INNOVATIVE DESIGN. **CLASSIC RESULTS.**

FINAL DRAINAGE REPORT FOR PAINT BRUSH HILLS FILING 13E

SEPTEMBER 2018

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Job no. 2053.50

PCD File No. SF189

FINAL DRAINAGE REPORT FOR
PAINT BRUSH HILLS FILING NO. 13E

DRAINAGE REPORT STATEMENT

DESIGN ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage report and said report is in conformity with the applicable master plan and drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

37155

Marc A. Whorton, Colorado P.E. #37155

9/25/18
Date

OWNERS/DEVELOPER'S STATEMENT:

I, the owner/developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: Aeroplaza Fountain LLC and Heidi LLC

9/25/18
Date

Title: Authorized Signing Agent

Address: 212 N. Wahsatch Ave., Suite 301

Colorado Springs, CO 80903

EL PASO COUNTY:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code, as amended.

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

Date

Conditions:

CLASSIC CONSULTING ENGINEERS & SURVEYORS

FINAL DRAINAGE REPORT FOR
PAINT BRUSH HILLS FILING NO. 13E

TABLE OF CONTENTS:

APPENDICES

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FINAL DRAINAGE REPORT FOR PAINT BRUSH HILLS FILING NO. 13E

PURPOSE

This document is the Final Drainage Report for Paint Brush Hills Filing No. 13E. This filing was originally part of the overall Final Plat submittal for Paint Brush Hills Filing No. 13, approved by the BOCC in 2006 but never recorded. This filing represents the next phase within the phased final plat for this development. The purpose of this report is to address on-site and off-site drainage patterns as discussed and approved within the original overall Final Drainage Report and update storm and drainage criteria to current County standards. This report will introduce an additional future detention facility and designed to meet current Full Spectrum Detention standards, yet remain consistent with drainage concepts approved in previous reports.

GENERAL DESCRIPTION

The original Paint Brush Hills Filing No. 13 site is a 300-acre site located in the county of El Paso within Section 25 and 26, Township 12 South, Range 65 West of the Sixth Principal Meridian, El Paso County, Colorado. The site is bounded on the north by existing platted (RR2 Zone) residential lots, to the east by existing platted (R Zone) residential lots, to the south by existing planned (R Zone) residential lots and on the west by existing (RR3 Zone) residential lots and unplatted parcels. The overall site was proposed for 553 single family units, a 10-acre elementary school site, a 6-acre community commercial site along with 44-acres of trails and open space. The residential lots will range in size from a 6000 S.F. minimum to 1.0+ acre.

Under the plat phasing resolution (No. 12-48) adopted by the County in 2012, the proposed filing 13E represent the next phase of development within this subdivision. Filing 13E contains 158 single family lots and proposes lots both within the RS-6000 and RS-20,000 zone districts as approved with the original Filing 13 overall Final Plat.

The average soil condition reflects Hydrologic Group "B" (Pring Course, Sandy Loam and Stapleton Sandy Loam), as determined by the "Soil Survey of El Paso County Area," prepared by the Soil Conservation Service.

EXISTING DRAINAGE CONDITIONS

Existing drainage of the overall Paint Brush Hills Filing No. 13 site is generally from north to south by way of existing natural drainage swales. The majority of the site is covered with native grasses and no trees. The major drainageway affecting the proposed filing runs in a north-south direction through the middle of the site and for the most part follows the alignment of the existing overhead power lines within an existing 275' easement corridor. These along with several existing well sites (permitted to the Paint Brush Hills Metropolitan District) will remain on-site as development occurs. This drainageway slopes at grades of 2% to 4% with depths ranging from 2' to 12'. There are two existing downstream detention facilities that were approved as a part of the Paint Brush Hills Filing No. 13C & D subdivision that collect flows from this drainageway. This drainageway also was shown with a 100-year floodplain per the (MDDP) "Master Development Drainage Plan for Falcon Hills Development," prepared by Kiowa Engineering Corporation, approved May 2002. With the proposed open space area as shown on the Preliminary Plan and Final Plat, meandering throughout this drainage/utility corridor, it is the intent to leave the majority of this area in its natural state. A proposed full spectrum detention facility (Pond D) is planned for the southern portion of this area just north of Londonderry Drive. The outfall for this facility will utilize the existing dual 36" RCP culverts under Londonderry Dr.

The detention facilities recently constructed with Paint Brush Hills Filing No. 13C & D subdivision were designed to account for this development. The historic flows from basins H-3 and H-4 shown exiting the existing dual 36" RCP culverts under Londonderry Drive at Design Point H1 equals Q_5 = 19 cfs and Q_{100} = 105 cfs. (See Historic Drainage Map) However, based on the previously approved Final Drainage Report for Paint Brush Hills Filing Nos. 13C & 13D, the anticipated developed inflow and release from the proposed Detention Facility D are as follows, respectively: Q_5 = 45 cfs and Q_{100} = 151 cfs and Q_5 = 12 cfs and Q_{100} = 72 cfs. Thus, this proposed development does not significantly change the developed flows entering downstream facilities. (See Drainage Map)

The southern boundary of the site is for the most part bounded by existing Londonderry Drive. This stretch of road was approved and constructed as a part of Paint Brush Hills Filing No. 10. The storm facilities were sized anticipating such future flows directly entering the road. Further discussions in this report will specifically itemize these contributing basins and verify the capacity of these facilities. Along the

east side of the property exists a natural ridge created with the adjacent Filing No. 9 development. The northern boundary of this Filing has another ridge with a small portion of the site draining to the north off-site into the natural channel further to the east. The portion of the overall Paint Brush Hills property to the west of this Filing continues to naturally drain in a southwesterly direction into the existing detention pond C constructed in 2004 along with Paint Brush Hills Filing Nos. 10, 11 and 12 development. This facility will be utilized by this Filing 13E as the temporary sedimentation basin for a small portion of the development. Upon the development of the final phases of Paint Brush Hills 13, this facility will then be upgraded to meet all current stormwater quality standards. As mentioned earlier, this site was previously studied as part of the MDDP, prepared by Kiowa Engineering Corporation, approved May 2002. This report generally described the drainage characteristics for this entire area, as well as offsite areas tributary to the site. The MDDP defined the two major drainage ways for this site, and provided for current detention facility locations, one at the southwesterly corner of the site, and the other at the southeasterly corner. Both of these facilities were then finalized within the "Preliminary Drainage Report for Falcon hills" and the "Final Drainage Report for Paint Brush Hills Filing Nos. 10, 11 and 12", both prepared by Classic Consulting Engineers and Surveyors, July 2003. To date, both facilities have also been constructed as a part of the Filing Nos. 10 and 11 approved construction plans and most recently with the Filing 13C & D development.

DEVELOPED DRAINAGE CONDITIONS
EXISTING STORM FACILITIES

Given some recent changes in City/County Drainage Criteria, the calculations for this development have been updated and now reflect current criteria. Proposed Pond D will be designed as a full spectrum facility to accommodate current drainage criteria. This will include the design of concrete forebays, concrete trickle channels, concrete micropool and an outlet structure designed to release flows based on full spectrum criteria. The attached developed conditions drainage map contains many design points related to proposed at-grade and sump conditions. All public Type R inlets have been designed at these various locations to accept both the 5-yr. and 100-yr. developed flows. All proposed storm facilities within the public Right-of-way will be public with ownership and maintenance by El Paso County. All proposed storm facilities within easements or tracts and the proposed Pond D will be owned and maintained by the Paint Brush Hills Metropolitan District.

Existing storm facilities within Londonderry Drive and Towner Boulevard have already have been designed and constructed as a part of Paint Brush Hills Filing No. 10. These facilities were designed to handle any future development such as the development proposed as a part of this Final Plat. Specific design points within this report refer to these existing facilities. The following descriptions compare the developed flows as specified in the "Final Drainage Report for Paint Brush Hills Filing Nos. 10, 11 & 12" verses the proposed developed flows for this development at these existing facilities:

Design Point 31 (Q_5 = 13 cfs and Q_{100} = 30 cfs) consists of developed flows from Basins LL, MM. An existing 12' sump inlet exists at this location. Based on the previous study, this location anticipated a developed flow of (Q_5 = 13 cfs and Q_{100} = 30 cfs). Thus, the existing facility at this location continues to adequately handle both the 5-year and 100-year developed flows.

Design Point 32 (Q_5 = 4 cfs and Q_{100} = 7 cfs) consists of developed flows from Basin NN. An existing 6' sump inlet exists at this location. Based on the original study, this location was notated as design point 18A with a developed flow of (Q_5 = 8 cfs and Q_{100} = 15 cfs). Thus, the existing facility at this location continues to adequately handle both the 5-year and 100-year developed flows.

In the previous reports, Design Point 34A (Q_5 = 46 cfs and Q_{100} = 106 cfs) consists of developed flows from Basins DD1, DD2, EE, OO, RR and SS only while basins FF, GG, HH, II, JJ and KK were collected in a separate storm system and routed directly to the existing dual 36" RCP storm sewers at this location. However, with the proposed detention facility (Pond D) now planned at this location, these piped flows will be routed directly into this facility, therefore reducing the flow downstream to historic levels or below. The total inflow into this facility is planned as **Design Point 34A** (Q_5 = 36 cfs and Q_{100} = 155 cfs). This facility will be constructed with the proposed Filing 13E and the downstream flows will remain consistent with the recent Filing 13C & D final drainage report.

Pond D has the following design parameters as a full-spectrum facility:

0.88 Ac.-ft. WQCV required

2.1 Ac.-ft. EURV required

2.1 Ac.-ft. EURV design with 4:1 max. slopes

5.9 Ac.-ft. 100-yr. storage

Total In-flow:	**Q_5 = 36 cfs, Q_{100} = 155 cfs**
Pond Design Release:	**Q_5 = 0.6 cfs, Q_{100} = 64 cfs**
Pre-development Release:	**Q_5 = 19 cfs, Q_{100} = 105 cfs**

Filing 13E Storm Facilities

Design Point 24 (Q_5 = 6 cfs and Q_{100} = 22 cfs) collects developed flows from Basin DD1. At this location a 15' Type R at-grade inlet will be installed to collect (Q_5 = 6 cfs and Q_{100} = 15 cfs) and (Q_5 = 0 cfs and Q_{100} = 7 cfs) will flow-by. This facility is designed to maintain the required street capacity at this location. **Design Point 25** (Q_5 = 3 cfs and Q_{100} = 16 cfs) and **Design Point 26** (Q_5 = 3 cfs and Q_{100} = 10 cfs) then collect developed flows from Basins DD2, EE and the flow-by from Design Point 24. At this sump condition, a 10' and a 5' Type R sump inlets, respectively, will be installed to completely collect both the 5-year and 100-year developed flows. These flows will have a maximum ponding depth of 1.0' and then be conveyed via a 30" RCP storm sewer to the natural channel, where a rip rap dissipater will be installed to minimize sediment transfer and erosion. The total flow within the pipe at this location is given by **Pipe Run 28 (Q_5 = 12 cfs and Q_{100} = 38 cfs).** The emergency overflow route at this location is via a natural swale between two lots within a drainage easement and then directly into the natural channel.

Design Point 27 (Q_5 = 7 cfs and Q_{100} = 23 cfs) and **Design Point 28** (Q_5 = 6 cfs and Q_{100} = 18 cfs) collect developed flows from Basins FF, GG and HH within sump conditions. 10' Type R sump inlets will be installed at both Design Point 27 and 28. Both the 5-year and 100-year flows at these locations will be fully collected and then conveyed via a 36" RCP storm sewer in a westerly direction within Londonderry Drive. The maximum ponding at these locations will be 1.0' and then the flows will travel around the corner directly into Londonderry Drive where the emergency overflow will head towards Design Point 31. **Design Point 29** (Q_5 = 6 cfs and Q_{100} = 15 cfs) and **Design Point 30** (Q_5 = 1 cfs and Q_{100} = 3 cfs) collect developed flows from Basins II, KK and JJ within sump conditions. A 10' Type R sump inlet will be installed at Design Point 29 and a 5' Type R sump inlet will be installed at Design Point 30. Both the 5-year and 100-year flows at these locations will be fully collected and then conveyed via a 30" RCP storm sewer into Londonderry Drive. These flows then combine with the upstream flows previously mentioned and are conveyed via a 36" RCP system within Londonderry Drive and then directly into the Detention Pond D. The total flow within the pipe at this location is given by **Pipe Run 35 (Q_5 = 18 cfs and Q_{100} = 53 cfs).** The maximum ponding at these locations will be 1.0' and then the flows will travel around the corner directly into Londonderry Drive where the emergency overflow will head towards Design Point 31.

Basins RR and SS are tributary to the sump condition at **Design Point 33** (Q_5 = 4 cfs and Q_{100} = 12 cfs) and **Design Point 34** (Q_5 = 3 cfs and Q_{100} = 9 cfs). A 5' Type R sump inlet will be installed at Design Point 33 and a 10' Type R sump inlet will be installed at Design Point 34. Both the 5-year and 100-year flows at these locations will be fully collected and then conveyed via a 24" RCP storm sewer towards the natural channel to the east where a rip rap dissipater will be installed to minimize sediment transfer and erosion. The total flow within the pipe at this location is given by **Pipe Run 37 (Q_5 = 7 cfs and Q_{100} = 21 cfs).** The emergency overflow route at this location is via a natural swale between two lots within a drainage easement and then directly into the natural channel. Basin OS-1 (Q_5 = 5 cfs and Q_{100} = 13 cfs) develops future off-site flows that will be routed to the natural channel and ultimately into Pond D.

Basin PP (Q_5 = 2 cfs and Q_{100} = 6 cfs) is a small area at the extreme north end of the subdivision and these developed flows actually will continue to travel as sheet flow in a northeasterly direction towards the existing natural channel further to the east. Not much impervious development will take place within this basin and thus there is no significant change from the pre-development flows as shown by Basin H-5 (Q_5 = 1 cfs and Q_{100} = 5 cfs). Basin OO (Q_5 = 12 cfs and Q_{100} = 51 cfs) consists mainly of the natural open space/overhead electric easement corridor along with the rear yards of all lots adjacent to this area. This basin will continue to sheet flow in a southerly direction into the natural channel and then directly into the proposed Detention Pond D.

Anticipated future development flow from basins OS-2 and OS-3 are tributary to **Design Point 35** (Q_5 = 9 cfs and Q_{100} = 25 cfs) and **Design Point 36** (Q_5 = 4 cfs and Q_{100} = 12 cfs). Future 15' Type R at-grade inlets are planned at both these locations. The anticipated future flow-by is as follows: Design Point 35 flow-by (Q_5 = 0.5 cfs and Q_{100} = 9.8 cfs) and Design Point 36 flow-by (Q_5 = 0 cfs and Q_{100} = 1.6 cfs). **Design Point 37** (Q_5 = 4 cfs and Q_{100} = 13 cfs) collects developed flows from Basin TT. At this location a 15' Type R at-grade inlet will be installed to collect (Q_5 = 4 cfs and Q_{100} = 12 cfs) with only (Q_5 = 0 cfs and Q_{100} = 1.4 cfs) flow-by. This collected flow will be piped via a 24" RCP and combine with the upstream flows within a 36" RCP within the future road to the west. **Design Point 38** (Q_5 = 4 cfs and Q_{100} = 20 cfs) collects developed flows from Basin QQ and the flow-by from Design Points 35 and 36. At this location a 15' Type R at-grade inlet will be installed to collect (Q_5 = 4 cfs and Q_{100} = 13.9 cfs) with only (Q_5 = 0 cfs and Q_{100} = 6.1 cfs) flow-by. This collected flow will be piped via a 24" RCP and combine with the upstream flows within a 30" RCP. Pipe Run 42 (Q_5 = 21 cfs and Q_{100} = 50 cfs) represents the total anticipated future

developed pipe flow within this system including the future development. Prior to future development to the west (basins OS-2, OS-3 and part of QQ) the minor flows collected from the two 15' Type R at-grade inlets at Design Points 37 and 38 equal (Q_5 = 5 cfs and Q_{100} = 15 cfs). These minor developed flows will daylight into the natural channel to the west and travel directly into the existing detention Pond C. This facility will serve as the temporary sediment basin for this development. Upon future platting and development, this 36" RCP storm system will be extended and the existing detention facility (Pond C) will be upgraded to meet current detention and stormwater quality standards.

Design Point 39 (Q_5 = 1 cfs and Q_{100} = 4 cfs) represents flows from Basin VV (Q_5 = 0.7 cfs and Q_{100} = 1.4 cfs) allowed to continue to flow off-site within the west side of Keating Drive and Basin UU (Q_5 = 1 cfs and Q_{100} = 3 cfs) allowed to continue to flow off-site within the east side of Keating Drive. These flows were accounted for in the "Final Drainage Report for Paint Brush Hills Filing Nos. 10, 11 & 12" and represented as Basin OS-1 (Q_5 = 2 cfs and Q_{100} = 4 cfs). Thus, the downstream facilities will not see any significant change.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. Individual on-site developed basin design used for inlet sizing and storm system routing was calculated using the Rational Method. Full-Spectrum detention pond modeling developed using UD-Detention spreadsheet ver. 3.07, Urban Drainage and Flood Control District.

The City of Colorado Springs/El Paso County DCM requires 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. **Employ Runoff Reduction Practices:** Proposed impervious areas (roof tops, patios) will sheet flow across landscaped yards and through open space areas to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets. This will minimize directly connected impervious areas within the project site.

2. **Stabilize Drainageways:** After developed flows utilize the runoff reduction practices through the front yards, these flows will travel via curb and gutter within the public streets and eventually public storm systems. These collected flows are then routed directly to the full-spectrum detention facility on-site (Pond D). Where developed flows are not able to be routed to public streets (rear yards), sheet flows will travel towards the natural drainage channel within the open space corridor (Tract A). This corridor will be protected with rip-rap and erosion control matting as required to reduce velocities to erosive levels.

3. **Provide Water Quality Capture Volume (WQCV):** Runoff from this development will be treated through capture and slow release of the WQCV in the proposed full-spectrum permanent Detention Basin (Pond D) designed per current El Paso County drainage criteria. However, the runoff within Keating Dr. will ultimately have WQCV provided by proposed full-spectrum pond modifications to the existing facility (Pond C, Paint Brush Hills Filing 12). Prior to the future development pond modifications, the interim flows will still be routed to and captured by this existing facility.

4. **Consider need for Industrial and Commercial BMPs**: No industrial or commercial uses are proposed within this development. However, a site specific storm water quality and erosion control plan and narrative has been submitted along with the grading and erosion control plan. Details such as site specific source control construction BMP's as well as permanent BMP's were detailed in this plan and narrative to protect receiving waters. BMP's will be constructed and maintained as the development has been graded and erosion control methods employed.

FLOODPLAIN STATEMENT

No portion of this site is located within a FEMA floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Numbers 08041C 0535F and 08041C 0575, with effective dates of March 17, 1997 (See Appendix).

EROSION CONTROL PLAN

The 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 Overlot Grading Plan and construction assurances posted prior to obtaining a grading permit.

DRAINAGE & BRIDGE FEES

This site lies within the Falcon Drainage Basin. The total acreage for Paint Brush Hills 13E is 172.08 acres. However, Tract E (88.63 acres) is being platted for future development with only 83.45 acres being platted for development at this time. Thus, the fees are calculated using the following impervious acreage method approved by El Paso County. The total development area is broken into two residential uses: RS-20000 zone (average lots size of 0.5 ac.) and RS-6000 zone (average lot size 0.25 ac.) and open space/drainage corridor (Tract A). Thus, the percent imperviousness for this subdivision is calculated as follows (See Figure 1 for Basin Area Exhibit):

RS-20000 Zone Area

(Per El Paso County Percent Impervious Chart for 0.50 ac. lots: 25**%**)

23.40 Ac. x 25% = **5.85 Impervious Ac.**

RS-6000 Zone Area

(Per El Paso County Percent Impervious Chart for 0.25 ac. lots: 40**%**)

40.29 Ac. x 40% = **16.12 Impervious Ac.**

Open Space/Drainage Corridor Area

(Per El Paso County Percent Impervious Chart for greenbelts: **2%**)

19.76 Ac. x 2% = **0.40 Impervious Ac.**

Total Impervious Acreage: 22.37 Imp. Ac.

The following calculations are based on the 2018 drainage/bridge fees for the Falcon Drainage Basin:

FEE TOTALS:

Bridge Fees

$ 3,814.00 x 22.37 Impervious Ac. = $ 85,319.18

Drainage Fees

$ 27,762.00 x 22.37 Impervious Ac. = $ 621,035.94

SUMMARY

This proposed development remains consistent with the previously approved MDDP, Final Drainage Report for Paint Brush Hills Filing Nos. 10, 11 & 12 and Final Drainage Report for Paint Brush Hills Filing 13C & D. The existing storm facilities continue to adequately handle both the 5-yr. and 100-yr. developed flows. All proposed detention facilities meet current criteria and provide full spectrum design. The proposed development will not adversely impact surrounding developments.

PREPARED BY:
Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

mw/205350/Reports/FDR Filing 13E.doc

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual, as revised in November 1991 and 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.

2. Soil Survey of El Paso County Area, Colorado Soil Conservation Service, June 1981.

3. "Master Development Drainage Plan, Falcon Hills Development," by Kiowa Engineering Corporation, May 2002.

4. "Preliminary Drainage Report for Falcon Hills," by Classic Consulting Engineers and Surveyors, approved November 2002.

5. "Final Drainage Report for Paint Brush Hills Filing Nos. 10, 11 &12," by Classic Consulting Engineers and Surveyors, approved July 2003.

6. "Preliminary Drainage Report for Paint Brush Hills – Phase 2", by Classic Consulting Engineers and Surveyors, approved January 2005.

7. "Drainage Report for Paint Brush Hills Filing No. 3," by Berge-Brewer & Assoc., Inc., April 1983.

8. "Falcon Area Drainage Basin Planning Study – Selected Plan Report", by URS, Sept. 2015.

9. "Final Drainage Study and Erosion Control Plan for Paint Brush Hills Filing No. 9," by Martin/Martin, Inc., approved September 2000.

10. "Final Drainage Report for Paint Brush Hills Filing No 13," by Classic Consulting Engineers and Surveyors, Sept. 2012, not formally approved.

11. "Final Drainage Report for Paint Brush Hills Filing No 13C & D," by Classic Consulting Engineers and Surveyors, approved May 2017.

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APPENDIX

VICINITY MAP

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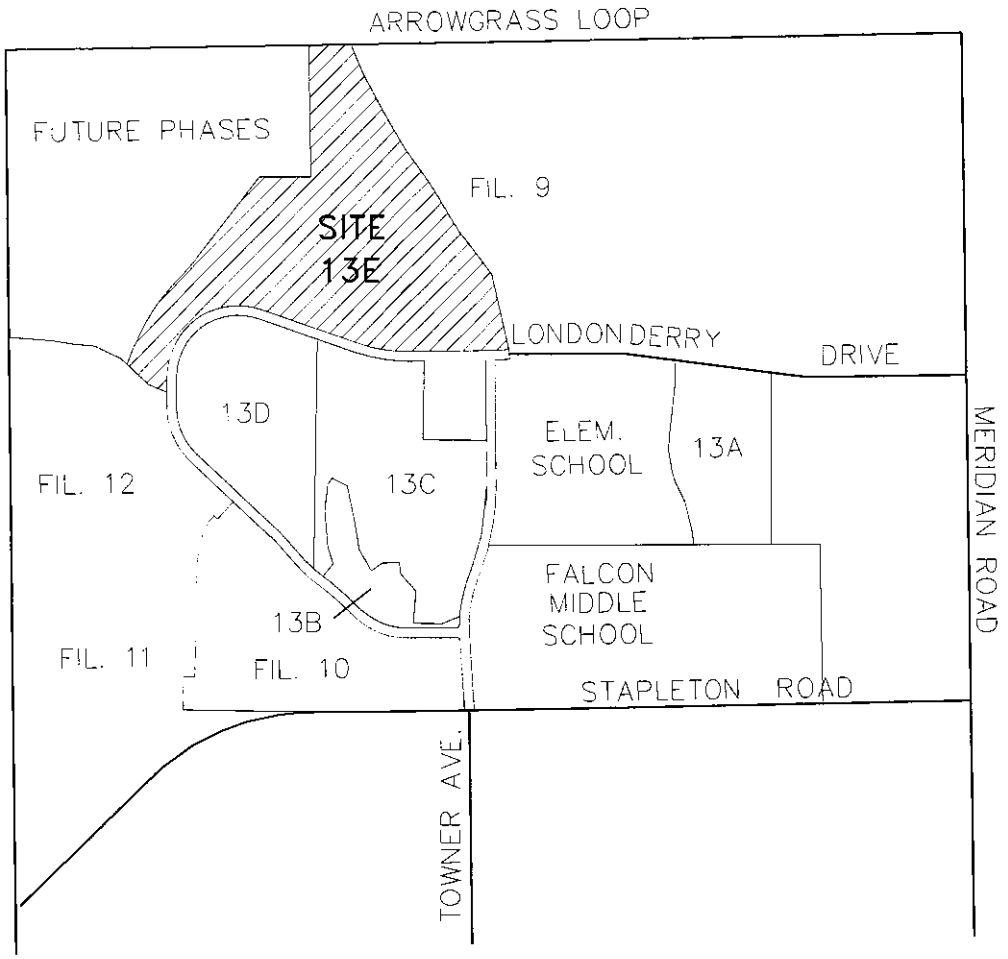

VICINITY MAP

N.T.S.

SOILS MAP

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Soil Map—El Paso County Area, Colorado

Map Scale: 1:11,900 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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 13, Sep 22, 2015

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

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

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

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	36.1	6.1%
71	Pring coarse sandy loam, 3 to 8 percent slopes	556.1	93.9%
Totals for Area of Interest		**592.3**	**100.0%**

El Paso County Area, Colorado

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Loamy Park (R048AY222CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 13, Sep 22, 2015

F.E.M.A MAP

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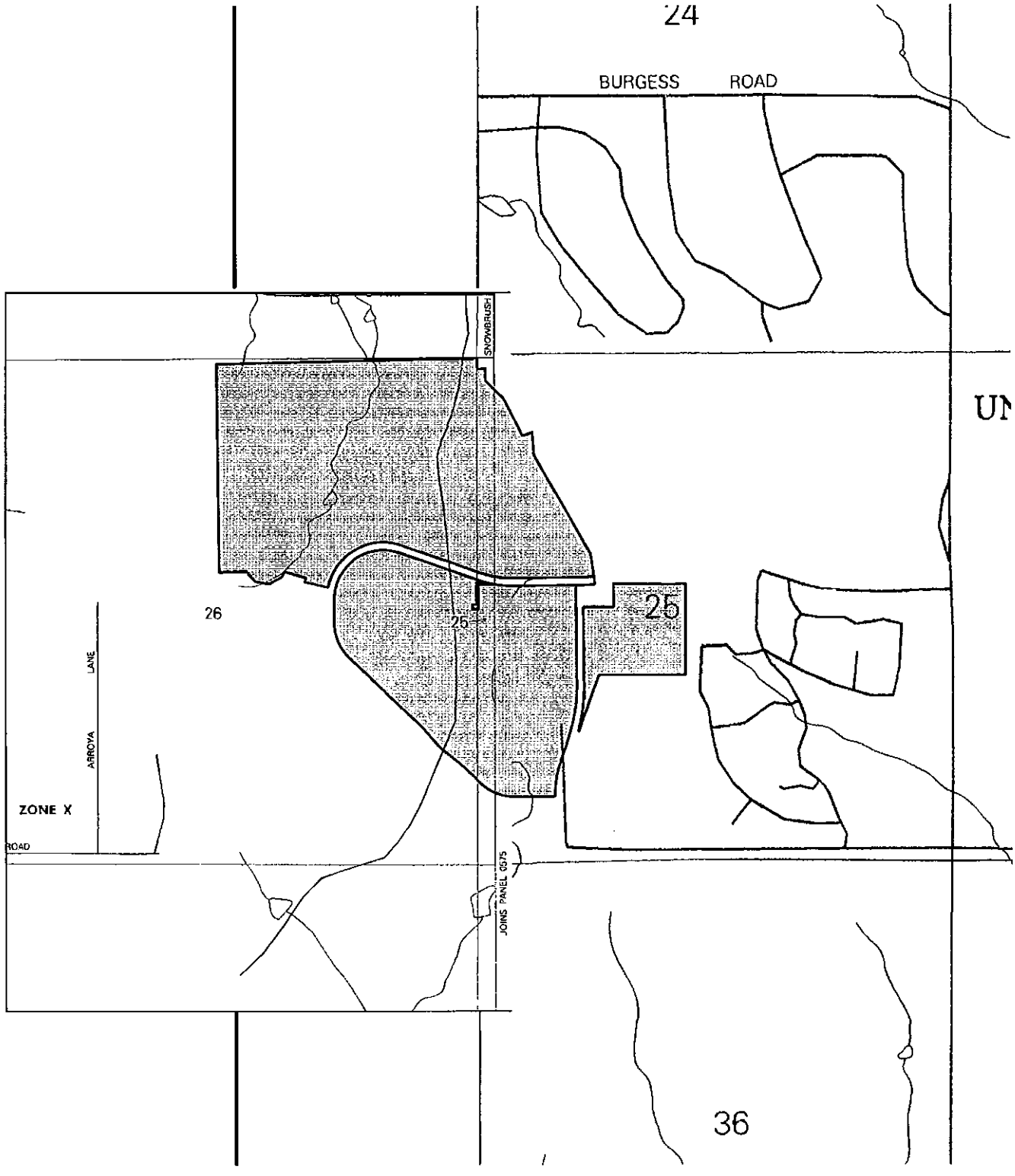
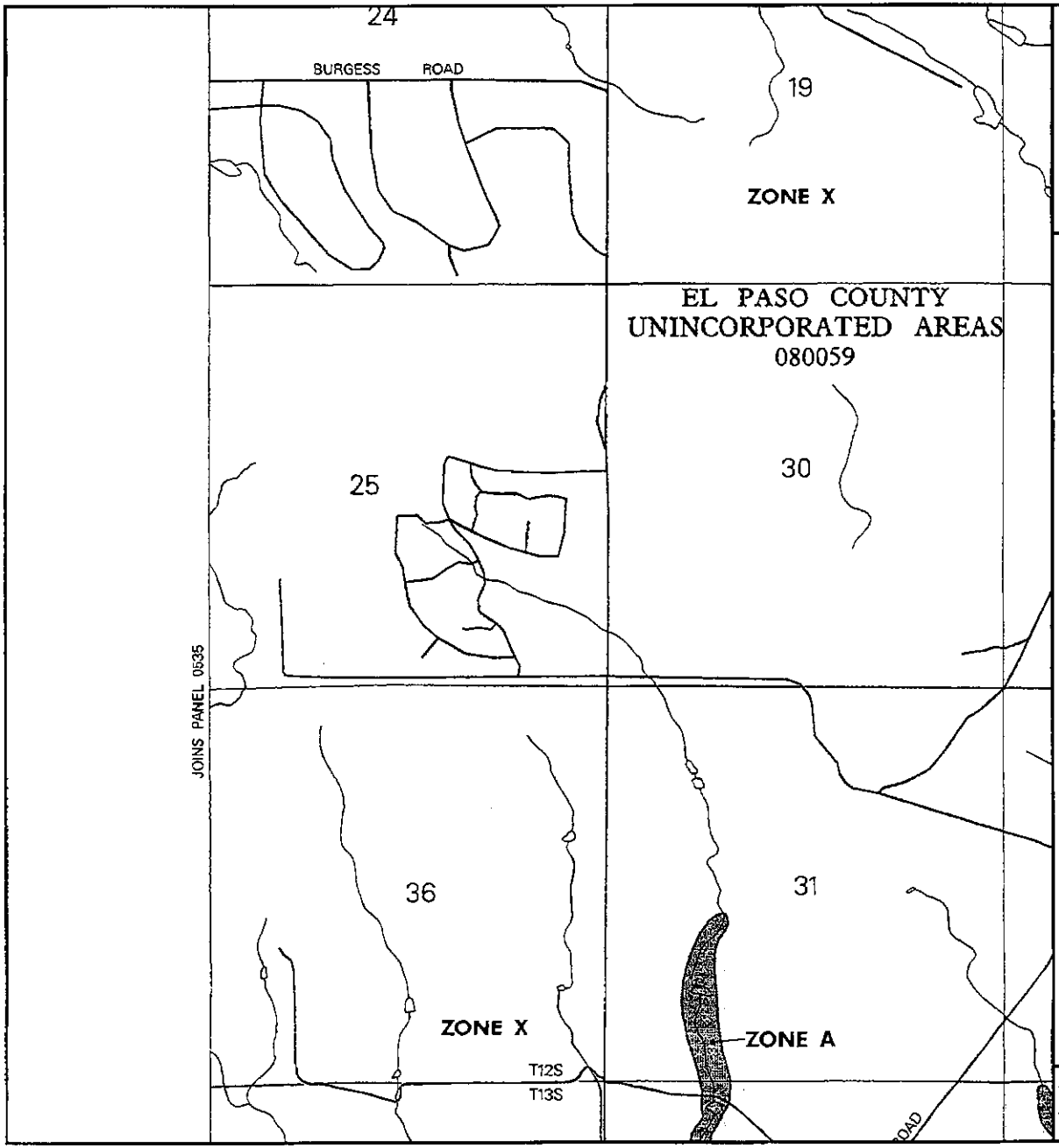
Colorado Springs, Colorado 80919

(719)785-0790
(719)785-0799 (Fax)

PAINT BRUSH HILLS
FILING NO. 13
AUGUST 2009
JOB NO. 2053.21
SHEET 1 OF 1





APPROXIMATE SCALE IN FEET

2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 575 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

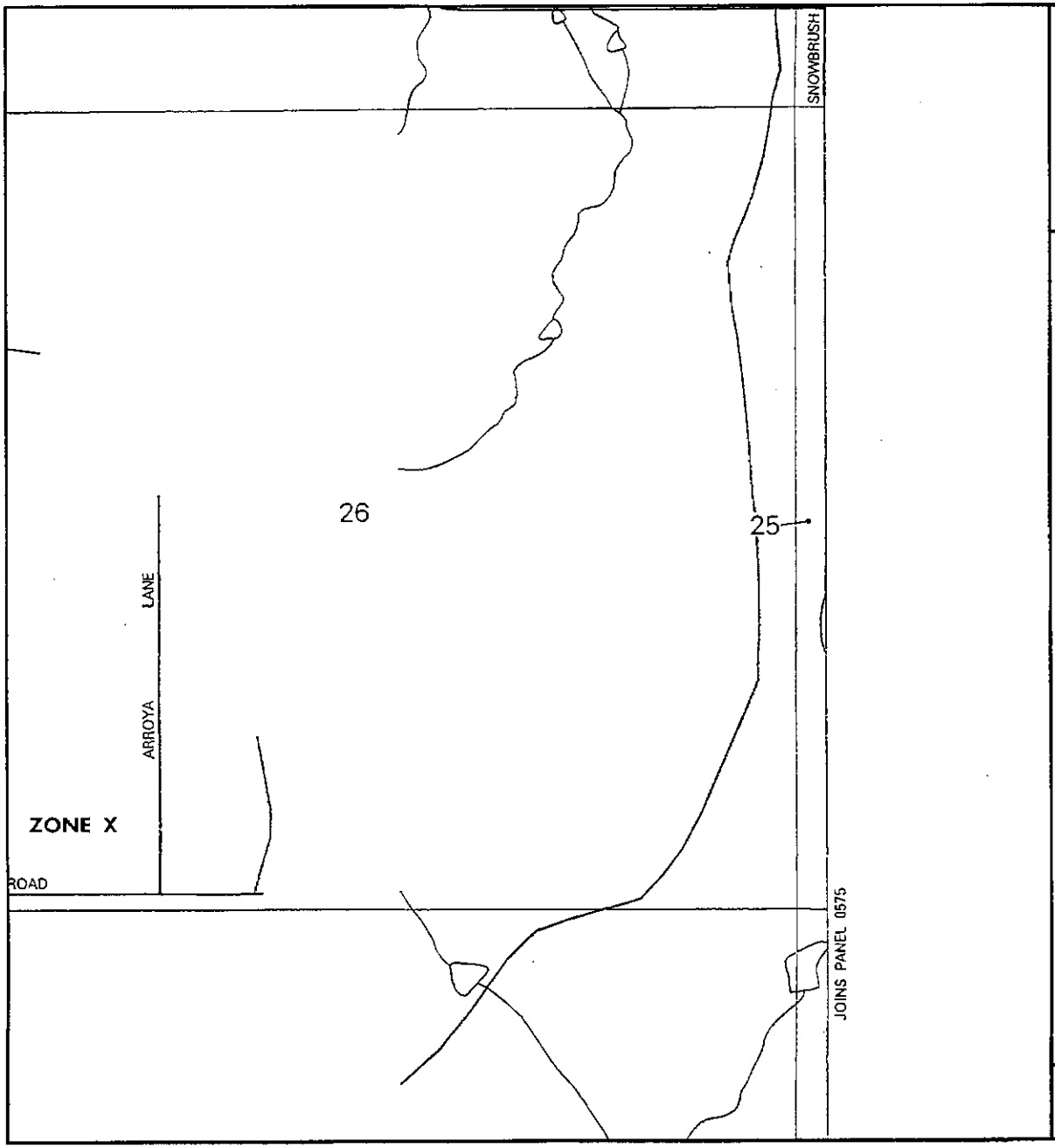
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0575	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0575	F

MAP NUMBER
08041C0575 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

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

MAP NUMBER
08041C0535 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

FINAL PLAT APPROVAL/

EXTENSION LETTERS

CLASSIC
CONSULTING
ENGINEERS & SURVEYORS

EL PASO COUNTY

COMMISSIONERS:
SALLIE CLARK (CHAIR)
DENNIS HISEY (VICE CHAIR)

JIM BENSBERG
DOUGLAS BRUCE
WAYNE WILLIAMS

DEVELOPMENT SERVICES DEPARTMENT
DICK ANDERWALD, AICP, DIRECTOR

October 23, 2006

P. J. Anderson
Six-Ninety-Nine Properties, LLC
545 East Pikes Peak, Suite 207
Colorado Springs, Colorado 80903

RE: Final Plat – Paint Brush Hills Filing 13 (SF-05-038)

This is to inform you that the above-referenced request by Six Ninety-Nine LA LLC for a final plat approval for 553-lot residential subdivision on approximately 301 acres in the Falcon area was heard and approved by the Board of County Commissioners on October 19, 2006. The property (Tax Schedule No. 52000-00-326) is zoned R (Residential), R-1 (Residential) and PBC (Planned Business Center) Districts.

Also approved was a limited waiver of Section 49.4F.5.c.1 of the El Paso County Land Development Code requirement to install sidewalks for all lots less than one (1) acre in area.

This approval is subject to the following:

CONDITIONS OF APPROVAL

1. PRIOR TO RECORDING THE PLAT:

   a. The Applicant shall submit Mylar to Enumerations for addressing. Drainage and Bridge fees for the Falcon Basin shall be paid (This amount is $577,720.18 after adjustment for Filing 12 credits. $172,570.94 is for bridge fees, and $405,149.22 for drainage fees.)

   b. Regional Park fees of $195,209.00 shall be paid (this reflects a reduction of one commercial lot from the Parks Dept. recommendation).

   c. No school fees are required due to land dedication credits.

   d. All Deed of Trust holders, if any, shall ratify the plat. The applicant shall provide a current Title Commitment at the time of submittal of the Mylar for recording.

2880 INTERNATIONAL CIRCLE, SUITE 110
PHONE: (719) 520-6300
COLORADO SPRINGS, CO 80910-3127
FAX: (719) 520-6695
WWW.ELPASOCO.COM

e. Colorado statute requires that at the time of the approval of platting, the subdivider provides the certification of the County Treasurer's Office that all ad valorem taxes applicable to such subdivided land, for years prior to that year in which approval is granted, have been paid. Therefore, this plat is approved by the Board of County Commissioners on the condition that the subdivider or developer must provide to the Development Services Department, at the time of recording the plat, a certification from the County Treasurer's Office that all prior years' taxes have been paid in full. The subdivider or developer must pay, for each parcel of property, the fee for tax certification in effect at the time of recording the plat.

f. The Subdivision Improvements Agreement, including the Estimate of Guaranteed Funds as approved by the County Engineer shall be filed at the time of the recording of the Final Plat.

g. Collateral sufficient to ensure that the public improvements as listed in the approved Estimate of Guaranteed Funds shall be provided when the Final Plat is recorded. Such collateral shall specifically address obligations associated with the Falcon Small Area Traffic Report to the satisfaction and shall allow for transfer of obligations from prior filings.

h. The County Attorney's Conditions of Compliance shall be adhered to at the appropriate time.

i. The plat shall be modified to indicate a 25-foot wide trail easement along the northern edge of Tracts H and J to be dedicated to El Paso County and to clarify that these tracts will be dedicated to the Paint Brush Hills Metropolitan District for maintenance.

j. The applicant shall make remaining minor technical corrections to applicable documents as identified in Engineering Division review comments, specifically including modifications to address agreed-upon modifications to drainage plans within and adjacent to Tract E.

k. Provide verification that the property has been annexed into the Woodmen Road Metropolitan District.

l. Revise Note 7 to create an exception for direct lot access to Lot 554 (commercial lot) in accordance with the Preliminary Plan.

2. Public improvements to be designed and constructed in association with this subdivision shall include standard sidewalks along Londonderry Drive and Towner Boulevard – on one side of the street only. The sidewalk shall generally be located on the "inside" of the loop created by these roads, except for a portion of sidewalk to be located on the east side of Towner Boulevard from the intersection of Jaggar Way, north to the intersection of Towner and Londonderry.

NOTATIONS

1. Failure to record the Plat within one (1) year following Board of County Commissioner approval will require reconsideration by the Board. Said reconsideration my involve compliance with new criteria, regulations and updated fees.

2. The applicant has voluntarily agreed to participation in the Falcon Community Builders for Classrooms program by signing a mutual donor agreement. Evidence of this continued participation may be required in conjunction with Final Plat approval.

This action will not become a matter of public record, nor can building permits be issued or lots conveyed based upon this action, until the Plat has been filed with the El Paso County Clerk and Recorder. This is done through our office but, in order to accomplish such filing, it will be necessary for you to contact us regarding recording fees which must be paid and make an appointment to pay the fees and submit the plat for recordation.

It is my understanding that your intent is to delay recording this Final Plat for a period of time. Prior to recording there will need to be minor changes made to the plat. Depending upon the timing and other considerations I may or may not be the Point of Contact for the recording process.

Please note the El Paso County Clerk and Recorder will no longer accept documents for recording unless they have a minimum one-inch clear margin at the top of each page.

This represents the Planning Division's understanding of the action taken by the Board of County Commissioners. A copy of their Resolution will be forwarded to you, once that document is available.

Should you have any questions, or if I can be of further assistance, please contact me at 719-520-6300.

Sincerely,

Carl Schueler, Long Range Planning Division Manager

cc: Marc A. Whorton
Classic Engineering
6385 Corporate Drive, Suite 101
Colorado Springs, Colorado 80919

File: Prompt/ SF-05-038

ec: Eileen Wheeler, Deputy Clerk to the Board

EL PASO COUNTY

COMMISSIONERS:
DENNIS HISEY (CHAIR)
JIM BENSBERG (VICE-CHAIR)

DOUGLAS BRUCE
SALLIE CLARK
WAYNE WILLIAMS

DEVELOPMENT SERVICES DEPARTMENT

October 29, 2007

Harold Fong
Six Ninety Nine Properties, LLC
4455 Fountain Avenue.
Cascade, Colorado 80809

RE: Extension of Time to Record Paint Brush Hills 13 Final Plat (SF-05-038)

This is to inform you that the above-referenced and attached request (dated September 14, 2007) for a 1 (one) year time extension to record this plat is **approved** through the administrative process set forth by the Board of County Commissioners in their interim resolution which governs this procedure until such time as the formal Procedural Manual for the El Paso County Land Development Code is adopted. Details are as follows:

The effective date of this approval was October 19, 2007. As this plat was originally approved by the Board of County Commissioners on October 19, 2006, a new expiration date of **October 19, 2008**, will be utilized for this subdivision noting that all conditions and notations of the prior approval remain valid and in effect, except for those relating to fees and Notation 1 which have been superseded by this approval. The applicable fees are now those in effect as of the date of this extension approval (September 26, 2007). There has been no change to the park fees. Specifically, the regional park fees will be $353 per lot as originally recommended by the Parks Board. At the time of original plat approval, there were no required urban or community park fees. Although the El Paso County Land Development Code has subsequently been amended to require these urban and community park land dedication or fees in lieu thereof for any residential lots of less than 2.5 acres, the interpretation of the Department is that change constitutes a new fee and, therefore, will not be applicable to this subdivision.

The drainage fees shall be those in effect as of the date of this extension (2007 fees) and will need to be formally re-calculated in conjunction with plat recording, as there were credits associated with the original calculation in the approved Final Drainage Report. The drainage fee for the Sand Creek Basin has increased from $6,053 to $6,925 per impervious acre. The bridge fee has increased by $335 per impervious acre for a total increase of $1,207.00 per impervious acre.

Additionally, an updated Subdivision Improvements Agreement with attached Estimate of Guaranteed Funds shall be received and re-approved by the County Attorney's Office and Engineering Division and approved by the County Engineer prior to recording. The calculation for the Falcon Small Area Traffic

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COLORADO SPRINGS, CO 80910-3127
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Report (which will presumably carry forward the obligations from the Filing 12 Subdivision Improvements Agreement) will also need to be specifically performed at the time of recording. This calculation will be based on the requirements of that Report as originally approved by the Board of County Commissioners subject to the limited increases in costs referenced in Section 10.6.II of that document. The document specifically allows for changes to reflect the effect of the Denver/Boulder Consumer Price Index between January, 2003 and the present. In the event there might be a larger subsequent modification of the Falcon Small Area Traffic Report or its successor document, this plat will not be subject to any of those revised costs or calculations.

Should you have any questions or if I can be of further assistance, please contact me at 719-520-6316.

Sincerely

Carl F. Schueler, Long Range Planning Division Manager

cc: Prompts/ File: SF-05-038

EL PASO COUNTY

COMMISSIONERS
JIM BENSBERG (CHAIRMAN)
SALLIE CLARK (VICE CHAIR)
AMY LATHEN
WAYNE WILLIAMS
DENNIS HISEY

DEVELOPMENT SERVICES DIVISION
IMAD KARAKI, DIRECTOR

April 9, 2009

Six Ninety Nine LA, LLC
4455 Fountain Avenue
Cascade, CO 80809

RE: Extension to Time to Record a Final Plat (SF-05-038)

This is to inform you that the above-referenced request for approval of an 18 month extension of the time to record a final plat for Paint Brush Hills Filing No. 13. The Board of County Commissioners approved the final plat on October 19, 2006 (SF-05-038). A one year extension to the time to record the final plat was granted administratively effective October 19, 2007. A six (6) month extension to the time to record the final plat was approved by the Board of County Commissioners on October 9, 2008. On April 9, 2009 a request for approval of an 18 month extension of the time to record was heard and approved by the Board of County Commissioners on April 9, 2009. The property included within the approved final plat is generally located northwest of the Stapleton Road and Meridian Road intersection and is bisected by Londonderry Drive and Towner Avenue.

This approval is subject to the following:

CONDITIONS OF APPROVAL

1. All applicable impact fees (drainage, parks, small area, etc.) associated with this plat shall be paid at the time of recording. The amount of the fees due shall be determined by the fees in place at the time that the extension request is approved.

2. All Deed of Trust holders shall ratify the plat. The applicant shall provide a current Title Commitment at the time of submittal of the mylar for recording.

3. Colorado statute requires that at the time of the approval of platting, the subdivider provides the certification of the County Treasurer's Office that all ad valorem taxes applicable to such subdivided land, for years prior to that year in which approval is granted, have been paid. Therefore, this plat is approved by the Board of County Commissioners on the condition that the subdivider or developer must provide to the Development Services Department, at the time of recording the plat, a certification from the County Treasurer's Office that all prior years' taxes have been paid in full.

4. The subdivider or developer must pay, for each parcel of property, the fee for tax certification in effect at the time of recording the plat.

5. The Subdivision Improvements Agreement, including the Estimate of Guaranteed Funds as approved by the El Paso County Development Services Department shall be filed at the time of the recording of the Final Plat.

6. The County Attorney's Conditions of Compliance shall be adhered to at the appropriate time.

NOTATIONS

1. Failure to record the plat within 18 months following Board of County Commissioners approval will require reconsideration by the Board. Said reconsideration may involve compliance with new criteria, regulations, and updated fees.

2. Notation No. 1, the Land Development Code requires the recording of a Final Plat within one (1) year of Board of County Commissioners' approval.

This action will not become a matter of public record, nor can building permits be issued or lots conveyed based upon this action, until the Plat has been filed with the El Paso County Clerk and Recorder. This is done through our office but, in order to accomplish such filing, it will be necessary for you to contact us regarding recording fees which must be paid and make an appointment to pay the fees and submit the plat for recordation.

It is my understanding that your intent is to delay recording this Final Plat for a period of time. Prior to recording there will need to be minor changes made to the plat. Depending upon the timing and other considerations I may or may not be the Point of Contact for the recording process.

This represents the Planning Division's understanding of the action taken by the Board of County Commissioners. A copy of their Resolution will be forwarded to you, once that document is available.

Should you have any questions, or if I can be of further assistance, please contact me at 719-520-6300.

Sincerely

Craig Dossey, Project Manager II

cc: Classic Consulting
Marc Whorton
6385 Corporate Drive, Suite 101
Colorado Springs, CO 80919

HYDROLOGIC/HYDRAULIC CALCULATIONS

CLASSIC
CONSULTING
ENGINEERS & SURVEYORS

JOB NAME: *Paint Brush Hills Filing 13E*
JOB NUMBER: *2053.50*
DATE: *09/18/18*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		IMPERVIOUS AREA / STREETS				LANDSCAPE/UNDEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	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)
DD1	8.90	0.00	0.89	0.90	0.96	8.90	0.15	0.22	0.46	0.15	0.22	0.46	**1.34**	**1.96**	**4.09**
DD2	3.31	0.00	0.89	0.90	0.96	3.31	0.23	0.30	0.50	0.23	0.30	0.50	**0.76**	**0.99**	**1.66**
EE	2.97	0.00	0.89	0.90	0.96	2.97	0.23	0.30	0.50	0.23	0.30	0.50	**0.68**	**0.89**	**1.49**
FF	1.20	0.00	0.89	0.90	0.96	1.20	0.15	0.22	0.46	0.15	0.22	0.46	**0.18**	**0.26**	**0.55**
GG	8.56	0.00	0.89	0.90	0.96	8.56	0.15	0.22	0.46	0.15	0.22	0.46	**1.28**	**1.88**	**3.94**
HH	6.24	0.00	0.89	0.90	0.96	6.24	0.23	0.30	0.50	0.23	0.30	0.50	**1.44**	**1.87**	**3.12**
II	4.11	0.00	0.89	0.90	0.96	4.11	0.23	0.30	0.50	0.23	0.30	0.50	**0.95**	**1.23**	**2.06**
JJ	0.92	0.00	0.89	0.90	0.96	0.92	0.23	0.30	0.50	0.23	0.30	0.50	**0.21**	**0.28**	**0.46**
KK	0.51	0.51	0.89	0.90	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	**0.45**	**0.46**	**0.49**
LL	2.34	2.34	0.89	0.90	0.96	0.00	0.02	0.08	0.35	0.89	0.90	0.96	**2.08**	**2.11**	**2.25**
MM	6.35	0.00	0.89	0.90	0.96	6.35	0.23	0.30	0.50	0.23	0.30	0.50	**1.46**	**1.91**	**3.18**
NN	Not Used														
OO	28.06	0.00	0.89	0.90	0.96	28.06	0.07	0.16	0.41	0.07	0.16	0.41	**1.96**	**4.49**	**11.50**
PP	2.57	0.50	0.57	0.59	0.70	2.07	0.07	0.16	0.41	0.17	0.24	0.47	**0.43**	**0.63**	**1.20**
QQ	3.37	0.00	0.89	0.90	0.96	3.37	0.23	0.30	0.50	0.23	0.30	0.50	**0.78**	**1.01**	**1.69**
RR	4.20	0.00	0.89	0.90	0.96	4.20	0.23	0.30	0.50	0.23	0.30	0.50	**0.97**	**1.26**	**2.10**
SS	3.01	0.00	0.89	0.90	0.96	3.01	0.23	0.30	0.50	0.23	0.30	0.50	**0.69**	**0.90**	**1.51**
TT	5.05	0.00	0.89	0.90	0.96	5.05	0.15	0.22	0.46	0.15	0.22	0.46	**0.76**	**1.11**	**2.32**
UU	1.27	0.00	0.89	0.90	0.96	1.27	0.15	0.22	0.46	0.15	0.22	0.46	**0.19**	**0.28**	**0.58**
VV	0.19	0.15	0.89	0.90	0.96	0.04	0.15	0.22	0.46	0.73	0.76	0.85	**0.14**	**0.14**	**0.16**
OS-1	4.44	0.00	0.89	0.90	0.96	4.44	0.23	0.30	0.50	0.23	0.30	0.50	**1.02**	**1.33**	**2.22**
OS-2	9.10	0.00	0.89	0.90	0.96	9.10	0.23	0.30	0.50	0.23	0.30	0.50	**2.09**	**2.73**	**4.55**
OS-3	3.60	0.00	0.89	0.90	0.96	3.60	0.23	0.30	0.50	0.23	0.30	0.50	**0.83**	**1.08**	**1.80**
H-1	92.30	0.00	0.89	0.90	0.96	92.30	0.03	0.09	0.36	0.03	0.09	0.36	**2.77**	**8.31**	**33.23**
H-2	1.50	0.00	0.89	0.90	0.96	1.50	0.03	0.09	0.36	0.03	0.09	0.36	**0.05**	**0.14**	**0.54**
H-3	55.60	0.00	0.89	0.90	0.96	55.60	0.03	0.09	0.36	0.03	0.09	0.36	**1.67**	**5.00**	**20.02**
H-4	29.90	3.00	0.89	0.90	0.96	26.90	0.03	0.09	0.36	0.12	0.17	0.42	**3.48**	**5.12**	**12.56**
H-5	2.57	0.50	0.57	0.59	0.70	2.07	0.03	0.09	0.36	0.14	0.19	0.43	**0.35**	**0.48**	**1.10**

JOB NAME: ***Paint Brush Hills Filing 13E***
JOB NUMBER: ***2053.50***
DATE: ***09/18/18***
CALC'D BY: ***MAW***

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)
DD1	1.34	1.96	4.09	0.22	180	4	16.4	650	3.0%	6.1	1.8	18.2	2.58	3.23	5.43	3	**6**	**22**
DD2	0.76	0.99	1.66	0.30	130	2.6	13.1	450	3.0%	6.1	1.2	14.3	2.87	3.59	6.02	2	**4**	**10**
EE	0.68	0.89	1.49	0.30	50	1	8.1	1300	3.0%	6.1	3.6	11.7	3.11	3.89	6.54	2	**3**	**10**
FF	0.18	0.26	0.55	0.22	250	6	18.8	300	1.3%	4.0	1.3	20.1	2.47	3.08	5.18	0.4	**0.8**	**3**
GG	1.28	1.88	3.94	0.22	180	6	14.3	900	3.0%	6.1	2.5	16.8	2.68	3.35	5.62	3	**6**	**22**
HH	1.44	1.87	3.12	0.30	120	2.4	12.6	750	1.5%	4.3	2.9	15.5	2.77	3.47	5.83	4	**6**	**18**
II	0.95	1.23	2.06	0.30	150	3	14.1	350	1.5%	4.3	1.4	15.4	2.78	3.48	5.84	3	**4**	**12**
JJ	0.21	0.28	0.46	0.30	50	1	8.1	350	1.5%	4.3	1.4	9.5	3.36	4.21	7.07	0.7	**1.2**	**3**
KK	0.45	0.46	0.49	0.08	20	1	4.8	400	1.5%	4.3	1.6	6.4	3.83	4.80	8.06	2	**2**	**4**
LL	2.08	2.11	2.25	0.08	150	4	16.3	350	1.3%	4.0	1.5	17.8	2.61	3.27	5.48	5	**7**	**12**
MM	1.46	1.91	3.18	0.30	130	2.6	13.1	520	4.0%	7.0	1.2	14.3	2.87	3.59	6.02	4	**7**	**19**
NN	Not Used																	
OO	1.96	4.49	11.50	0.16	300	10	19.8	2200	2.0%	4.9	7.4	27.2	2.11	2.63	4.41	4	**12**	**51**
PP	0.43	0.63	1.20	0.16	300	10	19.8					19.8	2.48	3.11	5.22	1	**2**	**6**
QQ	0.78	1.01	1.69	0.30	150	3	14.1	1300	2.0%	4.9	4.4	18.5	2.57	3.21	5.39	2	**3**	**9**
RR	0.97	1.26	2.10	0.30	150	3	14.1	250	2.0%	4.9	0.8	14.9	2.82	3.53	5.93	3	**4**	**12**
SS	0.69	0.90	1.51	0.30	150	3	14.1	400	2.0%	4.9	1.3	15.4	2.78	3.48	5.84	2	**3**	**9**
TT	0.76	1.11	2.32	0.22	150	3	15.5	450	2.0%	4.9	1.5	17.0	2.66	3.33	5.60	2	**4**	**13**
UU	0.19	0.28	0.58	0.22	150	3	15.5	150	2.0%	4.9	0.5	16.0	2.74	3.43	5.75	1	**1**	**3**
VV	0.14	0.14	0.16	0.22	20	0.5	5.3					5.3	4.06	5.10	8.56	0.6	**0.7**	**1.4**
OS-1	1.02	1.33	2.22	0.30	150	3	14.1	450	3.5%	6.5	1.1	15.2	2.80	3.50	5.87	3	**5**	**13**
OS-2	2.09	2.73	4.55	0.30	150	3	14.1	1250	3.0%	6.1	3.4	17.5	2.63	3.29	5.52	6	**9**	**25**
OS-3	0.83	1.08	1.80	0.30	50	1	8.1	1100	3.0%	6.1	3.0	11.1	3.17	3.97	6.66	3	**4**	**12**
H-1	2.77	8.31	33.23	0.09	1000	34	38.5	2000	2.5%	5.5	6.0	44.5	1.52	1.89	3.17	4	**16**	**105**
H-2	0.05	0.14	0.54	0.09	300	15	18.6					18.6	2.56	3.20	5.37	0.1	**0.4**	**3**
H-3	1.67	5.00	20.02	0.09	1000	51	33.7	700	2.0%	4.9	2.4	36.0	1.77	2.21	3.70	3	**11**	**74**
H-4	3.48	5.12	12.56	0.09	800	24	35.9	700	1.5%	4.3	2.7	38.6	1.69	2.10	3.53	6	**11**	**44**
H-5	0.35	0.48	1.10	0.09	400	14	24.1					24.1	2.25	2.81	4.71	1	**1**	**5**

JOB NAME:	*Paint Brush Hills Filing 13E*
JOB NUMBER:	*2053.50*
DATE:	*09/18/18*
CALCULATED BY:	*MAW*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
24	DD1	1.96	4.09	18.2	3.23	5.43	6	22	15' Type R At-Grade
25	DD2, DD1 Flowby	0.99	3.01	18.7	3.19	5.36	3	16	10' Type R Sump
26	EE	0.89	1.49	11.7	3.89	6.54	3	10	5' Type R Sump
27	GG, FF	2.15	4.49	20.1	3.08	5.18	7	23	10' Type R Sump
28	HH	1.87	3.12	15.5	3.47	5.83	6	18	10' Type R Sump
29	II, KK	1.69	2.54	15.4	3.48	5.84	6	15	10' Type R Sump
30	JJ	0.28	0.46	9.5	4.21	7.07	1	3	5' Type R Sump
31	LL, MM	4.01	5.42	17.8	3.27	5.48	13	30	Ex. 12' Type R
32	Not Used								
33	RR	1.26	2.10	14.9	3.53	5.93	4	12	5' Type R Sump
34	SS	0.90	1.51	15.4	3.48	5.84	3	9	10' Type R Sump
34A	**Total Inflow to Pond D (See UD Detention Worksheet)**						36	155	
35	OS-2	2.73	4.55	17.5	3.29	5.52	9	25	15' Type R Future At-grade Inlet
36	OS-3	1.08	1.80	11.1	3.97	6.66	4	12	15' Type R Future At-grade Inlet
37	TT	1.11	2.32	17.0	3.33	5.60	4	13	15' Type R At-Grade
38 (Ultimate)	QQ and DP-35 and DP-36 Flow-by	1.17	3.69	18.0	3.25	5.45	4	20	15' Type R At-Grade
38 (Interim)	Portion of Basin QQ (40%)	0.40	0.67	10.0	4.13	6.93	2	5	15' Type R At-Grade
39	UU, VV	0.42	0.75	16.0	3.43	5.75	1	4	
	Northerly Forebay (PR-28, PR-37, OS-1, OO)	10.93	22.26	27.2	2.63	4.41	29	98	
H1	Pre-development Flow at outlet of existing dual 36" RCP culverts	10.13	32.58	43.6	1.92	3.22	19	105	

JOB NAME: *Paint Brush Hills Filing 13E*
JOB NUMBER: *2053.50*
DATE: *09/18/18*
CALCULATED BY: *MAW*

* 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		Pipe Size*	Velocity (ft/sec)
					I(5)	I(100)	Q(5)	Q(100)		
25	DP24 Pickup	1.96	2.74	18.2	3.23	5.43	6	15	24" RCP	10.6
26	DP25	0.99	3.01	18.7	3.19	5.36	3	16	24" RCP	7.8
27	PR25, PR26	2.95	5.75	18.9	3.18	5.33	9	31	30" RCP	9.2
28	DP26, PR27	3.84	7.23	19.2	3.15	5.29	12	38	30" RCP	16.4
29	DP27	2.15	4.49	20.1	3.08	5.18	7	23	30" RCP	8.6
30	DP28	1.87	3.12	15.5	3.47	5.83	6	18	24" RCP	8.0
31	PR29, PR30	4.02	7.61	20.6	3.05	5.11	12	39	36" RCP	9.8
32	DP29	1.69	2.54	15.4	3.48	5.84	6	15	24" RCP	7.7
33	DP30	0.28	0.46	9.5	4.21	7.07	1	3	18" RCP	5.1
34	PR 32, PR33	1.97	3.00	15.6	3.46	5.81	7	17	30" RCP	8.0
35	PR31, PR34	5.99	10.61	21.3	3.00	5.03	18	53	36" RCP	9.5
36	DP 33	1.26	2.10	14.9	3.53	5.93	4	12	24" RCP	7.3
37	DP34, PR36	2.16	3.61	15.7	3.45	5.79	7	21	24" RCP	8.2
38	Pick-up from future At-grade inlets at DP-35 and DP-36	3.65	4.34	17.5	3.29	5.52	12	24	30" RCP	9.9
39	Pick-up from DP-38	1.17	2.55	18.0	3.25	5.45	4	14	24" RCP	9.9
40	PR-38, PR-39	4.82	6.89	18.0	3.25	5.45	16	38	30" RCP	13.1
41	Pick-up from DP-37	1.11	2.07	17.0	3.33	5.60	4	12	24" RCP	13.4
42 (Ultimate)	PR-40, PR-41	6.43	9.26	18.0	3.25	5.45	21	50	36" RCP	14.9
42 (Interim)	Collected flows from 15' at-grade inlets at Design Points 37 & 38	1.52	2.74	17.0	3.33	5.60	5	15	36" RCP	7.7

CLASSIC
CONSULTING
ENGINEERS & SURVEYORS
619 N. Cascade Avenue, Suite 200
Colorado Springs, CO 80903

Project: Paint Brush Hills 13E
Date: 2/27/18
Contact:
Phone:
By: MTW

NOTES
- ❑ Telephone Record
- ❑ Note to the File
- ❑ Job Information
- ❑ Meeting Minutes
- ❑ _____

Impervious Calcs.

Total site acreage = 83.43 ac.

RS-6000 Zone area = 40.29 ac.

RS-20000 Zone area = 23.38 ac.

open space area = 19.76 ac.

Avg. site imperviousness =

$40.29 \times .40 + 23.38 \times .25 + 19.76 \times .02$

$$\frac{22.37}{83.43} = 27\%$$

CLASSIC
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619 N. Cascade Avenue, Suite 200
Colorado Springs, CO 80903

Project: Paint Brush Hills 13E
Date: 2/5/18
Contact:
Phone:
By: MTW

NOTES
- ❑ Telephone Record
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- ❑ Job Information
- ❑ Meeting Minutes
- ❑ _____

Pipe Run 35 Imperviousness (Southerly Forebay)

Basins included: FF, GG, HH, II, JJ, KK

FF	1.2 ac	× 25%	=	0.3
GG	8.56 ac	× 25%	=	2.14
HH	6.24 ac.	× 40%	=	2.49
II	4.11 ac.	× 40%	=	1.64
JJ	0.92 ac.	× 40%	=	.37
KK	0.51 ac.	× 70%	=	.36
total	21.54 ac.			7.3

33.9% Imp.

(Northly Forebay)

DD1	8.9 ac.	× 25%	=	2.23
DD2	3.31 ac.	× 40%	=	1.32
EE	2.97 ac.	× 40%	=	1.19
por. of OO	22.6 ac.	× 2%	=	0.45
RR	4.20 ac.	× 40%	=	1.68
SS	2.22 ac.	× 40%	=	0.89
OS-1	5.33 ac	× 40%	=	2.13
total	49.53 ac.			9.89

20% Imp.

PAINT BRUSH HILLS
FILING NO. 2
DEVELOPMENT

FUTURE PAINT BRUSH HILLS
DEVELOPMENT

TRACT A
OPEN SPACE
19.76 AC.

RS-20000
18.67 AC.

PAINT BRUSH HILLS
FILING NO. 9
DEVELOPMENT

RS-6000
17.68 AC.

RS-6000
22.61 AC.

RS-20000
4.73 AC.

LONDONDERRY DRIVE

PAINT BRUSH HILLS
FILING NO. 13D
DEVELOPMENT

PAINT BRUSH HILLS
FILING NO. 13C
DEVELOPMENT

FIGURE 1

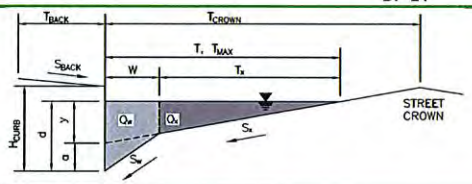
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-24



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_o =	0.028	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	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 Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

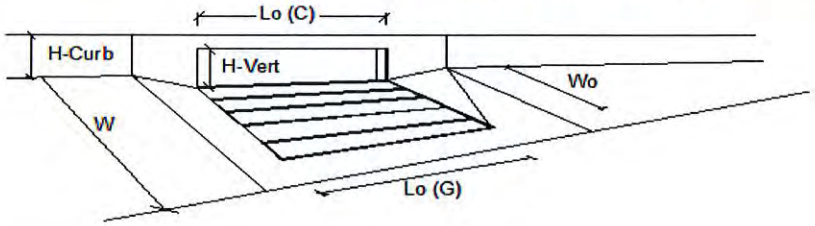
		Minor Storm	Major Storm	
	Q_{allow} =	18.1	18.2	cfs

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0		inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1		
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00		ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A		ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_fG =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_fC =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**6.0**	**22.0**	cfs
Water Spread Width	T =	10.7	17.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.1	5.9	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.3	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.548	0.324	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	2.7	14.9	cfs
Discharge within the Gutter Section W	Q_w =	3.3	7.1	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.51	0.82	sq ft
Velocity within the Gutter Section W	V_W =	6.4	8.7	fps
Water Depth for Design Condition	d_{LOCAL} =	7.1	8.9	inches

Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs

Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.123	0.081	ft/ft
Required Length L_T to Have 100% Interception	L_T =	13.54	31.83	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	13.54	15.00	ft
Interception Capacity	Q_i =	6.0	15.0	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	**6.0**	**14.6**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**7.4**	cfs

Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.0**	**14.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**67**	**%**

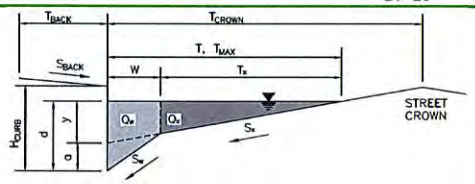
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-25



Gutter Geometry (Enter data in the blue cells)

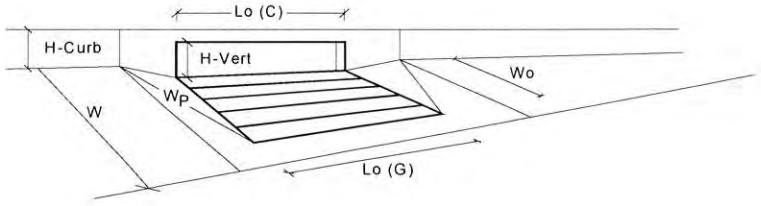
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	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	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0 inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	feet
Width of a Unit Grate		W_o =	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	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	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	10.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	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	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	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} =	0.33	0.83 ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	16.0	cfs

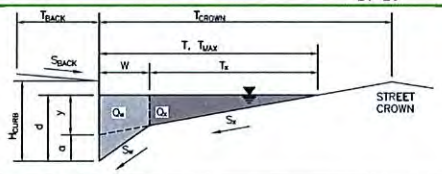
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-26



Gutter Geometry (Enter data in the blue cells)

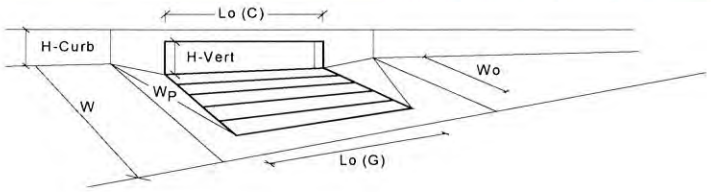
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0 inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	feet
Width of a Unit Grate		W_o =	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	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	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	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	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	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} =	0.33	0.83 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	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**	**12.3** **cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	3.0	10.0 cfs

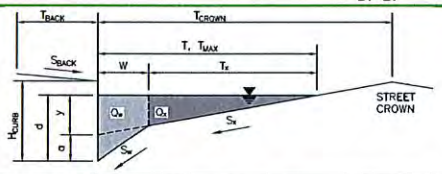
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-27



Gutter Geometry (Enter data in the blue cells)

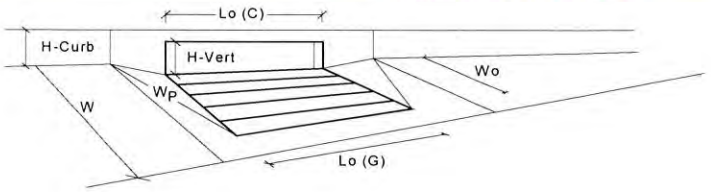
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00		inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1		
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A		feet
Width of a Unit Grate	W_o =	N/A		feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	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		
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A		
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00		feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00		inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00		inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40		degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	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		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.0	23.0	cfs

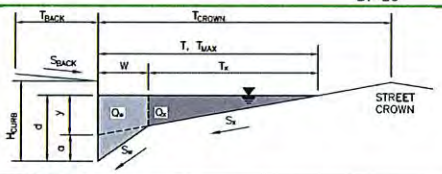
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-28



Gutter Geometry (Enter data in the blue cells)

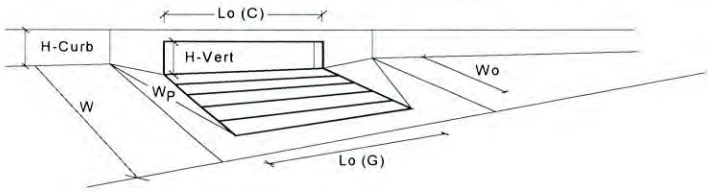
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0 inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	feet
Width of a Unit Grate		W_o =	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	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	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	10.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	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	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	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} =	0.33	0.83 ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =**	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.0	18.0	cfs

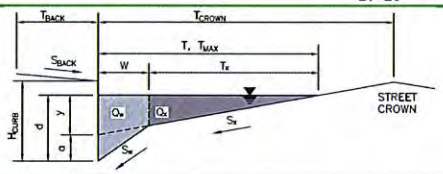
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-29



Gutter Geometry (Enter data in the blue cells)

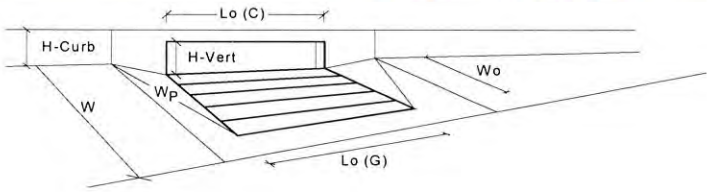
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00		inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1		
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A		feet
Width of a Unit Grate	W_o =	N/A		feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	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		
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A		
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00		feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00		inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00		inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40		degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	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		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =	**8.3**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.0	15.0	cfs

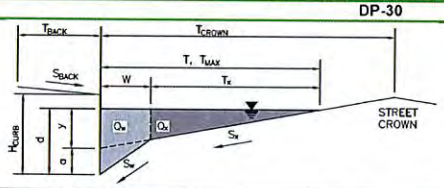
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-30



Gutter Geometry (Enter data in the blue cells)

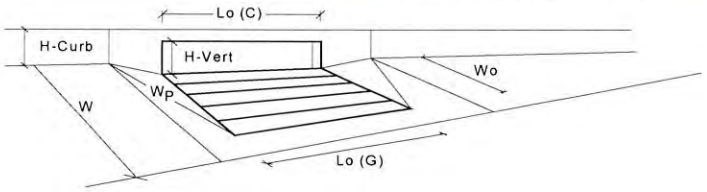
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_o =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00		inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1		
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A		feet
Width of a Unit Grate	W_o =	N/A		feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	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		
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A		
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00		feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00		inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00		inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40		degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	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		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	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**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	3.0	cfs

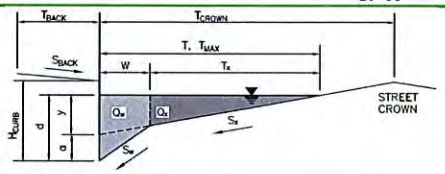
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-33



Gutter Geometry (Enter data in the blue cells)

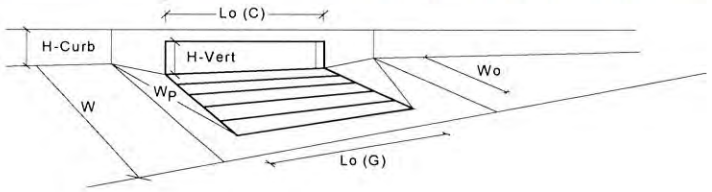
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0 inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	feet
Width of a Unit Grate		W_o =	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	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	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	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	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	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} =	0.33	0.83 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	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**	**12.3** **cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	4.0	12.0 cfs

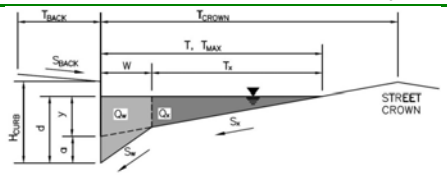
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-34



Gutter Geometry (Enter data in the blue cells)

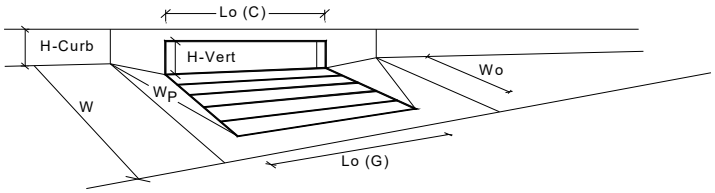
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	12.0	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) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	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} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	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**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	3.0	9.0	cfs

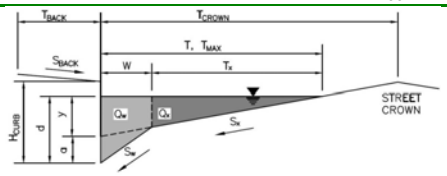
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-35



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.006	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

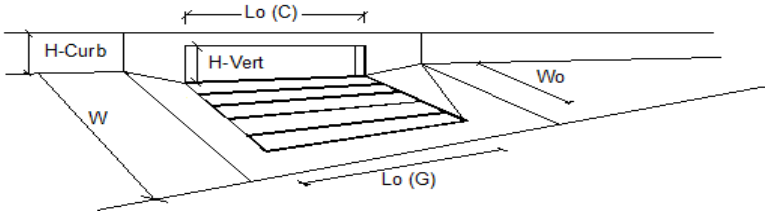
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**8.4**	**8.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.5**	**15.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.5**	**9.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**94**	**61**	**%**

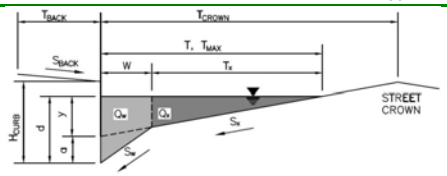
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-36



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.016	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

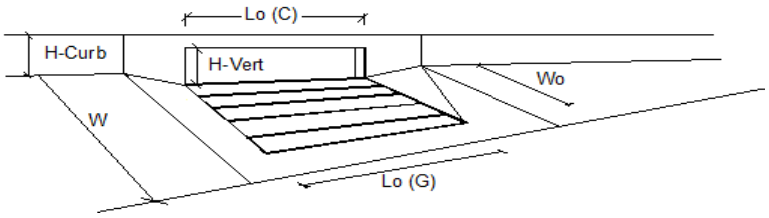
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.9**	**13.9**	**cfs**

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 =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	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 =	15.00	15.00	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 =**	**4.0**	**10.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**87**	**%**

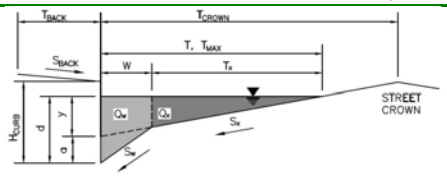
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-37



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	4.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

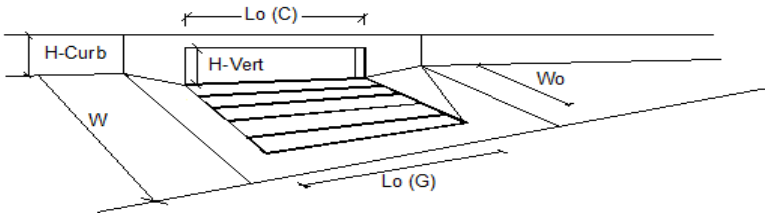
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**9.5**	**17.7**	**cfs**

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	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0 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 =	15.00	15.00 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 =**	**4.0**	**11.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**89**	**%**

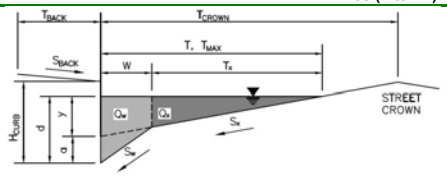
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-38 (Interim)



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

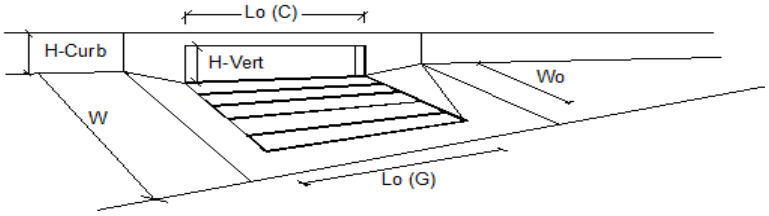
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**12.8**	**12.8**	**cfs**

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 =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	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 =	15.00	15.00	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**	**5.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

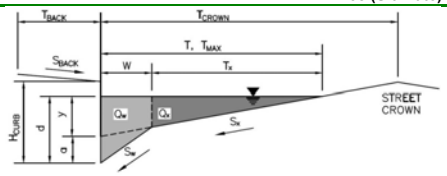
Version 4.05 Released March 2017

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

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

Project: PAINT BRUSH HILLS FILING 13E

Inlet ID: DP-38 (Ultimate)



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

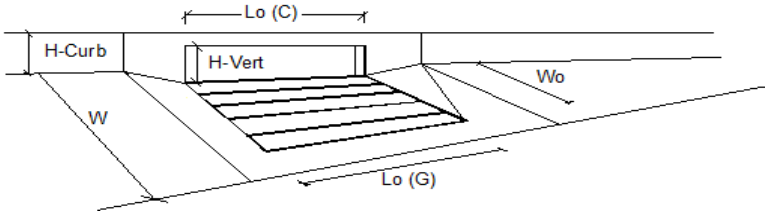
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**12.8**	**12.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	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 =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.0**	**13.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**69**	**%**

PIPE RUN 25

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02330	ft/ft
Diameter	2.00	ft
Discharge	15.00	ft^3/s

Results

Normal Depth	0.92	ft
Flow Area	1.41	ft^2
Wetted Perimeter	2.99	ft
Hydraulic Radius	0.47	ft
Top Width	1.99	ft
Critical Depth	1.40	ft
Percent Full	46.1	%
Critical Slope	0.00632	ft/ft
Velocity	10.60	ft/s
Velocity Head	1.75	ft
Specific Energy	2.67	ft
Froude Number	2.22	
Maximum Discharge	37.14	ft^3/s
Discharge Full	34.53	ft^3/s
Slope Full	0.00440	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	46.10	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 25

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02660	ft/ft
Diameter	2.00	ft
Discharge	15.00	ft^3/s

Results

Normal Depth	0.89	ft
Flow Area	1.35	ft^2
Wetted Perimeter	2.92	ft
Hydraulic Radius	0.46	ft
Top Width	1.99	ft
Critical Depth	1.40	ft
Percent Full	44.4	%
Critical Slope	0.00632	ft/ft
Velocity	11.14	ft/s
Velocity Head	1.93	ft
Specific Energy	2.82	ft
Froude Number	2.39	
Maximum Discharge	39.69	ft^3/s
Discharge Full	36.89	ft^3/s
Slope Full	0.00440	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	44.39	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 25

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02550	ft/ft
Diameter	2.00	ft
Discharge	15.00	ft^3/s

Results

Normal Depth	0.90	ft
Flow Area	1.37	ft^2
Wetted Perimeter	2.94	ft
Hydraulic Radius	0.47	ft
Top Width	1.99	ft
Critical Depth	1.40	ft
Percent Full	44.9	%
Critical Slope	0.00632	ft/ft
Velocity	10.96	ft/s
Velocity Head	1.87	ft
Specific Energy	2.77	ft
Froude Number	2.33	
Maximum Discharge	38.86	ft^3/s
Discharge Full	36.12	ft^3/s
Slope Full	0.00440	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	44.92	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 26

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.00	ft
Discharge	16.00	ft^3/s

Results

Normal Depth	1.24	ft
Flow Area	2.05	ft^2
Wetted Perimeter	3.63	ft
Hydraulic Radius	0.56	ft
Top Width	1.94	ft
Critical Depth	1.44	ft
Percent Full	62.1	%
Critical Slope	0.00661	ft/ft
Velocity	7.81	ft/s
Velocity Head	0.95	ft
Specific Energy	2.19	ft
Froude Number	1.34	
Maximum Discharge	24.33	ft^3/s
Discharge Full	22.62	ft^3/s
Slope Full	0.00500	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	62.07	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 27

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.50	ft
Discharge	31.00	ft^3/s

Results

Normal Depth	1.62	ft
Flow Area	3.37	ft^2
Wetted Perimeter	4.69	ft
Hydraulic Radius	0.72	ft
Top Width	2.39	ft
Critical Depth	1.90	ft
Percent Full	65.0	%
Critical Slope	0.00668	ft/ft
Velocity	9.19	ft/s
Velocity Head	1.31	ft
Specific Energy	2.94	ft
Froude Number	1.36	
Maximum Discharge	44.12	ft^3/s
Discharge Full	41.01	ft^3/s
Slope Full	0.00571	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	64.96	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 28

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.04000	ft/ft
Diameter	2.50	ft
Discharge	38.00	ft^3/s

Results

Normal Depth	1.20	ft
Flow Area	2.32	ft^2
Wetted Perimeter	3.82	ft
Hydraulic Radius	0.61	ft
Top Width	2.50	ft
Critical Depth	2.08	ft
Percent Full	47.8	%
Critical Slope	0.00834	ft/ft
Velocity	16.39	ft/s
Velocity Head	4.17	ft
Specific Energy	5.37	ft
Froude Number	3.00	
Maximum Discharge	88.24	ft^3/s
Discharge Full	82.03	ft^3/s
Slope Full	0.00858	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	47.83	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 29

Worksheet for Triborough Trail

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.50	ft
Discharge	23.00	ft^3/s

Results

Normal Depth	1.34	ft
Flow Area	2.68	ft^2
Wetted Perimeter	4.10	ft
Hydraulic Radius	0.65	ft
Top Width	2.49	ft
Critical Depth	1.63	ft
Percent Full	53.5	%
Critical Slope	0.00543	ft/ft
Velocity	8.60	ft/s
Velocity Head	1.15	ft
Specific Energy	2.49	ft
Froude Number	1.46	
Maximum Discharge	44.12	ft^3/s
Discharge Full	41.01	ft^3/s
Slope Full	0.00314	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	53.55	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 30

Worksheet for Triborough Trail

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.00	ft
Discharge	18.00	ft^3/s

Results

Normal Depth	1.35	ft
Flow Area	2.25	ft^2
Wetted Perimeter	3.85	ft
Hydraulic Radius	0.58	ft
Top Width	1.88	ft
Critical Depth	1.53	ft
Percent Full	67.4	%
Critical Slope	0.00729	ft/ft
Velocity	7.99	ft/s
Velocity Head	0.99	ft
Specific Energy	2.34	ft
Froude Number	1.29	
Maximum Discharge	24.33	ft^3/s
Discharge Full	22.62	ft^3/s
Slope Full	0.00633	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	67.39	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 31

Worksheet for Triborough Trail

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	3.00	ft
Discharge	39.00	ft^3/s

Results

Normal Depth	1.65	ft
Flow Area	3.98	ft^2
Wetted Perimeter	5.01	ft
Hydraulic Radius	0.79	ft
Top Width	2.99	ft
Critical Depth	2.03	ft
Percent Full	54.9	%
Critical Slope	0.00532	ft/ft
Velocity	9.80	ft/s
Velocity Head	1.49	ft
Specific Energy	3.14	ft
Froude Number	1.50	
Maximum Discharge	71.74	ft^3/s
Discharge Full	66.69	ft^3/s
Slope Full	0.00342	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	54.94	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 31

Worksheet for Londonderry Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	3.00	ft
Discharge	39.00	ft^3/s

Results

Normal Depth	1.65	ft
Flow Area	3.98	ft^2
Wetted Perimeter	5.01	ft
Hydraulic Radius	0.79	ft
Top Width	2.99	ft
Critical Depth	2.03	ft
Percent Full	54.9	%
Critical Slope	0.00532	ft/ft
Velocity	9.80	ft/s
Velocity Head	1.49	ft
Specific Energy	3.14	ft
Froude Number	1.50	
Maximum Discharge	71.74	ft^3/s
Discharge Full	66.69	ft^3/s
Slope Full	0.00342	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	54.94	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 32

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.00	ft
Discharge	15.00	ft^3/s

Results

Normal Depth	1.19	ft
Flow Area	1.95	ft^2
Wetted Perimeter	3.52	ft
Hydraulic Radius	0.55	ft
Top Width	1.96	ft
Critical Depth	1.40	ft
Percent Full	59.5	%
Critical Slope	0.00632	ft/ft
Velocity	7.70	ft/s
Velocity Head	0.92	ft
Specific Energy	2.11	ft
Froude Number	1.36	
Maximum Discharge	24.33	ft^3/s
Discharge Full	22.62	ft^3/s
Slope Full	0.00440	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	59.50	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 33

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	1.50	ft
Discharge	3.00	ft^3/s

Results

Normal Depth	0.55	ft
Flow Area	0.59	ft^2
Wetted Perimeter	1.95	ft
Hydraulic Radius	0.30	ft
Top Width	1.44	ft
Critical Depth	0.66	ft
Percent Full	36.6	%
Critical Slope	0.00513	ft/ft
Velocity	5.13	ft/s
Velocity Head	0.41	ft
Specific Energy	0.96	ft
Froude Number	1.42	
Maximum Discharge	11.30	ft^3/s
Discharge Full	10.50	ft^3/s
Slope Full	0.00082	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	36.58	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 34

Worksheet for Beckham Street

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.50	ft
Discharge	17.00	ft^3/s

Results

Normal Depth	1.12	ft
Flow Area	2.13	ft^2
Wetted Perimeter	3.67	ft
Hydraulic Radius	0.58	ft
Top Width	2.49	ft
Critical Depth	1.39	ft
Percent Full	44.9	%
Critical Slope	0.00478	ft/ft
Velocity	7.96	ft/s
Velocity Head	0.99	ft
Specific Energy	2.11	ft
Froude Number	1.52	
Maximum Discharge	44.12	ft^3/s
Discharge Full	41.01	ft^3/s
Slope Full	0.00172	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	44.87	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 35

Worksheet for Londonderry Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00800	ft/ft
Diameter	3.00	ft
Discharge	53.00	ft^3/s

Results

Normal Depth	2.20	ft
Flow Area	5.56	ft^2
Wetted Perimeter	6.17	ft
Hydraulic Radius	0.90	ft
Top Width	2.65	ft
Critical Depth	2.37	ft
Percent Full	73.4	%
Critical Slope	0.00680	ft/ft
Velocity	9.53	ft/s
Velocity Head	1.41	ft
Specific Energy	3.61	ft
Froude Number	1.16	
Maximum Discharge	64.17	ft^3/s
Discharge Full	59.65	ft^3/s
Slope Full	0.00631	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	73.37	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 35

Worksheet for Londonderry Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Diameter	3.00	ft
Discharge	53.00	ft^3/s

Results

Normal Depth	2.20	ft
Flow Area	5.56	ft^2
Wetted Perimeter	6.17	ft
Hydraulic Radius	0.90	ft
Top Width	2.65	ft
Critical Depth	2.37	ft
Percent Full	73.4	%
Critical Slope	0.00680	ft/ft
Velocity	9.53	ft/s
Velocity Head	1.41	ft
Specific Energy	3.61	ft
Froude Number	1.16	
Maximum Discharge	64.17	ft^3/s
Discharge Full	59.65	ft^3/s
Slope Full	0.00631	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	73.37	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 36

Worksheet for Devoncove Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.00	ft
Discharge	12.00	ft^3/s

Results

Normal Depth	1.04	ft
Flow Area	1.64	ft^2
Wetted Perimeter	3.21	ft
Hydraulic Radius	0.51	ft
Top Width	2.00	ft
Critical Depth	1.24	ft
Percent Full	51.8	%
Critical Slope	0.00559	ft/ft
Velocity	7.31	ft/s
Velocity Head	0.83	ft
Specific Energy	1.87	ft
Froude Number	1.42	
Maximum Discharge	24.33	ft^3/s
Discharge Full	22.62	ft^3/s
Slope Full	0.00281	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	51.79	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 37

Worksheet for Devoncove Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.00	ft
Discharge	21.00	ft^3/s

Results

Normal Depth	1.52	ft
Flow Area	2.57	ft^2
Wetted Perimeter	4.24	ft
Hydraulic Radius	0.61	ft
Top Width	1.70	ft
Critical Depth	1.64	ft
Percent Full	76.2	%
Critical Slope	0.00859	ft/ft
Velocity	8.18	ft/s
Velocity Head	1.04	ft
Specific Energy	2.56	ft
Froude Number	1.17	
Maximum Discharge	24.33	ft^3/s
Discharge Full	22.62	ft^3/s
Slope Full	0.00862	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	76.18	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 38

Worksheet for Keating Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.50	ft
Discharge	24.00	ft^3/s

Results

Normal Depth	1.37	ft
Flow Area	2.76	ft^2
Wetted Perimeter	4.18	ft
Hydraulic Radius	0.66	ft
Top Width	2.49	ft
Critical Depth	1.67	ft
Percent Full	55.0	%
Critical Slope	0.00555	ft/ft
Velocity	8.68	ft/s
Velocity Head	1.17	ft
Specific Energy	2.55	ft
Froude Number	1.45	
Maximum Discharge	44.12	ft^3/s
Discharge Full	41.01	ft^3/s
Slope Full	0.00342	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	54.96	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 38

Worksheet for Keating Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01430	ft/ft
Diameter	2.50	ft
Discharge	24.00	ft^3/s

Results

Normal Depth	1.23	ft
Flow Area	2.42	ft^2
Wetted Perimeter	3.90	ft
Hydraulic Radius	0.62	ft
Top Width	2.50	ft
Critical Depth	1.67	ft
Percent Full	49.4	%
Critical Slope	0.00555	ft/ft
Velocity	9.94	ft/s
Velocity Head	1.53	ft
Specific Energy	2.77	ft
Froude Number	1.78	
Maximum Discharge	52.76	ft^3/s
Discharge Full	49.05	ft^3/s
Slope Full	0.00342	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	49.37	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 39

Worksheet for Keating Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Diameter	2.00	ft
Discharge	14.00	ft^3/s

Results

Normal Depth	0.93	ft
Flow Area	1.42	ft^2
Wetted Perimeter	2.99	ft
Hydraulic Radius	0.48	ft
Top Width	1.99	ft
Critical Depth	1.35	ft
Percent Full	46.3	%
Critical Slope	0.00605	ft/ft
Velocity	9.85	ft/s
Velocity Head	1.51	ft
Specific Energy	2.43	ft
Froude Number	2.06	
Maximum Discharge	34.41	ft^3/s
Discharge Full	31.99	ft^3/s
Slope Full	0.00383	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	46.27	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 40

Worksheet for Keating Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02210	ft/ft
Diameter	2.50	ft
Discharge	38.00	ft^3/s

Results

Normal Depth	1.43	ft
Flow Area	2.90	ft^2
Wetted Perimeter	4.29	ft
Hydraulic Radius	0.68	ft
Top Width	2.47	ft
Critical Depth	2.08	ft
Percent Full	57.2	%
Critical Slope	0.00834	ft/ft
Velocity	13.10	ft/s
Velocity Head	2.67	ft
Specific Energy	4.10	ft
Froude Number	2.13	
Maximum Discharge	65.59	ft^3/s
Discharge Full	60.97	ft^3/s
Slope Full	0.00858	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	57.18	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 41

Worksheet for Keating Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.05170	ft/ft
Diameter	2.00	ft
Discharge	12.00	ft^3/s

Results

Normal Depth	0.66	ft
Flow Area	0.90	ft^2
Wetted Perimeter	2.44	ft
Hydraulic Radius	0.37	ft
Top Width	1.88	ft
Critical Depth	1.24	ft
Percent Full	32.9	%
Critical Slope	0.00558	ft/ft
Velocity	13.35	ft/s
Velocity Head	2.77	ft
Specific Energy	3.43	ft
Froude Number	3.40	
Maximum Discharge	55.33	ft^3/s
Discharge Full	51.44	ft^3/s
Slope Full	0.00281	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	32.86	%
Downstream Velocity	Infinity	ft/s

PIPE RUN 42

Worksheet for Keating Drive

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02560	ft/ft
Diameter	3.00	ft
Discharge	50.00	ft^3/s

Results

Normal Depth	1.44	ft
Flow Area	3.37	ft^2
Wetted Perimeter	4.60	ft
Hydraulic Radius	0.73	ft
Top Width	3.00	ft
Critical Depth	2.30	ft
Percent Full	48.1	%
Critical Slope	0.00642	ft/ft
Velocity	14.85	ft/s
Velocity Head	3.43	ft
Specific Energy	4.87	ft
Froude Number	2.47	
Maximum Discharge	114.79	ft^3/s
Discharge Full	106.71	ft^3/s
Slope Full	0.00562	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	48.14	%
Downstream Velocity	Infinity	ft/s

RIP-RAP CALCULATIONS

Design Point	100 Yr. Flow (cfs)	Tailwater Depth (ft.) (See Pipe Sheets)	Pipe Diameter (ft.)	$Q / D^{1.5}$	Y_t / D	Rock Type (See Fig. 9-38)	Rock Size (d50) (in.)
Pipe Run 37	21	1.52	2.0	7.4	0.8	Type L	9"
Pipe Run 42 (Interim)	15	0.76	3.0	2.9	0.3	Type L	9"

$$H_a = \frac{(H + Y_n)}{2}$$ Equation 9-19

Where the maximum value of H_a shall not exceed H, and:

D_a = parameter to use in place of D in Figure 9-38 when flow is supercritical (ft)

D_c = diameter of circular culvert (ft)

H_a = parameter to use in place of H in Figure 9-39 when flow is supercritical (ft)

H = height of rectangular culvert (ft)

Y_n = normal depth of supercritical flow in the culvert (ft)

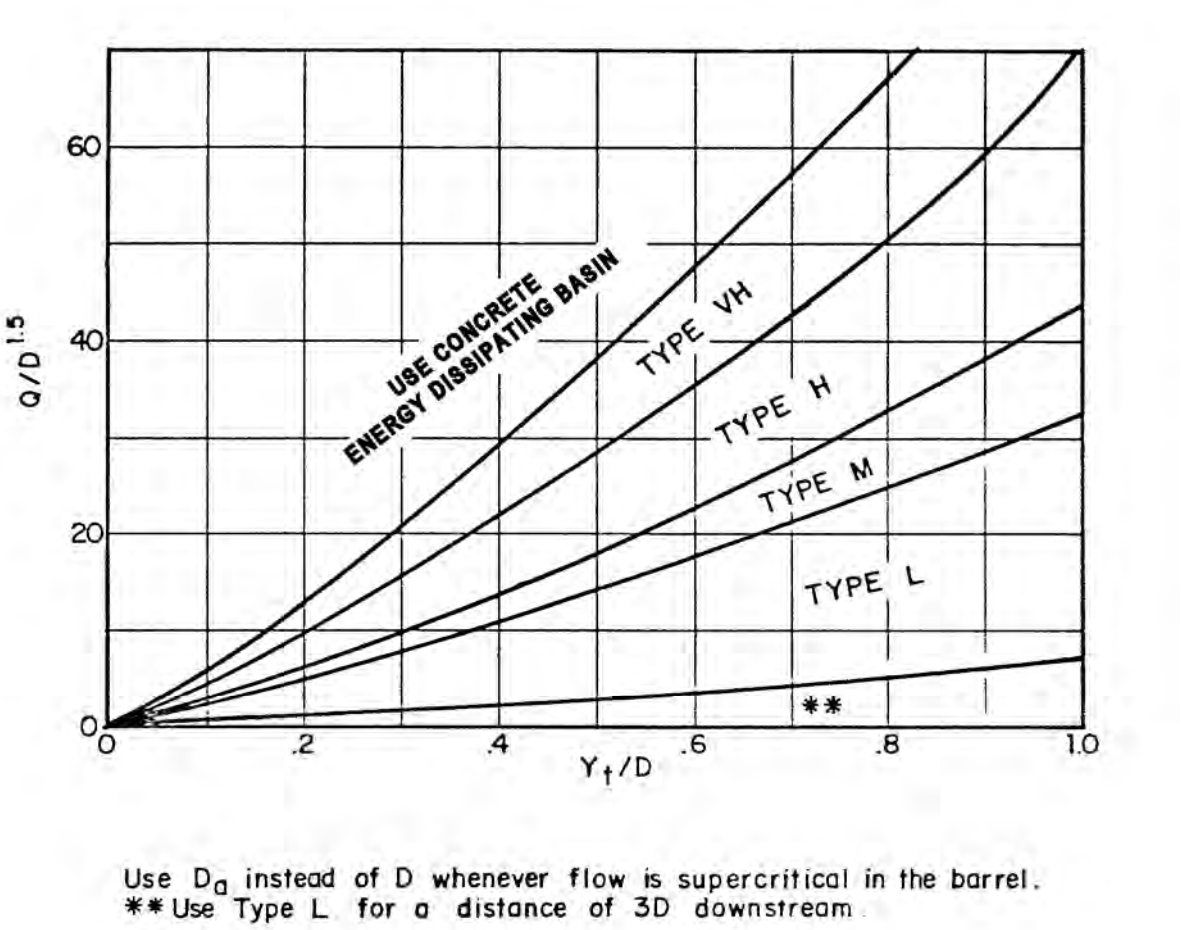
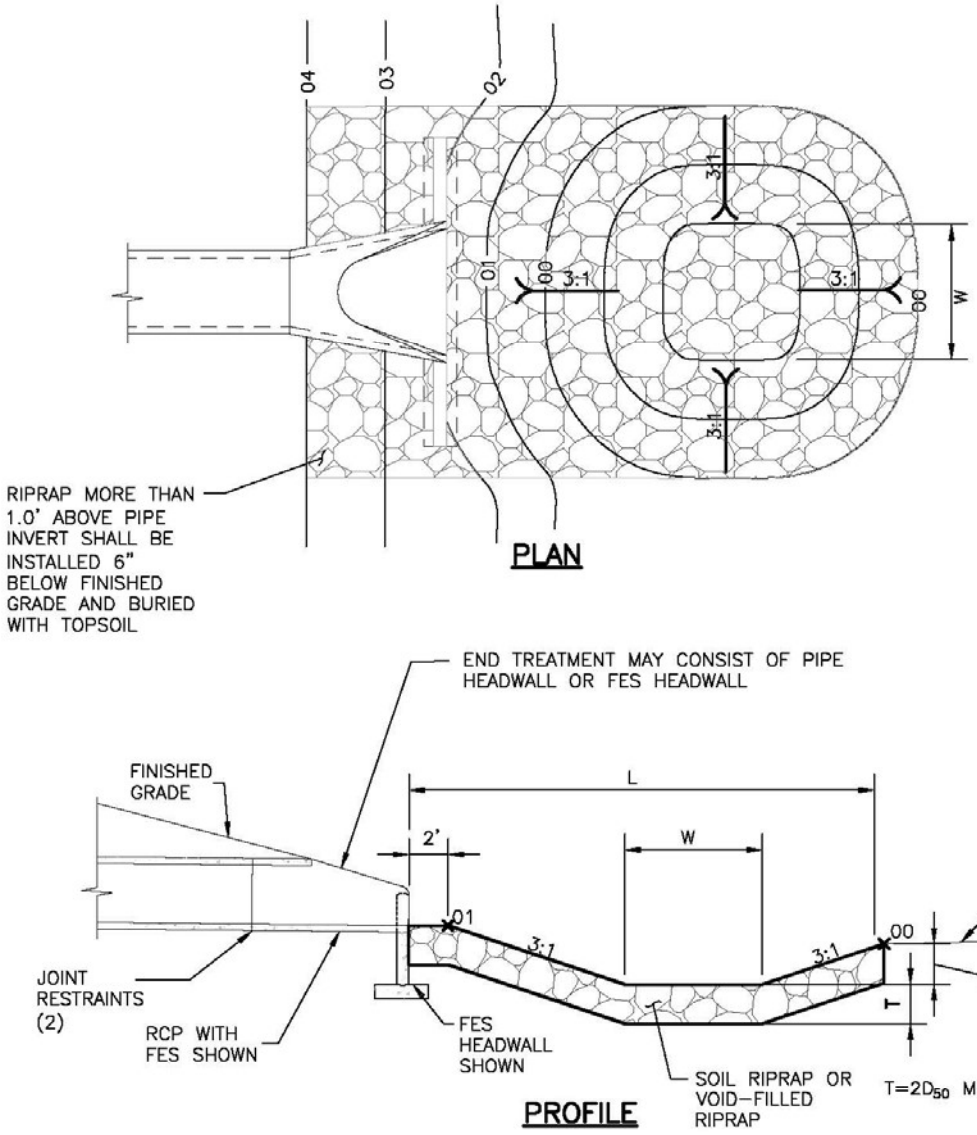


Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)



PIPE SIZE OR BOX HEIGHT	D	W*	L
18" – 24"	1'–0"	4'	15'
30" – 36"	1'–6"	6'	20'
42" – 48"	2'–0"	7'	24'
54" – 60"	2'–6"	8'	28'
66" – 72"	3'–0"	9'	32'

* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W, THEN W = CULVERT WIDTH

Figure 9-37. Low tailwater riprap basin

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Sep 28 2018

INTERIM CHANNEL

Trapezoidal

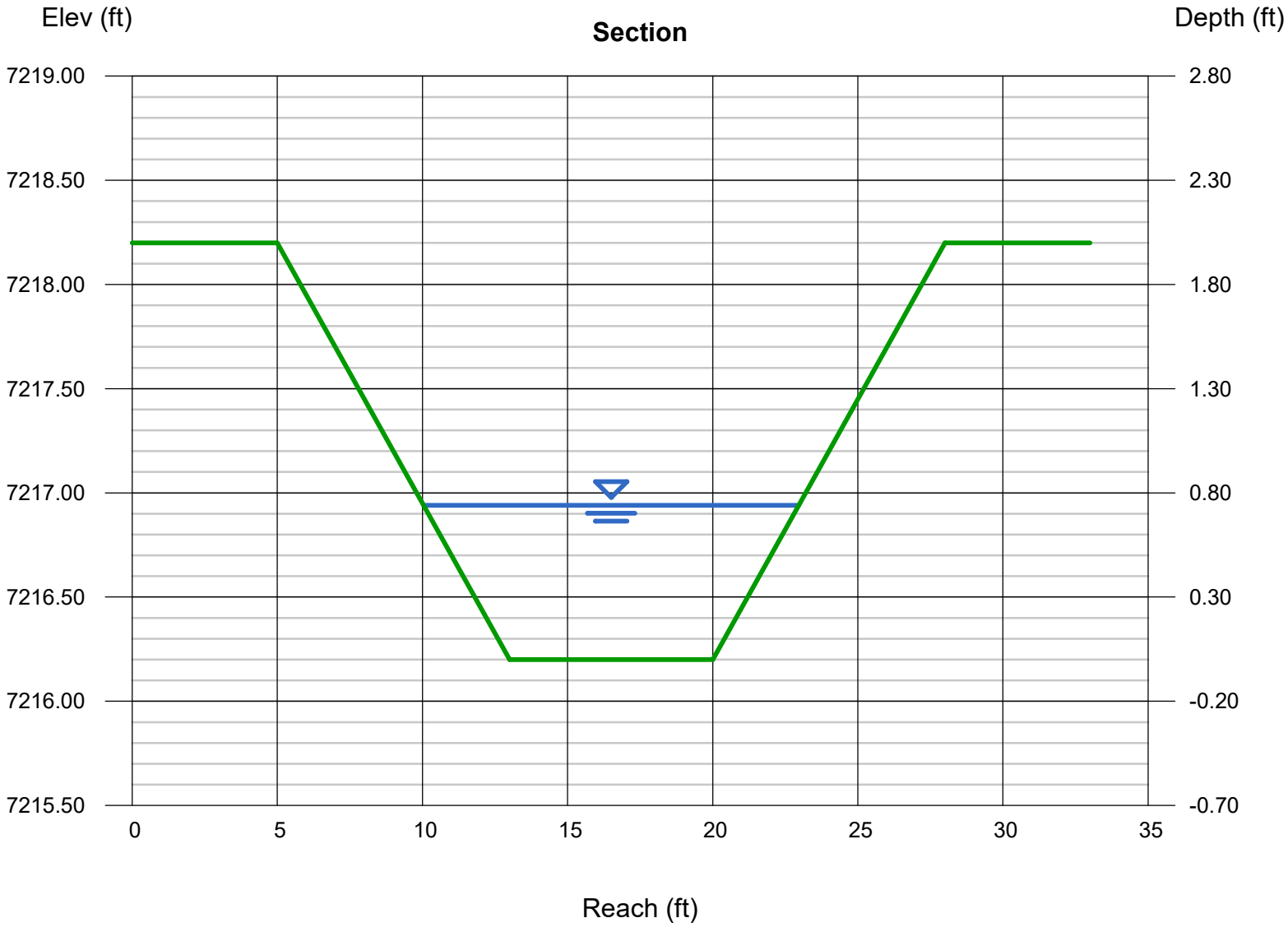
Bottom Width (ft)	= 7.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7216.20
Slope (%)	= 0.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 15.00

Highlighted

Depth (ft)	= 0.74
Q (cfs)	= 15.00
Area (sqft)	= 7.37
Velocity (ft/s)	= 2.04
Wetted Perim (ft)	= 13.10
Crit Depth, Yc (ft)	= 0.48
Top Width (ft)	= 12.92
EGL (ft)	= 0.80



SWQ/DETENTION CALCULATIONS

CLASSIC
CONSULTING
ENGINEERS & SURVEYORS

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**Marc A. Whorton, P.E.**
Company:	**Classic Consulting**
Date:	**September 26, 2018**
Project:	**Paint Brush Hills Filing 13E (Pond D)**
Location:	**Falcon, CO**

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 27.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.270
C) Contributing Watershed Area	Area = 75.030 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= 0.886 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$= 0.866 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ○ A ◉ B ○ C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	EURV = 2.068 ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	Rip-Rap Forebays

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: September 26, 2018
Project: Paint Brush Hills Filing 13E (Pond D)
Location: Falcon, CO

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.026 ac-ft

B) Actual Forebay Volume — V_F = 0.027 ac-ft

C) Forebay Depth (D_F = 30 inch maximum) — D_F = 18.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 155.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 3.10 cfs

E) Forebay Discharge Design

Choose One
- ○ Berm With Pipe
- ◉ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = 9.7 in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
- ◉ Concrete
- ○ Soft Bottom

F) Slope of Trickle Channel — S = 0.0100 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 230 sq ft

C) Outlet Type

Choose One
- ◉ Orifice Plate
- ○ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 2.11 inches

E) Total Outlet Area — A_{ot} = 10.53 square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: September 26, 2018
Project: Paint Brush Hills Filing 13E (Pond D)
Location: Falcon, CO

8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 113.1 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 115.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 332 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 467 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 3.8 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 73.6 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: September 26, 2018
Project: Paint Brush Hills Filing 13E (Pond D)
Location: Falcon, CO

10. Overflow Embankment	
A) Describe embankment protection for 100-year and greater overtopping:	Buried Soil Rip-Rap for emergency overtopping only
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	4.00
11. Vegetation	Choose One: ○ Irrigated ◉ Not Irrigated
12. Access	
A) Describe Sediment Removal Procedures	Access ramp provided for maintenance

Notes:

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Northerly Forebay)
Location: Falcon, CO

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 20.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.200
C) Contributing Watershed Area	Area = 49.530 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= 0.477 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$= 0.466 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ○ A ◉ B ○ C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	EURV = 0.987 ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	Rip-Rap Forebays

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Northerly Forebay)
Location: Falcon, CO

5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.014 ac-ft
B) Actual Forebay Volume	V_F = 0.014 ac-ft
C) Forebay Depth (D_F = 18 inch maximum)	D_F = 18.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 98.00 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 1.96 cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe ◉ Wall with Rect. Notch ○ Wall with V-Notch Weir (flow too small for berm w/ pipe)
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = in
G) Rectangular Notch Width	Calculated W_N = 7.4 in
6. Trickle Channel	Choose One: ◉ Concrete ○ Soft Bottom
A) Type of Trickle Channel	
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 235 sq ft
C) Outlet Type	Choose One: ◉ Orifice Plate ○ Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 2.28 inches
E) Total Outlet Area	A_{ot} = 12.24 square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Northerly Forebay)
Location: Falcon, CO

8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 60.9 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 117.5 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 379 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 534 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 3.2 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 66.4 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Northerly Forebay)
Location: Falcon, CO

10. Overflow Embankment	
A) Describe embankment protection for 100-year and greater overtopping:	Erosion Control mat for emergency overtopping only
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	4.00
11. Vegetation	Choose One: ○ Irrigated ◉ Not Irrigated
12. Access	
A) Describe Sediment Removal Procedures	Access ramp provided for maintenance

Notes:

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Southerly Forebay)
Location: Falcon, CO

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 34.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.340
C) Contributing Watershed Area	Area = 21.540 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN} = 0.293 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$ = 0.286 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$ = ac-ft
I) Predominant Watershed NRCS Soil Group	Choose One: ○ A ◉ B ○ C / D
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	EURV = 0.761 ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	Rip-Rap Forebays

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Southerly Forebay)
Location: Falcon, CO

5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.009 ac-ft
B) Actual Forebay Volume	V_F = 0.009 ac-ft
C) Forebay Depth (D_F = 18 inch maximum)	D_F = 18.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 53.00 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 1.06 cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe ◉ Wall with Rect. Notch ○ Wall with V-Notch Weir (flow too small for berm w/ pipe)
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = in
G) Rectangular Notch Width	Calculated W_N = 5.7 in
6. Trickle Channel	
A) Type of Trickle Channel	Choose One: ◉ Concrete ○ Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 137 sq ft
C) Outlet Type	Choose One: ◉ Orifice Plate ○ Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 2.16 inches
E) Total Outlet Area	A_{ot} = 10.95 square inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Southerly Forebay)
Location: Falcon, CO

8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 37.4 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 68.5 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 343 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 484 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 3.9 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 74.8 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: July 19, 2018
Project: Paint Brush Hills Filing 13E (Pond D - Southerly Forebay)
Location: Falcon, CO

10. Overflow Embankment	
A) Describe embankment protection for 100-year and greater overtopping:	Erosion Control mat for emergency overtopping only
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	4.00
11. Vegetation	Choose One: ○ Irrigated ◉ Not Irrigated
12. Access	
A) Describe Sediment Removal Procedures	Access ramp provided for maintenance

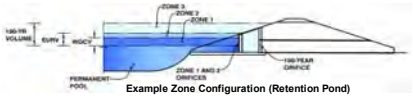
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: PAINT BRUSH HILLS FILING 13E

Basin ID: Pond D



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	75.03	acres
Watershed Length =	2,280	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	27.00%	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) =	0.886	acre-feet
Excess Urban Runoff Volume (EURV) =	2.062	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.564	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	2.245	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	3.528	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	6.154	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	7.864	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	10.100	acre-feet
500-yr Runoff Volume (P1 = 3.85 in.) =	17.829	acre-feet
Approximate 2-yr Detention Volume =	1.459	acre-feet
Approximate 5-yr Detention Volume =	2.106	acre-feet
Approximate 10-yr Detention Volume =	3.147	acre-feet
Approximate 25-yr Detention Volume =	3.708	acre-feet
Approximate 50-yr Detention Volume =	3.911	acre-feet
Approximate 100-yr Detention Volume =	4.674	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
3.85	inches

Stage-Storage Calculation

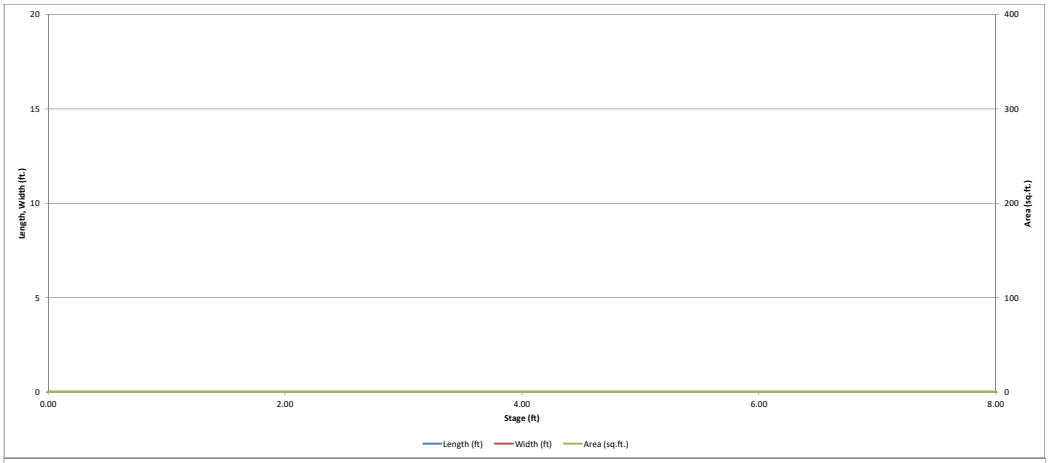
Zone 1 Volume (WQCV) =	0.886	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.175	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.612	acre-feet
Total Detention Basin Volume =	4.674	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

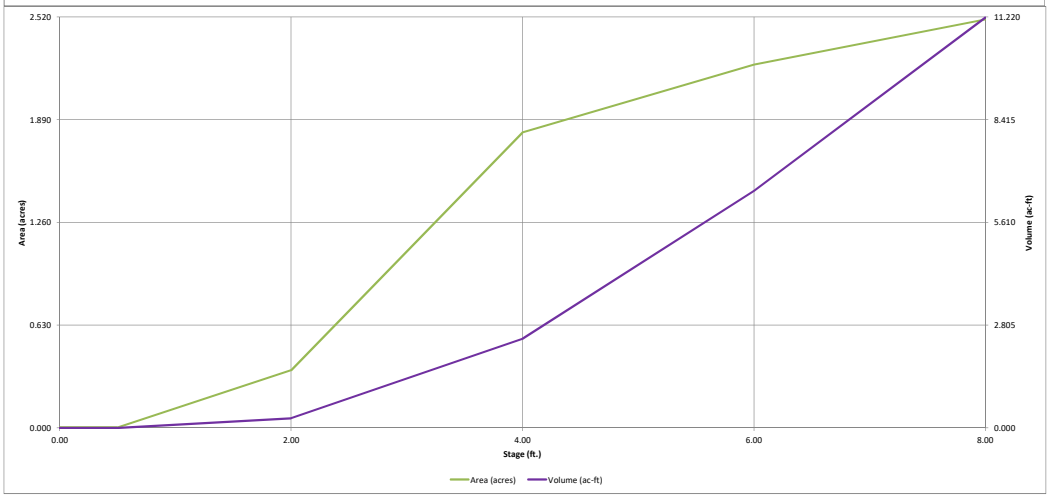
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	137	0.003		
ISV=7200.5	--	0.50	--	--	--	137	0.003	67	0.002
7202	--	2.00	--	--	--	15,360	0.353	11,538	0.265
7204	--	4.00	--	--	--	78,880	1.811	105,931	2.432
7206	--	6.00	--	--	--	97,014	2.227	281,825	6.470
7208	--	8.00	--	--	--	109,094	2.504	487,933	11.201

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



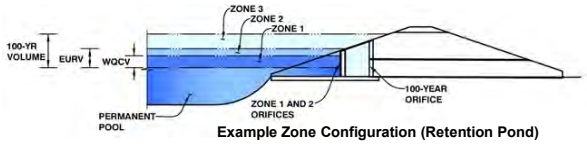


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: PAINT BRUSH HILLS FILING 13E

Basin ID: Pond D



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.91	0.886	Orifice Plate
Zone 2 (EURV)	3.79	1.175	Orifice Plate
Zone 3 (100-year)	5.17	2.612	Weir&Pipe (Restrict)
		4.674	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 =	3.80	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	15.20	inches
Orifice Plate: Orifice Area per Row =	3.51	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	2.438E-02	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	1.27	2.53					
Orifice Area (sq. inches)	3.51	3.51	3.51					

	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 =	3.80	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	75%	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 =	4.80	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	3.50	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	24.74	N/A	ft^2
Overflow Grate Open Area w/ Debris =	12.37	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 =	36.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	36.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	7.07	N/A	ft^2
Outlet Orifice Centroid =	1.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	65.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

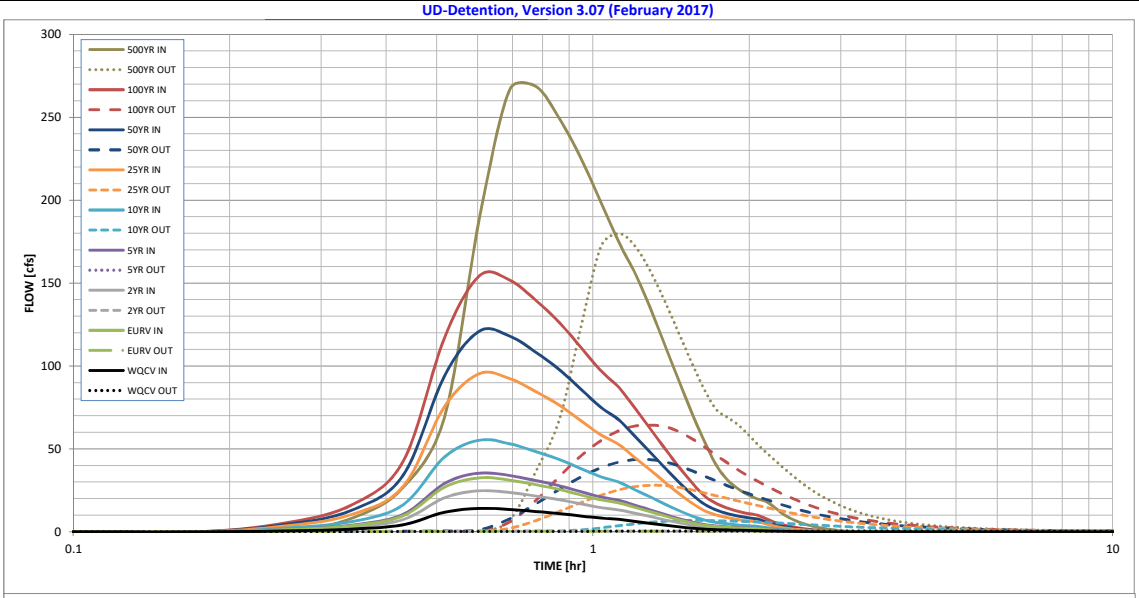
Spillway Design Flow Depth=	0.94	feet
Stage at Top of Freeboard =	7.94	feet
Basin Area at Top of Freeboard =	2.50	acres

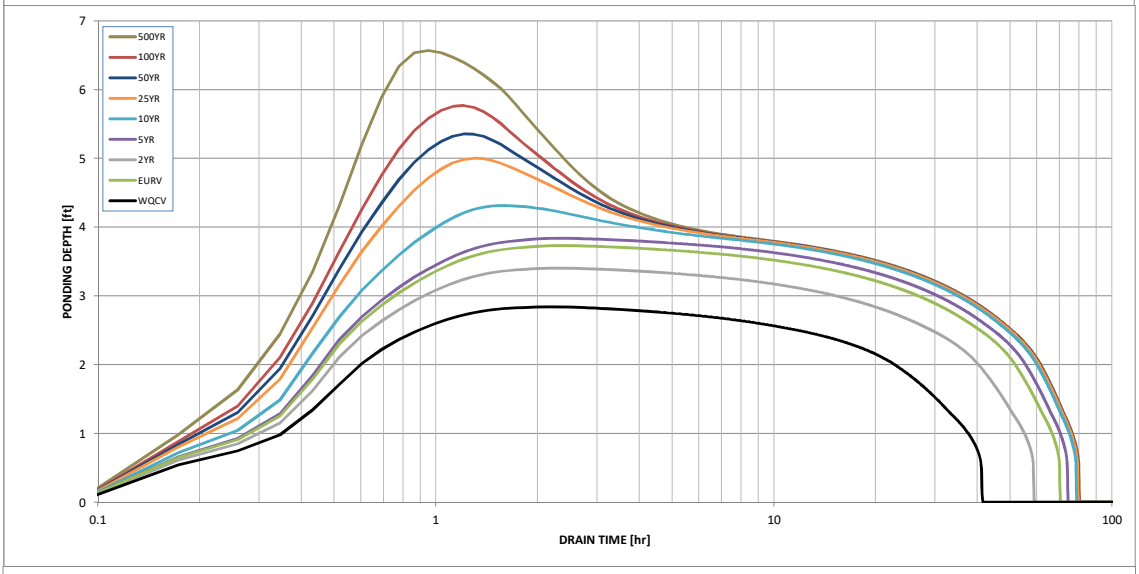
Routed Hydrograph Results

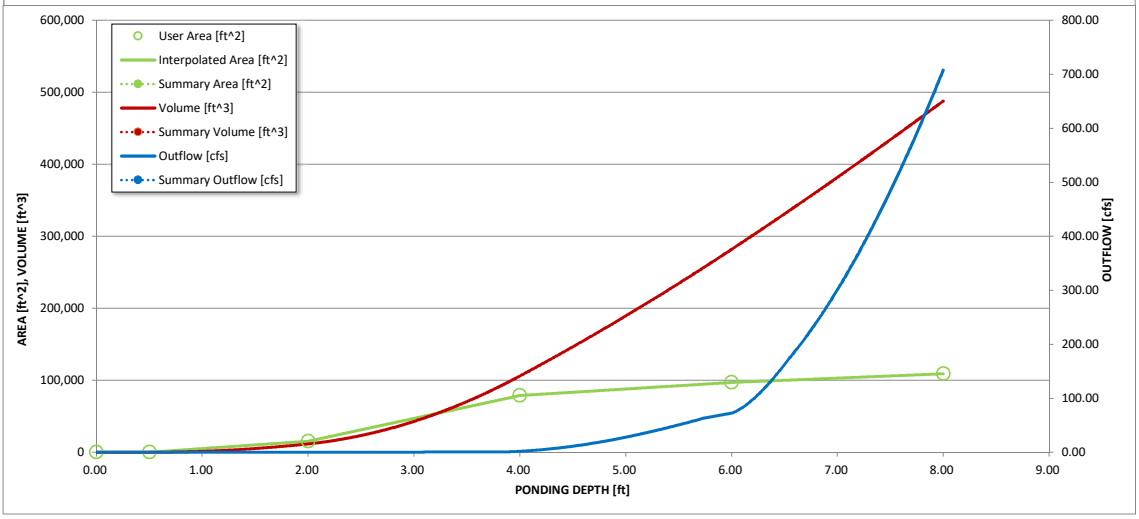
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	0.886	2.062	1.564	2.245	3.528	6.154	7.864	10.100	17.829
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.886	2.062	1.564	2.246	3.529	6.155	7.863	10.103	17.836
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.19	0.64	0.89	1.19	2.17
Predevelopment Peak Q (cfs) =	0.0	0.0	0.9	1.503	14.5	48.0	66.5	89.6	162.5
Peak Inflow Q (cfs) =	14.1	32.6	24.8	35.5	55.4	95.4	121.1	154.5	268.6
Peak Outflow Q (cfs) =	0.4	0.5	0.5	0.659	6.9	28.1	43.7	64.3	179.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.5	0.6	0.7	0.7	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.3	1.1	1.7	2.6	3.8
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	64	54	67	69	65	63	60	51
Time to Drain 99% of Inflow Volume (hours) =	**40**	68	57	72	75	73	72	70	66
Maximum Ponding Depth (ft) =	2.84	3.73	3.40	3.84	4.31	5.00	5.36	5.77	6.57
Area at Maximum Ponding Depth (acres) =	0.97	1.61	1.37	1.69	1.88	2.02	2.09	2.18	2.31
Maximum Volume Stored (acre-ft) =	0.822	1.969	1.477	2.135	3.003	4.347	5.066	5.941	7.762

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			

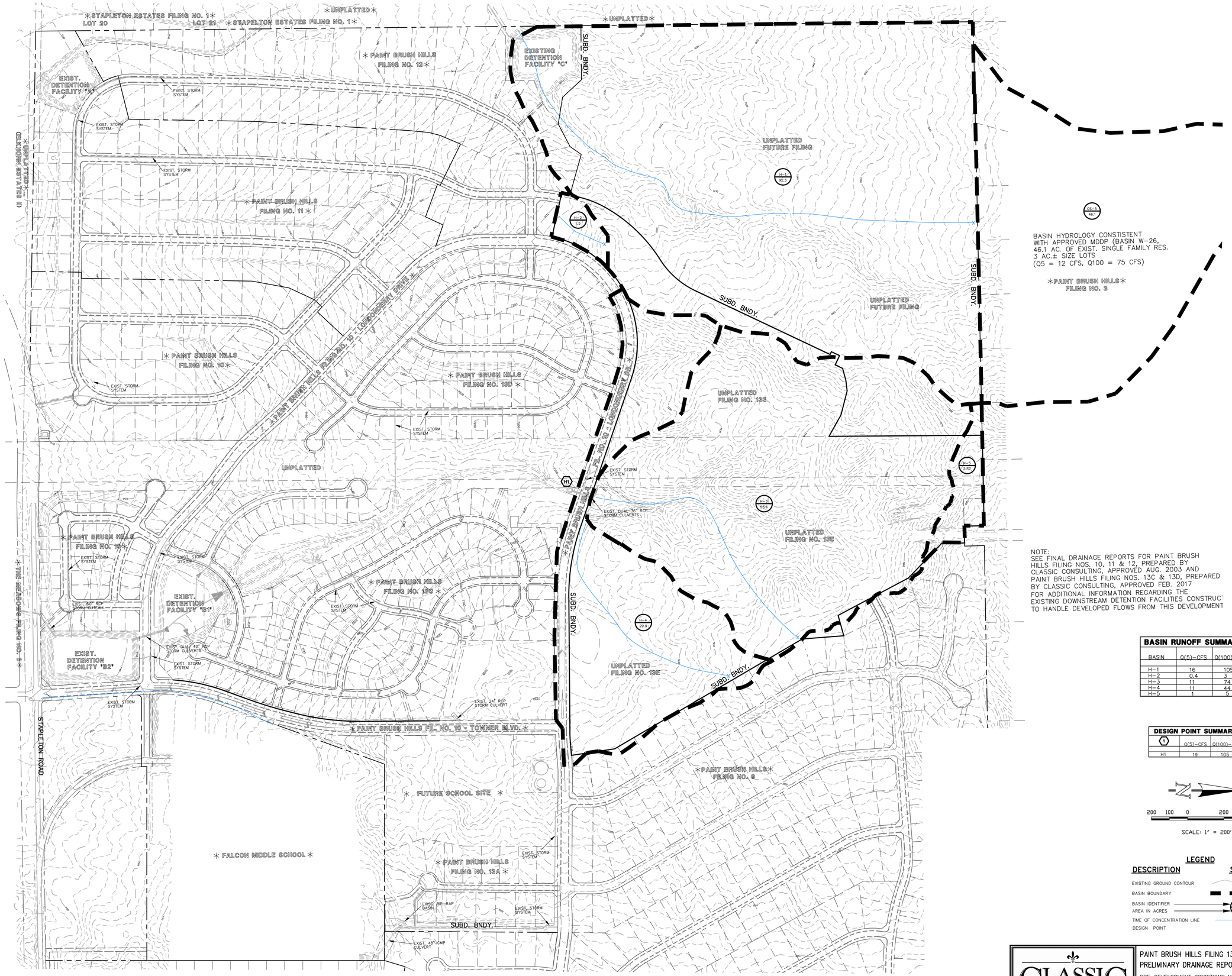
Detention Basin Outlet Structure Design

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]
5.18 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:10:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:15:32	0.62	1.40	1.07	1.52	2.32	3.80	4.65	5.66	8.54
0.966	0:20:43	1.68	3.83	2.92	4.16	6.42	10.76	13.41	16.71	26.98
	0:25:54	4.32	9.82	7.51	10.67	16.49	27.64	34.44	42.93	69.48
	0:31:05	11.87	26.97	20.62	29.29	45.23	75.70	94.23	117.32	189.15
	0:36:16	14.15	32.60	24.80	35.46	55.35	95.41	121.11	154.45	266.62
	0:41:26	13.52	31.22	23.73	33.97	53.16	92.49	118.15	151.89	268.63
	0:46:37	12.31	28.41	21.60	30.92	48.37	84.51	108.22	139.51	248.74
	0:51:48	11.01	25.52	19.38	27.78	43.56	76.19	97.61	125.91	224.71
	0:56:59	9.52	22.19	16.82	24.17	38.06	66.84	85.79	110.88	198.80
	1:02:10	8.29	19.29	14.61	21.02	33.19	58.45	75.08	97.11	174.29
	1:07:20	7.51	17.48	13.25	19.05	30.00	52.60	67.43	86.99	155.16
	1:12:31	6.22	14.58	11.03	15.89	25.10	44.30	56.99	73.85	133.16
	1:17:42	5.09	12.03	9.08	13.12	20.78	36.78	47.38	61.45	111.05
	1:22:53	3.94	9.43	7.09	10.30	16.43	29.32	37.91	49.37	90.07
	1:28:04	2.95	7.19	5.38	7.87	12.65	22.77	29.53	38.56	70.78
	1:33:14	2.13	5.30	3.93	5.81	9.42	17.12	22.29	29.21	54.18
	1:38:25	1.64	4.02	3.00	4.40	7.08	12.76	16.54	21.59	40.22
	1:43:36	1.35	3.27	2.45	3.57	5.71	10.20	13.17	17.11	31.41
	1:48:47	1.15	2.76	2.07	3.01	4.81	8.56	11.04	14.33	26.09
	1:53:58	1.01	2.41	1.81	2.63	4.19	7.43	9.57	12.39	22.43
	1:59:08	0.91	2.16	1.63	2.36	3.75	6.63	8.53	11.04	19.90
	2:04:19	0.83	1.98	1.49	2.16	3.44	6.07	7.79	10.07	18.08
	2:09:30	0.61	1.46	1.10	1.60	2.55	4.57	5.93	7.74	14.31
	2:14:41	0.45	1.07	0.80	1.16	1.85	3.30	4.28	5.58	10.33
	2:19:52	0.33	0.79	0.59	0.86	1.37	2.45	3.17	4.14	7.64
	2:25:02	0.24	0.58	0.44	0.64	1.02	1.82	2.36	3.08	5.67
	2:30:13	0.17	0.42	0.32	0.46	0.74	1.34	1.74	2.27	4.20
	2:35:24	0.12	0.30	0.22	0.33	0.53	0.96	1.26	1.65	3.06
	2:40:35	0.09	0.22	0.16	0.24	0.39	0.70	0.91	1.19	2.21
	2:45:46	0.06	0.15	0.11	0.16	0.27	0.49	0.64	0.85	1.59
	2:50:56	0.04	0.09	0.07	0.10	0.17	0.32	0.42	0.56	1.08
	2:56:07	0.02	0.05	0.04	0.06	0.10	0.19	0.25	0.34	0.66
	3:01:18	0.01	0.02	0.01	0.02	0.04	0.09	0.12	0.17	0.35
	3:06:29	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.05	0.13
	3:11:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	3:16:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:22:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:32:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:37:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:42:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:47:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:53:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:58:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:03:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:08:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:13:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:19:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:24:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:29:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:34:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:39:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:44:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:21:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:31:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:36:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:41:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:47:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:52:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:57:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:02:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:07:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:12:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



NOTE:
SEE FINAL DRAINAGE REPORTS FOR PAINT BRUSH HILLS FILING NOS. 10, 11 & 12, PREPARED BY CLASSIC CONSULTING, APPROVED AUG. 2003 AND PAINT BRUSH HILLS FILING NOS. 13C & 13D, PREPARED BY CLASSIC CONSULTING, APPROVED FEB. 2017 FOR ADDITIONAL INFORMATION REGARDING THE EXISTING DOWNSTREAM DETENTION FACILITIES CONSTRUCTED TO HANDLE DEVELOPED FLOWS FROM THIS DEVELOPMENT

BASIN RUNOFF SUMMARY.

BASIN	Q(5)-CFS	Q(100)-CFS
H-1	16	105
H-2	0.4	3
H-3	11	74
H-4	11	44
H-5	1	5

DESIGN POINT SUMMARY

(1)	Q(5)-CFS	Q(100)-CFS
H1	19	105

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
BASIN BOUNDARY	
BASIN IDENTIFIER / AREA IN ACRES	H-1 10.0
TIME OF CONCENTRATION LINE	
DESIGN POINT	H2

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

PAINT BRUSH HILLS FILING 13E
PRELIMINARY DRAINAGE REPORT
PRE-DEVELOPMENT CONDITIONS MAP

CLASSIC CONSULTING ENGINEERS & SURVEYORS

DESIGNED BY	MAW	SCALE		DATE	2-20-18
DRAWN BY	MAW	(H) 1"= 200'		SHEET	1 OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	2053.50

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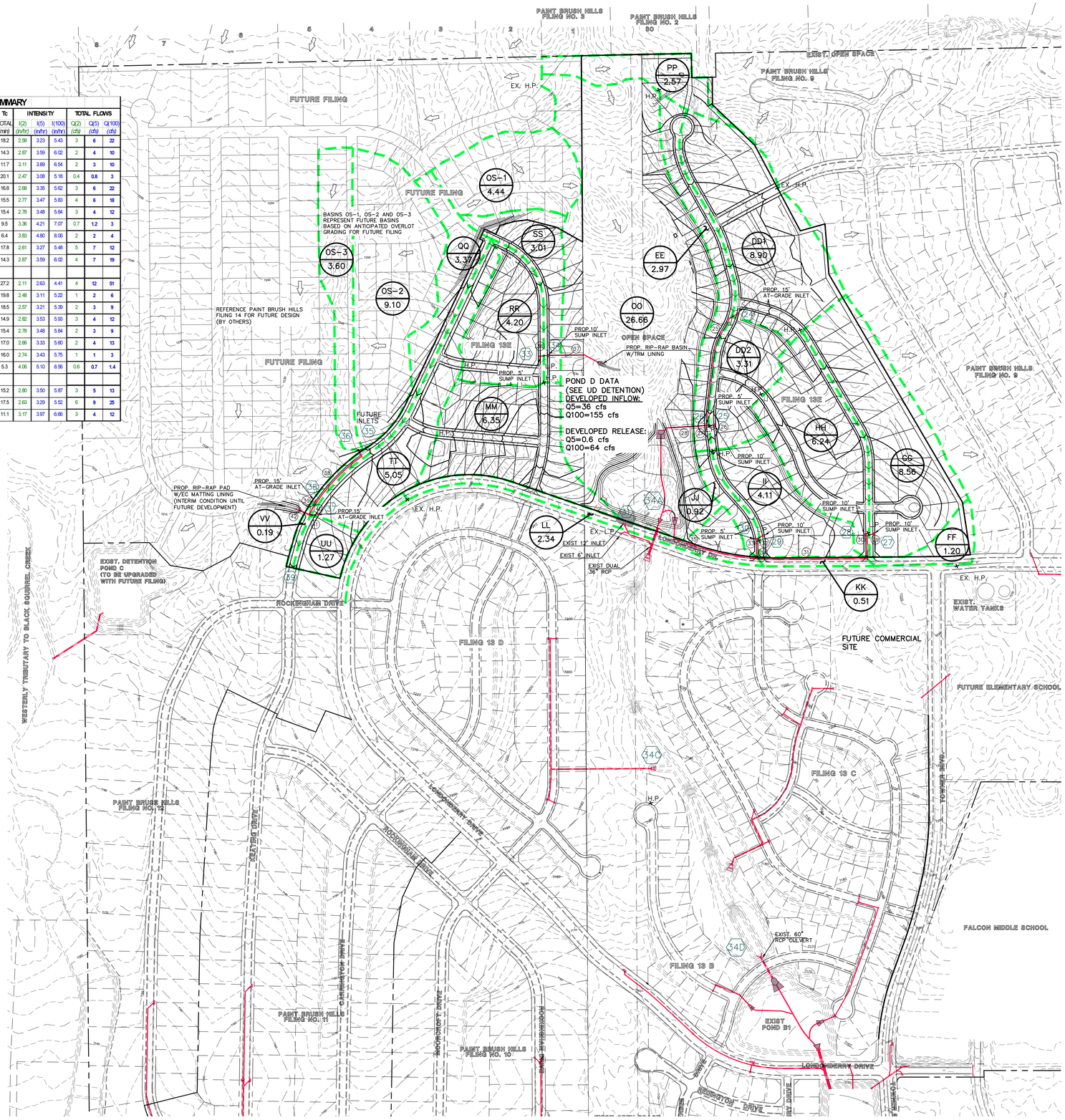
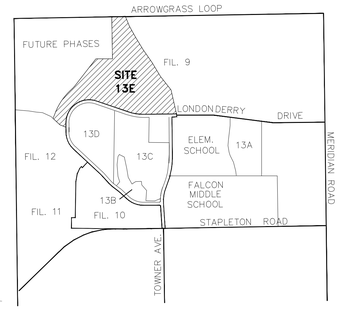
FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

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)
DD1	1.34	1.96	4.09	0.22	180	4	16.4	650	3.0%	6.1	1.8	18.2	2.58	3.23	5.43	3	6	22
DD2	0.76	0.99	1.66	0.30	130	2.6	13.1	450	3.0%	6.1	1.2	14.3	2.87	3.59	6.02	2	4	10
EE	0.68	0.89	1.49	0.30	50	1	8.1	1300	3.0%	6.1	3.6	11.7	3.11	3.89	6.54	2	3	10
FF	0.18	0.26	0.55	0.22	250	6	18.8	300	1.3%	4.0	1.3	20.1	2.47	3.08	5.18	0.4	0.8	3
GG	1.28	1.88	3.94	0.22	180	6	14.3	900	3.0%	6.1	2.5	16.8	2.68	3.35	5.62	3	6	22
HH	1.44	1.87	3.12	0.30	120	2.4	12.6	750	1.5%	4.3	2.9	15.5	2.77	3.47	5.83	4	6	18
II	0.95	1.23	2.05	0.30	150	3	14.1	350	1.5%	4.3	1.4	15.4	2.78	3.48	5.84	3	4	12
JJ	0.21	0.28	0.46	0.30	50	1	8.1	350	1.5%	4.3	1.4	9.5	3.36	4.21	7.07	0.7	1.2	3
KK	0.45	0.46	0.49	0.08	20	1	4.8	400	1.5%	4.3	1.6	6.4	3.83	4.80	8.06	2	2	4
LL	2.08	2.11	2.25	0.08	150	4	16.3	350	1.3%	4.0	1.5	17.8	2.61	3.27	5.48	5	7	12
MM	1.46	1.91	3.18	0.30	130	2.6	13.1	520	4.0%	7.0	1.2	14.3	2.87	3.59	6.02	4	7	19
NN	Not Used																	
OO	1.96	4.49	11.50	0.16	300	10	19.8	2200	2.0%	4.9	7.4	27.2	2.11	2.63	4.41	4	12	51
PP	0.43	0.63	1.20	0.16	300	10	19.8					19.8	2.48	3.11	5.22	1	2	6
QQ	0.78	1.01	1.69	0.30	150	3	14.1	1300	2.0%	4.9	4.4	18.5	2.57	3.21	5.39	2	3	9
RR	0.97	1.26	2.10	0.30	150	3	14.1	250	2.0%	4.9	0.8	14.9	2.82	3.53	5.93	3	4	12
SS	0.69	0.90	1.51	0.30	150	3	14.1	400	2.0%	4.9	1.3	15.4	2.78	3.48	5.84	2	3	9
TT	0.76	1.11	2.32	0.22	150	3	15.5	450	2.0%	4.9	1.5	17.0	2.66	3.33	5.60	2	4	13
UU	0.19	0.28	0.58	0.22	150	3	15.5	150	2.0%	4.9	0.5	16.0	2.74	3.43	5.75	1	1	3
VV	0.14	0.14	0.16	0.22	20	0.5	5.3					5.3	4.06	5.10	8.56	0.6	0.7	1.4
OS-1	1.02	1.33	2.22	0.30	150	3	14.1	450	3.5%	6.5	1.1	15.2	2.80	3.50	5.87	3	5	13
OS-2	2.09	2.73	4.55	0.30	150	3	14.1	1250	3.0%	6.1	3.4	17.5	2.63	3.29	5.52	6	9	25
OS-3	0.83	1.08	1.80	0.30	50	1	8.1	1100	3.0%	6.1	3.0	11.1	3.17	3.97	6.66	3	4	12





VICINITY MAP
N.T.S.

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	
PROPOSED STORM SEWER	
PROPOSED STORM SEWER INLETS	
STORM PIPE RUN SIZING	20
TIME OF CONCENTRATION	

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
24	DD1	1.96	4.09	18.2	3.23	5.43	6	22	15' Type R At-Grade
25	DD2, DD1 Flowby	0.99	3.01	18.7	3.19	5.36	3	16	10' Type R Sump
26	EE	0.89	1.49	11.7	3.89	6.54	3	10	5' Type R Sump
27	GG, FF	2.15	4.49	20.1	3.08	5.18	7	23	10' Type R Sump
28	HH	1.87	3.12	15.5	3.47	5.83	6	18	10' Type R Sump
29	II, KK	1.69	2.54	15.4	3.48	5.84	6	15	10' Type R Sump
30	JJ	0.28	0.46	9.5	4.21	7.07	1	3	5' Type R Sump
31	LL, MM	4.01	5.42	17.8	3.27	5.48	13	30	Ex. 12' Type R
32	Not Used								
33	RR	1.26	2.10	14.9	3.53	5.93	4	12	5' Type R Sump
34	SS	0.90	1.51	15.4	3.48	5.84	3	9	10' Type R Sump
34A	Total Inflow to Pond D (See UD Detention Worksheet)						36	155	
35	OS-2	2.73	4.55	17.5	3.29	5.52	9	25	15' Type R Future At-grade Inlet
36	OS-3	1.08	1.80	11.1	3.97	6.66	4	12	15' Type R Future At-grade Inlet
37	TT	1.11	2.32	17.0	3.33	5.60	4	13	15' Type R At-Grade
38 (Ultimate)	QQ and DP-35 and DP-36 Flow-by	1.17	3.69	18.0	3.25	5.45	4	20	15' Type R At-Grade
38 (Interim)	Portion of Basin QQ (40%)	0.40	0.67	10.0	4.13	6.93	2	5	15' Type R At-Grade
39	UU, VV	0.42	0.75	16.0	3.43	5.75	1	4	
	Northerly Forebay (PR-28, PR-37, OS-1, OO)	10.93	22.26	27.2	2.63	4.41	29	98	

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*	Velocity (ft/sec)
25	DP24 Pickup	1.96	2.74	18.2	3.23	5.43	6	15	24" RCP	10.6
26	DP25	0.99	3.01	18.7	3.19	5.36	3	16	24" RCP	7.8
27	PR25, PR26	2.95	5.75	18.9	3.18	5.33	9	31	30" RCP	9.2
28	DP26, PR27	3.84	7.23	19.2	3.15	5.29	12	38	30" RCP	16.4
29	DP27	2.15	4.49	20.1	3.08	5.18	7	23	30" RCP	8.6
30	DP28	1.87	3.12	15.5	3.47	5.83	6	18	24" RCP	8.0
31	PR29, PR30	4.02	7.61	20.6	3.05	5.11	12	39	36" RCP	9.8
32	DP29	1.69	2.54	15.4	3.48	5.84	6	15	24" RCP	7.7
33	DP30	0.28	0.46	9.5	4.21	7.07	1	3	18" RCP	5.1
34	PR32, PR33	1.97	3.00	15.6	3.46	5.81	7	17	30" RCP	8.0
35	PR31, PR34	5.99	10.61	21.3	3.00	5.03	18	53	36" RCP	9.5
36	DP 33	1.26	2.10	14.9	3.53	5.93	4	12	24" RCP	7.3
37	DP34, PR36	2.16	3.61	15.7	3.45	5.79	7	21	24" RCP	8.2
38	Pick-up from future At-grade inlets at DP-35 and DP-36	3.65	4.34	17.5	3.29	5.52	12	24	30" RCP	9.9
39	Pick-up from DP-38	1.17	2.55	18.0	3.25	5.45	4	14	24" RCP	9.9
40	PR-38, PR-39	4.82	6.89	18.0	3.25	5.45	16	38	30" RCP	13.1
41	Pick-up from DP-37	1.11	2.07	17.0	3.33	5.60	4	12	24" RCP	13.4
42 (Ultimate)	PR-40, PR-41	6.43	9.26	18.0	3.25	5.45	21	50	36" RCP	14.9
42 (Interim)	Collected flows from 15' at-grade inlets at Design Points 37 & 38	1.52	2.74	17.0	3.33	5.60	5	15	36" RCP	7.7

FLOOD PLAIN STATEMENT:
NO PORTION OF THIS SITE IS LOCATED WITHIN A FEMA FLOODPLAIN AS DETERMINED BY THE FLOOD INSURANCE RATE MAPS (F.I.R.M.) MAP NUMBERS 08041C 0535F AND 08041C 0575, WITH EFFECTIVE DATES OF MARCH 17, 1997 (SEE APPENDIX).

NOTES:
THIS MAP IS FOR DRAINAGE PURPOSES ONLY. SEE GRADING PLAN FOR APPROPRIATE GRADING INFORMATION.

N

200 100 0 200 400

SCALE: 1" = 200'

POND D DESIGN DATA:
(SEE UD DETENTION WORKSHEET)

TRIBUTARY ACREAGE = 75.03 AC. @ 27% IMP
WQCV REQ. = 0.88 AC-FT
EURV REQ. = 2.06 AC-FT

RELEASE:
Q5 = 0.6 cfs @ WSE = 7203.84 (2.14 AC-FT)
Q100 = 64 cfs @ WSE = 7205.77 (5.94 AC-FT)

EMERGENCY SPILLWAY ELEV. = 7206.00
EMERGENCY OVERFLOW ELEV. = 7206.94
TOP OF EMBANKMENT ELEV. = 7208.00

POND D STRUCTURE DESIGN DATA:

PIPE RUN 35 – 36" RCP (21.54 AC. @ 34% IMP.)
FOREBAY DESIGN:
261 CF REQ. – 268 CF PROVIDED W/18 IN. DEPTH & 6 IN. NOTCH

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NO.	REVISION	DATE
1	REVISED PER COUNTY COMMENTS	9-18-18
2	REVISED PER COUNTY COMMENTS	10-18-18

REVIEW:

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155 DATE

CLASSIC CONSULTING ENGINEERS & SURVEYORS SM
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Colorado Springs, Colorado 80903 (719)785-0799 (Fax)

PAINT BRUSH HILLS
FILING NO. 13E
FINAL DRAINAGE REPORT
PROPOSED CONDITIONS DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE	2/12/18
DRAWN BY	MAW	(H) 1"= 200'	SHEET	2 OF 2
CHECKED BY		(V) 1"= N/A	JOB NO.	2053.50