0.23	0.25	0.33	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	1	1	2
H	0.16	0.21	0.42	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	1	1	3
I	1.22	1.30	1.69	0.08	70	2	10.9	100	2.0%	2.8	0.6	11.5	3.13	3.92	6.58	3.8	5.1	11
J	0.06	0.07	0.13	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	0.2	0.3	1.0
K	0.15	0.18	0.31	0.08	40	1	8.6	0	0.0%	0.0	0.0	8.6	3.47	4.35	7.31	1	1	2
OS-1	0.36	0.37	0.39	0.08	10	1	2.7	100	2.0%	2.5	0.0	5.0	4.12	5.17	8.68	2	2	3
OS-2	2.78	3.14	4.81	0.08	300	14	19.2	100	2.0%	2.8	0.6	19.8	2.46	3.11	5.21	7	10	25
OS-3	26.53	28.97	40.41	0.08	0	0	0.0	0	0.0%	0.0	0.0	16.9	2.67	3.34	5.61	71	97	227
EX-1	0.27	1.09	4.78	0.08	300	10	21.4	0	0.0%	0.0	0.0	21.4	2.39	2.99	5.01	1	3	24
EX-2	0.17	0.66	2.98	0.08	300	10	21.4	0	0.0%	0.0	0.0	21.4	2.39	2.99	5.01	0	2	15

MIDTOWN AT WOLF RANCH FIL 1 & 2
DRAINAGE MAP
JOB NO.2555.00
DECMEBER 2019
SHEET 2 OF 2

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